Sustainable Landscape
MASTER PLAN

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MACALESTER COLLEGE

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BARR Barr Engineering Co.

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"At Macalester, sustainability is infused throughout our core values of academic excellence, internationalism, multiculturalism, and service to society."

—Macalester Sustainability Plan

Section 1. Introduction

For many years, the campus landscape plan has consisted of a sheet drawing—and it lacked detail. The need has grown for a well-thought-out plan that incorporates both campus aesthetics and the college's carbon neutrality goals. There also is a need to address issues with stormwater management, plant diversity, soil conditions, and energy efficiency. The purpose of the Sustainable Landscape Master Plan is to comprehensively address the sustainability of the Macalester College campus grounds while making a beautiful landscape.

This plan is intended as a dynamic document that will provide direction into the future. It is not prescriptive; rather, the Sustainable Landscape Master Plan will help inform decision making on the aesthetics of the campus while being done with sustainable practices. This plan was created with input from students, faculty, administrators, and campus landscape management staff.

Macalester College created a Sustainability Plan to assess and plan for the reduction of the college's carbon footprint. The plan established the goal to reduce 2007-2008 carbon dioxide emissions by 52 percent, at a rate of 2.9 percent per year by 2025, and achieve Zero Waste by 2020. Landscape management was targeted to help meet these goals. Specific landscape goals of the Sustainability Plan include:

- **Landscape**—Maintain grounds in a sustainable and educational manner while providing green space for recreation and events.
- **Stormwater**—Reduce the pollution, quantity, and speed at which water runs off the campus by infiltrating the first inch of precipitation on campus.

Sustainability at Macalester

As part of the college's sustainability planning process, the Macalester community expanded on the Brundtland Commission's classic 1987 definition to create a Macalester-specific definition of sustainability:

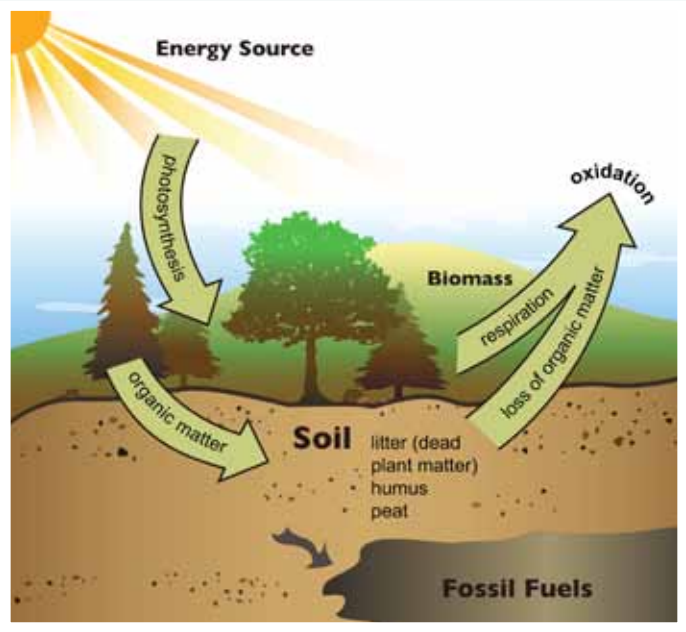
Sustainability is the continuous effort to meet the needs of the present generation without compromising the ability of future generations to meet their needs by working toward a healthy environment, social justice, and a strong economy.

At Macalester, sustainability is infused throughout our core values of academic excellence, internationalism, multiculturalism, and service to society.

Macalester College is committed to addressing climate change by taking responsibility for our institution's carbon footprint, rapidly reducing it, and becoming carbon neutral by 2025 and Zero Waste by 2020.

What is a Sustainable Landscape?

Sustainability as related to landscapes is based on the natural dynamics of ecosystems. It incorporates the efficiency and complexity of nature into human landscapes. Nature has it figured out—a complex of closed loops (cycles) have evolved that recycle resources and conserve energy. Examples of these loops are the carbon cycle, the nitrogen cycle and the hydrologic cycle, but there are many more. The art of establishing and maintaining sustainable landscapes is to make efficient these natural cycles on campus while at the same time meeting cultural expectations of the "campus" aesthetic.



Understanding the Carbon Cycle

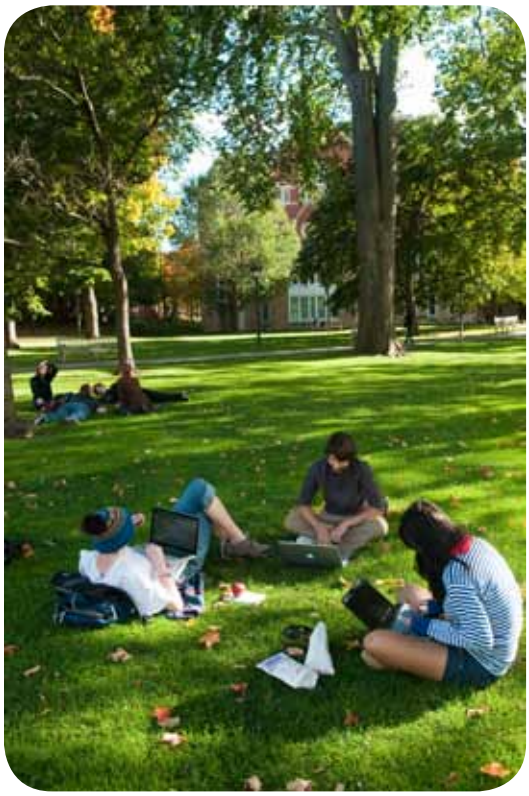
The carbon cycle is the sequence of transformations whereby carbon dioxide from the atmosphere is converted to organic forms through photosynthesis or chemosynthesis, recycled through the biosphere (with partial incorporation into soils), and ultimately returned to its original state through respiration or combustion. On earth the primary process of fixing atmospheric carbon dioxide is through photosynthesis. By growing plants in urban environments, and avoiding the use of fossil fuels in their production, people can sequester atmospheric carbon via the plants.

