

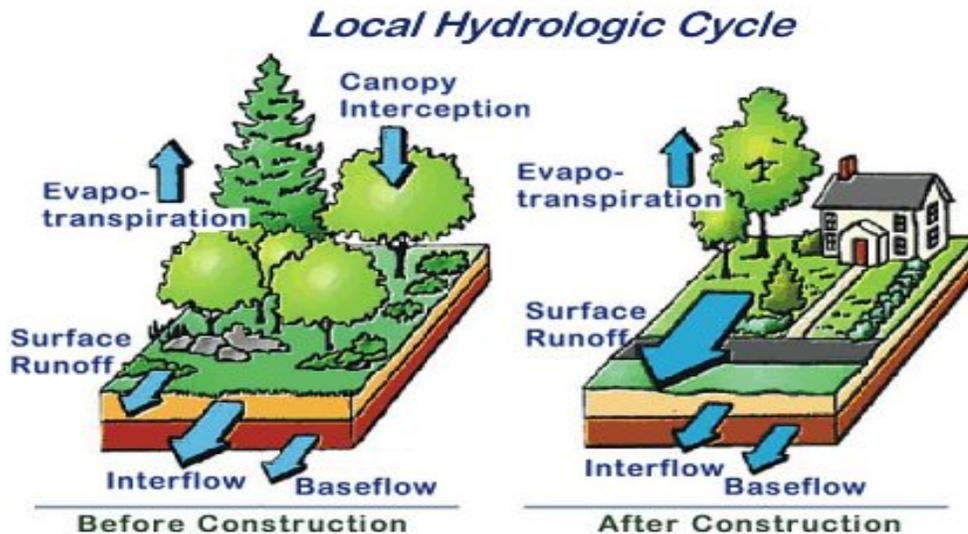
Stormwater Regulation and Groundwater/Surface Water Interaction

A Fact Sheet for Technical Staff in State and Local Regulatory Programs

Why does the Water Board regulate stormwater runoff?

Development and urbanization result in an increase in impervious surfaces, which creates new pollutant sources and changes in runoff patterns as compared to undeveloped landscapes. Urbanization replaces the naturally vegetated soil with impervious surfaces and efficient storm drain systems that transmit more runoff to creeks and the Bay quickly. With these changes, the soil's natural ability to absorb rainwater to

maintain groundwater levels and yield and effectively remove pollutants through natural infiltration is significantly reduced. As a result of these drastic changes to the landscape, urban creeks have become stressed with geomorphic alteration, including significant increases in runoff volume and flooding problems, erosive and incised streams, and increased pollutant loads.



Source: Maryland Stormwater Management Program

These impacts have long been apparent, not only in the Bay Area, but nationwide. Consequently, discharges from municipal separate storm sewer systems (MS4s) are subject to federal and state laws and regulations. In 1987, the U.S. Congress amended the 1972 federal Clean Water Act (CWA) to regulate such discharges. Section 402(p) of the federal CWA requires National Pollutant Discharge Elimination System (NPDES) permits for discharges from stormwater runoff, particularly from industrial and construction activities, and other activities considered significant contributors of pollutants

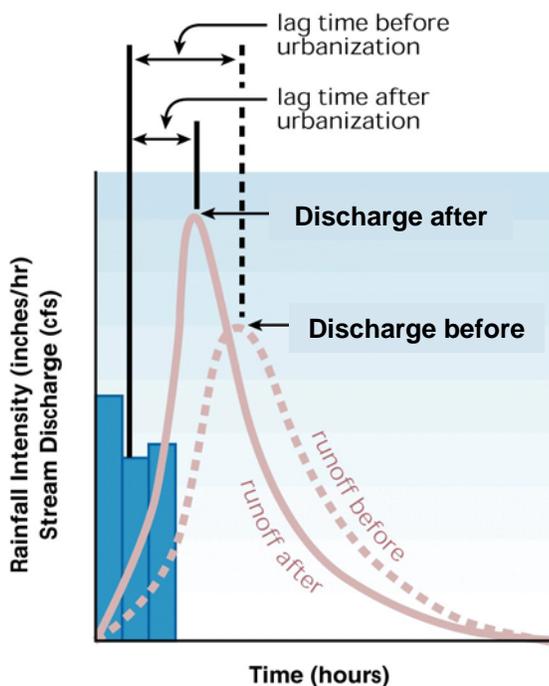
to waters of the United States. Consistent with federal law and regulations, the Water Board has also included a stormwater urban runoff management program in the San Francisco Bay Basin Water Quality Control Plan (Basin Plan). See Section 4.14 of the Basin Plan on the Web at http://www.waterboards.ca.gov/sanfranciscobay/basin_plan.htm. On November 16, 1990, the Environmental Protection Agency published regulations (40 CFR Part 122) prescribing permit application requirements for MS4s pursuant to Section 402(p) of the CWA.

