Challenging Sustainable Goals for Landscape Architects

By Barrett L. Kays[11], FASLA

Sustainable goals need to challenge landscape architects, our clients, and the public to incrementally solve major environmental issues. The LEED program has focus on an array of energy and environmental goals. More recently, the AIA has narrowed it's focus for new sustainable building design to eliminate the use of fossil fuels and to achieve a carbon-neutral status for each project. How will the new AIA approach affect landscape architects and sustainable site design?

Architecture 2030[2] is asking architects that design sustainable buildings to sign on to the **2030 Challenge** in conjunction with the building industry and to adopt the following aggressive sustainable goals:

- "All new buildings, developments and major renovations shall be designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional (or country) average for that building type.

- At a minimum, an equal amount of existing building area shall be renovated annually to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional (or country) average for that building type.

- The fossil fuel reduction standard for all new buildings and major renovations shall be increased to:
    - 60% in 2010
    - 70% in 2015
    - 80% in 2020
    - 90% in 2025
    - Carbon-neutral in 2030 (using no fossil fuel GHG emitting energy to operate)

- These targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power and/or purchasing (20% maximum) renewable energy and/or certified renewable energy credits."

The **2030 Challenge** goals greatly exceed the LEED criteria. Likewise, Landscape architects need to establish meaningful sustainable site goals that helps achieve significant energy and environmental targets. The ASLA Sustainable Site Initiative[3] has released draft guidelines that are intended to be

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[1] Barrett L. Kays, FASLA, Landis, Inc., Raleigh, NC
[2] www.architecture2030.org
[3] www.sustainablesites.org

incorporated into the LEED program. The guidelines present design strategies under the following categories:

- Site Selection
- Predesign Assessment and Planning
- Site Design – Ecological Components
- Site Design – Human Components
- Site Design – Materials Selection
- Construction
- Operation and Maintenance

Landscape architects need an aggressive sustainable challenge that exceeds the proposed Sustainable Site Initiative (SSI). A few of the problems and limitations of the draft SSI requirements are:

- SSI use “prerequisite” or mandatory standards and “credits” or optional standards. Many important standards are not mandatory.
- SSI proposes credits to partially achieve a carbon-neutral site. It limits its scope to restoring on-site vegetation and soils as sinks for greenhouse gases or purchasing CO_2 credits. SSI has no mandatory standard for reduction in energy consumption and has no requirements for on-site energy generation. Therefore, the SSI requirements are incredibly weak.
- SSI proposes credits for the use of vegetation to shade building west, southwest, southeast, and east walls. Even though, the shading of east, southwest and southeast walls will generally interfere with passive solar heating of the building. The shading standard does not allow for use of light shelves to shade windows or other forms of building insulation. SSI has created a one-size fits all approach. If the goal is to reduce energy consumption, why not set mandatory standards for energy reductions.
- SSI proposes a prerequisite standard to reduce potable water consumption for irrigation by at least 50%, instead of using a graduated reduction to eliminate the use of potable water by a certain date. The SSI standard just applies to landscape irrigation, not potable water use for the entire development project.
- SSI proposes credits for reduction in runoff from 30 to 90% of the predevelopment discharge volume for the 1-year storm event; this is a very minimal standard and instead it should apply to a 25 to 100-year storm events. Runoff reduction should be a mandatory standard.
- SSI proposes credits for the use of vegetation and reflective materials to reduce heat island effect on the site. However, use of reflective materials does nothing to reduce the heat island effect of the community. The reflective standards may simply transfer the problem off of the project site. The shading standards apply to the site’s hardscape, but not to building roofs, and is not a mandatory standard.

The SSI goals are too numerous and vague, and many of the goals do not achieve sufficiently high standards. Therefore, we need standards that are more challenging and that make sense for our region and our projects.

We need to focus on goals that we can actually effectuate on a project by project basis. For example, although we need to support increased public transit and reduction in automobile commuting as worthy goals that will reduce the use of fossil fuels, few of us can implement these goals on project scale design projects. Where we have projects that can address automobile commuting, we need to fully participate in finding meaningful solutions.