Cultural expectations and sustainability goals often conflict. For example, people may expect to have a weed-free, lush lawn, but this may require chemical-based fertilizers and pesticides. Or, there may be a desire to use a diversity of deep-rooted plants that create bird and insect habitat and that easily facilitate the infiltration of stormwater into the ground, yet not the budget to pay for weeding such plantings. Therefore, this sustainability plan provides a framework for landscape managers to thoughtfully resolve these conflicts in a way that balances the social, economic and environmental aspects of campus life.

Sustainable landscapes begin with appropriate design that includes functional, cost efficient, visually pleasing, environmentally friendly landscape elements that are easily maintained.

Section 2. Sustainable Landscape Goals

The first step in creating this plan has been to set goals for the sustainable landscape. This was done through an open process involving Macalester students, faculty, staff, and administration. The goals outlined below are the result of this process. They set the foundation for establishing sustainable landscape management guidelines.



Overall Vision

1. The campus landscape will reflect the greater sustainability values of Macalester College.
2. The campus landscape will display a unified aesthetic of beauty, safety, and sustainability.
3. The campus landscape will be used as a resource for sustainability education.

Campus Ecology

1. Turf areas on campus will be reduced by 60%.
2. The carbon foot print of landscape management on campus will be cut in half by the year 2025.
3. The species diversity of campus plantings will be increased.
4. Signature species of local native habitats will be used throughout the campus landscape.
5. Organic refuse from the landscape will be composted.
6. Integrated pest management will continue to be implemented as a means to decrease dependence on pesticides in landscape maintenance.
7. Song bird habitat will be created where possible.

Education, Demonstration, and Experimentation

1. The campus landscape will demonstrate sustainable landscape design principles.
2. Outdoor classrooms (framed by plantings) will be created to establish comfortable usable outdoor space, and to take advantage of microclimates to extend the season of use.
3. Students will be involved in sustainable landscape maintenance.
4. Students, faculty, staff, and administration will play an active role in sustainable landscape initiatives.
5. Edible species will be included in campus landscape plantings to demonstrate local food production.
6. Interpretive signage will be installed to explain landscape sustainability on campus.
7. A web presence will be developed to explain landscape sustainability on campus.
8. Classes will play a role in documenting before and after conditions of campus landscape sustainability.

Turf replacement planting concept at the library. Before (left) and After (above).

Institutional Image and Perception

1. The campus landscape will enhance the image of good land stewardship at Macalester College.
2. The campus landscape will suggest that Macalester College is an innovative institution.
3. The campus landscape will be a favorable part of visitors' first impression of Macalester College.
4. The campus landscape will attract students concerned with the environment.
5. Open lawn on campus will be retained to accommodate recreation and other uses.

Student and Employee Health

1. Fertilizer and pesticide use will be minimized in landscape maintenance.
2. The campus landscape will encourage walking, biking, and active recreation.

Safety and Security

1. The campus landscape will be designed to minimize security concerns.
2. The campus landscape will be designed to minimize risk of slips, trips and falls.

Financial

1. The operation and maintenance budget of the sustainable landscape will be comparable to the budget of a traditional landscape.

Parking Lots

1. Parking lot planting areas will be created to capture stormwater from paved surfaces where possible.
2. Pervious pavements will be incorporated where appropriate.
3. Impervious surfaces will be minimized.
4. Pavement will be shaded wherever possible.

Energy

1. Landscape plantings will be designed to improve building energy efficiency.
2. Campus landscape maintenance will increasingly rely upon human energy as opposed to fossil fuel energy.

Water Use, Water Conservation, and Stormwater Management

1. Stormwater runoff from impervious surfaces will be captured in shallow depressions where possible.
2. The use of potable water as a source for irrigation will be reduced.
3. Campus landscape plantings will incorporate drought tolerant/low water-use species.
4. Rainwater harvesting and reuse in landscape irrigation will be implemented where practical.

Section 3. The Sustainable Master Plan Drawing

The Sustainable Master Plan drawing (page 9) represents a guide for:

- Turf conversion
- Tree placement
- Rainwater garden placement

The drawing approximates the location and extent of these elements. The implementation of the final configuration of the elements will be determined based on the principles and guidelines put forth in this document.

Primary factors considered in creating this plan include:

- Converting ***unused*** lawn to alternative low-input plantings
- Retaining large recreational lawns
- Creating a hierarchy of different-sized outdoor rooms to encourage small and large group uses
- Placing trees to shade the east and west faces of buildings and to take advantage of passive solar heating of the south building faces in the winter months by not planting trees on the south side of buildings
- Locating rainwater gardens at natural low points where they can accept stormwater from hard surfaces

Macalester's sustainable landscape functions to:

- Capture stormwater and allow it to soak into the ground
- Use little or no chemical-based fertilizer, pesticide or irrigation
- Use little gasoline in the process of maintenance
- Recycle organic matter
- Be biodiverse and provide habitat

} Environmental

Social {

- Accommodate the convenient movement of people to their destinations
- Provide a variety of outdoor spaces for education, recreation and socialization
- Be safe and attractive

