Combined Sewer Overflows: A Threat to Water Quality in Missouri

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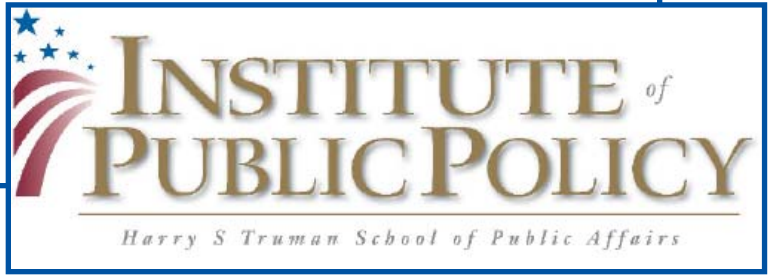

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Introduction

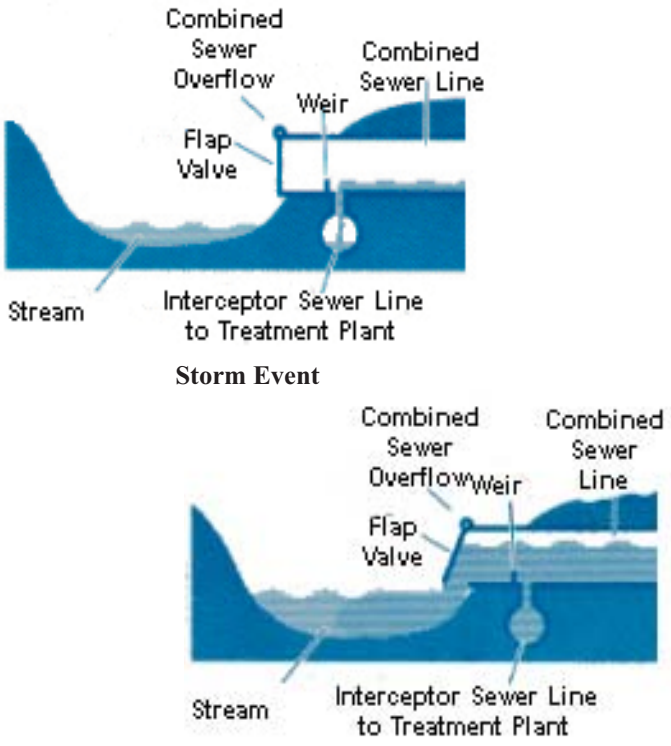
Clean water is essential to the health and well being of humans and their environment. Pollution threatens surface waters and may make them unsafe for human use. Much of the pollution is from man made sources and, by law, must be regulated to protect water quality. Wastewater discharges from industrial, commercial, and municipal treatment facilities make up a considerable number of point source discharges throughout the country. There are two forms of pollution: point source and nonpoint source pollution. A point source discharge is any discernible, confined, or discrete conveyance of pollutants to a water body. Sewer systems that carry precipitation runoff are another common form of point source pollution. Without proper regulation, pollution sources may limit the attainment of water quality goals highlighted in The Clean Water Act (40 CFR 131, EPA 2004). Combined sewer overflows (CSOs) are one type of pollution that has detrimental effects on water quality, and there is a growing consensus that these overflows are insufficiently regulated.

What is a combined sewer overflow?

A combined sewer overflow is a sewer system in which the same sewer pipes carry domestic and industrial wastewater and stormwater runoff (precipitation in the form of rain or melted snow). During periods of dry weather or minimal precipitation, wastewater is diverted to a nearby wastewater treatment facility where the wastewater is treated and then sent to a stream or river. During periods of heavy precipitation or runoff (storm events), however, the volume of water inside the sewer pipes becomes so great that the wastewater can no longer be diverted to a treatment facility. As a result, untreated wastewater mixes with precipitation runoff and flows directly into nearby streams or rivers (receiving stream). This is what is known as an overflow. This overflow was intentionally built in to combined sewer systems because wastewater treatment facilities would not have the capacity to handle the total flow (runoff plus wastewater) during a storm event. CSOs present a severe threat to human health and to the water quality of receiving streams and can affect the potential beneficial uses of the stream (EPA 2002).

Figure 1 shows how a simple CSO would work. On the left is a depiction of a CSO during dry weather. Notice the wastewater is easily diverted away from entering the receiving stream. On the right is a CSO during a storm event. The flow inside the pipe is so great that the weir (dam or diversionary device) cannot properly divert wastewater away from the receiving stream (City of Omaha Public Works Department).

Figure 1. Diagram of a simple CSO functioning during dry weather and a storm event.



