Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-01.1

Activity: Stream Corridors

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ◇

Sediment ♦ Heavy Metals ◇ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ♦
Oil& Grease ♦ Bacteria & Viruses ◇ Floatable Materials ♦ Construction Waste ♦

Description

Sensitive areas such as stream corridors (waterways and riparian land) are subject to special protection due to their unique characteristics. These waterways provide habitat for fish, aquatic plants, and bottom dwelling organisms. The modification to these inhabitants destroys physical features essential to a good habitat including: stable stream banks and bottom substrates, pools and riffles, meanders and spawning areas.

The vegetative habitat surrounding riparian land adjacent to stream banks filters pollutants from storm and floods and provides habitats for a variety of amphibians, aquatic birds and mammals. These creatures and their functions are impaired when development occurs within the corridor or riparian. Development causes more flooding to the area as well as meandering of natural streams.

To combat the developmental construction to the corridor or riparian, filter strips or forested buffers should be created or preserved along the banks of streams. Another method of preservation to corridors and riparian is the presence of vegetation along shorelines of ponds, lakes and wetlands. This aids in preventing erosion caused by wave action.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-01.2

Activity: Wetlands

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

Wetlands impart an aesthetically pleasing aspect to the environment while providing a unique habitat for plant and wildlife, including sensitive and endangered species. Wetlands also add value to flood storage, groundwater recharge and pollutant-filtering functions.

There are some wetlands that avoidance is recommended. These wetlands are very difficult to replace and are moderate to high-quality in nature. Sites where scattered and small low-quality wetlands are readily replaceable, mitigation is recommended to enhance the wetlands function and reduce potential constraints to development.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-01.3

Activity: Steep Slopes and Highly Erodible Lands

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Not Required

Recommended Personnel Involvement:
Town Engineer
Developers

Target Pollutants

Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦	Heavy Metals ◊	Nutrients ◊	Oxygen Demanding Substances ◊	Toxic Materials ◊	
Oil& Grease ◊	Bacteria & Viruses ◊	Floatable Materials ◊	Construction Waste ◊		

Description

Steep slopes can be characterized as any slope exceeding 10% which is measured by 1 foot of vertical drop per 10 feet of horizontal distance. Yet the variation on surface soil can make this definition debatable. The erodibility of surface soil can make flatter slopes fall under this classification if it is highly erodible along with the surface geology which is another aspect that determines the steepness of a slope.

The instability of slopes due to development causes destruction to the vegetative state, root systems and soil structures. The increase in flow velocity introduced by developmental construction exposes steep slopes to destructive and unsightly erosion, bare slopes, the chances of difficult re-vegetation and sediment deposition.

The minimization of the area and time of disturbance to the natural terrain should be a top priority with developers as construction takes place on a site. The protection of the site, vegetation, and all other inhabitants living in this constructed area should be protected and stabilized during development.

Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-01.4

Activity: Karst Topography

PLANNING CONSIDERATIONS:

Planning:
Not Required

Training:
Not Required

Recommended Personnel Involvement:
Town Engineer
Developers

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ♦ Heavy Metals ◇ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

Karst bedrock areas are underlain by bedrock containing soluble minerals. Karst areas develop voids and solution channels as groundwater gradually dissolves the bedrock. In these terrains, groundwater flow can be extremely rapid and unpredictable. Furthermore, the concentration of runoff may stimulate the formation of sinkholes. Sinkholes can develop as flowing water exposes and then washes into the mouths of the near surface openings of subterrain channels and caverns. Rapid degradation of groundwater resources can result when sediment or pollutant- laden runoff percolates into karst bedrock aquifers.

Few areas of Southern Indiana are susceptible to the development of karst conditions. Before introducing site alterations, which could concentrate or pond runoff, the presence or absence of carbonate bedrock should be established. If carbonate rocks do occur, a professional geologist or civil engineer should be consulted to determine whether sink hole activity is likely. The United States Geological Survey is a good source of information on karst bedrock in Indiana. If an area is prone to sink hole development, site drainage should be planned to minimize the concentration of runoff. This can be accomplished by reducing the hydraulic connectivity of impervious surfaces and by the use of filter strips. Where they are required, channels or ponds should be lined.

BMPs for the recharge of groundwater in karst areas provide infiltration opportunities over a very large area. Examples are filter strips, large bioretention facilities, and permeable pavement. These practices mimic the natural process by which rainfall enters the subsurface. Point sources of infiltration, such infiltration trenches or dry wells, should be avoided.

Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-02.1

Activity: Parking Lot Design

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Developers

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ◈ Heavy Metals ◈ Nutrients ◈ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◈ Bacteria & Viruses ◇ Floatable Materials ◈ Construction Waste ◇

Description

To reduce the amount of runoff volume in parking lot designs, infiltration swales and vegetation incorporation to reduce paved surfaces may occur. These two alternatives would provide water quality benefits to the parking lot design.

Reduced paved surfaces increases the amount of sediment-laden runoff that can be filtered through vegetation and settlement provided by swales. Vegetation acts as a sponge where runoff is concerned. Leaves, stems and branches intercept rainwater which then evaporates. Depending on the type of vegetation, some may even encourage infiltration (deep-rooted prairie plants).

While vegetation increases the amount of sediment-laden runoff captured and evaporated, swales enable sediment to settle out producing a cleaner runoff for the environment.

Suitable Applications

To compensate overly generous parking ration requirements.
Lots desiring minimum stall dimensions.
To use the most space-efficient stall configuration for a site.