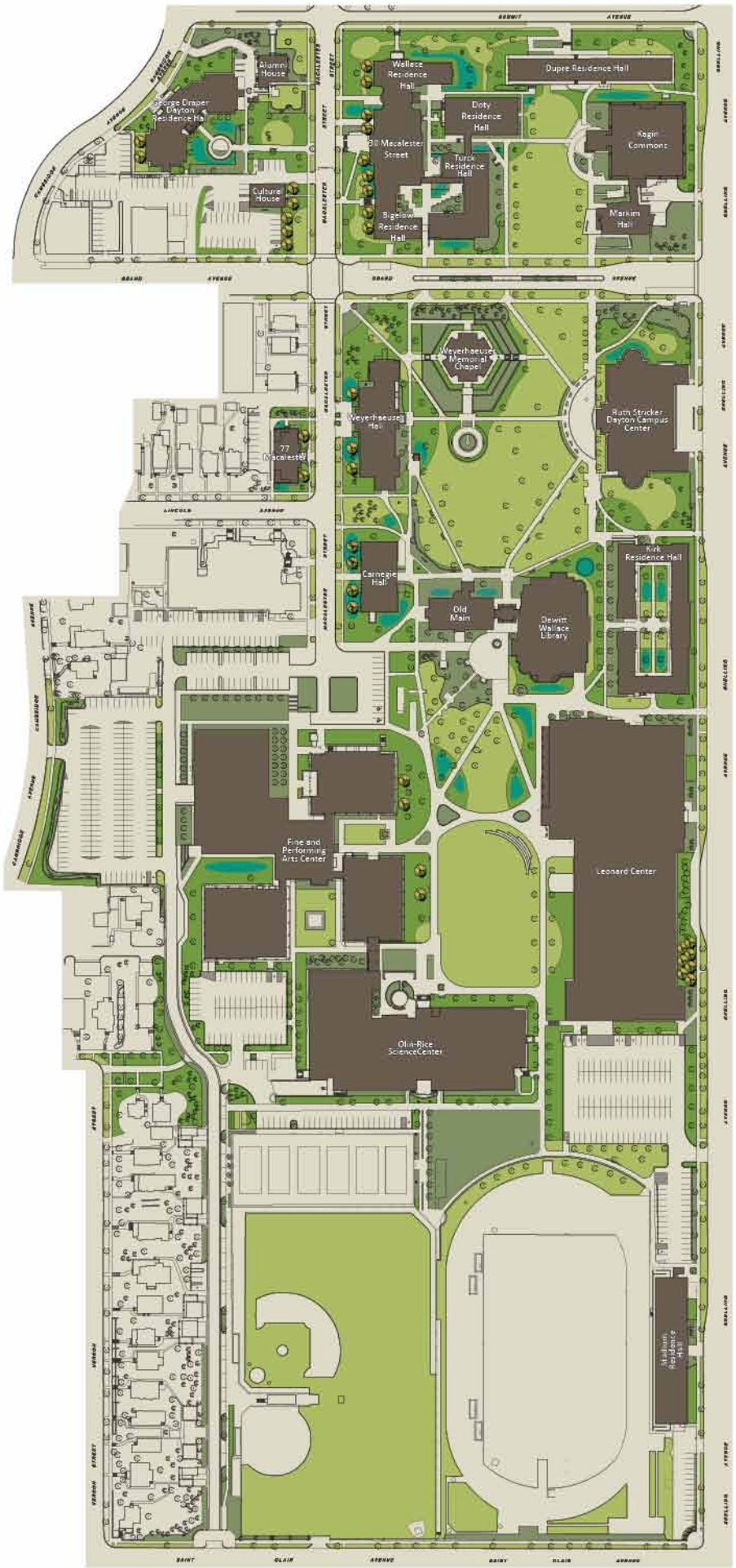
- Be affordable to establish
- Be affordable to maintain

} Economical

Turf Conversion

Plants are the work horses of a sustainable landscape. They sequester carbon, shade buildings, build soil, help infiltrate stormwater, cool the atmosphere in summer, provide wildlife habitat, provide food, and beautify the campus. The primary focus of a sustainable landscape is to create healthy plant communities. Turf will be replaced in areas where it is not actively used.

A turf conversion planting simulation at Leonard Center. Before (left) and After (above).



Sustainable Landscape Master Plan
Macalester College
St. Paul, Minnesota
Produced by Barr Engineering Company

BARR

The Sustainable Landscape Plan drawing considers several factors, including converting unused lawn to alternative low-input plantings, retaining large recreational lawns, creating different-sized outdoor rooms, placing trees thoughtfully to shade buildings, and locating rainwater gardens where they can best collect stormwater.

Accommodating people on campus is an essential component of a sustainable landscape. The Macalester campus is a human landscape for which biodiversity and greater ecological efficiency is desired. The following guidelines for landscape decision makers are intended to meet the socially oriented goals stated in the previous section, while at the same time meeting environmental and economic goals.

Human Experience Guidelines

Create great first impressions.

Research has shown that people prefer a neat and tidy landscape. Neatness signifies care for the community and the land. A goal of the college is to create good first impressions of visitors and perspective students. Therefore a neat and orderly appearance to the landscape is a priority. Neatness will be maintained in the landscape by:

- Grooming lawns to appear healthy and uniform, though some weeds will be tolerated. Student research could determine the tolerable level of weeds in lawn.
- Designing simple, colorful planting beds.
- Regularly weeding planting beds.
- Maintaining clean edges between lawn and planting beds.
- Pruning trees and shrubs on a regular basis.

