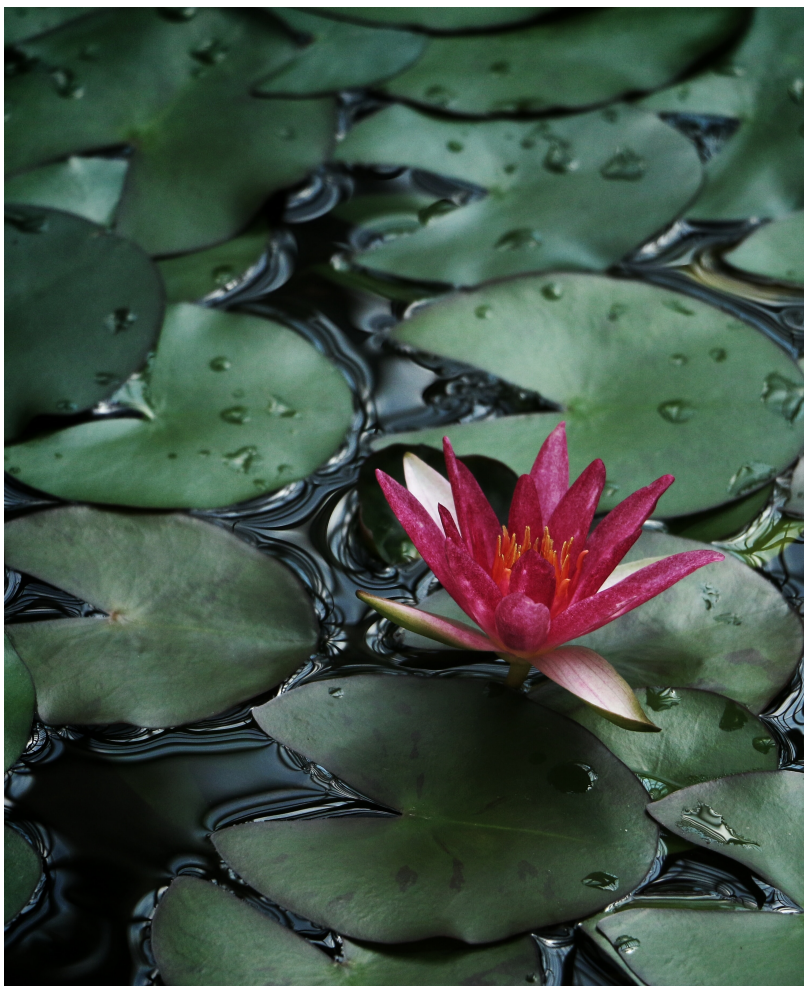
Water Quality and Consumption Attribute

Garden Workbook:



Climate & Sustainability Alliance

AMERICAN PUBLIC GARDENS ASSOCIATION

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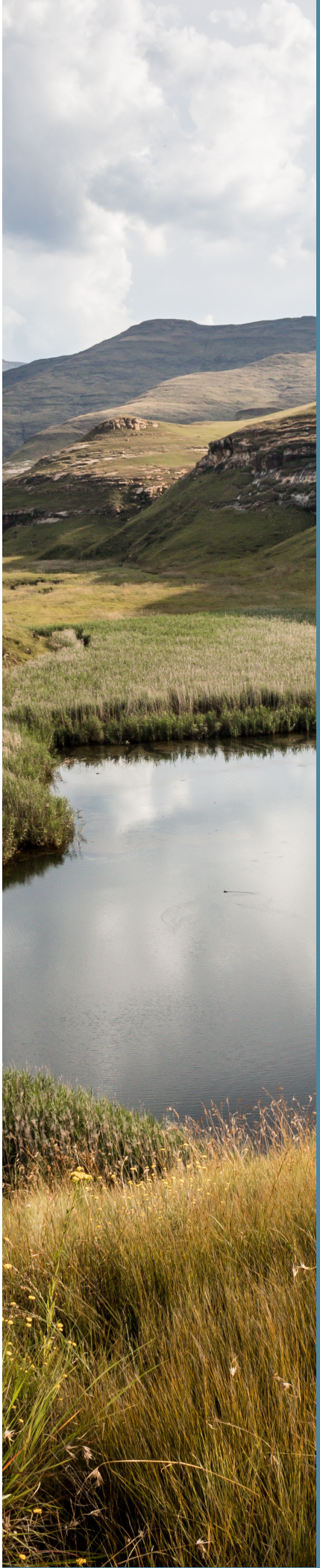


Introduction

The Water Quality & Consumption Attribute stresses the important role public gardens play in utilizing their water resources in the most sustainable ways possible. A wide range of best practices can set the standard for measurement, evaluation, design, construction, and implementation of strategies that minimize water consumption and promote surface and groundwater quality. Within this framework, public gardens can sustain a healthy and biodiverse ecosystem. The Goals and Key Performance Indicators (KPIs) were developed by public garden professionals as part of a peer-review process.

