

2002

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Recommended Citation

Buth, Mike (2002) "Analysis of Stormwater Policy: Rogue River Watershed, Kent County Michigan," *McNair Scholars Journal*: Vol. 6: Iss. 1, Article 5.

Available at: <http://scholarworks.gvsu.edu/mcnair/vol6/iss1/5>

Analysis of Stormwater Policy: Rogue River Watershed, Kent County Michigan



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Introduction

When people think of water pollution, the image of a large pipe discharging a toxic chemical from a factory probably comes to mind. This type is classified as point-source pollution and in the past accounted for many water pollution problems. Today it is regulated and is not as large of a problem as it had been. Now we are facing different problems that are not quite so easy to see. Increased amounts of stormwater runoff in developing and urbanized areas are discharged into rivers and streams, carrying many different types of pollutants into the water from many different sources spread over a large area. Scientists and engineers have learned to recognize that stormwater runoff can be viewed as two separate problems; water quality and water quantity. Each one can have a different effect on the receiving water body and can be addressed independently. Management of water quantity issues are best addressed during land development, whereas water quality issues can be addressed at any time. Solving the problems we face today often involves modifying existing regulations or creating new ones, in addition to educating the public on how they can help.

The purpose of this research is to summarize environmental regulations which pertain to stormwater policy in the Rogue River watershed. Watersheds are often comprised of several municipalities which implement or are affected by environmental policy in different ways. Management of our water resources is often conducted using the watershed as a management unit, so it is also important to view regulation and policy on the same level.

Background

One of the largest contributors to poor water quality today is stormwater runoff (USEPA 1994). Stormwater runoff is basically any rainfall that hits the ground and does not infiltrate. It runs off into surface water bodies such as rivers, lakes and streams. While a small amount stormwater runoff can be a natural occurrence in many undeveloped areas, it is often much more pronounced in developing and urbanized areas. In order to better manage stormwater runoff, it is important to distinguish between the quality and quantity of stormwater entering a water body. The quantity of stormwater is a fixed amount, influenced primarily by the amount of rain falling in the watershed. The amount of rainfall which enters the water body as stormwater can vary from one watershed to the next depending on certain physical characteristics of the land. The quality is influenced by the amount and types of materials transported as the rainfall flows across the ground and into the receiving waterway. In addition, water quality can be affected by airborne pollutants and particulates before it reaches the ground.

Consider some differences between developed areas and undeveloped areas. The biggest is the amount of impermeable land area. In an undeveloped area, most of the land is covered by vegetation and there are many places where rainfall can readily infiltrate rather than running off. As forested and agricultural lands are converted into urban land, much of the surface is converted from permeable soil to buildings, concrete and pavement. This offers very little open ground where rain water can infiltrate, and is much different from an area lacking development. Thus, in an urban area, most of the rainfall flows across the impermeable surfaces and into rivers and streams. While this also occurs in undeveloped areas, it happens on a

much smaller scale. The result is that during a rain event more rain fall flows into local rivers and streams in an urban area than within an undeveloped area.

Effects of Water Quantity

If the very nature of a stream or river is to convey water, how does stormwater runoff have a negative effect? The most obvious difference is the quantity of water entering the stream and the amount of time over which this flow occurs. In undeveloped areas, the rain water takes much longer to flow into streams. It moves slowly through meadows, pastures, wetlands and forests, soaking in all along the way and being slowed by vegetation covering the ground. In contrast, urban areas with impermeable surfaces act to channel water directly into streams via storm sewers. Water moving over surfaces such as concrete moves much faster, allowing much larger quantities of water to enter a stream in a shorter period of time. Streams receiving this stormwater may flood as a result. The current undercuts natural stream banks, damages the riparian area and scours the stream bottom, disturbing the organisms that occupy the stream and washing them away. Flooding can also cause erosion problems both on private property as well as around bridge crossings, costing thousands of dollars for bridge repairs and bank stabilization. Some municipalities may install concrete walls or stone in place of the natural banks to help stabilize them. These practices are not aesthetically pleasing and negatively impact the stream, further degrading it. These are a few physical results of stormwater runoff that can degrade a stream, but there are other secondary results that also affect water quality.

Effects of Water Quality

Rainfall acts to wash all of the impermeable surfaces during a rain event. Anything found on these surfaces

is transported directly into the receiving stream. Cars dripping oil, dust residue from vehicle brake pads, small particles of worn tire rubber, animal feces, excess yard fertilizer and pesticides, as well as sand and dust from streets all flow into the stream, usually with no treatment. Many organisms living in streams are very sensitive to these pollutants. Continuous exposure over time can cause their populations to be reduced or eliminated. Often the organisms affected are important primary food sources for many fish, so loss of certain fish species can also occur as a result. While clean river and stream systems contribute significantly to the economy and quality of life in their surrounding communities, degraded streams have less value.