What are the water quality impacts associated with stormwater runoff?

Stormwater runoff can adversely affect the hydrology, chemistry, and biotic communities associated with wetlands, streams, and other water bodies. The interaction between surface and groundwater is often difficult to measure, but increased volumes of surface water can alter wetlands and streams in many ways, including reduced soil oxygen levels and infiltration capacities; reduction in the amount of water held in the subsurface; reduced stream baseflow; changes in groundwater recharge and discharge zones; and reduced availability of nutrients and rates of decomposition. When a decrease in natural infiltration leads to excessive stormwater runoff, streams can become destabilized, receiving water temperatures can rise, and salinity can change in estuaries and other nearshore environments. These hydrologic and chemical changes can adversely impact biological productivity, species richness, and

species composition in wetlands, streams, and other water bodies.

Typical pollutants associated with urban runoff include sediment, nutrients, pathogens, oil and grease, metals, petroleum, synthetic organic compounds, pesticides, and other wastes. Gross pollutants such as trash and debris are also carried by urban runoff. Many pollutants in urban runoff can be removed using simple landscape features, such as vegetated swales, infiltration ponds, and bio-retention controls (also known as rain gardens), or using permeable pavement materials. These landscape features improve surface infiltration of runoff while reducing the volume and peak flow of stormwater runoff, thus minimizing excess erosion and sedimentation in receiving wetlands, streams, and other water bodies.



The graph to the left shows a comparison of hydrographs before and after urbanization. The solid blue bars indicate a rainfall event. The curves represent the runoff and creek flow in an example catchment area resulting from that rainfall. Lag time is the time between the main rainfall event and when peak runoff is observed. Adapted from *Stream Corridor Restoration: Principles, Processes and Practices* (Interagency Stream Restoration Working Group, October 1998).

How does the Water Board regulate stormwater runoff?

The core stormwater pollution prevention programs regulate construction, industrial, and municipal activities.

The goals of the three major stormwater programs are to prevent, minimize, or remove pollutant discharges into stormwater.

Construction Stormwater: Active construction projects that disturb one or more acres of soil, or projects that disturb less than one acre and are part of a larger common plan of development that disturbs one or more acres, are covered under the **statewide NPDES General Permit (Construction Stormwater Permit, Order 99-08-DWQ)**. Construction activities covered by this permit include clearing, grading and disturbance of ground such as stockpiling or excavation. Regular maintenance activities are excluded. To obtain coverage for a project under the Construction Stormwater Permit, project proponents must file a Notice of Intent with the State Water Board before beginning construction. The Construction Stormwater Permit requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) and a self-monitoring program. The main focus of best management practices (BMPs) for construction sites is erosion and sediment control, and source control for fuels, concrete, and other pollutants commonly in use at construction sites. For detailed information, go to <http://www.waterboards.ca.gov/stormwtr/construction.html>.

Industrial Stormwater: This permit regulates discharges associated with ten broad categories of industrial activities. The **statewide Industrial Stormwater General Permit, Order 97-03-DWQ**, requires the implementation of management measures that will achieve the performance standard of the best available technology that is economically achievable and best conventional pollutant control technology. Similar to the Construction Stormwater Permit, this permit also requires preparation and implementation of stormwater pollution

prevention plan to identify and reduce pollutant sources and a monitoring plan.