Adaptive and innovative water management is an integral part of responsible management of display gardens and plant collections. Public gardens have the opportunity to inspire future generations to think more sustainably about their own water use practices.

This document lists the goals and KPIs that have been identified as standards for gardens to better address this attribute in their policy and practice. Please refer to this document as a workbook for what items gardens should try to prioritize (as it makes sense for your gardens needs).

United Nations Sustainable Development Goals

The Public Gardens Sustainability Index is intended to share examples of how gardens are contributing to specific Sustainable Development Goals (SDGs) and to inspire gardens to advance their own garden programs to further the mission of their institution while connecting to local, national, and global sustainability efforts. This Index is a first step guide on how to "get started" with implementing the SDGs from 2015. It aims to help gardens of all sizes and governance models understand the SDG Agenda, to start an inclusive dialogue on SDG implementation, and to prepare SDG-based local or national development strategies (or align existing plans and strategies with the goals).

Public gardens have the opportunity to inspire future generations to think more sustainably about their own water use practices. Adaptive and innovative water management is an integral part of responsible management of display gardens and plant collections.

Public gardens should encourage responsible protection and use of the ocean or waterways. This is important to combat the adverse effects of overfishing, growing ocean acidification due to climate change, and worsening eutrophication (excessive nutrients from fertilizer runoff).

Water Goal 1: Develop transparent standards for the governance and management of water and ensure this is apparent in garden's plans, policies, and operational norms.

Key Performance Indicator (KPI)

a. Garden creates a plan, policy, or protocol that guides water conservation and quality decisions and actions on site.

b. Garden water management practices include reducing municipally supplied water.

c. Garden's water management practices include measuring, improving and reducing annual water discharge.

d. Garden adopts/aligns water conservation and quality strategies with broader local/regional efforts.

e. Garden makes informed decisions about water resource management involving or hiring experts for projects and programs.

Outcomes

a. Garden has (or will have) a water conservation and quality plan, policy or protocol.

b. Garden water management practices include efficient methods for reducing municipally supplied water (if applicable).

c. Water management practices include tracking/measuring annual water discharged from property (stormwater management). Water quality on site is tested regularly. Garden implements green infrastructure features to retain and reuse water.

d. Garden aligns water management strategies with government plan or policy, and/or collaborates with external agencies for conservation, quality, and water-wise projects.

e. Garden has program for professional development in water resource management. Garden utilizes expertise on projects. Garden has obtained special accreditation for water use and quality.

Suggested Strategies

Ensure that irrigation infrastructure is monitored and any issues such as leaks are reported and addressed in a timely manner. Operations and maintenance staff should determine a timeline for older infrastructure that may need to be replaced both in the short term and long term. Do pilot tests for new irrigation strategies before investing in a new system (Water.1.a).

Be sure staff charged with maintenance and management of water have regular meetings and communicate frequently to create schedules and outline responsibilities such as regularly checking equipment/technology used for watering gardens and monitoring soil moisture levels (Water.1.a).

Ensure that plant collection policies are aligned with landscape design and architecture goals. Determine your most valued plant collections and the months of the year where your water usage is highest. Plant collections that require the same amount of water should be grouped together when possible. Avoid putting plant collections that require different amounts of water adjacent to one another, especially if they are being watered by the same irrigation system or source. Divide plant collections into zones and determine which zones need the most and least water (Water.1.a).

Strategy In Action

Filoli Garden uses historical evapotranspiration data from the State of California to set irrigation schedules. Along with close monitoring by staff, this ensures water is used in the appropriate quantities and applied in a manner for efficient distribution.

Train staff that are in charge of evaluating and monitoring water quality and usage in any new irrigation or data collection procedures and methods that are more efficient. Develop a maintenance/operations plan to guide schedule and decision-making processes (Water.1.a).

Select drought tolerant and water efficient plants, especially if your garden is in an arid region with scarce water resources (Water.1.b).

Water Goal 1: Develop transparent standards for the governance and management of water and ensure this is apparent in garden's plans, policies, and operational norms.

Suggested Strategies Continued

Be aware of aquifer locations on your property and how much groundwater you are using. Develop a plan to monitor aquifer and soil moisture levels (Water.1.b).

