

SOUTH DAKOTA STATE UNIVERSITY

GROUNDS MANAGEMENT PLAN

2012



SOUTH DAKOTA STATE UNIVERSITY

GROUNDS MANAGEMENT PLAN

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Introduction

The SDSU Grounds Management Plan is a comprehensive document organized to assist in the planning and revitalization of the South Dakota State University campus landscape. This document offers guiding principles and standards, but is designed to be flexible to accommodate the necessities of different sites around campus.

Goals for the South Dakota State University Landscape Strategies Plan have been identified:

- ❖ Prioritize campus landscape areas to promote a focused and timely approach to development
- ❖ Establish landscape design guidelines, outline landscape types and their application rationales
- ❖ Identify existing landscape maintenance issues and offer recommendations for resolution
- ❖ Offer design suggestions to promote sustainability, conservation of natural resources and to lessen long term maintenance
- ❖ Provide cohesion through unified site furnishings, materials, and plant selections
- ❖ Preserve and advance the campus identity as an educational and environmentally conscience establishment
- ❖ Enhance the collegiate atmosphere by offering comfortable outdoor spaces of sociability
- ❖ Allow opportunities for individual involvement and input in a campus-wide beautification effort aimed at SDSU grounds

Area Prioritization

An adaptable and carefully planned landscape strategy will strengthen existing patterns and bring a cohesive layout to the campus of South Dakota State University. Careful planning, thorough implementation, and continued maintenance will be needed to achieve the goals set forth in the 2012 Landscape Standards & Design Guidelines. Efforts to restore, revitalize, and plan future landscaping can be focused after a prioritization of zones on campus. Landscape priorities should be divided into respective categories derived from visibility and use.

Figure 1.1 displays the various priority zones throughout the campus.

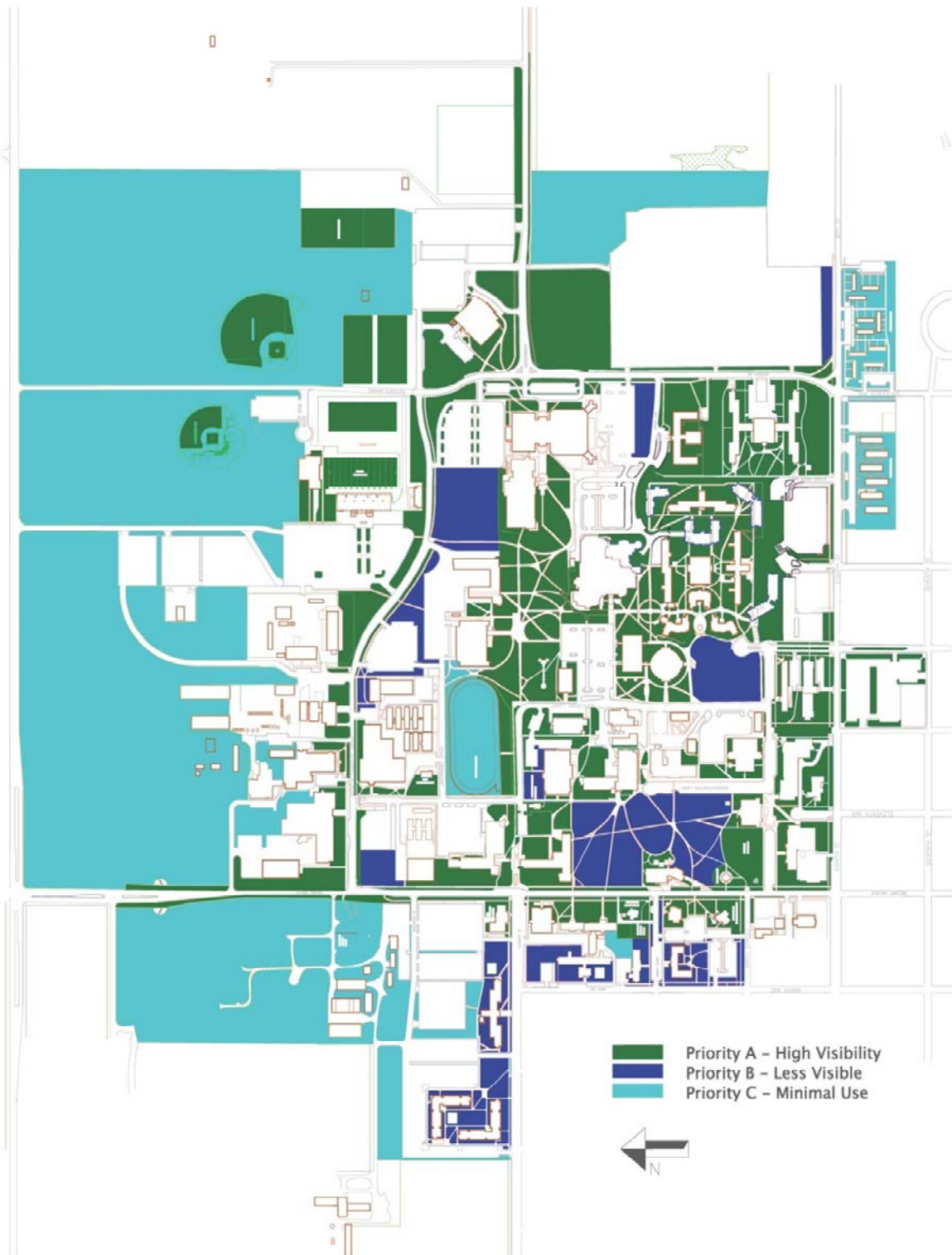


Figure 1.1 Illustrates the various prioritization zones on campus.

Categories are listed with maintenance requirements in respect to turf, trees, shrubs, flower beds and materials. Landscape zones are designated as the following:

- **Highly visible impact areas - *Priority 'A'***
 - These area types should harbor the finest aesthetic quality and functionality of any landscapes on campus. These will be the highest maintenance areas.
 - Areas along major roadways
 - The campus core and areas of high use during summer
 - Frequently trafficked pedestrian areas, including trafficked turf areas.
 - Priority 'A' areas will display shrub massing and tree plantings with a focus on attractive specimens with an educational focus.
 - Shrubs will be pruned regularly to provide optimal aesthetic value. Trees in this area will also be pruned for structural integrity and aesthetic purposes. All tree specimens in priority 'A' areas will have a mulched base.
 - Seasonal flower beds will be located in these areas.
 - Specimens in these beds need to be manicured according to the Flower Bed Maintenance plan.
 - Turf grass in these areas should be of the healthiest and most aesthetically pleasing on campus. Sidewalks will be edged.
 - All priority 'A' areas are to have mechanical irrigation installed to foster healthy plant growth.

- **Less visible but still important areas - *Priority 'B'***
 - Areas in this category should display basic design principles, but should not command the full attention of the site users.
 - Areas in this category will require occasional maintenance.
 - Any area off of major roadways
 - Sites with an emphasis on informal recreation
 - Corridors with minimal pedestrian traffic
 - Large informal campus greens

- Shrub plantings are to be limited or in priority 'B' areas. Trees in these areas will be planted with a focus on educational value.
 - All trees in priority 'B' zones will have mulched bases and will be pruned regularly for structural integrity and aesthetic purposes.
- Seasonal flower beds will not be installed in 'B' zones.
- Turf grass in this area should be healthy but not manicured. Sidewalks will be edged. These areas will look more natural than priority 'A' turf zones.
- Irrigation is to be supplied on a need only basis. Mechanical irrigation should not be installed in this zone.
- **Areas with only minimal use/impact - *Priority 'C'***
 - A focus on limited maintenance design solutions that do not display continued neglect.
 - Areas that are outside the immediate campus
 - Sites that rarely see pedestrian traffic
 - Maintenance and utilitarian areas
 - Any site that is blocked from dominant views
 - No shrubs are to be planted in 'C' areas. Trees in this zone are planted with a focus on utility; providing shade, visual barriers etc.
 - Bases of trees in this are to have weed growth around the trunks controlled with occasional herbicide application.
 - This area is not suitable for ornamental beds of any nature.
 - Turf in these areas will be watered infrequently and will look the most natural. Sidewalks do not need to be edged unless they pose a hazard.
 - Irrigation will be natural rainfall.

LANDSCAPE IMPROVEMENT STRATEGIES

In 1984, the Carnegie Institute did a study of college students asking them how they selected the college they attended. The questions covered everything from the college catalog to the course offering and the friendliness of the recruiting office. The study found that a very high percentage of the students made their final decision based upon the appearance of the campus grounds and buildings. The purpose of this 5-year grounds management plan is to improve the appearance of the campus in an efficient and cost-saving manner.

There are a few key components of the campus landscape to be focused on in the improvement process.

Areas of Focus

The following categories are the main areas of focus for landscape improvement on campus:

- **Landscape Design**
- **Turf**
- **Flower Beds**
- **Trees & Shrubs**
- **Pest Management**

Landscape Design

A standardized design palate is important to keep a cohesive appearance to the South Dakota State University campus. A strategic approach is accomplished by creating landscape types to address each site individually.

The plans for new campus greenways and the focus on a walking campus while giving users the opportunity to interact with many different landscapes on campus. Landscaping around high priority buildings will help give a unified appearance to the campus. These landscapes must support existing architecture and foster an interactive user environment. With the goal of a walking campus in mind, gathering areas and pedestrian circulation must be addressed. A collegiate atmosphere will be created by updating and installing these types of landscapes. Visual disturbances such as air cooling units and utility boxes will lessen this overall experience and should be screened in a thoughtful and attractive manner. By completing these projects with maintenance concerns such as snow removal and mowing efficiency in mind, the goal of a sustainable campus can be furthered.

Turf

Attractive campus grounds have a tremendous impact on potential students and their parents. Attractive grounds also improve the campus pride of current students and faculty. Strong prioritization and additional staffing will be needed in order to begin the revitalization process. New turf areas need to be adopted by SDSU where irrigation and seeding of proper cultivars of turf will become the responsibility of the university. Post seeding care by weed prevention and fertilization will also need to be incorporated.

The conversion of currently problematic turf areas to non-turf areas will help to minimize maintenance. Areas such as parking lot islands and student short cuts should be considered for conversion. Reducing damage to turf by managing snow removal and storage differently are also considerations to be made.

Maintenance practices such as mowing, irrigating, weed control, aerification, overseeding, and fertilizer

application will have to be well orchestrated and be compliant with the SDSU Turf Plan (Appendix A).

Flower Beds

Flower beds on the campus of SDSU need to support an attractive, colorful and educational campus setting. By integrating the management of the beds with that of the turf, we can maintain an approach that offers minimal environmental disturbance.

Where shrubs and trees cannot offer a transitional experience on the campus, plantings of ornamental flowers can achieve this goal. A cohesive, campus-wide flower bed system can be achieved by standardizing arrangements, plant material selection, plant spacing, and bed preparation.

The planting of materials into these beds should adhere to the SDSU Flower Plan (Appendix B) and routine maintenance be carried out to keep the flower beds looking their best. Weed and pest control, as well as disease prevention will be key in keeping beds aesthetically pleasing.

Trees & Shrubs

By identifying tactics to manage existing woody vegetation on campus we can provide guidance to ensure environmentally responsible design objectives are met. The development of conservation landscapes suggests that certain goals like water conservation, placement of trees to mitigate solar heat, and recycling of landscape waste be met. An aesthetically pleasing campus environment is harbored by providing age and species diversity as well as selections with habitat value. Native plant selections or plants with historical value will only further the educational setting of the campus.

