

Stormwater Treatment

Problem

Streets, lawns, roofs, driveways, parking lots and agricultural lands produce stormwater runoff that contains phosphorus, nitrogen and heavy metals contamination. This polluted stormwater then flows to the neighboring rivers, streams and lakes. Phosphorus can cause the eutrophication of these bodies of water. The added phosphorus generates an increase in algae blooms that severely degrade water quality.

Some species of algae, called blue-green algae, or cyanobacteria can release toxins into the water that can kill fish and are harmful to humans.

Other less toxic forms of algae also can severely degrade water quality. Algal blooms are the result of an excess of nutrients, particularly phosphorus. The excess of nutrients, that may originate from fertilizers applied to land for agricultural or recreational purposes, can then enter watersheds through water runoff. When phosphates are introduced into water systems. Higher concentrations cause increased growth of algae and plants. Algae tend to out-compete plants under these conditions, and many plant species may begin to die. This dead organic matter becomes food for bacteria that decomposes it. With more food available, the bacteria increase in number and use up the dissolved oxygen in the water. When the dissolved oxygen content decreases, many fish and aquatic insects cannot survive.

In addition, urban stormwater contains heavy metals (e.g. As, Cd, Cr, Cu, Ni, Pb, and Zn) in varying concentrations. They are, unlike organic pollutants, not degradable and may cause short and long term negative effects in the environment. Thus, heavy metal removal from stormwater is important to protect the receiving water and soil quality. **EnviRemed** can remediate the above-mentioned metals from water and soil.

Solution

EnviRemed can remove phosphorus from the stormwater basins with a geochemical media that will bind the phosphorus in a non-leachable matrix, thus permanently removing the phosphorus from the runoff water. Treatment protocols for water systems are varied, and are developed on a site-specific basis.

Reagents, both prior and after application, cannot be classified as either a hazardous or dangerous waste, as defined by regulatory guidelines worldwide, including the Hazardous Waste Act. For these reasons, our reagents are considered safe to transport, safe to handle, and safe to apply, and are not toxic to plants, soil biota, fish or other aquatic life when assessed using worldwide standards of toxicological practice. Reagents are there for considered to be fully sustainable and healthy for the environment.

EnviRemed tested this process on water from STA 1E and 1W and Harney Pond Canal locations through two independent laboratories in Florida utilizing a proper chain of custody, so the water samples never reached **EnviRemed**. Test results show a 98 to 99% removal of phosphorus.

Treatment Scenarios

Our simple, proven environmentally-safe processes can save you time and money and provide the answer to treating phosphorus.

A variety of engineered solutions have been deployed, and these can be tailored to the needs of influent sources around Lake Okechobee.

This technology has been applied around the world in a variety of direct addition and filtration applications, "Direct Addition" applications involve the direct mixing of a reagent with a contaminate, such as dosing a slurry into a wastewater stream, mixing a powdered

Lake Okechobee Test Results

Phosphorus (ppb)	Pre-treatment	After Treatment
STA 1E & 1W	259	4
Harney Pond Canal	549	7

reagent into a solid stream, or any other method of brining a reagent into direct contact with contaminants, such a phosphorus.

"Filtration" applications involve the passing of a contaminate waste stream through a porous filter medium in order to bring the contaminate into contact with the medium and thereby remove the contaminate from the waste stream. Filtrations is considered to be a "passive" treatment method, because it does not involve bringing the reagent to the contaminate, but rather passing the waste stream passively through the filter by either gravity or under pressure and allowing the filter medium to react with the contaminate.

As with direct addition, filtration involves bringing the contaminate into direct contact with the reagent. The filter system may be engineered in a variety of ways, including as an in-ground or above-ground permeable reactive barrier ("PRB"), as an open-under baffled tank, as a filter bed in a lagoon, or in a pressurized tank.