Approach

Pavement Reduction can be established in 3 main ways:

1. Changing Municipal Codes.
2. Reducing stall dimensions.
3. Promoting shared parking lots.

Activity: Parking Lot Design	SPD-02.1

Installation Procedures

Avoid compaction by not driving on areas during construction.
Loosen soils in planting areas to a depth of 24 inches, to a maximum compaction of 85% standard proctor density.

Maintenance

Planted areas must be weeded monthly during the first two to three years. After initial years, once or twice a growing season will be sufficient.

Water regularly during dry spells.

Irrigation should be two inches per week maximum.

Push street snow away from swales during winter seasons to avoid road sand accumulation.

Inspection Checklist

- q Plants are watered regularly during dry weather.
- q Weeds are under control.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-02.2

Activity: Street Design

PLANNING CONSIDERATIONS:

Planning: Required

Training: Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers

Target Pollutants

Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

The design of a street will determine the effects of stormwater runoff. This gives a developer numerous opportunities to reduce impervious areas and aid in the reduction of runoff and management requirements associated with runoff. Natural drainage patterns should be preserved whenever possible during street design planning. This ensures that maximum stormwater filtration and infiltration can take place.

Suitable Applications

Siting of streets.
Design width.
Street drainage.

Approach

Siting of Streets: This is a large consideration when planning the layout of a new street network layout or the siting of a road. To maximize stormwater filtration and infiltration, municipalities should aim to preserve natural drainage patterns whenever possible and avoid locating streets (and other impervious surfaces) in low areas or on highly permeable soils. The network selected should also be considered due to the total amount of pavement to be affected.

Design Width: Streets should be designed with the minimum pavement width that will support the area's traffic volume; on street parking needs; and emergency, maintenance and service vehicles.

Street Drainage: Curbless road design, such as the so-called "rural residential section" encourages infiltration via roadside swales. On low-traffic streets without curbs, grass shoulders can serve as an occasional parking lane, allowing a narrower paved area.

Activity: Street Design	SPD-02.2

Advantages

Thoughtful siting and design of streets helps achieve stormwater control "at the source", which means less runoff requiring management, less stormwater infrastructure, and less impact on downstream water bodies.
Reducing paving lowers development and maintenance costs.
Forgoing curb-and-gutter in favor of a rural residential section in major cost savings
Rural-section streets can incorporate attractive "rain garden" planting in low areas adjacent to the roadway, when soil permits.
Narrower streets tend to slow traffic and create a more pedestrian-friendly environment.
Reducing pavement lessens the urban heat island effect-the increase in air temperature that occurs when highly developed areas are exposed to the sun.

Limitations

Local ordinances may preclude narrowed or curbless street design.

Cities' desire to design roads to accommodate future growth may impede innovations.

Roadside swales are difficult to accommodate in single family residential developments with net densities above 8 units per acre.

Good drainage for road subgrade must be provided when using roadside infiltration methods.

Soil and topography may limit street siting opportunities.

Design Requirements

Design residential streets with the minimum pavement width necessary to support: the traffic volume; on-street parking needs; and emergency, maintenance, and service vehicles.

Use shallow, grassed roadside swales (rural residential cross section) instead of curb and gutter when net densities are 6 to 8 units or acre or less.

Swales to catch road runoff should be sloped no more than 3:1.

Limit sidewalks to one side on roads with less than 400 Average Daily Traffic (ADT) (or 200 ADT for cul-de-sacs).

Resist designing for distant future growth.

Construction Requirements

Take care not to compact adjacent, permeable soils during road construction.

Protect swales and other infiltrations areas from sediment influx during construction, or remove sediment after construction is complete.

Maintenance

Swales planted with perennials grasses and wildflowers rather than turf grass must be weeded at least monthly during the first two to three years. After that, weeding once or twice a growing season may suffice.

Swales will need periodic sediment removal to maintain volume and filtering ability.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPDs)

SPD-02.3

Activity: Cul-de-sac Design

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ◈ Heavy Metals ◇ Nutrients ◈ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

Impervious areas can greatly be decreased with the Cul-de-sac design in subdivisions. The smallest possible radius to this area ensures that stormwater runoff has less impact on downstream water bodies. The smallest design with a radius of 40 feet will accommodate the turning of most emergency service vehicles, while a 30 feet radius will allow the largest of these same vehicles one backing movement in order to turn around. This difference in radius can reduce the imperious coverage by 50%. Other combating methods of runoff acceptance in a Cul-de-sac stem from the application of flat apron curbs, islands to accept runoff from surrounding area and T-shaped turnarounds.

Suitable Applications

Subdivisions with tight developmental budgets.
Small subdivisions have 10 or fewer homes will benefit from the T-shaped turnaround.
Highly developed areas desiring a solution to the urban heat island effect.

Advantages

Cul-de-sac designs like those suggested here result in less management of stormwater runoff and less impact on downstream water bodies.
Planted Cul-de-sac islands are attractive amenities.
Less paving can lower development costs.
Reducing pavement lessens the urban heat island effect-the increase in air temperature than can occur when highly developed areas are exposed to the sun.
Reducing pavement can help reduce the increased runoff temperature commonly associated with impervious cover.

Activity: Cul-de-sac Design	SPD-02.3

Limitations

City ordinances may not accommodate small radii cul-de-sacs, due to accommodations for emergency vehicles.
Hammerhead turnarounds require vehicles to make a three-point-turn to exit.
In first two to three years, planted islands require more maintenance than paving.

Installation Procedures

Avoid compacting soil in center island, till soil to a 2 foot depth.
Select vegetation that thrives on high rainfall and drought.

