Pollinator Habitat

"If the bee disappeared off the surface of the globe, then man would have only four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man."

-Albert Einstein

Pollinators are very important to the reproductive processes of many plants, including many important agricultural products. Bees are the most productive pollinators, having contributed over 14 billion dollars of value to US crop production according to a 1999 study by Cornell University. Other pollinators, such as butterflies, hummingbirds, and bats, provide other ecosystem benefits including plant-biodiversity, pest management, and aesthetic appeal.

Maryland Pollinators



Figure 1. Ruby-Throated Hummingbird (left); Baltimore **Checkerspot (right)** Source: Wikimedia commons (left); Joshua Mayer-Flickr (right)

Maryland is home to a large variety of pollinators, most important of which are the bees. There are over 400 different species of bees, as well as over 150 different species of butterflies. In fact, our state insect is the Baltimore Checkerspot Butterfly. Ruby-Throated Hummingbirds are also a common sight throughout the eastern United States. Other pollinators in this region include ants, beetles, flies, moths, and wasps.

Habitat Loss & Population Decline

Troughout the United States, populations of pollinators are on decline. The exact causes for the declines are not fully understood, but habitat loss and degredation (from deer browsing and/or pesticide use), and succes-



Figure 2. Honeybee Source: Wikimedia Commons

sion of open wetlands to forest or dense shrubland are all certainly partly to blame.



Figure 3. Monarch Butterfly Pupa Source: Wikimedia Commons

Habitat Requirements

Pollinators need areas to find food, shelter, nesting-sites, and safety from human related activities like spraying, tilling, and mowing; during spring summer and fall. Most importantly they need ample sources of nectar and pollen. It is necessary for there to be at least .5 acres of contiguous habitat in order for the previously stated needs to be met.

Maintenance

Pollinator meadow habitats are very fragile ecosystems, so maintenance must be done carefully and regularly. Mowing, burning, or herbicide applications must be conducted outside of the nesting season, usually between May and July. Removal of invasive and successive species must be performed, especially during the first few years while the flowering plants and grasses are becoming established.

Plant Material





Figure 7. Wildflower Meadow Source: Creative Commons



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- 1. Aclepia tuberosa Butterfly Milkweed
- 2. Pychnanthemum spp. Mountain Mint
- 3. Eutrochium fistulosum Joe Pye Weed
- 4. Chelone glabra White Turtlehead





Biorentention

A bioretention is a filtration system that treats runoff by passing it through a filter bed mixture of sand, soil, and organic matter. It is often refers to a vegetated basin that uses surface storage, plants, to treat, detain, and retain stormwater runoff.

The primary component of a bioretention practice is the filter bed, which has a mixture of sand, soil, and organic material as the filtering media with a surface mulch layer.

Components and Cross Section of Bioretention



Figure 1. Components of Bioretention https://www.pwdplanreview.org/manual/chapter-4/4.1-bioinfiltration-bioretention



Figure 2. Bioretention Typical Cross Section https://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/ Ch3.5Bioretention_0.pdf

Different Sizes of Bioretention

able 2				
Design Factor	Micro-Bioretention	Bioretention Basins	Urban Bioretention	
Maximum Contributing Drainage Area	0.5 acres	2.5 acres	2.5 acres	
Typical Applications	Individual rooftops Driveways	Parking lots Commercial rooftops	Expanded tree pits Curb extensions Foundation planters	
Vegetations	Turf, herbaceous, shrubs, or trees			
Components of Fiter Bed	A mixture of sand(85% to 88%), soil (8% to 12%), and organic material(1% to 5%) as the filtering media with a surface mulch layer(2 to 3 inches).			



Figure 2. Micro-Bioretention https://twitter.com/hashtag/microhioretention



Figure 4. Urban Biorwtention Stormwater Planter City of Portland, OR



Figure 1. Bioretention https://twitter.com/hashtag/microbioretention

Benefits

Environmental Benefits:

Bioretention can increase the quality of stormwater though capture runoff and clean it. It also can provide a habitat for wildlife and native plants, improve air quality, reduce energy use, and mitigate urban climates.

