SITE VEGETATION

EW-5

1-3 POINTS

GOAL

Promote sustainable site vegetation that does not require irrigation.

CREDIT REQUIREMENTS

Site vegetation shall be subject to the following requirements in order to receive the points listed:

- **1 point:** Use non-invasive plant species only
- **1 point:** Do not use water (no irrigation) after the plant establishment period
- **1 point:** Use native plant species only

Details

"Site vegetation" is defined as all vegetation associated with a particular roadway project and shall include all vegetation within the roadway's right-of-way. This can include roadside vegetation, decorative planting (e.g., planter boxes or potted plants in urban areas) and vegetation contained in stormwater facilities (e.g., bioswales and rain gardens).

The following items must be performed to ensure that a plant species is considered "non-invasive":

1. Consult existing local (e.g. city, county, state, park service) vegetation policy and procedure that is applicable to the roadway project and is specifically formulated to prevent the use of invasive plant species and noxious weeds.
2. Use local and/or regional lists to identify invasive plant species.
3. Comply with local and/or national noxious weed laws.

"No water use" means that the site vegetation will not require any irrigation after the plant establishment period. The "plant establishment period" shall be stated in the project specifications. Typical plant establishment periods are 1-3 years. This requirement means that vegetation requiring irrigation such as seasonal planter boxes cannot receive the associated point even if it is fully comprised of non-invasive or native species.

"Native plant species" are plants native to the EPA Level III ecoregion that contains the roadway project site or known to naturally occur within 200 miles of the roadway construction site (The Sustainable Sites Initiative, 2009a).

DOCUMENTATION

- A vegetation or landscape plan showing type and location of all plant species. This can often be found in the standard project plans.
- The specification sections relating to site vegetation including planting bed requirements. These are typically found in the technical specifications.
- A copy of or reference to (e.g., web address) the policy or procedure used to select plant species.

RELATED CREDITS

- ✓ PR-10 Site Maintenance Plan
- ✓ EW-3 Runoff Quality
- ✓ EW-6 Habitat Restoration

SUSTAINABILITY COMPONENTS

- ✓ Ecology
- ✓ Economy
- ✓ Equity
- ✓ Extent

BENEFITS

- ✓ Reduces Water Use
- ✓ Reduces Water Pollution
- ✓ Reduces Greenhouse Gases
- ✓ Reduces Solid Waste
- ✓ Increases Aesthetics

APPROACHES & STRATEGIES

Use a Pre-Defined List of Approved Plants

In many cases the local road owner (e.g., City, County, State or other authority) already has a pre-defined list of acceptable plant species for site vegetation. Usually, these lists have been carefully developed to exclude invasive plants and noxious weeds; however they should still be checked against local/regional lists and laws. Often times, these pre-defined lists also identify native plants and drought tolerant plants (e.g., no water use). Following such lists can often achieve the non-invasive species point and zero water use point. Selecting native plants species (which may also be identified on these lists) can then earn the third point.

Pre-defined lists are advantageous because they are straightforward and easy to follow; plants are either on the list or not. However, when used alone they may not provide adequate guidance on establishing long-term ecosystem goals, management of site vegetation after planting, appropriate location and density of vegetation and other more advanced concepts.

Follow a Pre-Defined Process

It may be possible to identify a site vegetation process that has been approved or adopted by the local authority. These processes typically identify the site vegetation strategy and describe the actions and major steps needed to establish site vegetation. These plans can be complex, such as Western Federal Lands Highway Division's *Roadside Revegetation: An Integrated Approach to Establishing Native Plants* (Steinfeld et al. 2007) or more general in nature like Xeriscape Colorado (Colorado Waterwise 2009).

Sustainable Sites Initiative

One robust pre-defined process is associated with the Sustainable Sites Initiative (www.sustainablesites.org). This is "an interdisciplinary effort…to create voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices." (The Sustainable Site Initiative 2009c). A roadway project participating in the Sustainable Sites Initiative program and recognized as a "sustainable site" would likely quality for at least 1 point in this Voluntary Credit and, depending upon which Sustainable Sites credit benchmarks are achieved, could achieve all 3 points. Overall, the Sustainable Sites Initiative is a more robust set of benchmarks for site vegetation than Greenroads because its scope is limited to site development and does not include roadways, mobility, access or other metrics associated with transportation.

Have an Expert Develop a Site-Specific Vegetation Strategy

In the absence of existing guidance, it may be necessary to have an expert develop an entirely new site-specific vegetation plan. While this is an acceptable option, the expertise and time to develop the plan can be expensive in relation to the amount of site vegetation; especially on small projects where vegetation is limited. In addition to careful selection of appropriate plants, plan development requires consideration of planting bed specifications, topsoil needs, and planting techniques. Finally, long term maintenance plans and goals must be established for the plant community.

Example: City of Portland, OR

The City of Portland's Bureau of Planning and Sustainability has maintained a *Portland Plant List* since 1991. This list includes:

- **Native plants**. Plants historically found in the City of Portland. They are grouped by type (tree, arborescent shrubs, shrubs and ground covers) and include the scientific name, common name, and wetland indicator status and habitat type.
- **Nuisance plants**. Plants that can be removed manually without requiring an environmental review or greenway review. Plants are considered a nuisance because they have a tendency to dominate plant communities or are harmful to humans. Nuisance plants may be native, exotic or naturalized.
- **Prohibited plants**. Plants prohibited from use in all reviewed landscaping situations. These plants pose a serious threat to native plant and animal health/vitality.

Example: City of Seattle, WA

The City of Seattle provides guidance for project site vegetation using:

- Department of Transportation suggested plant list for street use.
- Links to plant selection databases.
- Tree protection ordinance, specifications and standard plans.
- Heritage tree program.
- Recommended street tree list.
- Landscape standard plans.

The suggested plant list for street use is called the "Seattle Green Factor Plant List" (http://www.seattle.gov/dpd/static/Green%20Factor%20Plant%20List_LatestReleased_DPDP015968.pdf).

Example: Western Federal Lands Highway Division

In 2007, Western Federal Lands Highway Division (WFLHD) published a native revegetation manual (Steinfeld et al. 2007) that they now use as their standard process for revegetating disturbed land on roadway projects. This manual does not provide a specific plant list but rather describes a comprehensive process for roadside revegetation and creation of a sustainable plant community. This process includes (1) necessary integration, (2) initiation, (3) planning, (4) implementation and (5) monitoring, and is illustrated on the web at: www.nativerevegetation.org.

Example: Sustainable Sites Initiative Case Studies

The Sustainable Sites Initiative website contains a number of case studies demonstrating sustainable landscape practices at: http://www.sustainablesites.org/cases

POTENTIAL ISSUES

1. Site planting without proper integration with other roadway activities (e.g., maintenance, roadside safety).
2. Inadequate plant establishment.
3. Not considering the suitability of a plant species specific for site conditions including cold/heat tolerance, salt tolerance and soil pH, sun/shade requirements, pest susceptibility, and maintenance requirements (The Sustainable Sites Initiative 2009). The roadway environment might be significantly different from the surrounding area, and may not necessarily support its indigenous plant species.
4. Site vegetation must be considered in the context of soils, compaction, slopes, and hydrology in order to be successful on road projects.
5. Disturbed soil conditions must be modified to create conditions that will sustain native plant growth. Planting beds should be prepared based on disturbed conditions and specified in project docuements.
6. This Greenroads credit does not currently track projects beyond construction to ensure continued maintenance and no water use.

RESEARCH

Site vegetation can impact four primary roadway sustainability components: ecology, economic, equity and extent. In the broad sense, arguments for sustainable site vegetation center on their contribution to the local ecosystem, which leads to broad arguments for how ecosystems and ecosystem services affect these areas of sustainability. In a more narrow sense, arguments for sustainable site vegetation center on how they may influence project specific ecological issues, costs, safety, culture, and durability. While these issues are often thought of as self-evident, it can be difficult to find quantifiable empirical evidence to use as proof. The following sections address site vegetation impacts by category.

Ecological

Site vegetation is part of the local ecosystem. The Millennium Ecosystem Assessment (2005) defines an ecosystem as "…a dynamic complex of plant, animal, and microorganism communities and the nonliving environment interacting as a functional unit." These can be systems relatively untouched by humans (e.g., natural forests) or those that have been significantly modified (e.g., urban areas and agricultural lands) (MEA 2005). In looking at ecosystems over the last 50 years the Millennium Ecosystem Assessment (2005) arrived at four major findings:

- Over the past 50 years humans have changed ecosystems more rapidly and extensively than in any comparable period of human history.
- Ecosystem changes have contributed to substantial net gains in human well-being and economic development, but these gains are at the expense of substantially diminishing the benefits that future generations obtain from ecosystems.
- The degradation of ecosystem services could grow significantly worse during the first half of the twenty-first century.
- Reversing ecosystem degradation can be done but involves significant changes in policies, institutions and practices that are not currently underway.

Thus, to the extent that site vegetation helps manage ecosystems more sustainably, it can contribute positively, though perhaps only slightly, to the reversal of some of the degradation seen over the last 50 years. Benefits attributed to more sustainable site vegetation include the regional and local impacts outlined below (MEA 2005):

Regional:
- Better air quality
- Climate regulation
- Water regulation
- Erosion regulation
- Water quality
- Pest regulation
- Pollination
- Natural hazard regulation

Local:
- Lower water use
- Reduced erosion
- Prevention of exotic plant species from out-compete native species
- Better survivability of site vegetation because it is better-adapted to the local environment (though plants indigenous to the local ecosystem are not necessarily suitable for the altered roadway environment).

Economic

As part of the local ecosystem, site vegetation can, in a broad sense, provide economic benefits such as clean air, clean water, food, renewable resources and waste decomposition (The Sustainable Sites Initiative, 2009b). It is difficult to value ecosystem services properly because (1) our attempts to value them are generally based on human values and not what might be considered objective value sets, and (2) they are not fully valued or quantified in commercial markets or policy decisions (Costanza et al. 1997). Nonetheless, attempts have been made to value ecosystem services that can provide insight. Costanza et al. (1997) provide a comprehensive overview on the value of the world's ecosystem services based on a synthesis of previous work. In short, they found a range of potential values of US$16 -54 trillion/yr with a mean of US$33 trillion/yr for 17 ecosystem services (in 1994 US dollars). This compares to a world gross national product (GNP) of US$18 trillion (1994 US dollars) making ecosystem services about 1.8 times the global GNP if the mean value is assumed. This estimate is based on marginal cost by "…determining the differences that relatively small changes in these services make to human welfare." (Costanza et al. 1997). They acknowledge that their estimates are on the low side, incomplete and flawed but reason that some estimate is better than none (Costanza et al. 1997).

In a narrow sense, site vegetation contributes to individual project cost over its life cycle if costs such as site maintenance, water demand, erosion control and problematic vegetation control are considered (Steinfeld et al. 2007a). One example of this comes from the City of Santa Monica in their garden\garden demonstration project. In this project the City and Water District compared two landscape strategies: sustainable vs. traditional (Santa Monica Office of Sustainability and Environment 2009). Table EW-5.1 summarizes some findings from the comparison.

Table EW-5.1: Landscape Comparison in Santa Monica, CA for the entire year of 2007

Category	Sustainable Landscape	Traditional Landscape
Initial Construction Cost	$16,700	$12,400
Water Use	14,300 gallons	76,700 gallons
Annual Water Cost	$14	$74
Yard Waste	250 lbs	670 lbs
Maintenance	15 hours	80 hours
Annual Maintenance Cost	$800	$3,000

It should be noted that direct comparisons between sustainable and traditional vegetation with actual values for cost, water use, waste, etc. such as that done by the City of Santa Monica are difficult to find.

Equity

As part of the local ecosystem, site vegetation can provide human equity benefits such as improved human health (e.g., better water quality) and cultural services like spiritual and religious values, recreation and aesthetics (MEA 2005). On a local scale, site vegetation can contribute to improved roadway safety by improving visibility and can create natural beauty that is appreciated and valued by motorists.

Extent

Site vegetation can also have an impact on the durability of a particular project, which affects project life or at least the level of necessary maintenance to achieve a specific project life. For instance, native revegetation of a highway roadside can be better than traditional non-native turf coverage because it can have a higher probability of surviving, last longer, require less maintenance and better prevent soil erosion based on a deeper and more hearty root structure (see comparison between Figures EW-5.1 and EW-5.2).

Figure EW-5.1: A failing revegetation effort on a steep slope that did not use a native revegetation approach (from Steinfeld et al. 2007a).

Figure EW-5.2: A native roadside revegetation in Glacier National Park (from Steinfeld et al. 2007a, photo by Tara Luna).

GLOSSARY

Native plant	Plant that is native to the EPA Level III ecoregion that contains the roadway project site or known to naturally occur within 200 miles of the roadway construction site (Sustainable Sites Initiative, 2009a).
Plant establishment period	Duration of time that allows newly installed vegetation to reach a state of maturity that requires minimal ongoing maintenance for survival. Activities during the plant establishment period can include: removal of litter and trash, weeding, water application (even for non-irrigated vegetation), replacement of dead plants and pest control (including the use of approved pesticides).
Xeriscape	A set of gardening principles designed to save water while creating a lush and colorful landscape.

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