Design Criteria

Areas with low traffic volume (10 or fewer homes) should consider a T-shaped turnaround.

Design Cul-de-sac with radius of 30 feet or less to reduce runoff from the area.

Widen rear pavements in Cul-de-sacs to ensure a easier turning.

Islands should be maintained and vegetation planted for the appropriate soil type.

Include an unpaved, depressed island, using whatever radius will allow a 20-foot road width.

Construction Criteria

During paving, care should be taken to avoid compacting soil in center island. Should compaction occur, it may be necessary to rip or till soils to a depth of 2 ft.

Choose plants that will thrive when rainfall is high, as well as during droughts without watering.

Maintenance

Cul-de-sac island planting areas must be weeded monthly during the first two to three years. After that, weeding once or twice a growing season may suffice.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-02.4

Activity: Permeable Pavements (Turf Pavers)

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Developers
Contractors

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ◈ Heavy Metals ◇ Nutrients ◈ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

Infiltration and the reduction of runoff are a result of turf paving. The decrease arises from modular paving blocks or grids, cast-in-place concrete grids and soil enhancement technologies. Healthy grass growth as well as foot and vehicular traffic occur as a result of the site's increased load bearing capacity.

Suitable Applications

Areas desiring roadside right-of-ways
Emergency access lanes.
Delivery access routes.
Overflow parking areas.

Approach

Modular Paving Blocks and Grids

Modular paving blocks or grass pavers consist of concrete or plastic interlocking units that provide structural stability while a series of gaps planted with turf grass allow for infiltration. Some blocks may also be filled with gravel and left unplanted. Depending on the use and soil type, a sand setting bed and gravel sub base is often added underneath to help further infiltration and prevent settling.

Cast-in-Place Concrete Systems

Monolithic concrete pavements incorporate gaps that are filled with topsoil and grass for a free-draining "pavement" with the structural capacity to handle most heavy vehicle loads. The surface is similar to that of modular concrete paving blocks.

Activity: Permeable Pavements (Turf Pavers)	SPD-02.4

Approach (Continued)

Soil Enhancements

The soil-amendment technology discussed here employs synthetic mesh elements blended with a sandy growing medium, resulting in a natural turf surface and an engineered load-bearing root zone. Appropriate for summer overflow parking, golf courses, recreational fields and areas where the aesthetic appeal of uninterrupted grass is important.

Advantages

Turf pavers reduce or eliminate other stormwater management techniques by reducing runoff.

Applied in combination with other BMP's, pollutant removal and stormwater management can be further improved.

There may be a construction cost savings due to reduced curb-and-gutter requirements.

Turf pavers are appropriate for driveways, walkways and overflow parking areas where handicapped access is not required or provided elsewhere.

Turf helps soften the look of an area and make it more pleasant for pedestrians.

Soil-enhanced turf systems are advantageous for sports and recreation fields as they resist compaction, thus increasing infiltration, and provide a soft playing surface.

The mesh elements stabilize soil without reducing its permeability. The elements combat compaction, as they flex under pressure and "cultivate" the surrounding soils.

Snow melts faster on a porous surface because of rapid drainage below the snow surface.

Porous pavement can help to reduce the increased runoff temperature commonly associated with impervious cover.

Limitations

For reasons of durability and maintenance, turf pavers are not recommended for high-traffic areas.

Turf paving systems limit wheelchair access.

Snow removal can be difficult, as plow blades can remove vegetation and catch the edge of the blocks, damaging the surface.

Salt and sand in runoff from adjacent impervious pavement can damage turf and clog gaps in the blocks.

Construction costs for turf paving may be higher than conventional pavements. Maintenance costs are generally higher.

Clay soils will limit infiltration.

Since turf paving encourages infiltration, it should not be applied on stormwater hotspots, places where land use or activities generate highly contaminated runoff, due to potential for groundwater contamination.

Design Criteria

Infiltration rates are affected by soil types and should be considered when designing turf areas.

Soil type also affects the sub base depth.

Fill voids with sand or sandy loam planting base (adhere to manufacturer's recommendations).

Construction Requirements

Modular and Cast-in-Place Concrete Systems

Cells may be planted in one of three ways:

1. Fill with a porous backfill mix (some products require sharp sand), scrape or back rake the entire surface to expose pattern. Broadcast seed or stolons or hydroseed and then top dress and fertilize as required.
2. Fill and scrape or back rake as above, then lay 5/8- inch sod on the assembled pavers. Water the sod, then use a hand water roller or power-driven roller to compress the sod and root system completely into the cells.
3. Do not fill the cells with any type of soil mixture. Lay 1-inch sod on the assembled pavers. Water the sod and compress as above.

Soil Enhancements

Sand or a proprietary growing medium is blended with a specific proportion of mesh elements using a mechanical shovel. A 20 kg sample of mixed material will contain 55.4-66.7 g of mesh elements (or approximately 44 lb. mesh for 5 cubic yards of sand mix). Manufacturer will supply precise proportions.

For some proprietary systems, materials are sourced locally and the patent-holder acts as project manager for the installation, using specially designed machines.
Grass cover is established using pre-germinated seed, washed turf or conventional seed.

Nonessential traffic should be kept off the area until grass is well-established.

Maintenance

Maintain turf pavers by irrigation, mowing, and fertilizing. **Do not aerate**.

Grass cover is established using pre-germinated seed, wash turf or conventional seed.

Nonessential traffic should be kept off the area until grass is well-established.

