

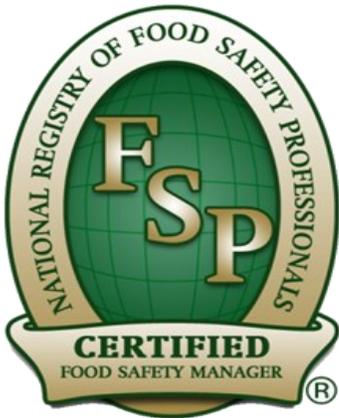
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Structural BMPs in Land Development and Preventing Mosquito Breeding

A Brief Introduction

Richard Diaz
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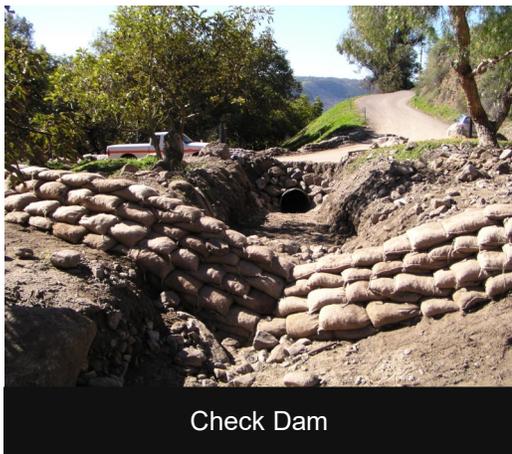
As his penitence, the Greek hero Heracles was tasked with completing 10 seemingly impossible labors. For his fifth labor, Heracles had to clean the Augean Stables which housed 1000 divine cattle and had not been cleaned in 30 years. For the right price, Heracles told King Augeas, he would clean the stables in a single day. Agreed. So at daybreak Heracles diverted the mighty Peneus and Alpheus rivers through the stables and rid them of all the divine filth before sundown...

...And the downstream neighbors? What recourse did they have? Not much, considering they had to go up against the king and a demi-god but with no mythological equivalent of US Army Corp of Engineers, Fish & Wildlife, or other resource agencies for backup.

Just as you can't stop the rain, water will flow "where it wanna go," i.e., along the path of least resistance. In open space land, rainwater infiltrates into the soil where it's taken up by vascular plants and utilized by soil biota before recharging aquifers or flowing below surface toward receiving waters. Surface runoff follows established ravines and gullies before converging into the tributaries of streams and creeks, replenishing riparian habitats that open up into wider estuarial or lake ecosystems distinct in their own flora, fauna and substrate.

In urban development, however, we grade and change the natural topography and install cement, asphalt, rooftops, roads, and other impervious surfaces, thereby reducing the overall infiltration capacity of the site. Since the 19th century, civil engineers have designed projects to remove water quickly from newly built and inhabited structures to prevent flooding and threats to life and property. Early flood control designs directed the runoff to open spaces; modern ones send it through a storm drain system of channels and underground pipes to nearby receiving waters.

As urban growth spreads, the runoff flow leaving a developed site increases. This increased volume of runoff moving at a higher velocity through the storm drain system delivers greater mechanical energy to receiving waters, often resulting in scouring of banks and the loss of soil, rocks, and anchoring tree roots. Flooding may also occur. In addition, an increase in population leads to an increased pollutant load in the runoff carrying trash, debris, sediment, fertilizers, animal waste, oils and grease. The resultant increase in total suspended solids, bacteria, toxicity, nitrates, phosphates, and biological and chemical oxygen demands can impair the aquatic health of inland waters. At the coastal river outfalls, it often leads to beach closures due to high indicator-bacteria counts.



But what if this runoff through the storm drain system stagnates—by inadequate design, poor construction, or lack of maintenance? Even a cupful of water, at the right water and ambient temperatures, can lead to mosquito vector breeding equally so in highly urbanized and backcountry locales.

Driven by legislation, civil engineers over the past 20 years have been designing how to keep storm water runoff on site and to minimize pollutants in it. These regulations are promulgated from the federal to the state and local levels, originating in the federal Clean Water Act and carried out through regional permitting under the National Pollutant Discharge Elimination System. In California, these water quality permits are issued by the nine regional water quality control boards. The gist: Retain storm water on site, or treat the runoff and reduce its flow before it leaves the property.

Eliminating Mosquito Havens

In California, six mosquito species raise the most concern in public health as vectors of West Nile Virus (WNV), St. Louis encephalitis (SLE), Western equine encephalitis (WEE), dengue fever (DF), Zika (Z), yellow fever (YF), malaria (M), and dog heartworm (DH).

Breeding sources can vary: *Culex tarsalis* (WNV, SE, WEE) and *Anopheles freeborni* (M) tend to breed in agricultural or open space areas; *C. pipiens* (WNV, SE) and *Aedes sierrensis* (DH), in increasingly more urbanized areas where cast-off items such as tires and containers provide a reservoir; and *Aedes aegypti* and *Aedes albopictus* (Z, DF, YF) breeding more opportunistically in urban areas—even a bottle cap can hold enough water to lay eggs.

