PROGRAM & DESIGN GUIDANCE FOR CPS DESIGN TEAMS

About Space to Grow

Space to Grow is managed by Healthy Schools Campaign and Openlands and is made possible through the financial support and partnership of Chicago Public Schools, Chicago Department of Water Management, and Metropolitan Water Reclamation District of Greater Chicago.

HEALTHY SCHOOLS
CAMPAIGN

openlands
conserving nature for life

Healthy Schools Campaign
Healthy Schools Campaign (HSC) is a nonprofit organization dedicated to making schools healthier places where all children can learn and thrive. HSC believes that health and wellness should be incorporated into every aspect of the school experience. Founded in 2002, HSC advocates for children to have better access to nutritious school food, physical activity, school health resources and clean air to shape their lifelong learning and health. HSC facilitates collaboration among students, parents, teachers, administrators and policymakers to help prepare this diverse group of stakeholders to lead change for healthier schools at the school, district, state and national levels. Visit healthyschoolscampaign.org for more information.

Openlands
Founded in 1963, Openlands protects the natural and open spaces of northeastern Illinois and the surrounding region to ensure cleaner air and water, protect natural habitats and wildlife, and help balance and enrich our lives. Openlands' vision for the region is a landscape that includes a vast network of land and water trails, tree-lined streets, and intimate public gardens within easy reach of every city dweller. It also includes parks and preserves big enough to provide natural habitat and to give visitors a sense of the vast prairies, woodlands, and wetlands that were here before the cities. Openlands believes that nature is vital to all people and that protected open space is critical for the quality of life of our region.

Table of Contents

Congratulations!

You have been selected to be part of a Space to Grow schoolyard renovation design team.

Space to Grow transforms Chicago schoolyards into beautiful and functional spaces to play, learn and be outside. The schoolyards also use special design elements to help reduce neighborhood flooding. Schoolyard transformations prioritize physical activity, outdoor learning and community engagement. The green schoolyards incorporate landscape features that capture a significant amount of rainfall, helping keep the city's water resources clean and resulting in less neighborhood flooding. It's a win for students, neighborhoods and our city's environment.

Space to Grow is managed by Healthy Schools Campaign and Openlands and is made possible through funding and leadership from Chicago Public Schools (CPS), the Chicago Department of Water Management (DWM) and the Metropolitan Water Reclamation District of Greater Chicago (MWRD).

Space to Grow strongly focuses design goals on the effective management of stormwater. The partners are working with a research team from Loyola University and the Nutrition Policy Institute at the University of California to evaluate the impact of Space to Grow schoolyards on schools, students and communities. The partners are also working with the U.S. Geological Survey (USGS) to monitor the effectiveness of the stormwater best management practices (BMPs) being used at Space to Grow schools.

SPACE TO GROW PROGRAM GOALS

Space to Grow Program Goals

Culture of Wellness

Space to Grow schoolyards are more than just new playgrounds. They are centers for a strong and vibrant community. The schoolyards contribute to a culture of wellness both inside and outside of schools, supporting the health of all students, their families, school staff and the surrounding neighborhood. Space to Grow schoolyards provide vibrant outdoor spaces for physical activity, recreation and play for CPS students and the entire community.

Connection to Nature

Space to Grow schoolyards have gardens, outdoor group seating and other special features that function as an extension of the classroom and provide environments for both structured and unstructured learning. Recent studies have shown that simply spending more time outdoors and interacting with the natural world leads to lower stress levels, improved cognitive development and higher standardized test scores. Space to Grow schoolyards provide an important daily connection to nature.

Addressing Neighborhood Flooding

Space to Grow focuses on schools and communities located in high-risk flooding areas. The schoolyard designs use green infrastructure and innovative techniques to effectively capture and manage stormwater, transforming traditional asphalt areas into beautiful and functional spaces that help address neighborhood flooding.

Designing for Space to Grow Program Goals

Space to Grow schoolyards serve as a national model for green schoolyards. Each new schoolyard design can achieve the stated wellness, nature and stormwater goals in ways that are filled with creativity and imagination. By integrating the following elements, Space to Grow will continue to be one of the nation's most innovative programs.

Nature Play

It's important to integrate features such as gardens and natural elements into the schoolyard designs to support children's outdoor play. This includes small, child-sized spaces and paths, gardens of interest to kids, and natural play equipment such as boulders for climbing or logs for balancing or running on. Recent research has shown benefits to students with exposure to nature and green spaces in their school life, including:

- Students who can merely see green space from the classroom have reduced stress levels and higher test scores.
- Exposure to native plants can help strengthen the immune system.
- Children play more creatively and cooperatively in natural areas, resulting in improved problem solving skills, and improved social and emotional learning.

- Engagement with nature improves fine motor, gross motor and sensory skills.
- Nature play provides diverse learners with different learning and developmental opportunities.

For more information about designing for natural play, visit the Natural Learning Initiative: naturalearning.org.