Economical Benefits:

By installing a bioretention near the water source, it can reduce the installation of the stormwater drainage infrastructure.





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Standards

Soils

Soil condition doesn't constrain the installation of bioretention, but it determines whether an underdrain is needed.

Hydrologic Soil Group (HSG) C or D usually require an underdrain, HSG A and some B soils do not need an underdrain.

Soil test is requirement, in order to determine if an underdrain is needed. If the minimum infiltration rate > 1/2 inch per hour for micro-bioretention and > 1 inch/ per hour for bioretention or urban bioretention is no need to install an underdrain.

Slope

Bioretention is best applied when the grade of contributing slopes is greater than 1% and less than 5%.

Minimum Depth to Water Table

The minimum vertical distance between the bottom of bioretention and the seasonal high water table is two feet.

Setbacks

Bioretention areas should not be hydraulically connected to structure foundations or pavement, to avoid seepage and frost heave concerns.

The setbacks from building is based on the various sizes of bioretention.

Ponding Depth

The recommendation ponding depth is 6 to 12 inches. The maximum depth is 18 inches.

Filter Bed Depth

The minimum depth of filter bed is 24 inches for bioretention basin and urban bioretention.

The minimum depth of filter bed is 18 inches for micro-bioretention.

Maintenance

A highly visible bioretention requires routine maintenance.

During drought seasons, it may be necessary to water the plants.





Permeable Paving

Permeable paving is a method that capture and allow stormwater to seep into ground, reduce stormwater runoff flow to the storm drain and clean stormwater. It consists of a variety of types of pavement.

The function of permeable paving is similarly to sand filters

Four Types of Permeable **Paving's Surface**



igure 1.Concrete Grid Pavers Chesaneake Stormwater Network



Figure 2. Pervious Concrete



igure 3. Porous Asphalt



igure 4. Permeable Interlocking Concrete Pavers



Landscape Architecture

Components and Cross Section of Permeable Paving



Figure 5. Detail of Permeable Paving STORMWATER DESIGN SPECIFICATION NO. 7

Figure 1.Cross Section of Permeable Paving STORMWATER DESIGN SPECIFICATION NO. 7

Different Sizes of Permeable Paving

Table 1

Design Factor	Micro - Scale Pavement	Small - Scale Pavement	Large - Scale Pavement	
Impervious Area Treated	250 to 1000 sq. ft.	1000 to 10000 sq. ft.	More than 10000 sq. ft.	
Typical Applications	Driveways Walkways Court Yards Plazas Individual Sidewalks	Sidewalk Network Fire Lanes Road Shoulders Spill-Over Parking Plazas	Parking Lots with more than 40 spaces Low Speed Residential Streets	
Load Bearing Capacity	Foot traffic Light vehicles	Light vehicles	Heavy vehicles	
Most Suitable Pavement	Interlocking Pavers	Interlocking Pavers, Porous Asphalt and Porous Concrete	Interlocking Pavers, Porous Asphalt and Porous Concrete	

Slope 5%.

inches.

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Standards

Soils

- Permeable Paving should not be used in areas of compacted fill or Karst topography.
- Before installing permeable paving, the soil test is
- needed, in order to make sure stormwater can infiltrate into soil.

- The permeable paving surface slope should less than
- The bottom slopes of the permeable pavement should be as flat as possible.

Setbacks

- Maintain 5 feet setback from sanitary sewer system or other utilities.
- Do not disturb more than 25% of the critical root zone for trees wit a diameter at breast heigh over eight
- Maintain ten feet setback from structures.

Minimum Depth to Water Table

The minimum vertical distance between the bottom of the permeable paving installation and the seasonal high water table is two feet.

Maintenance

Permeable paving is susceptible to clogging, so periodic maintenance is required.