Wear patterns occur due to high frequency traffic, rest periods will allow turf to grow back to its kept height.

Plow outfitted with a flexible plastic/rubber piece on the bottom will help to protect the product while maintaining the turf area.

Inspection Checklist

- q Turf method matches soil type.
- q Turf is maintained to accommodate traffic patterns.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-02.5

Activity: Open-Space Preservation

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

An open space conservation program involving a combination of method merging long-range planning with an opportunistic action approach. Those methods include: outright purchase of land at full or "bargain-sale" prices; establishment of permanent Conservation Restrictions through gift or purchase; exercise of the local first refusal right; limited development purchases; and others.

Suitable Applications

When prime open space in a community becomes available the opportunity to create blocks or greenbelts of local conservation land should be taken advantage of by the community.

Planning Considerations

Land preserved through acquisition, deed restriction, or other methods should be representative of each major land or habitat type within the town, and should be joined to form connecting corridors wherever possible.

A multi-faceted local approach to the preservation of open space requires the support of Town Meetings, a willingness to work with local or regional land trusts, the existence of a working open space plan, and the maintenance of a healthy conservation fund.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-02.6

Activity: Construction Phasing

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ♦ Heavy Metals ◈ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

A work schedule that coordinates the sequence of land-disturbing activities with the installation of erosion and sedimentation control practices.

A construction sequence schedule is a specified work schedule that coordinates the timing of land-disturbing activities and the installation of erosion protection and sedimentation-control measures.

Approach

To reduce on-site erosion and off-site sedimentation from land-disturbing activities by installing EPSC practices in accordance with a planned schedule.

Reduce on-site erosion and off-site sedimentation by performing land-disturbing activities and installing EPSC practices in accordance with a planned schedule.

Preserving the natural vegetation on-site to the maximum extent practicable will minimize the impacts of development on stormwater runoff. Preferably 65% or more of the development sit should be protected fro the purposes of retaining or enhancing existing forest cover and preserving wetlands and stream corridors.

Activity: Construction Phasing	SPD-02.6

Suitable Applications

Purpose of the construction sequence schedule is to address EPSC in an efficient and effective manner. Appropriate sequencing of construction activities can be a cost-effective way to help accomplish this goal. The plan can be open to changes that would be discussed at the erosion control project meetings.

The generalized construction activities shown in the following Table SPD 02.6-01, do not usually occur in a specified linear sequence, and schedules will vary due to weather and other unpredictable factors. However, the proposed construction sequence should be indicated in the EPSC plan.

Maintenance

Follow the construction sequence throughout project development.

When changes in construction activities are needed, amend the sequence schedule in advance to maintain management control.

Vegetation and trees should not be removed from the natural growth retention area, except for approved timber harvest activities and the removal of dangerous diseased trees.

Table SPD-02.6-1
SEQUENCING TABLE

	CONSTRUCTION ACTIVITY	SCHEDULE CONSIDERATION
1	Identify and label protection areas (e.g. buffer zones, filter strips, trees)	Site delineation should be completed before construction begins
2	Construction access. Construction entrance, construction routes, equipment parking areas and cutting of vegetation (necessary perimeter controls.	First land-disturbing activity. - Establish protected areas and designated resources for protection. Stabilize bare areas immediately with gravel and temporary vegetation as construction takes place.
3	Sediment traps and barriers. Basin traps, sediment fences, and outlet protection	Install principal basins after construction site is accessed. Install additional traps and barriers as needed during grading
4	Runoff control. Diversions, silt fence, perimeter dikes, and outlet protection.	Install key practices after principal sediment traps and before land grading. Install additional runoff control measures during grading.
5	Runoff conveyance system. Stabilize stream banks, storm drains, channels, inlet and outlet protection, and slope drains.	Where necessary, stabilize stream banks as early as possible. Install principal runoff conveyance system with runoff-control measures. Install remainder of system after grading.
6	Grubbing and grading. Site preparation: cutting, filling and grading, sediment traps, barriers, diversions, drains, surface roughening.	Begin major grubbing and grading after principal sediment and key runoff control measures are installed. Clear borrow and disposal areas only as needed. Install additional control measures as grading progresses.
7	Surface stabilization: temporary and permanent seeding, mulching, sodding, and installing riprap.	Apply temporary r permanent stabilization measures immediately on all disturbed areas where work is delayed or complete.
8	Building construction: buildings, utilities, paving	Install necessary erosion and sedimentation control practices as work takes place.
9	Landscaping and final stabilization: topsoiling, planting trees and shrubs, permanent seeding, mulching, sodding, installing riprap.	Last construction phase - Stabilize all open areas including borrow and spoil areas. Remove and stabilize all temporary control measures.
10	Maintenance	Maintenance inspections should be performed weekly, and maintenance repairs should be made immediately after periods of rainfall.

Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-03.1

Activity: Vegetative Buffers

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ♦ Heavy Metals ◇ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

This buffer consist of an undisturbed vegetation that has been enhanced or restored surrounding an area of disturbance or bordering streams, ponds, wetlands or lakes. This buffer filters and infiltrates runoff, reduces storm runoff velocities, protects channel banks, provides flood protection and a number of other enhancing traits.

Suitable Applications

Areas desiring enhancement to wildlife inhabitant.
Areas needing temperature regulation and replenishment of wildlife victuals.

Installation Procedures

Planting can consists of bare root seeding.
Container grown seeding, grown plants and balled and burlapped plants.
Soil preparation and maintenance are essential for the establishment of planted vegetation.
Standard permanent erosion control grasses and legumes may be used in denuded areas for quick stabilization.