Formal, neat, and tidy landscapes are resource consumptive (Central Park, New York).

The natural landscape is resource efficient, but not what most people consider tidy enough for urban situations. The design goal on campus is to combine the best of the groomed and native landscapes (as depicted on page 12).

Create outdoor rooms. The best ground cover for actively used landscapes is turf, but where it is not used, it will be converted to low-input plantings. Planting beds will be placed to shape outdoor spaces. A variety of outdoor rooms will be created with plantings to accommodate groups of varying sizes.

A turf conversion planting simulation at Wallace Residence Hall demonstrates how lawn can be converted but retain the valuable function of providing a comfortable space for campus users. Before (left) and After (above).

Maintain campus user safety. A safe campus has clear viewing distances across the landscape without hiding places. Plantings will be designed to accommodate clear, long viewing distances between knee and head level.

Maintain views into campus. It is important to the college to physically relate to the surrounding community. One way to do this is to allow views into campus. The landscape will be designed to allow viewing into the heart of campus from surrounding streets at crucial viewpoints.

Create educational opportunities. A sustainable landscape provides opportunities for demonstration, observation and research. The landscape will be designed and managed to create opportunities for teaching and research projects.

Landscape Practice Guidelines

The landscape managers at Macalester have begun to implement sustainable landscape practices. The guidelines stated here build upon those efforts.

Convert unused turf to alternative plantings. Turf is the most resource consumptive landscape element on campus. It is very valuable where it is actively used—but in the underused parts of campus it serves little active function. In these areas turf shall be converted to alternative plantings that are drought tolerant, require little or no fertilizer, and are disease and insect pest resistant.

Planting beds shall:

- Be placed in areas where lawn is not typically used by people.
- Be designed to form outdoor rooms.
- Planted with hardy, drought-tolerant, shrubs and perennial herbaceous plants that do not require fertilizer, supplemental water or pesticides to survive.
- Be designed to keep an open viewing distance between knee height and six feet.
- Incorporate appropriate spacing between plants to achieve full coverage of the ground at plant maturity. This continuous covering of vegetation shades the ground and reduces opportunities for weeds to establish, therefore reducing maintenance.
- Be kept mulched until plants create a full canopy over the ground.
- Be edged to create a neat, clean line between the bed and adjacent lawn. This can be done with edging material or hand edged once yearly.
- Be designed for maximum color and interest in spring and fall when students are on campus.
- Be designed to support birds and butterflies.
- Incorporate edible plant species to demonstrate local food production.

Increase species diversity. Diverse habitats are more resilient to stresses such as drought, cold and disease. The best method to increase species diversity on campus is through planting design—especially where turf is converted to perennial planting beds. Diverse plantings will attract a greater diversity of birds and insects. An effort will also be made to increase diversity of soil microbes—an unseen, but critical aspect of a sustainable landscape (see soils section, page 14).

EXAMPLES

Hardy, low-water-use plants for use on the Macalester College campus

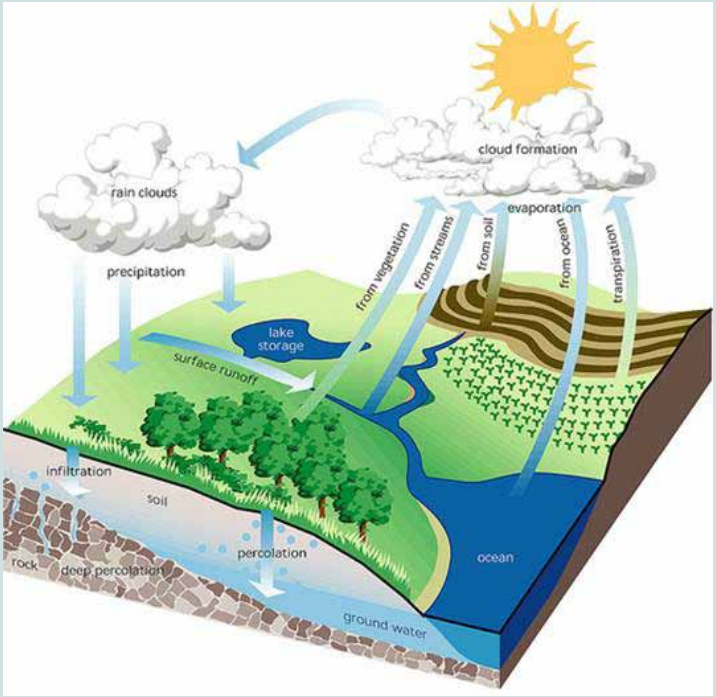
Perennials in sun: Sedum 'Autumn Joy' (and other cultivars), Russian sage, Switch grass cultivars, and Sage cultivars.

Perennials in shade: Japanese hakone grass, Canada wild ginger, Goatsbeard, and Starry Solomon's seal

Shrubs: Lowbush honeysuckle, Gro low sumac, the Muszam gray dogwood, and Spirea (many nice cultivars available)

Reduce irrigation. This will be accomplished by:

- Incorporating drought tolerant/low water-use plants into the landscape.
- Improving soils to increase soil water holding capacity.
- Mowing lawns at a greater height to allow individual grass plants to extend deeper root systems and become more drought tolerant.
- Keeping mower blades sharp to reduce the turf blades' water loss from a clean verses a torn cut (think of the healing speed of a clean verses torn skin wound).
- Maintaining a layer of mulch in planting beds to reduce evaporative water loss from the soil.
- Watering only in the early morning while temperatures are cool and less evaporation occurs.
- Using irrigation systems that use less water such as drip lines or water conserving spray heads (e.g. MP Rotator).



