**THE DEVELOPMENT OF A CONCEPTUAL GUIDE FOR THE
WISCONSIN K-12 FORESTRY EDUCATION PROGRAM (LEAF)
URBAN FOREST SUPPLEMENT**

by

Sarah M. Gilbert

A Thesis
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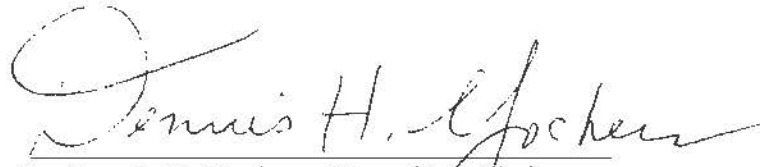requirements of the degree

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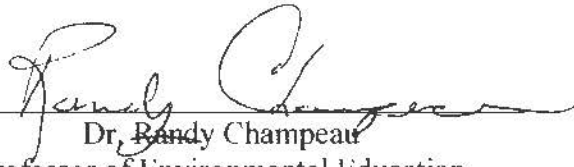(ENVIRONMENTAL EDUCATION)

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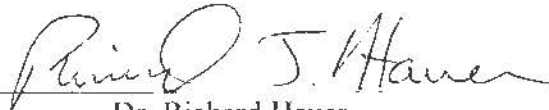Stevens Point, Wisconsin

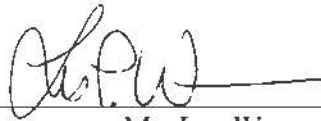
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APPROVED BY THE GRADUATE COMMITTEE OF:

Dr. Dennis H. Yockers, Committee Chairman
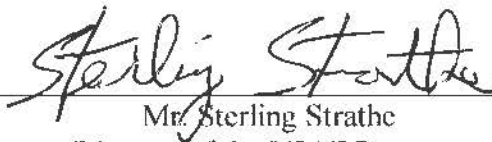Associate Professor of Environmental Education

Dr. Randy Champeau
Professor of Environmental Education

Dr. Richard Hauer
Assistant Professor of Forestry

Mr. Les Werner
Instructor of Forestry

Mr. Sterling Strathe
Director of the LEAF Program

Abstract

In 2002, the Learning, Experiences, and Activities in Forestry (LEAF) Program created a conceptual guide for K-12 forestry education to direct future forestry education efforts in Wisconsin. It focused on general forestry, its importance, and the factors influencing it. Forestry education stakeholders noted at the time that urban forestry needed a more specific education emphasis. As a result, LEAF is creating supplemental educational materials focusing on urban forests.

This study completes the first step in creating education materials with an urban forest emphasis. The result of the research is the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education.* The guide contains two parts: a conceptual framework and scope and sequence. The conceptual framework was created from input given by urban forest professionals and educators. It determines what should be included in the educational materials. The scope and sequence was created from teacher input and determines at what grade level the concepts should be taught. The scope and sequence also includes a list of the Wisconsin Department of Public Instruction Model Academic Standards addressed by the concepts.

The *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education* is being used to guide the creation of the urban forestry supplement to the LEAF materials. The supplement is intended to teach Wisconsin students about urban forests, as well as help students living in urbanized areas connect to all forests using the forest they live in as the basis for learning and understanding.

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CHAPTER 1

THE PROBLEM AND ITS SETTING

<u>Importance of the Study</u>

Wisconsin's forests and forestry are an important part of the economic,

environmental, and social health of the State (Finan, 2000). In order for today's students

to make responsible decisions about these forests in the future, they must have a basic

understanding of forest functions and values. Included in Wisconsin's forests are the trees

and other plants, animals, and nonliving components in our cities, towns, and villages.

These forests are referred to as urban forests. As with Wisconsin's other forests, urban

forests also provide economic, environmental, and social benefits students should know

about.

In 2001, the Wisconsin Department of Natural Resources - Division of Forestry

conducted a survey of Wisconsin residents in preparation for their State Forest

Management Plan. Four questions about urban forests were included; respondents were

asked their opinions about exotic species, absentee landowners in urban areas, increased

urbanization, and increasing development pressure. Results of the survey showed support

for including these issues in the state plan. However, comments indicated views ranged

from strong support of much needed attention to urban forests, to "I don't even know

how to respond," to complete denial of urban forests as part of Wisconsin's forest system.

It is clear that some citizens of Wisconsin do not understand the interconnectedness of the

ecosystems and social systems in different regions of the state. For example, they turn a

blind eye to the idea that what happens in Milwaukee can impact how forests are

managed in Northern Wisconsin and in turn forget that the forests of Northern Wisconsin supply goods and services to the residents of our cities and towns. They may also not realize or do not acknowledge that the pollution controlling qualities of trees, ability of trees to reduce the amount of energy used in heating and cooling, and an array of other services trees provide in cities can have a positive impact on all ecosystems of Wisconsin and beyond.

The idea that urban forests in Wisconsin have questionable value to some citizens is a concern considering population trends. Our society is becoming increasingly urban; almost 76 percent of Wisconsin residents live in a city, town, or village (U.S. Census Bureau, 2006). This urbanization may mean we are more disconnected from the natural world than previous generations. Education is the key to overcoming the disconnectedness.

Teachers in Wisconsin have access to concept-based forestry education materials developed by the LEAF (Learning, Experiences, and Activities in Forestry) Program. These materials provide lessons that teach about the importance of forests in Wisconsin. The materials are printed in multiple units titled with their unit number. For instance, the first unit in the series is the *Wisconsin K-12 Forestry Lesson Guide K-1 Unit* (LEAF, 2003). The units are based on the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* (LEAF, 2002). This conceptual framework and the accompanying scope and sequence were developed by LEAF to guide forestry education in Wisconsin. During the information gathering for that document, specific topics came to the forefront as areas that would need more attention. Urban forestry was one of those areas.

This study is the first step to creating an urban forest supplement for the *Wisconsin K-12 Forestry Lesson Guides*. The *LEAF Conceptual Guide for K-12 Urban Forestry Education in Wisconsin* created by this study will guide the development of the urban forest supplement. Whereas the *Wisconsin K-12 Forestry Lesson Guide* units help teach about forestry in general, the urban supplement will assist Wisconsin teachers in educating students about the value of and need for our urban forests. Additionally, it is hoped that the supplement can help teachers in urban areas teach the importance of forests in general by using familiar urban forest surroundings to engage students and ultimately make the *LEAF Wisconsin K-12 Forestry Lesson Guide* units more effective.

The Statement of the Problem

The purpose of this study is to develop a conceptual framework and a scope and sequence for an urban forest supplement to the *LEAF Wisconsin K-12 Forestry Lesson Guide*.

The Sub-problems

1. What are the important concepts about urban forests and urban forestry that students in Wisconsin should know by the time they graduate from high school?
2. In what grade level should concepts identified in the conceptual framework be taught?
3. How do the urban forestry concepts in the conceptual framework correlate to the Wisconsin Model Academic Standards?

The Limitations

1. The study will not replace the existing *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*, but will supplement it.

2. The study will not attempt to provide an urban forest education curriculum to users.

3. The study will not make recommendations about ways to implement the concepts into a curriculum.

Definitions of Terms

Concepts

An organizing idea about forests and forestry included in the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin.* Concepts act as headings for the more specific subconcepts.

Conceptual Framework

A document which lists important concepts about a particular subject and indicates several levels of detail.

Wisconsin K-12 Forestry Lesson Guide

A document created for use by teachers in Wisconsin. It was developed to incorporate forestry education into K-12 classrooms. It contains both classroom lessons and field enhancements.

<u>Scope and Sequence</u>	A document that details at what grade level and in what order important concepts should be taught.
<u>Subconcepts</u>	The specific ideas about forests and forestry that fall under the concept category.
<u>Urban Forest</u>	All of the trees, plants, and animals in a city or town.
<u>Urban Forestry</u>	The specific type of forest management that deals with the urban forest. It is the science of managing trees and associated vegetation within an urban environment.

Abbreviations

LEAF refers to Learning, Experiences, and Activities in Forestry - The Wisconsin K-12 Forestry Education Program

WCEE is the Wisconsin Center for Environmental Education

WDNR is the Wisconsin Department of Natural Resources

EE is Environmental Education

Assumptions

1. Concepts important to urban forests and urban forestry are somewhat different than the general forestry concepts in the *LEAF Conceptual Guide to K-12 Forestry Education.*

2. The urban forestry professionals involved in concept development will have a basic understanding of the education system in Wisconsin.

3. The educators involved in the scope and sequence work group will have a basic understanding of forestry and urban forestry.

4. Students in urban areas will see how forests impact their lives more easily by studying the urban forest.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter discusses literature relevant to the development of the *LEAF Wisconsin Conceptual Guide to K-12 Urban Forestry Education* for the LEAF Program. This literature review covers the following topics:

- Environmental Education in an Urban Environment

    - Urban learners and their families

    - Urban teachers

    - Urban environmental education strategies

- Urban Forests

    - A forest ecosystem

    - Social benefits

    - Economic benefits

    - Ecologic benefits

- Existing Forestry Education Materials

- Conceptual Guides in Environmental Education

- Wisconsin's Model Academic Standards

Environmental Education in an Urban Environment

The importance of teaching about the environment came to the forefront during the 1960s and 1970s. The Tbilisi Declaration (1978) outlines what environmental education is and why it is important. The aim of environmental education is to help students become aware, knowledgeable, skilled, dedicated citizens who are committed to work to improve and sustain the quality of the environment (Engleson & Yockers 1994). One of the keys to creating a citizenry that is concerned about the environment and willing take action for it, is to create a citizenry that has environmental sensitivity. Environmental sensitivity often comes from experiences learners have with the environment as well as interaction they have with role models (Sivek, 2002). The contact with nature that many people in rural, suburban, and urban areas have differs. This may change the approach to environmental education in these different areas.

Frank and Zamm (1994) contend that urban environmental education has the same objectives as traditional environmental education. The educational processes are fundamentally the same whether on a mountain top or on an urban street. They do say urban environmental education differs from traditional environmental education because of the context, diversity of audience, and relative abundance of educational resources available to teachers and learners.

Welsh (1993) notes that environmental education often focuses on the natural environment and study of things like wildlife and habitats. He says that this approach externalizes the environment, "locating it 'out there' in hedgerows and rain forests, the oceans and the atmosphere, and is likely to produce a disassociated and rootless form of environmental awareness." He reminds us, that most people's local environment is an

urban environment. Welsh (1993) further describes the underlying aim of urban environmental education in this way, "…to promote and develop an understanding of the urban environment as an integral part of the environment in both a local and a global context." This also serves as a descriptive link between urban environmental education and traditional environmental education.

Howard (1980) lists three aspects of urban environmental education: the natural environment, the built environment, and the social/political/economic environment. All three of these are important to include when teaching about urban areas. Howard (1980) further stresses these points:

- Knowledge of the urban environment is unevenly distributed; many people know little or nothing about the cities in which they live.
- Knowledge is power; therefore, greater knowledge of the environment is a prerequisite to greater mastery of it.
- By right, all individuals are entitled to maximize their knowledge and mastery of their environment in ways consistent with living in a civilized community. They are entitled to this because the urban environment is theirs, and its quality affects their lives.

Teaching about the urban environment, its importance to the lives of residents, and how it connects to other environments are necessary to complete understanding, and ultimately to action. This importance is illustrated in several studies.

In a study of teens on a wilderness experience, results implied that although programs that take teens to pristine natural areas hope to help them connect nature and humans, it actually has the opposite effect (Haluza-Delay, 2001). The teens felt that

nature was "out there" and was not present in their home environment. The results further suggest they had less concern for the environment where they lived because it wasn't really nature. He expresses the opinion that learning to look at the small wonders at home instead of focusing on pristine wonders away from home could be a useful technique to increase environmental sensitivity. Haluza-Delay (2001) also stressed, although these trips can be beneficial, it is to a very small population. The trips tend to take energy and interest from environmental needs of human-dominated environments where so many of us live. In other words, it addresses the nature component of Howard's (1980) comments, but not urban environment or connection to students' lives.

Similar comments were articulated by Frank and Zamm (1994) as they acknowledge that taking learners to natural areas can provide valuable opportunities for participants to gain deeper understanding of the environment. They caution however, "The implication to urban learners who are taken to rural nature centers is that their own homes and communities are not valid environments and are separate from the otherwise integrated functioning of the planet. At the very least, urban EE programs should strive to start where the audience is, rather than pack them off on field trips to more 'edifying' environments."

Similarly, Colwell (1997) presents his opinions on the idea of nature vs. culture in environmental education. He discusses the problems associated with the tendency to prohibit humans from being included in "nature" and also the problems with ignoring the exclusion of humans in certain situations. Instead of framing environmental education as nature – culture, we could use Earth system as the descriptive term. This would include all of the interactions on earth and allow the links to be accepted and studied. Colwell

(1997) also specifically addresses urban environmental education, saying that urban environmental educators have typically been on the defensive. The need to defend urban environment as environment is due to the nature – culture conflict (Colwell, 1997). Peters (1995) suggests that his Earth system approach would remove that hurdle, allowing urban environments to be part of a larger system of environments.

In further support of the notion of urban environmental education and the need to make it relevant, Peters (1995) writes, "An eco/social studies approach to environmental education allows urban students to become nature scientists as they study the character and composition of their communities." Peters says, "Students must appreciate, be concerned about, and be educated about the natural environment in their urban communities if they are to manage, maintain, and/or improve the quality of life there." He suggests students use nature that can be found in nearby, parks, wooded areas, ponds, creeks, for field-based activities. They can use classroom studies for directed learning lectures and demonstrations using thematic units. Peters also encourages students' involvement in community service projects to improve the environmental and social conditions of the community and to develop a sense of pride.

It is important in today's jam-packed school curriculums to make a case for the effectiveness of educating using the environment. According to a report by the National Environmental Education and Training Foundation (2000), environment as an integrating context can be successful. The report describes five case studies from schools around the country, including Hawley Environmental Elementary School in Milwaukee. In all of the schools profiled, achievement scores increased when using the environment as an integrating context. Specifically, Hawley students kept pace with, or exceeded Wisconsin

average scores for reading and math. Poverty and an urban setting did not seem to deter

academic achievement. As of the printing of the report in 2000, Hawley had 330 students

enrolled and 71% of them came from families that qualified for reduced price or free

lunches. As to the urban qualities of the school location, the school building had streets

on three sides and a paved playground on the third. This report suggests environmental

study can be beneficial and be successful in urban environments. Other non-formal

education programs exist in Milwaukee as well. Havenwoods Environmental Center,

Neighborhood House, and the Urban Ecology Center all provide environmental education

opportunities to students and teachers.

Urban learners and their families

An easy stereotype to make is that children who grow up in urban areas have less

concern for and understanding of the environment. Several studies contradict the

stereotype. Arcury and Christianson (1993) found no difference in environmental concern

or action between urban and non-urban students. Further, students growing up in an

inner-city environment have limited opportunities to explore nature, but still have a wide

range of images of nature (Wals, 1994). These images are developed from exposure to

nature in their community, incidental trips to forest areas, and nature-related media

coverage. Although these images may not be accurate, they do mean that these students

are indeed at least aware of nature.

A study in Australia revealed that young learners viewed the environment as an

object (Loughland, Petocz, & Reid, 2002). Students who view the environment as an

object may not see a need for themselves to take responsibility for it. This implies that

educational activities that focus on a subject driven activity to reach students may be more successful if they focused on the student's own experiences.

Another Australian study (Hillcoat & Forge, 1995) asked students in urban and suburban schools what they thought the word "environment" meant. The first answers included trees, animals, atmosphere, climate, etc. After further thought, students added schools and places they lived, either city or country. One student said, "First you think of animals and plants but then you think what's around us…the world and your place in it…..everything falls apart if you take one thing out." These Australian students (age 15-17) clearly considered urban areas as part of the environment.

A study done in an African American community in Houston Texas contradicts some notions about low income urban residents and environmental literacy. The study by Kahn and Friedman (1996) asked African American parents questions about their views of the environment and environmental education. The parents reported participating in recycling efforts, feeling that parks were important to their family, and a concern for environmental quality. When asked to rank the importance of education to prevent drug use and the importance of environmental education, there was no statistical difference in the responses. One parent put it well, "With the drugs you're not going to have a future and without any environment we're not going to have a future."

Kahn and Friedman (1996) cite numerous sources in saying that environmentalists often believe children need to experience pristine natural settings to appreciate the environment, and as a result educators question if environmental education can be done in an urban setting. Kahn and Friedman (1996) point out that their results show that educators can draw on other approaches, such as the use of locally relevant

environmental conditions that impact the families in the study. One approach they mention is using Shel Silverstein's book, The Giving Tree to foster empathy (Silverstein, 1964).

One woman in the Kahn and Friedman (1996) research told a story that is particularly relevant to the idea of urban forest education, "Yesterday, as my son and I were walking to the store and we were walking down Alabama [street] and for some reason, I think they're getting ready to widen the street. And it's a section of Alabama that I thought was so beautiful because of the trees and they've cut down all the trees. And you know it hurts me every time I walk that way and I hadn't realized that my son had paid attention to it, too. So, he asked me, he said, 'Mama, why are these, why have they cut down all the trees?' And then he asked me, 'Well, if they cut down all the trees everywhere, would that have an affect on how we breathe?'" The authors sum it up well in saying, "Thus our results suggest that nature in its splendor can be found everywhere, and that urban educators can look not only far off but close at hand for experiences from which to develop curriculum."

Frank and Zamm (1994) remind us that urban learners are a very diverse group. They are ethnically, culturally, socially, economically, and intellectually varied. With that in mind, it is challenging, but necessary to make urban environmental education activities meaningful by making them relevant to the lives of students.

Urban Teachers

Unfortunately, it appears that the idea of using the environment near to us is less appealing than using other environments. In one study (Simmons, 1993, 1998), teachers

in Chicago metropolitan area schools were interviewed about the perceived benefits and drawbacks to teaching environmental education in a natural setting. When questioned about the appropriateness of using sites which included deep woods, rivers, ponds, and marshes, a county park, and urban nature, the urban nature was viewed with the least enthusiasm, with rivers and ponds and deep woods being most appealing. Simmons (1998) suggests that to encourage teachers to use urban areas for environmental education, EE planners need to furnish them with a rationale for doing so. Simmons goes on to say, "Teachers need to understand why these settings are appropriate, why they are important learning environments."

In related research Simmons (1994) used the same pictures and asked third and fourth grade students in Chicago metropolitan area schools which area was most appealing. Students perceived the urban nature and school yard to be the most appealing to them and the rivers and ponds, and deep woods the least. This would indicate that teachers and students are looking at things from opposite sides. Teacher experience, personal likes and dislikes, fears, and abilities impacted teacher opinions. It should be noted that it appears play had a major impact on student impressions. One thing that Simmons (1994) calls critical to the children's perspective was the threat of danger. To be able to use the natural settings such as deep woods or rivers and ponds, teachers must prepare students with appropriate imagery for the unfamiliar setting. In parting words, Simmons says, "Finally, teachers must recognize that what they particularly like or find fascinating may not be shared by their students. However, utilizing a setting for environmental education that the children find particularly interesting should enhance their motivation for learning."

