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Best Management Practices to Reduce Stormwater Runoff and Pollution at your Sports Facility

Stormwater Runoff

Stormwater runoff is generated from excessive irrigation, rainfall, or snowmelt that flows over land or impervious surfaces and does not infiltrate into the ground. As the runoff flows over land and impervious surfaces, it can accumulate debris, chemicals, sediment, and other pollutants that can negatively affect water quality if runoff is left untreated.

Stormwater runoff is a problem because of increased volume and rate of runoff from impervious surfaces, such as parking lots and other paved areas, and concentration of pollutants in the runoff. High volumes of polluted runoff can cause changes in hydrology and water quality such as habitat modification and loss, increased flooding, decreased aquatic biological diversity, and increased sedimentation and erosion.

Sports and recreational areas can contaminate stormwater runoff with pesticides, sediment, fertilizer, and other pollutants. A simple change in behavior and maintenance practices can result in reduced inputs, cost savings, and cleaner, safer waterways. Knowing your site and noticing where property runoff is directed and where drain inlets go can help you develop specific best management practices applicable to your facility.

Picture courtesy of Aaron Volkening, P.E.

Best Management Practices (BMPs) for Sports and Recreational Facilities

The primary method to control stormwater discharges is the use of best management practices. It is more cost effective and environmentally sound to put management practices in place before aquatic systems are affected. Restoring a polluted water body is much more difficult and expensive than utilizing best management practices from the start. Reducing stormwater pollution can be achieved by implementing various management systems suggested here. Additional best management practices can be found on the U.S. Environmental Protection Agency (EPA) website, www.epa.gov. You may also refer to your state's environmental department or municipal land agency.

BMPs for Bare Soil

During rain events and snowmelt, bare soil is subject to surface runoff and soil erosion. Runoff from bare soil can transport pollutants and sediment to surrounding water bodies or stormwater systems.

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Bare soil during sports field construction - Picture courtesy of Aaron Volkening, P.E.

- If a site is undergoing construction, clear only the land needed for building activities and vehicle traffic. This will reduce soil erosion and decrease the amount of sediment entering nearby waterways and storm drain systems.
- Silt fences can be used around bare areas to prevent runoff during construction or establishment periods.
- Vegetation such as trees, bushes, and grasses provide erosion control, stormwater detention, and biofiltration. Natural or established vegetated buffer zones can process high quantities of stormwater runoff. These areas protect water quality, hold soil in place, slow runoff, provide an area where runoff can permeate the soil, contribute to groundwater recharge, and filter sediment.
- Erosion of bare soil can be controlled by mulching, seeding, sodding, or using a compost blanket.

BMPs for Spill Response and Prevention

Hazardous spills include pesticides, paints, cleaners, petroleum products, and fertilizers. Every facility should have a spill response plan in place.

- A spill response plan should include safety measures to be taken with each kind of waste, procedures for containing, diverting, isolating, and cleaning of a spill, specific equipment to use to clean the spill, and disposal of contaminated materials.
- The spill response plan should include information on the appropriate authorities that need to be notified of the spill.
- Train employees. All employees should be aware of the spill response plan, know the location of the spill response equipment, and know step-by-step instructions for response to spills.
- Perform preventative maintenance on the facility area and equipment. For example, disconnect or redirect drains in maintenance areas so they do not empty in to the storm sewer or stormwater collection areas.
- Substitute less toxic or non-toxic materials for toxic materials.

BMPs for Good Storage Practices

Failure to properly store materials increases the probability they will end up in local waterways.

- Use appropriate signage to identify storage areas.
- Store pesticides and other chemicals in a safe, covered area away from high traffic.
- For any pesticides or chemicals not stored in a closed cabinet, store them in a plastic container with a 4-6 inch lip. The plastic container should still be able to fit on a shelf and allow for identification of the stored product. This storage method ensures containment of the chemical if it were to leak.
- To reduce the likelihood of spills, have sufficient aisle space and stack containers in accordance with manufacturer's directions.
- Store containers on pallets or other raised structures to reduce the likelihood of leaks, corrosion, or damage by pests.
- Cover materials such as fertilizers, mulches, or topdressing sand to limit contact with rain and prevent pollutants from entering stormwater runoff.
- Storage areas should be checked and cleaned regularly.
- Keep product labels with the product. Be sure the label contains the name of the chemical, unit number, expiration date, handling instructions, and health or environmental hazards.
- Keep waste containers securely closed and under cover. For example, used motor oil should be stored in a plastic or metal container with a secure lid.
- Always have a spill kit available for emergencies.