Evaluate total water usage, rainwater usage, municipal water usage based on fiscal year, measuring by cubic meters or other standard measurements for comparison and analysis (Water.1.b).

Reach out to water-focused non-profits (watershed organizations) and local government agencies (EPA, state department of natural resources, environment & sustainability offices) to set up meetings or discussions on how your garden can collaborate with experienced professionals to reduce water consumption and improve water quality. These collaborations can be on-going and help your staff learn about creative, current, and more efficient water management strategies (Water.1.b).

For small gardens and gardens on county-owned property nearby cities, work with your district utility company. Focus on identifying your water source(s). Some of these companies will conduct a free audit and provide a report on your current irrigation system flaws, where water is coming from, and provide guidelines to increase your efficiency and repair damages (Water.1.b).

Strategy In Action

Descanso Gardens in Southern California used The Metropolitan Water District of Southern California to cut their water consumption by 65%.

Determine how your water usage and quality is currently being measured and how often (daily, weekly, monthly). Use Energy Star Portfolio Manager to track water consumption, checking regularly (Water.1.c).

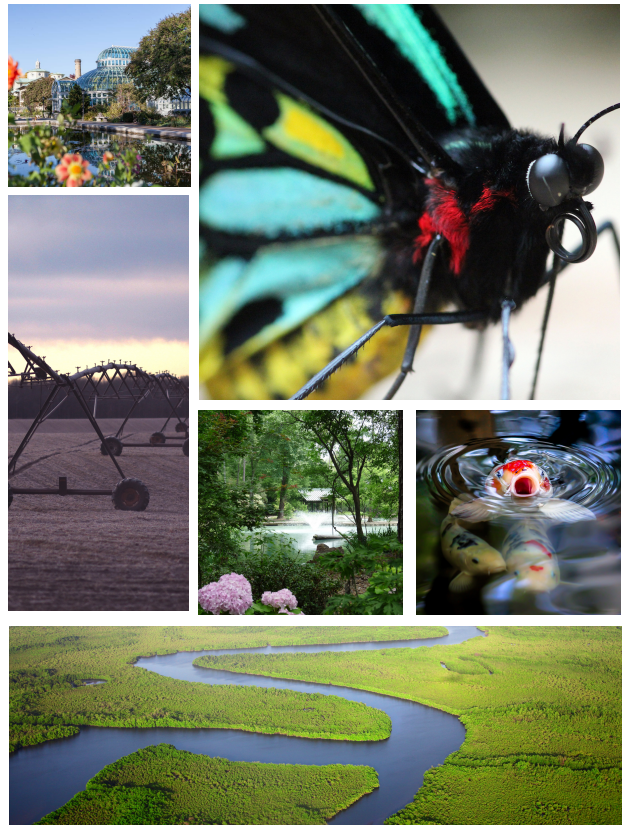
Manually water where required, ensure that your garden is watering at the most efficient times of day. Determine staff members that are responsible for when and where watering needs to take place daily (Water.1.c).

Water Goal 1: Develop transparent standards for the governance and management of water and ensure this is apparent in garden's plans, policies, and operational norms.

Suggested Strategies Continued

If applicable, work with adjacent agricultural landowners and/or neighbors to ensure your combined stormwater runoff and chemical applications are not worsening your streams, rivers, or other sources of natural water. Planned development should ensure streams have access to floodplains during heavy rainfall events to limit erosion and downstream flooding (Water.1.c).

Determine how many gallons of water are captured by rainwater harvesting and how that water is redistributed to areas of your garden. Ensure that analysis and evaluation of water retention and storage systems are meeting irrigation needs (Water.1.c).



Water Goal 2: Implement strategies that increase water resources education, reduce water consumption, and improve water quality on and off-site.

Key Performance Indicator (KPI)

a. Garden supports professional development opportunities for staff in charge of managing water on-site such as gardeners, horticulturists, groundskeepers (training opportunities include formal/informal instruction and distance learning on water resource management).

b. Garden educational/interpretative components include water conservation and quality as a theme.

c. Garden allocates funds that demonstrate long-term commitment to projects/green design features for the purposes of efficient water use, retention, flow, capture, and storage

d. Garden regularly monitors and tests the quality of natural water resources on-site and takes actions to ensure those resources are not polluted from garden activities.

Outcomes

a. Conference/symposia training fees, continuing education/course fees, partnerships with local college/university for climate related resources/tools/training/research, tuition support.

b. Display/tours on water filtration/use/management throughout garden, classes/demos that discuss water-wise gardening, volunteer programs for water conservation/quality, food related programs that emphasize water importance, role water plays in habitat restoration, and climate change content related to water conservation and management.

c. Garden allocates a portion of annual budget towards water programs/projects (or on ad hoc basis), if relevant to garden mission.

d. Garden regularly tests natural water sources on site and takes appropriate action to correct water issues.