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Simmons (1999) has also studied training impacts on teacher use of natural areas. Approximately 56% of the teachers in her study had participated in environmental education training of some sort. Only 16% of the teachers had training in the use of urban nature. Simmons (1999) concluded that there was a strong relationship between site specific environmental education training and willingness to provide nature experiences.

Urban environmental education strategies

Petit and Gangloff (1995) encourage urban forestry advocates to remember the importance of stressing local connections. They say that the local connection will pique the interest of the people you are trying to reach more than a general or regional issue. Gary Moll is quoted as having said that he envisions urban forests as "training centers for handling larger environmental problems" (Field, 1993).

The first step in encouraging urban learners to take action on behalf of the environment is to convince them that their urban environment needs attention. The human systems in urban areas mimic natural cycles and sometimes give residents false assurance of their success. For instance, systems for treating storm runoff work to make that water "disappear" down a storm drain, traditional urban systems therefore appear successful at managing the water cycle. Because of this apparent success, the average citizen has little incentive to get involved with community environmental decisions (Petit & Gangloff, 1995). Hwang, Kim, and Jeng (2000) conclude from their study that if environmental educators want to change their students' intention to act, they should use materials that stimulate internal locus of control.

Sometimes a multiple topic approach is the best way to teach. A study done in Philadelphia examined the effectiveness for educating urban youth about forestry and how that education affected attitudes (Broussard, Jones, Nielsen, & Flanagan, 2001). The study used classroom exercises, urban forestry exercises in an urban park, and exercises in a working demonstration forest. They concluded all three were valuable, noting it was important to translate the educational experience into something students could relate to. The classroom exercises helped address any fears or discomforts associated with being in a forest, maybe for the first time. They found the working forest was more effective at changing attitudes about harvest and utilization, but the use of an urban park allowed students to make a connection with natural resources in a familiar place.

For those of us who are as comfortable in the forest as we are in our living rooms, it is important to remember that is not the case for everyone. A survey response from a study by Bixler and Carlisle (1994) relates an experience of a naturalist in a wilderness area. The naturalist reported the event by saying, "One small girl from the inner city was shivering and holding her arms while glancing upward. I asked if she was cold. She said, 'I'm afraid of the big things." [trees]."

The literature suggests many ways of approaching environmental education for urban learners to achieve success. One college professor in Charlotte North Carolina has developed an ecology and environmental science unit that uses the urban environment as a teaching tool (Fail, 1995). The curriculum focuses on technology's impact on environment. The investigations are done in field trips and during a research phase of the unit. Field trips begin with one to an urban park. Students observe and are asked to speculate about the system they are in and how it functions. They also visit an airport,

wastewater treatment plant, nuclear power plant, and incinerator. The final field trip is to a rural forest. Students observe the forest and are asked to explain how the human urban systems are designed to mimic natural systems they see.

While Martil-de Castro (1999) was a teacher-in-training in Toronto, she was concerned over the emphasis on nature experiences in places and situations that were inaccessible to her urban students. As she strived to incorporate environmental education into her curriculum, she found that some of the urban situations that she thought would inhibit environmental education were the most beneficial and useful. She used areas that lacked biodiversity to encourage observation skills and to help increase knowledge of biodiversity. These observations prompted students to question why biodiversity was lacking. She also used the biodiversity and diversity of cultures in her classroom to engage students in learning.

Urban forests and trees are often listed specifically in strategies for teaching urban environmental education. For example, three of the six suggestions by Frank and Zamm (1994) in response to the question, "What Can Students do Outdoors in the City?" are urban forest related activities.

- Find out how buildings and trees affect local climate. Measure the air temperature on four sides of a building, above a street, under a tree.
- Assess street trees. Inventory which species are used in your area, and evaluate which species grow best, provide the best shade, and so on. Follow up with letters to the city parks department.
- Examine residential use of outdoor greenery. Observe and ask questions to determine what features of parks are most attractive.

Awareness is an important step in urban environmental education. Fisman (2005) studied third and fifth graders in Connecticut who had participated in an urban education program that focused on their local area. Students were asked to draw maps of their home before and after the education program. During the program students were asked to find a "special tree" to describe as part of an activity. She found that 69% of the students included their "special trees" when drawing their second map. Fisman reports that knowledge levels also increased significantly.

A group called the Washington D.C. Youth Tree Corps teaches students using classroom activities, field trips, and tree planting. One focus of the program is to introduce students to careers in forestry they might not have known about (Gangloff, 1993).

Urban Forests

A forest ecosystem

The definition of a forest according to the *Dictionary of Forestry* (Helms, 1998) is, "an ecosystem characterized by a more or less dense and extensive tree cover, often consisting of stands varying in characteristics such as species composition, structure, age class, and associated processes, and commonly including meadows, streams, fish, and wildlife." The *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*, (2002) defines forest as "an ecosystem characterized by a dominance of tree cover and they contain a variety of other organisms (e.g., other plants, animals)." The *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* also defines an ecosystem as "An area

that contains organisms (e.g., plants, animals, bacteria) interacting with one another and their nonliving environment."

The images of a forest conjured up in the minds of most people involve acres of woodlands with large trees, small trees, shrubs, forbs, and herbs. Rarely do we envision people as part of a forest. The Wisconsin Department of Natural Resources-Division of Forestry (Finan, 2000) defines urban forests as, "All of the trees and other vegetation in and around a city, village, or development." A closer look at the definition of forest shows that the urban forest truly fits the description as well as any other. An urban forest contains living (biotic) things like trees, shrubs, flowers, grasses, animals, insects, birds, and also contains nonliving (abiotic) factors such as sunlight, water, pavement, soil, cars, and wind. Humans have modified soil, created pollution, removed vegetation, planted other species, and paved acres of land (Moll & Petit, 1994). Frank and Zamm (1994) state that humans are the dominant organism in the city. They point out that all the functions that take place in "natural" ecosystems also take place in cities, but cities are affected more by human government, economy, and culture. According to the Wisconsin Department of Natural Resources-Division of Forestry publication *Wisconsin Forests at the Millennium: an Assessment* (Finan, 2000), Wisconsin has 1.7 million acres of urban forest. That represents about 4.7% of Wisconsin's land area.

Just as rural forests provide important functions that support the social, economic, and ecologic systems of Wisconsin, so do urban forests. Many of the examples that will be identified in each of these areas fit into more than one area. It is for these reasons that public support for the health and even the existence of urban forests is vitally important.

Social benefits

Just as with a rural forest, urban forests provide many values. Numerous studies have been done about the social and psychological benefits of "green" in urban environments. The findings of the studies make a strong case for the importance of urban forests.

Urban vegetation plays an important role in alleviating urban residents' stresses. Urban public housing residents who lived in buildings without trees and grass nearby were asked about how they cope with major life issues. They reported more procrastination and assessed their issues as more severe than residents with green nearby (Kuo, 2001).

Although there are studies that link vegetation and fear of crime, Kuo and Sullivan (2001b) suggest a different perspective. They found that apartment buildings with high levels of greenery had approximately one half of the property and violent crimes than those with little no vegetation. A similar study by Kuo and Sullivan (2001a) that examined the potential relationship between aggression and violence found that residents living in areas without nearby nature reported more aggression and violence than those living with nearby green.

A study done with children with Attention Deficit Disorder (ADD) found that children with ADD were better able to focus and concentrate after playing in natural, green settings, than in those where concrete was predominant (Taylor, Kuo, & Sullivan, 2001). Another study involving children in the inner-city and the impacts of near-home nature on self-discipline found that, on average, the more nature a girl is exposed to near home, the higher her self-discipline. (Taylor, Kuo, & Sullivan, 2002)

<u>Economic benefits</u>

The economic benefits of the urban forest are increasingly being documented. This documentation process is still in its infancy, however (Wolf, 2005b). Economics often becomes the language when it comes to urban forest management. Budgets of municipalities must cover an array of services. The benefits of an urban ecosystem must often be proven to secure funding and costs are more easily accounted for than benefits (Wolf, 2005b). Benefits can be calculated, however, and McPherson, Simpson, Peper, Maco, and Xiao (2005) found that for every dollar spent the benefits returned were worth from $1.37 to $3.09 in five U.S. cities.

Trees can save money through reduced energy costs. Cities create what is referred to as a heat island. The concrete, asphalt, buildings, and other surfaces collect and hold heat from the sun. Shading, evapotranspiration, and wind-speed reduction all help conserve energy in buildings (McPherson, Simpson, Peper, Maco, Gardner, Cozad, & Xiao, 2005). As referenced in McPherson et. al. (2005), another study by McPherson has found that trees placed in the proper location can reduce total heating and cooling costs by eight percent for one year in Minneapolis, Minnesota.

Trees not only reduce home heating and cooling costs, but also increase the value of property. Research suggests that property value with trees can increase three to seven percent (McPherson et. al., 2005).

Some economic benefits are the result of the presence of trees and the impact they have on consumer spending. Recent research suggests that consumers perceive shopping areas with a green streetscape have a more positive image, atmosphere, and comfort

level. In addition to those perceptions, people were willing to pay 9.2% more for products in a shopping area with trees (Wolf, 2005a).

One under-utilized economic benefit that urban trees can provide is based on products. Municipalities and tree services across the country have come up with ways to use the wood that is cut from an urban forest (Bratkovich, 2001). Products include specialty furniture, musical instruments, lumber for shelters, and artwork. Revenue from the wood of urban trees could be used to defray the cost associated with the removal, making trees an even better investment.

Ecologic benefits

Benefits often fall into more than one category; such is the case for energy savings. Not only does reducing energy consumption save money, it has ecological benefits as well. With reduced energy consumption comes reduced pollution (McPherson et. al., 2005). Urban forests provide four main air quality benefits:

- They absorb gaseous pollutants (e.g., ozone, nitrogen oxides, and sulfur dioxide) through leaf surfaces.
- They intercept particulate matter (e.g., dust ash, pollen, smoke).
- They release oxygen through photosynthesis.
- They transpire water and shade surfaces, which lowers air temperatures. This reduces ozone levels.

Specific ways trees help reduce air pollution according to McPherson et. al. (2005) include: absorbing the gaseous pollutants through leaf stomata during the normal exchange of gases, binding or dissolving water soluble pollutants onto moist leaf

surfaces, intercepting and storing larger particulates on outer leaf surfaces, the epidermis, which may be waxy, resinous, hairy, or scaly, and capturing and storing particulates on the uneven, rough branch and bark surfaces.

Trees can also impact runoff. Water runoff from precipitation is dealt with by city storm water systems. However, most of the methods used create a host of problems like pollution, failure to recharge groundwater, and loss of wildlife (Petit & Gangloff, 1995). Trees have a positive impact on this problem. McPherson et. al. (2005) list the following ways trees can reduce runoff, and therefore reduce a variety of problems associated with the runoff:

- Leaves and branch surfaces intercept and store rainfall, thereby reducing runoff volumes and delaying the onset of peak flows.
- Roots increase the rate at which rainfall infiltrates soil and the capacity of soil to store water, thereby reducing overland flow.
- Tree canopies reduce soil erosion by diminishing the impact of raindrops on barren surfaces.
- Transpiration through tree leaves reduces soil moisture, increasing the soil's capacity to store rainfall.

Existing Forestry Education Materials

A review of existing forest-focused education materials revealed a wide array of types of materials. Those discussed here have specific ties to urban forests.

The Wisconsin Department of Natural Resources-Division of Forestry sponsors an annual poster contest from the Arbor Day Foundation. In 2004, to celebrate the

centennial of forestry in Wisconsin, LEAF created a booklet specific to Wisconsin. It was titled, *Rebuilding Our Forests: One Hundred Years of Forestry in Wisconsin* (Strathe & Nyquist, 2004). The contest booklet contained an activity called, "Urban Trees on TV."

Discovering the Urban Forest Activity Book (South Carolina Forestry Commission, 1999) is a collection of activities for fourth through seventh grade students. It identifies a purpose, and the ideas and activities get more complex as you proceed through the book. *Planting Trees in Your Community Forest*, (Elmendorf & Smith, 1999) is another collection of activities. It contains much information about trees, planting, and care; it is designed for a child to use independently.

The United States Department of Agriculture Forest Service (USDA Forest Service) has two notable resources for urban forestry education. *Urban Forestry Laboratory Exercises,* (Kupkowski, Cave, Prichard, Turner, Watson, & Dwyer, 1996) is a set of indoor laboratory and field activities for elementary, middle, and high school students. The materials identify objectives and goals for learning and present activities to achieve them. This comprehensive resource is available on the USDA Forest Service website.

Another USDA Forest Service publication is in its *Natural Inquirer* series. The urban forest edition (McDonald, Nickelsen, & Heyer, 2005) is designed for teachers to give to students. It contains scientific research written for middle school student understanding. The materials give them information about the research that has been conducted, then encourages students, through activities, to go investigate for themselves.

The well known *Project Learning Tree* (PLT) (American Forest Foundation, 2001) and the *LEAF K-12 Forestry Education Lesson Guide*, (2004) have a number of

educational activities in them that are easily used in urban environments. Although these materials can be used in an urban setting, they are not all designed specifically for it. The University of Florida Extension, however, has created a supplement to the PLT materials for urban forests (deVera & Monroe, 2004). The supplement identifies three goals. Each goal is addressed by identifying existing PLT activities that can be modified to meet the goal. In addition, new activities are included to address the goal.

The Talking Tree is a story book which describes trees' needs (Cherry & McKenzie). *The Forest Where Ashley Lives* (Vitosh, 2000) is another story book. It tells about the urban forest through the eyes of a young girl. It also contains "Did You Know?" facts about trees and urban forests along with the narration.

There are technology tools that can be used in teaching about urban forests as well. In an article in *American Forests*, Brown (2005) examines uses of American Forests' CITYGreen software in classrooms. This software is GIS based and offers students a chance to use technology along with field experiences to learn about the values of urban forests.

Materials also come in the form of videos with accompanying materials. *From Sidewalks to Treetops: The amateur's guide to exploring nature in your neighborhood* (Cabán, 2003) is a video produced by the Girl Scouts. It gives step by step instructions on how to conduct environment based activities and is intended for leaders who may not have experience with environmental education.

Another video and activity combination is, *The Forest Where We Live: A Six-Part Series* (Tizzard, Rubin, & Jeanne, 1999). This set of materials has recognizable goals, lists national science education standards it addresses, and also references The *Excellence*

in Environmental Education-Guidelines for Learning (K-12) (North American

Association for Environmental Education, 1999 & 2000). The materials are aimed at fifth

through twelfth grade students.

Conceptual Guides in Environmental Education

The design of educational materials is an evolving process. Increasingly, fact-

based curriculum is being seen as less effective than using broad ideas to educate

(Wiggins, McTighe 1998; Erickson, 1998, 2001). The system used to create the

curriculum varies, but authors often use portions of other systems in their own theories

(Erickson 1998, 2001).

Wiggins and McTighe (1998) have created "Understanding by Design," a

technique to assist in lesson and curriculum planning. They refer to their technique as a

backward design process. The Understanding by Design technique asks educators to

consider what they want students to learn before they create activities. The technique is

"backwards" because educators often create lessons by coming up with great activity and

only after that, if ever, do they consider what they want their students to learn. Wiggins

and McTighe (1998) list three stages in their process: 1. Identify desired results. 2.

Determine acceptable evidence. 3. Plan learning experiences and instruction. The first

step of their process is where the creation of a conceptual guide relates to the process.

Erickson (1998) defines a concept as, "…an organizing idea; a mental construct

that categorizes a variety of examples." Erickson also points out that concepts need to

"spiral" through grade levels. This allows them to become more complex through time.

Concepts can be used to organize integrated curriculum, when many subjects are taught

simultaneously with one effort, or may be used as a single subject curriculum. The current LEAF curriculum falls into both categories. It focuses on forestry, but uses social studies, math, science, visual arts, and language arts to do so.

The North American Association for Environmental Education (NAAEE) has published documents that offer concept guidance. *Essential Learnings in Environmental Education - A Database for Building Activities and Programs* (1990) lists concepts designed to address the goals of the Tblisi Declaration (1978). The handbook is intended to provide building blocks for educators who are designing or reviewing environmental education materials. In addition, NAAEE has published *Excellence in Environmental Education: Guidelines for Learning (K-12)* (1999, 2000). This document is designed specifically for the K-12 educator audience and includes skills and processes in the format. It is divided by grade levels.

Conceptual guides have been developed for a number of environmental education materials. Perhaps the most recognizable names in national environmental education curriculum, PLT (American Forest Foundation, 2001), Project WILD (Council for Environmental Education, 2001), Project WET (The Watercourse & the Council for Environmental Education, 1995), and Windows on the Wild (World Wildlife Fund, 1999), all used a conceptual framework in the creation of their documents.

Another Wisconsin-based program, and the basis for the structure of the LEAF Program, is the K-12 Energy Education Program (KEEP). KEEP has developed the *Wisconsin K-12 Energy Education Program A Conceptual Guide to K-12 Energy Education in Wisconsin* (KEEP, 2003). Since the initial publication, KEEP has added renewable energy concepts into the guide to accommodate the expanding scope of the

materials they provide. The document is divided into themes with concepts included within them.

The Center for Land Use Education, located at the University of Wisconsin-Stevens Point, used the KEEP and LEAF conceptual guides as models to develop a framework for land use education (CLUE, 2005). It also uses themes and concepts.

The *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* (LEAF, 2002) serves as the basis for the future development of conceptual frameworks in the LEAF program. This existing document was created with the KEEP and Windows on the Wild conceptual frameworks as references. The document has proved to be a strong guiding force in the creation of educational materials for the LEAF program. The document contains two sections, a conceptual guide and a scope and sequence. The conceptual guide lists four themes and each theme contains several concepts with further divided subconcepts within them.

The four themes, posed as questions, and the concepts within them in the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* (LEAF, 2002) are found in Figure 2.1.

Theme 1 What is a forest?
        Definition of a forest
        Classification of forests
        Trees as part of the forest
        Forests as ecosystems
        Biodiversity and forests

Theme 2 Why are they important?
        Historical importance
        Current importance
        Future importance

Theme 3 How do we sustain them?
        Forest owners
        Definition of forest management
        Reasons to manage forests
        Forest managers
        Forest management decisions
        Forest management issues

Theme 4 What is the future?
        Studying forests
        Your connection to forests
        The future of forests

Figure 2.1 *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* **themes and concepts.**

In addition to the conceptual frameworks used to guide the development of the

LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin (LEAF, 2002), the

Atlas of Science Literacy – Project 2061 (American Association for the Advancement of

Science, 2000) was used as an example to set up the scope and sequence section of the

document that was not included in many of the conceptual frameworks. The scope and

sequence identifies concepts appropriate for each grade level. It also identifies the

Wisconsin Model Academic Standards that can be addressed by the concepts.

