Sustainable Sites Management

1 point **SSM Credit 1.1**

Site Management: **Building Exterior & Hardscape Management Plan**

Intent

Encourage environmentally-sensitive building exterior and hardscape management practices that provide a clean, well-maintained and safe building exterior, while supporting high performance building operations.

Health Issues

Ongoing exterior management of a facility's hardscape is inextricably linked to occupant and community health and safety. Many detergents, window cleaning chemicals and snow removal chemicals commonly used on health care facility grounds have not been tested for their low-level, long-term health impacts. Some of these products contain Persistent Bioaccumulative and Toxic chemicals (PBTs), are classified as hazardous waste, and/or otherwise contribute to environmental pollution during their manufacture, transport, use, and/or disposal. In addition, non-toxic and least-toxic cleaning products exist for nearly every health care facility need. Monitoring the chemicals used for hardscape practices for consistency with the facility's environmental health will help ensure occupant and community health and safety. Noise and emissions from equipment are also well-documented sources of health burdens workers and to the surrounding community. Research finds that in hospitals with reduced noise levels, the patients' satisfaction with care giving increased, their sleep improved, and their blood pressure lowered; similarly, staff in low-noise environments were more positive about their jobs and indicated improved sleep. Human health effects associated with exposure to airborne toxicants, particulates, gases, and bioaerosols may include respiratory diseases (e.g., asthma, hypersensitivity pneumonitis, bronchitis); cardiovascular events (e.g., sudden death associated with particulate air pollution), among others, depending on exposure levels.

Credit Goals

- Develop and implement an environmentally-sensitive, low-impact building exterior and hardscape management plan that helps preserve surrounding ecological integrity. The plan must employ best management practices that significantly reduce the use of harmful chemicals, energy waste, water waste, air pollution, solid waste and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared to standard practices, whether direct-purchase or contracted services. The plan must address all of the following operational elements that occur on the building and grounds, as applicable:
  - **Outdoor maintenance equipment** (lawnmowers, snow plows, leaf blowers, pallet lifters, golf carts, parking trolleys, etc.) in accordance with GGHC ES Credit 1.6: Environmentally Preferable Cleaning: Cleaning Equipment and meeting the U.S. EPA Proposed Emission Standards for New Nonroad Spark-Ignition Engines, Equipment and Vessels or running on low-emitting fuels (e.g., biodiesel, compressed natural gas or liquid propane), rechargeable batteries or corded electrical equipment. All exterior equipment shall generate maximum 85 dBA noise level while operational as measured from the nearest property line, but no less than 50 feet from the source. Employees and contracted services shall utilize adequate hearing protection in accordance with the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.95 when noise levels exceed 75 dBA.
  - **Green cleaning and maintenance** products, practices and materials, including window cleaner and any detergents, in accordance with GGHC ES Credit 1.3-1.5: Environmentally Preferable Cleaning: Sustainable Products & Materials.

SSM Credit 1.1 continued

Site Management: **Building Exterior & Hardscape Management Plan**

- **Least toxic snow removal strategies** including, but not limited to: snowmelt piping, canopies or covered walkways and low impact sites for dumping snow.

Suggested Documentation

❑ Document and annually review the low-impact building exterior management plan in accordance with Credit Goals, specifically highlighting the actions being implemented and tracking progress.

Reference Standards

Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.95, http://www.osha.gov

U.S. Environmental Protection Agency (EPA), Proposed Emission Standards for New Nonroad Spark-Ignition Engines, Equipment, and Vessels, April 2007 (Document No. EPA 420-F-07-032), http://www.epa.gov/otaq/regs/nonroad/marinesi-equipld/420f07032.htm

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of this credit with GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 3: Stormwater Management; GGHC SSM Credit 4.1: Heat Island Reduction: Non-Roof; GGHC FM Prerequisite 1: Energy Efficiency Best Management Practices: Planning, Documentation & Opportunity Assessment; GGHC CM Prerequisite 3: Community Contaminant Prevention: Leaks & Spills; GGHC ES Credit 1.1-1.2: Environmentally Preferable Cleaning: Policy Development; GGHC ES Credit 1.3-1.5: Environmentally Preferable Cleaning: Sustainable Products & Materials; GGHC ES Credit 1.6: Environmentally Preferable Cleaning: Cleaning Equipment, GGHC; GGHC ES Credit 2: Entryway Systems; and, GGHC ES Credit 3: Indoor Integrated Pest Management.*
- Include green cleaning and maintenance practices and materials that minimize environmental impacts in the green building exterior management plan.
- Examples of conventional gas powered machinery that can be replaced with electric equivalents include, but are not limited to: maintenance equipment and vehicles, landscaping equipment and cleaning equipment.
- Safeguard building occupants and neighboring sites from air and noise emissions associated with building exterior and hardscape management by avoiding the application of wet-applied products near outside air intake grills and by limiting work to business hours.

Resources

Boehland, J., (2005) “Hospital Heal Thyself: Greening the Design and Construction of Health Care Facilities.” *Environmental Building News*, Vol. 14, No. 6.

U.S. Environmental Protection Agency (EPA), Integrated Pest Management for Schools: A How-to Manual, EPA 909-B-97-001, March 1997, http://www.epa.gov/pesticides/ipm/.

1 point

SSM Credit 1.2

Site Management: **Integrated Pest Management, Erosion Control & Landscape Management Plan**

Intent

Preserve ecological integrity, enhance natural diversity, and protect wildlife while supporting high performance building operations and integration into surrounding landscapes.

Health Issues

Landscape management methods and practices can have a direct impact on public health. Pesticides and fertilizers can be transported into the health care facility by air or carried in by people from the surface of soil and transmitted to patients, family and staff. According to U.S. EPA, herbicides, insecticides, and excess fertilizers are major sources of nonpoint source pollution (NPS) – the leading cause of compromised water quality in the U.S. These products can contribute to environmental pollution during their manufacture, transport, use, and/or disposal.