Opportunities for Art

Space to Grow schoolyards should be places where members of the school community are able to express themselves artistically while adding color during the winter months. Artistic expression can take many forms in the schoolyard, such as a wooden fence painted by the community, collaborative mosaic projects on a raised garden bed or student performances on an outdoor stage. Built-in art elements are encouraged, and they should be responsive to the community's interests and talents.

While these elements may not be designed before the Space to Grow construction drawings go out to bid, locations can be sited and foundations called for to support the installation of these features in the future.

Green Infrastructure

Each Space to Grow schoolyard must be designed to meet stormwater management goals for both rate and volume capture that well exceed the city and regional codes. For Space to Grow projects, design teams are asked to design to a standard release rate of 0.15 cfs per acre for onsite detention and a goal of 3 inches or better of volume capture as retention. The total retention capacity must be greater or equal to 150,000 gallons, as calculated using MWRD's Design Retention Capacity Calculator, included on page 37. This means relying on green infrastructure to capture and retain stormwater on site, beyond the usual detention requirements.

The design should facilitate the capture of water the entire property, including roofs, parking lots and other traditional hard surfaces through the use of stormwater best management practices (BMPs) such as rain gardens, permeable asphalt and pavers and other porous surfaces, as well as underground basins. Design teams are encouraged to be innovative in the use and integration of these green infrastructure elements within their designs, and may consider exposing or including these elements throughout the schoolyard. Schoolyard designs that create educational opportunities for the school community to visually learn about how the schoolyard manages stormwater are encouraged; these can include day-lighted and temporarily pooling water bodies created by stormwater. We have included two examples of innovative stormwater management at Space to Grow schoolyards.

BMP Resources

- Appendix C of the City of Chicago's Stormwater Ordinance Manual: spacetogrowchicago.org/stormwater-manual
- Delta Institute Toolbox: delta-institute.org/tools/#section-publications
- MWRD Design Retention Capacity Calculator, page 37

SCHOOLYARD PLANNING + DESIGN

School Community Planning and Design Meetings

As a member of the CPS Architect of Record (AOR) team for a Space to Grow project, you have the opportunity to participate in meaningful projects that fully engage and respond to the needs of the entire school community—including the students, parents, teachers, staff, administration and community members.

Space to Grow program partners encourage a high level of creativity in all phases of design, and have set up an engagement process that allows for input from the entire school community at all phases. In this way, a Space to Grow project is more about the inventive, innovative and thoughtful integration and use of Space to Grow program goals and desired elements than simply the arrangement of required scope items. This document serves to introduce you to the Space to Grow program and the important planning and engagement efforts made to achieve the Space to Grow goals.

Schoolyard planning and design takes place over a series of two or three planning days at the school with each of the five school community groups:

- students
- faculty/staff
- administration
- parents
- community members and community organizations

Each school will have a designated School Planning Coordinator who will facilitate this process. The process includes brainstorming, participatory mapping and visual preference exercises to gauge the school community's priorities and interests, followed by review of and input on conceptual designs presented by the AOR team. The meetings are typically open house style and AOR teams are encouraged to participate.

Schoolyard Design Guidelines

Space to Grow schoolyards are designed with and for each unique school community. As such, there is no standard or prescriptive Space to Grow schoolyard. However, several elements are encouraged to help meet the Space to Grow mission and goals.

It is important to note this is neither an exhaustive list, nor is it a guarantee that all components will be included within the Space to Grow design, as all Space to Grow schoolyards should respond to the unique priorities of their particular community. Design teams should be mindful of CPS' maintenance requirements when selecting materials and furnishings.

Raised Vegetable Garden Beds

To support Space to Grow program goals of health and wellness, most Space to Grow schoolyard projects should include a raised bed vegetable garden unless a school specifically indicates that they do not want one during Space to Grow school community planning. Raised vegetable beds should be located near a water source in a location on the schoolyard that receives eight hours of direct sun. If a schoolyard does not currently have a working water source, one should be added to the project scope.

Native Gardens, Trees and Shrubs

Each Space to Grow schoolyard should incorporate native perennial gardens, as well as native trees and shrubs throughout the schoolyard to increase learning opportunities, biodiversity and habitat in the schoolyard and surrounding neighborhood. Please see the attached Appendix for the list of approved plants for Space to Grow schoolyards. AOR teams should consider the following items and issues to ensure that the schoolyard design meets the native plant and stormwater goals:

- Use of deep-rooted native plants to maximize stormwater capture will require targeted soil depths and may increase demolition needs/costs.
- Incorporating flowering plants (including trees and shrubs) will add the benefits of attracting pollinators and providing habitat for birds and insects.
- Incorporating at least one monarch butterfly habitat area, which must include common plants that serve as a food source, is highly encouraged.
- Use of sturdy plants, like shrubs, is preferred in gardens near playgrounds or sports fields and other high-traffic areas, such as outside main entrance doors and along high-traffic footpaths. Careful consideration should be given to the adjacent circulation routes, and plant selection should prevent traffic in and compaction to planting beds. Consider limiting the use of landscaped areas at the ends of sports fields, as they are extremely high-traffic.