In moving forward with the development of the *LEAF K-12 Urban Forestry Conceptual Guide*, a recent addition to PLT will be referenced. DeVera and Monroe at the University of Florida have developed, *Urban Forests: A Supplement to Florida's Project Learning Tree* (2004). This document includes a conceptual framework with three goals. Each goal contains learning goals and the concept addressed. The goals and concepts are found in Figure 2.2.

Goal 1: Increase youth's awareness of their urban forest ecosystem

Learning Goal: Students will learn about the ecology of their local forest habitat through: observing, measuring, and finding patterns.

Concepts: Growth-Development, Mapping-Exploring, Urban Forest Ecology

Goal 2: Increase youth's understanding of the benefits and costs of their urban forest

Learning Goal: Students will be able to explain the benefits provided by an urban forest.

Concepts: Benefits

Goal 3: Engage youth in opportunities to monitor, maintain, and enhance the urban forest

Learning Goal: Students will be able to assess forest health and design activities to improve their community's urban forest.

Concepts: Forest Health, Community Projects

Figure 2.2 Florida *Project Learning Tree* urban forest supplement learning goals and concepts.

Wisconsin's Model Academic Standards

The Wisconsin Department of Instruction (WDPI) has created a set of documents that list the education standards for Wisconsin. The environmental education document is referenced here (Grady, S.M., Lee, S.A. & Marinac, P.A., 1998). WDPI describes academic standards with the following explanation: "Academic standards specify what students should know and be able to do, what they might be asked to do to give evidence of standards, and how well they must perform. They include content, performance, and proficiency standards."

WDPI describes the need for standards by saying that standards serve as goals for teaching and learning. WDPI says further that if no standards are set, students may be unmotivated and confused. They may lack the ability to acquire the knowledge and skills necessary for success.

The *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* (LEAF, 2002) lists the Wisconsin Model Academic Standards that apply to each of the concepts included in it. Subject areas included are agriculture, environmental education, science, and social studies. The listing of standards is one of the purposes of the scope and sequence section of the document. Further, the *LEAF Wisconsin K-12 Forestry Lesson Guide* (LEAF, 2004) lists the standards that each lesson addresses. Grounding the materials in the standards teachers in Wisconsin observe, validates the use of the materials in classrooms. Since the program is a Wisconsin specific program, the Wisconsin standards were identified as the appropriate choice, as opposed to using the existing National Standards as some other materials do.

<u>Summary</u>

Urban environmental education has the same general goals as environmental education. Learners in urban areas are generally concerned about the environment, but often have the impression that the environment is "out there" and is not part of their day to day life. It falls to educators to promote awareness and understanding of all aspects of environment including the environment around us every day. There are benefits to using an environment students are familiar with to teach them new concepts. Reaching students with things they can see and investigate, allows them access to an issue they can take action on.

The urban forest is sometimes ignored by educators and even its residents. The urban forest is, however, a forest. It is an ecosystem containing living and nonliving things interacting together. This ecosystem has impacts beyond geopolitical boundaries. Even more than the ecologic impacts and benefits, it also impacts social and economic systems. Recent studies show social impacts such as crime reduction, reduction in violence, and increased consumer spending because of the sight of green in our cities. Economic benefits can now be calculated using comparisons between the cost of maintaining trees to the cost of treating storm water and the cost of cooling buildings without trees to shade them.

There are existing forestry education materials that deal with an array of important forest education ideas. Few, however, are solely based on urban forests and none are specific to Wisconsin.

To create sound educational materials, one must first identify what the goals of those materials are. One system used to do this is to create a conceptual framework.

Concepts can be used to guide the creation of educational materials to meet a specific focus, like urban forests. The same concepts can also remain general enough to guide a wide array of types of educational materials created with them.

The Wisconsin Department of Public Instruction has created a set of academic standards that schools strive to meet. By aligning the concepts in a framework to these standards, it becomes easily justifiable as an educational tool. This allows for easier integration into existing curricula.

Combining the use of environmental education with an understanding of the urban forest can help teach students about the importance of the forest outside their door. Once that basic connection to trees and forests as been made, students will have a strong base to learn about other concepts and different forests. Both of these ideas, urban environmental education and urban forestry, can come together to aid the forward movement of both.

CHAPTER 3

METHODS

<u>Overview</u>

During the development of the *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education*, concerns arose about how well the topic of "urban forest" was being addressed. Although the concepts included in the *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education* do encompass urban forestry, it was decided that more specific urban-focused materials should be developed as a future project. Related to those concerns were others that students in urban areas may not be able to make personal connections to forests as represented in the original concepts. A suggestion was made by LEAF staff that an urban forestry supplement to the *Wisconsin K-12 Forestry Lesson Guide* could be produced. Since the existing *Wisconsin K-12 Forestry Lesson Guide* fulfills many of the forestry education needs of students across the state, information was needed to determine what specific urban forestry related lessons should be taught. The first step in that process is to create an urban conceptual framework and scope and sequence. This chapter describes the methods used to determine what urban forestry concepts are important for students in Wisconsin to learn by the time they graduate from high school and at what grade level those concepts should be taught.

Statement of the Problem

The purpose of this study was to develop a conceptual framework and scope and sequence for an urban forest supplement to the *Wisconsin K-12 Forestry Lesson Guide*.

Sub-problem 1 Methods

Sub-problem 1: What are the important concepts about urban forests and urban forestry that students in Wisconsin should know by the time they graduate from high school?

The process used to create the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* was the model for this project (LEAF, 2002). The methods used in this project followed similar steps used in the development of the main LEAF framework.

As with the development process for the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin,* the basis of the technique used for the conceptual framework development of this project is the Nominal Group Technique (NGT). The NGT was first developed in 1968 (Delbecq, Van de Ven, & Gustafson, 1975). The basic steps involved in the technique are:

1. Silent generation of ideas in writing.

2. Round-robin feedback from group members to record each idea in a terse phrase on a flip chart.

3. Discussion of each recorded idea for clarification and evaluation.

4. Individual voting on priority ideas with the group decision being

mathematically derived through rank-ordering or rating.

As was mentioned, the NGT was the basis for the process used to develop the

LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin. The technique and

modifications used in that process were the recommendation of Dr. Corky McReynolds

who was the facilitator. In both the initial LEAF conceptual framework process and this

urban forest conceptual framework process, the NGT was used as the foundation, but

different information gathering and ranking techniques were incorporated as are

described in the specific tasks below.

Task 1.1: Adapt the themes and concept headings from the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* to reflect urban forestry.

The *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* is divided

into themes, concepts, and subconcepts. The themes are posed as questions: What is a

forest? Why are forests important? How do we sustain them? What is the future? Each

theme is followed by concepts that address the question, and the concepts are further

divided into numbered subconcepts. The themes are arranged so that they build on each

other. Students progress from a basic understanding of forests to the understanding of

forests in a social context. These divisions came about during the creation process for the

document. Because the basic set up of the *LEAF Conceptual Guide to K-12 Forestry

Education in Wisconsin* has been successful, it has been used as the outline for the *LEAF

Conceptual Guide to Urban Forestry Education in Wisconsin* which was created by this

project. The researcher used the themes in the *LEAF Conceptual Guide to K-12 Forestry*

Education in Wisconsin to create the four urban forestry themes and the concepts that

relate to (Figure 3.1).

What is an Urban Forest? - Definition of an Urban Forest; Classification of Urban Forests; Trees as Part of the Urban Forest; Urban Forests as Ecosystems; Biodiversity and Forests

Why are they important? - Historical Importance; Current Importance; Future Importance

How do we sustain them? - Forest Owners; Definition of Forest Management; Reasons to Mange Urban Forests; Urban Forest Managers; Urban Forest Management Decisions; Urban Forest Management Issues

What is the future? - Studying Urban Forests; Your Connection to Urban Forests; The Future of Urban Forests

Figure 3.1 Four Urban Forestry Themes and Concepts

Task 1.2: Invite urban forestry education stakeholders to submit suggestions for urban forest related ideas they feel are important for students to learn.

A list of urban forest stakeholders was provided by Wisconsin Department of

Natural Resources-Division of Forestry State Urban Forest Coordinator, Richard Rideout.

In addition, existing LEAF contacts were included in the list. (Appendix A) Stakeholders

included representatives from the Wisconsin Urban Forestry Council, the tree care

industry, municipal foresters, utilities, the United States Department of Agriculture Forest

Service, the Wisconsin Department of Natural Resources, and the University of

Wisconsin - Stevens Point. This group was sent a letter requesting their input. The letter

explained the purpose of the project and asked them to use an enclosed reply envelop to

add their ideas to the outline created in Task 1.1 (Appendix B). The letter also stated that

the materials included in the packet could be accessed on the LEAF website and encouraged them to tell others who may want to contribute their ideas. The letter also requested information about existing urban forestry education materials stakeholders were aware of. This information would not be used in this project, but would be helpful in future steps to create education materials. Time given to return comments was approximately five weeks.

In addition to the letter that was mailed, a similar letter and the same outline was posted on the LEAF website (Appendix C). There was an open invitation to anyone interested to submit their ideas using the materials posted there.

Task 1.3: Compile submissions and re-write to create a consistent format.

In addition to stakeholder responses to themes and concepts, a review of existing urban forestry materials in the LEAF collection was used to identify potential ideas to add. Returned suggestions from stakeholders were copied verbatim by hand from the returned comments onto half sheets of paper along with the ideas gathered from the literature. These ideas were coded by the concept the submitter put them under so that the original intent would not be lost. The ideas were grouped based on their general topic. If more than one idea had the same focus, they were grouped and re-written under one main idea with the original ideas stapled behind it. Other ideas were re-written for consistency, but were not grouped because the ideas were unique. After this grouping and re-writing, the concepts from the outline document were removed, leaving only the four themes and the ideas in those themes.

Task 1.4: Conduct a concept focus group meeting to offer guidance to identify the most important ideas submitted.

In order to choose a date for a meeting, urban forestry stakeholders were identified by Richard Rideout and were mailed a letter requesting them to provide the dates they could participate (Appendix D). The date that had the most people and key people available was chosen for the meeting. The meeting would be referred to as a concept focus meeting.

In addition to those on the list, individuals with experience in education were identified and invited to the meeting. These individuals included: a LEAF adjunct faculty member with general forestry knowledge, an environmental educator with experience with urban audiences, a graduate student studying urban forestry who had previously been a classroom teacher and Dr. Dennis Yockers from the Wisconsin Center for Environmental Education at the University of Wisconsin - Stevens Point who participated in the role of environmental educator to keep groups balanced during the process.

After the meeting date and participants were established, an email was sent to confirm that those who had indicated availability were coming. The list of ideas for them to comment on was distributed so they could be revised by the date of the meeting (Appendix E).

Sunshine [Kapusta] Buchholz of the LEAF Program was chosen to facilitate the meeting due to her previous experience and involvement with the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* development process. Assisting Buchholz was Jessica Tomaszewski, another LEAF employee. Originally four groups were planned, but due to inclement weather, a number of people were unable to attend

the meeting. The groups were rearranged into three groups of approximately the same number of individuals with the same variety of interests in each group as was the original intent.

The agenda for the meeting is included in Appendix F. Groups were given a paper copy of the themes and ideas (Appendix G). The information on the paper copy was also listed on poster paper by theme around the room. The poster paper included a letter or group of letters by each idea for reference so that the ideas could be differentiated during the process if needed.

Each group was assigned a theme to begin with. They were given twenty-five minutes to consider the ideas on the list. Each person was given a specific number of colored dot stickers determined by n/3 with n being the total number of ideas in the theme. (Fig. 3.2.)

Theme 1 – What is an urban forest? – 6 green dots

Theme 2 – Why are they important? – 6 blue dots

Theme 3 – How do we sustain them? – 8 red dots

Theme 4 – What is the future? – 6 yellow dots

Figure 3.2 Number of dots per person per theme.

Participants were instructed that they could place dots on any idea within the theme that they felt were important. They were allowed to place more than one dot on an idea if they chose. Participants were told that ideas that had fewer dots or no dots would not be eliminated. Groups rotated around the room so they had time to spend at each of the four themes. After the themes were "dotted" the individuals were asked to put any

thoughts they had about the themes, ideas, or grouping onto chart paper next to each theme.

A step included in this process that was not included in the creation of the original LEAF Conceptual Guide is the placing of "no" dots. Individuals were given four red dots that they were to place on ideas they felt should be removed. This was done because, without this step, the researcher cannot remove ideas from the list with any certainty using this system.

To end the process, participants looked at each of the themes as a group and discussed any questions they had with each other. Additional notes and clarifications were written on the chart paper. The researcher compiled information from the theme sheets and chart paper into a document. The document was sent to concept meeting participants for their feedback. This step was used to verify that participant ideas were accurately captured.

Task 1.5: Use the information gathered to create a draft conceptual framework.

Additional comments gathered and the information gathered in Task 1.4 were used to refine the list of ideas. The ideas would become what subconcepts in the final version of the document, and were eventually grouped under concepts. For the purpose of narrowing the number of subconcepts, the midpoint between the greatest number of votes in all themes and the least number was identified. Those subconcepts receiving votes above that point were included automatically and those below were set aside for further consideration Subconcepts that only received "no" votes were removed. Subconcepts that did not receive a vote of any kind were not immediately removed. Comments made on the chart paper were used to combine ideas that meeting participants felt were alike. Staff

from LEAF reviewed the initial grouping of ideas to validate the grouping. Their experience in creating and using the original *LEAF Conceptual Guide* greatly assisted the validation step.

As a follow-up, results of the concept focus meeting and the draft of the *LEAF Urban Forestry Conceptual Framework* were sent in an email to participants for comment. The comments received were used for further modification.

Task 1.6: Create a final draft of the conceptual framework.

After completion of the draft of the scope and sequence section, the entire document was sent to the stakeholders identified in Task 1.2. In addition, the educators who participated in the scope and sequence meeting, LEAF adjunct faculty, graduate committee members, and LEAF staff were included in the review of the final conceptual framework draft. Their comments were considered and changes were made as appropriate.

<u>**Sub-problem 2 Methods**</u>

Sub-problem 2: In what grade level should concepts identified in the conceptual framework be taught?

Task 2.1 Conduct a scope and sequence focus meeting with teachers and environmental educators.

A group of teachers from Neenah, Wisconsin and Milwaukee, Wisconsin were gathered. Some of the teachers chosen had past experience with the LEAF Program, some did not. The teachers had contact with students in varying levels of urban

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development, and were willing to attend the meeting. The meeting was held at Havenwoods Environmental Center in Milwaukee, Wisconsin.

The group included teachers from different grade levels and environmental educators with different expertise in various grade levels. Participants were divided into three groups representing K-4, 5-8, and 9-12. There were three people in the K-4 group, three people in the 5-8 group, and two people in the 9-12 group (Appendix H). Each participant was sent a packet of information prior to the meeting (Appendix I).

The agenda for the day outlined the process and noted that if time remained additional information would be gathered. The additional information gathered was about the differences and similarities of urban and suburban students along with information about they types of activities the teachers would recommend. This information was not used in this project, but will be helpful in future steps to create educational materials.

Each group was given a set of index cards with the subconcepts identified in Task 1.5 printed on them. Groups then determined if each subconcept would be appropriate to teach in the grade levels they represented. Additionally, participants were asked to identify at what grade subconcepts would be introduced, would appear in the middle, or would be mastered. The high school group was also asked to note the class they thought it might apply to. Any subconcepts that the participants did not think should be included were noted.

Once the groups had discussed individually and placed their index cards on chart paper, the whole group discussed the placement. Where there was contrast in placement between grades, consensus was reached through discussion, and clarification was added to the index cards as needed.

Task 2.2 Use input from Scope and Sequence meeting to create draft scope and sequence.

The results of the scope and sequence meeting were compiled. Modifications to the placement of subconcepts were made based on how completely the participants felt students in the grade level were able to understand the subconcept. Subconcepts that could only have a single portion of the subconcept introduced at a grade level rather than the entire subconcept introduced were removed from that grade level.

Task 2.3 Create a final draft of the scope and sequence section.

Once the changes were made to the scope and sequence original suggestions, the draft was combined with the conceptual framework. Both were sent to the educators who participated in the scope and sequence meeting for comment as well as the participants in the concept focus meeting, graduate committee members, LEAF staff, and LEAF adjunct faculty members. Their comments were incorporated and a final draft of both documents was created.

Sub-problem 3 Methods

Sub-problem 3: How do the concepts in the urban forestry conceptual framework

correlate to the Wisconsin Model Academic Standards?

Task 3.1 Identify Wisconsin Model Academic Standards that apply to each theme.

After the draft scope and sequence was created, subconcepts within each theme

were evaluated. The Wisconsin Model Academic Standards that apply to each theme

taught at the different grade levels were identified. Subconcepts were reviewed and

correlated to the Model Academic Standards for Agriculture Education, Environmental

Education, Science, and Social Studies. These areas of the standards were chosen to

maintain consistency with the *LEAF Conceptual Guide to K-12 Forestry Education in*

Wisconsin. The standards identified were then listed in the scope and sequence and were

written out in the *LEAF Conceptual Guide to K-12 Urban Forestry Education in*

Wisconsin. The correlations made between standards and the subconcepts were reviewed

and commented on by and environmental educator.

Summary

This study used qualitative data to determine and justify the content of the *LEAF*

Conceptual Guide to K-12 Urban Forestry Education in Wisconsin. The process began

by gathering input from urban forestry stakeholders from Wisconsin and the Midwest.

This input included the ideas these stakeholders felt were important for Wisconsin

students to know about urban forestry.

The ideas were refined and the most important of them were identified by a focus group which included urban forestry stakeholders and educators. Results of that meeting were used to create a draft of the conceptual framework portion of the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education.* Teachers and environmental educators from Milwaukee and Neenah participated in the process to identify at what grade level the concepts should be taught. They were gathered for a meeting and asked to review the subconcepts created from the concept focus meeting. The educators determined which subconcepts fit into their grade level, then came to group consensus on how they should flow throughout the K-12 educational process. Once the grade levels the subconcepts fit into were identified, Wisconsin Model Academic Standards in Agriculture Education, Environmental Education, Science, and Social Studies that would apply to the subconcepts were identified.

The conceptual framework, scope and sequence, and academic standards were combined to create the draft of the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education.* The draft document was sent to the stakeholder list as well as the teachers, LEAF adjunct faculty, the researcher's graduate committee, and LEAF staff for comment. The comments were incorporated and the final document was created.

CHAPTER 4

RESULTS

The purpose of this study was to develop a conceptual framework and scope and sequence for urban forestry education. This chapter describes the results of the study.

Sub-problem 1 Results

Sub-problem 1: What are the important concepts about urban forests and urban forestry that students in Wisconsin should know by the time they graduate from high school?