Effective pollutant source control is the main goal at industrial sites. BMPs range from good house-keeping practices to structural controls that may be engineered to lesser or greater degrees to control the pollutant sources specific to that site. The objective of structural control is to prevent pollutants from being discharged and reduce pollutants in runoff. For detailed information, go to <http://www.waterboards.ca.gov/stormwtr/industrial.html>.

Municipal Stormwater: In the San Francisco Bay Region, MS4 NPDES permits cover communities and cities in Alameda, Contra Costa, San Mateo and Santa Clara counties and the cities of Vallejo, Fairfield, and Suisun City. The Water Board is currently in the process of issuing a single permit to cover all these municipalities, called the Municipal Regional Permit (MRP). Communities in Marin, Napa, and Sonoma counties are covered by a statewide stormwater NPDES general permit for small municipalities. Permits require implementation of controls (such as BMPs) to reduce pollutants in stormwater discharges to the maximum extent practicable. Controls and management practices span several action program areas:

- Municipal maintenance activities – Street sweeping; inspecting and cleaning storm drain inlets; maintaining corporate yards; removing trash; controlling pesticide applications.
- Commercial/industrial and illicit discharge controls – Inspect commercial and industrial facilities; identify, control and eliminate illicit discharges from industrial and commercial facilities; terminate illicit discharges.

- Public information and participation – Educate and inform the public on reducing pollutant discharges to storm runoff.
- New development and redevelopment construction control measures – Control sediment-laden discharges from active construction sites; implement effective post-construction pollutant and flow control measures.
- Watershed assessment and monitoring –Identify effective BMPs to protect stormwater quality;

develop tools and methods to measure stormwater impacts and results of management activities.

For detailed information about municipal stormwater programs, go to <http://www.waterboards.ca.gov/stormwtr/municipal.html>.

For additional local municipal stormwater program guidelines and recommended best management practices, see <http://www.basmaa.org/Programs>

How is stormwater related to groundwater?

Polluted stormwater may be a potential threat to groundwater because nearly all surface water features (e.g., streams, lakes, reservoirs, wetlands, estuaries) interact with groundwater and these water bodies are the final destination of most stormwater runoff.¹ The impact and extent of the interactions depend on the chemical and physical nature of the pollutants and the geological strata separating the two water regimes. The effects will be directly proportional to the depth of groundwater and the soil type of the unsaturated zone.

Many urban runoff pollutants are not readily soluble in water and have a great affinity to soil particulates, which limits their mobility.

However, some urban runoff pollutants (such as fertilizers) are readily soluble in water and may have great mobility in soil, thus posing potential threats to groundwater quality. The greatest concern about how stormwater can affect groundwater is through localized recharge related to treatment devices that have an infiltration component (e.g., vegetated swales or retention basins). Increased local recharge from such devices can have adverse impacts on pre-existing groundwater contaminant plumes, forcing plumes to move in unexpected directions, for example. Safeguards against undesirable impacts from stormwater infiltration should be addressed in the study of groundwater/surface water interaction.

How can groundwater and stormwater professionals provide “mutual aid”?

Groundwater staff who are conducting field work can help stormwater staff by being “eyes and ears” for illicit discharges into the storm drains, and specifically, for erosion/sediment control problems at active construction sites that they also oversee for groundwater programs. Similarly, stormwater staff should develop a working knowledge of groundwater issues in their oversight area. A little knowledge about threats to groundwater, locations of vulnerable areas, and locations of major groundwater contamination can help assure that potential

infiltration projects get off to a good start. Further, SWPPPs and discharge monitoring at industrial stormwater sites are focused on the protection of nearby surface water areas. It is possible that groundwater protection concerns are being overlooked in the effort to protect the surface waters. For example, while we often encourage carwash and downspout runoff to be directed to bare soil or landscaped areas, beneficial or adverse impacts to groundwater should also be evaluated.

For more information about this fact sheet, contact Habte Kifle at 510-622-2371 or hkifle@waterboards.ca.gov

¹A Comprehensive Groundwater Protection Evaluation for the South San Francisco Bay Basins, May 2003.