- The plant/soil relationship is critical for the success of the native plantings. While organic matter is desirable, research indicates that native plantings perform best with a leaner mixture of soil containing less organic matter. AOR teams should think through the specifications and soil mixtures carefully as part of the overall design.
- Natural features should be open and interactive, and potentially serve multiple functions. For example:
    - Maintenance pathways through the perennial gardens and seating areas could be surrounded by bushes and understory trees to provide shade and a sense of exploration.
    - Seating elements such as boulders or logs may also serve as play structures that encourage kids to test balancing skills.

Outdoor Classrooms

Space to Grow schoolyards should have an area with seating for at least 32 students to hold class outdoors. The seats should be close enough that all students can see and hear instruction from a teacher at one central point. The design team should consider the following when designing an effective outdoor classroom:

- Locate classrooms as far away from the playgrounds and sports fields as possible to reduce undesirable noise and distractions.
- Select a quiet location not alongside a busy street or near a busy schoolyard entrance.
- Consider using popular seating options such as amphitheater style classrooms and outcropping stones. Other potential seating materials include large rocks, logs and tree stumps.
- Include a feature to demarcate the outdoor classroom as such, rather than a few benches or stones grouped together.

Play Structures for All Ages

Any new playground structures and designs shall follow the approved CPS guidelines for playground design including age appropriate play spaces, equipment types and approved vendors, fall protection, shade and circulation requirements. The school community should provide input on what types of play equipment they would like to see, as well as the color of the equipment.

Interpretive Signage

In order to highlight some of the green infrastructure components in the schoolyard and to continually educate the school community about stormwater management, all Space to Grow schoolyards will include interpretive signs to explain how the various schoolyard features work. The signage specifications and graphics will be provided to design teams by CPS during the construction documentation process.

School Culture

Each school has its own unique culture, which should be reflected in the schoolyard.

School characteristics such as their mascot, school's namesake, area of focus (such as being a Science, Technology, Engineering and Mathematics (STEM) school or Fine Arts Academy), or their primary after-school activities and school colors should be considered when creating the initial schoolyard designs. In addition, AOR teams may want to take design cues from the larger community to create a sense of connection and identification to the adjacent neighborhood.

School Traffic Patterns

Understanding the flow of school traffic is essential to creating a successful schoolyard design and creating access opportunities for all. The school will provide detailed notes about how they currently use their schoolyard; this will identify areas where students line up to enter and exit the building as well as operations such as trash and recycling pick up. Any new design should take these established practices into account and allow the school to maintain or improve their current flow of traffic. AOR teams should give careful consideration to the effects and impacts of their proposed circulation patterns on the site; for example, unfenced native gardens are likely to be trampled if placed in the path of least resistance from the school building to the school's recess area.

Safety Considerations

Space to Grow schoolyards are meant to be open and inviting to the entire school community, and must be accessible to the greater community during non-school hours. The design of the schoolyard is extremely important because it strongly influences actual and perceived crime, which will affect the overall use and success of the schoolyard.

AOR teams should keep in mind that common solutions to address security concerns, such as tall fences and locked gates, are contrary to the Space to Grow mission, which supports activating spaces to encourage community engagement and positive loitering to keep the schoolyard safe.

It is important to consider safety issues in all stages of the planning process. The AOR team should understand and be able to effectively communicate the following issues when designing the schoolyard for safety:

- Spaces with activity generators, such as sports fields, experience less crime than unprogrammed spaces.
- Selected landscape features should not inhibit any security or surveillance measures.
- Research indicates that a lack of route and circulation choices increases the fear of crime, so designs should avoid isolated park amenities and paths.
- Consider potential unintended uses of site materials, such as gravel for pathways or smaller rocks for seating elements, due to their potential use as projectiles or other roles in vandalism.

Resources

- National Guidelines: Nature Play and Learning Places, by Robin Moore
- Asphalt to Ecosystems, by Sharon Gamson Danks
- Crime and Planning, by Derek Paulsen
- Safescape: Creating a Safer Physical Environment, by Dean Brennan

INNOVATIVE STORMWATER DESIGN CASE STUDIES

The outdoor classroom is constructed with porous unit paving.

CASE STUDY: VIRGIL GRISSOM ELEMENTARY

Grissom Elementary was one of the first four completed Space to Grow schoolyards, opened in fall 2014. The majority of this school's 3.7 acre site was impervious surface before the Space to Grow transformation. In addition to the building, which has a 21,000 square-foot footprint, there was an approximately 124,000 square foot asphalt parking lot and "play area" included in the program. The project's budget was not sufficient to transform all of this asphalt into impervious surface. However, runoff from over half the site was managed by the improvements, resulting in zero discharge from the treated portion of the site up to a 2-year event.