Source: Sustainable Water Resource Alliance

The hydrologic cycle is the movement of water from the atmosphere to the earth and back to the atmosphere through evaporation, transpiration, condensation, precipitation, percolation, runoff, and storage.

Capture stormwater where it lands to reduce the need for irrigation

One aspect of climate change in Minnesota is that the rhythms of the hydrologic cycle are changing. Rain events are occurring less frequently but are more intense. We are experiencing more intense storms with large volumes of water falling in a short period of time, but fewer slow soaking rains. Because the water comes down so quickly, more water runs off the surface of the ground, and less water soaks into the ground. Therefore, to prevent excessive irrigation, it is best to capture stormwater wherever possible to get it to soak into the ground.

Collect stormwater. Collect stormwater on campus by:

- Creating rainwater gardens (infiltration or filtration basins) wherever possible to capture stormwater that runs off roofs, sidewalks, streets and parking lots. The Master Plan graphic on page 10 shows potential locations for these basins on campus. Soils at Macalester College have a large clay component which makes stormwater infiltration difficult. Rainwater gardens should be either very shallow (six inches), or be designed as filtration basins which have a drain tile in the underlying soil that allows the basin to slowly drain down. It is best if rainwater gardens draw down within 72 hours of a rain event.
- Improving soils wherever possible (including lawns) as described above in order to infiltrate and hold stormwater in the soil.
- Considering cisterns and rain barrels to capture roof runoff. This water could be used for landscape irrigation.

Water

Two methods of water conservation will be put into practice at Macalester College:

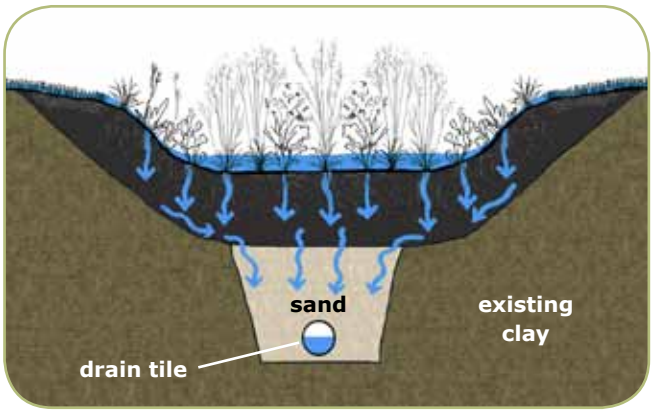
1. Capture of stormwater runoff for infiltration into the ground
2. Minimized irrigation

Stormwater capture can occur in three primary ways on campus:

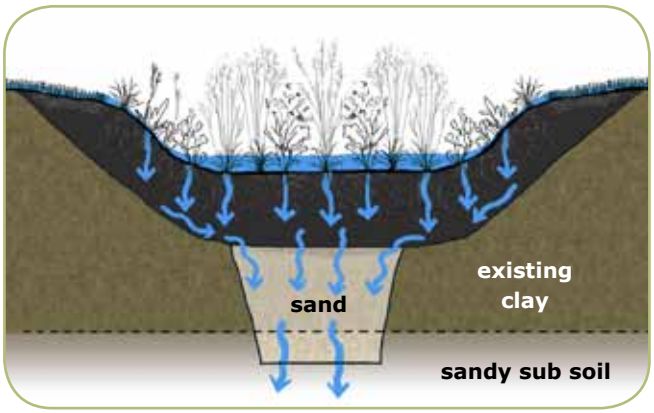
a. Creating shallow depressions (rainwater gardens) that puddle water and allow it to slowly soak into the ground.

b. Improving soils through organic matter incorporation and deep tilling (as described above) so water can easily infiltrate and be held in soil pore spaces.

c. Capturing roof runoff and holding it in cisterns for later use.



Filtration basin. Filtration basins filter stormwater through vegetation and soil before it drains away through a drain tile.



Infiltration basin. Infiltration basins are constructed in areas where lower layers of free-draining soil can be accessed.

Minimize hard surfaces. Water-impervious surfaces such as streets, parking lots, sidewalks and roofs are the non-point source of pollutants and shed valuable stormwater during storm events. Whenever hard surfaces are redesigned, consider reducing their footprint to allow stormwater to soak into the ground. This also protects downstream water bodies from large volumes of water. The use of pervious pavers can also help to attain this goal.

Regenerate soils. Create healthy soils on campus by:

- Improving soils whenever soils become exposed either during a construction or planting project. Analyze soils to determine their condition prior to planting. Amend or replace soil as necessary.
- Improving soils should include the incorporation of organic matter to a minimum of five percent by weight and mixing to a depth of 18 to 24 inches. Loosening of the soil will allow air and water to move through the soil column, and the organic matter will help keep soils loose while providing the base material (food source) for microbes.
- Allowing leaves, grass clippings, and other plant matter to accumulate and decompose in planting beds. Experiment with the level of "messiness" that is tolerable on campus.

Source: U.S. Post Office

Soils teem with life. The interaction of biotic and abiotic components of soil continually loosen and aerate the soil, facilitating the vigorous growth of plants.