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BMPs for Materials Management

Pathogens, nutrients, surfactants, and toxic pollutants may be flowing into waterways untreated. Identifying and eliminating untreated discharges and spills to stormwater drain systems can significantly reduce the amount of pollutants entering waterways.

- Buy the correct amount of raw materials to decrease the amount of excess materials discarded. For example, know the square footage of your fields and buy only the amount of fertilizer needed to cover that area.
- Recycle materials. Reduce solid waste by finding ways to reuse materials. What you may consider waste at your facility may be useful to another operation. For example, old equipment may be broken down into parts that could be used at a different facility.
- Recycle waste such as paper products, glass, and paper. Encourage users to recycle waste such as drink containers by setting up appropriate receptacles with clear signage.
- Reduce the amount of trash entering stormwater by having a sufficient amount of trash and cigarette butt receptacles. Use clear signage to educate the public on their responsibility for keeping the facility clean.
- Utilize street sweeping, trash and recycling receptacle servicing, and roadside cleanup to prevent accumulation and possible entrance into waterways.
- Use grates and screens to filter trash from stormwater before it enters the drain system.

Grates can filter trash and debris from stormwater - Picture courtesy of Aaron Volkening, P.E.

BMPs for Fueling Areas

Fueling vehicles and equipment can generate spills and leaks of gasoline, diesel fuel, and heavy metals. Aquatic systems can be impaired by these toxic materials.

- Fueling areas should be located under cover and on an impervious surface.
- Drains should direct water to a treatment system instead of directly to stormwater areas or stormwater drains.
- The tank system should be in good condition and checked regularly for any physical damage such as leaks, cracks, or scratches.
- Clean the fueling area regularly. Water should not be used to wash down the area. Instead, sweep to remove litter and debris. Use rags and absorbent materials for leaks and spills.
- Have a spill prevention plan and have a spill kit available for emergencies.

BMPs for Property and Equipment Maintenance

Vehicle and equipment maintenance can release significant amounts of pollutants such as hydrocarbons, heavy metals, antifreeze, brake fluid, motor oil, fuel, etc. Improper disposal or clean-up of these fluids can result in their entrance into ground and surface water supplies.

- Conduct equipment and vehicle maintenance indoors or under cover.
- Use less toxic or non-toxic materials for cleaning, coating, and lubricating to prevent costly, hazardous waste generation.
- Monitor equipment and vehicles for fluid leaks and place pans under the leaks to collect fluids until the leak can be fixed.
- Concentrate cleaning and disposal at a centralized station to confine solvents and other fluids to one area. Direct drip pans and draining boards to the solvent sink or holding tanks. Used fluids should be kept in recycling drums or hazardous waste containers until they can be disposed of properly. Use local services to collect used liquids.
- Clean up spills immediately using absorbent materials instead of water.

- Seal drains in maintenance areas that may be connected to stormwater systems.
- Reduce the amount of water used for cleaning equipment.
- Direct wash water to the sanitary sewer. Be sure to check sewer authority requirements for wastewater before discharge into the sanitary sewer.
- Install a system to recycle wash water for equipment wash areas.

BMPs for Irrigation

Excessive irrigation can transport pollutants and cause erosion which can negatively affect waterways.

- Conduct an irrigation water audit to maximize water use efficiency. The audit should check sprinkler head operation and output as well as irrigation distribution, uniformity, and pressure.
- Regularly check the irrigation system for leaks.
- Make sure tall grass, groundcovers, or shrubs are not blocking or deflecting the water spraying out of the sprinklers. When the water pattern is deflected by tall grass or leaves it results in uneven watering and water waste. To reduce water waste, use sprinkler heads that pop up 3 or more inches or trim plants around the sprinkler.
- Locate sprinkler heads 4-6 inches away from the edge of sidewalks, curbs, patios, etc. This will reduce the amount of spray onto the paved surface and will not create a dry area along the edge. Locate sprinkler heads 12 inches away from shrub areas. To optimize water use in shrub areas, consider using a drip irrigation system.
- Plants should only be watered when needed, which enhances root growth, improves overall plant health, and decreases wastewater.
- Water deeply and infrequently. To minimize runoff, cycle the irrigation so sprinklers run in shorter increments to give the water time to infiltrate into the soil.

