

## Landscaping and the Environment at Macalester College

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Although it is easy to take for granted the ground you walk on daily here at Macalester, or the trees you study beneath on a sunny day, there is a detailed process behind these simple joys, and as an eco-conscious politically-correct Macalester student you must stop and ask yourself, what are the potential environmental consequences of my simple joys? Our objective through this extensive research report is to provide the Macalester student with a detailed analysis of what exactly goes on behind-the-scenes in the landscaping of this campus, so that you can enjoy your frolics in the grass with an at-ease conscience.

In order to accomplish this we divided ourselves into four main areas of landscaping:

1. Irrigation
2. Herbicide Usage
3. Composting/ MULCH
4. Non-Native Plant Species

Our objective in each of these is to fully assess the environmental impact, if any, that they have on campus.

Each individual topic established its own methods and results.

### **Irrigation Usage**

The examination of irrigation practices provided us with data about which areas are irrigated, how often and how long they are irrigated, and the volume of water used per minute of irrigation. From this data we were able to calculate the estimated total volume of water used for irrigation per year. The table of obtained data can be found in the Appendix

The irrigation practices at Macalester seem to be well managed in an environmentally conscious manner. Out of 25 acres of “turf and ornamentals” on campus, only 10.5 acres are irrigated. Some additional grass areas are watered occasionally. However, these are not connected to the irrigation system and represent only a negligible fraction of the irrigation water use. Most of the irrigation is used on the athletic fields, which have to meet regulations for their respective sports and leagues. The frequency and/or amount of irrigation is seasonally adjusted, and the weather conditions are taken into account. Rain automatically shuts off any irrigation. However, the adjustments for cloudiness or other weather conditions are decided on an ad-hoc basis by the head of Grounds Department of the Physical Plant. These adjustments do not seem to have substantial effect on the volume of water spent on irrigation. Most of the irrigation water is absorbed by the soil or sinks into the ground water table. Only a negligible portion of water drains off through the city network, which is favorable both for environmental and financial reasons.

The only relatively significant problem is the 12-inch layer of sand on the athletic field, which requires significantly more water than the dirt on Shaw Field or the regular soil of other areas. Jerry Nelson, Grounds Manager, stated that the Physical Plant is looking into the option of replacing the turf on the athletic field for more modern and less water-demanding type (Nelson, interview). However, this option is inevitably dependent on the budgetary priorities and financial consideration.

Overall, the irrigation practices were found to be reasonable. The overall impact of irrigation practices at Macalester are not worrying.

## **Fertilizers, Herbicides and Miscellaneous Landscape Care**

### **Landscape Chemicals**

Compared to other institutions, Macalester College uses a small amount of landscape chemicals each year. However, herbicides, pesticides, fungicides, and fertilizers are still applied in order to maintain the appearance of gardens, athletic fields and the rest of the grounds.

Once each spring, Trugreen Chemlawn is called into spray the entirety of the campus with an herbicide. Besides contracting once a year for weed control and prevention, Macalester also uses several other treatments, including broadleaf control and Roundup. Broadleaf control is composed of mostly inert ingredients, but its active components are Mecoprop-p acid, dicamba acid, 2,4-D 2-ethylhexyl ester and carfentrazone-ethyl (figure 1). Roundup is composed of water, a surfactant (a compound that reduces surface tension) and glyphosate isopropylamine salt. Both broadleaf control and Roundup are used sparingly; they are used on an “as needed” basis.

Besides herbicides, Macalester also fertilizes at many other times of year without contracting a separate company. Every year the physical plant buys about five tons of 18-0-18 grade fertilizer and another ton of 46-0-0 grade fertilizer to be used on grass areas. The “active” agents in the 18-0-18 grade fertilizer are Nitrogen (N) and Soluble Potash ( $K_2O$ ). This grade has a one to one ratio of Nitrogen and Soluble Potash, and has 18 pounds of nitrogen, and 18 pounds of potash per 100 pounds fertilizer. The 46-0-0 uses Nitrogen as its active nutrient agent. The Nitrogen comprises 46 pounds of every 100 pounds of fertilizer. An additional 50 to 100 pounds of 10-10-10 fertilizer is bought each year for use in the gardens. The 10-10-10 fertilizer has a one to one to one ratio of nitrogen, phosphate ( $P_2O_5$ ), and soluble potash, and contains ten pounds of nitrogen, ten pounds of phosphate and ten pounds of potash per one hundred pounds of fertilizer.