Credit Goals

Develop and implement an environmentally-sensitive erosion control and landscape management plan for the site's natural components. The plan must employ best management practices that significantly reduce the use of harmful chemicals, energy waste, water waste, air pollution, solid waste, and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared to standard practices, whether direct-purchase or contracted services. The plan must address the following operational elements at a minimum:

- **Outdoor Integrated Pest Management (IPM)** is a systematic approach to managing outdoor pests (plants, insects, and/or animals) in a way that minimizes risks to human health and the surrounding environment and that improves economic returns through the most effective, least risk option. Driven by these parallel goals, IPM prioritizes non-chemical intervention. When non-chemical methods have been exhausted, the approach allows minimal use of least-toxic chemical pesticides and herbicides, used only in targeted locations, and only for targeted species. IPM requires routine inspection and monitoring. The outdoor IPM plan must address all of the specific IPM requirements listed in GGHC ES Credit 3: Indoor Integrated Pest Management, including preferred use of non-chemical methods, definition of emergency conditions, and Universal Notification. The outdoor IPM plan must also integrate with any indoor IPM plan used for the building as appropriate.
- Implement **green landscape management actions**, such as using a greater variety of plants, using more native plants, reducing size of lawns, changing maintenance practices, reducing the use of power equipment, stormwater control, using low-nitrogen and phosphorous/pesticide-free fertilizer and only on an as-needed basis, composting waste, creating wildlife habitat including providing water sources for wildlife drinking and bathing, physically removing and prohibiting purchase of invasive species, protecting natural areas and using plants to reduce building heating and cooling needs. In landscape maintenance, keep vegetation, shrubs and organic mulch materials a minimum of twelve (12) inches away from structures.
- **Use native and/or drought-tolerant plants** that are naturally resistant to pests and/or that provide food and/or habitat for wildlife. Physically remove existing and prohibit purchase of invasive plant species.

SSM Credit 1.2 continued

Site Management: **Integrated Pest Management, Erosion Control & Landscape Management Plan**

- **Erosion and sedimentation control** for ongoing landscape operations (where applicable) and future construction activity. The Erosion and Sedimentation Control Plan (ESC) shall conform to the erosion and sedimentation requirements of the 2003 EPA Construction General Permit OR local erosion and sedimentation control standards and codes, whichever is more stringent. The plan must address both site soil and potential construction materials. The plan must also include measures that prevent erosion and sedimentation, prevent polluting the air with dust or particulate matter, and restore eroded areas.
- Comply with installation and design recommendations for **maintenance of landscape technologies** such as bioswales, rain gardens, outdoor places of respite and vegetated roofs.
- **Divert landscape waste** from the waste stream via mulching, composting, or other low-impact means.

Notes:

- *For projects in urban sites with little or no building setback (i.e. zero-lot-line), GGHC SSM Credit 1.2 may be earned using vegetated roof surfaces if the plants meet the definition of non-invasive native/adapted, and if the vegetated roof surface covers at least 5% of the project site area.*
- *Native plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds.*
- *According to the National Invasive Species Information Center, invasive species are "1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health." For more information, visit http://www.invasivespeciesinfo.gov.*

SSM Credit 1.2 continued

Site Management: **Integrated Pest Management, Erosion Control & Landscape Management Plan**

Suggested Documentation

- ❑ Document and annually review an environmentally-sensitive erosion control and landscape management plan employing best management practices in accordance with Credit Goals, specifically highlighting the actions being implemented and tracking progress.

Reference Standards

2003 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP), http://cfpub.epa.gov/npdes/stormwater/cgp.cfm

Potential Technologies and Strategies

- ***Credit Synergies:*** *Coordinate implementation of this credit with GGHC SSM Credit 1.1: Site Management: Building Exterior & Hardscape Management Plan; GGHC SSM Credit 3: Stormwater Management; GGHC ES Credit 1.1-1.2: Environmentally Preferable Cleaning: Policy Development; GGHC ES Credit 1.3-1.5: Environmentally Preferable Cleaning: Sustainable Products & Materials; GGHC ES Credit 1.6: Environmentally Preferable Cleaning: Cleaning Equipment, GGHC; GGHC ES Credit 3: Indoor Integrated Pest Management; GGHC FS Credit 5: Hospital Supported Agriculture: Food and Farm Linkages; and, GGHC FS Credit 6.1: Food Donation and Composting.*
- Address overall site management practices, chemicals, fertilizers, landscape waste and pest management practices. Include such green landscape management practices in reducing the use of power equipment, improving stormwater control, using low-nitrogen and phosphorous/pesticide-free fertilizer on an as-needed basis, composting waste, applying integrated pest management, creating wildlife habitat, avoiding/physically removing invasive plants, protecting natural areas and using plants to reduce heating and cooling needs. Use mulching mowers to significantly reduce yard waste generation, fertilizer needs and water consumption through retention of organic matter.
- Plant Health Care (PHC) management is a concept in managing landscape developed from Integrated Pest Management. PHC emphasizes plant health and horticultural practice, recognizing that health is impacted not only by pests, but improper irrigation, compacted soils, and other landscape conditions.
    - Apply organic fertilizers several times annually rather than a single, heavy application.
    - Use methods of spot treatment of non-toxic or least toxic pesticides rather than area wide applications.
    - Use mulching mowers to significantly reduce yard waste generation, fertilizer needs and water consumption through retention of organic matter.
- Consider contracting with pest control companies that meet 100% of the requirements for IPM certification.
- Plant native vegetation or restore native habitat where appropriate on the site.

SSM Credit 1.2 continued

Site Management: **Integrated Pest Management, Erosion Control & Landscape Management Plan**

- Avoid use of mulch made from rubber tires due to the potential presence of contaminants. For more information about the potential hazards associated with rubber mulch, see the Connecticut Agricultural Experiment Station's Report "Examination of Crumb Rubber Produced from Recycled Tires" in Appendix 1 of the Environment & Human Health, Inc. report "Artificial Turf: Exposures to Ground-Up Rubber Tires," http://www.ehhi.org/reports/turf/turf_report07.pdf.
- On sites with populations with chemical sensitivities, consider including lime application to landscaping in the Outdoor Integrated Pest Management Universal Notification policy.