About one-third of the asphalt (38,000 sf) was replaced with a combination of green infrastructure elements, including:

· permeable asphalt basketball courts

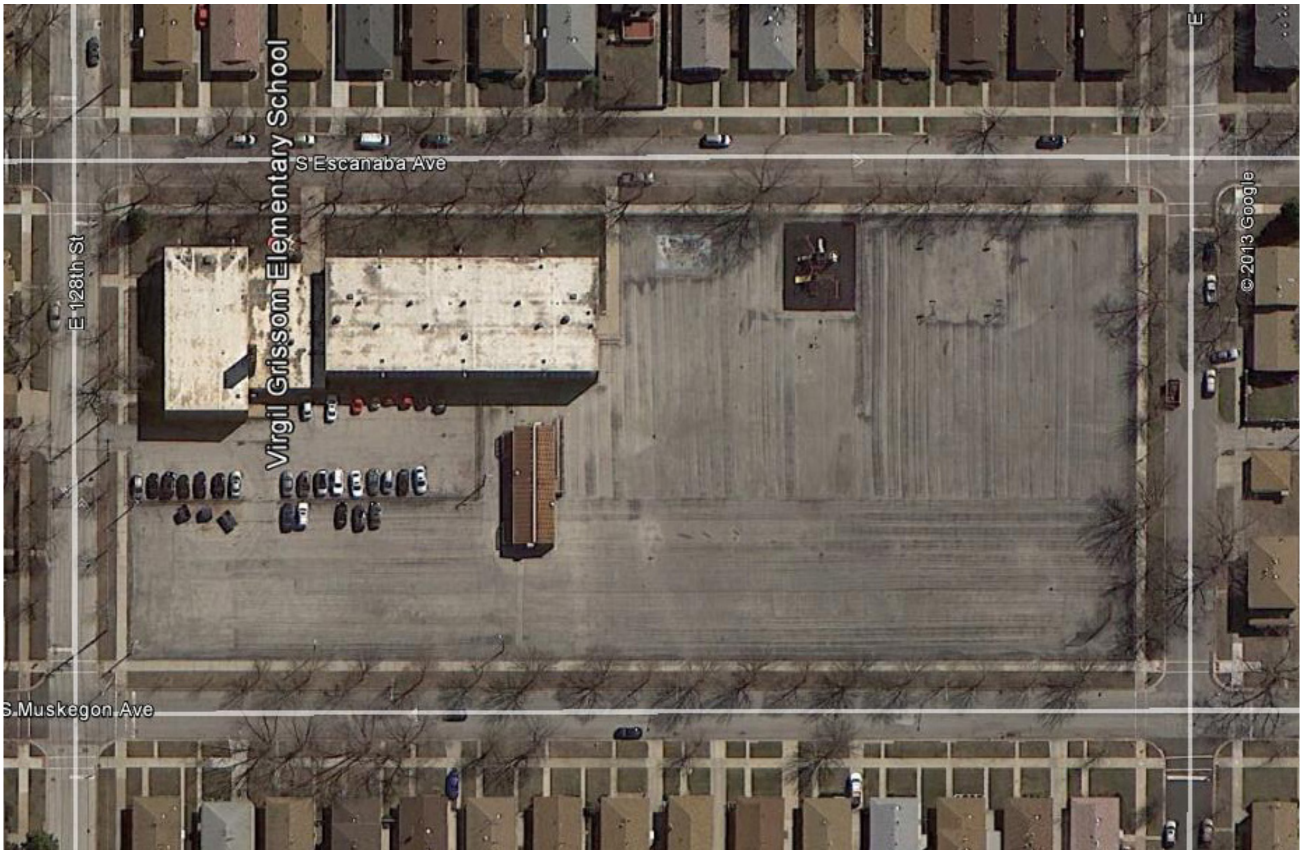
· permeable rubber play surfaces

· porous unit paving outdoor classrooms

· permeable artificial turf play area

· planted bioretention butterfly gardens

Beneath all of these surfaces is a continuous layer of open-graded stone where runoff from the school site is filtered, cooled and detained. The project benefits from relatively high infiltration rates due to the presence of sandy subgrade soils. As a result, a high amount of stormwater volume reduction is achieved. The team capitalized on this feature and redirected the runoff from much of the existing asphalt surface that remains into these underground gravel storage areas. The team considered capturing the runoff from the building's roof, but the existing arrangement that combines roof runoff with wastewater flow made that impractical. A single custom 4" vortex restrictor provides the necessary passive control for the system, which exceeds the standard rate control requirements and almost doubles the code requirements for volume control (3,440 cubic feet were required and 6,790 cubic feet were provided).



Virgil Grissom Elementary: Before Schoolyard Transformation

Virgil Grissom Elementary: After Space to Grow Schoolyard Transformation

Stepped stone channel directs roof runoff into the bioretention area.