Themes in the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* were used to create the four urban forestry themes and the concepts that relate to them which are listed in Figure 4.1. The themes were derived from input from forestry education stakeholders during the development of the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*. These themes and concepts were the basis for other tasks in the project.

> **What is an Urban Forest?** - Definition of an Urban Forest;
> Classification of Urban Forests; Trees as Part of the Urban Forest; Urban
> Forests as Ecosystems; Biodiversity and Forests
>
> **Why are they important?** - Historical Importance; Current Importance;
> Future Importance
>
> **How do we sustain them?** - Forest Owners; Definition of Forest
> Management; Reasons to Manage Urban Forests; Urban Forest
> Managers; Urban Forest Management Decisions; Urban Forest
> Management Issues
>
> **What is the future?** - Studying Urban Forests; Your Connection to
> Urban Forests; The Future of Urban Forests

Figure 4.1 Theme and Concept Headings for the Urban Forestry Conceptual Guide

Fifty-four letters were sent to urban forest stakeholders in Wisconsin and the Midwest requesting their ideas for important things K-12 students should learn about urban forests. Eleven out of the fifty-four, or 18%, responded. These ideas, along with ideas gathered by the researcher from existing urban forestry literature, totaled 139.

If this process were used with a similar group of stakeholders in the future, it would be better to present them only with themes to put their ideas under. The concepts were confusing to several and some expressed frustration with the process, although their responses were complete and appropriate to the question asked.

An initial set of ideas, which would later be turned into subconcepts, was developed from the input from urban forest stakeholders and ideas from urban forest documents. As a result of the revision process the original list of 139 ideas was reduced to 80. Later these 80 were reviewed by the Concept Focus meeting participants prior to the meeting date and modifications were made to wording and three additional ideas were added. The list of themes and ideas used at the Concept Focus Meeting included, Theme

1 which contained twenty ideas, Theme 2 which contained eighteen ideas, Theme 3 which contained twenty-five ideas, and Theme 4 which contained twenty ideas (Appendix G).

Due to inclement weather on the day of the concept focus meeting as well as personal conflicts, the original list of sixteen people dropped to twelve; twelve is an acceptable number for the Nominal Group Technique used. The working groups were originally planned to have four people in four groups representing a variety of types of stakeholders. Instead, there were only three groups but each still had the same number of members and the stakeholder ratio was the same. See Appendix J for the list of those planned to attend and those who attended.

The "no" dot step was a modification to the technique used in the development of the *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education.* It was an effective way to allow participants to voice a strong dislike for a particular idea in this process. Not every participant chose to use their dots.

For each of the four themes any subconcepts that received six or more votes were automatically included. Six votes was chosen because it was a midpoint between the greatest number of votes (11) and the least (0). Subconcepts that only received "no" votes were removed. Those with zero to five votes were modified as the comments suggested and then reconsidered based on their new format

The information gathered in Task 1.4 (Appendix K) was used to further refine the list of ideas into subconcepts. In Theme 1, the greatest number of votes received by one subconcept was nine. The subconcept with the most "no" votes (eight votes) was "Urban

forests are similar to savannahs. They have a few trees with a lot of grasses."

Subconcepts receiving six or more votes can be found in Table 4.1.

Table 4.1. Theme 1 – "What is an urban Forest?" Subconcepts Receiving Six or More Votes.

Subconcept	Yes votes
An urban forest is an ecosystem. An ecosystem is an area that contains living and nonliving things existing together and interacting. DD	7
Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others. EE	9
An urban forest is all of the trees and other vegetation in and around a town, village, or city. LL	7
Individual trees function via storm water retention, noise and view mitigation, and absorbing pollutants. These benefits are important and quantifiable. NN	8
Trees, soil, buildings, roads, and people interact as parts of the urban forest ecosystem. The interactions are increasingly important. RR	6

Some of the comments provided during the meeting combined several subconcepts. The subconcept labeled as "PP" which reads, "A tree's ability to grow can be restricted by soil that is poor due to construction of buildings and roads and compaction" was recommended to be moved to Theme 3. Another comment said, "Expand [PP] to include the <u>overall</u> poor quality of urban soil as a growing medium due to <u>MANY</u> factors, not just construction."

Subconcept "NN" was also recommended to be moved. "Individual trees function via storm water retention, noise and view mitigation, and absorbing pollutants. These

benefits are important and quantifiable" was suggested to be moved to Theme 2. Another

comment said, "NN – the focus should be on <u>canopy</u> rather <u>individual trees</u>."

In Theme 2, the greatest number of votes received was eleven and two

subconcepts received eleven votes. The only subconcept in Theme 2 to receive "no"

votes was, "Changes in technology, economic structures, and social values over time

have changed the urban forest." and it received two votes. Subconcepts receiving six or

more votes can be found in Table 4.2.

Table 4.2. Theme 2 "Why are they important?" Subconcepts Receiving Six or More Votes.

Subconcept	Yes votes
Urban forests affect the physical and psychological health of the humans in them. II	6
81% of Wisconsin residents live in a city, town, or village. The vitality and viability of communities are impacted by urban trees. MM	6
A healthy urban forest has a positive impact on the social, economic, and environmental health of an urban area. (e.g. heat sink, community involvement, reduced crime, increased property value.) OO	11
The benefits of healthy, well-maintained urban forests outweigh the costs to plant and maintain them. RR	11

Theme 2 did not have as many comments. The two comments made combined six

subconcepts into two.

In Theme 3, the highest votes were nine and two subconcepts received that

number. The subconcept with the most "no" votes was, "Many who plant, maintain, or

manage urban trees are not schooled in arboriculture; neglect and misguided tree care

commonly result." This subconcept received two "no" votes, but also received one "yes"

vote. Subconcepts receiving six or more votes can be found in Table 4.3.

Table 4.3. Theme 3 "How do we sustain them?" Subconcepts Receiving Six or More Votes.

Subconcept	Yes votes
Poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult. BB	7
Urban forest ownership is divided by many property owners, which complicates management. GG	7
Urban forest management is the use of planning and science-based techniques (e.g. planting, watering, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes. KK	8
Trees in the urban environment are under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counter act these conditions. RR	9
Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, educators, researchers, public works employees, and park and recreation staff. UU	9
Invasive species, such as the gypsy moth can create problems in the urban forest; management attempts to control invasive species. XX	7

Five of the ten comments in Theme 3 were recommendations to combine various

subconcepts. Another comment recommended, "MM should be included in Theme 2."

The concept they were referring to was, "Urban forests provide services (storm water

runoff reduction, air filtration, cooling) that are as much a part of the community

infrastructure as police and fire protection, water and sewage service, etc, and need to be

managed to be able to continue doing so." Other comments made points about other

aspects of the subconcepts as written, "OO – I don't think the concept is framed correctly – they aren't opposing goals. The tradeoff is more related to FUNDING CHOICES (police, fire…)."

In Theme 4, the most votes received by one subconcept was nine. The only subconcept to receive a "no" vote in Theme 4 was, "Citizen committees play a role in decision making and training." Subconcepts receiving six or more votes can be found in Table 4.4.

Table 4.4 Theme 4 "What is the future?" Subconcepts Receiving Six or More Votes

Subconcept	Yes votes
Research can show the benefits of proper tree planting and maintenance so that funding and effort can be put into preventative maintenance instead of crisis management. AA	7
Improving land development and construction practices will reduce loss of existing trees. FF	9
Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of the urban forest. JJ	7
All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests. LL	9
Society must understand the importance of the urban forest in order to support funding for its care and management. NN	6

Comments in Theme 4 again suggest combining a number of subconcepts. One comment questioned whether another theme should be created, "*Issues/problems facing urban forests – Do we need another theme category – bring in from other themes?" The

result of this comment was not another theme, but became a specific concept in another

Theme 3.

The general comments collected at the end of the meeting proved very helpful in

determining which of the borderline subconcepts to give weight to. These comments can

be found in Figure 4.2.

Notes from group discussion

- Soil, water, air, and trees are part of urban ecosystem, too – is this concept represented. Really talking about an urban system, not just forest.
- Where should "issues" go? – issues are here and now – a current issues concept?
- Address preconceptions and myths – for instance the urban ecosystem is unnatural
- Struggle in Theme 3 and Theme 4 that things are changing – How do we keep concepts timely?
- Sustaining theme [3] focuses on public management and we need more on private ownership and management
- More weight on private owners they need to think about how their actions impact the whole system
- Ecosystem discussion - degree - what is it?
- We've placed manmade things into an existing ecosystem. Conditions (soil, climate etc.) still exist. Because it's been disturbed doesn't mean it's been taken out of nature.

Additional Comments

- Tree care practices good/bad/how in "urban forest management..." subconcept in Theme 3. – This should be sure to be included in an activity. It isn't a large enough idea for a subconcept but should definitely be covered.
- Planning before you plant a concern for utilities. Activity emphasis.

Figure 4.2 General Comments from Concept Focus Group

After the changes based on meeting comments were made, additional revisions

combined like subconcepts. This part of the process considered the original votes, but

because so many had been combined and/or moved, the original voting was not as

influential. LEAF staff was consulted when subconcepts to be removed or combined were unclear. As subconcepts were refined, the concepts that could be grouped under each theme became more obvious. These concepts also helped to guide the revision process as a pattern developed. The new concepts can be found in Figure 4.3.

Theme 1 What is an urban forest?
Defining the urban forest
Urban forest connections

Theme 2 Why are they important?
Environmental benefits
Social benefits
Economic benefits

Theme 3 How do we sustain them?
Defining urban forest management
Challenges
Solutions

Theme 4 What is the future?
Issues
Your connection
Research
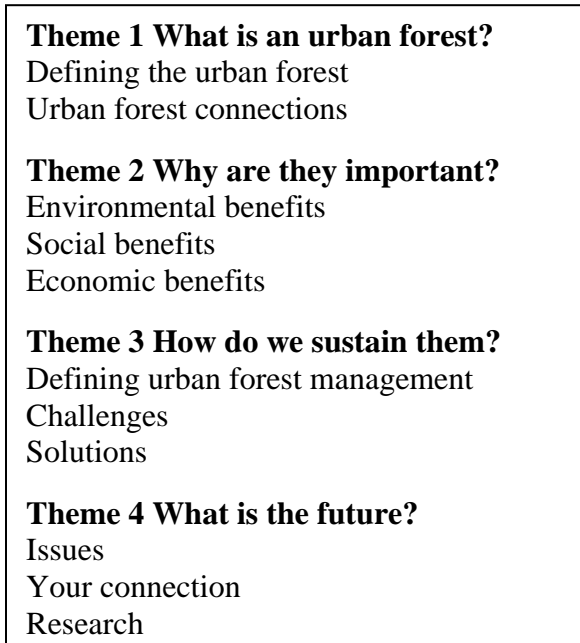
Figure 4.3 Final Urban Forest Conceptual Guide Themes and Concepts.

LEAF staff offered suggestions after reviewing both the scope and sequence and the conceptual framework drafts. The draft conceptual framework was combined with the draft scope and sequence. Along with introductory materials and an appendix, this document was sent to the participants of the Concept Focus Meeting and the Scope and Sequence meeting. The comments received were incorporated and the final document can be found in Appendix M.

Sub-problem 2 Results

Sub-problem 2: In what grade level should concepts identified in the conceptual framework be taught?

Eight educators participated in the scope and sequence meeting. It would have been preferable to have had another 5-8 level teacher from another area of Wisconsin and one or two more high school teachers. Despite the lack of these additional educators, the researcher feels that, because of the discussion that was had at the end of the process, consensus was reached and was reliable.

Seventeen of twenty-eight subconcepts were identified to be included at all of the three grade divisions. One of the twenty-eight subconcepts was removed from the list by the educators as an unteachable subconcept. That subconcept was, "Society must understand the importance of an urban forest in order to support funding for its care and management." There were a total of seventeen subconcepts identified to be included in grades K-4, twenty subconcepts identified for grades 5-8, and all twenty-eight were identified for grades 9-12. The specific recommendations from the meeting are included in Appendix L.

Modifications to the placement of subconcepts were made based on how completely the students in the grade level were able to understand the subconcept. For instance, "In order to successfully manage its urban forest, a community must have strong local interest, policies and goals that accommodate trees, and technical expertise available to implement them" was removed from the K-4 section. The meeting

participants reported that the "strong local interest" portion could be introduced in grade 3-4, but that was not a strong enough connection to leave the subconcept at that level.

Once the changes were made to the scope and sequence draft, and it was combined with the conceptual framework draft. Both were sent to educators and those mentioned in Task 1.6 for comment. Their comments were incorporated and a final draft combines both documents was created (Appendix M). The final document includes twenty-five subconcepts falling under eleven themes.

Sub-problem 3 Results

Sub-problem 3: How do the concepts in the urban forestry conceptual framework correlate to the Wisconsin Model Academic Standards?

The researcher identified the Wisconsin Model Academic Standards that would apply to each of the subconcepts included in the scope and sequence by grade levels. The standards identified as well as their description can be found in the final draft of the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education* (Appendix M). The researcher used the Model Academic Standards for Agriculture Education (three standards identified), Environmental Education (twenty-nine standards), Science (eight standards), and Social Studies (three standards). Only standards that showed an obvious correlation to the subconcepts were included. Dr. Dennis Yockers, environmental educator with the Wisconsin Center for Environmental Education reviewed the correlations to validate the findings.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

<u>Summary</u>

The goal of this project was to develop a conceptual framework and scope and sequence, together known as a conceptual guide, for urban forestry education in Wisconsin. This document was intended to supplement the existing *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education.* This project used techniques similar to those used in the development of the *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education.*

The *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education* was developed by addressing three subproblems. Subproblem one was to identify the important concepts about urban forests and urban forestry that students in Wisconsin should know by the time they graduate from high school. A list of ideas was gathered and a modified nominal group technique process was used to rank this information. This information created the conceptual framework. The second subproblem was to determine in what grade level concepts identified in the conceptual framework should be taught. Teachers met and evaluated using a group process to determine which grade levels they recommended. The third subproblem was to determine how the concepts in the conceptual framework correlate to the Wisconsin Model Academic Standards. The conceptual framework contents were evaluated and the Wisconsin Model Academic Standards and identified the standards that would apply.

Conclusions

The goal of this project was to create a conceptual guide to urban forestry education in Wisconsin. This goal was reached and the project completed with the creation of the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education.* The document contains four themes, eleven concepts, and twenty-five subconcepts.

This project was the first step for the LEAF Program to address the subject of urban forestry, as well as to create a tool to use in reaching urban audiences with the LEAF message. The next step for that process is to use the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry* to create supplemental educational materials for the LEAF Program. That project will use this document as a guide. In addition, the conceptual guide will act as an evaluation tool. The information in the conceptual guide will be a benchmark for student understanding.

Initially, this document will be printed along with the urban forest supplement materials. It will also be available on the LEAF Program website. In the future, the document will be included in the *LEAF Conceptual Guide to Wisconsin K-12 Forestry Education.* It will not be incorporated, but rather become its own section in that document. It is also important to note that the Wisconsin Model Academic Standards identified in the scope and sequence are not exhaustive of those that will eventually be covered.

<u>Recommendations</u>

There are seven recommendations that were made regarding the use of the information included in the *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education* and the future development of educational materials.

<u>Recommendation One</u>

A challenge in creating supplemental forestry education materials is to make them complete, but not so overwhelming that teachers are unable to practically incorporate them in their own curriculum. Teaching time available is limited. Rather than create materials that address all 25 subconcepts, but are too time consuming for a teacher to ever use, lessons should flow logically and include subconcepts as appropriate. Effort should not be made to force subconcepts into lessons.

<u>Recommendation Two</u>

As the lesson materials are created, it is recommended to group the materials into the same groupings as are found in the scope and sequence (K-4, 5-8, and 9-12). Based on the conversations and comments from the teachers during the scope and sequence meeting, there is considerable difference between understanding and background in students in the various urban and suburban parts of Wisconsin. Teachers will need to determine if their individual class is ready for specific ideas and materials. A range of grade listings will help them see approximately where there group may be, but will make creating materials less complicated.

Recommendation Three

Additional Wisconsin Model Academic Standards that correlate to specific lessons should be identified as lesson materials are created. Teachers should be asked to review the standards and comment as they use the lessons. Standards that are identified to support lesson materials should be considered as possible additions to the scope and sequence of the *LEAF Conceptual Guide to Urban Forestry Education in Wisconsin* in future versions.

Recommendation Four

Several times during correspondence regarding this project, concern was expressed by representatives of utilities that students learn about the importance of planting the right size tree under utility lines. Since this was not a large enough idea to be a subconcept, it was not included as such. It is recommended, however, that that idea be included as part of at least one lesson in the lesson guide.

Recommendation Five

A comment made during the concept focus meeting addresses an additional potential future project to be guided by this conceptual guide. The potential project would be the creation of a Geographic Information Systems based lesson for middle or high school students. The comment was made in conjunction with a suggested subconcept that was later eliminated. The subconcept was, "Using GIS, GPS, and remote sensing as tools will allow more efficient and more effective management of urban forests in the future."

Lesson materials of this type would allow that idea to be addressed. This could be used as a field component to enhance the supplemental classroom materials.

Recommendation Six

Field enhancement lessons from the *LEAF Wisconsin Forestry Education Lesson Guides* can be used to get students outdoors in urban areas. In addition to these lessons, the creation of more urban-specific outdoor education materials is recommended.

Recommendation Seven

The *LEAF Conceptual Guide to K-12 Urban Forestry Education in Wisconsin* document has the potential to be shared with urban forestry professionals. It could be used as a basis for professional development trainings and workshops. It could help encourage urban forestry professionals and teachers to work together to educate about urban forests.