The maintenance of trees and shrubs on campus will be carried out by Facilities and Services with the specific maintenance by the Campus Arborist. Guidance on the establishment and preservation of campus woody

vegetation will be carried out according to the campus Tree & Shrub Management Plan (Appendix D).

The diversity and number of existing campus trees is already outstanding. A tree inventory program is needed to take advantage of the opportunity of a campus arboretum. The potential for educational outreach can be invested in by taking observations such as species identification and locations on campus. Other benefits of a detailed inventory include risk assessment and performance evaluation of time.

Pest Management

The principles of integrated pest management will be followed with respect to pest management and pesticide use on campus. Pesticide applications will only be for the management of pests, with the most environmentally sound products used at the proper rate and time. A low impact approach, using products only when needed and with careful consideration for desirable species, will help preserve the campus environment. Proper notification will be needed as stated in the Pesticide Use Plan (Appendix E).

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Contents of the plan:

Appendix A: Turf Management Plan

- Inventory of the weed densities throughout campus
- Specifications and timetables for weed control and fertilizing
- Specifications for seeding
- Procedures for dethatching, aerating and leaf recycling

Appendix B: Flower Bed Plan

- Inventory of flower beds identifying soil characteristics
- Specifications and timetables for bed preparation, fertilizing, planting, weed control and pinching/deheading

Appendix C: Landscape Standards & Design Guidelines

- Design needs
 - Identification of areas needing planting
 - ranking in order of importance
 - list of desirable plant material
 - Identification of buildings and areas needing landscaping
 - ranking in order of importance

Appendix D: Tree & Shrub Management Plan

- Inventory of all campus trees and shrubs identifying location, species, size and condition
- Identifying a pruning cycle and timetable for the young and mature trees on campus
 - *pruning specifications for pruning young and mature trees
 - *procedures for brush recycling and disposal
 - *pruning and shearing specifications for various shrubs
- Implementation of an annual risk assessment of campus trees with provisions for inspections after storms
 - *reporting forms
 - *procedures to identify trees that require removal and how such removals will be communicated to the campus community
- Identifications of other care activities
 - *mulching specifications
 - *fertilizing requirements and timetables for certain trees with micronutrient deficiencies

Appendix E: Pest Management

- Procedures for monitoring key pests
- Management strategies for key pests
- Identification of chemical used to manage pests
 - application techniques
 - pesticide application forms

Appendix F: Grounds Maintenance Calendar

- Timetable for implementation
- Yearly maintenance schedule

Appendix G: Policy

- Campus definition
- Policy statement and training specifications

Appendix H: 2014 Updated Priority Zone Map

- Priority zone map

Appendix I: 2014 Phase Implementation Plan

- Grounds Spending Definitions
- Phase Map
- Phases of Implementation
- Additional Projects

Appendix A

TURF PLAN

Attractive campus grounds have a tremendous impact on potential students and their parents. Attractive grounds also improve the campus pride of current students who may be more willing to volunteer for campus clean ups or at least use sidewalks instead of shortcuts. Plus, attractive grounds can only help to positively affect alumni and/or potential donors. Outlined here is a systematic approach to improve campus over three to five years with expenses distributed over that period.

1. **Prioritization**

Basic turf management practices such as overseeding or aerification have not occurred for at 16 to 20 years. Turf areas neglected for this long will take time and effort to improve, and not all of the areas can be improved immediately. Therefore turf areas should be prioritized into

- A. Highly visible impact areas
- B. Less visible but still important areas
- C. Areas with only minimal use/impact

2. **Additional staffing:** Given the scale of the campus improvements required, a special projects team made up of a permanent skilled leader and two to three seasonal staff is needed. The skilled leader needs to be experienced and degreed in some area of agronomy, horticulture and/or turf and be capable of planning and completing projects, creating and carrying out maintenance schedules, calibrating equipment, etc. The seasonal staff could be temporary adult employees or potentially students. For instance, UNL Grounds uses about 10 students in the spring and fall while classes are in session and retains a few of them over the summer.

3. **New turf areas**

- a. **Quality control/oversight** - Recent construction on campus has created many new or renovated turf areas, but quality control seems to be an issue. SDSU will take over the landscape installation after irrigation is installed and final grade has been finished and approved. SDSU will be responsible for seeding, fertilization, and grow-in of the turf since oversight is close and immediate. However, giving SDSU Grounds this responsibility requires part of each building's construction budget be earmarked for the Grounds Dept.
- b. **Irrigation** - In spite of most architects' insistence on eliminating in-ground irrigation for LEED approval, irrigation must be available throughout campus. Turfgrass requires irrigation during establishment and then periodically after grow-in, especially in high visibility or high traffic areas. Automatic irrigation systems are ideal, but manual quick-coupler systems could suffice.
- c. **Species selection** - The only turfgrass species that will be used throughout the campus is Kentucky bluegrass. Tall fescue should be avoided because of winterkill potential and extremely poor drought survival. A blend including 4 or 5 cultivars of Kentucky bluegrasses will always be used, and 50-70% of each seedlot should contain at least 2 or 3 cultivars

from Table 1. Including 10-15% perennial ryegrass in the mix will speed cover, but should not affect long-term performance.

Table 1. Kentucky bluegrass cultivars most likely to perform adequately in South Dakota

| Top performers in 2005-2010 NTEP study in North Dakota under no irrigation | | Top performers in 2001-2005 NTEP study in IA, NE, or SD (at least 2 of 3 states) under irrigation to prevent stress | |
|--|------------|---|---------------|
| Armada | Juliet | Alexa | Ginney |
| Avid | Jump start | Alpine | Glenmont |
| Bandera | Madison | Arcadia | Impact |
| Bariris | Mystere | Award | Langara |
| Barrari | Nuglade | Awesome | Midnight II |
| Bewitched | Rugby ii | Barnique | North Star |
| Blue Note | Shiraz | Barrister | Nu Destiny |
| Diva | Sombrero | Bedazzled | Nuglade |
| Futurity | Starburst | Beyond | Odyssey |
| Gladstone | Washington | Bluestone | Quantum Leap |
| Glenmont | Yankee | Champlain | Rugby II |
| Hampton | | Courtyard | Showcase |
| | | Diva | Total Eclipse |
| | | Everglade | Tsunami |
| | | Freedom II | |

d) **Post seeding care**

Table 3: Summary of maintenance practices following seeding for SDSU.

| | Fertilizer (lb/1000 sq ft) | Crabgrass | BDLV |
|--|----------------------------|-----------|------|
| | | | |

| Dormant or May seedings | | | |
|-----------------------------------|-----------------------------|------------|-------------------------|
| In the Seedbed | 0.5 lb N + 1.0-1.5 lb P2O5* | Tenacity** | |
| 4 WAE*** | 0.5 lb N + 1.0-1.5 lb P2O5 | Tenacity** | Quicksilver (if needed) |
| 8 WAE | 0.5 lb N + 1.0-1.5 lb P2O5 | | |
| Sep | 1.0 lb N | | |
| Oct | 1.0 lb N | | 3 way |
| July-early August seedings | | | |
| In the Seedbed | 0.5 lb N + 1.0-1.5 lb P2O5* | | |
| 4 WAE** | 0.5 lb N + 1.0-1.5 lb P2O5 | | |
| Sep | 1.0 lb N | | |
| Oct | 1.0 lb N | | 3 way |

*Depends on soil tests

** May not be needed on all sites, but will control both crabgrass and many broadleaf weeds.

***Weeks after emergence

4. **Conversion of currently problematic turf areas to non-turf.** As part of the priority setting on campus, SDSU will take areas out of turf to minimize maintenance.
 - a) Small areas like parking lot islands and narrow parkways (areas between the sidewalk and street) are heat sinks and thus cool-season grasses are difficult to maintain in these areas, creating eye sores. Furthermore, these areas may be difficult to access, too small to mow with large mowers, and/or too small to alternate mowing patterns to distribute wear and tear. Ornamental beds or even concrete may be good alternatives. For direct planting into beds or reproduction in the greenhouse, 1 to 2" plugs of ornamental grasses can be used at a fraction of the cost of 6 inch containers.
 - b) Turf in shaded areas next to buildings should be replaced with ornamental beds, as should most shaded areas under trees.
 - c) Poorly shaped ornamental beds, sidewalks, etc., that require hand-mowing or string-trimming should also be redesigned to eliminate extra labor.

- d) Student short-cuts or "cow paths" should be converted where appropriate to sidewalks or replaced with planting beds to prevent traffic.

5. Reducing damage on current turf areas:

- a) Snow management - If possible, avoid piling snow in large piles in visible areas on campus. Snow mold, suffocation, and potential salt damage can result in turf and ornamental damage. Use temporary piles on perimeters of lots for eventual transport off campus.
- b) Adjacent to walks – Salt damage on turf can be minimized by using 100% sand or calcium magnesium acetate (CMA). The road salt (NaCl) currently used should be avoided because it will damage turf, ornamentals and soil. Consider identifying walk edges prior to the first snowfall if practical, using snow blades narrower than the sidewalks, or perhaps inserting a schedule 80 PVC pipe on the bottom edge of the snow blade so it better "floats" over softer surfaces.
- c) Traffic management- Student short-cuts or "cow paths" should be controlled with plantings, fences, or other tasteful "obstructions" such as benches or bike racks.

6. Maintenance practices

- a) Mowing: all areas should be mowed at 3.0 to 3.5 inches throughout the year and often enough to avoid removing more than 1/3 of the leaf blade. This may mean mowing once every 4 days in the spring or once every two to three weeks in the summer. As fertilization increases in parts of the campus, mowing frequency will have to increase proportionally to growth rate.
- b) Irrigation: Irrigation is required for optimum turf health, resistance to traffic, and appearance. "Deep and infrequent" irrigation is ideal. Irrigation should be applied in the summer at the first sign of drought stress (bluish-gray color of turf in the afternoons or foot prints left in the turf). Enough irrigation should be applied to wet the soil through the depth of rooting and then irrigation should not be applied until the first signs of drought. Priority 'A' areas may need irrigation once or twice/week during the summer, depending on weather. Priority 'B' areas can be watered in much the same fashion as Priority 'A' areas. Areas can be allowed to go dormant from drought and then every 3 to 4 weeks during the drought, apply ¼" of water to ensure the crown stays hydrated. This should prevent widespread drought damage, but all traffic (students, mowers etc.) will need to be kept off drought stressed or dormant turf to prevent damage. Low priority areas may need irrigation once or twice per year.
- c) Fertility: Fertilization should be increased to 2.5 to 3.0 lbs N/1000 sq ft/yr on all areas immediately and then fertilization of Priority 'B' and 'C' areas can be tapered off over time (Table 1). Fertilization just after Labor Day is most important followed by a second fertilization near the last mowing (early October). Apply 1.0 lb N/1000 sq ft in September consisting of 20-40% slow release N and 0.75 to 1.0 lb N/1000 sq ft in October consisting of 0 to 25% slow release. The early May application can be combined with preemergence herbicide for crabgrass control if needed and should apply 0.75 to 1.0 lb N/1000 sq ft with 20-40% slow release N. New soil samples should be taken to a depth of no more than 4 inches and Table 2 shows the recommendations.