Water Goal 2: Implement strategies that increase water resources education, reduce water consumption, and improve water quality on and off-site.

Suggested Strategies

Develop future plans to educate the public on the importance of water conservation and quality. Ensure that construction projects and infrastructure that are visible to the public are designed and built in ways that encourage responsible water management (Water.2.b).

Bioretention features such as rain gardens, curb cuts/curb extension, stormwater planter's/tree boxes, tree trenches, retention ponds/basins, and bioswales are effective ways to retain and reuse stormwater. Ditches or channels near parking lots or other paved surfaces can be used to remove silt and pollution from surface water runoff. Instead of channeling stormwater from the parking lot directly into a drainage pipe, a filter strip and bioswale can work together as a living drain to capture stormwater so that it leaves cleaner than when it entered. Pavement can be graded to direct stormwater runoff from the parking lot and the road into the planted filter strip then into the bioswale where some water infiltrates the ground, replenishing groundwater supply (Water.2.c).

Strategy In Action

Cornell Botanic Gardens created a ditch/channel with a variety of plants that cleanses water near their visitor center parking lot.

Communicate via interpretive walks and educational programs how stormwater is reused or cleansed as it travels through your property and ways visitors can emulate these actions at home. Interpret your water conservation initiatives through displays, panels, and exhibits (Water.2.b).

Use demonstration gardens to provide training to visitors, showing them a wide range of ways to reduce their water consumption and increase water quality in their community. Ensure that these demonstrations are inclusive and include strategies that are affordable for all participants (water-wise gardening) (Water.2.b).

Add or invest in more permeable surfaces. Mandate that new paving is permeable, and explore opportunities for retrofitting or rebuilding existing impervious features to make them permeable. Examples include: Parking lots, Driveways, and Pathways (Water.2.c).

Report water conservation achievements in garden publications, on garden website, and social media. Publicize and communicate to visitors all facilities that were certified (LEED) or built with water efficiency in mind (Water.2.b).

Water storage features such as cisterns and rain barrels are low-cost affordable options. Use a rain gauge to measure monthly and annual rainfall. Be sure to place your gauge out in the open so nothing blocks the rain from entering (Water.2.c).

Water Goal 2: Implement strategies that increase water resources education, reduce water consumption, and improve water quality on and off-site.

Suggested Strategies Continued

Look into installing constructed Wetlands (a wetland area in a lower area depending on the topography of a garden can serve as a detention and groundwater recharge basin). Stormwater wetlands generally are large, shallow, vegetated basins or regions designed to capture and treat stormwater runoff from nearby drainage areas, such as a parking lot or roadway. As stormwater runoff flows through the wetland, pollutants are removed when velocity is slowed and particles settle out of suspension. Nutrients are absorbed through plant roots (Water.2.c).

Work with external sources to conduct a water quality study on site and off site (nearby watersheds) (Water.2.d).

Purchase fuels, lubricants, pesticides, and fertilizer in quantities that will be used within a reasonable time to avoid the potential for environmental contamination (Water.2.d).

Track how much insecticide and pesticide products you are using. Ensure that these materials are stored properly so water contamination is less likely to occur. Develop and follow a rigorous inspection plan for underground storage tanks for fuels (Water.2.d).

Invest in green roofs. A green roof is a roof of a building that is partially or completely covered with growing media and vegetation on top of a waterproof roof membrane. Rainwater falling on the rooftop is retained in the media and then used by the plants. These can be added on one or multiple buildings/facilities in your garden (Water.2.c).

Strategy In Action

Cheyenne Botanic Gardens invested in a state of the art green roof atop their Grand Conservatory/Visitor Center, but also features a green roof in the Paul Smith Children's Village with interpretive components on drought tolerant plants.

Measure pH level regularly (assigning appropriate staff to do so) and determine key sample points where you can repeatedly measure water quality (e.g. a drainage pipe that flows water into a retention pond) (Water.2.d).

Consider developing nutrient management plans for greenhouse crops, turfgrass, and areas that require fertilization to limit the potential for nutrient contamination of surface water and groundwater (Water.2.d).

Strategy In Action

Filoli Garden has implemented water buffer zones for any application of herbicides/pesticides based on regulations. Staff will not spray or utilize a non-approved substance in the water buffer zones.

Water Goal 3: Establish a set of best practices for collecting, monitoring, and measuring water usage and quality, and use the data to adjust future water management best practices.