Planting

Permeable paving is easily to clogged, in order to reduce the possibility of clogging, trees with needles and other evergreen trees should be avoided. The planting beds require frequently mulching.

ADA Accessible

Most interlocking pavers are ADA compliant.

Benefits

- **Environmental Benefits:**
- During a heavy rainfall, permeable paving can capture stormwater runoff. This process reduces stormwater runoff enter natural waterways, and promotes the infiltration of stormwater.
- **Economical Benefits:**
- When using permeable paving, it can save a lot of money on drainage system and retention system.



Parking and Access Drive

Parking facility layout and

Parking lot is a cleared area that is intended for parking vehicles. The surface in this area is designed due to some standards explained below.

- Parking areas should be related directly to the buildings which they serve.

- Handi-capped parking stalls should be no more than 30 meters (100) from building entries.

- Drop-off zones should be located as close as possible to primary entryways.

- No grade changes should be exit between between road surface and adjacent walkways, vehicular connections to drop-offs, site entrance and parking areas should be direct.

- Site entrances should be well identified with obvious relationship to the buildings and sites they serve. Clear and legible signage should be provided to direct

- Parking facilities shall be designed to conform to the following minimum standards:

- Driveways/Drive Aisles. Driveways providing access to parking facilities shall have the following dimensions: 20feet long and 10 feet wide.

- Nonresidential Uses. When fire apparatus access is required, the minimum driveway width shall be twenty feet for one-way traffic and twenty-four feet for two way traffic. Otherwise the minimum driveway width for a one-way driveway shall be fourteen feet. Where one-way drives exist, directional signs and arrows shall be provided.

Photo credits :

-Graphic Standards for Landscape Architects -Time Saver Standards for ladscape Architure



Parking Layout

Figure1. Parking Lot layout with different angles



Figure2. Parking Lot layout with one way and two way road

Curbs



Figure3. Curbs used for parking lot area















LOCUST GROVE NATURE CENTER

Exterior Routes

Exterior routes are paths in an outdoor setting that allow travel between buildings and facilities. These routes follow the standard ADA accessibility guidelines.

Major guidelines:

- The maximum running slope is 5% with a 60" long • landing every 200'.
- The maximum cross slope is 2%.
- Path width minimum is 36".
- Passing areas of 60" width should be available • every 200'.
- All surfaces should be firm and stable. If this • question can be answered yes, the surface is considered firm and stable. "Can a folding stroller with a 3 year old be pushed easily on this surface without making imprints?"

Outdoor Recreational Access Routes

ORARs are used to connect more remote sites like campsites, picnic areas and accessible trail heads. The accessibility guidelines allow some greater flexibility in maximum slope and frequency of landings.

Major guidelines:

- The maximum running slope is 8.3% with a 60" long landing every 50'.
- Even steeper slopes up to 10% are allowed with a 60" landing every 30'.
- The maximum cross slope is 3%.
- Path width minimum is 36". This can be a little as 32" if there is an occasional unmovable barrier.
- Passing areas of 60" width should be available every 200'.

Accessibility Details

Accessibility guidelines for outdoor spaces include many additional details. A few major examples are listed below.

- Vertical clearance needs to be a minimum of 80".
- Objects that protrude into the path must do so less than 4".
- Roots and rocks must be less than 1" high. If the rock or root is beveled at 45 degrees to the direction of travel, then the protrusion is allowed to be 2".
- Protective edges must be 3" around the base of elevated walkways.
- Openings on boardwalks must be perpendicular to the direction of travel and a maximum of 1/2 wide.



Figure 1. Illustration of running and cross slope





Figure 6. Illustration of boardwalk openings



Figure 2. Illustration of a landing



Figure 4. Illustration of a passing area



Figure 5. Three at the Top!!