Table 2. Recommended P and K applications for established turf areas. Total lbs P_{2O5} /1000 sq ft applied between soil tests are based on Bray P1 testing. Soil tests should be run every 3 to 5 years after establishment. A corrective one-time application of the amount of phosphorus recommended can be made or a series of applications totaling the amount recommended can be made to gradually build-up the phosphorus level. Modified from the University of Wisconsin's "Interim Turf Nutrient Management Guide" at <http://www.turf.wisc.edu/docs/dnr1100-TurfNutrientManagement.pdf>.

| Soil test results | | Established, lawns, parks, golf course roughs | Soil test results | | Established lawns, parks, golf course roughs |
|-------------------|---------|--|-------------------|---------|--|
| ppm P | lbs/A P | lbs P_{2O5} /1000 sq ft recommended to be applied between soil tests | ppm K | lbs/A K | lbs K_{2O} /1000 sq ft/yr |
| 0-5 | 0-11 | 3 | 0-25 | 0-50 | 4-5 |
| 6-10 | 12-21 | 2 | 25-50 | 50-100 | 2-3 |
| 11-15 | 22-30 | 1 | 50-75 | 100-150 | 1 |
| 16-20 | 31-40 | 0 | 75-100 | 150-200 | 0 |
| 21-30 | 41-60 | 0 | 100+ | 200+ | 0 |
| 31-40 | 61-80 | 0 | | | |
| 41-50 | 81-100 | 0 | | | |
| >50 | >100 | 0 | | | |

- d) Crabgrass control: Use post emergence herbicides as needed. Preemergence herbicides are much harsher on new turf, but still use caution if applying a post emergence herbicide to new turfgrass seedlings. Post emergence herbicides such as Quinclorac (Drive, Quinclorac, Quinstar, and others) or Tenacity (Mesotrione) can be applied over seedlings for crabgrass control and do not have a significant soil residual. Tenacity can also be applied to a newly seeded area prior emergence as it will provide adequate weed control while allowing the desired turf to germinate. Regardless of the crabgrass method used, crabgrass pressure

may diminish over time, reducing the need for herbicidal control. None of the products mentioned should pose a problem to greenhouse crops.

- e) Broadleaf weed control: Dandelions, clover and other broadleaf weeds are best controlled with a single herbicide application in September or October. There are probably 50 different products to choose from and all 2-3 way herbicides can be effective when applied in the fall. Low volatile and low odor products are available, but applications should still be made on weekends to limit unnecessary attention. Furthermore, apply on relatively calm, cool, and dry days and stay at least 50 to 100 feet upwind of any of the greenhouses. Do not miss the fall applications because May applications become much less effective while increasing the chances for off-target damage. Realizing the greenhouses can be troublesome, consider notifying the greenhouse house manager(s) prior to application so they can take the proper precautions. Since these herbicides are so effective in the fall, a single application every two to three years near the greenhouses may provide adequate control for our purposes there.
- f) Aerification: All turf areas become compacted with typical mowing traffic, but this compaction is quickly magnified by student traffic, snow removal operations, poor topsoil after construction, etc. Compacted soil leads to poor rooting, poor drought tolerance, increased thatch build-up and more. A dedicated effort to aerify all areas is needed. Aerifying twice per year with implements punching 20-40 holes per square foot and 0.5 to 0.75 inch diameter hollow tines are recommended. This usually requires a reciprocating arm aerifier. Tractor mounted aerifiers are required for most of the campus, but a walk-behind model is needed for the tighter areas. Aerification should be done throughout campus, with extra aerification in the heavy wear areas.
- g) Overseeding: Heavy traffic, extended drought, construction damage, etc. will thin turf and force overseeding to introduce new turf plants. Overseeders cut essentially cut slits in the turf/soil and drop seeds into the slits. Similar to the aerification, both a tractor-mounted overseeder and a walk-behind overseeder will be needed for the campus.

Table 3: Summary of suggested maintenance practices for SDSU.

| | Fertilizer (lb N/1000 sq ft) | | | Crab grass | BDLV | Overseed | Aerification | |
|---|------------------------------|-----|--------------|------------|-----------|-----------|--------------|-------------------|
| | May | Sep | Oct | May-June | Oct | Aug | June | August |
| Priority A: Highly visible impact areas | | | | | | | | |
| 1 st year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | X | X | X |
| 2 nd year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | X | X | X |
| 3 rd year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | As needed | As needed | X | X |
| 4 th year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | As needed | As needed | As needed | X |
| 5 th year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | As needed | As needed | As needed | X |
| Priority B: Less visible but still important areas | | | | | | | | |
| 1 st year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | X | X | X |
| 2 nd year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | As needed | X | X |
| 3 rd year | 0.75-1.0 | 1.0 | | As needed | As needed | As needed | As needed | X |
| 4 th year | 0.75-1.0 | 1.0 | | As needed | As needed | As needed | As needed | X |
| 5 th year | 0.75-1.0 | 1.0 | | As needed | As needed | As needed | As needed | As needed every 2 |

| | | | | | | | | |
|---|-----------|-----|--------------|--------------|--------------|--------------|------------------|----------------------------------|
| | | | | | | | d | years |
| Priority C: Areas with only minimal use/impact | | | | | | | | |
| 1 st year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | X | X | X |
| 2 nd year | 0.75-1.0 | 1.0 | 0.75 -1.0 | As needed | X | As needed | X | X |
| 3 rd year | 0.75-1.0 | 1.0 | | As needed | As needed | As needed | As need ed | X |
| 4 th year | 0.75-1.0 | 1.0 | | As needed | As needed | As needed | As need ed | As needed every 2 years |
| 5 th year | As needed | 1.0 | | As needed | As needed | As needed | As need ed | As needed every 2 years |

7. Equipment purchases and maintenance

- a) Aerifier - three point hitch for large areas, preferably PTO-driven with reciprocating tines (John Deere and Toro are two good sources).
- b) Aeifier – walk behind model with reciprocating tines for smaller areas (Jacobsen, John Deere, Toro, Turfco)
- c) Sprayer- 3-boom 15 foot sprayer for broadleaf herbicides (Jacobsen, John Deere, Toro). Consider purchasing a unit with the boom in front of the driver for maximum visibility. Ride on sprayer/spreaders often used in lawn care operations that spray about 10' wide may suffice for much of campus (PermaGreen, Turfco, GroundLogic, Rittenhouse {Lesco}). A sprayer mounted on an ATV could also work for much of campus.
- d) Overseeder-three point hitch model for large areas (John Deere, Toro, Turfco)
- e) Overseeder – walk behind model for smaller areas (Toro, Turfco)
- f) Walk behind fertilizer spreaders with appropriate guards for keeping product out of beds and off impermeable areas (Lesco, Scotts, many others)
- g) Turf friendly loader to minimize turf damage in tree pruning, mulching, etc. (Bobcat and many others)
- h) All tractors should have turf tires to minimize damage.
- i) Maintenance: There is a need for consistent and frequent calibration of any equipment that applies seed, fertilizer or pesticide.

2012 Plan:

1. Immediately:
 - a. Determine personnel plan
 - b. Prioritize areas
 - c. Purchase overseeders, aerifiers, and sprayer
 - d. Develop snow management plan for next winter
2. Green-up:
 - a. Determine extent of fall/winter drought damage
 - b. Apply starter fertilize, aerify and overseed damaged areas
 - c. Apply Tenacity (8 oz/Acre) or maybe Tupersan to control weeds in damaged areas
 - d. Facilitate irrigation for damaged areas
 - e. Apply fertilizer on non-damaged areas
3. After germination of seed:
 - a. Apply Tenacity (8 oz/Acre) to control crabgrass and other weeds
 - b. Apply starter fertilizer again
 - c. Continue irrigation throughout the summer
4. Summer:
 - a. Initiate plan of removing turf/modifying traffic, etc.
 - b. Purchase spreaders, sprayer
5. Early September
 - a. Apply fertilizer 1.0 lb N/1000
 - b. Begin aerification of entire campus
 - c. Overseed areas that either suffered in summer or did not recover from last fall/winter
6. Early October (weekend)
 - a. Apply broadleaf herbicide
7. Mid October
 - a. Apply last application of fertilizer 1.0 lb N/1000

Appendix B

FLOWER BED PLAN

Goals

It is the stated policy of South Dakota State University to provide an attractive, colorful, and accessible educational campus landscape for the enjoyment of students, faculty, staff, and visitors. The campus flower beds shall be designed to comply with the following:

- 1) To maximize the benefits of campus flower beds, which include improving aesthetic values and student educational experiences.
- 2) To integrate management of flower beds with that of turf; trees and shrubs using an approach that encompasses pest management, nutrient, and irrigation strategies to maintain a high quality landscape with minimal environmental disturbance.
- 3) To provide transition zones between different areas in the landscape and between buildings and the landscape.
- 4) To improve appearance of campus grounds not suitable for turf, trees or shrubs.

Definitions

"Annual" plant that completes its life cycle in a single growing season

"Crown" point on a plant where root system and shoot system meet.
Herbaceous perennials die back to this point in winter.

"Dead-heading" removal of dead flowers preventing seed production to increase number of blooms, duration of blooming period, prevent spread of plant by seed dispersal, and improve overall appearance of the plant.

"Ground cover" plant with a spreading prostrate habit of growth.

"Hardy perennial" plant that will live for more than two growing seasons in our hardiness zone (4b).

"Pinching" removal of the apical (point furthest from the roots) portion of the shoot'.

"Tender perennial" plant that will live for more than two growing seasons in warmer hardiness zones (5a or greater) but will not usually survive winters in our hardiness zone.

Planting design

Arrangement

Number-of colors within individual annual flower beds should be no more than three for beds less than 200 square feet and four for flower beds greater than 400 square feet. Plants with a final spread less than twelve inches (12") should always be planted with at least two rows.

Flower bed designs incorporating both annuals and perennials shall be arranged so that all annuals are grouped together and either in the front or to the side of the flower bed and perennials in the back or one side to allow tillage of annual areas each year.

When multiple rows of the same material are used, adjacent rows will always be staggered (i.e. each row offset one-half the distance between plants within a row).

Plant Material Selection

The plants will be selected for color, low maintenance, tolerance of marginal soil conditions (moisture and texture), and past performance on the campus. For perennial plantings, only hardy perennials will be used.

Spacing

Plant spacing, or the distance from the center of one plant to the center of the adjacent plant in any direction, will be determined from reported final spread and height of plant as well as growth rate of the specific variety being considered. A general rule of thumb is to space plants 1/2 (plants with slow growth rate such as Sweet Allysurn, Edging Lobelia, Nierembergia, and Snapdragons) or 2/3 (plants with rapid growth rate and/or sensitive to mildews such as Marigolds, Zinnias, Verbena 'Imagination', and Impatiens) of the expected spread of the plant to insure annual beds fill in completely.

Perennial plants should be spaced close to their expected spread for groups of the same variety. Additional space should be allowed between adjacent groups so that characteristics each group may be viewed independently.

Bed preparation

New beds will be sprayed with Roundup herbicide at least ten days prior to tillage to reduce weed control problems. Beds will be tilled a minimum of six inches (preferably ten inches) deep. After initial tilling, four inches of fine bark or six inches of shredded peat moss will be incorporated into soil. All tilling should be done when soil is moist enough to form a ball in the hand with no water dripping from it and that will crumble easily. If fertilizer is to be incorporated it should be done at this time.

Existing flower beds should be tilled a minimum of six inches (preferably ten inches) deep prior to planting. Bed should also receive at least three inches of well composted organic matter (pine bark, peat moss, composted leaves, etc.) to be tilled in prior to planting. All tilling should be done when soil is moist enough to form a ball in the hand with no water dripping from it and that will crumble easily. If fertilizer is to be incorporated it should be done at this time.