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APPENDICES

Appendix A

Urban Forest Stakeholders Solicited for Subconcept Suggestions

First Name	Last Name	Affiliation1	Affiliation2
Dr. R Bruce	Allison	Allison Tree Care, Inc.	Wisconsin Urban Forestry Council
Linda	Barcz	Wisconsin Arborist Association	Wisconsin Urban Forestry Council
Mike	Barger	Mike's Tree Surgeons	
Timothy	Bauknecht	Village of Ashwaubenon	Wisconsin Urban Forestry Council
Bob	Brush	American Society of Landscape Architects, WI Chapt	Wisconsin Urban Forestry Council
Lisa	Burban	USFS Northeastern Area Urban Forestry	
Cindy	Casey-Widstrand	WDNR - WCR	
Gina	Childs	USFS Northeastern Area	
Bob	Dahl	WI Dept. of Ag. Trade & Consumer Protection	
Paul	DeLong	WDNR Division of Forestry	
Tom	Dilley	USFS Northeastern Area Urban Forestry	
Mark	Dochnahl	City of Tomahawk	Wisconsin Urban Forestry Council
Jeff	Edgar	Wisconsin Landscape Federation	Wisconsin Urban Forestry Council
Kathy	Esposito	WDNR Division of Forestry	
Genny	Fannucchi	WDNR Division of Forestry	
Burnell	Fischer	Indiana Department of Natural Resources	
Christine	Giese	Village of Theresa	Wisconsin Urban Forestry Council
Wayne	Glowac	Clowac, Harris, Madison, Inc.	Wisconsin Urban Forestry Council
Jeff	Gorman	Wisconsin Parks and Recreation Association	Wisconsin Urban Forestry Council
Richard	Hauer	UW-Stevens Point	
Kirsten	Held	WDNR Division of Forestry	
Kevin	Hinckley		Wisconsin Urban Forestry Council
Leif	Hubbard	WI Dept. of Transportation	
Lee	Huss	City of Bloomington, IN	

First Name	Last Name	Affiliation1	Affiliation2
Jeff	Iles	Iowa State University - Dept of Horticulture	
Jill	Johnson	USFS Northeastern Area Midwest Center for Urban Forestry	
Dr. Laura	Jull	UW-Madison Dept. of Horticulture	Wisconsin Urban Forestry Council
Skip	Kincaid	Skip Kincaid and Associates	
Don	Kissinger	WDNR Division of Foresry WCR	
David	Liska	City of Waukesha	Wisconsin Urban Forestry Council
Michael	Maddox	UW-Extension Rock County	Wisconsin Urban Forestry Council
Suzanne	Malec	City of Chicago - Dept of Environment	
Heather	Mann	Urban Open Space Foundation	Wisconsin Urban Forestry Council
Robert	Mather	WDNR Bureau of Forest Management	
Maureen	McDonough	Michigan State University	
Mike	Michlig	NE UF Working Group	Wisconsin Urban Forestry Council
Janette	Monear	Tree Trust	
Ken	Ottman	International Society of Arboriculture	Wisconsin Urban Forestry Council
Patty	Petersen	Trees Forever	
Dick	Rideout	WDNR Division of Forestry	
Phillip	Rodbell	USFS Northeastern Area Urban Forestry	
Tracy	Salisbury	WDNR Division of Forestry NER	
Jessica	Schmidt	WDNR Division of Forestry NER	
Kim	Sebastian	WDNR Division of Forestry SER	
Robert	Skiera	Urban Forestry Consultant	Wisconsin Urban Forestry Council
Kristina	Skowronski	WDNR Division of Forestry SER	

First Name	Last Name	Affiliation1	Affiliation2
Joan	Stevens	Greenfield Beautification	Wisconsin Urban Forestry Council
Daniel	Traas	Ranger Services, Inc.	Wisconsin Urban Forestry Council
James	Warren	WDNR Bureau of Forest Management	
Patrick	Weicherding	University of Minnesota	
Richard	Welch	Superior Urban Forestry Tree Board	Wisconsin Urban Forestry Council
Les	Werner	University of WI - Stevens Point	
Lynne	Westphal	USDA Forest Service - North Central Research Station	
Joe	Wilson	Greening Milwaukee	Wisconsin Urban Forestry Council

Appendix B

Concept Idea Gathering Letter and Outline

Learning, **E**xperiences, & **A**ctivities in **F**orestry
Wisconsin K-12 Forestry Education Program

July 15, 2004

Hello,

I am writing to request your input as an urban forestry stakeholder. LEAF, Wisconsin's K-12 Forestry Education Program, is a joint effort between the Wisconsin DNR – Division of Forestry and the Wisconsin Center for Environmental Education. We seek to promote forestry education in Wisconsin. LEAF is creating an urban forest supplement to enhance our existing *LEAF K-12 Forestry Lesson Guide*. These lessons are used by K-12 teachers in Wisconsin to teach their students about the importance of Wisconsin's forests and forestry. You can find more information about LEAF and the services we provide on our website at www.uwsp.edu/cnr/leaf.

You have been identified as someone who can provide us helpful insights into what information, related to urban forests, students should know by the time they graduate from high school. The suggestions you and others send will be compiled, edited, and put into the Urban *Forest Education Conceptual Guide*. This document will guide the development of the lesson materials.

Attached is information on how you can help by submitting ideas you feel should be included in the conceptual guide. Please let other urban forest stakeholders know about this project so that they can contribute their ideas as well. They can access the attached materials online at www.uwsp.edu/cnr/leaf/urban

Please use the enclosed reply envelope to **return your suggestions by August 9th**. The ideas we receive will be compiled on that date. After the ideas have been compiled, a group of stakeholders will meet to determine which will be included in the final copy of the conceptual guide. We will then meet with a group of teachers to decide at what grade level each of the ideas should be taught.

As part of this project, I am also collecting existing urban forestry education materials to review. Please let me know about any existing materials you are aware of. It is important that I know what materials already exist so that we don't duplicate services and can promote them to teachers.

If you have questions, feel free to call (715) 346-4924 or email Sarah.Gilbert@uwsp.edu.

Thank you for your time. Your input will help ensure that future generations understand urban forests and are aware of their importance in Wisconsin.

Sincerely,

Sarah Gilbert
Forestry Education Specialist

We need your perspective!

What is an urban forest?

The concepts in this theme provide students with a fundamental knowledge of Wisconsin's urban forest and help students appreciate urban forests as ecosystems. Comprehending these concepts will lead to an understanding of the interrelationship between urban forests and humans.

Definition of an Urban Forest
Identifying what constitutes an urban forest provides students the basis for examining forests in a broader context.

Classification of Urban Forests
Classifying and differentiating urban forests into biomes and types help students make connections among the forests in their community, the forests in Wisconsin, and other forests in the world.

<u>Trees as Part of the Urban Forest</u>
One of the defining characteristics of urban forests is the trees in them. The following information helps students appreciate the uniqueness of trees and comprehend how individual trees function and fit into an urban forest ecosystem.

<u>Urban Forests as Ecosystems</u>
Understanding basic ecological principles and how they apply to urban forest communities helps students appreciate the characteristics of living systems and how they relate to humans.

<u>Biodiversity and Forests</u>
Understanding the following information helps students make connections between urban forests, biodiversity, and sustainability.

Why are they important?
Concepts in this section help students investigate the connection between Wisconsin's urban forests and their own lives. Recognizing these connections increases students' awareness and understanding of the importance of sustainable urban forests to humans.

<u>Historical Importance</u>
Historical perspectives on forests provide students an understanding of how urban forests have been important to humans throughout time.

Current Importance
Understanding the following information provides students the opportunity to see the wide range of ways urban forests impact their lives.

Future Importance
The following information helps students identify the continuing need for urban forests in the future.

How do we sustain them?

These concepts help students understand the role humans play in sustaining Wisconsin's urban forests. For students to become participating members of a society that works toward sustainable urban forests, they must be able to comprehend the role urban forest management plays in meeting society's needs.

Forest Owners
Understanding who owns Wisconsin's urban forests helps students identify the basis for different urban forest management decisions.

Definition of Forest Management
Understanding what forest management is helps students explore further topics on management.

Reasons to Manage Urban Forests
Understanding the reasons urban forests are managed helps students develop informed attitudes about urban forest management.

Urban Forest Managers
By understanding the many individuals and groups are involved in urban forest management, students will be able to recognize that the responsibility of urban forest management is shared.

Urban Forest Management Decisions
Understanding how urban forests are managed helps students participate in urban forest management decisions.

Urban Forest Management Issues
The following information helps students understand the complexity of urban forest management decisions by examining management issues and the factors that contribute to them.

What is the future?

Concepts in this theme help students identify ways to ensure Wisconsin's urban forests are sustained for future generations. For students to willingly and effectively take action regarding urban forest resource management, they must have a clear understanding of what urban forests are, why they are important, what is involved in their management, and how citizens affect each of these.

Studying Urban Forests
The following information helps students better understand how urban forests are studied and that there is more to be learned about urban forests and their management.

Your Connection to Urban Forests
Students will recognize their role as citizens in making decisions regarding resource use and the ways those decisions influence urban forests.

The Future of Urban Forests
Understanding current and future trends in urban forestry helps students predict how scientific, technological, and societal changes will influence urban forests. Students will also be able to evaluate how personal and societal actions affect urban forests.

Do you know of existing urban forestry education materials?

What is it and where can I obtain a copy?

Please describe the materials below and include whatever contact information you can.
- Contact Name
- Address
- Phone
- Email
- Website

Appendix C

Letter From LEAF Website

Learning, **E**xperiences, & **A**ctivities in **F**orestry

July 15, 2004

Hello,

I need your input as an urban forestry stakeholder. LEAF, Wisconsin's K-12 Forestry Education Program, is a joint effort between the Wisconsin DNR – Division of Forestry and the Wisconsin Center for Environmental Education. We seek to promote forestry education in Wisconsin. LEAF is creating an urban forest supplement to enhance our existing *LEAF K-12 Forestry Lesson Guide*. These lessons are used by K-12 teachers in Wisconsin to teach their students about the importance of Wisconsin's forests and forestry. You can find more information about LEAF and the services we provide on our website at www.uwsp.edu/cnr/leaf.

We are looking for people with insights into what information, related to urban forests, students should know by the time they graduate from high school. The suggestions you and others send will be compiled, edited, and put into the *Urban Forest Education Conceptual Guide*. This document will guide the development of the lesson materials.

Attached is information on how you can help by submitting ideas you feel should be included in the conceptual guide. Please let other urban forest stakeholders know about this project so that they can contribute their ideas as well.

Please write your suggestions on the following document and **return it by August 9th**.

Mail to:
Sarah Gilbert   LEAF/WCEE/CNR   UWSP   Stevens Point, WI 54481

The ideas we receive will be compiled on that date. After the ideas have been compiled, a group of stakeholders will meet to determine which will be included in the final copy of the conceptual guide. We will then meet with a group of teachers to decide at what grade level each of the ideas should be taught.

As part of this project, I am also collecting existing urban forestry education materials to review. Please let me know about any existing materials you are aware of. It is important that I know what materials already exist so that we don't duplicate services and can promote all materials to teachers.

If you have questions, feel free to call (715) 346-4924 or email Sarah.Gilbert@uwsp.edu.

Thank you for your time. Your input will help ensure that future generations understand urban forests and are aware of their importance in Wisconsin.

Sarah

Sarah Gilbert
Forestry Education Specialist

Wisconsin Center for Environmental Education-College of Natural Resources
University of Wisconsin-Stevens Point
Stevens Point, WI 54481
(715) 346-4956

Appendix D

**Suggested Invitees for LEAF Urban Forest Concept Focus
and Concept Focus Meeting Date Set Letter**

UF Council Members:

Dr. R. Bruce Allison	Allison Tree Care, Inc.
Ms. Linda Barcz	Wisconsin Arborist Association
Mr. Timothy Bauknecht	Ashwaubenon Village Forester
Mr. Bob Brush	Amer. Soc. Landscape Architects, WI Chap.
Mr. Mark Dochnahl	City of Tomahawk, Dir. of Public Works
Mr. Jeff Edgar	Wisconsin Landscape Federation
Ms. Christine Giese	Village Forester, Theresa
Mr. Wayne Glowac	Glowac,Harris, Madison, Inc.
Mr. Jeff Gorman	Wisconsin Parks and Recreation Association
Mr. Kevin Hinckley	President, Lodi Park Commission
Dr. Laura Jull	UW-Madison Dept. of Horticulture
Mr. David Liska (Chair)	Waukesha City Forester
Mr. Michael Maddox	UW-Extension Rock County
Ms. Heather Mann	Urban Open Space Foundation
Mr. Mike Michlig	NE UF Working Group
Mr. Ken Ottman (Vice-Chair)	International Society of Arboriculture
Mr. Robert Skiera	Urban Forestry Consultant
Ms. Joan Stevens	Director, Greenfield Beautification
Mr. Daniel R. Traas	President, Ranger Services, Inc.
Mr. Richard Welch	Superior Urban Forestry Tree Board
Mr. Joe Wilson	Greening Milwaukee
Mr. Bob Dahl	WI Dept. of Ag. Trade & Consumer Protection
Ms. Lisa Burban	USFS Northeastern Area Urban Forestry
Mr. Leif Hubbard	WI Dept. of Transportation

DNR Staff

Ms. Cindy Casey	WDNR - WCR (western 2/3), NR (western 1/3)
Mr. Nathan Eisner	WDNR Division of Forestry
Ms. Kathy Esposito	WDNR Division of Forestry

Ms. Genny Fannucchi	WDNR - Division of Forestry
Ms. Kirsten Held	WDNR Division of Forestry
Mr. Don Kissinger	WDNR - WCR (eastern 1/3), NR (eastern 2/3)
Mr. Richard Rideout	WDNR Division of Forestry
Ms. Tracy Salisbury	WDNR - NER
Ms. Jessica Schmidt	WDNR - NER
Ms. Kim Sebastian	WDNR - SER (southern 1/2)
Ms. Kristina Skowronski	WDNR - SER

Other Interested Parties, non-voting guests

Gina Childs	USFS Northeastern Area
Todd Ernster	City Forester
David Graham	The DWG Co. Landscapists
Rich Hauer	UWSP
Jill Johnson	USFS Northeastern Area Midwest Center for Urban Forestry
Gary Majeskie	Brookfield Parks, Recreation & Forestry
Melinda Myers	Milwaukee Area Technical College
Scott Nelson	Madison Gas and Electric
Pete Rudquist	Mid-State Technical College
Stacey Schaefer,	Sigurd Olson Environmental Institute
Dave Scharfenberger	Wachtel Tree Science and Service
Waunell Trepanier,	WPS Line Clearance Coordinator
Jeff Treu	We Energies
Mike Wendt	Milwaukee Area Technical College
Les Werner	UWSP
Ron Zillmer	Mid-State Technical College

LEAF

Learning, **E**xperiences, & **A**ctivities in **F**orestry

I am writing to ask you to check your calendar. LEAF, Wisconsin's K-12 Forestry Education Program, is creating a supplement to its existing educational materials. The supplement will focus on urban forestry. To learn more about the LEAF program go to www.uwsp.edu/cnr/leaf

The first step in the process of creating educational materials is to identify the important ideas that should be included. We have collected suggestions from urban forest stakeholders and now we need to focus the list. LEAF will be holding a meeting to accomplish this. You have been identified as someone who may be willing to help. First we need to establish a meeting date. Please look over the dates listed and let me know <u>all</u> that you are able to attend. The **one day meeting** will likely run from **10:00 until 3:00**. The meeting will be held in **Stevens Point**.

We will select a representative group from those of you who have indicated that you are able to attend on the date we choose. Those selected to attend will receive information about the date and agenda. You will also receive materials to review and comment on before the meeting. Those of you who are not selected to attend may still be asked to act as reviewers later in the process.

Please consider taking time to help with this important step in creating K-12 urban forestry educational materials.

Potential Dates
Check all that you are available for.

December 13	
December 14	
December 15	
December 16	
December 17	
January 4	
January 5	
January 6	
January 7	

Please reply by Wednesday, November 17th.

Feel free to contact me if you have any questions.

Thank you!

Sarah Gilbert
Forestry Education Specialist
LEAF Program
Wisconsin Center for Environmental Education
College of Natural Resources
University of Wisconsin-Stevens Point
Stevens Point, WI 54481
(715) 346-4924
Sarah.Gilbert@uwsp.edu
www.uwsp.edu/cnr/leaf

LEAF is a partnership program between the Wisconsin Department of Natural Resources Division of Forestry and the Wisconsin Center for Environmental Education

Appendix E

Email and Ideas Sent to Concept Focus Participants for Comment Prior to Meeting

From:	Gilbert, Sarah		**Sent:**	Mon 12/6/2004 11:44 AM
To:	'Cbrodbeck@mge.com'; 'lburban@fs.fed.us'; 'cynthia.casey-widstrand@dnr.state.wi.us'; Hauer, Richard; 'leif.hubbard@dot.state.wi.us'; 'jilljohnson@fs.fed.us'; 'don.kissinger@dnr.state.wi.us'; 'dliska@ci.waukesha.wi.us'; 'melmyers@execpc.com'; 'kottma@mpw.net'; 'Richard.Rideout@dnr.state.wi.us'; 'peter-jon.rudquist@mstc.edu'; 'ss9708@northland.edu'; 'kristina.skowronski@dnr.state.wi.us'; 'wtrepan@wpsr.com'; Yockers, Dennis; 'rzillmer@mstc.edu'			
Cc:				
Subject:	January 6th LEAF urban meeting			
Attachments:	Urban Conceptual Framework for concept focus.doc(54KB)			

Hello,

As I mentioned in my earlier email, the date for the urban forestry concept focus meeting has been set. **Please RSVP to confirm you are still available for this date.**

January 6th, 2005 (Thursday)

9:30 to 1:30

Schmeeckle Reserve visitor center meeting room, Stevens Point

For directions, go to http://www.uwsp.edu/cnr/schmeeckle/ . There is no charge for parking in the Schmeeckle parking lot. Lunch will be provided.

Attached to this email you will find the list of "subconcepts" we will consider on the 6th. I have taken approximately 150 ideas suggested by urban forestry professionals and others and combined those that were alike to arrive at the 80 on the list. On the 6th, we will work in small and large groups to discuss the merits of the subconcepts and decide which are most important for students to learn by the time they graduate from high school. The subconcepts are divided into major theme areas. The themes are posed as questions: What is an urban forest?, Why are they important?, How do we sustain them?, and What is the future? The general content of the theme is described in italics under the theme heading.

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- Things that are missing
- Comments on inaccuracies
- Rewording suggestions

Any suggestions will be incorporated and we will use the revised list on the 6th.

Thank you for taking time to help with this important step in the creation of the LEAF Urban Forestry Supplement. Let me know if you have any questions.

Sarah

Sarah Gilbert

Forestry Education Specialist

LEAF Program

Wisconsin Center for Environmental Education

College of Natural Resources

University of Wisconsin-Stevens Point

Stevens Point, WI 54481

(715) 346-4924

Sarah.Gilbert@uwsp.edu

www.uwsp.edu/cnr/leaf

What is an urban forest?

The concepts in this theme provide students with a fundamental knowledge of Wisconsin's urban forest and help students appreciate urban forests as ecosystems. Comprehending these concepts will lead to an understanding of the interrelationship between urban forests and humans.

- Urban forest ecosystems are connected to other forest ecosystems.

- Trees are the link between the urban and rural forest.

- Increased biodiversity in an urban forest can help decrease the impact of pests and diseases like gypsy moth and Dutch elm disease.

- Urban forests are ecosystems.

- The value of individual trees is quantifiable and many times used to assign value to a property.

- An urban forest is an ecosystem. An ecosystem is an area that contains living and nonliving things existing together and interacting.

- Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others.

- Trees from all over the world are being planted in Wisconsin's urban forests, according to climate, soils, and maintenance regimes.

- A tree is a perennial plant with a well defined woody stem, crown, and roots.

- Urban forests are similar to savannahs. They have a few trees with a lot of grasses.

- The human psyche is often attached to individual trees and helps create a good or bad social environment.

- From street to neighborhood to community to region and beyond, forests are interconnected ecosystems.