Regulatory Overview

In newly developing areas, the management of stormwater can be a very important tool in maintaining water quality. Today, even with numerous laws in place, stormwater runoff remains a significant threat to surface water quality. Since the passage of the Water Pollution Control Act in 1948, citizens and government officials have worked to pass and enforce a variety of environmental regulations protecting surface water. Most of these regulations were aimed at eliminating untreated industrial waste and sewage. It was not until 1965 that serious work began on solving a growing problem with surface water quality in the United States. In that year, Congress created the Federal Water Pollution Control Administration and required states to begin to develop and enforce water quality standards. Even with this push from the federal government, more than ten years would pass before problems with surface water quality would get more legislative attention. In the early 1970's, it was realized that our nation's water resources were not improving.

In 1972, Congress amended the Federal Water Pollution Control Act of 1948 (also known as the Clean Water Act). Part of the amendments stated "it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985." The 1972 amendments created the National Pollutant Discharge Elimination System (NPDES), a permitting process established to reduce point-source pollution. Its original focus was on discharges from municipal sewage treatment facilities and industrial effluent discharges. By the mid-80's however, scientists recognized that although the elimination of point-source pollution sources had improved water quality, many waterways were still impaired. Research pointed to uncontrolled stormwater runoff, and Congress once again set out to address this problem. In 1987, Congress again amended the Clean Water Act and modified the NPDES system to account for stormwater runoff. It established a permitting process for certain types of stormwater discharges, in addition to calling on municipalities to develop stormwater management plans to address local stormwater issues. The NPDES program is aimed at pollution prevention, and the management plan focuses on regulating many activities aimed at preventing stormwater from becoming contaminated. This can include large city projects such as regular street sweeping, as well as regulation of de-icing chemicals, fertilizer usage and lawn watering.

The modified NPDES system was to be implemented in two phases. NPDES Phase-1 (established in 1990) was designed to address three types of stormwater-related discharges. The first is stormwater discharges associated with certain categories of industrial stormwater runoff. For example, industrial runoff could include a metal treatment facility that stores chemically

treated products in an outdoor stock yard. Rainfall washes excess treatment chemicals across the yard and into the storm sewer system, which in turn discharges directly into rivers and streams with no treatment. The second includes discharges from Large and Medium MS-4s (or separate storm sewer systems) located in municipalities with a population greater than 100,000. Sewage is conveyed to a treatment facility, while all of the stormwater runoff from city streets and parking lots is discharged directly to a river or stream without treatment. The third type is any construction activity disturbing five or more acres of land. The permit process calls for implementing Best Management Practices, (BMPs), to control soil erosion from large tracts of exposed soil. BMPs include placing structures around storm drains to prevent stormwater carrying soil from entering the system, as well as prompt re-seeding of areas as soon as construction activities cease. NPDES Phase-2 (currently being implemented) is designed to address discharges from Small MS-4s, which would include municipalities with populations less than 100,000. However, not all MS-4s are required to comply with the program. Those municipalities who are located in an "Urban Area," as designated by the United States Census Bureau, need to comply. Those small MS-4s located outside of an urban area are examined on a case by case basis as determined by the NPDES authority (DEQ). Phase-2 also adds permit requirements for certain construction activities disturbing between one and five acres of land.

Implementation of NPDES program: Federal and State Roles

The NPDES program is officially overseen by the United States Environmental Protection Agency (USEPA). However, as with many EPA-administered programs, EPA can grant

special enforcement authority to a state, allowing it to implement and enforce federal mandates. In this case, EPA acts in an oversight capacity, monitoring the activities of the authorized states. Michigan was granted this authority in 1973. The Michigan Department of Environmental Quality administers the NPDES program. They monitor permits for regulated municipalities and industrial facilities. For regulated construction activities DEQ requires a certified site operator, someone who is trained by DEQ to maintain BMPs during construction activities. DEQ then ensures that construction firms are utilizing a certified site operator.

Local Management of Stormwater

While state programs regulate a variety of activities in order to protect surface water quality from stormwater runoff, a large part of stormwater management rests with local municipalities. The NPDES program does not address stormwater quantity, which is also a significant problem for surface water. In order to prevent this from becoming a problem, some local municipalities have been requiring new developments to install stormwater detention ponds. The ponds are intended to hold rain water from the development site and allow it to slowly discharge into the stream, infiltrate or evaporate. Local ordinances can also include the use of grass ditches instead of concrete, and installing stone barriers to slow the water and prevent erosion. These ordinances are implemented by requiring those wishing to begin new construction to submit a site plan for review and approval by the local zoning officials. Certain exceptions to this system exist. In some areas, the county government is the authority for site drainage. In areas where the local waterway is a Designated County Drain, the county drain commissioner is responsible for reviewing the site plans. Local ordinances will vary slightly between municipalities.

Those municipalities required to have a NPDES permit are responsible for their stormwater management plan, which outlines prevention strategies. It is up to each municipality to decide how they will meet the requirements of the NPDES permit. However, the permit and their plan is overseen by a DEQ official.

The Rogue River Watershed

The Rogue River watershed is located northwest of the city of Grand Rapids (Figure 1). The watershed area is 167,625 acres and includes several counties and municipalities (Table 1), although the majority of the watershed is located within Kent County. The Rogue River flows south and empties into the Grand River in Plainfield Township. The river is well known as an excellent fishery and recreational stream. Currently the area is experiencing rapid growth and development and, because of this, it has been the focus of many studies on how to maintain the quality of the river in the face of this growth.