Perennial flower beds may be covered with weed barrier fabric after tillage is completed. Weed barrier fabric may be installed either before or after planting. When installed before planting, holes must be cut through fabric where plants are to be planted. When installed after planting, a marker stake must be placed at the location of each plant so that holes may be cut through fabric after it is installed.

Planting

Time For annuals - planting should start after average last spring frost date (May 20) and may continue throughout the growing season. However late planting will allow plants less time to fill in and expose plants to greater stress from high temperatures and dry conditions therefore closer spacing will be required.

For containerized actively growing perennials- spring planting should start After average last spring frost date (May 20) and may continue until late June. Fall planting may begin in mid-August and should be completed by the first week of September to avoid frost heaving and subsequent winter kill.

For bare root perennials - planting may begin 2-3 weeks prior to last frost date until late June.

Depth

All containerized plants will be planted so that the upper surface of the soil contained in the root ball is at the same level as the surface of the soil in the flower bed or slightly deeper (no more than W'). For bare root perennials, plant crowns should be at a depth appropriate for the species, usually just below the surface of the soil in the flower bed.

Mulching

The flower beds that are slow to establish or with high spacing distances can be mulched in spring after planting or after 2-4" of new growth has occurred (existing perennials) to buffer soil temperatures, reduce moisture loss and reduce weed control efforts. Mulching material should consist of any organic material that is not unsightly, relatively porous and free of weed seeds. Mulch should be spread 2" deep and reduced at the crown of the plant.

Pinching

Many annuals and perennials used for ground covers should be pinched early in their growth cycle to encourage branching. This will insure bushy compact plants and more flowering stems. Pinching should be done about one to two weeks after planting so that plants are past the shock of transplanting and have active root growth. Plants should still be small at this time so that after removal of the terminal, branches that are stimulated to grow are still close to the ground.

Fertilization

For all flower beds 5 lbs. 5-1 0-5 or 2.5 lbs. 10-10-10 granular fertilizer should be incorporated 8-10" into soil per 100 square feet of flower bed before planting. A second application should be made 8 weeks after planting as top dressing evenly broadcast over bed or in strips between rows at least three inches away from stems of plants. Alternatively, a slow release fertilizer with three month release duration, such as Osmocote 14-14-14, may be incorporated into the top 1" of soil at planting without need for a second application. This fertilizer (14% N) should be applied at 3.5 lbs. per 100 square feet.

Established perennial beds should be fertilized only as needed with need indicated by reduced plant vigor, yellow and dying lower leaves during the first 2/3 of the growing season. Perennials generally require little fertilizer. Over-fertilizing will cause excessive vegetative growth and reduce the number of blooms produced. Some exceptions (heavy feeders) are *Astilbe*, *Chrysanthemum*, *Delphinium*, *Lupines* and *Phlox*.

Irrigation

Flower beds should be irrigated when necessary to supplement natural precipitation so the total moisture received equals one inch per week, or 60 gals per 100 square feet. Irrigation should be thorough and infrequent to encourage a deep root system. One irrigation per week is suitable for loam soils. Sandy soils will require higher frequency while clay soils will require less frequent irrigation. Overhead irrigation should be avoided whenever possible. Drip irrigation, soaker hose systems and other methods that deliver water at ground level are preferred to prevent disease infestations. When using overhead irrigation, irrigate in the morning to allow plants time to dry quickly and before nightfall.

Weed Control

Annual and perennial flower bed weed control is best achieved by hand weeding and frequent shallow cultivation, no greater than 1" deep to avoid damage to the shallow root systems. Cultivation in perennial flower beds should not begin until mid-June to avoid damage to late emerging species such as *Asclepias tuberosa* (Butterfly Weed) and *Liatris spicata* (Gayfeather).

Insect Control

Insect pest problems may occur such as damage from aphids, spider mites, caterpillars and others; however, damage will most likely not be severe enough to warrant insecticide. Often, simple spraying with water from a hose is enough to knock severe infestations of insects off the foliage.

Disease Control

Disease control is best achieved by prevention: restrict watering, especially overhead watering, to morning hours. Irrigation in late afternoon and evening may not dry on leaf surfaces, enhancing the possibility of disease. Avoid over-watering especially in heavy clay soils as this will encourage root and crown rot organisms. Avoid planting too densely to allow good air circulation, especially plants sensitive to mildew organisms such as *Zinnia elegans* (Garden Zinnia), *Rudbeckia hirta* (Blackeyed Susan, Gloriosa Daisy), *Phlox paniculata* (Garden Phlox). Fungicide use would be cost prohibitive.

Pesticide Use

Follow information under general policy.

Dead-heading and General Plant Maintenance

Dead-heading or removal of spent flowers should be performed on most perennials and some annuals to increase the number of flowers produced, the duration of the blooming period, and to improve the overall appearance of the plant. Good examples of annuals that require dead-heading are Marigolds, Petunias, and Coreopsis.

Winter Protection for Perennial Flower Beds

Two weeks after the ground has frozen 2" deep in fall, vegetation remaining on perennial plants should be cut (not pulled) to 4 - 6" above the ground. The bed should then be covered with a layer of mulch 4" deep. Mulching material should be very porous such as straw. This mulch should be removed in spring after danger of last severe frost (these plants can tolerate temperatures below freezing at this time) has past but before significant new growth has occurred. The same material can be reapplied as summer mulch once enough new growth has occurred to identify the location of the plants.

Appendix C

LANDSCAPE STANDARDS & DESIGN GUIDELINES

A standardized plant and design palate is important to keep a cohesive appearance to the South Dakota State University campus. The standards and guidelines outlined in this document set the minimum design criteria to be met for all investments. This section is divided into two categories including *landscape types* and *landscape components*. Landscape types are the projects themselves, while components are the materials and various elements within a site. These standards ensure that all projects fully address the site conditions and surrounding landscapes through thoughtful design and composition, thorough implementation, and consideration for efficiency and sustainability.

Landscape Types

Landscape Types are grouped into the following categories:

- **Building Design**
- **Gathering Areas**
- **Circulation**
- **Campus Greens**
- **Utilities**



Opportunity for scaled landscape at Caldwell Hall

Building Design

The landscape links the interior of the building to the outdoors and connects the site to the campus setting. It offers a direct user experience and can impart a sense of arrival while also assisting the flow of pedestrian traffic. Educational opportunities, functional use areas, and a transition from the natural environment to the indoor experience are affordances of the immediate landscape.

Landscapes on campus should be installed on a priority basis consistent with the prioritization zones set forth in the Grounds Management Plan. The massing of trees, shrubs and groundcover of appropriate scales will help enhance existing landscapes and connect buildings to the campus as a whole. Projects designed within the Historic District should enhance the existing theme rather than compete with the architecture. Existing landscapes throughout campus may require regeneration measures such as pruning old growth shrubs and trees, or by installing additional material to bridge gaps in scale and ensure longevity of existing plant masses. Site improvements for newly constructed or recently disturbed sites will ensure the campus continues moving forward towards a unified appearance.



Proposed design for Bailey Rotunda, a priority 'A' location.

The pedestrian experience can be enhanced by locating ornamental plantings at main building entrances, using materials that complement existing architecture, as well as accommodating the removal and temporary storage of snow. Tight corners and other hard to mow turf areas around structures should be replaced with landscape elements to avoid consistent maintenance challenges. Utility access and trash removal routes should be observed to offer an un-interrupted user experience. Permanent or seasonal bicycle parking should be designed in a manner that it does not interfere with pedestrian traffic or snow removal. Existing or new building signage must be incorporated into the landscape and connect the building to the larger campus context.

Gathering Areas

The 2008 SDSU Master Plan outlines the goal for an eventual walking campus. A widespread network of spaces will help to connect pedestrian walks and foster a rich collegiate atmosphere. Informal outdoor gathering areas will be designed to link adjacent buildings and offer areas of rest and conversation. Primary building entrances offer high traffic, and

gathering spaces in these locations often experience frequent use. These areas should be attractive and interesting, offer sunlight or shade, and take advantage of prospects for outdoor art.

Gathering spaces should offer a wide variety of seating to facilitate conversation, people watching, or solitary environments. Areas of high pedestrian traffic are excellent candidates for seating nodes and should be provided with easy access for both pedestrians and maintenance services. Areas of damaged turf due to frequent short cuts are good opportunities for gathering spaces and can help to mitigate damage by defining pedestrian traffic.



Aerial view of the pedestrian circulation through the College Green

Plantings in these gathering areas should be soft textured, if possible. Massing shrubs and trees will help to define the immediate seating space, focus desirable views off-sight, and buffer undesirable noise. Trash receptacles may need to be installed if the area is frequently high in traffic.

Circulation

The landscape can improve navigation and help give scale to the campus by defining circulation patterns and differentiating pedestrian paths. Sidewalks, roads, parking lots and areas between adjacent buildings are high traffic and should be programmed through landscape design to assist in the guidance and wayfinding throughout campus.



Standard bicycle rack experiencing moderate use

The primary route of pedestrian traffic on the interior of campus is through the extensive sidewalk system. Seating nodes or landscaped intersections are ideal where busy sidewalk intersections occur. The six-way intersection on the College Green is a high traffic intersection and could benefit from landscape materials such as differential paving and human scale plantings. Sidewalks that run alongside busy roads should harbor planting buffers where the width is at least twelve feet. Alternative landscape materials can be used where width is less than twelve feet. Buffers along busy streets help to regulate pedestrian crossing and vehicle pedestrian conflict is minimized. Plantings along streets need to be adaptable to dry, saline, and nutrient poor conditions. Plant materials also need to be vigorous and resistant to damage from snow storage and other structural compromises. Buffers would also be beneficial where large parking lots connect to the campus. Sixteenth Ave. receives frequent and erratic



SDSU proposed engineering quad

CODELUENCE
December 2, 2010



Proposed campus green space renderings show the Jackrabbit Green corridor as well as more structured gathering greens.



Sylvan Green located in the Historic District.

pedestrian traffic due to its location between a main parking lot and the eastern residence halls.

Bicycle parking should also be well articulated and sited out of the direct flow of pedestrian traffic. This is especially problematic during peak traffic times, such as class change. Incorporating permanent or moveable bicycle racks into nearby landscapes is encouraged where possible. Providing circulation from multiple points to the bike racks will reduce the queue time and make for a pleasant arrival experience. When racks are full, bicycles often find their way locked to undesirable site elements, and can become a hazard for pedestrians. Overflow bicycle parking should be located in an accessible area while not causing traffic conflicts.

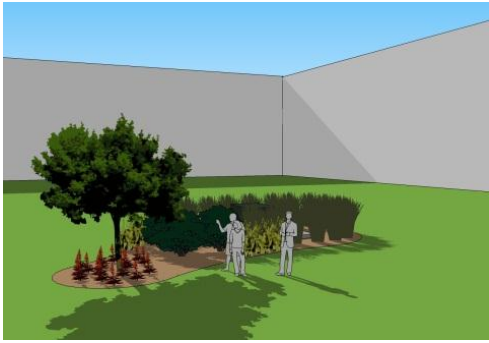
Informal and undesirable circulation occurs in areas around campus. Short-cuts, or “cow-paths” wear heavily on turf grass and should be replaced with alternative materials. These areas are not cost effective and are best left to low maintenance and better looking alternatives. The creation of ornamental planting beds or barriers, replacement of turf with concrete pads or pavers, and sidewalk installation are ways to mitigate damage. These areas can be considered for informal or semi-formal gathering areas to take advantage of the pedestrian traffic.

Campus Greens

The two planned campus greenways open a spectrum of opportunity for the Campus of SDSU. Through the elimination of vehicular traffic on campus, the human scale can be incorporated for a more inviting and urbane collegiate experience.