To preserve water quality and to reduce the risk of mosquito breeding, the regional permits require the proper design, sizing, installation, and maintenance of structural best management practices (S-BMPs) when proposed development projects intend to increase the impervious surfaces by a threshold, e.g., 10,000 sq. ft. or greater. But these are engineered BMPs, not sediment traps left over from construction. The S-BMPs are calculated and designed to capture storm water runoff representative of a large 24-hour rain event, typically to the 85th or even 95th percentile. And the S-BMPs are designed to draw down, or empty, in less than 96 hours (4 days), depending on local regulations. In plan check, proposed projects that cannot meet this drawdown requirement may be passed to the Vector Control unit for review before rejection.

In the field, S-BMPs can be found in recent developments: large single-family dwellings, condominiums, apartment complexes, industrial parks, shopping centers, planned communities, and municipal facilities.

Structural BMPs comprise three categories based on function: retention, biofiltration, and flow-through control.



Detention Pond

Retention: These BMPs retain storm water runoff. Cisterns “harvest” runoff for reuse (irrigation or non-potable uses) between rain events. A standard window screen mesh (18 X 16) is required in piping and openings to prevent mosquito entry. Infiltration BMPs, e.g., infiltration basins, bioretention areas, and permeable pavement, capture and infiltrate runoff. These BMPs might not be feasible or allowed in areas with high water tables.



Biofiltration With Sediment Trap

Biofiltration: These BMPs treat stormwater runoff by filtration, sedimentation, vegetative uptake, evapotranspiration, and biochemical processes before release to the storm drain system. Runoff is filtered through shallow basins filled with treatment media (activated biota)/soil and drainage rock. An under-drain and impermeable liner are used to convey the treated runoff to the storm drain system.

Flow-through control: These BMPs remove pollutants from storm water runoff through physical methods before release to the storm drain system. Examples include vegetated swales, media filters, sand filters, dry extended detention basins, and proprietary devices such as curb drainage inserts.

Again, S-BMPs must not hold storm water runoff for more than 96 hours, perhaps less in some jurisdictions.

An engineered and installed S-BMP can fail if not maintained properly, resulting in ponding and an opportunity for mosquitoes to breed. Overgrown vegetation, clogged filter media, die-off or clearing of vegetation, importation of fill, and un-permitted pool or septic system excavations can cause ponding at the S-BMP.

(Continued on page 6)

CEHA Awards and Scholarships

The deadline to submit all completed applications for our nominations has passed for 2018. The recipients will be announced at the 2018 AES. Start thinking about who to nominate for 2019. Visit our webpage for more information and to start working on nominations.

www.ceha.org



Just Because the Fire is Out...Does Not Mean All the Work is Done

Nick del Valle, MPH, REHS, CPESC
Environmental Scientist
County of San Diego

Fire season is no longer predictable. In San Diego County, the 2003 and 2007 wildfires took place at the beginning of the historical rainy season from October through April. Similarly, the Napa, Thomas, and other 2017 fires occurred during early fall. However, in 2014 wildfires unexpectedly occurred in San Diego in May, and monsoonal rain events in the summer led managers to plan for a wildfire/rain-event response plan year-round.

The results of a wildfire: As vegetation is burned, the destroyed root system no longer holds back the soil, so subsequent rains can dislodge sediment, ash, rocks, boulders, burned tree limbs and even cast-off items once-hidden in the brush. These debris flows can damage property and harm lives if not addressed.

In San Diego, once the wildfires were contained and put out, County staff in conjunction with erosion control consultants quickly helped to survey, design and implement Best Management Practices (BMPs) to reduce the risk of erosion and sedimentation damage in the fire-impacted areas prior to anticipated rain events.

At times you can see such BMPs in place along Caltrans state highway projects.

On steep hillsides we strategically placed gravel-bag check dams to help reduce the flow velocity of erosion and encourage sediment removal from the runoff yet still allow water to filter through. We also staked in fiber rolls along the contours of hillsides to help reduce erosion and flow velocity. As a final touch on hillsides, a contractor applied hydro-mulch over the burned land, fiber rolls, and check dams to act as a "glue barrier" to temporarily protect exposed soil from raindrops which keeps the soil in place on the hillside. We also used sandbag barriers and K-rail at the base of steep hillsides to help stop and redirect mud or debris flows away from homes and county roads.

Overall, the temporary BMPs that we implemented after the 2003, 2007, and 2014 wildfires in San Diego County worked well in reducing erosion damage in the fire-affected areas during rain events. In certain areas we needed to clean out behind check dams to increase the capacity after a rain event. So monitoring and maintaining the BMPs was important to extend the effectiveness of the BMPs throughout the length of the rainy season.

After wildfires, time is of the essence to design and implement temporary BMPs to help protect homes, structures, and roads before rain events. Check dams, fiber rolls, hydro-mulch, and K-rail are effective temporary BMPs to help reduce the flow velocity of erosion, encourage sediment removal from runoff, and redirect mud or debris flows away from structures and roads until the natural vegetation can grow back.