Resources

Beyond Pesticides: http://www.beyondpesticides.org.

J. Haugland, *Changing Cost Perceptions: An Analysis of Conservation Development,* (Elmhurst, IL: Conservation Research Institute, 2005), http://www.nipc.org/environment/sustainable/conservationdesign/cost_analysis

Healthy Hospitals, Controlling Pest without Harmful Pesticides, 2003, Beyond Pesticides and Health Care Without Harm, http://www.noharm.org/pesticidesCleaners/issue

Insect Management for the Interiorscape Environment, http://ipm.ncsu.edu/InteriorScapes/insect.html.

National Technical Information Service (order # PB92-235951), http://www.ntis.gov, 800-553-6847.

Practice Greenhealth, Green Landscaping, http://www.practicegreenhealth.org

Practice Greenhealth, Landscape Waste Composting, http://www.practicegreenhealth.org

The Stormwater Manager's Resource Center, http://www.stormwatercenter.net/

U.S. Environmental Protection Agency (EPA) Office of Water, http://www.epa.gov/OW; http://yosemite.epa.gov/water/owrccatalog.nsf. Search by title index. Hardcopy or microfiche:

U.S. Environmental Protection Agency (EPA) Storm Water Discharges From Construction Activities, http://cfpub.epa.gov/npdes/stormwater/const.cfm

1 point

SSM Credit 2.1

Reduced Site Disturbance: Protect or Restore Open Space or Habitat

Intent

Conserve existing natural site areas and restore damaged site areas to provide habitat and promote biodiversity.

Health Issues

Healthy ecosystems contribute to the health of people in many ways, including the health-promoting qualities of clean air and water as well as significant social, psychological and physical benefits derived from physical and visual connections to the natural environment. Health care facilities should protect, restore and enhance a site's existing natural areas as therapeutic resources for patients, staff, and visitors. Research shows that physical and visual connections to the natural environment provide social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- Protect or restore natural habitat area as follows:

Natural Habitat Area Required = (Site Area) (.15 – Site Size Factor) ÷ (Floor Space Ratio)

For the above formula:

Floor Space Ratio = the constructed building gross floor building area including all service spaces, excluding parking areas, divided by the site area.

Site Size Factor = (√Site Area/Site Area)(10)

- Improving and/or maintaining off-site areas with native or non-invasive adapted plants can contribute toward earning GGHC SSM Credit 2.1. Every 2 square feet off-site will be counted as 1 square foot on-site. Off-site areas must be documented in a contract with the owner of the off-site area that specifies the required improvement and maintenance of the off-site area.

Notes:

- *The Natural Habitat Area formula requires larger areas of habitat for less densely developed sites.*
- *Natural habitat area may include vegetated roof area at any building level. Non-native vegetation may be included in the calculation in courtyards, terraces, balconies, and roof space if required to survive reduced sunlight and if the area's irrigation system uses a non-potable water source, is high-efficiency, or if no permanent irrigation system is installed. For the purposes of this credit, "high-efficiency irrigation systems" are defined as irrigation systems that use minimum 30% less water than conventional sprinkler irrigation. High-efficiency irrigation systems include micro or drip irrigation systems, moisture sensors, clock timers and water-data based controllers.*
- *Native plants are plants indigenous to a locality or cultivars of native plants that are adapted to the local climate and are not considered invasive species or noxious weeds. Projects pursuing GGHC SSM Credit 2.1 and using vegetated roof surfaces may apply the vegetated roof surface to this calculation if the plants meet the definition of native/adapted.*

SSM Credit 2.1 continued

Reduced Site Disturbance**: Protect or Restore Open Space or Habitat**

- *According to the National Invasive Species Information Center, invasive species are "1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health." For more information, visit http://www.invasivespeciesinfo.gov.*
- *Rows of street trees spaced at or less than 1.0 x mature diameter apart qualify as natural habitat area, equal to mature diameter x length of row.*
- *Other ecologically appropriate features that contribute to this credit are natural site elements beyond vegetation that maintain or restore the ecological integrity of the site, including water bodies, exposed rock, un-vegetated ground or other features that are part of the historic natural landscape within the region and provide habitat value.*
- *Sample calculation: For 100,000 gsf site with a 200,000 gsf building; Floor Space Ratio = 2; Site Size Factor is (316/100,000)*10 = 0.0316. The natural habitat area required by formula is: 100,000*(.15-0.0316)/2 = 5,920 gsf.*

Suggested Documentation

- ❑ Develop and annually review highlighted site drawings with area calculations demonstrating the percentage of the site that has been provided/restored with native vegetation.
- ❑ Develop and annually review a habitat protection plan and backup documentation describing restoration and re-vegetation of degraded habitat areas, including use of native and non-invasive adapted vegetation.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of the credit with GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan, GGHC SSM Credit 2.2: Reduced Site Disturbance: Protect or Restore Open Space or Habitat, GGHC SSM Credit 4: Heat Island Reduction, GGHC SSM Credit 5: Connection to the Natural World, GGHC FM Credit 2.1-2.5: Potable Water Use Reduction: Total Building Reduction, GGHC FM Credit 2.6: Potable Water Use Reduction: Water Efficient Landscaping, GGHC FM Credit 9: Light Pollution Reduction, and GGHC FS Credit 5: Hospital Supported Agriculture: Food and Farm Linkages.*
- Perform a site survey to identify site elements and adopt a master plan for development of the project site.
- Establish clearly marked construction boundaries and provide adequate protection measures to minimize disturbance of existing site and restore previously degraded areas to their natural state.
- Minimize unnecessary ground disturbance (topsoil stripping) and removal of existing groundcover by protecting existing vegetation, including clusters or groupings of existing trees or shrub masses. Avoid planting isolated plant material.