Jackrabbit Green in particular will open a gateway for pedestrian access and fosters the opportunity for gathering spaces on buildings directly connected to it. Much like the College Green anchors the architecture of the Historic District, Jackrabbit Green will add appropriate scale and directional quality to the northern academic area.

Further opportunities to create greenways should be pursued whenever possible. Jackrabbit Green and areas like it on campus will offer green space for informal recreational activities as well as more structured large events. Areas designated for campus greenways, or open green space should not be considered for possible building or development sites.



This simulation of a utility box screen for a priority 'A' area includes ornamentals away from the object for a visual distraction.

Utilities

Utilities should be screened by proper siting on new building construction whenever possible. The visual disturbance is lessened by siting utilities out of main lines of view and away from main building entrances.

Screening solutions will be needed where utilities are visible. Landscape materials such as tasteful fencing, green fences or planting beds can help to obscure the utilities. If an architectural fencing solution is chosen, the style should be standardized and applied consistently throughout campus. Utility screens should be bridged into adjacent landscapes whenever possible to avoid drawing more attention to the objects. Visual distraction may also be used to direct attention from site utilities. Pedestrian attention can be diverted by locating ornamental plants away from the utility, and providing a neutral texture screen around the immediate object.

Landscape Components

Landscape components are the various elements that make up a site. Plant selections, hardscape materials, site furnishings, lighting and campus artwork give identity to the site and help to reinforce the cohesion of each site within the campus. Generally speaking, site components should share conformity whenever possible, though variation is acceptable in certain circumstances as approved by the planning committee.

Landscape components are divided into the following categories:

- **Materials**
- **Site amenities**
- **Plantings**



Poured in place concrete seat wall at Jackrabbit Village.



Bioswales located in a parking lot at the Morton Arboretum.

Materials

Landscape materials include any paved or nonliving surface. The proper selection and conformity of materials throughout campus help project a unified appearance from site to site. Only materials with proven quality and durability to wear should be chosen to lessen long term maintenance. Choose materials that match existing elements of the site, such as nearby buildings or other hardscape surfaces. Precast concrete retaining walls, poured-in place concrete, and native stone make excellent choices for hardscape retaining or seat walls. Seat walls should reach 14 to 18 inches in height when possible to offer comfortable pedestrian seating. Landscaped beds of any type should be edged with 12 gauge black steel landscape edging. This type of edging has lasting durability and can be easily installed. Beds are not to have weed barrier fabric installed and should be covered with at least 3 inches of wood mulch, preferably recycled from campus trees.

When constructing hardscape elements on a site it is important to correctly direct the drainage away from other paved surfaces. Surface water can be directed into an adjacent bioswale or raingarden if necessary. Areas that are especially problematic with meltwater and drainage are hazards for pedestrians, not cost effective, and should be dealt with accordingly.

Site Amenities

Site amenities are the interactive utility items of the site. Benches, trash receptacles, bicycle racks, cigarette urns, seasonal planters, and utility lighting are all amenities of the campus setting. Standardization of site amenities helps build a unified characteristic and contributes to the overall identity of the campus. Out of date, or amenities that do not match should be phased out and replaced in order of priority. Only benches and bike racks that are manufactured in house or have been approved by the SDSU design committee should be implemented on sites.





Raingarden at the University of Wisconsin adjacent to hardscape areas.

Plantings

The landscape of the South Dakota State University campus serves as the backdrop for daily pedestrian life and should reflect a commitment to progression and display a consistent identity. The university is located in the Prairie Coteau region of the Great Plains, and should reflect its geographic location appropriately through plant selection. By placing an emphasis on plant survivability, sustainability of landscape ecosystems and timeless design layouts, the university can build an identity that shows an obligation to environmental awareness and the student experience.

As a land grant university, SDSU features a history of agriculture, horticulture and biological sciences. Advances in research and education continue this tradition and any opportunity to display and further advance this history should be capitalized. Disciplines of forestry, landscape architecture, horticulture and conservation sciences will benefit from an investment in the campus landscape. By using the campus as a method of instruction for students, the goal of an interpretive and educational experience can be furthered.

Ecological and sustainability concerns should be the guiding principles in the investment of landscapes on campus. Healthy landscape communities can be accomplished with a focus on biodiversity and consideration for site constraints. Planting areas should be 5 by 10 feet at a minimum for groundcovers, shrubs, or herbaceous perennials to ensure adequate room for healthy growth. Masses of plants should be installed to mimic the plant colonies and habits found in the natural environment. Plant masses should be oriented in a fashion that does not obscure campus lighting or sight lines in order to provide a secure campus environment.

There are a variety of different planting palettes to consider for the campus setting, they include:

Historical Plants

A number of plantings on the immediate campus are of historical value with dates back to the beginnings of the university. The grove of trees to the North of Caldwell Hall was installed by Dr. Neils Hansen, a pioneer of early plant breeding. They have survived in the site since the 1930's. This rich culture can be extended by planting Hansen or SDSU introduction plant material where appropriate.

Another component of the history of SDSU is the Historic District and similar early buildings. Plantings around these buildings should reflect the historical nature of the buildings by the use of time-appropriate plants.

Native Plants

Harsh winters and recently unpredictable weather on the Great Plains limits our options for plant material that can survive while holding desirable characteristics. With the growing threat of invasive species and disease, plant selections with a tolerance of rigorous weather are desirable. By installing a variety of native plants on appropriate sites, concerns for weather stress and the need for continued maintenance are both reduced. Indigenous plants have applications that range from droughty and rough textured sites to rain gardens or bioretention areas. The use of native plants should be a high priority on the campus, as it displays an ecological intent and fits the aesthetic of the region.

Ornamental Plants

Though the campus plantings should be largely comprised of native species, the inclusion of rare and highly ornamental species can contribute to the diversity of the campus. These plants provide excellent educational opportunities for plant identification classes, and their ornamental characteristics can be appreciated by all. Overplanted species, or invasive plants of any kind should not be planted on the campus.

Appendix D

TREE & SHRUB MANAGEMENT PLAN

Adopted December 15, 2010

Introduction

The purpose of this plan is to identify strategies and tactics to better manage existing campus woody vegetation and to provide guidance for the further development of the campus landscape that is environmentally responsible, sustainable given financial resource constraints and incorporates other campus planning and design objectives.

Goals

Three management goals have been established.

Goal 1.

Development of a landscape that is sustainable and provides for the long-term conservation of resources.

- *Water conservation* - Utilize plant materials and design that minimizes water usage.
- *Create a "Cool" campus* - Achieve the goal of 40 percent canopy cover on the campus by 2030.
- *Create a campus of solar friendly trees* - Place trees so as to maximize summer shading and minimize winter shading of buildings and parking areas.
- *Snow control* - Place trees and shrubs as "living snow fences" to reduce snow loading in parking areas and campus streets
- *Green waste* - All brush from pruning and removal operations will be processed into mulch to be used on the campus grounds. Larger sections of wood will be utilized as jumps for the Horse Unit, structural wood for campus sheds and other building purposes or processed into other uses whenever possible.

Goal 2.

Develop a campus landscape that is aesthetically pleasing and provides a "sense of place."

- *Species and age diversity* - Provide both a diversity of species and genera as well as age distribution in the campus landscape. A specific goal is to achieve a diversity of

no more than five (5) percent of our campus trees be represented by a single genus by 2020.

- *Habitat value* - Utilize plant material that provides wildlife value to native species of birds and other wildlife.
- *Tree and shrub species use* - Whenever possible and appropriate utilize native species in naturalized settings.
- *Preservation* - Preserve historically significant species.

Goal 3.

Provide for the establishment, maintenance and preservation of campus trees.

- *Planting* - Plant enough trees each year to balance, in terms of projected canopy cover, the loss of trees from campus.
- *Pruning* - Train and prune trees to minimize hazards and improve vitality and aesthetics.
- *Inspection* - Annually inspection of campus trees by the Campus Arborists for their overall health and safety.
- *Protection* - Control threatening pests through a plant health care approach. Protect trees from construction activities.

Responsible Authority

The responsibility for the preservation and maintenance of the woody vegetation on campus rests with Facilities and Services. They are responsible for the day-to-day maintenance of the grounds. The person charged with the specific maintenance of the campus trees is the Campus Arborist. This is a position within Facilities and Service and the individual that serves as the campus arborist must have a 4-year degree in horticulture, forestry or a related field and be an International Society of Arboriculture Certified Arborist.

The Campus Tree Advisory Board is a subcommittee of the University's Master Planning and Design Committee. The subcommittee's function is to provide guidance on the establishment and preservation of trees and shrubs in the campus landscape and report to the Committee. The subcommittee suggests locations where addition plantings are needed, advises on the placement of buildings and other infrastructure to minimize the impact on existing trees and serves to educate the campus community on the importance and benefits of trees to South Dakota State University. Subcommittee service for faculty is five-year term that may be continued for another term at the discretion of the Master Planning and Design Committee. Facility and Services members serve as long as the individual is acting as the Vice President, Director or Grounds Supervisor. The student member serves for a two-year term. The member of the community is served by the City of Brookings Park and Recreation Director.

Tree Inventory Program

A tree inventory is crucial to maintaining a vital and sustainable campus community forest. One key goal for the campus is that no more than five percent of our trees will be represented by a single genus. An accurate and up-to-date inventory is essential to meeting this goal. The inventory also provides the Campus Arborist with the information

needed to maintain tree health and manage risk. However, this biennial inventory does not replace the required annual hazard assessment.

South Dakota State University utilizes the *TreeWorks* inventory software system with the *Topcon GMS-2* unit. *TreeWorks* is the software program that the South Dakota Department of Agriculture encourages communities to use for tree inventories.

Performing the Inventory

The Campus Arborist will be responsible for coordinating and mobilizing teams to conduct a biennial inventory of the campus. This inventory will be conducted such that the inventory is updated completely every two years hence it may be accomplished over a longer or shorter time period each inventory cycle depending upon personnel and other resources. The inventorying effort will be used as an educational opportunity for appropriate arboriculture or horticulture courses whenever possible.

The following information is recorded for each campus tree:

- 1) Species and cultivar;
- 2) Height, diameter, and canopy spread;
- 3) Indicators of key stressors;
- 4) Photograph;
- 5) Defects;
- 6) Specific GPS location
- 7) Planting date and nursery source (if known)
- 8) Special tree.

Tree Identification

Each tree surveyed shall have both common and scientific names recorded. Cultivar information will also be recorded where known.

Height, Diameter, and Spread

Each tree shall be measured for diameter (at 4.5 feet for trees more than 8 inches in diameter, at 1 foot for trees between 4 and 8 inches in diameter and at 6 inches for trees 4 inches in diameter or less. The total height of the tree and canopy spread will be recorded. The canopy spread will be used to calculate percent campus canopy cover.

Indicators of Key Stressors

Trees showing signs or symptoms of serious insect infestation, disease infection or disorders will be identified. The Campus Arborist will be responsible for determining any necessary treatments or mitigation efforts.

Photograph

A digital picture of each tree will be taken during inventory. This information may be used by the campus arborists in determining the cause and value to possible construction damage or vandalism.

Defects

The Campus Arborist will be responsible for conducting an annual tree risk assessment and this is separate from the inventory. However, the inventory includes a field for common tree defects and notes their severity. The defects to be noted include:

- a) Dead branches greater than one (1) inch at the base;
- b) Trunk cracks;
- c) Weak branch attachment;
- d) Trunk decay or cankers;
- e) Root diseases or disruptions ;
- f) Poor tree architecture

Specific GPS Location

Each tree surveyed will have its exact GPS location plotted so that grounds crews will be able to locate individual trees for maintenance or removal.

