Sustainability: General Principles, Relationship to GreenCO BMPs and Energy Conservation

BMP Type			
Design			X
Installation			X
Maintenance/Operations			X
Green Industry Relevance			
ASLA	X	GCC	X
ALCC	X	ISA	X
CALCP	X	RMSGA	X
CNGA	X	GCSAA	X

Description

Both national and local efforts are underway to improve the sustainability of landscaping and development. Definitions of sustainable landscaping vary, with three representative definitions including:

1. "A sustainable Colorado landscape balances resource use with tangible benefits to the local, regional and global environment throughout its lifespan." (Front Range Sustainable Landscaping Coalition 2008).

2. "Sustainable landscaping should include an attractive environment that is in balance with the local climate and requires minimal resource inputs, such as fertilizer, pesticides and water. Sustainable landscaping begins with an appropriate design that includes functional, cost efficient, visually pleasing, environmentally friendly and maintainable areas." (Colorado State University Extension 2008).

3. "Design, construction, operations and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs." (Sustainable Sites Initiative™ 2007).

"Sustainable Landscaping" has different meanings, depending on the audience, and may best be described along a continuum that progresses from conventional practices, which are often dependent on significant natural resource and energy inputs, to sustainable practices, which require less natural resource and energy use. For some audiences, the endpoint is to become "neutral" in terms of natural resource consumption and environmental benefits; whereas for other audiences, the endpoint is to move beyond "neutral" into restorative and regenerative landscape designs (Reed 2006). Regardless of the endpoint, the Green Industry has many opportunities to work toward sustainable landscaping practices.

National and Local Sustainability Initiatives

In 2007, the national "Sustainable Sites Initiative" was launched as an interdisciplinary partnership between the American Society of Landscape Architects (ASLA), the Lady Bird Johnson Wildflower Center, the United States Botanic Garden and a diverse group of stakeholder organizations to develop guidelines and standards for landscape sustainability. The motivation behind this initiative stemmed from the desire to protect and enhance the ability of landscapes to provide services such as climate regulation, clean air and water, and improved quality of life. Sustainable Sites™ is a cooperative effort with the intention of supplementing existing green building and landscape guidelines, as well as becoming a stand-alone tool for site sustainability. This national effort spawned the local Front Range Sustainable Landscaping Coalition effort. For more information on these two efforts, see (www.sustainablesites.org) and (www.frslc.wetpaint.com).

As stated by the U.S. Environmental Protection Agency, "sustainable development marries two important themes: that environmental protection does not preclude economic development and that economic development must be ecologically viable now and in the long run." The Green Industry has many opportunities to both thrive economically and protect and restore the environment.

During the 2008 revision of this manual, sustainability concepts moving beyond water issues were of substantial interest to the GreenCO advisory committee; however, at the time of this publication, many of these concepts were in the development phase under local and national sustainable sites initiatives and were not fully developed or adopted by GreenCO members. This BMP introduces basic sustainability and energy conservation concepts that Green Industry professionals can consider integrating into their professional practice. These concepts are likely to be further developed in future GreenCO efforts.

Basic Practice Guidelines

This BMP focuses primarily on 1) increasing familiarity of Green Industry members with general sustainability concepts advocated by local and national efforts, and 2) energy conservation opportunities for the Green Industry, which have not been addressed in previous releases of the GreenCO BMP Manual. Table 1 cross-references the GreenCO BMPs to key sustainability concepts envisioned at the local and national levels.

Guiding Principles for Sustainability Advocated by the Front Range Sustainable Landscaping Coalition

The Front Range Sustainable Landscaping Coalition is in the process of developing sustainable landscape practices that provide specific recommendations for site preparation, planting, water management, mulching, hardscapes, mobilization, maintenance and other practices. Underlying these forthcoming specific practices are the following principles:

- Minimize use of non-renewable resources
  - Energy
    - Use local materials
    - Reduce energy use in buildings
    - Use renewable energy
  - Water
    - Retain water on site
    - Use efficient irrigation
  - Compost use (instead of harvesting topsoil and peat)
- Restore "ecological functioning" (or ecosystem services)
  - Support healthy soil, which provides these benefits:
    - Absorbing and cleaning runoff and precipitation
    - Absorbing and neutralizing air pollution
    - Fixing/sequestering carbon
  - Provide habitat
- Minimize waste: reduce, reuse, recycle
- Protect and minimize disturbance to healthy ecosystems