Maintenance

Areas closest to the stream should be maintained with minimum impact.
Water during periods of drought as well as during the initial year, watering may be necessary in all buffer areas planted or seeded for enhancement.
It is imperative that the structure of the vegetated stream buffer be maintained.
If the buffer has been planted, it is suggested that the area be monitored to determine if plant material must be replaced. Provisions for the protection of new plantings from destruction or damage from beavers or other damaging pests should be incorporated into the plan.

Design Criteria

Buffer width should be selected to permit the zone to perform its intended purpose.
Slope, hydrology, width and structure shall be considered.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-03.2

Activity: Disturbed Stabilization (Temporary Seeding)

PLANNING CONSIDERATIONS:

Planning:
Not Required

Training:
Not Required

Recommended Personnel Involvement:
Town Engineer
Developers
Contractors

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ♢

Sediment ♦ Heavy Metals ♢ Nutrients ♢ Oxygen Demanding Substances ♢ Toxic Materials ♢
Oil& Grease ♢ Bacteria & Viruses ♢ Floatable Materials ♢ Construction Waste ♢

Description

For seasonal protection and areas with fast growing species the establishment of temporary seeding is desired to reduce storm water runoff velocity, maintain sheet flow, protect the soil surface from erosion, to promote infiltration of runoff into the soil, improve wildlife habitat, aesthetics and soil condition for permanent planting.

Suitable Applications

Coordinate with permanent measures to assure economical and effective stabilization.
Used as companion crops until permanent seeding is established.

Installation Procedures

Seedbeds are to be compacted by equipment or rainfall unless hydraulic seeder is used
Soil shall be disked, plowed, tiled or otherwise scarified for seed lodgment and germination.
Select grass or grass-legume mix to coincide with the area and season.
Apply uniformly by hand, cyclone seeder, drill, cultipacker seeder, or hydraulic seeder.
Drill or cultipacker should place seed ½ -1/4 inch deep.
Watering of area should be at a rate not to cause runoff or erosion during drought season.
Water depth should ensure germination of the seed.

Maintenance

Inspection of area made before anticipated rain events and within 24 hours after the end of a storm event of 0.5 inches or greater.

Maintenance should be corrected prior to the next known storm event or within 7 days after identification.

Inspection Checklist

q Identified areas that require re-seeding.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-03.3

Activity: Disturbed Area Stabilization (Permanent Seeding)

PLANNING CONSIDERATIONS:

Planning:
Not Required

Training:
Not Required

Recommended Personnel Involvement:
Town Engineer
Developers
Contractors

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ♢

Sediment ♦ Heavy Metals ♢ Nutrients ♢ Oxygen Demanding Substances ♢ Toxic Materials ♢
Oil& Grease ♢ Bacteria & Viruses ♢ Floatable Materials ♢ Construction Waste ♢

Description

Final stabilization occurs when perennial vegetation is introduced to construction areas. This stabilization occurs as a result of planting trees, shrubs, vines, grasses or legumes on exposed areas. The result of this aesthetic overture reduces stormwater runoff velocity, maintains sheet flow, protect soil surface from erosion, promotes infiltration of runoff into the soil and improves wildlife habitat. Permanent stabilization also acts as a protective cover for cuts, fills, and other denuded areas that will not be regarded.

Suitable Applications

Areas where topsoil was never stripped.
Topsoil has been returned and incorporated into the soil surface.

Design Criteria

Stripped sites should save stockpile for later use.

Stockpiled topsoil should be stabilized using vegetation.

Topsoil shall be incorporated into the site if a suitable medium is not present.

Irrigation should be done when soil is dry or summer planting is done.

To ensure erosion control, low maintenance plants and native species should be used. Wildlife planting is to be applied when applicable.

Activity: Distributed Area Stabilization (Permanent Seeding)	SPD-03.3

Installation Procedures

Grade and shape slope unless hydraulic seeding has taken place.
Divert erosion causing concentrations of water to safe outlets.
Plants should be selected based on characteristics specific to soil conditions, site, planned and maintenance of the area, method of planting, etc.
Topsoil should be friable and loamy, free of debris with a uniform application of 5 inches recommended.
Seedbed preparations: When conventional seeding is to be used, topsoil should be applied to any are where the disturbance results in subsoil being the final grade surface.

Broadcast Planting

1. Seedbed preparation may not be required where hydraulic seeding equipment is to be used.
2. Tillage, at a minimum, shall adequately loosen the soil to a depth of 4 to 6 in.; alleviate compaction; incorporate topsoil, lime, and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of plants; and allow for the anchoring of straw or hay mulch if a crimper is to be used.
3. Tillage may be done with any suitable equipment
4. Tillage should be done parallel to the contour where feasible
5. On slopes too steep for the safe operation of tillage equipment, the soil surface shall be pitted or trenched across the slope with appropriate hand tools to provide consecutive beds, 6 to 8 in. apart, in which seed may lodge and germinate. Hydraulic seeding may also be used.

Individual Plants

1. Where individual plants are to be set, the soil shall be prepared by excavating holes, opening furrows, or dibble planting.
2. For nursery stock plants, holes shall be large enough to accommodate roots without crowding.
3. Where pine seedlings are to be planted, use a subsoiler under the row to a depth of 36 in. on the contour four to six months prior to planting. Subsoiling should be done when the soil is dry, preferably in August or September.
4. Trees should not be planted in power line right-a-ways or under power lines.