Source of Tree

Newly planted trees will have the nursery they were purchased identified as well as whether the tree was containerized, B&B, or bare root. This information will be used to monitor performance and behavior based on the source of the plant material.

Special trees

Any tree that serves a special purpose, or was planted in memory of someone or recognition of an event or organization will have that distinction recorded into the inventory. Also contact information for the individual or organization with interest in that tree will be maintained in the inventory.

All maintenance performed, new plantings, and removals are recorded at the time of the operation and entered into *TreeWorks* so that an accurate profile of each tree may be kept.

Tree Planting Plan

Tree Canopy

The tree canopy can be described as the layer of leaves, branches, and stems of trees that cover the ground when viewed from above. A goal is to achieve a 40 percent tree canopy throughout campus by 2030. Once this goal is achieved it will be maintained by annual plantings in sufficient quantities for a projected balance of any canopy loss due to construction, disease, weather or other event.

Plant Selection

The list of appropriate tree species for planting can be located at the end of this plan. In the case of a request for a memorial tree, the tree must be selected from the attached list. The exact location for planting the tree will take into consideration the wishes of the individual or group providing the tree but is solely decided by the campus arborist. Trees added to the list should be selected for educational purposes, underrepresented genera, and for appropriate environmental conditions.

Planting size

Only trees of 1 ½" minimum caliper will be planted on campus.

Planting Standards

The standards for planting are based upon the most current specification of the *American National Standard – Transplanting*, A300 (Part 6) and International Society of Arboriculture's *Best Management Practices – Tree Planting*. This will be reviewed and update annually.

Campus Pruning Practices

All tree care will be performed following the most current specifications of the *American National Standard - Pruning*, A300 (Part 1). Worker safety will follow all OSHA standards and regulations as well as the most current specifications of the *American National Standard for Arboricultural Operations – Safety Requirements*, Z133.

Pruning Schedule

The maintenance pruning schedule is dictated by tree species, age, function, and placement. It will follow the standards set in the International Society of Arboriculture's *Best Management Practices – Tree Pruning*.

Trees less than 10 years old receive structural pruning on an annual basis to achieve the desired form. During the first three years after planting a strong scaffold branch structure must be developed by selecting the primary scaffold branches. To improve the scaffold structure, branches that are crossing, have included bark, or interfere with the scaffold branches are removed.

A crown cleaning is conducted on trees between 10 and 20 years old every five years

Trees 20 years old and older have a cleaning performed every 10 years,

Trees adjacent to roadways, walkways, sign, and street lights are annually inspected for safety and clearance issues and maintenance pruned as necessary. Lower branches may be removed if they interfere with streets, sidewalks, and/or parking lots.

Service Requests

Requests for pruning may be made by any member of the campus community, students, faculty and staff. These requests must be made to Facilities and Services and will be followed up by an inspection of the tree by the campus arborist. The arborist will determine

the need and type of pruning to be performed by staff. Routine inspections should still provide most of the pruning needs. Pruning of campus trees and shrubs may not be performed by members of the campus community.

Pruning Practices

To encourage the development of a strong, healthy tree, the following guidelines will be followed.

- 1) Pruning shall not be conducted without a clear objective or outcome;
- 2) Prune first for public safety, next for health, and finally for aesthetics;
- 3) Pruning operations will be led by the Campus Arborist.
- 4) Whenever possible pruning and other tree care operations will be incorporated into educational opportunities.
- 5) No tree on campus will be topped or tipped.

Trees along streets and parking areas will be pruned so that the lowest branches projecting over the street or parking lot provides a clearance no less than 14 feet. This can be waived for young trees provided they do not interfere with public travel or safety. No branches will grow or hang over the line of the sidewalk lower than eight feet above the level of the sidewalk.

Trees along buildings will be pruned to maintain a clearance of not less than three feet from the building

Shrubs will be pruned utilizing either renewal or rejuvenation cuts. Hedges will be maintained by shearing

Brush will be chipped and set aside for use on campus as mulch.

All stumps will be identified and placed on bid to be ground twice each growing season. After the stumps have been ground, the wood waste will be removed, top soil added to the area and seeded with appropriate turfgrasses.

Elm (*Ulmus*) and oak (*Quercus*) livewood pruning from April 15 to September 15 will be limited to the removal of storm-damaged or hazardous branches to reduce the spread of diseases.

Fallen Limb Removal

When limbs fall from trees on campus, members of the campus community can call in or make a service request for prompt cleanup of the debris. Every attempt will be made to clean up fallen limbs within the same day, depending on the severity of the storm and the extent of the tree damage.

Tree Support Systems

If the campus arborist advises a tree support system is necessary the *American National Standard – Supplemental Support Systems, A300 (Part 3)* International Society of Arboriculture’s *Best Management Practices - Tree Support Systems* will be followed.

Removals

Evaluations for removals will be done by the Campus Arborist.

In the case of storm damage, the Campus Arborist may remove any tree deemed hazardous without permission from the Tree Advisory Board.

Removal of hazards not requiring immediate action will be approved by the Tree Advisory Board. Due to the timing of the Tree Advisory Board’s meeting schedule, this may not always be possible. In these circumstances the Chair of Campus Master Planning and Design Committee will be consulted directly. All other removals will be brought to the Tree Advisory Board for consideration. However, the Assistant Vice President of Facilities and Services has the final say in any tree removal decision.

Trees marked by the city as having Dutch elm disease will be removed without further consultation.

Protection and Preservation during Construction

No sooner than six (6) months before any construction occurs, all trees within the construction footprint and those nearby must be evaluated and identified in regards to need for removal or protection. The tree evaluation and assessment will only apply to planted trees, volunteer trees will not be considered. The tree assessment will be conducted by the campus arborist. Trees within and nearby the footprint will be classified as not salvageable, low priority, or high priority. The *American National Standards – Management of Trees and Shrubs during Site Planning, Site Development and Construction, A300 (Part 5)* and International Society of Arboriculture’s *Best Management Practices – Conservation/Preservation* will serve as a guide for tree protection on campus.

Not salvageable

Not salvageable classification includes all trees that are within the footprint. This may also include trees on immediate adjacent land of a proposed building/structure that must be removed in order for the construction to take place. This could also include trees within the area that are in very poor health and/or are of undesirable species. These trees would have to have a strong likelihood of being removed in the near future regardless of construction activity. These are the sacrificial trees in a construction zone.

Low priority

Low priority classification includes trees with a diameter at 4.5 feet or less than 10 inches which are located outside the footprint. However, these trees must be foreseen to be negatively affected by construction activity. This also includes larger trees (any greater than 10 inches) which fall outside the footprint, but have relatively low landscape and aesthetic values. An example would be trees with poor form or volunteer trees.

High priority

High priority classification includes all trees of desirable species outside the footprint with a diameter at 4.5 feet of 10 inches or greater and possess good health and form and have sufficient room for continued growth. All memorial trees and trees with educational value should be strongly considered for high priority classification, regardless of their size.

Protection zones

During the planning and preparation stages, all protected trees need to have protection zones established by the campus arborist before any construction activity takes place. These designated areas are to remain free from construction traffic to protect the trees' trunks, canopies, and root systems. These protection zones are to remain established and maintained throughout the entire construction process. If at any time during the construction process the protection zones are removed or relocated in such a way they do not meet the protection zone standards, the responsible contractor(s) is (are) liable for any/all fines and penalties. The campus arborist reserves the right to evaluate and report the maintenance of the protection zones throughout the entire construction process.

Protection zones should be constructed of wood, plastic, chain link fencing or any other material that is highly visible and capable of withstanding the duration of the entire construction process and should also be at least four (4) feet in height. For all high priority trees, the protection zone must be established at a minimum of 15 feet from the trunk of the tree and should not be located within the reach of tree's canopy. For all low priority trees, the protection zone must be established at a minimum of 10 feet from the tree's trunk and should not be located within the reach of the tree's canopy.

The campus arborist must be notified of, and be present during, any utility trenching and tunneling construction activities near trees to advise and assist with the activities to reduce damage to roots and injury to trees.

If trees on the low to high priority list are to be removed, the campus arborist must be notified beforehand. The trees that are outside of the foot print of the building plan and must be removed for the convenience of construction vehicles will result in a development of a replacement plan. This plan requires that for every square inch of trunk area (at 4.5 feet) removed, trees totaling an equivalent trunk area will be planted.

Damage penalties

If a tree is damaged during the construction a charge will be made to the contractor to replace or repair the tree. The Campus Arborist will determine the cost of replacement or repair following the *Guidelines for Plant Appraisal* 9th Edition.

*List of tree species currently approved
for planting on the SDSU campus*

The following is a list of tree species that currently do not exist or are unrepresented on campus. These species and cultivars are needed to improve the educational value of the campus. This list is updated every two years.

Abies balsamea – Balsam fir
Abies concolor – Concolor fir
Acer miyabei ‘Morton’ – State Street maple
Acer pseudosieboldianum – Korean maple
Acer saccharum – Sugar maple
Acer triflorum – Three flower maple
Acer tataricum – Tatarian maple
Aesculus x ‘Homestead’ – Homestead buckeye
Aesculus x *arnoldiana* ‘Autumn Splendor’- Autumn Splendor buckeye
Alnus glutinosa – European or Black alder
Alnus hirsuta ‘Harbin’ – Prairie Horizon alder
Betula nigra – River birch
Betula papyrifera – Paper birch
Carpinus caroliniana - Bluebeech
Catalpa speciosa – Northern catalpa
Cladrastis kentukea - Yellowwood
Ginkgo biloba – Ginkgo
Gynocladus dioicus – Kentucky coffeetree
Larix decidua – European larch
Maackia amurensis – Amur maackia
Magnolia stellata ‘Royal Star’ – Royal Star magnolia
Ostrya virginiana – American hophornbeam
Picea abies – Norway spruce
Picea omorika – Serbian spruce
Pinus cembra – Swiss stone pine
Pinus contorta – Lodgepole pine
Phellodendron amurense – Amur corktree
Phellodendron sachalinense ‘His Majesty’ – His Majesty Corktree
Populus grandidentata – Big-tooth aspen
Populus tremula – European aspen
Populus tremuloides – Quaking aspen
Prunus maackii – Amur chokecherry

Prunus serotina – Black cherry
Pseudotsuga menziesii – Douglas-fir
Pyrus ussuriensis 'MorDak' – Prairie Gem pear
Quercus alba x *robur* – Crimson Spire oak
Quercus bicolor – Swamp white oak
Quercus ellipsoidalis – Northern pin oak
Quercus macrocarpa – Bur oak
Quercus rubra – Northern red oak
Salix 'Prairie Cascade' – Prairie Cascade willow
Tilia americana – American linden
Tilia x *euchlora* – Crimean linden
Tilia mongolica 'Harvest Gold' – Harvest Gold linden
Thuja occidentalis 'Rushmore' – Rushmore arborvitae
Ulmus 'Morton Glossy' – Triumph elm
Ulmus pumila – Siberian elm

List of tree species prohibited for planting on the SDSU campus

The following are tree species that either have serious pest problems or are over-represented on the campus. They may not be planted on campus.