Table 1. Relationship of GreenCO BMPs to Various Sustainability Principles

Soils	**Energy Conservation**
Soil Amendment/Ground Preparation	Sustainable Landscaping
Soils, Hydrology, Materials, Vegetation	**Water Conservation Focused Practices** *(note: all GreenCO practices interrelate to promote water conservation)*
Landscape Design (including Plant Selection & Placement and Hardscapes)	Water Budgeting
Xeriscape	Drought and General Water Conservation Practices for Landscapes
Park, Golf Course and Other Large Landscape Design and Management	Irrigation Efficiency
Vegetation-focused Practices (provide guidance promoting healthy vegetation, while minimizing chemical usage)	Irrigation Efficiency Audits
Fertilizer Application	Irrigation System Design
Herbaceous Plant Care	Irrigation System Installation
Landscape Maintenance	Irrigation System Maintenance
Lawn Aeration	Irrigation Technology and Scheduling
Mowing	Irrigation Using Nonpotable Sources
Mulching	Production Practices for Nurseries, Greenhouses, and Sod Growers
Pesticide and Herbicide Application	Retail Practices for Nurseries, Greenhouses and Garden Centers
Pesticide, Fertilizer and Other Chemical Storage, Handling and Disposal	Water Management Practices for Nurseries, Greenhouses, Sod Growers and Holding Yards
Tree Placement in the Urban Landscape	
Tree Planting	**Hydrology/Drainage/ Water Quality Related Practices**
Tree Protection	Landscape Installation/Erosion and Sediment Control
Turf Management	Revegetation of Drainageways
Woody Plant Care	Riparian Buffer Zone Preservation
Waste Reduction	Role of Landscaping in Low Impact Development
Lawn Waste Disposal/Composting	Snow Removal and Management

Guiding Principles for Sustainability under the Sustainable Sites Initiative™

Guiding principles of the Sustainable Sites Initiative™ follow, along with specific goals which may be directly related to the Green Industry, as summarized in Table 2. See the Sustainable Sites Initiative™ website for more detail and the most current versions of these concepts.

1. Do No Harm[1]: Make no changes to the site that will degrade the surrounding environment. Promote projects that occur where there has been previous disturbance or development that presents an opportunity to regenerate ecosystem services through sustainable design.

2. Precautionary Principle: Be cautious in making decisions that could create risk to human and environmental health. Some actions can cause irreversible damage. Examine a full range of alternatives—including no action—and be open to input from all affected parties.

3. Design with Nature and Culture: Create and implement designs that are responsive to economic, environmental, and cultural conditions with respect to the local, regional, and global context.

4. Use a Decision-Making Hierarchy of Preservation, Conservation, and Regeneration: Maximize and mimic the benefits of ecosystem services by preserving existing environmental features, conserving resources in a sustainable manner, and regenerating lost or damaged ecosystem services.

5. Provide Regenerative Systems as Intergenerational Equity: Provide future generations with a sustainable environment supported by regenerative systems and endowed with regenerative resources.

6. Support a Living Process: Continuously re-evaluate assumptions and values and adapt to demographic and environmental change.

7. Use a Systems Thinking Approach: Understand and value the relationships in an ecosystem and use an approach that reflects and sustains ecosystem services; re-establish the integral and essential relationship between natural processes and human activity.

8. Use a Collaborative and Ethical Approach: Encourage direct and open communication among colleagues, clients, manufacturers, and users to link long-term sustainability with ethical responsibility.

9. Maintain Integrity in Leadership and Research: Implement transparent and participatory leadership, develop research with technical rigor, and communicate new findings in a clear, consistent, and timely manner.

[1] Although the term "do no harm" is adopted directly from the Sustainable Sites Initiative, it is important to recognize that there are inevitable effects from changing the natural environment. Green Industry members may choose to consider ways to "minimize" or "avoid" harm.

Table 2.
General Goals of the Sustainable Sites Initiative to Progress Toward Site Sustainability
(Source: Sustainable Sites Initiative 2007)

SOILS

1. Maintain and/or improve soil health so that on-site and surrounding ecosystem services are sustained or enhanced.
2. Avoid the use of pollutants, chemicals, or soil amendments that can harm human and ecological health.
3. Create a net zero waste site.
4. Reduce greenhouse gas emissions.

HYDROLOGY

1. Value all water on the site.
2. Maintain or regenerate healthy hydrologic processes.
3. Promote water quality and healthy aquatic habitats.

VEGETATION

1. Design and maintain vegetation so that on-site and surrounding ecosystem services are sustained or enhanced.
2. Reduce resource consumption and waste.

MATERIALS

1. Manage resources and materials efficiently.
2. Select and use sustainable landscape materials.
3. Reduce energy use, both embodied and operational.
4. During all phases, avoid materials, products and practices that are harmful to humans and the environment.

HUMAN WELL-BEING

1. Design and maintain conditions to promote health and physiological benefits.
2. Enhance human cognitive function.
3. Promote positive social dynamics.

Energy Conservation

1. In addition to sustainability practices related to water conservation and water quality protection, the Green Industry has many opportunities for energy conservation as it continues to encourage sustainability. In a general sense, the typical areas to seek energy conserving opportunities include: building envelopes, windows, lighting systems (including daylight), electrical systems, plug loads and HVAC systems. Although this BMP Manual does not go into detail on this topic, basic practices that can be implemented across the Green Industry include these first steps (NREL 2008):
    - Replace incandescent lights with electronically ballasted (T-8) compact fluorescent lights. These use about 70 percent less electricity than incandescents.
    - If motors are used in the greenhouse, switching to variable speed equipment and using the lowest speed appropriate can decrease energy use.
    - Maintain all heating, water pumping, mowing and irrigation equipment for optimum performance to reduce energy use.
    - Caulk and seal building shell leaks and penetrations in greenhouses.
    - Turn off equipment when not in use and reduce vehicle idling times during deliveries.
    - When replacing trucks and transportation fleets, consider gas mileage and alternative fuel sources.
2. Based on research completed by NREL, energy conservation in the greenhouse is an area of limited research and focus relative to some other industries. Alternative fuel sources for greenhouses include geothermal energy (particularly in the southwest corner of Colorado), solar energy and wind energy. One area that has been developed to some extent includes basic principles of solar greenhouse design, including the following very general principles:
    - Orient glazing to receive maximum solar heat during the winter.
    - Use heat storing materials to retain solar heat.
    - Have large amounts of insulation where there is little or no direct sunlight.
    - Use glazing material and installation methods that minimize heat loss.
    - Rely primarily on natural ventilation for summer cooling.

3. For large landscapes, the following energy-saving tips are recommended by the U.S. Environmental Protection Agency under its "Greenscape" program:
    - Strategically plant vegetation outside and around buildings to reduce indoor heating and cooling needs.

Drops to Watts: Have You Made the Water Use—Energy Connection? (Excerpted from USEPA 2008)

"Although most people understand that heating water requires energy, they don't always consider the energy it takes to treat and deliver the water they use. In 2005, the nation's municipal water infrastructure consumed about 56 billion kilowatt hours of electricity—that's enough energy to power more than 5 million homes for an entire year. Plus, as the demand for water grows, water utilities must pump water from more distant and deeper sources, which, in turn, requires even more energy…That's why simple [water efficient devices and practices] can really make a difference when it comes to addressing global warming—the less water we use, the fewer greenhouse gases will be produced to generate electricity."

- Use hand or electric equipment where ever feasible to reduce emissions.
- Use biobased fuels and lubricants in place of petroleum.
- Implement a regularly scheduled equipment maintenance program for increased efficiency and reduced emissions
- Use compost to improve soils (it also makes an excellent air filter media for volatile organic compounds).
- Specify Green Building requirements for building structures.
- Plant trees to replace those removed or damaged during construction.
- Buy locally produced goods and services whenever possible to reduce transportation emissions and costs.
- Purchase or rent fuel efficient vehicles for your fleet.
- Use high efficiency lighting for roadways, parking lots, security, and landscaping.
- Use solar powered lighting and signage wherever possible.
- Utilize solar, wind, and other renewable energy sources. Purchase "green power" from renewable energy sources if available.

Greenscape Concepts: Reduce, Recycle, Reuse and Rebuy ("the 4 Rs")

The U.S. Environmental Protection Agency is encouraging "Greenscape" concepts focused on environmentally beneficial landscaping, taking into consideration conservation opportunities associated with reducing waste, reusing materials, recycling materials and rebuying recycled materials. Many of the Greenscape concepts are consistent with the GreenCO BMPs, whereas a few of the recommended practices such as recycling gray water are not regionally permissible. To download the USEPA Greenscapes Tip Sheet, cost calculator and other brochures to see which practices could be incorporated into your business, go to www.epa.gov/greenscapes.

Regional or Industry Considerations/Adaptations

1. Many efforts to move toward more sustainable sites that relate to the Green Industry have been in existence for some time and others continue to evolve. Representative examples include:
    - U.S. Green Building Council's (national) Leaders in Environmental Design (LEED) program (http://www.gbci.org/ or http://www.usgbc.org/)
    - Built Green Colorado (statewide) (http://www.builtgreen.org/)
    - Partners for a Clean Environment (PACE) (local-Boulder) (http://www.ci.boulder.co.us/www/pace/index.html)
2. Related efforts include focus on specific components of sustainability such as:
    - Energy Star: A joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy designed to reduce energy use and protect the environment through energy efficient products and practices. (http://www.energystar.gov/).

- WaterSense: EPA's new program to provide certification of water products and training programs that promote water conservation and efficiency. (http://www.epa.gov/watersense/).
- As of 2008, Xcel energy had a solar rewards program in place in support of its Renewable Energy Compliance Plan that may be a source of rebates related to renewable energy sources. The Solar*Rewards program allows residents or businesses to receive cash back for installing a photovoltaic (PV) system based on the size of the system installed. See www.xcelenergy.com for more information.

3. Some national sustainability and recognition programs may not fully account for regional constraints for some practices. For example, rainwater harvesting, greywater and blackwater recycling onsite are restricted under Colorado Water Law and/or the Colorado Department of Public Health and Environment.
4. While the general concepts presented in the Sustainable Sites Initiative are consistent with GreenCO's BMPs, GreenCO and its member industries have not yet either endorsed or rejected the standards and practices proposed as part of the Sustainable Sites Initiative.

Key References

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