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Figure 3. Illustration of an ORAR





Figure 7. Mom and her kids



Resources:

Hopper, L., & Smith Maran Architects. (2007). Landscape architectural graphic standards (Wiley graphic standards). Hoboken, N.J.: John Wiley & Sons

Applying the Forest Service Outdoor Recreation Accessibility Guidelines - United States Department of Agriculture





Trails and Maintenance



Figure 1. Nature Trail AllTrails.com Example of a nature trail, Maple Road Trail to Blue Ridge, NC **Trail Corridors**

"Trail standards typically define the edges of the trail corridor as the clearing limits. Vegetation is trimmed back and obstacles, such as boulders and fallen trees, are removed from the trail corridor to make it possible to ride or walk on the tread."

In level terrain, the corridor is cleared an equal distance on either side of the tread's centerline. Hiking trails, the corridor is cleared for a distance of 1 meter either side of center. Within (1 feet)of the edge of the tread, plant material and debris should be cleared all the way to the ground. Farther than (1.5 feet) from the trail edge, plants do not have to be cleared unless they are taller than (1.5 feet).(MTDC Trail Construction and Maintenance Notebook)

Rocks, climbing trees, logs, and related materials can be placed near the lower edge of the tread to guide traffic towards the center, but the materials shouldn't prevent water from draining off the trail.

Trees growing within the corridor should be removed because, seedlings grow into pack-snagging trees and are harder to remove. Also, excessively pruned trees should be cut down and be careful to not leave pointed stobs. Fallen trees lying parallel to the trail that have trunks not within the clearing limits can be left on the trail, but prune the limbs flush with the trunk. Limbing the tree helps the truck decay quicker. If a leaning tree is within the trail clearing zone it should be removed. It is recommended that trained and certified sawyers and trail workers remove and cut trees, since it is such a dangerous task.

Trail Elements

The half rule and grade reversals are required to keep sustainable grades and creates less maintenance "The half way rule says that the grade should be no more than half the side slope." (MTDC Trail Construction and Maintenance Notebook)



Figure 3. Half Rule www.fs.fed.us Example of half rule with sideslope 16% and trail grade 8% or less. (0723-2806 MTDC Trail Construction and Maintenance Notebook)2004

Switchbacks and Climbing Turns are used to reverse trees, and when terrain or vegetation screens the view the direction of travel on hillsides and to gain elevation of travelers coming from upper approach to the turn. quickly, and keep water off turning trails. Climbing Turns are also less expensive than switch-Switchbacks are typically used on steep terrains, usubacks because less excavation is needed and fill is not ally steeper than 15 percent. Sideslopes ranging from used. 15 to 45 percent are ideal locations for switchbacks. Switchbacks with sideslopes up to 55 percent, require **Bridges** retaining structures. Natural platforms are recommended for switchbacks because it reduces the cost of There a variety of trail bridges to choose from in trail excavation and fill needed in future maintenance. Usuconstruction. Trail bridges include: simple foot bridge ally, the greater the turning radius, the wider the platwith a handrail to multiple span, suspended, and truss form, or flatter the turn, which requires more excavastructures. In Forest Service handrails are required on tion. When constructing the approach on switchbacks all bridges, unless the risk of falling off the bridge is the last 65 feet turn should be as steep as the desired minimal or the trail itself presents a higher risk. Native level of difficulty will allow, but to avoid flattening the material on simple foot bridges are at times difficult to grade, and to make sure to keep it smooth enough to maintain due, to rotten wood. Unnatural materials are connect the turn from 6 ¹/₂ to 10 feet. For turns below often imported to avoid clear cutting next to the bridge, the upper approach grade reversals the tread should be and to avoid rebuilding structures made by native ma-19 to 39 inches wider than the approach. It is importan terial. The Forest Service requires all bridge structures to also, mention that placing rocks between the trails to be inspected by a certified bridge inspector every 5 grades of switchbacks help reduce users from cutting years to be determine if a bridge should remain open through. The Y-shaped platform or smooth radius to circulation or traffic. "All bridges require a curb." turns ranging from 5 to 10 feet are best suited for hik-According to national forests, all bridges require design ers. approval from engineering before construction.