Key Performance Indicator (KPI)

a. Garden develops best practices for water used outdoors for landscape maintenance and plant health.

b. Garden follows best practices for indoor facilities to reduce water consumption. EXAMPLES include conservatories, greenhouses, and public facilities.

c. Garden sets a percentage goal to reduce overall water consumption annually.

Outcomes

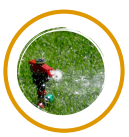
a. Garden maps/assesses current irrigation systems, divides plant collections based on water zones, completes inventory of when water infrastructure was designed and installed, invests in meters/sub-meters/probes to monitor soil moisture and temperatures, invests in smart automated sprinklers, develops a rigorous manual watering schedule.

b. Garden uses water-efficient plumbing in buildings such as low flow appliances, maintaining indoor plumbing service pressure of 60 psi, and fixtures automated to turn off when not triggered.

c. Garden reduces overall water consumption by a significant percentage (if a focus of the garden).

Suggested Strategies Continued

Install automated irrigation systems that are fully integrated with evapotranspiration monitors. Use drip irrigation for individual trees and shrubs. Sprinklers waste water by unnecessarily watering more than the plant needs and a lot is lost to evaporation. Instead, drip irrigation or a soaker hose is more precise and efficient, allowing less irrigation between plants and fewer weeds to grow (Water.3.a).



Research and look into utilizing UgMO, Toro, Rainbird, TDS, or other soil moisture based systems that are zone specific. Each zone can be tied to parameters that are set to a percent of soil moisture. Ground sensors are available that measure temperature, soil moisture, and salinity. These sensors can link and feed data into a central database that can be checked online and/or via Bluetooth by staff members (Water.3.a).

Replace or put in new and more efficient infrastructure and equipment such as pipelines that control and retain water flow and direction better, effluent sump pumps, and stream rotator heads (larger droplets for irrigation than a mist head) that can help conserve and reuse water (Water.3.a).

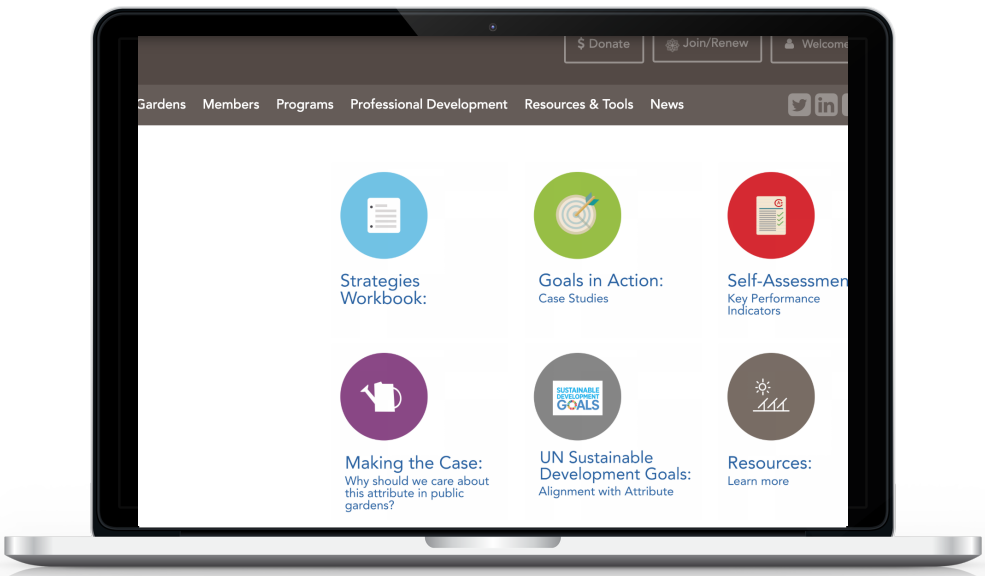
Reduce reliance on water pumps for electricity. Invest in more efficient designs such as specialized glass for greenhouses and conservatories or cooling systems that can reduce dependence on water (Water.3.b).

Install flow meters and sub-meters throughout or in certain areas of your property. Meter different garden areas to compare costs and usage. If reliant on a utility bill, track water use by specific garden areas or specify what information you need and want to make your garden more sustainable and to reach your water conservation goals (Water.3.a).

Install water-efficient plumbing fixtures in restrooms (automated sensors) and at restaurants/cafes (dishwashers) (Water.3.b).

FOR MORE INFORMATION

Visit the sustainability index attribute pages for more case studies, resources, and a self-assessment!



Go To: https://www.publicgardens.org/sustainability-index/attributes/water-quality-consumption