Inoculants

1. All legume seeds shall be inoculated with appropriate nitrogen fixing bacteria. The inoculants shall be pure culture prepared specifically for the seed species and used within the dates on the container.
2. A mixing medium recommended by the manufacturer shall be used to bind the inoculants to the seed. For conventional seeding, twice the amount of inoculants recommended by the manufacturer. For hydraulic seeding, four times the amount of inoculant recommended by the manufacturer shall be used.
3. All inoculant seed shall be protected from the sun and high temperatures and shall be planted the same day inoculated. No inoculated seed shall remain in the hydroseeder longer than one hour.

Installation Procedures (Continued)

Planting

1. Hydraulic Seeding: Mix the seed (inoculant if needed), fertilizer, and wood cellulose or wood pulp fiber mulch with water and apply in a slurry uniformly over the area to be treated. Apply within one hour after the mixture is made.
2. Conventional Seeding: Seeding will be done on a freshly prepared seedbed. For broadcast planting, use a cultipacker seeder, drill, rotary seeder, other mechanical seeder, or hand seeding to distribute the seed uniformly over the area to be treated. Cover the seed lightly with 1/8 to ¼ in. of soil for small seed and ½ to 1 in. for large seed when using a cultipacker or other suitable equipment.
3. No-Till Seeding: No-till seeding is permissible into annual cover crops when planting is done following maturity of the cover crop or if the temporary cover stand is sparse enough to allow adequate growth of the permanent (perennial) species. No-till seeding shall be done with appropriate no-till seeding equipment. The seed must be uniformly distributed and planted at the proper depth.
4. Individual Planting: Shrubs, vines and sprigs may be planted with appropriate planters or hand tools. Pine trees shall be planted manually in the subsoil furrow. Each plant shall be sent in a manner that will avoid crowding the root.

Nursery stock plants shall be planted at the same depth or slightly deeper than they grew at the nursery. The tips of the vines and sprigs must be at slightly above the ground surface.

Where individual holes are dug, an appropriate amount of fertilizer shall be placed in the bottom of the hole, two in. of soil shall be added, and the plant shall be set in the hole and the hole filled.

Applying Mulching

Mulch is required for all permanent vegetation applications. Mulch applied to seeded areas shall achieve 75% soil cover. Select the mulching material from the following and apply as indicated.

1. When using temporary erosion control blankets or block sod, mulch is not required.
2. Dry straw or dry hay of good quality and free of weed seeds can be used. Dry straw shall be applied at the rate of 2 tons per acre. Dry hay shall be applied at a rate of 2 ½ tons per acre. *Sericea lespedeza* hay containing mature seed shall be applied at a rate if three tins per acre.
3. Straw or hay mulch will be spread uniformly within 24 hours after seeding and/or planting. The mulch may be spread by blower type spreading equipment, other spreading equipment or by hand.
4. Wood cellulose mulch or wood pulp fiber shall be used with hydraulic seeding. It shall be applied at the rate of 500 pounds per acre. Dry straw or dry hay shall be applied (at the rate indicated above) after hydraulic seeding.
5. One thousand pounds per acre of wood pulp fiber, which includes a tackifier, shall be used with hydraulic seeding on slopes ¾:1 or steeper.
6. Wood cellulose and wood pulp fibers shall not contain germination or growth inhibiting factors. They shall be evenly dispersed when agitated in water. The fibers shall contain a dye to aid in uniform application during seeding.

Activity: Distributed Area Stabilization (Permanent Seeding)	SPD-03.3

Installation Procedures (Continued)

Anchoring Mulch

1. Emulsified asphalt can be (a) sprayed uniformly onto the mulch as it is ejected from the blower machine or (b) sprayed on the mulch immediately following mulch application when straw or hay is spread by methods other than special blower equipment. The combination of asphalt emulsion and water shall consist if a homogeneous mixture satisfactory for spraying. The mixture shall consist of 100 gallons of water per ton of mulch. Care shall be taken at all times to protect state waters, the public, adjacent property, pavements, curbs, sidewalks, and all other structures from asphalt discoloration.
2. Hay and straw mulch may be pressed into the soil immediately after the mulch is spread. A special "crimper" or disk harrow with the disks set straight may be used. Serrated disks are preferred, and should be 20 in. or more in diameter and 8 to 12 in. apart. The edges f the disks shall be dull enough to press the mulch into the ground without cutting it, leaving much of it in an erect position. Mulch shall not be plowed into the soil.
3. Synthetic tackifiers or binders may be applied in conjunction with or immediately after the mulch is spread. Synthetic tackifiers should be mixed and applied according to manufacturer's specifications.

Irrigation

Irrigation will be applied at a rate that will not cause runoff.

Maintenance

Inspect seeding and mulch regularly.

Any washout areas should be repaired immediately.

Maintenance needs that have been identified should be repaired before the next storm event or within seven days of identification.

Inspection Checklist

q Inspect all applications and make appropriate repairs.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-03.4

Activity: Disturbed Area Stabilization (Mulch)

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ♢

Sediment ♦ Heavy Metals ♢ Nutrients ♢ Oxygen Demanding Substances ♢ Toxic Materials ♢
Oil& Grease ♢ Bacteria & Viruses ♢ Floatable Materials ♢ Construction Waste ♢

Description

Mulch is used to promote vegetation during vegetative stabilization practices to reduce stormwater runoff and erosion, conserve moisture, promote germination of seed, prevent surface compaction or crusting, protect seed from birds, modify soil temperature and increase biological activities in the soil.

Suitable Applications

Cleared areas where seed may not promote an erosion –retardant cover.
Protection of seed from birds.
Reduction of soil surface temperature is desired.

Design Criteria:

Select mulching material depending on desired soil coverage.
Anchor mulch immediately after application.

Installation Procedures

Grade to enable use of equipment for mulch application.
Install BMP as required (diversions, terraces, and/or sediment barriers).
Loosen compacted soil to a minimum depth of 4 inches if using mulch while seeding.
Anchor mulch by using emulsified asphalt, hay and straw mulch or synthetic tackifiers.
Emulsified asphalt should be sprayed uniformly onto the mulch with 100 gallon water to 100 gallon of asphalt ratio per ton of mulch.
Hay and straw are to be pressed into the soil immediately after the mulch is spread.

Activity: Distributed Area Stabilization (Mulch)

SPD-03.4

Maintenance

When applying mulch, protect state waters, the public, adjacent property, pavements, sidewalks and curbs, and other structures from asphalt discoloration.

Mulch should not be plowed into the soil.

Synthetic tackifiers should be mixed and applied according to manufacturer's specification.

Areas disturbed by blowing wind should be retreated.

Maintenance needs identified should be repaired before the next storm event or within 7 days after being identified.

Inspection Checklist

- q Inspection should coincide with other erosion and sediment control inspections.
- q Site reviewed after wet weather event.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-03.5

Activity: Disturbed Area Stabilization (Sodding)

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

Areas needing immediate vegetative cover such as grass swales, drop inlets, and waterways with intermittent flow use sod brought from other locations. This BMP is referred to as Disturbed Area Stabilization. The stabilization establishes immediate ground cover, reduces stormwater runoff, protects soil surface from erosion, reduces damage from sediment and runoff to downstream areas as well as improves aesthetics.

Installation Procedures

Bring soil surface to final grade.
Clear surface of trash.
Apply sod to soil surfaces only (not frozen).
Do not use top soil recently treated with herbicides.
Mix fertilizer and/or lime into soil surface.
Lay sod with tight joints and in straight lines.
Stagger joints, do not stretch sod.
Sod should be anchored with pins for slopes deeper than 3:1.
Irrigate sod and the top 4 inches of soil immediately after installation.
Excessive watering should not be performed. Irrigation should be used to supplement rainfall for a minimum of 2-3 weeks.

Design Criteria

Sod selected material should be certified.
Sod grown in the area is preferred.
Sod should be machine cut and contain ¾ (+ or – ¼ inch) of soil.
Cuts should be installed within 36 hours of digging.
Avoid planting when subject to frost heave or hot weather if irrigating is not available.

Activity: Distributed Area Stabilization (Sodding)	SPD-03.5

Maintenance

Re-sow areas where an adequate stand of sod is not obtained.

New sod should be moved sparingly.

Grass height should not be cut to less than 2-3 in.

Inspection Checklist

- ☐ Sod inspected after wet weather event.
- ☐ Sod is maintained to ensure grass height remains in specified range.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-03.6

Activity: Erosion Control Mats/Blankets

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ◇

Sediment ♦ Heavy Metals ◇ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

In areas where erosion hazards are high matting and blankets can be applied. This protective blanket or stabilization mat aids in establishing temporary or permanent vegetation on steep slopes, channels or stream banks. The presence of this BMP prevents erosion to the soil surface or seed, promotes seed germination, protects young vegetation and prevents the dispersion of seed or mulch.

Suitable Applications

All concentrated flow areas with slopes steeper than 2.5:1, with a height of 10 ft. or greater and cuts and fills within stream buffers.
Temporary blankets should be (at a minimum) used to stabilize concentrated flow areas.
Vegetative lining is desired in stormwater conveyance channels where velocity is projected to be between 5 and 10 ft. per second.

Design Criteria

Care must be taken to choose the type of blanket or matting appropriate for each project.

Rolled erosion control blankets are made of plastic netting intertwined with a natural organic or manmade mulch.

Jute mesh is a typical homogeneous design that can act alone as a stabilization blanket.

Activity: Erosion Control Mats/Blankets	SPD-03.6

Installation Procedures

Temporary blankets consist of straw blankets, excelsior, coconut, wood fiber and jute mesh.
Straw blanket consist of weed free straw with a 5/16 x 5/16 top side and a minimum thickness of 3/8 in. and minimum dry weight of 0.5 lbs per square yard.
Excelsior blankets are curled wood excelsior formed into a blanket with 1 ½ x 3 in. mesh sides and a minimum thickness of ¼ in. with a 0.8 dry weight lbs per square yard.
Coconut blankets consist of 100% coconut fiber with a ¼ thickness, a minimum dry weight of 0.5 lbs per square yard and a 5/8 x 5/8 in. maximum mesh .
Wood fiber blankets consist of reprocessed wood fiber with a maximum mesh size of 5/8 x ¾ in. and 0.35 lbs per square yard minimum dry weight.
Jute mesh consists of woven root fiber or yarn with regularly spaced openings between strands and 1.0 lbs per square yard dry weight for basic slope applications.
Shape and grade site.
Prepare a friable seedbed free from clods and rocks.
Temporary blankets should be installed vertically from the top of the slope to bottom. For shallower slopes (less than 2:1) with height twice as much as the width, and a maximum height of 16 feet, the blanket may be applied horizontally. Concentrated flow area blankets should be placed in the direction of water flow.
Entrench blanket beyond the top and bottom of the slope and at any horizontal joint a minimum of 6 in.
Permanent matting begins installation at the bottom of the slope and works towards the top while being centered in the middle of the channel.
Shingle upstream layer over downstream layer overlapping 3 ft.
Temporary blankets should be anchored with staples per manufacturing directions.