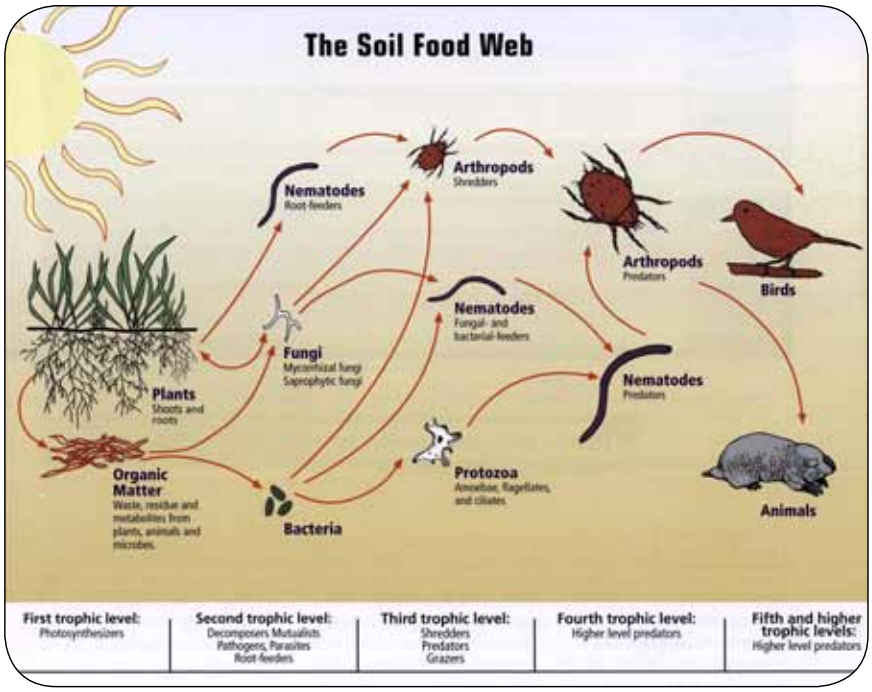
Healthy Soils

"Healthy" soils are crucial to a successful sustainable landscape because they:

- Hold water in pore spaces which is then available to plants
- Provide nutrients to plants
- Allow for oxygen to reach roots
- Support root structures
- Create habitat for microbes that decompose organic matter and recycle nutrients

"Healthy" soils are:

- loose
- free draining yet hold water for plants
- neutral in pH
- about five percent organic matter which:
  - holds and releases nutrients
  - allows for air circulation
  - holds water for plants
- diversely populated with microbes



A complex web of soil life is fueled by the sun and plant matter. Sustainable landscapes emerge from rich, living soils.

Source: www.soilfoodweb.com

Adopt landscape maintenance methods that rely upon human energy. Reducing the amount of machinery and chemicals used for landscape maintenance (and therefore achieving the goal of the 2009 Sustainability Plan) will require that alternative methods be adopted to achieve maintenance goals. Weed suppression is a primary function of machinery and landscape chemicals. Without them the responsibility falls on people. This creates jobs—green jobs. Dollars previously invested into machines and products can be redirected to human resources.

Using human energy rather than machines and landscape chemicals reduces CO_2 emissions and creates green jobs.

Expand the implementation of Integrated Pest Management (IPM) techniques. By carefully studying a pest or disease problem and impacting it where it is most vulnerable, landscape managers can minimize the use of pest control chemicals (pests such as dandelions, grub worms or fungus).

Integrated Pest Management

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. IPM takes advantage of all appropriate pest management options including, but not limited to, the judicious use of pesticides. In contrast, an organic approach applies many of the same concepts as IPM but limits the use of pesticides to those that are produced from natural sources, as opposed to synthetic chemicals.

Thoughtfully place new trees on campus.

Use these guidelines to appropriately place new trees:

- Trees should be placed to shade east and west sides of buildings, and not in front of south facing windows in order to keep south sides of buildings open to winter sun (with awnings to shade windows from summer sun).
- Trees should be placed to shade pavement.
- Trees should be placed to form outdoor rooms.
- Drought-tolerant, study (wind-resistant) trees should be planted. See species list (next page).

The Campus Center landscape beds use a combination of perennials and annuals.

Tree Species

The following tree species are recommended for use on the Macalester College campus because of their hardiness, drought tolerance, hard wood, form, and tolerance of urban growing conditions.

Street trees

American basswood
Amur corktree "His Majesty"
Bicolor oak
Elm cultivars such as "New Horizon," "Princeton," and "Discovery"
Hackberry
Honeylocust
Kentucky coffee tree "Espresso"
Littleleaf linden

Canopy trees for the interior of campus

American basswood
Amur corktree "His Majesty"
Bur oak
Elm cultivars such as "New Horizon," "Princeton," and "Discovery"
Ginkgo
Hackberry
Honeylocust
Horsechestnut
Kentucky coffee tree "Espresso"
Littleleaf linden
Norway spruce
Ponderosa pine
Red oak
White oak

Mid-story trees for screening and ornament on campus

Blue beach
Flowering crab
Ironwood
Red cedar
Redbud
Upright yew
White cedar "Techny"