Stormwater is an unavoidable by-product of growth and development, so it is important to track changes in policy related to this issue. The Rogue River watershed is subject to several different types of stormwater regulations. Phase-1 of the NPDES program does not include any municipalities in the Rogue River watershed except as it pertains to construction activities and industrial permits. Phase-2 is currently being implemented, but again it is not likely that any municipalities will be included, and only construction activities will be impacted. Until recently, many municipalities in the watershed lacked an ordinance that was designed specifically for stormwater management. A model stormwater ordinance (GVSU-WRI 2001) has been developed and is being adopted by many municipalities to address this issue (Table 2).

Methods

The data for Table 2 (stormwater ordinance status) was obtained through telephone interviews with appropriate officials from each municipality. Data on federal and state roles in stormwater policy was obtained through both the USEPA website and DEQ website, in addition to telephone interviews with officials from DEQ. Information on the Stormwater Management Plan was obtained through telephone interviews with DEQ officials and by personally reviewing the City of Grand Rapids Stormwater Management Plan.

Conclusion

With the amount of growth and development in the Grand Rapids area and the resulting growth in the surrounding communities within the Rogue River watershed, continuous monitoring of both policies and water quality changes are critical. In a sense, the Rogue River watershed is one large experiment where new knowledge is being applied in an attempt to protect the waterway in the face of rapid growth. The Rogue River watershed is looking toward a much brighter future than other waterways in the past. The growth and development is occurring in a time where many people are aware of what causes stream degradation and also what can be done to preserve it, unlike much of the development during the past fifty years.

Several positive things have been put into practice for stormwater management in the watershed. First, there is awareness and action on the local level. Stormwater retention basins which protect rivers and streams from the quantity of stormwater entering a waterway during a rain event are being implemented in some municipalities in the watershed without state mandates. Second, ordinances which specifically address stormwater runoff and management have been or are currently

being implemented in most of the municipalities throughout the watershed (primarily those experiencing rapid growth and covering the majority land area). Practices such as these are key in protecting the Rogue during its development. However, many of the outlying municipalities with slow growth and little development have not addressed stormwater management. While this is due primarily to the lack of significant land changes within their borders, there is still development occurring.

It is unfortunate that often stormwater management does not become an issue until it has already become a problem. If citizens wish to preserve the quality of the Rogue, similar standards should be applied throughout the watershed rather than only in certain areas. In reality, the areas with very little growth and development have the best opportunity to protect the Rogue. They do not have existing development from times when stormwater management and surface water quality were not priorities. These areas have a chance to be the areas where in 10 or 20 years they can say all of their development was done with the Rogue River in mind. Will it be possible to maintain the Rogue? It will be very interesting in the coming years and decades to see if the Rogue River can maintain its reputation as a quality fishery and recreation area.

Table 1. *Counties and Municipalities of the Rogue River Watershed*

Counties	Townships	Cities	Villages
Kent	Algoma	Cedar Springs	Casnovia
Montcalm	Alpine	Rockford	Kent City
Muskegon	Cannon		Sand Lake
Newaygo	Courtland		Sparta
Ottawa	Nelson		
	Plainfield		
	Solon		
	Sparta		
	Tyrone		
	*Grant		
	*Ensley		
	*Pierson		
	*Casnovia		
	*Chester		

* Townships outside of Kent County. Not a significant contribution to watershed area.

Table 2. *Kent County Municipalities Stormwater Ordinance Status*

Municipality Name	Stormwater Ordinance Status
City of Cedar Springs	Follows county standards, done by private firm
City of Rockford	Use their own soil erosion and sedimentation ordinance, "100-year" wet ponds. This provides more flexibility than a specific ordinance
Village of Casnovia	No response
Village of Kent City	Newly passed ordinance based on model
Village of Sand Lake	No response
Village of Sparta	No specific stormwater ordinance
Algoma Township	Adopting Kent County model ordinance as written
Alpine Township	Adopted ordinance based on Kent County model ordinance
Cannon Township	Natural rivers area. Ordinance based on counties, but more restrictive. Pro-active approach. Bear Creek protection district
Courtland Township	No response
Nelson Township	Uses Natural Rivers overlay along stream corridor
Plainfield Township	Has developed their own specific stormwater policy
Solon Township	Relies on DNR / DEQ, no specific ordinance
Sparta Township	No response
Tyrone Township	Most of the township is state land, they see no need for a specific ordinance

Data obtained through telephone interviews or faxed questionnaires

References

United States Environmental Protection Agency 1994

National Water Quality Inventory: 1994 Report To Congress (305(b) report)
USEPA Doc. #EPA841-B-97-002A and EPA841-B-97-002B

Grand Valley State University Annis Water Resources Institute 2001

Proposed Model Storm Water Ordinance for Kent County Townships and Municipalities.
Prepared by the Kent County Drain Commissioner Storm Water Management Task Force.
Available on request from GVSU-WRI.