CASE STUDY: OROZCO COMMUNITY ACADEMY

Completed in fall 2015, Orozco Community Academy sits on a 2.3 acre site in the historic Pilsen neighborhood. The 54,000 square foot building was recently developed (1999), but its stormwater management system relied on outdated methods of managing rainwater. The design for the previous site backed rainwater runoff from the roof and asphalt parking area into a grassed detention basin in the northeast corner of the site where it was stored at the surface. Since the detention basin did double duty as the only playground space on site, this resulted in a frequently muddy and very messy play space for the children.

The new design for the school site replaces the large asphalt parking lot with a smaller one constructed of porous unit pavers. Also added is a permeable rubber playground, permeable artificial turf, and a vegetated bioretention butterfly garden. Underlaying all of these surfaces is a layer of open-graded gravel base which provides filtering, cooling and detention of stored rainwater. The presence of lower permeability soils on the site prevented the high levels of infiltration that were achieved at the Grissom site. However, the system was designed to provide infiltration to the degree feasible given the soil constraints.

In addition, the adjacent building's roof runoff is filtered by the Space to Grow schoolyard's bioretention area before it is detained in the underground gravel layer. The bioretention plants and soils provide filtration of sediments and other material prior to draining to the gravel storage layer. Although the site is within the combined sewer area of the City, filtration continues to be an important element of the system to increase the longevity of the gravel and limited infiltration capacity of the subgrade soils. The challenge with this project was that the outgoing roof drain from the building was too low to daylight it at the surface of the bioretention basin. The solution that the team devised was a "roof drain diverter" structure which has a pipe restrictor that backs the water up to a higher elevation where it can discharge into the bioretention area. The diverter structure has a very small drain down pipe that allows the diverter structure to drain between rain events. The discharge of rainwater from the roof is highlighted by a stepped stone channel that directs the runoff and dissipates the flow.

Orozco Community Academy: Before Schoolyard Transformation

Orozco Community Academy: After Space to Grow Schoolyard Transformation

APPROVED PLANTING LISTS

Approved Planting Lists

	PLANTING GUIDELINES FOR AOR/EOR TEAMS
1	Plant Schedules for Space to Grow projects shall have one schedule for the areas delineated for contractor installation and one schedule for the areas delineated for community installation. Both schedules and planting areas shall be clearly marked and easily identifiable in Construction Documents.
2	Unless specifically indicated otherwise by the individual school, Space to Grow plant Lists shall be derived from the Space to Grow Approved Planting List.
3	Planting Areas shall have no more than an additional 10-15 perennial species.
4	Containerized perennial plant sizes must be no smaller than gallon size listed in drawings, with spacing at maximum 15" O.C. Should Value Engineering be required, all plants sizes will be reduced to no smaller than quart size containers with spacing no more than 12" O.C. No plugs will be specified for Space to Grow projects.
5	For all Space to Grow tree plantings located in the parkway of a school, if any, please refer to CDOT and BOF species lists and size requirements.
6	Plant beds / drifts shall contain no more than 3 species per bed / drift.
7	Plant beds / drifts shall contain no less than 25 plants per species and no more than 75 plants per species.
8	Due to maintenance, plant areas shall be mainly comprised of shrubs and understory/ ornamental trees with perennials used in focal areas and as necessary as accents.
9	Perennial selections for raingardens are based on the ability of the soil to retain moisture for prolongued periods. Should a free draining soil be used in conjunction with traditional sewer infrastructure, plants for rain garden areas shall be selected from non-rain garden sections provided for each growing condition.
10	Openlands will review and approve all substitution requests for species, size, root/container of selected species.

Approved Planting List: Perennials

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
ACMI	Achillea millefolium	Yarrow	Full Sun		X	Summer	2.5'
ALCE	Allium cernuum	Nodding Pink Onion	Full Sun, Part Shade	X	X	Summer	1.25'
AMTA	Amsonia tabernaemontana	Bluestar	Full Sun			Spring	2.5'
AQCA	Aquilegia canadensis	Columbine	Part Shade, Full Shade	X		Spring	2.5'
ASIN	Asclepias incarnata	Swamp Milkweed	Full Sun	X	X	Summer	4.5'
ASSU	Asclepias sullivantii	Sullivan Milkweed	Full Sun		X	Summer	2.5'
ASTU	Asclepias tuberosa	Butterfly Milkweed	Full Sun		X	Summer	1.5'
ATFI	Athyrium filix-femina	Lady Fern	Full Shade			N/A	2.5'
BALE	Baptisia alba	Wild Indigo	Full Sun		X	Spring	3.5'
COLA	Coreopsis lanceolata	Lanceleaf Coreopsis	Full Sun		X	Spring/Summer	1.5'
COPA	Coreopsis palmata	Prairie Coreopsis	Full Sun		X	Spring/Summer	2'
DRMA	Dryopteris marginalis	Wood Fern	Part Shade, Full Shade			N/A	2'