SSM Credit 2.1 continued

Reduced Site Disturbance**: Protect or Restore Open Space or Habitat**

- Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals, including soil bioengineering technologies.
- Adopt rehabilitation, restoration, and reclamation strategies for the site's watershed management.
- Restore or provide natural vegetated area with emphasis on native and limited use of adapted vegetation. Ensure that no adapted vegetation is a known invasive species. Native plants are those species that occur naturally in the particular region, state, ecosystem, and habitat without direct or indirect human actions.
- Protect and encourage the development of native vegetation.
- Encourage the development of urban green space by connecting or adding to bike paths, parks, etc.
- Plant native vegetation or restore native habitat where appropriate on the site.

Resources

J. Haugland, *Changing Cost Perceptions: An Analysis of Conservation Development* (Elmhurst, IL: Conservation Research Institute, 2005), http://www.nipc.org/environment/sustainable/conservationdesign/cost_analysis (accessed March 1, 2006).

National Park Service, *Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors: A Resource Book* (National Park Service, 1995), http://www.nps.gov/pwro/rtca/econindx.htm

A. Steed, *Naturalized Streetscapes: A Case Study of Crown Street, Vancouver* (City of Vancouver Greenways, Vancouver, BC: City of Vancouver Greenways, no date), http://www.sustainability.ca/Docs/Naturalized%20Streetscapes-AS.pdf?CFID=19075623&CFTOKEN=60214114 (accessed March 31, 2006).

Trust for Public Land, *The Economic Benefits of Open Space* (Trust for Public Land, 1999), http://www.tpl.org/tier3_cd.cfm?content_item_id=1195&folder_id=727

1 point

SSM Credit 2.2

Reduced Site Disturbance: Structured Parking

Intent

Conserve existing natural site areas and restore damaged site areas to provide habitat and promote biodiversity.

Health Issues

Healthy ecosystems contribute to the health of people in many ways, including the health-promoting qualities of clean air and water as well as significant social, psychological and physical benefits derived from physical and visual connections to the natural environment. Health care facilities should protect, restore and enhance a site's existing natural areas as therapeutic resources for patients, staff, and visitors. Research shows that physical and visual connections to the natural environment provide social, psychological and physical benefits for patients, staff and visitors.

Credit Goals

- Achieve SSM Credit 2.1.

AND

- Ensure that minimum 50% of total installed parking spaces meet one or more of the following criteria:
  - Onsite structured parking
  - Off-site structured parking
  - Shared existing off-site surface parking

Note: For the purposes of this credit shared off-site parking will be defined as parking shared with organizations whose peak hours of use complement the facility's parking needs. Off-site areas must be documented in a contract with the owner of the off-site area that specifies the hours of use.

Note: For the purposes of this credit, the terms "onsite" and "off-site" shall align with the project scope in use for all credits in the GGHC Operations section.

SSM Credit 2.2 continued

Reduced Site Disturbance**: Structured Parking**

Suggested Documentation

- ❑ Compile and annually review site drawings with parking calculations demonstrating compliance with Credit Goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of the credit with GGHC SSM Credit 2.1: Reduced Site Disturbance: Protect or Restore Open Space or Habitat, GGHC SSM Credit 4: Heat Island Reduction, GGHC SSM Credit 5: Connection to the Natural World, GGHC TO Credit 1: Alternative Transportation, and GGHC FM GGHC FM Credit 9: Light Pollution Reduction.*
- Perform a site survey to identify site elements and adopt a master plan for development of the project site.
- Select a suitable location for structured parking, minimizing its footprint to minimize site disruption. Strategies include:
  - Stacking building program and structured parking
  - Tuck-under parking
  - Sharing parking facilities with neighbors
- Coordinate habitat, wetland, and stream preservation programs with erosion control and stormwater management goals for the parking structure, including soil bioengineering technologies.
- Provide frequent shuttle service to off-site structured and shared parking.
- When constructing new structured parking facilities, refer to design strategies outlined in GGHC Version 2.2 MR Credit 7.1: Resource Use: Design for Flexibility and LEED HC MR Credit 6: Design for Flexibility regarding flexible layouts that allow for future conversion to non-parking uses.

Resources

Leonard Bier, et. al., “Parking Matters: Designing, Operating, and Financing Structured Parking in Smart Growth Communities,: July 2006, http://www.state.nj.us/dca/osg/docs/parkingmatters070106.pdf

Eno Transportation Foundation. Publications of particular interest: “Parking and Planning” and “Parking for Institutions and Special Events,” http://www.enotrans.com

Whole Building Design Guide, “Parking: Outside/Structured,” http://www.wbdg.org/design/park_outside.php

1 point

SSM Credit 3

Stormwater Management

Intent

Limit the disruption of natural hydrology by the building and grounds.

Health Issues

According to the U.S. EPA[1], nonpoint source pollution (NPS) – the result of stormwater runoff – is the leading cause of compromised water quality in the U.S. In some cases, NPS has disrupted aquatic ecosystems and forced nearby communities to look elsewhere for a reliable water supply. Controlling stormwater run-off lessens contamination of receiving waters thereby safeguarding people and wildlife from exposure to waterborne pollutants, including bacteria, toxic chemicals, and lawn care nutrients that degrade water quality and increase risks of cancer, birth defects, and nervous system disorders, among others.

Credit Goals

- Develop and implement a stormwater management plan that infiltrates, collects and reuses, or evapotranspirates runoff from 15% of the rainfall falling on the whole project site:
  - During an average weather year, and
  - During the two-year, 24-hour design storm
- Implement an annual inspection program of all stormwater management facilities to confirm continued performance. Perform all routine required maintenance, necessary repairs, or stabilization within 60 days of inspection.

Suggested Documentation

- ❑ Document and annually review the stormwater management plan and associated calculations in accordance with Credit Goals.
- ❑ Maintain documentation of annual inspections, including identification of areas of erosion, maintenance needs, and repairs in accordance with Credit Goals.

Reference Standards

There are no reference standards for this credit.