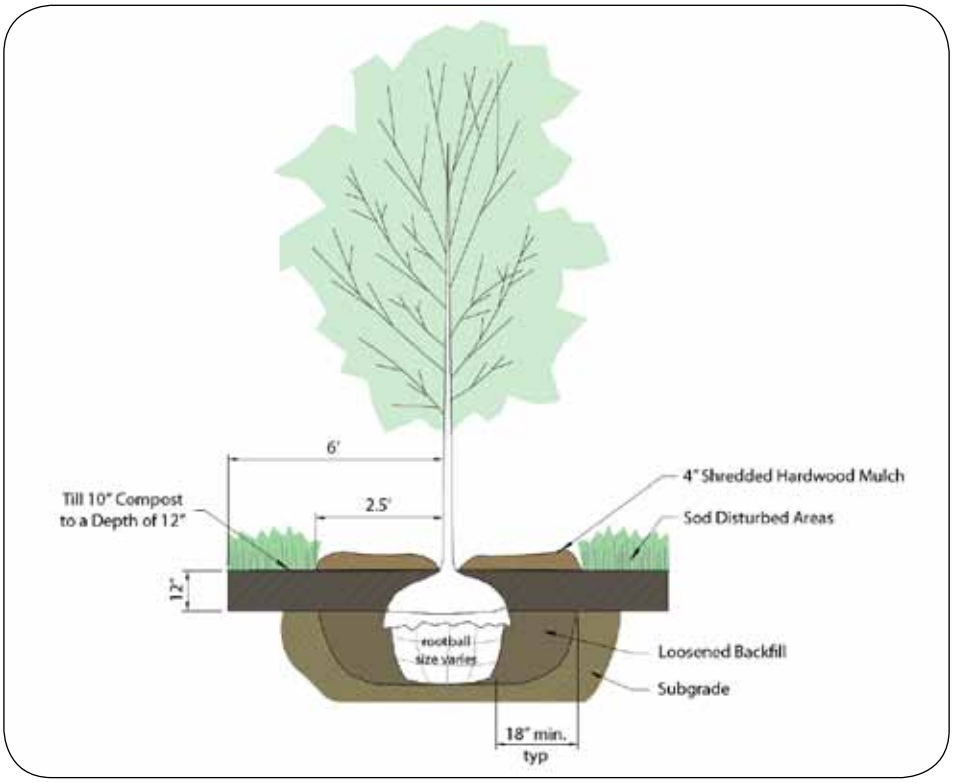
Amur corktree

Upright yew

Princeton elm

Littleleaf linden

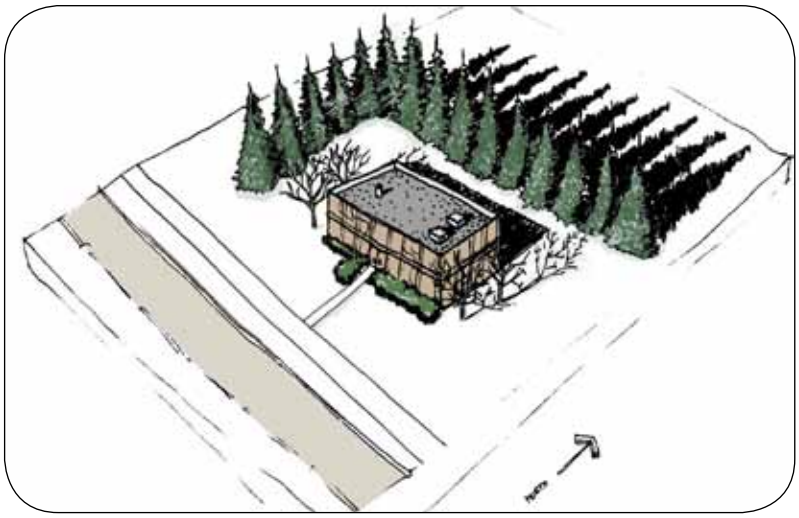
Horse chestnut



When planting a new tree thorough soil preparation will expedite its establishment and improve its health throughout its life.

Use plantings to improve building energy efficiency. For best energy efficiency in our climate it is important to:

- Plant shade trees on the east and west sides of buildings to prevent the hottest morning and afternoon sun from hitting buildings in the summer.
- Keep the south side of buildings open to winter sunlight by avoiding planting shade trees near southern walls. Install awnings to shade south windows in the summer.
- Plant windbreak trees to block winter winds from the northwest.
- Maintain a tree canopy of at least 50 percent of the total campus area to keep winter winds from blowing through campus at ground level.



In our climate, it is most energy efficient to shade the east and west sides of buildings while keeping the south side open to collect winter sun.

Convert to organic lawn care where reasonable.

An organic approach to lawn care will be tested in an effort to reduce chemical-based fertilizer and pesticide use on campus. The critical factor in the success of organic care will be the tolerance and understanding of people on campus to appreciate the uneven appearance of an organic lawn. An organic lawn will probably not look as weed free and bright green as a lawn that is managed with regular fertilizing and weed control through pesticides. The organic lawn may contain a greater diversity of species, such as clover and thyme, that distinctly change the consistency of the lawn. Maybe even a dandelion or two will show up.

The key to an organic lawn is to promote "healthy" soils with a high capacity to store water and nutrients, and the capacity to move oxygen to root systems. Amending soils with organic matter and tilling as described in the soil guidelines (page 17) is an important first step in creating an organic lawn. The goal will be to establish and maintain diverse and vigorous colonies of microbes that function to support plant growth.

Learning to love an imperfect lawn

An organic lawn contains a greater diversity of plant species and requires less fertilizer and pesticide use.

This lawn is showing signs of dormancy. With education and understanding, people can come to accept this natural process, which results in brown lawns in the summer.

Turf Management Guidelines

Below are listed management suggestions for reducing lawn resource consumption.

Rejuvenation

- Test soils for fertility, compaction and microbe content prior to implementing maintenance procedures. Test to determine soil type, pH, and nutrient levels. Soil test reports explain exactly what soil amendments, if any, your soil will need to produce a vigorous lawn.
- Incorporate organic matter whenever possible to feed microbes.
- Overseed with selections of turf seed that are vigorous under low fertility conditions. Select low-maintenance turf grasses such as common Kentucky bluegrass varieties (examples are: Aquila, Argyle, Kenblue, Monopoly, Nassau, Newport, Park, Ram I, Rugby, South Dakota Certified) or the fine leaved fescues (creeping red fescue, chewings fescue, or hard fescue).
- If the soil of established lawns is compacted, aerate once per year in mid-spring or fall just after Labor Day. Use a hollow tube aerator and leave the cores on the lawn. They will quickly break down.

Watering

- Encourage deep rooting by watering seldom but thoroughly. Deeply rooted grasses are more tolerant of stress.
- Actively growing turf requires just one inch of water per week. This equals one hour of watering once a week if no rain has fallen.
- To survive hot, dry weather, lawn grasses naturally go into a state of dormancy. They quit growing and become brown. Allow nature to take its course and give yourself a break from mowing. Gradually stop watering in mid-summer to allow low-maintenance grasses to go dormant. Yellow lawns can look acceptable to people when they realize that natural resources are not being wasted.
- During severe drought, water dormant grass 1/4 to 1/2 inch every two or three weeks to keep crowns (the growing point at the soil surface) from dehydrating beyond the point of recovery.

Mowing

- Mow high (low maintenance grasses should be cut at 2.5 to 3 inches) this allows for a deeper, healthier root system and allows for grass plants to become more stress tolerant.
- Increase mowing height by 1/2 to 1 inch in midsummer to reduce plant stress.
- Sweep up grass clippings blown onto pavement so they don't get washed into lakes or storm sewers where the nutrients they contain become pollutants.
- Keep blades sharp; dull blades shred rather than cut leaf tissues increasing water loss and disease susceptibility.

Weed and Insect control

- Insecticides are seldom needed in the upper Midwest. It is rare that insects must be controlled in a manicured landscape.
- When needed, herbicides are best applied to perennial broadleaf weeds in fall when the chemicals are translocated to the roots and effectively kill the entire plant.
- If dandelions or other weeds are a problem during other times of the year, spot treat them individually with a read-to-use spray container of herbicide. The brand Weed-Be-Gone® can be purchased in a hand-held spray bottle.
- In small lawns, weeds can be pulled by hand.
- By maintaining a healthy lawn, many weeds, including crabgrass will be unable to get established and become a problem. Weed seeds will not germinate in the shade of vigorous grass plants. You may be able to wean your lawn completely off pesticides when the mower height is raised.
- Historically, lawns were composed of a variety of grasses and broad-leaf plants like clover. Not until the advent of herbicides after World War II did the weed free lawn become the standard. Considering the environmental costs of maintaining the perfect lawn, it is appropriate to go back to a more diverse community of plants within the lawn.
- For all pesticides, read and adhere to manufacturer's directions to protect yourself and the environment. Applying more than the recommended amount of any lawn care product is wasteful and can lead to pollution problems.

Education

Sustainable landscape at Macalester is a tangible, identifiable merging of the natural and cultural worlds, full of lessons, demonstrations and opportunities. Sometimes people perceive that these worlds are separate, yet we are very dependent on nature, and can strive to live in a way that is less impactful. Education is critical in getting people to understand our expectations of a college campus aesthetic and how we've been incultureated with such expectations. The campus can demonstrate a new way of designing and maintaining landscapes. What better place to teach this new approach?

Sustainable landscape education on campus can include (but is not limited to):

- Discrete signage
- Tours
- Demonstration gardens (such as food producing gardens)
- Research plots
- Interactive web site, online discussion forums, and related social networking

Great Opportunity

Sustainable practices can most easily be implemented with construction projects on campus. It's the most efficient time to regenerate soils, create water systems, and minimize future maintenance through thoughtful design.

Phased Implementation

Implementation of this plan will be phased over the next five to seven years, with a projected annual budget ranging between $25,000 - $50,000.

Priority for implementation will be given to:

- Areas of safety concern
- Steep slopes that are currently eroding
- Underutilized lawns
- Primary views into and through campus
- Construction and development projects on campus

Conclusion

The goal of the Sustainable Landscape Master Plan is to reduce carbon dioxide emissions and achieve zero waste by 2020 while reflecting the greater sustainability values of Macalester College. This will be accomplished by displaying a unified aesthetic of beauty, safety, and sustainability. Many design options are available. Success will depend on the use of experimentation and expanding upon what works. Success will also depend upon human perception of the campus. Can we meet aesthetic expectations or can we alter expectations to reach our sustainability goals? Time will tell.

Reducing Macalester's Greenhouse Gas Emissions

What will be done in the landscape to reduce atmospheric carbon dioxide?

- Plant species that do not require mowing, fertilizing or supplemental water.
- Reduce the extent of hard surfaces such as roofs, parking lots and streets in order to consume fewer resources (gravel and asphalt) in their construction and maintenance, to reduce stormwater runoff, and to ***create space for more plants*** (Note: plants sequester carbon through photosynthesis). This helps to reduce the urban heat island effect—which also reduces summer cooling costs.
- Reduce the amount of lawn. This results in less mowing and prevents the burning of gasoline.
- Where lawn is used, avoid the use of chemical-based fertilizers and pesticides. These are energy consumptive to produce.
- Minimize irrigation since much energy is consumed in pumping, treating, and piping of potable water for irrigation.
- Keep open soils covered with plants or mulch as open soils continually volatilize carbon dioxide.
- Promote carbon storage in the soil by allowing falling leaves to decompose in planting beds, and by adding locally available compost to planting beds.

Success of the Sustainable Landscape Master Plan will depend on the use of experimentation and expanding upon what works, as well as human perception of the campus. Time will tell if we can meet aesthetic expectations or if we can alter expectations to reach our sustainability goals.

Sustainable Landscape Master Plan

MACALESTER COLLEGE