Picture courtesy of Tom Serensits

- Use turfgrasses that are drought tolerant.
- Reduce water use on utility turf by creating landscaped areas that do not require water in addition to rainfall. Choose plants, trees, and shrubs that are drought tolerant and thrive in your particular climate. Indigenous plant species are adapted to the precipitation and diseases associated with the region. Work with your local cooperative extension service to determine the best native plants for your situation.
- Invest in a rain switch. A rain switch is a rain sensor that detects measurable rainfall, then turns off automatic irrigation valves.

BMPs for Fertilizers

Applying excessive nutrients or high quantities of fertilizer increases the likelihood that nutrients will end up in local waterways due to stormwater runoff from excessive rain or irrigation.

- Routine soil testing can help prevent overapplication of nutrients to turf and landscaped areas. Test soils every 1-3 years to determine the amounts of nutrients already present in the soil. Plan your fertilizer program according to soil test recommendations.
- Apply the minimum amount of fertilizer to the minimum area needed. For example, fertilize only the soccer field and not surrounding utility turf areas.

- Apply fertilizer at lower application rates, but at a higher application frequency.
- If applying fertilizer to bare soil, work the fertilizer into the soil to reduce exposure of nutrients to stormwater runoff.
- Slow release organic fertilizers are less likely to enter stormwater than quick release nitrogen sources.
- Do not apply fertilizers close to impervious surfaces. If fertilizer granules land on an impervious surface, clean them off so they are less likely to enter stormwater runoff.
- Do not apply fertilizers on a windy day or before heavy rainfall.
- Dispose of excess fertilizer and fertilizer containers safely.

BMPs for Pesticides/Integrated Pest Management (IPM)

Pesticides in stormwater runoff directly affect the health of aquatic organisms and their presence in drinking water threatens human health. A U.S. Geological Survey study found that insecticide concentrations in urban streams frequently exceeded the Environmental Protection Agency's (EPA) guidelines for protecting aquatic life.

- Employ Integrated Pest Management (IPM) strategies. The goal of IPM is not to eliminate pests, but to manage pests at a tolerable level while avoiding environmental disruptions. IPM programs combine preventative practices with non-chemical and chemical pest controls to minimize pesticide use and promote natural pest control.
- Be open minded to alternatives to pesticides. Alternatives are often perceived as more time intensive and less reliable, but simple changes may reduce cost and reliance on pesticides. For example, use of insecticidal soaps or having a higher tolerance for certain weed species reduces the need to apply pesticides.
- Only use chemical pesticides when all else fails.
- Always apply pesticides in accordance with label recommendations. Keep detailed and accurate records for each application.

BMPs for Stormwater Runoff Collection Areas Management

The best way to reduce stormwater impacts is to use practices to treat, store, and infiltrate runoff onsite before it can affect surrounding water bodies or water bodies downstream. Methods include infiltration, filtration, retention/detention, and innovative best management practices. Careful planning and design of these areas can minimize water loss and contamination of waterways.

Infiltration

- Grass swales are vegetated, open channel management systems designed specifically to treat and lessen stormwater runoff. When stormwater enters grass channels, runoff velocity is reduced. Decreased flow rates allow sedimentation. The grass also provides water quality benefits through filtration and infiltration. The stormwater is filtered through a subsoil matrix, and/or infiltrates into the underlying soil for pollutant and nutrient removal. Grass swales are effective at removing suspended solids, phosphorus, nitrogen, and metals.
- An infiltration basin is a shallow impoundment designed to store stormwater and allow it to infiltrate the soil. The soil filters the stormwater for groundwater recharge. These basins are an effective way to remove high levels of pollutants; however, they may require high levels of maintenance to prevent the soil from becoming clogged with fine soil particles from sedimentation.

Filtration

- Vegetated filter strips are vegetated surfaces adjacent to impervious surfaces. The filter strips can treat stormwater sheet flow, slow runoff velocities, filter out sediment and other pollutants, and provide infiltration into the soil. A study from the University of Rhode Island shows that a 15-foot-wide grass buffer can achieve a 50 percent removal rate of nitrogen, phosphorus, and sediment, and that a 100-foot buffer can reach closer to 70 percent removal of these constituents.

- Bioretention areas/rain gardens are shallow depressions landscaped with native vegetation. The plants, mulch, and soil help trap sediment, temporarily hold water, and trap, utilize, or degrade pollutants. Rain gardens delay and filter surface runoff and increase the amount of water that infiltrates into the soil. This reduces pollutant transport into nearby water bodies. Rain gardens are also effective in preventing landscape and stream bank erosion, maintaining base flow in streams, and aiding in recharge of aquifers.

Bioretention area/rain garden - Picture courtesy of Aaron Volkening, P.E.

- Catch basins are typically an inlet to a storm drain system meant to catch sediment, debris, and pollutants. The effectiveness of a catch basin depends on design and maintenance. Pollutant removal can be enhanced with catch basin inserts, which can remove oil and grease, trash, debris, and sediment from untreated stormwater runoff.

Retention/Detention

- A dry detention pond is a basin designed to store stormwater runoff for a minimum amount of time to allow sediment and other pollutants to settle. These ponds are effective for flood control from heavy rain or snowmelt.

Dry detention pond - Picture courtesy of Aaron Volkening, P.E.

- Wet ponds are constructed basins that have a permanent pool of water throughout the year or during the wet season. Wet ponds provide flood control, allow particles to settle, and allow biological activity to take up pollutants and nutrients.

Wet pond - Picture courtesy of Aaron Volkening, P.E.

- Stormwater wetlands are designed to specifically treat stormwater runoff and have less biodiversity than natural wetlands. Natural wetlands should not be used for stormwater runoff, as this can potentially harm the habitat. Stormwater wetlands provide pollutant removal through settling and biological uptake. They are also effective for flood control.

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Innovative BMPs

- Green parking areas can reduce the total impervious cover of a parking lot to reduce stormwater runoff. Ideas for green parking include minimizing dimensions of parking lot spaces, using alternative pavers (gravel, cobbles, porous pavement, grass pavers, or turf blocks) in overflow parking areas, or directing stormwater runoff from parking lots to bioretention areas.

Porous pavement - Picture courtesy of Aaron Volkening, P.E.

- Green roofs can reduce stormwater runoff by absorbing, storing, and evapotranspiring initial precipitation. Green roofs generally absorb 50% of rainfall. Soil microbial processes and plant uptake utilizes nitrogen and phosphorus contamination in stormwater runoff.

BMPs for Educational Outreach

Implementing management strategies to reduce stormwater runoff at your facility should be promoted to employees, supervisors, users, and the community. Taking action to reduce and prevent stormwater runoff will encourage facility employees and the public to follow your lead.

- Educate employees, supervisors, users, and the community about what you are doing at your facility to reduce stormwater runoff from entering storm sewers and water bodies. A variety of media, such as signs, magnets, calendars, videos, and BMP fact sheets and handbooks, can all be used to promote the stormwater management practices you are using. A successful outreach campaign educates facility users on the programs being utilized as well as how users benefit from the programs.
- Spreading the message on the importance of stormwater management can generate community interest to undertake group activities that protect local water resources. Involving the public could create an opportunity for a community funded project, such as a bioretention area, at your facility.

Summary

There are a wide variety of solutions for reducing, preventing, and treating stormwater runoff. Effective management of stormwater runoff results in protection of wetlands and aquatic ecosystems, improved quality of receiving waterbodies, conservation of water resources, flood control, and protection of public health. Start looking into some options for how your facility can improve or add to your stormwater management practices. For more information on how you can manage stormwater runoff, visit www.epa.gov, or contact your state's environmental department or municipal land agency.

Resources
Environmental Protection Agency (www.epa.gov)
Contributions made by STMA Information Outreach Committee
Pictures provided by Aaron Volkening, P.E. and Tom Serensits