- The relative economic and social worth of one tree in an urban forest is higher than one tree in a rural forest.

- Urban forest ecosystems are part of greater water cycles, carbon cycles, and energy cycles.

- Trees compete for nutrients, sunlight, space, and water.

- An urban forest is all of the trees and other vegetation in and around a town, village, or city.

- Humans are a large part of urban forest ecosystems.

- Individual trees function via storm water retention, noise and view mitigation, and absorbing pollutants. These things are important and quantifiable.

- You cannot reach sustainability unless you have biodiverse areas.

- A tree's ability to grow can be restricted by soil that is poor due to construction of buildings and roads and compaction.

- Biodiversity in an urban forest may be in terms of canopy cover, diameter and species distribution, richness and evenness, as well as genetic diversity.

- Trees, soil, and people interact as parts of the urban forest ecosystem. The interactions are increasingly important.

- Urban forests, biodiversity, and sustainability are interdependent.

Why are they important?

Concepts in this section help students investigate the connection between Wisconsin's urban forests and their own lives. Recognizing these connections increases students' awareness and understanding of the importance of sustainable urban forests to humans.

- Trees have played a role in the history of communities.

- Humans value forests for their aesthetic, cultural, ecological, economic, educational, and recreational benefits.

- Use of forests has progressed from utilitarian (lumber, fuel, food, fiber) to quality of life (air, water, etc.).

- In the future, trees may play an important role in cleaning the environment inexpensively through phytoremediation.

- Urban or community forests occur or expand from recognized necessity. (Detreed communities in the 1600s spawned tree laws, Dutch elm disease increased urban forest activities, and urban sprawl increased tree preservation ordinances.)

- Urban forests affect the physical and psychological health of the humans in them.

- Meeting places and town squares many times had trees, communities that were carved out of the woods or built in /on prairies had trees added to make the area more livable.

- Trees will increasingly be part of communities' infrastructure as a "green utility."

- Historically, people have brought trees from other countries with them because the trees made them feel better, more comfortable, or to enhance a livelihood.

- One reason urban forests are important is that most Wisconsin citizens live in urban areas.

- Changes in technology, economic structures, and social values over time have changed the urban forest.

- A healthy urban forest positively impacts the social, economic, and environmental health of an urban area. (e.g. heat sink, community involvement, reduced crime, increased property value.)

- People's attitudes change both positively and negatively with increase of green. In the future, this may be used to better physical and mental health.

- The economic benefits of urban forests include reduced energy costs, reduced storm water runoff, and increased property values.

How do we sustain them?

These concepts help students understand the role humans play in sustaining Wisconsin's urban forests. For students to become participating members of a society that works toward sustainable urban forests, they must be able to comprehend the role urban forest management plays in meeting society's needs.

- Individual trees are often managed due to the potential for hazards and liability.

- Poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult.

- 81% of Wisconsin residents live in a city, town, or village. The vitality and viability of communities are impacted by urban trees.

- Urban forests are managed as both individual trees for safety concerns and as stands for the impact they have on the community.

- The majority of urban forest area is owned by individuals.

- Urban forest management is different than traditional rural forest management.

- Volunteer citizen groups, such as tree boards, are one way citizens can participate in creating and maintaining a healthy urban forest.

- Urban forest ownership is divided by many property owners.

- Issues such as urban sprawl and insect and disease infestation are changing the characteristics of the urban forest rapidly.

- Urban forest management encompasses, to a large extent, people management since they create the budgets, priorities, and ordinances that are to be carried out.

- Federal, state, and local governments can work together and with citizen groups to manage urban forests.

- Urban forest management is the use of techniques (e.g. planting, watering, mulching, pruning, removal) to meet desired outcomes.

- Decisions made in an urban forest to plant non-native species can affect other Wisconsin forests if those species spread beyond the urban forest.

- Urban forests provide services (storm water runoff reduction, air filtration, cooling) that are as much a part of the community infrastructure as police and fire protection, water and sewage service, etc. and need to be managed to be able to continue doing so.

- When developing an urban forest management plan, three questions need to be answered:
  What do we have?
  What do we want?
  How do we get what we want?

- Urban forestry tries to balance environmental concerns for a clean, vibrant, biodiverse, urban forest and economic concerns to maintain or increase jobs and standards of living.

- Urban forests can be managed to meet societal goals, ecologic goals, and economic goals.

- In order to successfully manage its urban forest, a community must have the personnel, equipment, knowledge, and funding to complete identified goals.

- Trees in the urban environment are under more stress than trees in rural areas due to harsh growing conditions (soil compactions, limited space, pollution); urban trees are managed more intensely to counter act these conditions.

- Arboriculture is the scientific care of individual trees and woody plants in cities and villages.

- Public safety is a key concern of urban forest management.

- Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, educators, researchers, public works employees, and park and recreation staff.

- Urban forests are managed through the use of inventories, creation of management units, setting up maintenance schedules, and determining planting schedules.

- Urban forest management takes input from urban foresters, governmental bodies, citizen groups, scientists, parks/streets/public works departments , engineers, and others.

- Invasive species, such as the gypsy moth can create problems in the urban forest; management attempts to control invasive species.

What is the future?

Concepts in this theme help students identify ways to ensure Wisconsin's urban forests are sustained for future generations. For students to willingly and effectively take action regarding urban forest resource management, they must have a clear understanding of what urban forests are, whey they are important, what is involved in their management, and how citizens affect each of these.

- Research can show the benefits of proper tree maintenance so that funding and effort can be put into preventative maintenance instead of crisis management.

- A citizen who recognizes the importance of good urban forest management will expect it throughout the community.

- Urban forest managers need to consider the perceptions of the public, press, and politicians in order to secure funding.

- Citizen committees play a role in decision making and training.

- Urban forestry and arboriculture are increasingly researched and studied at universities, technical schools, and by professional organizations (ISA, TCIA, American Forests).

- Improving building construction techniques will reduce loss of existing trees.

- Research can help us find ways to deal with new insect and disease problems before they become epidemic.

- Urban forest related decisions can be affected by politics, science, emotion, and economics.

- Urban forestry is a growing and changing field with many career opportunities.

- Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of the urban forest.

- Increased use of trees to eliminate or neutralize harmful substances (phytoremediation) in the environment may help improve environmental health.

- All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

- Research is an important part of urban forestry.

- If society understands urban forestry and its importance, it will support it into the future and positive things will happen.

- Research investigates what trees can do for us and how we can better maintain them.

- Population in urban areas will continue to grow. With more people living closely together, the calming, mitigating impact of the urban forest landscape ecosystem becomes increasingly important.

- Citizens need to recognize the services urban forests provide and their importance.

- Using GIS, GPS, and remote sensing as tools will allow more efficient and more effective management of urban forests in the future.

Appendix F

Agenda for Urban Forest Conceptual Framework Focus Meeting

Agenda
Urban Forest Conceptual Framework Focus Meeting
January 6th, 2005

9:30 – Introductions, where we've come from, why we're here, process

10:00 – Small group discussion of subconcepts and place dots

11:45 –Lunch and further subconcept discussion

12:15 – share fair individual – write down thoughts. Place more dots. Share as a large group.

1:00 – wrap-up where are we going, what's next?

Appendix G

Themes and Ideas for Urban Forest Conceptual Framework Focus Meeting

Theme 1

What is an urban forest?

The concepts in this theme provide students with a fundamental knowledge of Wisconsin's urban forest and help students appreciate urban forests as ecosystems. Comprehending these concepts will lead to an understanding of the interrelationship between urban forests and humans.

- Urban forest ecosystems are connected to other ecosystems.

- Trees are the link between the urban and rural forest.

- Increased biodiversity in an urban forest can help decrease the impact of pests and diseases like gypsy moth and Dutch elm disease.

- An urban forest is an ecosystem. An ecosystem is an area that contains living and nonliving things existing together and interacting.

- Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others.

- Trees from all over the world are being planted in Wisconsin's urban forests, based on their ability to adapt to climate, soils, and maintenance regimes.

- A tree is a perennial plant with a well defined woody stem, crown, and roots.

- Urban forests are similar to savannahs. They have a few trees with a lot of grasses.

- From street to neighborhood to community to region and beyond, forests are interconnected ecosystems.

- Urban forest ecosystems are part of greater water cycles, carbon cycles, and energy cycles.

- Trees compete with each other and other plants for nutrients, sunlight, space, and water.

- An urban forest is all of the trees and other vegetation in and around a town, village, or city.

- Humans are a dominant part of urban forest ecosystems.

- Individual trees function via storm water retention, noise and view mitigation, and absorbing pollutants. These benefits are important and quantifiable.

- You cannot attain urban forest sustainability without biodiversity.

- A tree's ability to grow can be restricted by soil that is poor due to construction of buildings and roads and compaction.

- Biodiversity in an urban forest concerns canopy cover, diameter and species distribution, richness and evenness, as well as genetic diversity.

- Trees, soil, buildings, roads, and people interact as parts of the urban forest ecosystem. The interactions are increasingly important.

- Urban forests, biodiversity, and sustainability are interdependent.

- Mature tree canopy and intact ecosystems generally provide greater benefits than do newly planted landscapes.

Theme 2

Why are they important?
Concepts in this section help students investigate the connection between Wisconsin's urban forests and their own lives. Recognizing these connections increases students' awareness and understanding of the importance of sustainable urban forests to humans.

- The relative economic and social worth of one tree in an urban forest is higher than one tree in a rural forest.

- The human psyche is often attached to individual trees and the presence of trees helps create a good or bad social environment.

- The value of individual trees is quantifiable and the presence of trees on a lot generally results in higher property value.

- Trees have played a role in the history of communities.

- Humans value forests for their aesthetic, cultural, ecological, economic, educational, and recreational benefits.

- Use of forests has expanded beyond just utilitarian (lumber, fuel, food, fiber) to quality of life (air, water, etc.).

- Trees can play an important role in cleaning the environment inexpensively through phytoremediation.

- Urban or community forest programs occur or expand from recognized necessity. (Detreed communities in the 1600s spawned tree laws, Dutch elm disease increased urban forest activities, and urban sprawl increased tree preservation ordinances.)

- Urban forests affect the physical and psychological health of the humans in them.

- Meeting places and town squares many times had trees, communities that were carved out of the woods or built in /on prairies had trees added to make the area more livable.

- Trees will increasingly be part of communities' infrastructure as a "green utility."

- Historically, people have brought trees from other countries with them because the trees made them feel better, more comfortable, or to enhance a livelihood.

- 81% of Wisconsin residents live in a city, town, or village. The vitality and viability of communities are impacted by urban trees.

- Changes in technology, economic structures, and social values over time have changed the urban forest.

- A healthy urban forest has a positive impact on the social, economic, and environmental health of an urban area. (e.g. heat sink, community involvement, reduced crime, increased property value.)

- People's attitudes change both positively and negatively with increase of green. In the future, this may be used to better physical and mental health.

- The economic benefits of urban forests include reduced energy costs, reduced storm water runoff, and increased property values.

- The benefits of healthy, well-maintained urban forests outweigh the costs to plant and maintain them.

Theme 3

How do we sustain them?
These concepts help students understand the role humans play in sustaining Wisconsin's urban forests. For students to become participating members of a society that works toward sustainable urban forests, they must be able to comprehend the role urban forest management plays in meeting society's needs.

- Individual trees are often managed due to the potential for hazards and liability.

- Poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult.

- Urban forests are managed as both individual trees for safety concerns and as stands for the impact they have on the community.

- The majority of urban forest area is owned by individuals.

- Urban forest management is different than traditional rural forest management.

- Volunteer citizen groups, such as tree boards, are one way citizens can participate in creating and maintaining a healthy urban forest.

- Urban forest ownership is divided by many property owners, which complicates management.

- Issues such as urban sprawl, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest rapidly.

- Urban forest management encompasses, to a large extent, people management since they create the budgets, priorities, and ordinances that are to be carried out.

- Federal, state, and local governments can work together and with citizen groups to manage urban forests.

- Urban forest management is the use of planning and science-based techniques (e.g. planting, watering, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

- Decisions made in an urban forest to plant non-native species can affect ecosystems if those species spread beyond the urban forest.

- Urban forests provide services (storm water runoff reduction, air filtration, cooling) that are as much a part of the community infrastructure as police and fire protection, water and sewage service, etc. and need to be managed to be able to continue doing so.

- When developing an urban forest management plan, three questions need to be answered:
  What do we have?
  What do we want?
  How do we get what we want?

- Urban forestry tries to balance environmental concerns for a clean, vibrant, biodiverse, urban forest and economic concerns to maintain or increase jobs and standards of living.

- Urban forests can be managed to meet societal goals, ecologic goals, and economic goals.

- In order to successfully manage its urban forest, a community must have the personnel, equipment, knowledge, and funding to complete identified goals.

- Trees in the urban environment are under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counter act these conditions.

- Arboriculture is the scientific care of individual trees and woody plants.

- Public safety is a key concern of urban forest management.

- Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, educators, researchers, public works employees, and park and recreation staff.

- Urban forests are managed through the use of inventories, creation of management units, setting up maintenance schedules, and determining planting schedules.

- Urban forest management is most effective when there is adequate input from urban foresters, governmental bodies, citizen groups, scientists, parks/streets/public works departments , engineers, and others.

- Invasive species, such as the gypsy moth can create problems in the urban forest; management attempts to control invasive species.

- Many who plant, maintain, or manage urban trees are not schooled in arboriculture; neglect and misguided tree care commonly result.

Theme 4

What is the future?

Concepts in this theme help students identify ways to ensure Wisconsin's urban forests are sustained for future generations. For students to willingly and effectively take action regarding urban forest resource management, they must have a clear understanding of what urban forests are, whey they are important, what is involved in their management, and how citizens affect each of these.

- Research can show the benefits of proper tree planting and maintenance so that funding and effort can be put into preventative maintenance instead of crisis management.

- A citizen who recognizes the importance of good urban forest management will expect it throughout the community.

- Urban forest managers need to consider the perceptions of the public, press, and politicians in order to secure funding.

- Citizen committees play a role in decision making and training.

- Urban forestry and arboriculture are increasingly researched and studied at universities, technical schools, and by professional organizations (ISA, TCIA, American Forests).

- Improving land development and construction practices will reduce loss of existing trees.

- Research can help us find ways to prevent and manage new insect and disease problems before they become epidemic.

- Urban forest related decisions can be affected by politics, science, emotion, and economics.

- Urban forestry is a growing and changing field with many career opportunities.

- Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of the urban forest.

- Increased use of trees to eliminate or neutralize harmful substances (phytoremediation) in the environment may help improve environmental health.

- All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

- Research is an important part of urban forestry.

- Society must understand the importance of the urban forest in order to support funding for its care and management.

- Research investigates tree benefits and how we can better maintain them.

- Population in urban areas will continue to grow. With more people living closely together, the calming, mitigating impact of the urban forest landscape ecosystem becomes increasingly important.

- Using GIS, GPS, and remote sensing as tools will allow more efficient and more effective management of urban forests in the future.

- Overall, the health and abundance of urban trees is poor and in many cases declining, especially in large metropolitan regions of the country (and world), resulting in increased storm water runoff, reduced air quality and overall climate change on a global scale.

- Future loss of or damage to urban trees can be better controlled in there is knowledge of tree value and tree needs by the public.

- Advocacy and coalition building are important to sustaining support for urban forestry programs.

Appendix H

Urban Forest Scope and Sequence Meeting Participants

Scope and Sequence Meeting Participants
3-02-05

Delores Brewster
Hawthorne Glen Environmental Center
Milwaukee, Wisconsin

Peggy Dillman
3rd grade
Lincoln Avenue School
Milwaukee, Wisconsin

Roger Festerling
High School
Wisconsin Lutheran High School
Milwaukee, Wisconsin

Suzanne Klein
6-8
School on the Lake
Maplewood Middle School
Menasha, Wisconsin

Judy Klippel
Havenwoods Environmental Center
Milwaukee Wisconsin

Barb Lukaszewski
Early Childhood
Victory School
Milwaukee, Wisconsin

Brent Nerat
6-8
School on the Lake
Maplewood Middle School
Menasha, Wisconsin

Sterling Strathe
LEAF Program Director
Stevens Point, Wisconsin

Appendix I

Packet of Information for Urban Forest Scope and Sequence Meeting

Agenda
LEAF Urban Forest Supplement
Scope and Sequence Meeting
March 2, 2005

9:00-9:45 Introduction

9:45-10:15 Review of subconcepts

10:15-10:30 Break

10:30-12:00 Developing the scope and sequence part 1

12:00-12:30 Lunch

12:30-2:00 Developing the scope and sequence part 2

2:00-2:30 Large group discussion of scope and sequence

2:30-3:00 Wrap up

If extra time remains, we will identify which specific grade level each subconcept should be taught in.

Urban Forest Conceptual Framework - Draft

Theme 1
What is an urban forest?

The concepts in this theme help students understand what urban forests are and how urban forests are connected to other ecosystems.

Defining the Urban Forest

1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest.

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, roads) things existing together and interacting. Humans play a dominant role in the ecosystem.

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, **riparian** areas, manicured lawns, the urban-rural interface, and others.

Urban Forest Connections

4. Urban forest ecosystems are part of water cycles, carbon cycles, and energy webs.

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance **regimes** are being planted in Wisconsin's urban forests.

Theme 2
Why are they important?

The concepts in this theme help students investigate the connection between urban forests and their own lives.

Environmental Benefits

6. The tree canopy functions to retain storm water, **mitigate** noise and views, reduce **heat island** effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable.

Social Benefits

7. The vitality and viability of communities are impacted by urban trees.

8. Urban forests affect the physical and psychological health of human residents.

Economic Benefits

9. A healthy urban forest can provide economic benefits including reduced energy costs, reduced storm water runoff, and increased property values.

10. The benefits of healthy, well-maintained urban forests outweigh the costs to maintain them.

Theme 3
How do we sustain them?

The concepts in this theme help students understand the role humans play in sustaining urban forests.

Defining Urban Forest Management

11. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

12. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works employees, and park and recreation staff.

13. Urban forests are managed for both individual trees and as **stands** of trees for the impact they have on the community.

Challenges

14. Land development practices and poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult.

15. Urban forest ownership is divided among many property owners; this complicates management.

16. Trees in the urban environment can be under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees

are managed more intensively to counteract these conditions.

17. Invasive plant and animal species can create problems in the urban forest; management attempts to control and slow the spread of invasive species.

Solutions

18. Urban forest management is most effective when there is adequate input from resource professionals, governmental bodies, and citizens.

19. Inclusion of private lands and participation of private landowners in urban forest management is essential to successfully manage an urban forest as an ecosystem.

20. In order to successfully manage its urban forest, a community must have strong local interest, policies and goals that accommodate trees, and technical expertise available to implement them.

21. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of pests, diseases, and damaging weather events.

Theme 4
What is the future?

The concepts in this theme help students identify the challenges and possibilities that urban forests may face in the future.