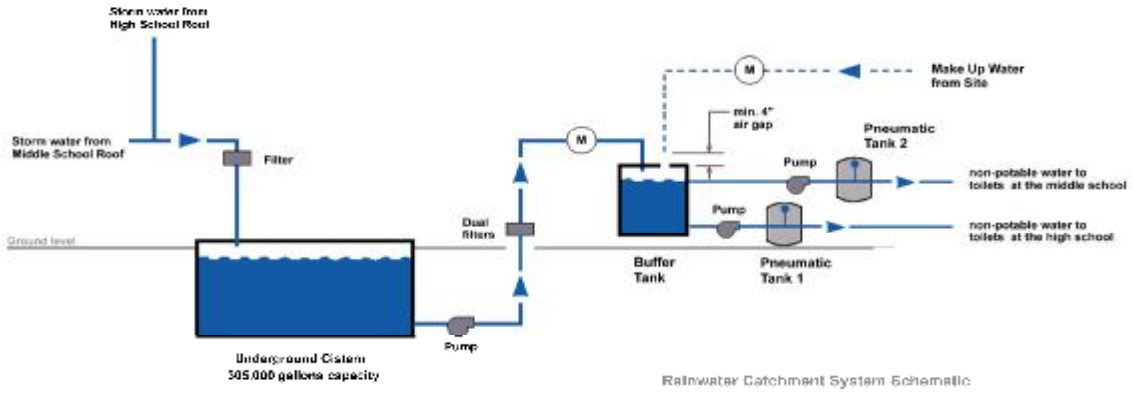
Let me suggest some aggressive goals that can be achieved by innovative landscape architects working on private or public development projects of course assuming that the clients value sustainable sites:

- Join on-line and subscribe to the Architecture 2030 goals
- Substantially reduce the use of potable water by rainwater collection, storage, treatment, and reuse systems on all new developments, new construction and substantial renovations:
    - 30% reduction by 2010
    - 50% reduction by 2015
    - 70% reduction by 2020
    - 90% reduction by 2025
    - 100% reduction by 2030
    - This goal can substantially reduce the operation costs, reduce load on potable water systems, and enhance the use of decentralized systems.
- Substantially reduce all stormwater runoff by infiltration, bioretention, treatment, and reuse systems on all new developments, new construction and substantial renovations:
    - 30% reduction by 2010
    - 50% reduction by 2015
    - 70% reduction by 2020
    - 90% reduction by 2025
    - 100% reduction by 2030
    - This goal can substantially reduce downstream water quality impacts, improve low flow condition in streams, and minimize impacts of high flow events.
- Treat, reuse and recycle wastewater and nutrients for growth of on-site uses or use municipal reuse waters on all new developments, new construction and substantial renovations:
    - 30% by 2010
    - 50% by 2015
    - 70% by 2020
    - 90% by 2025
    - 100% by 2030

    - This goal can substantially reduce the use of non-reuse waters, reduce use of fertilizers, and enhance the use of decentralized systems.
- Achieve production of biomass by creating vigorous enhanced rooting depths all non-paved surfaces of new developments , new construction and substantial renovations:
    - 12-inches by 2010
    - 15-inches by 2015
    - 18-inches by 2020
    - 21-inches by 2025
    - 24-inches by 2030