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Share Tables at Schools

By Umair Rafique, MPH

USDA defines share tables as "tables or stations where children may return whole food or beverage items they choose not to eat if it complies with local and state health and food safety codes."

In an effort to minimize waste and reduce food insecurity, legislation (SB-557) was proposed to revise section 114079 of the Health and Safety Code. SB-557 would allow perishable prepackaged foods on sharing tables, provided they are "placed in a proper temperature-controlled environment." The bill also aims to allow for these perishable items that have not been taken by a pupil during meal service time to be donated to a food bank or any other nonprofit charitable organization.

Existing California law (HSC § 114079) prohibits contributing potentially hazardous foods to sharing tables due to concerns about food safety. While any food facility may currently donate food to a food bank or any other nonprofit charitable organization, the current law discourages donation of food left on cafeteria share tables because it has been served. The proposed legislation calls for donating perishable, returned foods on a share table which, practically speaking, may be susceptible to a higher risk of temperature abuse.

According to the Los Angeles Unified School District (LAUSD), a sponsor of the bill, "nearly \$100,000 worth of food is thrown in the trash per day". LAUSD's Office of Environmental Health and Safety claims that "in any given week, LAUSD is throwing out approximately 600 tons of organic waste". The Food and Nutrition Service of the United States Department of Agriculture (USDA) states that share tables are an innovative strategy to encourage the consumption of nutritious foods and reduce food waste in Child Nutrition Programs (CNP).

Since CNP operators are tasked with preparing, planning, and ordering food to accommodate a single meal per child during meal services and leftover food is consistently contributing to food waste, maybe it's time to focus on adjusting production practices and menu planning. After all, starting from the top of the chain would result in a better opportunity for financial savings arising from the efficient use of resources and reducing the cost of eliminating organic waste from school sites.

The Centers for Disease Control and Prevention, through epidemiological data, classifies "Improper Holding Temperatures" as one of the most prevalent contributing factors for foodborne illnesses. It would be in the public's best interest to keep temperature abuse to a minimum and enact food safety laws which are based on practicality, the likelihood of procedural adherence, and principles that do not put our most vulnerable populations at risk, i.e. our children, the poor, and the homeless.

[Update: On September 25, 2017, SB-557 was approved by the governor]

For additional information on this and other legislation, visit the State of California's Legislative Information site at <http://leginfo.legislature.ca.gov> or to view additional guidance on the "Use of share Tables in Child Nutrition Programs" visit the California Department of Education website at <http://www.cde.ca.gov/ls/nu/cc/mbcnp042016.asp>

Please note: The opinions, beliefs and viewpoints expressed by the various authors in this publication do not necessarily reflect the opinions, beliefs and viewpoints of CEHA or official policies of CEHA. If you have an article or differing opinion, please contact the publications committee.

2018 AES Exhibitors

Thank you!



A civil engineer is initially responsible for developing and implementing an S-BMP maintenance plan “to run with the property.” On the first sale, the maintenance responsibility passes to the buyer: homeowner, homeowners association, or a residential or commercial landlord; when the land is re-sold, the responsibility transfers to the new buyer. Maintenance continues in perpetuity until the land use is changed or the property is redeveloped. Regardless of tight plan check procedures, in the transfer of responsibility of the property lies the potential weakness in the S-BMP process.

Governmental agencies also are responsible for maintenance of S-BMPs on their properties.

In a perfect world, King Augeas today would sit patiently waiting for his number to be called, then walk to the permit counter to learn what he needs to do to get out of the cattle business and open an equestrian center and vineyard---tasting room and guest suites to come later.

“How many horses did you say?” asks the counter staff. “Oh, I see. Well there’s...

“...Zoning for number of horses and setbacks; Vector Control, fly-breeding; APCD, dust nuisance; Stormwater, polluted runoff; Animal Services, living conditions of horses; Solid Waste, manure management;”



Treatment Wetland



Fiber Rolls

Storm Water BMP Tips

When emptying containers, such as pots or rain barrels, don't forget to scrub the inside surfaces: Eggs and larva can adhere to the surfaces.

Inefficient irrigation systems can leave puddles deep enough for mosquito breeding.

If a landscaped area next to a new building or parking lot drains poorly a week after a rain event, it may be an S-BMP in need of maintenance.

The 85th percentile rain event is the event in which the total rainfall is equal to or greater than 85% of all 24-hour storms on an annual basis for a given area.

In California most storm drain systems are separate from the sewer system and runoff does not get treated before discharge to water bodies.

Sources

County of San Diego BMP Design Manual

City of San Diego Low Impact Development Design Manual

County of San Diego Low Impact Development Design Manual

<http://www.stormwaterpartners.com/facilities/>

California Department of Public Health, Mosquitoes and Mosquito-borne Diseases, <https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/MosquitoesandMosquitoBorneDiseases.aspx>

Fight the Bite: Latest West Nile Virus Activity in California, <http://www.westnile.ca.gov/>

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Make sure you submit your article in Microsoft Word format. Include your contact information, any pictures you would like considered to go with the article as well as captions to go with the pictures.

Please note that submitting an article does not guarantee that it will be published. Contact the publications committee if you have any questions at the email above.

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