Acer x *freemanii* – Any Freeman maple cultivar
Acer negundo – Boxelder
Acer platanoides – Norway maple
Acer rubrum – Red maple
Acer saccharinum – Silver maple
Acer tataricum var. *ginnala* – Amur maple
Elaeagnus angustifolia – Russian-olive
Fraxinus spp – All ash species and cultivars
Juglans cinerea – Butternut
Juglans nigra – Black walnut
Malus spp. – Crabapple
Picea pungens – Colorado spruce
Populus alba – White poplar
Populus deltoides – Cottonwood
Prunus virginiana 'Shubert' – Canada Red chokecherry
Ulmus americana – American elm (exception Dutch elm disease tolerant cultivars)
Ulmus rubra – Slippery elm

Appendix E

PESTICIDE USAGE

The principles of integrated pest management will be followed with respect to pest management and pesticide use on campus. Pesticide applications will only be for the management of specific weeds, insects, mites or disease pathogens, with the most environmentally sound products used at the proper rate and time. All pesticide applications will conform to federal and state regulations.

The Campus Turf Manager will inform the Assistant Director of Facility Services at least 72-hours before any pesticide application is made. All pesticide applications will be made during the least disruptive time period, typically evenings and weekends. A list will be compiled annually of all pesticides to be used on campus in the coming year. MSDS sheet on any or all of these pesticides will be supplied to any interested party upon request.

In addition, it is imperative that pesticide applications on campus do not affect, injure or kill desirable species on the grounds, in adjacent research plots and homeowner yards and in campus greenhouses. A list will be kept of individuals to be contacted at least 48-hours before any pesticide application is made. In addition, the department head of Plant Science will be notified at least 72-hours in advance to be certain that any planned chemical application will not harm research and ornamental greenhouse plants. No further notification, beyond that identified above, will be given unless required by federal or state law.

Pesticide application made on the campus grounds by Health, Physical Education and Recreation staff must follow the pesticide usage policy.

Appendix F

GROUNDS MAINTENANCE CALENDAR

January – March

Flowers

Order annual bedding plants

Ornamentals

Order trees, shrubs and perennial to be planted this season

Prune deciduous tree and conduct rejuvenation pruning of shrubs

Check woody plants for rabbit injury and add needed protection

Turf

Order any needed turfgrass seed for spring

April

Flowers

Remove winter mulch from perennial beds

Ornamentals

Begin planting bare-root trees on campus and in the nursery

Complete any shrub pruning

May

Conduct annual training workshop

Flowers

Till flower beds and add organic amendments

Plant flower beds after May 20

Ornamentals

Begin renewal pruning of spring-flowering shrubs (after
flowering) Begin shearing formal hedges

Apply any additional mulch to shrub beds

Bids out for stump

grinding Update campus

tree inventory Complete

landscape projects

Turf

Sweep priority turfgrass areas to remove winter debris
Apply preemergent herbicide prior to soil temperatures of 62 F
Apply light fertilizer to priority turfgrass areas
Overseed worn or thin areas of turf along sidewalks if pre-emergence herbicide was not applied
Mow at 2-2.5 in. Prevent removal of more than 1/3 of grass blades each time.

June**Flowers**

Remove weeds from annual beds
Dead-head flowers

Ornamentals

Water newly planted trees and shrubs if rainfall is inadequate

Turf

Continue mowing at 2-2 1/2 inches
Water turfgrasses as needed. Irrigation should be done infrequently and deep.

July**Flowers**

Continue maintaining flower beds by weeding and dead-heading
Top-dress flower beds

Ornamentals

Prune watersprouts and suckers from crabapples

Turf

Raise mowing height to 3 inches prior to hot and dry weather
Edge curbs and sidewalks of overgrowing turf

August**Flowers**

Continue maintaining flower beds by weeding and dead-heading

Ornamentals

Shear formal hedges
Begin fall planting
Apply any needed mulch to shrub beds
Bids out for stump grinding

Turf

Continue mowing at 3 inches
Begin thatch removal (if needed) by mid-month
Begin core-cultivation of high traffic areas
Complete edging curbs and sidewalks of overgrowing turf

September

Flowers

Continue maintaining flower beds by weeding and dead-heading

Ornamentals

Complete any fall landscape projects

Turf

Continue mowing but reduce height to 2-2.5 inches

October

Flowers

Clean flower beds after the first killing frost
Mulch perennial flowers
Complete any spring bulb planting

Ornamentals

Update campus tree inventory

Turf

Remove leaves and fallen debris from turf areas
Complete fertilization of priority turf areas
Complete applications of broadleaf herbicides

**November-
December**

Flowers

Prepare flower bed designs for the coming year

Ornamentals

Begin pruning (but avoid pruning any marginally-hardy plants until March) Apply winter protection from rabbits

SOUTH DAKOTA STATE UNIVERSITY GROUNDS POLICY

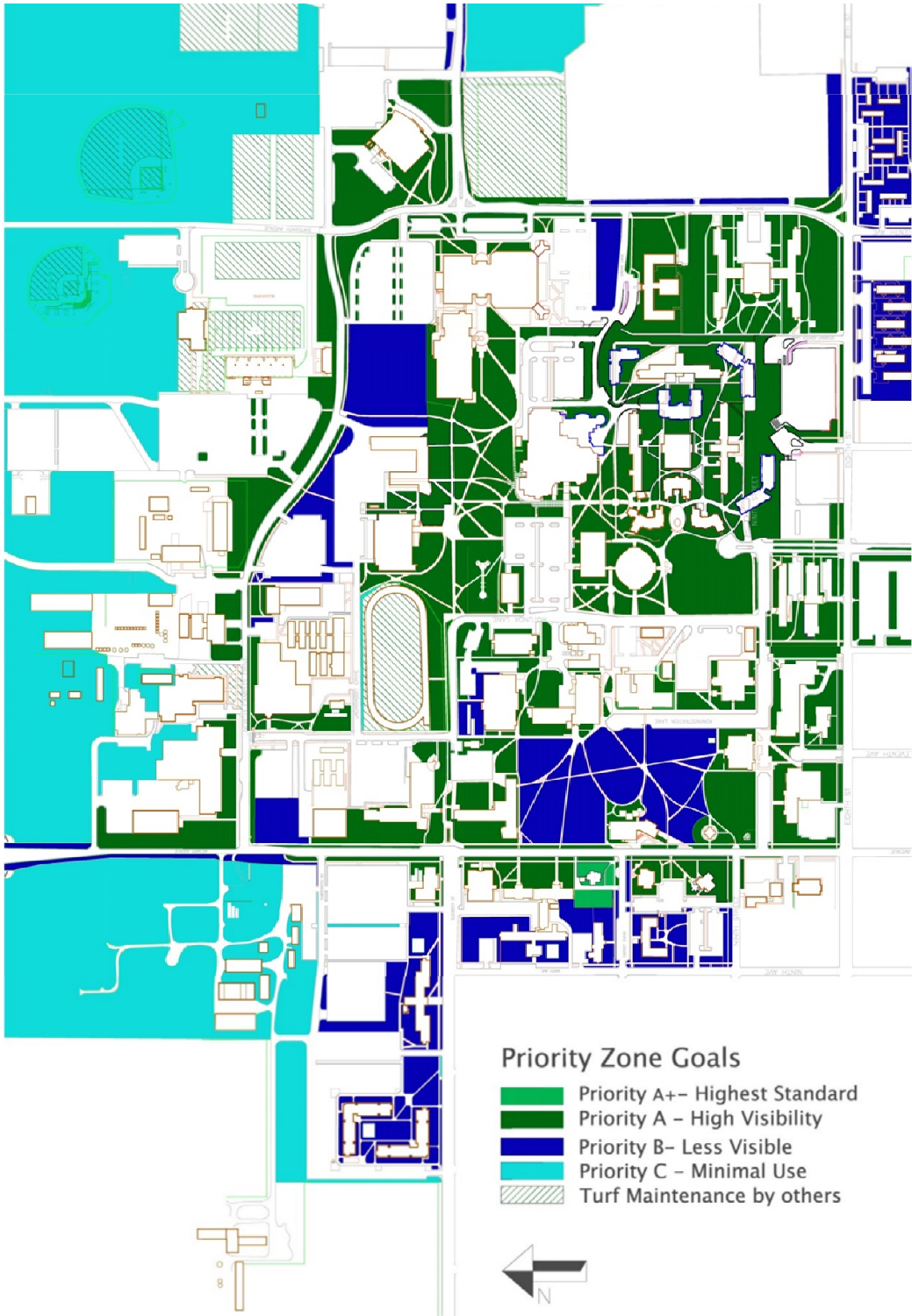
General Definition

"**Campus**" means the main campus of South Dakota State University as diagramed in the current South Dakota State University Bulletin. The campus includes all athletic fields but for the purpose of this management policy excludes McCrory Gardens and the State Arboretum

Training

To ensure that grounds policies are being followed, a half-day training session will be conducted each May. The training will be provided by the appropriate faculty from the Plant Science Department for all grounds crew members involved in the care of the campus landscape.

2014 UPDATED PRIORITY ZONE MAP



South Dakota State University Grounds Management Plan

Appendix I

PHASE IMPLEMENTATION PLAN

Grounds Spending per Grounds Management plan implementation

The Grounds Management Plan was developed in 2012 in reaction to declining conditions in established landscape beds and turf areas around the SDSU campus. The initial phase was implemented in 2013 to bring areas of campus up to outlined Priority Status A, B, or C; and also to help identify actions needed to maintain or restore previous areas upgraded as parts of project to their established levels. Full additional funding has not been identified for the increased yearly maintenance costs outlined below.

Increased Yearly Maintenance Costs: Cumulative effect of increased maintenance costs to sustain newly and previously established zones to the indicated priority level of the Grounds Management Plan. The plan was develop assuming consistent increase maintenance over multiple years. Therefore, missing years of funded maintenance will increase the future cost of maintenance to achieve priority zone goals outlined in the Grounds Management Plan.

Athletics, Residential Life, and Student Wellness areas adjacent to their facilities are paid for by department.

Cost estimates for one time funding investments and ongoing maintenance cost increases by Phase:

| Phase I | | Phase 2 | | Phase 3 | | Phase 4 | | Phase 5 and Final | |
|-------------------------------|-----------------|-------------------------------|-----------------|-------------------------------|-----------------|-------------------------------|-----------------|-------------------------------|-----------------|
| Summer 2013 | | Planned for Summer 2014 | | Planned for Summer 2015 | | Planned for Summer 2016 | | Planned for Summer 2017 | |
| One Time Implementation Costs | Incremental Add | One Time Implementation Costs | Incremental Add | One Time Implementation Costs | Incremental Add | One Time Implementation Costs | Incremental Add | One Time Implementation Costs | Incremental Add |
| \$169,367 | \$0 | \$94,000 | \$130,945 | \$ 83,375 | \$121,500 | \$ 58,360 | \$141,940 | \$ 32,000 | \$178,500 |

Figure 1.1 is the Phase Implementation Map to complete the work outlined in the Phase Implementation Plan. This map identifies corridors of land to focus on each consecutive year in order to bring these areas up to their respective Priority Zone Goals.