Approved Planting List: Perennials

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
ECPA	Echinacea pallida	Pale Purple Coneflower	Full Sun		X	Summer	2'
ECPU	Echinacea purpurea	Purple Coneflower	Full Sun		X	Summer	3'
ERYU	Eryngium yuccafolium	Rattlesnake Master	Full Sun			Summer/Fall	4'
EUFI	Eupatorium fistulosum	Tall Joe Pye Weed	Part Shade		X	Summer/Fall	6'
EUPM	Eupatorium maculatum	Spotted Joe Pye Weed	Full Sun, Part Shade	X	X	Summer/Fall	5'
EUCO	Euphorbia corollata	Flowering Spurge	Full Sun, Part Shade			Summer	3'
EUMA	Euphorbia maculata	Spotted Spurge	Full Sun			Summer/Fall	.5'
EURM	Eurybia macrophylla	Bigleaf Aster	Full Shade	X		Summer/Fall	3'
FRVI	Fragaria virginiana	Wild Strawberry	Full Sun, Part Shade			Spring	.5'
GEMA	Geranium maculatum	Wild Geranium	Part Shade, Full Shade	X	X	Spring	2'
HEAU	Helenium autumnale	Dogtooth Daisy	Full Sun	X		Fall	4'

Approved Planting List: Perennials

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
HEVI	Heuchera villosa, var. Atropurpurea	Maple Leaved Alum Root	Part Shade			Summer/Fall	2'
IRVI	Iris virginica shrevei	Shreve's Iris	Full Sun, Part Shade	Rain Garden Only		Summer	2'
LIAS	Liatris aspera	Gayfeather / Dense Blazingstar	Full Sun		X	Fall	2.5'
LIPY	Liatris pycnostachya	Blazingstar	Full Sun	X	X	Summer	3'
LISP	Liatris spicata	Gayfeather / Dense Blazingstar	Full Sun	Rain Garden Only		Summer	3'
LOSI	Lobelia siphilitica	Great Blue Lobelia	Full Sun, Part Shade	Rain Garden Only		Summer/Fall	2.5'
MAST	Matteuccia struthiopteris	Ostrich Fern	Part Shade, Full Shade	X		N/A	4'
MIRI	Mimulus ringens	Monkey Flower	Full Sun, Part Shade	X		Summer/Fall	2'
MOFI	Monarda fistulosa	Wild Bergamot	Full Sun, Part Shade	X	X	Summer/Fall	3'
OSCL	Osmunda claytoniana	Interrupted Fern	Part Shade, Full Shade			N/A	2.5'
PAIN	Parthenium integrifolium	Wild Quinine	Full Sun			Summer/Fall	3'

Approved Planting List: Perennials

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
PEDI	Penstemon digitalis	Foxglove Beard Tongue	Full Sun, Part Shade		X	Spring	4'
PHDI	Phlox divaricata	Wild Blue Phlox	Part Shade, Full Shade	X	X	Spring	2'
PORE	Polemonium reptans	Jacob's Ladder	Part Shade, Full Shade	X		Spring/Summer	1.5'
POBI	Polygonatum biflorum	Solomon's Seal	Part Shade, Full Shade	X		Spring	2'
POAC	Polystichum acrostichoides	Christmas Fern	Part Shade, Full Shade			N/A	2.5'
PYVI	Pycnanthemum virginianum	Mountain Mint	Full Sun		X	Summer/Fall	2.5'
RAPI	Ratibida pinnata	Prairie Coneflower	Full Sun	X		Summer	4'
RUFU	Rudbeckia fulgida	Black-Eyed-Susan	Full Sun		X	Summer/Fall	2.5'
RUHI	Rudbeckia hirta	Black-Eyed-Susan	Full Sun, Part Shade		X	Summer/Fall	2'
RUHU	Ruellia humilis	Wild Petunia	Full Sun			Late Spring/Fall	1.5'
SACA	Sanguinaria canadensis	Bloodroot	Full Shade			Spring	.5'
SITE	Silpheum terebinthinaceum	Prairie Dock	Full Sun			Summer/Fall	4'

Approved Planting List: Perennials

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
SONE	Solidago nemoralis	Field Goldenrod	Full Sun		X	Summer/Fall	1.5'
SYCO	Symphyotrichum cordifolium	Common Blue Wood Aster	Part Shade, Full Shade		X	Summer/Fall	3'
SYLA	Symphyotrichum laeve	Smooth Blue Aster	Full Sun, Part Shade		X	Fall	2.5'
SYNO	Symphyotrichum novae-angliae	New England Aster	Full Sun, Part Shade	X	X	Summer/Fall	4'
SYOO	Symphyotrichum oolentangiense	Sky Blue Aster	Full Sun		X	Fall	2.5'
TRBR	Tradescantia bracteata	Prairie Spiderwort	Full Sun			Summer	1.5'
TROH	Tradescantia ohiensis	Bluejacket	Full Sun, Part Shade, Full Shade	X		Spring/Summer	2.5'
VEST	Verbena stricta	Hoary Vervain	Full Sun			Late Spring/Fall	3'