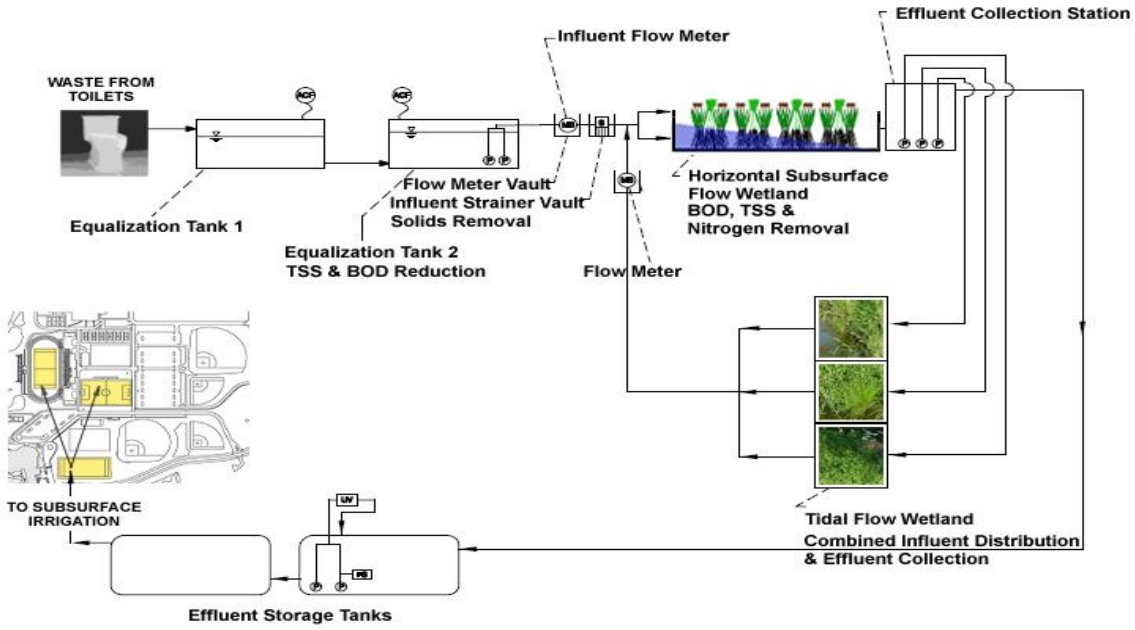
Let me illustrate how these goals are being achieved on a project in North Carolina. In 2008, Innovative Design, Inc., located in Raleigh, NC won the 2008 Beyond Green High Performance Building Award from the Sustainable Building Industry Council for the nation's top school project - Northern Guilford County Middle School. The author served as landscape architect to the project team. The team also worked closely with a sustainable high school built on the same campus. The landscape architect for the high school was Christine Hilt. Summary of goals and strategies for the middle school:

- **Reduction in energy consumption**
    - The building and grounds were designed to achieve a 60% reduction in energy consumption as compared to other non-sustainable middle school buildings built in the same year.
    - About 10% of energy consumption is generated using photovoltaic systems for hot water heating, wetland pond aeration systems, and drip irrigation controls.
- **Reduction in use of potable water**
    - The middle school has achieved 92% reduction in potable water consumption for the first two years of operation; projects involving schools are perhaps easier than most other types of projects to meet aggressive reductions in potable water use.
    - Rainwater was collected on the roofs of the middle school and high school, piped into a common 550,000 gallon rainwater tank, treated and reused in toilet and urinal flushing.



Northern Guilford Middle & High School Rainwater Collection System

- **Reuse of wastewater on-site**
  - The wastewater is treated in “Living Machine” aquatic biological treatment plant and then reused for subsurface drip irrigation on the high school football field, high school soccer field, and middle school football field, using custom structural soils. Thereby, the waters are reused for the second time. The drip irrigation system uses 33-miles of drip lines and 176,248 emitters. The irrigation application meets 100% of the nutrient requirements for the three athletic fields.
  - The volume of drip irrigation is automatically regulated using twelve soil moisture tensiometers in the sports fields.
  - Only limited portions of the remaining landscape were designed with drip irrigation; most of the landscape was designed for no irrigation.