Climbing Turns have a wider turn radius (13 to 20 feet), which serve as an advantage to switchbacks and are used on gentle slopes, usually 15 percent or less. The best slope grade for climbing turns is 7 percent. It is also best not to build these turns in sets on open hillsides except if they're very steep terrains. This trail element should be built among dense bushes and



Switchbacks are ideal for mountain bikers and hikers. This trail element works well with vegetation and rocks along the tread to reduce users from cutting through



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inhabitat.com **Figure 4. Arched Foot Bridge** Example of bicycle and foot bridge, DANS Architects used timber planks and shingles to create this 54 long meter arched foot bridge, Slovenia (Nicole Jewell, 2015)

This footbridge would be implemented as a flat foot bridge versus a arched foot bridge for ADA accessibility, and is a great choice for sustainability.



SITE ANALYSIS: Interior Land Uses

Nature Play Spaces

Nature Play Space: A space intentionally designed or designated to integrate natural components into a place for structured and unstructured play and learning. This natural play space will:

- Provide an important early conznection for children with nature and create future environmental stewards
- Provide an opportunity for both physical and creative play
- Support children's physical, intellectual, and emotional development. http://dnr.maryland.gov/cin/Pages/NPS/index.aspx

General Physical Components and Activities

Figure 1: Physical Components:

- -Bridges
- -Hiding Places
- -Plants
- -Loose Parts
- -Varying Terrain
- -Pathways
- -Water
- -Seating
- -Signage

Maryland Applicable Guidelines

If you are creating nature play spaces intended for children 12 years old and under, you should consult the U.S. Consumer Product Safety Commission's Public Playground Safety Handbook.

In Maryland, compliance with these guidelines is *not* legally required at the state level. However, some local jurisdictions, insurance carriers, agencies, or others may require compliance with the CPSC Hand-

book http://dnr.maryland.gov/cin/Documents/Safety.pdf

Accessibility Guidelines

The 2010 Americans with Disabilities Accessibility Guidelines became effective on March 15, 2011. The ADA Guidelines for Play Areas are included in this amended version of the ADA.

Note the section called, "Unique Play Areas," which states, "A *play area is* a portion of a site containing play components designed and constructed for children. Play components may be manufactured or natural.".

Figure 2: Nature Play Activities

-Balancing -Building -Climbing -Connecting -Nature Art -Gardening & Digging -Listening & Observing



Figure 3: Maryland Dept of Natural Resources Guide



2011/2012 MD DNR/ N

National Level Attempts to Generate Helpful US Access Board Guidelines Standards (National Wildlife Feder-Figure 4: US Access Board Guidelines "Play Areas" ation and National Forest Service)

	NITED STATES ACCESS BOARD				Search Search Guide on P Search entire site	Search Guide on Play Areas Search entire site	
	The Board	Guidelines & Standards	Training	Enforcement	Research		
TABLE OF CONTENTS	Guide c	on Play Areas	es for Play Ar	reas	About Recreat	FACILITIES	
Introduction Play Area Terms Application Play Component	January 2 The produ illustrate f of the pro not evalua guidelines	007 ucts shown in this guide are on the accessibility guidelines, and ducts. Other products may be ate or certify products for comp s. Users are advised to obtain a	ADA and ABA store to tts <u>Guides</u> <u>Background</u> for <u>Other Resource</u>	ADA and ABA Standards <u>Guides</u> Background Other Resources			

The play area guidelines are a supplement to the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Once these guidelines are adopted as enforceable standards by the Department of Justice, all newly constructed and altered play areas covered by the ADA will be required to comply.