Roughly ninety percent of all fertilizers applied are applied to the athletic fields which additionally have an application of fungicide twice a year.

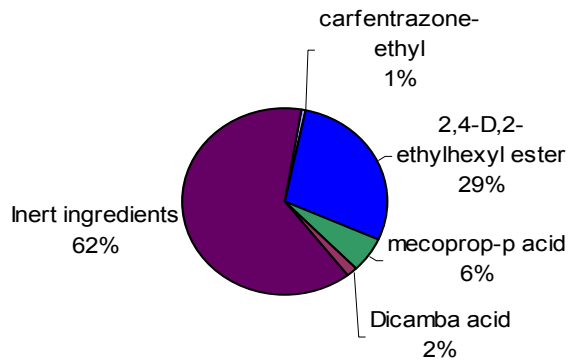


Figure 1: Percentage Composition of Broadleaf Herbicide

### Miscellaneous Landscape Care

Macalester does various tree maintenance jobs each year, from pruning to spraying for pests and parasites. The college also plants new sod each year, although the amount planted is dependent on the year. For instance, if there is a lot of construction work that rips up much of the grass, then much sod is needed. On average, around three hundred yards of sod are put in each year.

### Results

In the end, Macalester's herbicide use is not in any way excessive, and we don't see any need for immediate attention to the matter, especially because the Grounds Management would prefer to keep use down to the minimum necessary anyway, for cost reasons.

## Composting and MULCH

### Goals/Objectives:

The first goal was to find out whether or not composting is normally used on the Macalester campus to dispose of the organic wastes created during landscaping..

The second goal was to find out about the role and impact of the campus environmental organization, Macalester Urban Land and Community Health, on the campus landscape, as well as the organization's relationship with the physical plant.

### Materials and Methods:

My method for finding information about composting of landscaping waste was to interview Jerry Nelson. To find out information about MULCH, we interviewed MULCH organizer Rina Rossi and used the Macalester Environmental Studies program website.

**Results:**

Composting is not directly implemented by the Physical Plant on the Macalester campus. Jerry Nelson, head of the Grounds Department of the Physical Plant, provided the information that the Physical Plant does haul old flowers, weeds, and tree branches to a composting site off campus, but as of now there is not room to have composting on campus. When digging holes that create excess soil, the Physical Plant does try to mix this soil with other soil so that it can be reused (Nelson pers. comm.).

Macalester Urban Land and Community Health (MULCH) is a student organization that maintains a community garden between the field house and Olin Rice. MULCH operates under the broader goal to be "... a venue for people to learn about the food system, the politics and power that food carries, and how we as individuals are able to take some of that power back." (Environmental Campus Groups URL)

The MULCH garden is not entirely organic, primarily because the grass that is around the garden is sprayed by the Macalester landscaping employees. Despite this impediment to maintaining an organic garden, relations between the grounds crew and MULCH are good, though they do not have frequent interactions, according to Rina Rossi, a MULCH organizer. MULCH is able to borrow equipment from physical plant when needed, and the grounds crew is encouraged to take some of the garden's harvest each year. While antagonism between MULCH and Physical Plant does seem to have been reduced, Physical Plant still will not approve of the creation of a compost for MULCH use, something that was also noted in the 2002 environmental audit as a point of contention. A compost of primarily garden waste will continue to be a demand of MULCH's as it would reduce waste and help the growth of the garden by returning the lost nutrients to the soil.

The garden itself is run primarily by Macalester students and is based on environmentally sound practices. According to Rossi, what is chosen to be grown is based on what will grow well and what people like to have in the garden and eat. They also try to plant some heirloom and unusual seed varieties, because even though they have a lower success rate these plants will help preserve some agricultural genetic diversity. They also practice crop rotation in order to maintain healthy soil. The garden does not include the use of any chemical fertilizers, they instead use turkey feces and ground up fish solution (Rossi pers. comm.)

**Discussion:**

It was found that there is an attempt by the Physical Plant to recycle waste landscaping matter through composting, but the composting itself it is not carried out directly on campus.