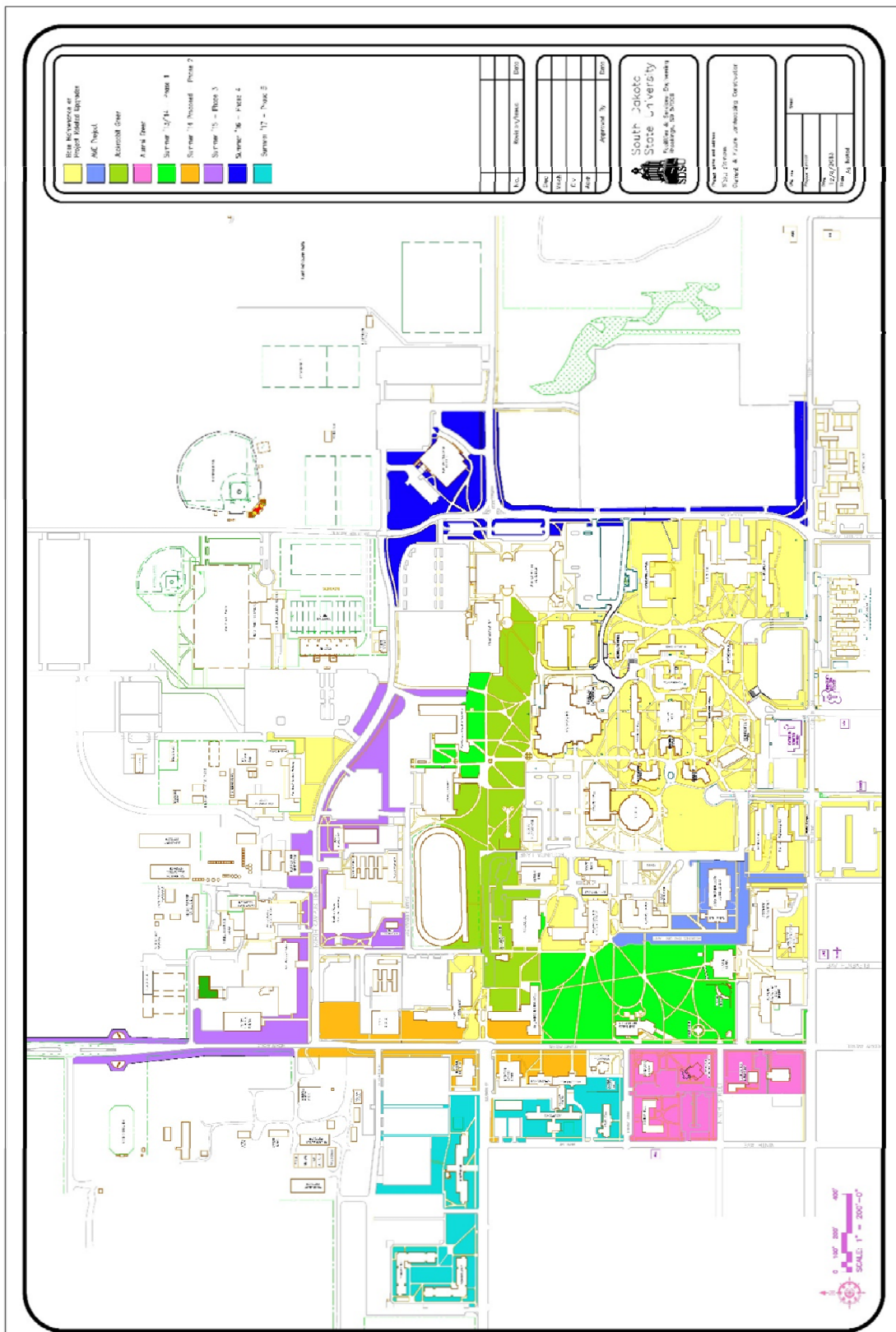


Figure 1.1 outlines areas of focus for each year's beautification efforts.

South Dakota State University Grounds Management Plan

PHASE 1:

Turf upgrades began on the Medary Corridor from 8th Street North to Ag Hall and Historic Green

Medary Corridor consists of a homogeneous area from the intersection of 8th street and Medary Ave North to the intersection of Medary Ave and North Campus Drive including the Historic Green/Sylvan Theater and Lincoln Music Hall and extending back from Medary approximately 30'-40' from the East and West curb lines into campus.

- Summer 2013:
 - *Initial aeration to work to remove 20 year backlog per Appendix A of management plan*
 - *Increased fertilizer application to re-establish grass per Appendix A of management plan*
 - *Seeding and spraying measures to thicken canopy per Appendix A of management plan*
 - *Pest Management per Appendix E of management plan*
 - *First phase of plant/bedding installation around Lincoln Music Hall per Appendix B, C and D of management plan*
 - *Partial installation of sprinkler system to Medary Corridor per Appendix A of management plan*
 - *Sodding of Medary Ave along Pugsley per Appendix A of management plan*
 - *Tree & shrub work per Appendix D of management plan*
 - *Upgrade to Ag Museum, installation paid for by Ag Museum per Appendix B,C, and D of management plan*

Underfunded Yearly Maintenance Costs: This situation exists for areas where initial work was completed under previous projects or campus upgrades such as Jackrabbit Grove, Avera, and 13th Ave parking lot. Projects or upgrades were completed per Appendix A, B C, D, E, F and G of management plan and now are declining or need additional maintenance dollars due to needed regularly scheduled maintenance ,per the plan, for activates such as these outlined below:

- *Twice a year aeration*
- *Over-seeding*
- *Twice a year pest management*
- *Increased bed/flower maintenance*
- *Increase mowing frequencies*
- *Increased irrigation maintenance costs*
- *Replacement stock for established beds*
- *Repair of areas damages from winter snow activities*
- *Tree & shrub work*

PHASE 2:

Proposed summer 2014:

Continuation of Medary Corridor

- Upgrade/installation work-Medary Corridor consisting of completion of the area from 8th street north to 11th Street and initial work on the area from 11th Street north to North Campus Drive:
 - *Turf work from 11th Street north to North Campus Drive per Appendix A and E of management plan:*
 - *Initial aeration*
 - *Over-seeding*
 - *Increased fertilizer application*
 - *Increased pest management*
 - *Completion of the installation of sprinkler system to Medary Corridor*
 - *Second phase of plant/bedding installation around Lincoln Music Hall per Appendix B, C and D of management plan*
 - *Planting of ground cover under trees and on steep boulevard slopes on the east side between Art Museum and Ag Hall per Appendix B and C of management plan*
 - *Completion of Ag Museum Landscaping/Irrigation(paid for by Ag Museum) per Appendix B, C, and D of management plan*
 - *Tree & shrub work per Appendix D of management plan*
- Increased Yearly Maintenance Costs to maintain completed priority zones to the appropriate indicated level:
 - *Twice a year aeration*
 - *Over-seeding*
 - *Twice a year pest management*
 - *Increased bed/flower maintenance*
 - *Increase mowing frequencies*
 - *Increased irrigation maintenance costs*
 - *Replacement stock for established beds*
 - *Repair of areas damages from winter snow activities*
 - *Tree & shrub work*
 - *Continued establishment efforts of previous year, ie: reseeding areas that did not grow, repairing damage to newly established upgrades from traffic, replace dead stock that did not survive winter.*
 - *Increased Maintenance costs of Ag Museum Landscaping*

PHASE 3:

Proposed summer 2015:

North Campus Drive Corridor

Area from Medary Ave east to Facilities and Services approximately 30' to 40' back from the curbs including the area around Northern Plains Biostress, Physiology, Hort-Forestry.

- Upgrade/installation work-North Campus Drive Corridor:
 - *Initial turf work from Medary Ave east to Facilities & Services per Appendix A and E of management plan:*
 - *Initial aeration*
 - *Over-seeding*
 - *Increased fertilizer application*
 - *Increased pest management*
 - *Completion of the installation of sprinkler system by Facilities & Services*
 - *Re-planting/intense Maintenance of Landscaping around Northern Plains Biostress per Appendix B,C, and D of management plan*
 - *Planting of ground cover or installation of colored concrete on north side of parking lot 165 for area too small to support healthy turf growth per appendix B and C of management plan*
 - *Specific hand weed control around sensitive area of the Hort-Forestry Greenhouses/Physiology per Appendix E of management plan*
 - *Tree & shrub work per Appendix D of management plan*
- Increased Yearly Maintenance Costs to maintain completed priority zones to the appropriate indicated level:
 - *Twice a year aeration*
 - *Over-seeding*
 - *Twice a year pest management*
 - *Increased bed/flower maintenance*
 - *Increase mowing frequencies*
 - *Increased irrigation maintenance costs*
 - *Replacement stock for established beds*
 - *Repair of areas damages from winter snow activities*
 - *Tree & shrub work*
 - *Continued establishment efforts of previous year, ie: reseeding areas that did not grow, repairing damage to newly established upgrades from traffic, replace dead stock that did not survive winter.*
 - *Higher manual weed control costs due to spray sensitivity around greenhouses*

PHASE 4:

Proposed summer 2016:

16th Avenue Corridor

Area from North Campus Drive south to 8th Street 30'-to 75' back from curbs including the area surrounding the Performing Arts Center.

- Upgrade/installation work-16th Avenue Corridor:
 - *Initial turf work from North Campus Drive (including PAC turf) south to 8th Street per Appendix A and E:*
 - *Initial aeration*
 - *Over-seeding*
 - *Increased fertilizer application*
 - *Increased pest management*
 - *Re-conditioning of current planting beds and landscape around PAC to bring it up to desired priority level standard (A) per management plan*
 - *Planting of ground cover or installation of colored concrete on east side of parking lot 151 for area too small to support healthy turf growth, as well as divider island at the intersection of 16th Ave and 8th street per Appendix A and C of management plan*
 - *Tree & shrub work per Appendix D of management plan*
 - *Eliminating and replacing at least 50% of Ash trees along 16th avenue for disease preparedness per Appendix D and E of management plan*

- Increased Yearly Maintenance Costs to maintain completed priority zones to the appropriate indicated level:
 - *Twice a year aeration*
 - *Over-seeding*
 - *Twice a year pest management*
 - *Increased bed/flower maintenance*
 - *Increase mowing frequencies*
 - *Increased irrigation maintenance costs*
 - *Replacement stock for established beds*
 - *Repair of areas damages from winter snow activities*
 - *Tree & shrub work*
 - *Care for small and establishing street trees including intensive pruning for high-branching structures, fertilization and cultural controls.*
 - *Continued establishment efforts of previous year, ie: reseeding areas that did not grow, repairing damage to newly established upgrades from traffic, replace dead stock that did not survive winter.*

PHASE 5:

Proposed summer 2017:

11th Street/9th Avenue Corridor

Area on the east side of 9th Ave surrounding West Hall and Waneta Hall north to 11th Street, the north side of 11th street from Ag Museum west to Meadows North and South including all turf areas surrounding Hansen Hall, Meadows North and South and the associated parking lots.

- Turf work-11th Street/9th Street Corridor:
 - *Initial turf work from North Campus Drive (including PAC turf) south to 8th Street per Appendix A and E of management plan:*
 - *Initial aeration*
 - *Over-seeding*
 - *Increased fertilizer application*
 - *Increased pest management*
 - *Tree & shrub work per Appendix D of management plan*
- Increased Yearly Maintenance Costs to maintain completed priority zones to the appropriate indicated level:
 - *Twice a year aeration*
 - *Over-seeding*
 - *Twice a year pest management*
 - *Increased bed/flower maintenance*
 - *Increase mowing frequencies*
 - *Increased irrigation maintenance costs*
 - *Replacement stock for established beds*
 - *Repair of areas damages from winter snow activities*
 - *Tree & shrub work*
 - *Continued establishment efforts of previous year, ie: reseeding areas that did not grow, repairing damage to newly established upgrades from traffic, replace dead stock that did not survive winter.*

Additional projects with yearly maintenance cost increase

Jackrabbit Green Implementation:

- \$5,230,000.00 Construction
- **\$173,253.00** yearly maintenance cost

Architecture Math Engineering:

- Implementation part of total project cost
- **\$20,860.00** yearly maintenance cost