Approved Planting List: Grasses and Sedges

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
BOCU	Bouteloua curtipendula	Sideoats Grama	Full Sun			Summer	2'
CALC	Calamagrostis canadensis	Blue Joint Grass	Full Sun	X		Summer	2.5'
CABI	Carex bicknellii	Copper Shouldered Oval Sedge	Full Sun, Part Shade			Spring	1.5'
CAPE	Carex pensylvanica	Pennsylvania Sedge	Part Shade, Full Shade			Spring	.75'
CARS	Carex sprengelii	Long Beaked Sedge	Full Sun, Part Shade, Full Shade			Spring	2.5'
CAVU	Carex vulpinoidea	Fox Sedge	Full Sun, Part Shade	X		Spring	1.5'
DECE	Deschampsia cespitosa	Tufted Hairgrass	Part Shade			Summer/Fall	2.5'
ELHY	Elymus hystrix	Bottlebrush Grass	Full Sun			Fall	3'
ELHY	Elymus hystrix	Bottlebrush Grass	Part Shade			Fall	3'
ERSP	Eragrostis spectabilis	Purple Love Grass	Full Sun			Summer	2'
KOMA	Koeleria macrantha	June Grass	Full Sun			Summer	2'
PAVI	Panicum virgatum	Switchgrass	Full Sun	X		Summer/Fall	3.5'

Approved Planting List: Grasses and Sedges

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	HEIGHT
SCSC	Schizachyrium scoparium	Little Blue Stem	Full Sun			Fall	3'
SONU	Sorghastrum nutans	Indian Grass	Full Sun			Fall	4'
SPPE	Spartina pectinata	Prairie Cordgrass	Full Sun	X		Summer	5'
SPHE	Sporobolus heterolepis	Prairie Dropseed	Full Sun			Summer/Fall	2.5'

Approved Planting List: Shrubs

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	FRUIT SEASON	MIN. SIZE	ROOT/ CONTAINER	MAX. SPACING	HEIGHT
AMFR	Amorpha fruticosa	Indigo-Bush	Full Sun	X		Spring	Summer	3' Ht.	B&B or 5 Gal.	5' O.C.	6'
ARUU	Arcto-staphylos uva-ursi	Bearberry	Full Sun, Part Shade			Spring/ Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	1'
ARME	Aronia melanocarpa	Black Chokeberry	Full Sun, Part Shade, Full Shade			Spring	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	4'
CEAM	Ceanothus americanus	New Jersey Tea	Full Sun, Part Shade		X	Spring	Summer	3' Ht.	B&B or 5 Gal.	5' O.C.	3'
CEPO	Cephalanthus occidentalis	Buttonbush	Full Sun, Part Shade	X	X	Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	6'
CORA	Cornus racemosa	Gray Dogwood	Full Sun, Part Shade, Full Shade	X		Spring/ Summer	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	8'
COSE	Cornus sericea	Red Twig Dogwood	Full Sun, Part Shade	X		Spring/ Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	6'
FOGA	Fothergilla gardenii	Dwarf Fothergilla	Full Sun, Part Shade			Spring	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	3'
HYKA	Hypericum kalmianum	St. Johns Wort	Full Sun, Part Shade	X		Summer	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	3'
LIBE	Lindera benzoin *	Spicebush	Part Shade		X	Spring	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	7'
MOPE	Morella pensylvanica *	Bayberry	Full Sun, Part Shade			Spring	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	7'
PHOP	Physocarpus opulifolius	Ninebark	Full Sun, Part Shade	X		Spring/ Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	6'
RHAR	Rhus aromatica *	Fragrant Sumac	Full Sun, Part Shade			Spring	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	4'
RHGL	Rhus glabra *	Smooth Sumac	Full Sun, Part Shade			Spring/ Summer	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	12'
RHTY	Rhus typhina *	Staghorn Sumac	Full Sun			Summer	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	17'

*Dioecious: Males needed for female fruit

Approved Planting List: Shrubs

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAIN GARDENS	SUITABLE FOR BUTTERFLY GARDENS	BLOOM SEASON	FRUIT SEASON	MIN. SIZE	ROOT/ CONTAINER	MAX. SPACING	HEIGHT
SYAL	Symphori-carpos albus	White Snowberry	Full Sun, Part Shade			Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	5'
VIDE	Viburnum dentatum	Arrowwood	Full Sun			Spring/ Summer	Summer/Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	8'
VITR	Vibunrum trilobum	Highbush Cranberry	Full Sun, Part Shade	X		Spring	Fall	3' Ht.	B&B or 5 Gal.	5' O.C.	8'