Source: City of Omaha Public Works Department, Quality Control Division

These combined sewer systems are common in many cities with older sewer systems, especially areas in the Northeast United States and in the Great Lakes Region (Morandi 1992). In Missouri, St. Louis, Kansas City, St. Joseph, Moberly, Macon, Sedalia, and Cape Girardeau have combined sewer systems (Missouri Clean Water Commission, September 2004).

Water Quality Standards

The Clean Water Act directs individual states to establish a permit system for point sources of water pollution through the National Pollutant Discharge Elimination System (NPDES). The NPDES is targeted at regulating point source discharges such as, for example, effluent discharged into a stream from a pipe (EPA 2003).

The purpose of the permits is to ensure that these point sources do not overpollute their receiving waters, which is accomplished by limiting the amount of particular pollutants in the effluent. The amount of allowable pollution is determined by the state water quality standards, which describe the beneficial uses (such as swimming, fishing, drinking water, etc.) of water bodies within the state (EPA 2004). Pollution levels that would cause any of the beneficial uses to be unattainable would not be allowed. By limiting pollutants in this fashion, the state can prevent discharges from violating state water quality standards (EPA 2003).

The permitting process can get somewhat complicated due to the differences in point sources and the water bodies into which they discharge. In Missouri, the basic effluent regulations are based on monthly and weekly averages of biological oxygen demand and nonfilterable residues (BOD_5 and NFRs) in the effluent water (MO Code of State Regulations 10 CSR 20-7.015). Biological oxygen demand refers to the amount of oxygen needed to break down compounds in the effluent. The greater the BOD_5, the more of an effect the effluent will have on the receiving water. Nonfilterable residue is the amount of suspended materials in the effluent. Like biological oxygen demand, the more NRFs in the effluent, the greater the effect on the receiving water. Levels of these pollutants are measured in milligrams per liter. Generally, Missouri permit limits allow a weekly average of 45 mg/L BOD_5 and 45 mg/L NFR in effluent water, which may also be expressed 45/45 (MO Code of State Regulations 10 CSR 20-7.015).

What has been done to address CSOs?

The potential threat of CSOs on receiving stream water quality is important because they can prevent attainment of water quality goals under the Clean Water Act. As a result of this threat, the U.S. Environmental Protection Agency has developed a CSO Policy along with guidance to provide state and city officials with a framework with which to effectively lessen the effects of CSOs and ultimately attain the required Clean Water Act goals and state water quality standards. This policy is not intended to be a requirement but is aimed at helping states achieve water quality standards.

The EPA CSO policy is made up of two parts. First is a set of nine minimum controls recommended by EPA to lessen the impacts of CSOs while minimally impacting communities. These controls do not require any major construction and are relatively easy to implement (EPA 2002). Communities with CSOs are also expected to develop a long-term control plan (LTCP) detailing costs, plans, and public participation that will serve to help communities meet water quality standards (EPA 2002). Although EPA has developed this guidance to help control CSOs, not all states have adopted and utilized it.

What progress has Missouri made?

The Missouri Department of Natural Resources (DNR) has yet to adopt EPA guidance for CSO control. Currently, DNR permits CSO communities under similar NPDES guidelines as communities with normal wastewater treatment facilities. CSO communities are held to the same 45/45 effluent standards that are described above. Because of the intermittent and volatile nature of CSOs, these CSO communities violate their NPDES permits and sometimes must pay fines associated with these violations. St. Louis, Kansas City, St. Joseph, Moberly, Macon, Sedalia, and Cape Girardeau have combined sewer systems (Missouri Clean Water Commission, September 2004). Many of these communities believe that DNR's method for permitting CSOs is not effective, environmentally or economically.

For example, the City of Moberly samples water quality at each of four CSO outfalls during every storm event. In 2003, the effluent from these outfalls only met the permitted limit 35% of the time. This means that 65% of the overflow exceeded the City's permitted limit and was a violation (Missouri Clean Water Commission Minutes, November 2004). Violations could result in fines depending on the extent of the violation.

CSO communities in Missouri would like to see DNR adopt a framework for permitting CSOs similar to EPA guidance. These communities believe that permit limits for CSOs should be site-specific and should reflect the receiving stream's ability to process effluent water. Some CSO communities have begun to develop their own LTCP and to search for viable alternatives to the current DNR permitting policy (Missouri Clean Water Commission Minutes, November 2004). Until DNR adopts a framework to more effectively address these issues, CSO communities will continue to exceed their permit limits and pay fines as a result.

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Author Biography

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David Carani is a graduate research assistant in the Truman School of Public Affairs, University of Missouri – Columbia. He earned a bachelor's degree in Fisheries and Wildlife biology and will complete his master's in Public Policy in May 2005, both from the University of Missouri-Columbia. After receiving his master's degree, David will begin work on a master's degree in Water Quality at the University of Missouri-Columbia.

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