Issues

22. Issues such as **urban sprawl**, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest.

23. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale.

Your Connection

24. Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of an urban forest.

25. Society must understand the importance of an urban forest in order to support funding for its care and management.

26. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

Research

27. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management.

28. Urban forestry and **arboriculture** are increasingly researched and studied at universities, technical schools, and by professional organizations (e.g., International Society of Arboriculture, Tree Care Industry Association, American Forests, Society of American Foresters).

Glossary

Arboriculture
The science of managing individual trees.

Biodiversity
The variety and complexity of all life on earth. (from master list – 5-6. there is a longer version in the other framework.)

Heat island
The phenomenon that, because concrete and asphalt absorb heat, cities are 5-9 degrees warmer than rural areas.

Mitigate
To lessen, to make less serious.

Regime
A system of administration.

Riparian
Relating to the land around a river or another body of water.

Stand – A group of trees in a given area. (from master list 7-8)

Urban sprawl
Wide-spread, low-density development spreading out from urban areas into previously undeveloped farmland and forestland.

Appendix J

Urban Forest Concept Focus Meeting Planned Participants

Concept Focus Meeting Planned Participants
Cathy Brodbeck – Madison Gas and Electric - Attended
Cindy Casey-Widstrand – WDNR - Attended
Sally Ellingboe – Retired educator - Attended
Gail Epping Overholt – Aldo Leopold Nature Center - Did not Attend
Todd Ernster – City of Stevens Point - Attended
Rich Hauer – UWSP - Did not Attend
Leif Hubbard – Wisconsin Dept. of Transportation - Attended
Jill Johnson – USDA Forest Service - Attended
Don Kissinger – WDNR - Attended
Dave Liska – City of Waukesha - Attended
Ken Ottman – City of Milwaukee - Did not Attend
Richard Rideout – WDNR - Attended
Stacy Schaefer – Sigurd Olson Environmental Institute - Did not Attend
Brian Wahl – graduate student - Attended
Dennis Yockers – UWSP - Attended
Ron Zillmer – Midstate Technical College - Attended

Appendix K

Results of Urban Forest Concept Focus Meeting

Theme 1
What is an urban forest?

Subconcept	Dots received
Urban forest ecosystems are connected to other ecosystems. AA	1 yes
Trees are the link between the urban and rural forest. BB	2 no
Increased biodiversity in an urban forest can help decrease the impact of pests and diseases like gypsy moth and Dutch elm disease. CC	3 yes
An urban forest is an ecosystem. An ecosystem is an area that contains living and nonliving things existing together and interacting. DD	7 yes
Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others. EE	9 yes
Trees from all over the world are being planted in Wisconsin's urban forests, based on their ability to adapt to climate, soils, and maintenance regimes. FF	4 yes
A tree is a perennial plant with a well defined woody stem, crown, and roots. GG	4 yes
Urban forests are similar to savannahs. They have a few trees with a lot of grasses. HH	1 yes 8 no
From street to neighborhood to community to region and beyond, forests are interconnected ecosystems. II	1 yes 1 no
Urban forest ecosystems are part of greater water cycles, carbon cycles, and energy cycles. JJ	5 yes
Trees compete with each other and other plants for nutrients, sunlight, space, and water. KK	1 yes
An urban forest is all of the trees and other vegetation in and around a town, village, or city. LL	7 yes
Humans are a dominant part of urban forest ecosystems. MM	3 yes
Individual trees function via storm water retention, noise and view mitigation, and absorbing pollutants. These benefits are important and quantifiable. NN	8 yes
You cannot attain urban forest sustainability without biodiversity. OO	1 no
A tree's ability to grow can be restricted by soil that is poor due to construction of buildings and roads and compaction. PP	1 yes
Biodiversity in an urban forest concerns canopy cover, diameter and species distribution, richness and evenness, as well as genetic diversity. QQ	3 yes

Trees, soil, buildings, roads, and people interact as parts of the urban forest ecosystem. The interactions are increasingly important. RR	6 yes
Urban forests, biodiversity, and sustainability are interdependent. SS	2 yes 1 no
Mature tree canopy and intact ecosystems generally provide greater benefits than do newly planted landscapes. TT	4 yes

Comments
- MM is encompassed in RR
- PP belongs in Theme 3
- Ecosystems have been urbanized to meet human needs
- NN – the focus should be on <u>canopy</u> rather than <u>individual trees</u>
- NN should be in #2
- CC, OO, QQ, and SS are all biodiversity subsets
- DD – ecosystems aren't "areas" – they are flexible...no firm boundaries; change over space and time
- Expand to include the <u>overall </u>poor quality of urban soil as a growing medium due to <u>MANY</u> factors, not just construction

Theme 2
Why are they important?

Subconcept	Dots received
The relative economic and social worth of one tree in an urban forest is higher than one tree in a rural forest. AA	5 yes
The human psyche is often attached to individual trees and the presence of trees helps create a good or bad social environment. BB	None
The value of individual trees is quantifiable and the presence of trees on a lot generally results in higher property value. CC	5 yes
Trees have played a role in the history of communities. DD	3 yes
Humans value forests for their aesthetic, cultural, ecological, economic, educational, and recreational benefits. EE	5 yes
Use of forests has expanded beyond just utilitarian (lumber, fuel, food, fiber) to quality of life (air, water, etc.). FF	2 yes
Trees can play an important role in cleaning the environment inexpensively through phytoremediation. GG	4 yes
Urban or community forest programs occur or expand from recognized necessity. (Detreed communities in the 1600s spawned tree laws, Dutch elm disease increased urban forest activities, and urban sprawl increased tree preservation ordinances.) HH	None

Urban forests affect the physical and psychological health of the humans in them. II	6 yes
Meeting places and town squares many times had trees, communities that were carved out of the woods or built in /on prairies had trees added to make the area more livable. JJ	None
Trees will increasingly be part of communities' infrastructure as a "green utility." KK	3 yes
Historically, people have brought trees from other countries with them because the trees made them feel better, more comfortable, or to enhance a livelihood. LL	3 yes
81% of Wisconsin residents live in a city, town, or village. The vitality and viability of communities are impacted by urban trees. MM	6 yes
Changes in technology, economic structures, and social values over time have changed the urban forest. NN	3 no
A healthy urban forest has a positive impact on the social, economic, and environmental health of an urban area. (e.g. heat sink, community involvement, reduced crime, increased property value.) OO	11 yes
People's attitudes change both positively and negatively with increase of green. In the future, this may be used to better physical and mental health. PP	1 yes 2 no
The economic benefits of urban forests include reduced energy costs, reduced storm water runoff, and increased property values. QQ	7 yes
The benefits of healthy, well-maintained urban forests outweigh the costs to plant and maintain them. RR	11 yes

Comments
- II encompasses PP and BB
- FF, JJ, and LL making the same point

Theme 3
How do we sustain them?

Subconcept	Dots received
Individual trees are often managed due to the potential for hazards and liability. AA	None
Poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult. BB	7 yes
Urban forests are managed as both individual trees for safety concerns and as stands for the impact they have on the community. CC	4 yes
The majority of urban forest area is owned by individuals. DD	2 yes

Urban forest management is different than traditional rural forest management. EE	3 yes
Volunteer citizen groups, such as tree boards, are one way citizens can participate in creating and maintaining a healthy urban forest. FF	None
Urban forest ownership is divided by many property owners, which complicates management. GG	7 yes
Issues such as urban sprawl, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest rapidly. HH	4 yes
Urban forest management encompasses, to a large extent, people management since they create the budgets, priorities, and ordinances that are to be carried out. II	2 yes
Federal, state, and local governments can work together and with citizen groups to manage urban forests. JJ	1 yes
Urban forest management is the use of planning and science-based techniques (e.g. planting, watering, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes. KK	8 yes
Decisions made in an urban forest to plant non-native species can affect ecosystems if those species spread beyond the urban forest. LL	1 yes
Urban forests provide services (storm water runoff reduction, air filtration, cooling) that are as much a part of the community infrastructure as police and fire protection, water and sewage service, etc. and need to be managed to be able to continue doing so. MM	4 yes
When developing an urban forest management plan, three questions need to be answered: 　　What do we have? 　　What do we want? 　　How do we get what we want? NN	3 yes 1 no
Urban forestry tries to balance environmental concerns for a clean, vibrant, biodiverse, urban forest and economic concerns to maintain or increase jobs and standards of living. OO	2 yes
Urban forests can be managed to meet societal goals, ecologic goals, and economic goals. PP	2 yes
In order to successfully manage its urban forest, a community must have the personnel, equipment, knowledge, and funding to complete identified goals. QQ	4 yes
Trees in the urban environment are under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counter act these conditions. RR	9 yes
Arboriculture is the scientific care of individual trees and woody plants. SS	3 yes
Public safety is a key concern of urban forest management. TT	2 yes

Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, educators, researchers, public works employees, and park and recreation staff. UU	9 yes
Urban forests are managed through the use of inventories, creation of management units, setting up maintenance schedules, and determining planting schedules. VV	4 yes 1 no
Urban forest management is most effective when there is adequate input from urban foresters, governmental bodies, citizen groups, scientists, parks/streets/public works departments, engineers, and others. WW	4 yes
Invasive species, such as the gypsy moth can create problems in the urban forest; management attempts to control invasive species. XX	7 yes
Many who plant, maintain, or manage urban trees are not schooled in arboriculture; neglect and misguided tree care commonly result. YY	1 yes 2 no

Comments
- JJ encompasses FF
- LL relates to XX (combine but say plant and animal invasives)
- AA and CC can be combined
- MM should be included in Theme 2
- JJ and WW can be combined
- VV encompasses NN
- If UF's are ecosystems, management of private land is critical
- BB – Expand concept to ..."Land development practices and poor construction..."
- QQ – This describes a very traditional program structure. Expand or modify to include contracting, partnerships, volunteer involvement and other mans of program/service delivery
- OO – I don't think the concept is framed correctly – there aren't opposing goals. The tradeoff is more related to FUNDING CHOICES (police, fire...)

Theme 4
What is the future?

Subconcept	Dots received
Research can show the benefits of proper tree planting and maintenance so that funding and effort can be put into preventative maintenance instead of crisis management. AA	7 yes
A citizen who recognizes the importance of good urban forest management will expect it throughout the community. BB	3 yes
Urban forest managers need to consider the perceptions of the public, press, and politicians in order to secure funding. CC	1 yes

Citizen committees play a role in decision making and training. DD	1 no
Urban forestry and arboriculture are increasingly researched and studied at universities, technical schools, and by professional organizations (ISA, TCIA, American Forests). EE	3 yes
Improving land development and construction practices will reduce loss of existing trees. FF	9 yes
Research can help us find ways to prevent and manage new insect and disease problems before they become epidemic. GG	1 yes
Urban forest related decisions can be affected by politics, science, emotion, and economics. HH	3 yes
Urban forestry is a growing and changing field with many career opportunities. II	4 yes
Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of the urban forest. JJ	7 yes
Increased use of trees to eliminate or neutralize harmful substances (phytoremediation) in the environment may help improve environmental health. KK	1 yes
All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests. LL	9 yes
Research is an important part of urban forestry. MM	2 yes
Society must understand the importance of the urban forest in order to support funding for its care and management. NN	6 yes
Research investigates tree benefits and how we can better maintain them. OO	1 yes
Population in urban areas will continue to grow. With more people living closely together, the calming, mitigating impact of the urban forest landscape ecosystem becomes increasingly important. PP	3 yes
Using GIS, GPS, and remote sensing as tools will allow more efficient and more effective management of urban forests in the future. QQ	None
Overall, the health and abundance of urban trees is poor and in many cases declining, especially in large metropolitan regions of the country (and world), resulting in increased storm water runoff, reduced air quality and overall climate change on a global scale. RR	4 yes
Future loss of or damage to urban trees can be better controlled in there is knowledge of tree value and tree needs by the public. SS	3 yes
Advocacy and coalition building are important to sustaining support for urban forestry programs. TT	2 yes

Comments

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- AA, MM, OO, EE, GG all have a <u>research</u> focus
- QQ can be a wonderful activity for middle/hs students
- *Issues/problems facing urban forests – Do we need another theme category – bring in from other themes
- TT "champions" are important

Side note.   *Theme 3 and 4 – Need to use <u>specific</u> case studies – small, medium, large communities as examples in activities – show that urban forestry can be successful at all levels.

Notes from group discussion
- Soil, water, air, and trees are part of urban ecosystem, too – is this concept represented. Really talking about an urban system, not just forest.
- Where should "issues" go? – issues are here and now – a current issues concept?
- Address preconceptions and myths – for instance the urban ecosystem is unnatural
- Struggle in Theme 3 and Theme 4 that things are changing – How do we keep concepts timely?
- Sustaining theme [3] focuses on public management and we need more on private ownership and management
- More weight on private owners they need to think about how their actions impact the whole system
- Ecosystem discussion – degree - what is it?
- We've placed manmade things into an existing ecosystem. Conditions (soil, climate etc.) still exist. Because it's been disturbed doesn't mean it's been taken out of nature.

Additional Comments
- Tree care practices good/bad/how in "urban forest management..." subconcept in Theme 3. – This should be sure to be included in an activity. It isn't a large enough idea for a subconcept but should definitely be covered.
- Planning before you plant a concern for utilities. Activity emphasis.

Appendix L

Results of Urban Forest Scope and Sequence Meeting

Theme 1

. . . .

1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest. *Introduce K*

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, roads) things existing together and interacting. Humans play a dominant role in the ecosystem. *Introduce early – Mid spiral later*

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, **riparian** areas, manicured lawns, the urban-rural interface, and others. *Introduce 1-2*

4. Urban forest ecosystems are part of water cycles, carbon cycles, and energy webs. *Introduce water cycles in 2-3 as a link between basic concept of interconnections and more complex idea of how cycles work, and how things depend on each other. Introduce energy cycles in 4th.*

K-4

. . . .

1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest. *Mastery 5*

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, roads) things existing together and interacting. Humans play a dominant role in the ecosystem. *Mastery 6-8*

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, **riparian** areas, manicured lawns, the urban-rural interface, and others. *Introduce to mid   highlighted things introduced*

4. Urban forest ecosystems are part of water cycles, carbon cycles, and energy webs. *Introduce carbon cycles in 8   Water cycles and energy webs are mid   7-8*

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance **regimes** are being planted in Wisconsin's urban forests. *Introduce 8*

5-8

. . . .

1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest. *Bio, Env Sci   Introduce-Mastery*

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, roads) things existing together and interacting. Humans play a dominant role in the ecosystem. *Bio, Env Sci   Mastery*

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, **riparian** areas, manicured lawns, the urban-rural interface, and others. *Bio, Env Sci Mastery*

4. Urban forest ecosystems are part of water cycles, carbon cycles, and energy webs. *Bio, Env Sci   Mastery*

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance **regimes** are being planted in Wisconsin's urban forests. *World biomes   Bio, Geography, Env Sci   Mastery*

9-12

Theme 2

∙∙

6. The tree canopy functions to retain storm water, **mitigate** noise and views, reduce **heat island** effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable. *Introduce   wildlife habitat K-1   mitigate noise and views 3   absorb pollutants 4th*

8. Urban forests affect the physical and psychological health of human residents. *Introduce K-1 "A Tree Is Nice"*

K-4

∙∙

6. The tree canopy functions to retain storm water, **mitigate** noise and views, reduce **heat island** effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable. *Wildlife habitat master at 5   Introduce others 5-6*

8. Urban forests affect the physical and psychological health of human residents. *Introduce Physical 5-6   psychological 7-8*

9. A healthy urban forest can provide economic benefits including reduced energy costs, reduced storm water runoff, and increased property values. *Introduce 7-8*

5-8

∙∙

6. The tree canopy functions to retain storm water, **mitigate** noise and views, reduce **heat island** effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable. *Physics, Env Sci   Mastery*

7. The vitality and viability of communities are impacted by urban trees. *Cross curricular Lang arts/Env Sci Introduce*

8. Urban forests affect the physical and psychological health of human residents. *Cross curricular Lang Arts/Env Sci   Introduce*

9. A healthy urban forest can provide economic benefits including reduced energy costs, reduced storm water runoff, and increased property values. *Similar to 6   Physics, Env Sci Mastery*

10. The benefits of healthy, well-maintained urban forests outweigh the costs to maintain them. *Env Sci   Introduce*

9-12

Theme 3

. . . .

11. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes. *Introduce 2-3-4 Trees need to be taken care of*

12. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works employees, and park and recreation staff. *Introduce K-1*

14. Land development practices and poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult. *Introduce 2-3*

16. Trees in the urban environment can be under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions. *3rd grade "Happy/Sad Tree"*

17. Invasive plant and animal species can create problems in the urban forest; management attempts to control and slow the spread of invasive species*. Introduce 3-4*

20. In order to successfully manage its urban forest, a community must have strong local interest, policies and goals that accommodate trees, and technical expertise available to implement them. *Introduce 3-4*

21. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of pests, diseases, and damaging weather events. *Richness (# of species) evenness (different ages) introduce 3-4*

K-4

. . . .

11. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes. *Introduce 5-6 Mid 7-8*

12. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works employees, and park and recreation staff. *Introduce to mid*

13. Urban forests are managed for both individual trees and as **stands** of trees for the impact they have on the community. *Introduce?*

14. Land development practices and poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult. *Introduce*

16. Trees in the urban environment can be under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions. *Introduce 7-8*

17. Invasive plant and animal species can create problems in the urban forest; management attempts to control and slow the spread of invasive species. *Introduce – Mid 7-8*

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21. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of pests, diseases, and damaging weather events. *Biodiversity 5-6   Genetic diversity 7-8   Introduce*

5-8

11. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes. *Ag, Bio, Env Sci, Life Sci   Introduce - Mid*

12. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works employees, and park and recreation staff. *Ag, Env Sci, Life Sci,   Introduce - Mid*

13. Urban forests are managed for both individual trees and as **stands** of trees for the impact they have on the community.*Ag?*

14. Land development practices and poor construction techniques used to build homes, businesses, roads, etc. can kill or damage existing trees and make growing new trees difficult. *Ag, Life Sci, Env Sci,   Introduce - Mid*

15. Urban forest ownership is divided among many property owners; this complicates management. *Poli Sci   Introduce*

16. Trees in the urban environment can be under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions. *Bio, Env Sci, Ag   Mid - Mastery*

17. Invasive plant and animal species can create problems in the urban forest; management attempts to control and slow the spread of invasive species. *Bio, Env Sci, Life Sci, Ag   Mastery*

18. Urban forest management is most effective when there is adequate input from resource professionals, governmental bodies, and citizens. *Government, Poli Sci, Env Sci   Introduce*

19. Inclusion of private lands and participation of private landowners in urban forest management is essential to successfully manage an urban forest as an ecosystem. *Government, Poli Sci, Env Sci   Introduce*

20. In order to successfully manage its urban forest, a community must have strong local interest, policies and goals that accommodate trees, and technical expertise available to implement them. *Env Sci?*

21. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of pests, diseases, and damaging weather events*. Bio, Env Sci   Mastery*

9-12

Theme 4

22. Issues such as **urban sprawl**, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest. *Introduce 3-4*

24. Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of an urban forest. *Introduce 3-4*

26. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests. *Introduce K-1 Mid 2-3-4*

27. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management. *Introduce 3-4 Analogy to brushing teeth*

K-4

22. Issues such as **urban sprawl**, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest. *Mid*

23. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale. *Introduce 6-8*

24. Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of an urban forest. *Introduce 5*

26. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests. *Mid 5-6 Mastery 7-8*

27. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management. *Introduce*

5-8

22. Issues such as **urban sprawl**, tree neglect, and insect and disease infestation are changing the characteristics of the urban forest. *Bio, Env Sci, Ag Mid*

23. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale. *Env Sci, Mastery*

24. Individuals, neighborhood groups, volunteer groups, and elected officials all can have a positive influence on others to recognize the value and importance of an urban forest. *Env Sci Tied with 23   Introduce*

26. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests. *Bio, Env Sci, Life Sci   Mastery*

27. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management. *Env Sci, Introduce-Mid?*

28. Urban forestry and **arboriculture** are increasingly researched and studied at universities, technical schools, and by professional organizations (e.g., International Society of Arboriculture, Tree Care Industry Association, American Forests, Society of American Foresters). *Ag, Env Sci, Bio Tied to Careers*

9-12

Appendix M

Final Draft *LEAF Conceptual Guide to Wisconsin K-12 Urban Forestry Education*

Conceptual Guide to K-12 Urban Forestry Education in Wisconsin
DRAFT

Urban forests are an important resource in Wisconsin. For example, they provide benefits like storm water retention, energy use reductions, carbon sequestration, as well as aesthetic values. During the development of the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*, urban forestry was identified as an area that should be addressed separately so that its unique characteristics could be explored more fully.

It was decided that an Urban Forest Supplement would be created and used in conjunction with the existing LEAF educational materials. As with the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*, an urban forest conceptual guide was needed to guide the development of the K-12 Urban Forest Supplement educational materials.

The *LEAF Conceptual Guide to K-12 Urban Forest Education* includes two parts, a conceptual framework and a scope and sequence. The conceptual framework identifies the important ideas, or concepts, that students in Wisconsin should learn by the time they graduate from high school. The scope and sequence identifies at what grade level those concepts should be taught.

This conceptual guide is arranged under four themes posed as questions: What is an urban forest? Why are they important? How do we sustain them? and What is the future? Each theme is followed by concepts that address the question and the concepts are further divided into numbered subconcepts. Definitions of some terms relative to use in this document are provided for clarity.

The concepts identified here are not detailed urban forestry principles; those principles are beyond the scope of this document and K-12 education. These concepts are instead, basic ideas that informed citizens of Wisconsin should understand. By understanding these ideas, citizens will be able to make educated, knowledgeable decisions regarding their urban forests.

In addition to the important ideas identified in this document, certain basic ideas from the original LEAF K-12 Forestry Education Conceptual Guide should also serve as a guide when creating urban forestry based materials. The following subconcepts from that document have been identified to help promote a more complete understanding.
- *Subconcept 6*. A tree is a perennial plant (lives more than one growing season) with a well-defined woody stem, crown, and roots.

- *Subconcept 7.* Trees compete for nutrients, sunlight, space, and water.
- *Subconcept 8.* Trees have life stages that include germination, growth, maturity, reproduction, decline, and death.

The subconcepts in this framework have been correlated with the Wisconsin Model Academic Standards so teachers can address the academic standards while infusing urban forestry education into the curriculum. These standards are listed in the scope and sequence section. The standards specify what student should know and be able to do by certain points in their K-12 education. School districts may use the academic standards as guides for developing local grade-by-grade curricula. The four subject areas cited (science, environmental education, social studies, and agriculture education) have the most direct correlation to the subconcepts.

Note: As this document moves from draft to final version, additional standards may be identified.

Conceptual Framework
DRAFT

Theme 1
What is an urban forest?

The concepts in this theme help students understand what urban forests are and how urban forests are connected to other ecosystems.

Defining the Urban Forest

1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest.

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, utilities, roads) things existing together and interacting. Humans play a dominant role in the ecosystem.

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, **riparian** areas, manicured lawns, the urban-rural interface, and others.

Urban Forest Connections

4. Urban forest ecosystems are part of matter cycling and **energy webs**.

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance **regimes** are being planted in Wisconsin's urban forests.

Theme 2
Why are they important?

The concepts in this theme help students investigate the connection between urban forests and their own lives.

Environmental Benefits

6. The tree canopy functions to retain storm water, reduce **heat island** effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable.

Social Benefits

7. Urban forests affect the physical and psychological health of human residents.

Economic Benefits

8. A healthy urban forest can provide economic benefits including reduced energy use costs, reduced storm water runoff, and increased property values.

9. The benefits of healthy, well-maintained urban forests outweigh the costs to maintain them.

Theme 3
How do we sustain them?

The concepts in this theme help students understand the role humans play in sustaining urban forests.

Defining Urban Forest Management

10. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

11. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works or utility employees, and park and recreation staff.

12. Urban forests are managed for both individual trees and as groups of trees for the impact they have on the community.

Challenges

13. Land development practices and poor construction techniques used to build homes, businesses, utilities, roads, etc. can kill or damage existing trees and make growing new trees difficult.

14. Urban forest ownership is divided among many property owners with different and sometimes conflicting goals; this complicates management.

15. Trees in the urban environment can be under more stress than trees in rural areas due to difficult growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions.

16. **Invasive** plant and animal species, pests, diseases, and damaging weather events can create problems in the urban forest; management attempts to control these.

Solutions

17. Urban forest management is most effective when there is adequate input from resource professionals, governmental bodies, and citizens.

18. Inclusion of private lands and participation of private landowners in urban forest management is essential to successfully manage an urban forest as an ecosystem.

19. A community must have strong local interest, policies and goals that accommodate trees, and technical expertise available to implement them, in order to successfully manage its urban forest.

20. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of invasive species, pests, diseases, construction activities, and damaging weather events.

Theme 4
What is the future?

The concepts in this theme help students identify the challenges and possibilities that urban forests may face in the future.

Issues

21. Issues such as **urban sprawl**, tree neglect, and insects and diseases are changing the characteristics of the urban forest.

22. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale.

Your Connection

23. Individuals, neighborhood groups, volunteer groups, and elected officials can have a positive influence on others by increasing recognition of the proper care, value, and importance of an urban forest.

24. All citizens have a responsibility to be stewards of the environment. Decisions they make affect urban forests as well as other forests.

Research

25. Research can show potential benefits of proper management, identify new uses for trees, find ways to protect urban forests from insects and disease, and suggest improvements for tree care techniques.

Glossary

Biodiversity
The variety and complexity of all life on earth.

Energy webs
A system where energy is transferred through a series of interconnected food chains.

Heat island
The phenomenon that, because concrete and asphalt absorb and re-radiate heat, cities are 5-9 degrees warmer than rural areas.

Invasive species
A species that enters an area and causes harm by out-competing species that are already there.

Mitigate
To lessen, to make less serious.

Regime
A system of administration.

Riparian
Relating to the land around a river or another body of water.

Urban sprawl
Wide-spread, low-density development spreading out from urban areas into previously undeveloped farmland and forestland.

Urban Forest Scope and Sequence
DRAFT

Theme 1
What is an urban forest?

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K-4
Defining the Urban Forest
1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest.

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, utilities, roads) things existing together and interacting. Humans play a dominant role in the ecosystem.

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others.

Urban Forest Connections
4. Urban forest ecosystems are part of matter cycling and energy webs.

Wisconsin Model Academic Standards:
AG E.4.2, E.4.3
EE B.4.1, B.4.4, B.4.5
SCI F.4.4
SS A.4.7

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5-8
Defining the Urban Forest
1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest.

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, utilities, roads) things existing together and interacting. Humans play a dominant role in the ecosystem.

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others.

Urban Forest Connections
4. Urban forest ecosystems are part of matter cycling and energy webs.

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance regimes are being planted in Wisconsin's urban forests.

Wisconsin Model Academic Standards:
EE B.8.5, B.8.10

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9-12

Defining the Urban Forest
1. An urban forest is all of the trees and other vegetation in and around a town, village, or city. Plants, people, and animals are part of the urban forest.

2. An urban forest is an ecosystem. An ecosystem is an area that contains living (e.g., trees, people, animals) and nonliving (e.g., soil, buildings, utilities, roads) things existing together and interacting. Humans play a dominant role in the ecosystem.

3. Many different components make up urban forests. They may include street trees, park trees, woodlands, riparian areas, manicured lawns, the urban-rural interface, and others.

Urban Forest Connections
4. Urban forest ecosystems are part of matter cycling and energy webs.

5. Trees from all over the world with the ability to adapt to climate, soils, and maintenance regimes are being planted in Wisconsin's urban forests.

Wisconsin Model Academic Standards:
EE B.12.1
SCI F.12.7, F.12.8, F.12.9, F.12.10

Theme 2
Why are they important?

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K-4
Environmental Benefits
6. The tree canopy functions to retain storm water, mitigate noise and views, reduce heat island effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable.

Social Benefits
7. Urban forests affect the physical and psychological health of human residents.

Wisconsin Model Academic Standards:
EE B.4.10

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5-8
Environmental Benefits
6. The tree canopy functions to retain storm water, mitigate noise and views, reduce heat island effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable.

Social Benefits
7. Urban forests affect the physical and psychological health of human residents.

Economic Benefits
8. A healthy urban forest can provide economic benefits including reduced energy use costs, reduced storm water runoff, and increased property values.

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9-12
Environmental Benefits
6. The tree canopy functions to retain storm water, mitigate noise and views, reduce heat island effects, absorb pollutants, and provide wildlife habitat. These benefits are important and quantifiable.

Social Benefits
7. Urban forests affect the physical and psychological health of human residents.

Economic Benefits
8. A healthy urban forest can provide economic benefits including reduced energy use costs, reduced storm water runoff, and increased property values.

9. The benefits of healthy, well-maintained urban forests outweigh the costs to maintain them.

Wisconsin Model Academic Standards:
EE B.12.2, B.12.12, D.12.8
SCI G.12.3, H.12.1

Theme 3
How do we sustain them?

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K-4

Defining Urban Forest Management

10. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

11. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works or utility employees, and park and recreation staff.

Challenges

13. Land development practices and poor construction techniques used to build homes, businesses, utilities, roads, etc. can kill or damage existing trees and make growing new trees difficult.

15. Trees in the urban environment can be under more stress than trees in rural areas due to difficult growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions.

16. Invasive plant and animal species, pests, diseases, and damaging weather events can create problems in the urban forest; management attempts to control these.

20. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of invasive species, pests, diseases, construction activities, and damaging weather events.

Wisconsin Model Academic Standards:
AG D.4.5
EE B.4.11, C.4.1, C.4.5

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5-8

Defining Urban Forest Management

10. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

11. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works or utility employees, and park and recreation staff.

12. Urban forests are managed for both individual trees and as stands of trees for the impact they have on the community.

Challenges

13. Land development practices and poor construction techniques used to build homes, businesses, utilities, roads, etc. can kill or damage existing trees and make growing new trees difficult.

15. Trees in the urban environment can be under more stress than trees in rural areas due to difficult growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions.

16. Invasive plant and animal species, pests, diseases, and damaging weather events can create problems in the urban forest; management attempts to control these.

Solutions
20. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of invasive species, pests, diseases, construction activities, and damaging weather events.

Wisconsin Model Academic Standards:
EE B.8.3, B.8.22, B.8.23
SCI G.8.1

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9-12
Defining Urban Forest Management
10. Urban forest management is the use of planning and science-based techniques (e.g., planting, mulching, pruning, removal, monitoring, evaluation) to meet desired outcomes.

11. Jobs related to urban forestry include: arborists, planners, city foresters, nursery workers, landscapers, consultants, landscape architects, educators, researchers, public works or utility employees, and park and recreation staff.

12. Urban forests are managed for both individual trees and as stands of trees for the impact they have on the community.

Challenges

13. Land development practices and poor construction techniques used to build homes, businesses, utilities, roads, etc. can kill or damage existing trees and make growing new trees difficult.

14. Urban forest ownership is divided among many property owners with different and sometimes conflicting goals; this complicates management.

15. Trees in the urban environment can be under more stress than trees in rural areas due to harsh growing conditions (e.g. soil compaction, limited space, pollution); urban trees are managed more intensively to counteract these conditions.

Solutions
16. Invasive plant and animal species, pests, diseases, and damaging weather events can create problems in the urban forest; management attempts to control these.

17. Urban forest management is most effective when there is adequate input from resource professionals, governmental bodies, and citizens.

18. Inclusion of private lands and participation of private landowners in urban forest management is essential to successfully manage an urban forest as an ecosystem.

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20. **Biodiversity**, in terms of canopy cover, diameter and species distribution, richness, evenness, and genetic diversity, can help decrease the impact of invasive species, pests, diseases, construction activities, and damaging weather events.

Wisconsin Model Academic Standards:
EE B.12.21, C.12.1

Theme 4
What is the future?

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K-4

Issues

21. Issues such as urban sprawl, tree neglect, and insects and diseases are changing the characteristics of the urban forest.

Your Connection

23. Individuals, neighborhood groups, volunteer groups, and elected officials can have a positive influence on others by increasing recognition of the proper care, value, and importance of an urban forest.

24. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

Wisconsin Model Academic Standards:
EE C.4.3, D.4.5, E.4.1
SS D.4.7

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5-8

Issues

21. Issues such as urban sprawl, tree neglect, and insects and diseases are changing the characteristics of the urban forest.

22. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale.

Your Connection

23. Individuals, neighborhood groups, volunteer groups, and elected officials can have a positive influence on others by increasing recognition of the proper care, value, and importance of an urban forest.

24. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

Research

25. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management.

Wisconsin Model Academic Standards:
EE D.8.3, D.8.5, E.8.1
SS D.8.11

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9-12

Issues
21. Issues such as urban sprawl, tree neglect, and insects and diseases are changing the characteristics of the urban forest.

22. Declining health and abundance of urban trees, especially in metropolitan regions of the country (and world), can result in increased storm water runoff, reduced air quality, and overall climate change on a global scale.

Your Connection
23. Individuals, neighborhood groups, volunteer groups, and elected officials can have a positive influence on others by increasing recognition of the proper care, value, and importance of an urban forest.

24. All citizens have a responsibility to be stewards of the environment. Decisions they make affect their urban forest as well as other forests.

Research
25. Research can show the benefits of proper tree planting and preventative maintenance so that funding and effort can be put into preventative maintenance instead of crisis management.

Wisconsin Model Academic Standards:
EE B.12.13, B.12.22, D.12.4, D.12.5, D.12.7, E.12.3

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Appendix

Wisconsin's Model Academic Standards

Agriculture (AG)
D.4.5 Identify careers in the areas of food, fiber, and ornamental plant production and processing.

E.4.2 Identify the different ways land is used.
- Recognize how land use affects plants, domestic animals, and wildlife
- Identify the different uses of land in one's community.

E.4.3 Understand how different climatic conditions determine the plants that are grown in an area.

Environmental Education (EE)
B.4.1 Describe the flow of energy in natural systems, citing the sun as the source of energy on the Earth: e.g., a food chain.

B.4.4 List the components of an ecosystem, including the qualities of a healthy habitat.

B.4.5 Describe natural and human-built ecosystems.

B.4.10 Describe how they use natural resources in their daily lives.

B.4.11 List jobs in the community that result from or are influenced by processing and using natural resources.

B.8.3 Explain the importance of biodiversity.

B.8.5 Give examples of human impact on various ecosystems.

B.8.10 Explain and cite examples of how humans shape the environment.

B.8.22 Identify careers related to natural resources and environmental concerns.

B.8.23 Identify governmental and private agencies responsible for environmental protection and natural resource management.

B.12.1 Evaluate the relationship of matter and energy and the flow of energy in natural, managed, and built systems.

B.12.2 Describe the value of ecosystems from a natural and human perspective; e.g., food, shelter, flood control, water purification.

B.12.12 Evaluate the environmental and societal costs and benefits of allocating resources in various ways and identify management strategies to maintain economic and environmental sustainability.

B.12.13 Analyze how different political and governmental systems manage resource

development, distribution, consumption, and waste disposal.

B.12.21 Research the roles of various careers related to natural resource management and other environmental fields.

B.12.22 Research individuals who have made important contributions to the field of resource management.

C.4.1 Identify environmental problems and issues.

C.4.3 Identify people and groups of people that are involved in the issue.

C.4.5 Identify proposed solutions to the issue and discuss arguments for and against the issue.

C.12.1 Compare the effects of natural and human-caused activities that either contribute to or challenge an ecologically and economically sustainable environment.

D.8.3 List reasons why an individual or group chooses to participate or not participate in an environmental activity in the home, school, or community.

D.8.5 Explain how personal actions can impact an environmental issue: e.g., doing volunteer work in conservation.

D.12.4 Describe the rights and responsibilities of citizenship in regard to environmental problems and issues.

D.12.5 Develop a plan to maintain or improve some part of the local or regional environment, and enlist support for the implementation of that plan.

D.12.7 Analyze political, educational, economic, and governmental influences on environmental issues,* and identify the role of citizens* in policy formation.

D.12.8 Use cost-benefit analysis to evaluate proposals to improve environmental quality.

E.4.1 Identify and describe examples of their environmental civil responsibilities and the actions they take to meet them.

E.8.1 Formulate a personal plan for environmental stewardship.

E.12.3 Take action in regard to environmental issues* in the home, school, or communities.

Science (SCI)
F.4.4 Using science themes, develop explanations for the connections among living and nonliving things in various environments.

F.12.7 Investigate how organisms both cooperate and compete in ecosystems.

F.12.8 Using the science themes, infer changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution.

F.12.9 Using the science themes, investigate energy systems (related to food chains) to show how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

F.12.10 Understand the impact of energy on organisms in living systems.

G.8.1 Identify and investigate the skills people need for a career in science or technology and identify the academic courses that a person pursuing such a career would need.

G.12.3 Analyze the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community.

H.12.1 Using science themes and knowledge of the earth and space, life and environmental, and physical sciences, analyze the costs, risks, benefits, and consequences of a proposal concerning resource management in the community and determine the potential impact of the proposal on life in the community and the region.

Social Studies (SS)
A.4.7 Identify connections between the local community and other places in Wisconsin, the United States, and the world.

D.4.7 Describe how personal economic decisions, such as deciding what to buy, what to recycle, or how much to contribute to people in need, can affect the lives of people in Wisconsin, the United States, and the world.

D.8.11 Describe how personal decisions can have a global impact on issues such as trade agreements, recycling, and conserving the environment.