*Dioecious: Males needed for female fruit

Approved Planting List: Understory / Ornamental Trees

CODE	BOTANIC NAME	COMMON NAME	LIGHT CONDITIONS	SUITABLE FOR RAINGARDENS	SUITABLE FOR BUTTERFLY GARDENS	MIN. SIZE	ROOT / CONTAINER
AMAR	Amelanchier arborea	Shadblow Serviceberry	Part Shade	X		6' tall	B&B
AMCA	Amelanchier canadensis	Shadblow Serviceberry	Full Sun	X		6' tall	B&B
AMLA	Amelanchier laevis	Allegheny Serviceberry	Full Sun, Part Shade			6' tall	B&B
CACA	Carpinus caroliniana	American Hornbeam	Part Shade	X		6' tall	B&B
CECA	Cercis canadensis	Redbud	Full Sun, Part Shade			6' tall	B&B
COAL	Cornus alternifolia	Alternate Leaved Dogwood	Full Sun, Part Shade	X		4' tall	B&B
CRCG	Crataegus crus-galli	Cockspur Hawthorn	Full Sun	X		2" Cal or 8' tall	B&B
HAVI	Hamamelis virginiana	Common Witchhazel	Full Sun, Part Shade, Full Shade			6' tall	B&B
JUVI	Juniperus virginiana	Eastern Red Cedar	Full Sun			4' tall	B&B
MAVI	Magnolia virginiana	Sweetbay Magnolia	Full Sun			6' tall	B&B
MAIO	Malus ioensis	Crab Apple	Full Sun			2" Cal or 8' tall	B&B
OSVI	Ostrya virginiana	Hop Hornbeam	Full Sun, Part Shade			6' tall	B&B
VIPR	Viburnum prunifolium	Blackhaw Viburnum	Full Sun, Part Shade, Full Shade			6' tall	B&B

MWRD DESIGN RETENTION CAPACITY CALCULATOR

The Stormwater Engineering Department at the Metropolitan Water Reclamation District of Greater Chicago has developed the following calculator to assist the AOR teams with calculating each schoolyard's Design Retention Capacity (DRC). Following is a sample page from the form, which AOR teams must fill out and submit during the design process. An electronic copy of the form will be provided to the AOR team.

MWRDGC

Stormwater Retention Calculations for Design Retention Capacity

Appendix ____

Name of Project: ______________________

Address: ______________________

Plan Revision Used: ______________________

Calculation Revision: v8h-50

KEY
user input
calculated

Note:

For questions or a digital copy, please contact MWRD Engineers:
John Watson: John.Watson@mwrd.org, 312.751.3263
Jim Yurik: James.Yurik@mwrd.org, 708.588.3608
Please reference all user-input data using Reference Column

Retention Area #1 (______________________________)

					Reference (Page#, report, etc)
6	Design soil infiltration rate	i		in/hr	
7	Elevation of bottom of BMP (the infiltration surface) IF there is no underdrain, OR the lowest underdrain invert elevation	$ELEV_{BMP}$		feet	
8	Groundwater elevation	$ELEV_{GW}$		feet	
9	Depth to seasonal groundwater (Must be 2 feet or greater, or 3.5 feet or greater if draining to combined sewer)	D_{GW}	0.0	feet	
	Section 3 BMP Specifications				Reference (Page#, report, etc)
10	Dimensions of the bioinfiltration facility (length, width, or area)	L		feet	
		W		feet	
		A_{BMP}		square feet	
11	Depth of prepared soil	D_1		feet	
12	Prepared soil porosity (0.25 maximum unless detailed materials report provided)	P_1		[unitless]	
13	Depth of underlying aggregate (optional)	D_2		feet	
14	Aggregate porosity (0.38 maximum unless detailed materials report provided)	P_2		[unitless]	
15	Surface storage volume (provide supporting calculations, max depth 12 inches) (=6" for projects with safety-limited surface storage (CPS))	V_{AIR}		cubic feet	
16	Total media void volume = $A_{BMP} * [(D_1 * P_1) + (D_2 * P_2)]$	V_{SOIL}	0	cubic feet	
	DRC Volume Including Infiltration				Reference (Page#, report, etc)
20	Depth of Prepared Soil Below Drain (if drained, if not drained, total depth of prepared soil)	D_3		feet	
21	Soil Void Volume Below Drain = (A_{BMP}*D_3*P_1)	V_3	0	cubic feet	
22	Depth of Prepared Aggregate Below Drain (if drained, if not drained, total depth of prepared aggregate) (must be less than or equal to total depth, D_1+D_2)	D_4		feet	
23	Aggregate Void Volume Below Drain = (A_{BMP}*D_4*P_2)	V_4	0	cubic feet	
24	6-hr infiltrated volume = (i*A_{BMP}-5[hrs]/12[in/ft])	V_5	0	cubic feet	
25	50% of Volume Above Drain = 0.5*(VSOIL-V4-V3)	V_6	0	cubic feet	
26	Total Retained and Infiltration Volume ($V_3+V_4+V_5+V_6+V_{AIR}$)	V_{DRC}	0	cubic feet	
27	V_{DRC} = Above [in Gallons]	V_{DRC}	0	gallons	

Please reproduce and add for multiple retention areas, 7 additional provided below

Note: