GUIDING PRINCIPLES FOR LANDSCAPE DESIGN, CONSTRUCTION AND MAINTENANCE

For over three centuries, the open space of Yale's campus has been central to both the aesthetics and functionality of the university. Twenty-first century environmental challenges such as climate change and water quality necessitate the application of an ecological lens to the design, construction, and maintenance of the campus. With the 2010 release of the Yale Sustainability Strategic Plan, it is now incumbent upon the university to incorporate ecological factors into its landscape stewardship. Although the campus map illustrates physical boundaries to the land owned and managed by Yale, the university must think outside these lines. The adoption of an urban ecosystem lens will allow the university to capitalize on the organic infrastructure that the landscape can provide. This methodology will take into consideration not only aesthetics and recreation but also ecosystem services such as storm water management, microclimate mediation, and habitat connectivity. The entire university, the local community, and the region stand much to gain from a holistic approach that seeks to improve the health and security of both the biotic and the human population. The purpose of this document is to outline the environmental, economic, and social sustainability principles for the management of Yale University's open space.

In adopting an ecosystem services approach, the University establishes a foundation based on the interconnectivity of all systems. The health of each component- soil, water, air, plants, animals, microbes- is integral not only to the ecological health of the campus but also to the social fabric and economic health of the Yale community. The landscape management strategy seeks to provide an aesthetically pleasing and functional campus by putting into practice the science of ecosystem services research. This research suggests that, by improving the resiliency, integrity and longevity of the campus ecosystem, the addition of an organic infrastructure perspective will improve the health of the people who inhabit the campus. The adoption of this landscape management approach will contribute to the continued supply and regulation of clean air and water, decomposition of waste, microclimate regulation, water retention, erosion control, and spaces for social interaction and fitness. In addition, the new approach may help to reduce the costs of landscape maintenance and campus heating and cooling expenses.

NEW CONSTRUCTION & RENOVATION DESIGN Principles

The overall design and management of Yale's landscape will support the University's traditional needs and values, recognizing outdoor spaces as important and critical components of the overall campus experience. In the planning stage of each project, it is essential to create spaces that are visually compelling, appropriately sited, functional, maintainable, and affordable. In order to maximize the short and long term sustainability of the site, the design process will include the following:

- clear articulation of the intent for the site
- detailed site assessment
- documentation of the site's features that allow for the incorporation of design concepts to capitalize on existing site features
- site specific long-term maintenance plan to ensure that the site is maintained as intended.

CONSTRUCTION Principles

The landscape construction phase will be closely linked to the design phase with clear communication and collaboration between the designer and landscape contractor to ensure project goals are achieved. The existing conditions of the site, including vegetation and soil, will be evaluated and assessed in order to determine the least damaging construction approach. This includes minimizing the effects of construction related activities such as construction pollutants, soil disruption, restoration of soils, reuse of vegetation, and minimal exposure to localized air pollutants.

OPERATION & MAINTENANCE Principles

Best practices for landscape management will be based upon Integrated Pest Management (IPM), proactively pursuing effective alternatives to pesticides by using current and comprehensive information on the life cycles of pests and their interactions with the environment. This methodology, in combination with available pest control methods, will result in the most cost effective and the least possible hazard to people, property and environment.

NEW CONSTRUCTION & RENOVATION GUIDELINES

1. Conduct a pre-design site assessment and explore opportunities for site sustainability
    - Hydrology – gain an understanding of the site hydrology including water runoff and opportunities for reducing potable water usage for irrigation.
    - Soil – conduct a soil test to ensure hazardous chemicals are not found in site soils and to determine soil health and composition.
    - Develop a construction staging plan that designates protected areas, creates soil stockpiling areas ,and coordinates the entry and exit of machinery and vehicles.
    - Vegetation – Determine the feasibility of protecting and/or storing existing site vegetation for post-construction use. Resources should not be squandered saving vegetation that cannot withstand the impact of construction.
2. Site Design
    - Intended Use – Site design should be founded on a strong understanding of how the site will be used. Maintenance must be a factor at all stages of the design process, from schematic design, detailed design, to construction design. All materials chosen- softscape and hardscape- must take into account existing available maintenance resources.
    - Plant/tree selection – Develop guidelines for plant selection based on soil suitability, water demands, required maintenance regime, aesthetics, and ecological goals. Invasive species must be avoided. Non-native species that are not invasive are acceptable when no native species that meet the above criteria can be found. Remove any existing species during construction. Plants that need no irrigation once established are preferable to those that need long term irrigation.
    - Irrigation – During the design process, plan for an irrigation system that recognizes and accounts for the water requirement of planting beds. Plants with similar water requirements should be planted in the same bed. Where possible, reduce potable water use for irrigation and explore opportunities for rain water capture and use.

- Hardscape – Develop guidelines for the selection and installation of hardscape materials. Determine the preferred pervious to impervious ratio for the site.
- Soil – Determine preferred levels of off-site fill soil, on-site soil, mulch, and soil amendments including fertilizer, compost, and compost tea

3. Construction Observation
    - Pollutants – Develop guidelines for monitoring, controlling, remediating, and retaining construction pollutants.
    - Soil – Develop guidelines for protection, reuse, and restoration of site soil.
    - Vegetation/Trees – Ensure the protection and reuse of site vegetation/trees, where possible.
    - Monitoring/enforcement of guidelines- Routine site monitoring during the construction process to ensure compliance with protection standards and penalties for violation. (Phil to develop further)

4. Site Maintenance Plan – Require each new site to develop a site maintenance plan that addresses the following areas:
    - Plant stewardship – Describe the strategy for site vegetation maintenance. Describe how plants will be monitored to prevent disease, pest infestations, and avoidable death. Describe plan for plant replacement.
    - Invasive species management – commitment to removal of invasive species as spaces are renovated
    - Soil stewardship – describe soil principles of the site
    - Irrigation & water use – describe watering principles and list potential opportunities for decrease irrigation and water use.
    - Stormwater management – describe stormwater management principles and list potential opportunities for site storm water management.
    - Recognizes existing maintenance costs, staffing levels and requirement as compared to those that the new design will require.

CAMPUS OPERATION & MAINTENANCE GUIDELINES

- Integrated Pest Management – IPM will be the most cost effective approach and pose the least possible risk to people, property, and the environment. Further explain importance of IPM strategy
- Plant stewardship – describe the process in which vegetation maintenance will occur. Describe how plants will be monitored to prevent disease, pest infestations and dying vegetation. Describe plan for plant replacement. Describe importance of funding this aspect.
- Invasive species management - Invasive that have been designed into the landscape should be removed at earliest possible renovation opportunity and not replaced in kind. Invasive that are volunteered should be removed programmatically and as part of the IPM process
- Organic materials management – general disposal method for diseased plants

- Soil stewardship - describe process for identifying soil deficiencies prior to adding amendments. Describe process for applying fertilizers that ensures effective application and prevents environmental harm and human health. Describe plan for avoiding soil erosion and compaction.
- Irrigation & water use – general guidelines for watering site vegetation. Base on seasonal plant requirements. Specific delivery requirements of the irrigation system and holistic changes as the landscape evolves.
- Snow and ice removal – describe process for managing snow and ice removal with regard to campus safety and requirements.