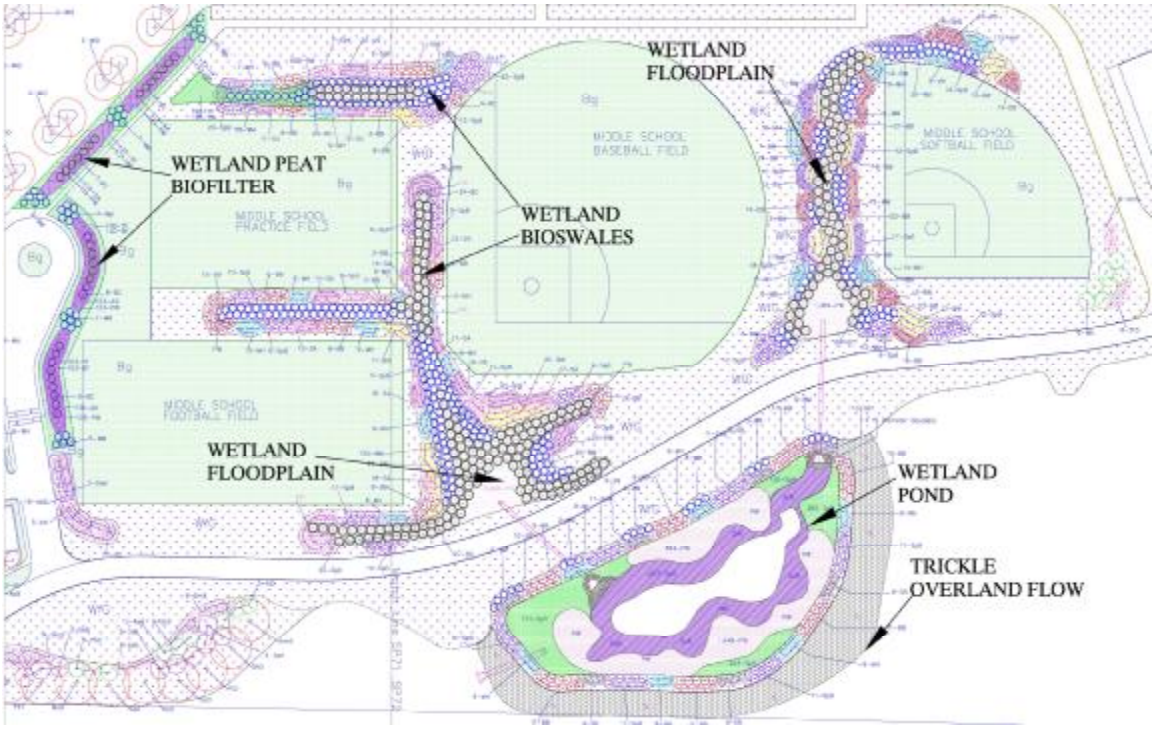
Northern Guilford Middle & High School Wastewater Reuse System on Sports Fields

Purple Drip Wastewater Lines on Portion of Soccer Sports Field

- **Reduction in stormwater runoff**
  - Stormwater runoff was eliminated for up to back to back 100-year frequency storm events; and was reduced by over 90% for larger storm events.

- Stormwater treatment is achieve through a “treatment train” consisting of area wide enhanced infiltration, wetland biofilter swales, wetland biofilter floodplains, and wetland stormwater infiltration basins.
- Rainwater is aggressively infiltrated by amending 100% of the disturbed soils on the site and achieving a vigorous rooting depth of 9-inches or greater; thus storing the first 4-inches of rainfall.
- Native grasses and wildflower meadows cover the majority of the site.
- Stormwater runoff is conveyed through a series of biofilter swales with dense woody and herbaceous wetland plants.
- Stormwater floodplains or super wide biofilter swales as act as settling areas in lieu of use of fore bays that require sediment removal.
- Excess stormwater flows into stormwater infiltration basins that can store runoff from a 100-year frequency storm event. Larger flows from the 140-acre site discharge through a 2-inch pipe onto a trickle overland flow buffer.

- **Biomass production through enhanced rooting depth**
  - All of the disturbed soils on the site were remediated with both physical and chemical soil amendments,
  - The soils were ripped, thoroughly tilled and pulverized to a depth of at least 9-inches,
  - Ground dolomitic limestone was incorporated to a 9-inch depth at rate of 18-tons per acre,
  - Ground 50% super phosphate was incorporated to a 9-inch depth at rate of 3-tons per acre, and
  - Native wildflowers, grasses, trees and shrubs were planted to achieved deep vigorous rooting and to start biomass production.



Wetland Stormwater Treatment System on Portion of Northern Guilford Middle School Site

How far can we go at these aggressive standards? The Maharishi University in Fairfield, IA formulated some of the most aggressive design goals for their new Sustainable Living Center building and grounds. The students and faculty in the Sustainable Living Program set the goals. They wanted an “off-the-grid” project, in that it is not to be connected into any water, sewer, electric, gas, or telephone land lines. They choose to produce potable water through on-site rainwater catchment and treatment system, manage all wastewater through on-site treatment and reuse system, all electricity through solar and wind generation systems, and all telephone service through wireless systems. They also choose to collect all stormwater, treat and reuse it in fountains, pools and landscape. They choose to have over well over half of the exterior landscape plantings to be edible and to include a greenhouse for winter production of edible plants. And, finally they choose a high eco-friendly standard for all building materials and to use as many local producers of materials to achieve a high carbon neutral standard for the entire project. Although most of our more innovative clients are not yet ready for “off-the-grid” projects, it is something that is beginning to happen. It is already happening in eco-friendly resort projects, and may soon come to your town.