Figure 4: US Access Board "Play Areas" Summary ACCESSIBLE PLAY AREAS or Play Areas







U.S. Consumer Product Figure 5: MD DNR Referenced Safety Commission's Public Playground Safety Handbook is suggested as a reference guideline: nature play spaces

intended for children 12 years old and under, you should consult the U.S. Consumer Product Safety Commission's **Public Playground** Safety Handbook.

CPSC Public Safety Commission's Hanbook





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for Nature Play Areas: Nature Play & Learning Places is a project of the National Wildlife Federation (NWF) and the Natural Learning Initiative at the College of Design, North Carolina State University. The project was funded by the U.S. Forest Service and the guidelines were developed with substantial assistance from NRPA staff and member agencies

New National Guidelines Figure 6: US Access Board "Play Areas" Summary



Nature Play & Learning Places

ROBIN C. MOORE

Montgomery County Department of Parks: ADA Compliance Manual

Sect 5. RECREATION FACILITIES

- 5.1 Play Area
- Surface Materials
- Accessible Route
- Clear Width
- Accessible Route Height Clearances
- Transfer Platforms
- Ramps
- Ramp Handrails
- Components Floor
- Clearances



Version 01 | 2015 Prepared for use at Montgomery County Parks

MONTGOMERY COUNTY DEPARTMENT OF PA



ADA COMPLIANCE MANUAL



STANDARDS: Nature Play Spaces





Standards: Nature Play Spaces

Nature Play Spaces in Maryland Figure 8: MD Nature Play Spaces (http://dnr.maryland.gov/cin/Pages/NPS/index.aspx)



Maryland DNR Website Elements of **Nature Play Spaces**

Maryland DNR Website provides examples of the elements of Nature Play Space such as:

1. Adventure – physically challenging

2. Fantasy and Imagination- Challenge and stimulate the imagination

3. Animal Allies – creating bonds and associations with animals

4. Maps and paths – places to explore

5. Special Places – found or constructed places, a bridge between the safety of home and the outside world

6. Small Worlds – miniature ecosystems etc.

7. Hunting and Gathering – connections to our ancestors and the way we co-existed in nature

These elements can be physical structures such as: - Seating and quiet places

- Hiding places / tunnels/ nooks
- Varying terrain / boulder fields
- Pathways (racing, maze, texture)

- Water features, fire pit areas and seating **Figure 8: Nature Play Space Physical Structure Examples**





Standard Nature Play Space Component and Activites

Literature review of international, national and regional Figure 9: Nature Play Space Activity and Tool Examples nature play space sources provides the following wider summary of standard general activites, program-support physical structures, and educational tools/aids to support a broad nature play space program for a wide range of ages.

General Activity categories:

- Balancing brick building
- Climbing
- Connecting
- Nature Art
- Gardening rake listening and observation
- Sketching and heart
- Music and dance
- Hunting or gathering
- Parent Quiet Spot(s)

Specific structural pieces/areas:

- Entrances: Adult and child / ADA
- Bamboo shoots or small trees area
- Hills and berms (even if AstroTurf)
- Cargo net climbing / areas,
- Climbing walls and trees (vert./ horizontal)
- Waterspouts or pump features, cooking areas
- Maze or Labyrinth (moveable wood slabs or stone)
- Balance beams or logs
- Fort / Tree house, tents and teepees
- Stage / performance area
- Gathering/collecting items area
- Gardening, bird nests and bird house areas
- Measuring, maps, and blueprints areas
- Log or post lined paths, foot race areas
- Swings (rope, from trees or structures), hammocks

Additional Tools and Program Aids

- Rocks, shells pine cones or seeds ID collections
- Mammals and ground creature keys and aids
- Guides for habitats, food and physical environs
- Garden exploration: pollinator, herbs, native species
- Butterfly garden / butterfly habitat plants
- Vegetable and edible garden
- Field and outdoor survival guides for children
- Weather station site
- Earth digging/moving tools
- DAy/night exploration items: binoculars, flashlights
- Bug cages, butterfly nets, magnifying glasses
- Paper pads and pencils , art/sketching notepads



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