[1] U.S. Environmental Protection Agency (EPA), http://www.epa.gov/owow/nps/qa.html

SSM Credit 3 continued

Stormwater Management

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of this credit with GGHC SSM Credit 1.1: Site Management: Building Exterior & Hardscape Management Plan; GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 5: Connection to the Natural World; GGHC FM 2.6: Potable Water Use Reduction: Water Efficient Landscaping; and, GGHC CM Prerequisite 3: Community Contaminant Prevention: Leaks & Spills.*
- Consider utilizing best management practices (BMPs) to treat runoff to remove 80% of the average annual total suspended solids (TSS) load based on existing monitoring reports. BMPs are considered to meet these criteria if (1) they are designed in accordance with standards and specifications from a state or local program that has adopted these performance standards, or (2) there exists in-field performance monitoring data demonstrating compliance with the criteria. Data must conform to accepted protocol (e.g., Technology Acceptance Reciprocity Partnership [TARP], Washington State Department of Ecology) for BMP monitoring.
- Consider establishing regular testing for pollutants in stormwater runoff.

Resources

M. E. Barber, King, S. G., Yonge, D. R., and Hathhorn, W. E. 2003, "Ecology ditch: A best management practice for storm water runoff mitigation." *J. Hydrol. Eng.*, 8 (3), 111–122.

J. N. Carleton, Grizzard, T.J., Godrej, A.N., Post, H.E., 2001. Factors affecting the performance of stormwater treatment wetlands. Water Res. 35 (6), 1552–1562.

M. E. Dietz, and Clausen, J. C. _2005_. "A field evaluation of rain garden flow and pollutant treatment." *Water, Air, Soil Pollution*, 167, 1–4, 123–138.

Puget Sound Action Team, *Reining in the Rain: A Case Study of the City of Bellingham's*

Teresa Durkin and Roos, Marina, *Green Guide for Health Care* Sustainable Site Design: Stormwater Mitigation Technical Brief, http://www.gghc.org.

J. Mentens, Raes, D., Hermy, M., 2006. Green roofs as a tool for solving the rainwater runoff problem in the urbanized 21st Century? Landscape Urban Planning, 7 (3), 217–226.

The Stormwater Manager's Resource Center, http://www.stormwatercenter.net/

Texas Water Development Board (TWDB), 2005. The Texas Manual on Rainwater Harvesting, third ed. http://www.twdb.state.tx.us/publications/reports/RainwaterHarvestingManual 3rdedition.pdf.

Use of Rain Gardens to Manage Stormwater (Puget Sound Action Team, 2004), www.psat.wa.gov/Publications/Rain_Garden_book.pdf (accessed September 11, 2007).

U.S. Environmental Protection Agency (EPA), Guidance Specifying Management Measures for Sources of Non-Point Pollution in Coastal Water, January 1993 (Document No. EPA 840B92002), http://www.epa.gov/owow/nps/MMGI

N. D. VanWoert, Rowe, D.B., Andresen, J.A., Rugh, C.L., Fernandez, R.T., Xiao, L., 2005. Green roof stormwater retention: effects of roof surface, slope, and media depth. J. Environ. Qual. 34 (3), 1034–1044.

S. Watanabe, 1995. Study on storm water control by permeable pavement and infiltration pipes. Water Sci. Technol. 32 (1), 25–32.

1 point

SSM Credit 4.1

Heat Island Reduction: **Non-Roof**

Intent

Reduce heat islands (temperature differences between developed and undeveloped areas) to minimize impact on microclimate and human wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory symptoms and illness. In addition, a cooler microclimate reduces a building's cooling load, thereby reducing energy costs, curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions. Reducing or eliminating a facility's contribution to the regional heat-island effect also demonstrates a commitment to active involvement in slowing global climate change.

Credit Goals

OPTION A

Use any combination of the following strategies for 50% of the site hardscape (including roads, sidewalks, courtyards and parking lots):

- Shade from existing canopy or within 5 years of landscape installation, where landscaping (trees) must already be in place at the time of credit achievement.
- Shade from structures fully covered by solar photovoltaic panels.
- Shade from architectural devices or structures that have a Solar Reflectance Index (SRI) of at least 29. Implement a maintenance program that ensures these surfaces are cleaned at least every 2 years to maintain good reflectance.
- Light colored paving materials with an SRI of at least 29. Implement a maintenance program that ensures these surfaces are cleaned at least every 2 years to maintain good reflectance.
- Open grid pavement system (at least 50% pervious).

OR

OPTION B

Place a minimum of 50% of parking spaces under cover (defined as underground, under deck, under roof, or under a building). Any roof used to shade or cover parking must have an SRI of at least 29. Implement a maintenance program that ensures all SRI surfaces are cleaned at least every 2 years to maintain good reflectance. The top parking level of a multi-level parking structure is included in the total parking spaces calculation, but is not considered a roof and is not required to be an SRI surface.

Note: The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918 or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C1371.

SSM Credit 4.1 continued

Heat Island Reduction: **Non-Roof**

Suggested Documentation

- ❑ Develop and annually review highlighted site plans with calculations indicating that 50% of the site hardscape OR 50% of parking spaces comply with Credit Goals.

Reference Standards

American Society for Testing and Materials (ASTM), http://www.astm.org.

Potential Technologies & Strategies

- *Credit Synergies: Coordinate implementation of the credit with GGHC SSM Credit 1.1: Site Management: Building Exterior & Hardscape Management Plan; GGHC SSM Credit 1.2: NEW: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 2.1: Reduced Site Disturbance: Protect or Restore Open Space or Habitat; GGHC SSM Credit 2.2: Reduced Site Disturbance: Structured Parking, GGHC SSM, GGHC SSM Credit 5: Connection to the Natural World; and, GGHC TO Credit 1: Alternative Transportation .*
- Employ strategies, materials, and landscaping techniques that reduce heat absorption of exterior materials.
- Install shading devices (calculated on June 21, noon solar time) in the form of native or climate tolerant trees and large shrubs, vegetated trellises or other exterior structures supporting vegetation.
- Eliminate blacktop hardscape surfaces and consider the use of new coatings and integral colorants for asphalt to achieve light-colored surfaces.
- Position photovoltaic cells to shade impervious surfaces. When installing photovoltaic (PV) cells as shading devices, run water beneath the PV units to recirculate the heat generated by array for process uses.
- Plant native vegetation or restore native habitat where appropriate on the site.
- In areas subject to pavement glare, consider installing manufactured or vegetated shading devices and/or planting trees.

Resources

New York Metropolitan Region, Climate Change Information Resources – Urban Heat Island Resources, http://ccir.ciesin.columbia.edu/nyc/links_impacts_heat.html

U.S. Environmental Protection Agency (EPA), Cool Pavement Report – EPA Cool Pavements Study – Task 5, http://www.epa.gov/hiri/resources/pdf/CoolPavementReport_Former%20Guide_complete.pdf

U.S. Environmental Protection Agency (EPA), Heat Island Effect, http://www.epa.gov/hiri/index.html

1 point

SSM Credit 4.2

Heat Island Reduction: **Roof**

Intent

Reduce heat islands (temperature differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Health Issues

Mitigating the heat island effect results in lowering ground level temperatures near buildings thereby reducing conditions favorable for ground-level ozone (smog) formation that can lead to respiratory symptoms and illness. In addition, a cooler microclimate reduces a building's cooling load, thereby reducing energy costs, curbing reliance on fossil-fuel generated electricity, and reducing associated particulate and greenhouse gas emissions. Reducing or eliminating a facility's contribution to the regional heat-island effect also demonstrates a commitment to active involvement in slowing global climate change.

Credit Goals

OPTION A

- Install and maintain roofing materials having a Solar Reflectance Index (SRI) equal to or greater than the values in the table below for a minimum of 75% of the roof surface. If more than 75% of the roof surface is covered with the SRI material, the SRI value may be lower than the required value if the resulting area-weighted equivalent SRI performance is at least as high as having the required value on 75% of the surface.
- Implement a maintenance program that ensures all SRI surfaces are cleaned at least every 2 years to maintain good reflectance.

OR

OPTION B

- Withstanding a structural verification, install and maintain a vegetated roof for at least 50% of the roof area.
- Implement a vegetated roof maintenance program in accordance with design and installation instructions.

SSM Credit 4.2 continued

Heat Island Reduction: **Roof**

OR

OPTION C

- Install and maintain high albedo and vegetated roof surfaces that, in combination, meet the following criteria: (Area of SRI Roof/0.75) + (Area of vegetated roof/0.5) ≥ Total Roof Area

Roof Type	Slope	SRI
Low-Sloped Roof	≤ 2:12	78
Steep-Sloped Roof	> 2:12	29

Note: The Solar Reflectance Index (SRI) is a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measured according to ASTM E 903, ASTM E 1918 or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C1371.

Suggested Documentation

- ❑ Compile and annually review a highlighted site plan indicating roofing area calculations in accordance with Credit Goals.
- ❑ Document and annually review the facility roof maintenance program, if applicable, in accordance with Credit Goals.

Reference Standards

American Society for Testing and Materials (ASTM) Standards ASTM E 1980, ASTM E 903, ASTM E 1918, ASTM C 1549, ASTM E 408, ASTM C1371, http://www.astm.org.

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of the credit with GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 5: Connection to the Natural World; and, GGHC FM Credit 2.6: Potable Water Use Reduction: Water Efficient Landscaping.*
- Consider installing high-albedo and vegetated roofs to reduce heat absorption.
- Ensure that vegetated roofs are properly maintained in accordance with design/installer instructions.
- Consider converting a vegetated roof area into a clinical space (e.g., for rehabilitation therapy, etc.) or into an outside place of respite. See GGHC SSM Credit 5.1: Connection to the Natural World: Outdoor Places of Respite for more information.

SSM Credit 4.2 continued

Heat Island Reduction: **Roof**

- Consider incorporating the roofing emissions criteria outlined in GGHC EP Credit 3.1-3.5 into facility specification criteria in addition to the SRI rating referenced under Credit Goals.
- Avoid use of mulch made from rubber tires due to the potential presence of contaminants. For more information about the potential hazards associated with rubber mulch, see the Connecticut Agricultural Experiment Station's Report "Examination of Crumb Rubber Produced from Recycled Tires" in Appendix 1 of the Environment & Human Health, Inc. report "Artificial Turf: Exposures to Ground-Up Rubber Tires," http://www.ehhi.org/reports/turf/turf_report07.pdf.

Resources

Cool Roof Rating Council, http://www.coolroofs.org

New York Metropolitan Region, Climate Change Information Resources – Urban Heat Island Resources, http://ccir.ciesin.columbia.edu/nyc/links_impacts_heat.html

U.S. Environmental Protection Agency (EPA) Energy Star, http://www.energystar.gov

U.S. Environmental Protection Agency (EPA), Heat Island Effect, http://www.epa.gov/hiri/index.html

1 point

SSM Credit 5.1

Connection to the Natural World: **Outdoor Places of Respite**

Intent

Provide outdoor places of respite on the health care campus to connect health care patients, staff, and visitors to the health benefits of the natural environment.

Health Issues

Health care facility design should address the physical, emotional, and spiritual needs of the patients and/or residents, staff, family members, and visitors that inhabit these buildings. Privacy, confidentiality, security, dignity, comfort, orientation, and connection to nature are key elements and issues that need to be addressed in the design of supportive environments.

Places of respite connected to the natural environment are key elements in defining a supportive, high performance, healing environment with proven effects on patient, staff, and visitor well-being and improved clinical outcomes. A growing body of research indicates that patients and medical staff experience positive health benefits from access to daylight and landscape views. Providing a variety of spaces for patients, families, and caregivers to pause and experience their natural surroundings is an important facility objective.

Credit Goals

- Provide patient, staff, and visitor accessible outdoor places of respite equal to 5% of the net usable program area. Qualifying areas are defined below.

  Note: For the purposes of this credit, net usable program area refers to usable areas within the scope of the project with a programmed function. It does not include closets or mechanical rooms.

- Provide additional dedicated outdoor place(s) of respite for staff equal to 2% of the net usable program area.
- Exterior places of respite shall be subject to occupancy, located within 200 feet of a building entrance or access point, and must be spaces where no medical intervention or direct medical care is delivered. Qualifying areas shall be open to fresh air, the sky and the natural elements, including seasonal weather. In addition, qualifying areas shall comply with all of the following:

  - Seating areas shall provide options for shade or indirect sun. Provide shade structures, a trellis or tree-shaded wheelchair accessible seating areas at a minimum of 1 space/ 200 sf of garden area with 1 wheelchair space per 5 seating spaces.

  - Horticulture therapy or other specific clinical special use gardens (Cancer Healing Garden, for example), unavailable to all building occupants may be used to meet up to 50% of the required area.

  - Universal access natural trails with places to pause, available to staff and/or patients. (Nature trails may comprise up to 30% of the required area, provided trail access is available within 200 feet of a building entrance.)

  - Places of respite must be designated as non-smoking in accordance with GGHC FM Prerequisite 6: Environmental Tobacco Smoke (ETS) Control.

  - Existing exterior places of respite on the hospital campus may be used to comply with this credit, provided that the location of the existing spaces meets the credit goals.

SSM Credit 5.1 continued

Connection to the Natural World: **Outdoor Places of Respite**

Suggested Documentation

- ❑ Compile and annually review the facility's net usable program area.
- ❑ Compile and annually review site plans highlighting public outdoor places of respite equal to 5% of project net program area in accordance with Credit Goals.
- ❑ Compile and annually review floor plans and site plans highlighting outdoor places of respite dedicated for staff use equal to an additional 2% of project net program area in accordance with Credit Goals.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of the credit with GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 2: Reduced Site Disturbance; GGHC SSM Credit 3: Stormwater Management; GGHC SSM Credit 4: Heat Island Reduction; GGHC FM Credit 2.1-2.5: Potable Water Use Reduction: Total Building Reduction; GGHC FM Credit 2.6: Potable Water Use Reduction: Water Efficient Landscaping; GGHC FM Credit 9: Light Pollution Reduction; and GGHC FS Credit 5: Hospital Supported Agriculture: Food and Farm Linkages.*

- Select appropriate locations for places of respite, taking into account:
  - Environmental factors (e.g., winds, orientation, views)
  - Programs of care (e.g., Horticultural Therapy)
  - Needs of specific patient populations (e.g., immune suppression, sunlight sensitivity)
  - Realistic levels of maintenance
- Consider issues of wayfinding and orientation, accessibility, strength and stamina, activity and interest, privacy and security, independence.

- Provide choice and variety in the design of spaces (for example, spaces that engage all the senses but also areas with limited sensory stimulation). Consider a variety of smaller spaces conveniently located throughout the facility rather than one large space. Also consider integrating these exterior spaces with interior public spaces to enhance the connection to nature throughout the facility.

- Design considerations should include freedom from distractions, such as noise from mechanical systems, facility administrative activities and medical treatments.

- Direct connection to the natural environment includes views of distant and nearby nature (such as inaccessible rooftop spaces with "green" (vegetated) roofs and mature street trees). Positive views and vistas should be considered and visual barriers into patient rooms, treatment rooms and mechanical systems should be implemented.

SSM Credit 5.1 continued

Connection to the Natural World: **Outdoor Places of Respite**

- Coordinate the integration of gardens and nature for exterior environments with the facility's environmental health and safety personnel. This includes addressing concerns of chemical sensitivities and allergens with certain high-pollen plant materials.

- Specify and install plant materials that are natural, appropriate to sun/shade requirements and hardiness zone, and able to display seasonal habitat and change. For ongoing maintenance of Outdoor Places of Respite, see GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion and Landscape Management Plan.

- Qualifying areas should not be used for regularly scheduled physical rehabilitation.

- Consider the development of on-grade gardens and green spaces that will also help integrate the facility into the surrounding community.

- For building atria and greenhouses, see GGHC v2.2 EQ Credit 8: Views and Daylight.

- For dedicated protected/preserved natural site area, see GGHC SSM Credit 2.1: Reduced Site Disturbance: Protect or Restore Open Space or Habitat.

Resources

J. Boehland, (2005) "Hospital Heal Thyself: Greening the Design and Construction of Health Care Facilities." *Environmental Building News*, Vol. 14, No. 6.

Cooper, Marcus & Barnes, M. (1999). *Healing Gardens Therapeutic Benefits and Design Recommendations*, Wiley Publications.

H.R. Rubin, and Owens, A.J., (1996). *Status Report: An Investigation to Determine Whether the Built Environment Affects Patients' Medical Outcomes.* Martinez, CA: The Center for Health Design.

Roger S. Ulrich, (1999). "Effects of Gardens on Health Outcomes: Theory and Research." In Cooper Marcus, Barnes, *Healing Gardens Therapeutic Benefits and Design Recommendations*, Wiley: New York.

Ulrich and Zimmering, (2004). *The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity*, Report to The Center for Health Design for the Designing the 21st Century Hospital Project.

S. Whitehouse, Varni, J.W., Seid, M., Cooper Marcus, C., Ensberg, M.J., Jacobs, J.R., et al. (2001). "Evaluating a children's hospital garden environment: Utilization and consumer satisfaction." *Journal of Environmental Psychology*, 21(3), pp. 301-314.

1 point

SSM Credit 5.2

Connection to the Natural World: **Exterior Access for Patients**

Intent

Provide outdoor places of respite on the health care campus to connect health care patients, visitors, and staff to the health benefits of the natural environment.

Health Issues

Health care facility design should address the physical, emotional, and spiritual needs of the patients and/or residents, staff, family members, and visitors that inhabit these buildings. Privacy, confidentiality, security, dignity, comfort, orientation, and connection to nature are key elements and issues that need to be addressed in the design of supportive environments.

Places of respite connected to the natural environment are key elements in defining a supportive, high performance, healing environment with proven effects on patient, staff, and visitor well-being and improved clinical outcomes. A growing body of research indicates that patients and medical staff experience positive health benefits from access to daylight and landscape views. Providing a variety of spaces for patients, families, and caregivers to pause and experience their natural surroundings is an important facility objective.

Credit Goals

OPTION 1

- Provide direct access to an exterior courtyard, terrace or balcony with a minimum area of five square feet/patient served for 75% of all inpatients AND 75% of qualifying outpatients with clinical length of stay (LOS) greater than four hours. Vegetation (including planters) shall use either non-potable water for irrigation or a high-efficiency irrigation system.
  - Patients with length of stay greater than four hours, whose treatment makes them unable to move, such as those in Emergency, Stage 1 surgical recovery, and critical care, may be excluded. Qualifying outpatients may include Outpatient Renal Dialysis, Chemotherapy, Ambulatory Surgery Intake and Stage 2 Recovery.
  - Immediately adjacent outdoor places of respite, as defined by GGHC SSM Credit 5.1, may be used to meet this Credit Goal.
  - Qualifying spaces must be designated as non-smoking and meet the requirements of GGHC FM Prerequisite 6: Environmental Tobacco Smoke (ETS) Control.
  - Qualifying spaces must meet the requirement for outdoor air quality enumerated in GGHC FM Prerequisite 5: Outside Air Introduction & Exhaust Systems and be more than 100 feet from building exhaust air locations, loading docks, building entrances and roadways subject to idling vehicles.

OR

OPTION 2

- Develop and implement a program that facilitates regular access to outdoor places of respite for all inpatients and qualifying outpatients with clinical length of stay (LOS) greater than four hours.

  Note: To comply with this credit, outdoor places of respite must meet the requirements in GGHC SSM Credit 5.1: Connection to the Natural World: Outdoor Places of Respite.

SSM Credit 5.2 continued

Connection to the Natural World: **Exterior Access for Patients**

Suggested Documentation

- ❑ Compile and annually review diagrams describing and demonstrating that 75% of all inpatients and 75% of qualifying outpatients with >4 hour LOS have access to secure and supervised outdoor space in accordance with the Credit Goals.

OR

- ❑ Document annual usage goals for the policy facilitating regular access to outdoor places of respite for inpatients and qualifying outpatients and track progress.

Reference Standards

There is no reference standard for this credit.

Potential Technologies & Strategies

- ***Credit Synergies:*** *Coordinate implementation of the credit with GGHC SSM Credit 1.2: Site Management: Integrated Pest Management, Erosion Control & Landscape Management Plan; GGHC SSM Credit 2: Reduced Site Disturbance; GGHC SSM Credit 3: Stormwater Management; GGHC SSM Credit 4: Heat Island Reduction; GGHC FM Credit 2.1-2.5: Potable Water Use Reduction: Total Building Reduction; GGHC FM Credit 2.6: Potable Water Use Reduction: Water Efficient Landscaping; GGHC FM Credit 9: Light Pollution Reduction; and GGHC FS Credit 5: Hospital Supported Agriculture: Food and Farm Linkages.*
- Direct access means not having to pass through another patient room, dedicated staff or service/utility space. Patient/public circulation corridors or common sitting areas, waiting and day space may be on the circulation route to the outdoor space.
- Locate patient accessible outdoor spaces in direct line of sight from the most continuously occupied staff workstation. Provide appropriate safety barriers to secure upper level patient accessible outdoor spaces.
- Locate patient accessible outdoor spaces facing the most temperate weather conditions, as determined by local climatic conditions, ideally within or with views over exterior places of respite and other natural site amenities.
- Provide planting where possible.
- Provide the majority of seating and wheelchair space in filtered sunlight. Consider additional full sunlit areas as well where possible.
- Provide medical services support, such as oxygen outlets, to allow extended use.
- Design balcony edges to ensure patient safety.

SSM Credit 5.2 continued

Connection to the Natural World: **Exterior Access for Patients**

Resources

Beneditti, Francesco, et al., (2001). "Morning sunlight reduces length of hospitalization in bipolar depression." *Journal of Affective Disorders*, 62(3), pp. 221-223.

J. Boehland, (2005) "Hospital Heal Thyself: Greening the Design and Construction of Health Care Facilities." *Environmental Building News*, Vol. 14, No. 6.

Cooper, Marcus and Barnes, M. (1999). *Healing Gardens Therapeutic Benefits and Design Recommendations*, Wiley Publications.

H.R. Rubin and Owens, A.J., (1996). *Status Report: An Investigation to Determine Whether the Built Environment Affects Patients' Medical Outcomes.* Martinez, CA: The Center for Health Design.

R. Ulrich, Zimring, C., Quan, X., Joseph, A., "The Environment's Impact on Stress", pg. 37, in Marberry, S., Ed., "Improving Healthcare with Better Building Design", The Center for Health Design, 2005

Ulrich and Zimmering, (2004). *The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity*, Report to The Center for Health Design for the Designing the 21st Century Hospital Project.

Roger S. Ulrich, (1999). "Effects of Gardens on Health Outcomes: Theory and Research." In Cooper Marcus, Barnes, *Healing Gardens Therapeutic Benefits and Design Recommendations*, Wiley: New York.

R.S. Ulrich, (1984). "View through a window may influence recovery from surgery." *Science, 224* (4647), pp. 420-421.

W. Whitehouse, S., Varni, J.W., Seid, M., Cooper Marcus, C., Ensberg, M.J., Jacobs, J.R., et al. (2001). "Evaluating a children's hospital garden environment: Utilization and consumer satisfaction." *Journal of Environmental Psychology*, 21(3), pp. 301-314.