Maintenance

Manufacturer's recommendations should be followed when choosing products.

All preliminary seeding and soil amendments should be done prior to installation of temporary blankets.

Permanent matting areas should be brought to final grade before installation of matting. After installation and backfilling of topsoil, seeding and mulch should be applied.

Inspection Checklist

- q Inspection completed before a storm event.
- q Inspection completed within 24 hours after the end of a storm event of 0.5 inches or greater.

Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-04.1

Activity: Covenants

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

Conservation covenants are voluntary, legally binding agreements between a landowner and the State Government which are designed to provide permanent protection for areas or species that have conservation value. The covenant is registered on the title of the land and travels with the title to future landowners. Once a covenant is in place it can only be modified or revoked with the agreement of the landowner and the relevant state or local agency.

A management agreement is usually provided with a covenant and will detail how the conservation values are to be managed. Some activities such as grazing and firewood collection may be allowed within a conservation covenant. For those activities that are allowed, the details of how they will be undertaken are outlined in detail within the management plan. Both documents are drafted in consultation with the landowner.

The aim of conservation covenants is to ensure that land use is compatible with the natural values of that area. A conservation covenant will apply to all or most of the native vegetation on a property. However, a landowner may also choose to exclude parts of their property from the covenant for example to allow for building a house in the future.

Description (Continued)

Participation in a conservation covenant is entirely voluntary and the details of the covenant and management agreement are agreed only with the cooperation and consent of the landowner.

Management Agreements

Management agreements are agreements between a landowner and the State Government that are not registered on the land title. Management agreements set out required management practices to protect the nature conservation values.

Benefits of Covenanting Land

There are many benefits gained by having a conservation covenant on your land, they include:

- Rate rebates in some areas or districts.
- Exemption from land tax
- Having a conservation covenant helps if you are applying for grants for environmental work.
- By maintaining remnant native vegetation you benefit from erosion and salinity protection; and you provide shade and shelter for livestock; and protect wetlands, catchments and water quality.

Southern Indiana Stormwater Best Management Practices (BMPs) Site Planning and Design Practices (SPD's)

SPD-04.2

Activity: Setbacks and Buffers

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ♦ Heavy Metals ◇ Nutrients ◇ Oxygen Demanding Substances ◇ Toxic Materials ◇
Oil& Grease ◇ Bacteria & Viruses ◇ Floatable Materials ◇ Construction Waste ◇

Description

A *setback* is the area between intensive development (i.e., buildings, parking lots, roads) and a protected area, such as a wetland. Setbacks are necessary for:

- Controlling the peripheral effects of development
- Protecting developments
- Providing access for maintenance

For example, a highway or parking lot built directly on the edge of a high-quality wetland may adversely affect water quality and wildlife habitat from pollutant runoff or spray and traffic noise. Setback requirements for structures, particularly adjacent to streams, reflect the fact that streams naturally meander or expand over time. Placing structures in the natural path of a meandering stream virtually guarantees that expensive stabilization measures will be needed in the future as the stream approaches building foundations, threatening their collapse.

Only limited activities are recommended for approval in a setback. The types of activities include minor improvements, such as walkways, foot bridges, and observation decks; roadways necessary for crossing a water body; maintenance and repair of existing roads and utilities; and the establishment of landscaped lawns or parks. In general, major modifications to the land surface should be avoided in setbacks.

Description (Continued)

Limiting activities in a *floodway* to appropriate uses is similar to a setback requirement. A floodway is the part of the floodplain, centered on the stream, which will convey most of the flow during a high water event. Appropriate uses exclude most buildings and structures. However, other uses that are allowed may adversely affect water quality and habitat. These include:

- Parking lots
- Roadways parallel to the waterbody
- Garages and storage sheds
- Treatment plants and pumping facilities

Within a setback, a *buffer strip* is the transitional vegetated area closest to the waterbody or wetland. The purposes of a buffer are to:

- Minimize erosion
- Stabilize the stream bank or lakeshore
- Filter runoff pollutants from adjacent developments
- Preserve fish and wildlife habitat
- Screen manmade structures and preserve aesthetic values
- Provide access for maintenance or trails

Buffers reflect that natural aquatic systems may not function well in isolation and that a gradual continuum exists from natural riparian or wetland systems to upland. Ideally, a buffer should be maintained or planted in native riparian vegetation to maximize pollutant filtering, soil stabilization, and habitat functions.

Southern Indiana
Stormwater Best Management Practices (BMPs)
Site Planning and Design Practices (SPD's)

SPD-04.3

Activity: Conservation Easements

PLANNING CONSIDERATIONS:

Planning:
Required

Training:
Required

Recommended Personnel Involvement:
Town Engineer
Town Attorney
Developers
IDEM
IDNR

Target Pollutants

Significant ♦	Partial ◈	Low or Unknown ◇

Sediment ♦	Heavy Metals ◇	Nutrients ◇	Oxygen Demanding Substances ◇	Toxic Materials ◇	
Oil& Grease ◇	Bacteria & Viruses ◇	Floatable Materials ◇	Construction Waste ◇		

Description

Another useful tool for protecting sensitive areas is a conservation easement. A conservation easement incorporates legal provisions into a property deed that limits the use of the property. Conservation easements allow for the continued private ownership of the land but restrict land uses to current uses or to non-damaging activities. The legal concession may be donated by or purchased from the owner. The land owner also may be compensated by reduced property taxes on the land in the easement.