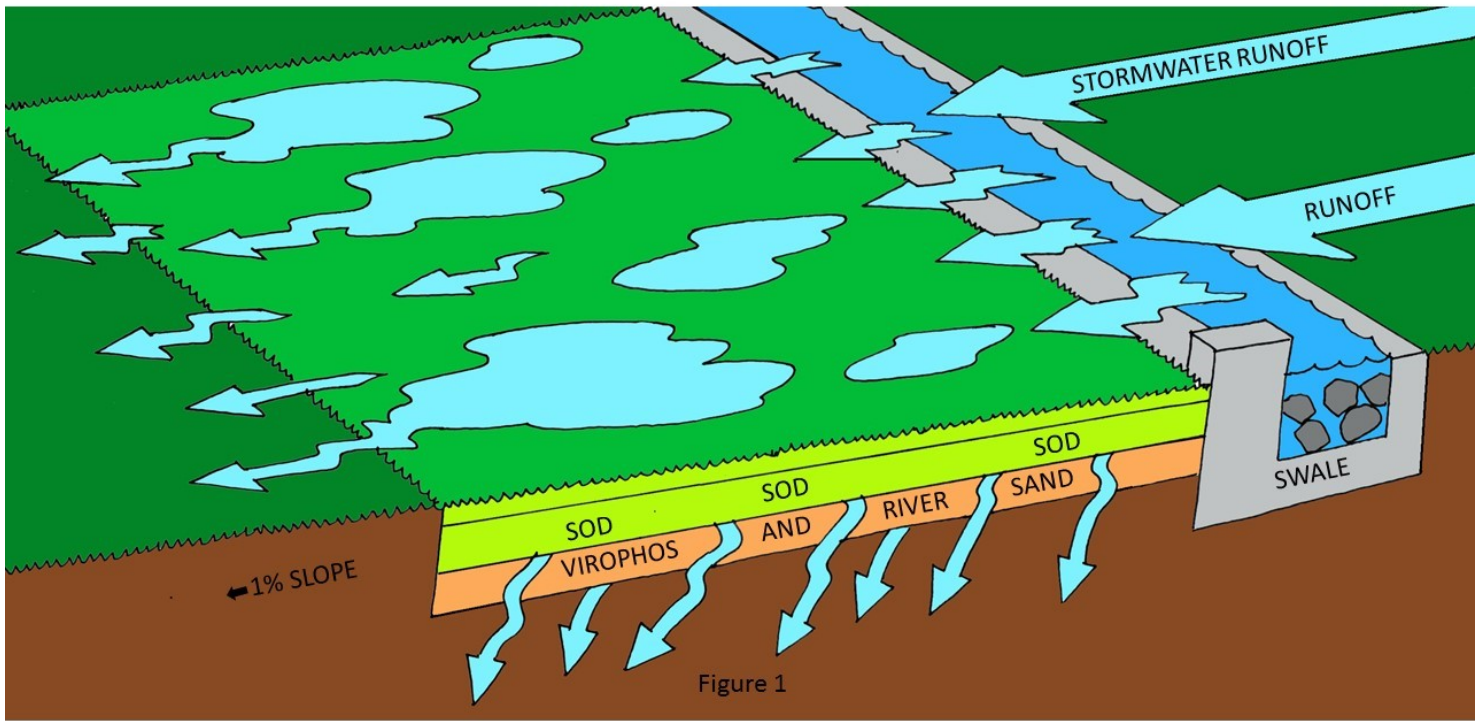
One of the most applicable and practical designs for the treatment of runoff from agricultural operations such as small farms, and municipal wastewater is the use or conversion of existing, disused or new lagoons as filter beds for wastewater treatment.

EnviRemed

EnviRemed is a consortium of top scientists, engineers, contractors and businessmen who have united to offer the best available technology to provide safe and natural solutions for governmental authorities, corporations, and private citizens to create a cleaner future for our planet.

Available worldwide, we offer environmentally friendly solutions that help your bottom line and the expertise to implement them. Through simple processes we have saved our customers millions of dollars, thousands of man hours, and improved the way they take care of their business.

EnviRemed technology has proven to reduce the amount of phosphorus.



**IMPROVE YOUR RESULTS AND YOUR CLIENTS' BOTTOM LINE FOR
STORMWATER TREATMENT**

USING LEVEL SPREADER-VEGETATIVE FILTER STRIPS AMENDED WITH VIROPHOS

Let ViroPhos help you in reducing the size of your stormwater filter system or help you bring noncompliant systems into compliance.

How do we know this?

ViroPhos Technology has been used for decades around the world to deal with Phosphorus, Nitrogen and TSS. North Carolina conducted a study in Wilson, N.C. using ViroPhos. The objective of this test was to indicate the reduction of Total Phosphorus (TP), Total Nitrogen (TN), and Total Suspended Solids (TSS) in Level Spreader-Vegetative Filter Strips (LS-VFS). The reductions shown by the Wilson study were significant at the 0.05 level for LS-VFS amended with sand and ViroPhos for TP, TN and TSS, compared with unamended tests for a loading ration of 19:1. The significance of using amended LS-VFS amended with ViroPhos allows for a reduction of 20 plus percent in the surface area required for new construction of LS-VFS. Non-compliant existing LS-VFS installations may also be retrofitted with the ViroPhos and sand mixture as amendment to gain compliance with nutrient runoff. The Wilson test showed the load reductions with ViroPhos and Sand amendment as follows:

Parameter		
Loading Ratio	32:1	19:1
Slope	1.0%	1.0%
TN load reduction	58%	69%
TP load reduction	53%	56%
TSS load reduction	90%	94%

Red values indicate significance at the 0.05 level, or 95% confidence interval. ViroPhos is a geochemical which has the ability to sequester Phosphorus and most heavy metals into a chemical bond which is non-leachable on a TCLP basis. The bonding of ViroPhos with Phosphorus has a unique property, which is that sorbed Phosphorus is non-leachable, but is a bio-available as a nutrient to plants. This feature makes Phosphorus removal in a LS-VFS a complete eco-cycle of Phosphorus removal. Harvested grass from the sod removes Phosphorus from the LS-VFS location, thus allowing the ViroPhos the capacity to remove more Phosphorus.

**EnviRemed is the licensed U.S. solution provider for Virotec Global Solutions.



Environmentally Safe, Non-Pathogenic & Natural Remediation Solutions for:

WasteWater | Groundwater | Hydrocarbons | Heavy Metal Remediation in Water & Soil | Landfills | Sludge Reduction (Human & Animal Waste) | Grease Remediation | Agriculture & Aquaculture | Industrial, Municipal, Gov't & Military Applications

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