MULCH provides a positive environmental impact on the landscape by maintaining an ecologically sound garden. There is a working relationship between the Physical Plant and MULCH, but they would be able to improve both the relationship and the environmental sustainability of the garden if they approved the compost pile for MULCH.

**Conclusions:**

While overall maintaining environmentally friendly landscaping processes, the Physical Plant should look into implementing composting on campus both for landscaping wastes and for the MULCH community garden.

### **Non-Native Plant Species**

**Objectives:** To determine the extent to which, if any, non-native plant species affected or endangered the ecosystem of Macalester College and the surrounding area.

**Methods/Materials:** First I sought to understand the reasons and conditions under which non-native plants threaten an ecosystem. The consequences of non-native plant invasion include a reduction in biodiversity, a reduction in natural wildlife that rely on aforementioned biodiversity, an increase in soil erosion, and a potential increase in river or lake pollution (Palermo, URL). The ecology website *eco-pros.com* called invasive species “the second worse threat...to native creatures and biodiversity (*eco-pros.com*, URL). They flourish in non-native habitats because of a couple key reasons. First, they are usually pioneer species, and often grow quicker and easier than native species. Second, in most habitats, there are no established predators or environmental controls existing for non-native species (*eco-pros.com*, URL).

Not all non-native species are invasive, however. Furthermore, most need a significant base population of seedlings to grow and pollinate in order to become widespread as well as a wild habitat in which to develop, such as a forest or grassland, depending on the species. I took this into account when developing my assessment of Macalester’s campus, and developed my methods as follows:

- 1) Identify tree and shrub species currently on campus
- 2) Classify each species as native, non-native, or undetermined
- 3) Cross-check for presence of invasive species or noxious species

To accomplish this, I worked with Jerry Nelson, grounds manager of Macalester College, using catalog information of past tree and shrub orders, as well as past listings of on-campus species. Next I used various other sources, including the Minnesota DNR and the Wisconsin DNR website to check for native/non-native/invasive status of each species.

**Results:** I was able to identify 97 trees and shrubs on campus (Nelson, 2003), including 47 truly native species, 14 non-native species, 2 potentially invasive species, and 37 species that were undeterminable. For full listing, consult the appendices. I classified the native species using the 2002 Bachman’s Wholesale Catalog from which Macalester orders most of its trees and shrubs as well as through the MN DNR classifications list. (Bachman’s, 2002 and MNDNR, 2002) The non-native species were also identified using the MNDNR listings. The undeterminable species are the result of a lack of information or due to being a hybrid with no current classification of native status, or have been given mixed status.

Of most importance is the presence of invasive species. On the Macalester Campus, our two identified invasive species are Norway Maple and Amur Maple. The Norway Maple, *Acer platanoides*, has been found invasive in Wisconsin and parts of Minnesota, thriving in forests. (WIDNR, URL) The second, Amur Maple, *Acer ginnala*, has been found invasive in Wisconsin, Illinois, and south eastern Minnesota. (WIDNR, URL and Illinois State Museum, URL) Amur Maple spreads in grasslands and produces large clusters of seeds that sprout quickly. Macalester also has Buckthorn, a Minnesota invasive species, but only has *Rhamnus frangula*, as opposed to the invasive species *Rhamnus Cathartis*. (MNDNR, 2002)

**Conclusion:** Although Macalester is home to several non-native species of trees and shrubs and two invasive species, it is not likely to cause any problems for the area, due to Macalester's location in the city, away from any large forests or grasslands, and also due to the isolated nature of current species, prohibiting significant cross-pollination.

### **Final Recommendations**

We found that Macalester has taken great steps to maintain environmentally sound landscaping practices. We did not find any aspects that caused immediate concern. In irrigation, we found that the only potential issue, the football field soil, was already being looked into. Herbicide use was not excessive. In composting, we found that the campus could benefit from having a compost, but that current practices, as well as the presence of the student-run MULCH garden are still environmentally beneficial. There were only two species of potentially invasive tree or shrub species, but these species do not seem likely to overrun the campus or St. Paul in any way, and even if they were to pollinate, it does not seem likely anyway, due to the daily observation of grounds crews.

So next time you're playing on the grass or climbing one of Macalester's many trees, feel free to do so with a clear conscience, knowing that the landscaping of the campus does not pose any immediate threats to the sustenance of these natural joys. And if you see Jerry Nelson, tell him thanks for running a clean ship!

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### Appendix

<b>Lawn</b>	<b>Athletic Fields</b>	<b>Shaw Field</b>	<b>Center + Kagin</b>
<b>Area (cca.)[acres]</b>	5	2.5	3
<b>Soil</b>	12 in. of sand	dirt	regular
<b>Flow [gal/min]</b>	80 to 90	50	20
<b>Summer</b>	30 min * 3.5/week	45 min * 2/week	20 min * 2/week
<b>Fall/Spring</b>	15 min * 3.5/week	45 min * 1/week	20 min * 1/week
<b>Total Volume [gal/year]</b>	cca. 200,000	cca. 90,000	cca. 16,000

300 000 gallons of water enter the Mississippi river from Itasca lake each 111 minutes.  
(National Park Service. <http://www.nps.gov/miss/features/factoids>. Accessed 12/6/2003)

#### Master List for Trees and Shrubs at Macalester College

<b>Common Name, <i>Scientific Name</i></b>	<b>Classification</b>
1. Sugar Maple, <i>Acer saccharum</i>	Native

2. Norway Maple, <i>Acer platanoides</i>	Non-Native, Invasive
3. Blackhills Spruce, <i>Picea glauca densata</i>	Native
4. Honey Locust, <i>Gleditsia triacanthos var. inermis</i>	Native
5. Silver Maple, <i>Acer saccharinum</i>	Native
6. American Linden, <i>Tilia Americana</i>	Native
7. Green Ash, <i>Fraxinus pennsylvanica</i>	Native
8. Red Maple, <i>Acer robrum</i>	Native
9. White Pine, <i>Pinus strobum</i>	Native
10. American Elm, <i>Ulmus Americana</i>	Native
11. Colorado Blue Spruce, <i>Picea pungens</i>	--
12. Hackberry, <i>Celtis occidentalis</i>	Native
13. Columnar Norway Maple, <i>Acer platanoides 'Columnarbroad'</i>	--
14. Crabapple, <i>Malus spp.</i>	Native
15. Gingko, <i>Gingko biloba</i>	Non-native
16. Japanese Tree Lilac, <i>Syringa reticulata</i>	--
17. Scotch Pine, <i>Pinus sylvestris</i>	Non-native
18. Common Lilac, <i>Syringa vulgaris</i>	Non-native
19. Austrian Pine, <i>Pinus nigra</i>	--
20. White Ash, <i>Fraxinus americana</i>	Native
21. Black Walnut, <i>Juglans nigra</i>	Native
22. Jane Magnolia, <i>Magnolia liliflora 'Jane'</i>	--
23. Merrill Magolia, <i>Magnolia x loebneri 'Merrill'</i>	--
24. Pagoda Dogwood, <i>Cornus alternifolia</i>	Native
25. Cutleaf Silver Maple, <i>Acer saccharinum 'Crispum'</i>	Native
26. Common Yew, <i>Taxus canadensis</i>	Native
27. Winged Euonymous, <i>Euonymous alatus</i>	--
28. Thorned Hawthorn, <i>Crataegus crusgalli</i>	Native
29. Thornless Hawthorn, <i>Crataegus crusgalli var. inermis</i>	Native
30. Japanese Red Maple, <i>Acer palmatum 'Atropurpureum'</i>	--
31. Common Honey Locust, <i>Gleditsia tiracanthos</i>	Native
32. Ohio Buckeye, <i>Aesculus glabra</i>	Non-Native
33. Jade Glenn Norway Maple, <i>Acer platanoides 'Jade Glenn'</i>	--
34. Whitespire Birch, <i>Betula platyphylla japonica 'Whitespire'</i>	--
35. Regal Elm, <i>Ulmus x regal</i>	--
36. Red Oak, <i>Quercus rubra</i>	Native
37. Pin Oak, <i>Quercus palustris</i>	--
38. Crimson King Norway Maple, <i>Acer platanoides 'Crimson King'</i>	--
39. Greenspire Linden, <i>Tilia cordata 'Greenspire'</i>	--
40. Autumn Purple White Ash, <i>Fraxinus Americana 'Autumn Purple'</i>	Native
41. Bur Oak, <i>Quercus macrocarpa</i>	Native
42. Catalpa, <i>Catalpa speciosa</i>	Non-native
43. Pink Spires Crabapple, <i>Malus 'Pink Spires'</i>	--
44. Yellowwood, <i>Cladrastis lutea</i>	--
45. Tulip Poplar, <i>Liriodendron tulipifera</i>	--

46. Red Splendor Crabapple, <i>Malus 'Red Splendor'</i> ;	--
47. Amur Maple, <i>Hacer ginalla</i>	Non-native, Invasive
48. Amur Corktree, <i>Phellodendron amurense</i>	--
49. Boxelder, <i>Hacer negundo</i>	Native
50. Canada Red Cherry, <i>Prunas virginiana</i>	Native
51. Seeded Green Ash, <i>Fraxinus pennsylvania</i>	Native
52. Kentucky Coffeetree, <i>Gymnocladus dioicus</i>	Native
53. Smoketree, <i>Cotinus cogyria</i>	Non-native
54. Royal Red Norway Pine, <i>Acer platanoides 'Royal Red'</i>	--
55. Redmond Linden, <i>Tilia Americana 'Redmond'</i>	Native
56. Summit Green Ash, <i>Fraxinus Pennsylvania 'Summit'</i>	Native
57. Amur Cherry, <i>Prunus maackii</i>	--
58. Willow, <i>Salix alba</i>	Non-native
59. Buckthorn, <i>Rhamnus frangula</i>	--
60. Arborvitae, <i>Thuja occidentalis spp.</i>	Native
61. Eastern Cottonwood, <i>Populus deltoids</i>	Native
62. Norway Spruce, <i>Picea abies</i>	Non-Native
63. Apple Trees, <i>Malus spp.</i>	Non-Native
64. English Yew, <i>Taxus baccata</i>	Non-Native
65. Red (Norway) Pine, <i>Pinus resinosa</i>	Native
66. Sugar Tyme Crabapple, <i>Malus 'Sugar Tyme'</i>	--
67. Mugo Pine, <i>Pinus mugo</i>	--
68. Paper Birch, <i>Betuna papyifera</i>	Native
69. Honeysuckle, <i>Lonicera spp.</i>	Native
70. Chinese Elm, <i>Ulmus parvifolia</i>	Non-Native
71. Serviceberry, <i>Amelanchair x grandiflora 'Autumn Brilliance'</i>	--
72. Autumn Blaze Hybrid Maple, <i>Acer x freemanii 'Jefferesred'</i>	--
73. Northern White Cedar, <i>Thuja occidentalis spp.</i>	Native
74. Pussy Willow, <i>Salix caprea</i>	Native
75. Tree Hydrangea, <i>Hydrangea paniculata</i>	--
76. Swamp White Oak, <i>Quercus bicolor</i>	Native
77. Royal Star Magnolia, <i>Magnolia stellata 'Royal Star'</i>	--
78. Ironwood, <i>Ostrya virginiana</i>	Native
79. Weeping Mulberry, <i>Morus alba 'Chaparral'</i>	Non-Native
80. River Birch, <i>Betula nigra</i>	--
81. Fall Festival Ash, <i>Fraxinus Americana 'Fall Festival'</i>	Native
82. American Larch, <i>Larix laricina</i>	Native
83. Hemlock, <i>Conium maculatum</i>	--
84. Larch, <i>Larix spp.</i>	--
85. River Birch, <i>Betula nigra</i>	--
86. Kentucky Coffeetree, <i>Gymnocladus dioicus</i>	Native
87. Pagoda Dogwood, <i>Cornus alternifolia</i>	Native
88. Eastern Redbud, <i>Cercis canadensis</i>	Native
89. Tulip Tree, <i>Liriodendron tulipifera</i>	Native

90. Forsythia, <i>Forsythia</i> , <i>spp.</i>	--
91. Cranberry Cotoneaster, <i>Cotoneaster apiculatus</i>	--
92. Hydrangea, <i>Hydrangea vulgaris</i>	--
93. Spirea, <i>Spirea spp.</i>	--
94. Red Snowberry, <i>Symphoricapos orbiculatus</i>	Native
95. Arrowhead Viburnum, <i>Viburnum dentatum</i>	Native
96. Nannyberry Viburnum, <i>Viburnum lentago</i>	Native
97. Northern Pin Oak, <i>Quercus ellipsoidalis</i>	Native