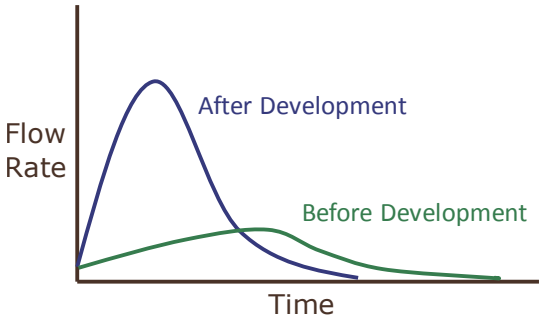
Hydromodification

A Fact Sheet from the Southern California Coastal Water Research Project

March 2013

What Is Hydromodification?

"Hydromodification" refers to alterations in natural watershed hydrology associated with changes in land use or cover. Conversion of the open landscape to features such as roads, buildings, houses, sidewalks, parking lots, flood control channels, and agricultural fields modifies runoff patterns, causing rainfall to run off into streams more quickly with higher energy, and large flow events to occur more frequently.



Hydromodification Effects

Changes in runoff, as well as reduced sediment transport into the stream from surrounding land, cause stream channels to erode. The eroded sediments may transport pollutants and/or deposit in downstream habitats such as bays and estuaries.

Why Is Hydromodification a Concern?

Modified hydrology and erosion are two primary causes of degraded biological communities in streams. Many management programs focus on improving water quality; however, managing water quality and hydrology together is a more effective approach to restoring long-term stream health. Beyond biological effects, hydromodification also reduces groundwater recharge and may impact houses, roads, bridges, pipelines, and other structures.

Hydromodification in Southern California

In southern California, hydromodification is exacerbated by rugged topography (steep elevation changes over short distances), naturally erodible soils, periodic intense precipitation events, and frequent wildfires. These factors cause the region's streams to be particularly sensitive, and even small rain events can potentially bring about substantial damage.

Management Measures

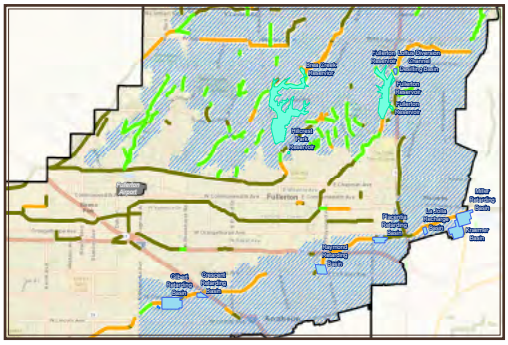
Vegetated swales allow parking lot runoff to infiltrate on-site.

Hydromodification effects can be minimized through land-use planning, low-impact development, and runoff controls. These preventative measures are often more cost-effective than trying to remediate the effects after they occur.

SCCWRP collects data and develops tools to help assess and manage hydromodification at a watershed level.

Watershed Characterization

SCCWRP has collected a large data set on physical stream conditions in southern California. These data were used to recalibrate national models for predicting stream flow at ungauged sites and national models describing relationships between land use and channel erosion. The data also provide a scientific foundation for local predictive modeling.



Tools for Risk Mapping and Field Screening

Because of variability in individual streams and watersheds, land cover alone cannot predict hydromodification risk. Working with partners, SCCWRP recently developed screening tools to assess hydromodification susceptibility. First, GIS analyses are applied to map higher-risk areas in a watershed. Next, a field-based assessment method based on readily observable indicators and intuitive decision trees characterizes the susceptibility of individual stream channels.

Predictive Modeling, Decision Support, and Monitoring Design

SCCWRP and partners developed a multifaceted guidance framework for hydromodification modeling and management. This framework supports decisions about appropriate actions based on the degree of hydromodification risk and downstream habitat sensitivity, and enables tailored solutions for each unique reach of a watershed. Guidelines for a watershed monitoring program help managers evaluate the effectiveness of management actions over time.

Decision Matrix for:
Upper Watershed, Low Sensitivity of Downstream Habitat

		Expected Change in Runoff		
		High	*Medium*	*Low*
Channel Susceptibility	*High*	Aggressive	Aggressive	Moderate
	Medium	Moderate	Moderate	Moderate
	Low	Moderate	Low	Low

Degree of Flow Control Needed: Aggressive, Moderate, Low

Management Applications

SCCWRP's existing guidance materials can be applied to protect against hydromodification and address legacy effects throughout watersheds. Because surface water regulatory programs in California are moving toward setting goals for biological condition, future work will focus on tools that connect physical hydromodification processes to changes in biological communities.

For more information on SCCWRP research, visit: **www.sccwrp.org.**