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Issue Paper

TMDLs AND WETLANDS

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TMDLs AND WETLANDS[1]

By Jon Kusler, Esq.[2]

This paper has been prepared to stimulate discussion. What are the U.S. Environmental Protection Agency (EPA) requirements for applying Total Maximum Daily Loads (TMDLs) to wetlands? To what extent have other states adopted TMDLs for wetlands? What recommendations may be made to states concerning wetlands and TMDLs based upon experiences to date?

EPA and Clean Water Act TMDLs Requirements[3]

The Clean Water Act does not specifically address the topic of wetlands and Total Maximum Daily Loads (TMDLs)[4] although wetlands are indirectly addressed because wetlands are considered by EPA to be part of broader "waters of the U.S." There is increasing interest throughout the U.S. in adopting TMDLs for wetlands where wetlands are subject to pollution. There is also increasing interest in the creation, restoration, or enhancement of wetlands to help meet TMDL limits for phosphorous, nitrogen, sediment, and other pollutants for other water bodies (lakes, streams), portions of water bodies, or watersheds.

TMDLs describe the amount of each pollutant a water body can receive without violating water quality standards. This includes the sum of waste load allocations, load allocations, and a margin of safety. TMDLs take into account the water quality of an entire water body or watershed and assess all of the pollutant loadings into that water body, rather than considering the compliance with water quality standards of each individual discharge. TMDL implementation mechanisms may include not only traditional point source pollution regulations but nonpoint source pollution regulations, agricultural and other best management practices, land acquisition, wetland and riparian restoration,

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[2]Association of State Wetland Managers. The ideas expressed in this paper are those of the author and not necessarily those of the Association.

[3]See generally, What is a TMDL? http://www.epa.gov/OWOW/tmdl/overviewoftmdl.html; National Academies Press, Commission on Geosciences, Environment and Resources, Assessing the TMDL Approach to Water Quality Management (2001); http://epa.gov/owow/tmdl/guidance.html: EPA Office of Wetlands, Oceans and Watershed (OWOW) and Office of Wastewater Management (OWM), Draft "TMDLs to Stormwater Handbook (2008); EPA, Office of Water, Office of Wetlands, Oceans, and Watersheds, Handbook for Developing Watershed TMDLs.

[4]"The total maximum daily load (TMDL) is a calculation for the greatest amount of pollutant that a water body can receive and still meet water quality standards and an allocation of that load among various sources of that pollutant." See http://www.epa.gov/OWOW/tmdl/overviewoftmdl.html. A TMDL specifies how much of a pollutant can come from various sources of that pollutant including point, nonpoint and natural sources and a safety factor. Point sources of pollution receive a "wasteload" allocation. Nonpoint sources receive a "load allocation". Point sources include all sources subject to regulation under the National Pollution Discharge Elimination System (NPDES). Nonpoint sources include all of the remaining sources of pollution.

pollutant trading, infrastructure funding, and other techniques. Typical sources of pollutants include sediment, nutrient, and pesticide runoff from farms, roads, construction sites, and septic tanks, discharges from industries and government wastewater treatment plants, stormwater runoff, and runoff from mining and logging.

TMDLs do address individual pollutants. At least one TMDL must be done for "every waterbody or segment impaired by one or more pollutants.[5] TMDLs are done pollutant by pollutant, although if a waterbody or segment were impaired by two or more pollutants, the TMDLs for each pollutant could be done simultaneously."

States and tribes have, to date, adopted only a small number of TMDLs to reduce pollutants in wetlands or to include wetlands in plans to reduce pollutants in other water bodies to serve a variety of objectives which will be discussed below. See discussion below and Appendices A, B, C, and D.

The Clean Water Act uses two basic approaches for protecting and restoring the nation's waters. One is a "technology based, end-of-pipe approach" whereby EPA and the states promulgate effluent guidelines that rely on technologies available to remove pollutants. This approach is implemented primarily through Clean Water Act Section 402 permits and end of the pipe water quality standards.

The second approach is receiving-water based and is designed to achieved desired uses of waters. Section 305(b) requires states to monitor surface waters and provide a description of water quality for all surface waters of the state, an assessment of state water pollution control activities, and an estimate of the costs and benefits of implementing the Clean Water Act. Section 303(d) of the Clean Water Act requires states to identify and list "impaired waters"-- water bodies that are threatened or not meeting water quality standards. States and tribes are responsible for developing TMDLs for such waters. Such waters may include wetlands although only a few states have adopted TMDLs for wetlands.

EPA categories for impaired waters Section 303(d) listing include for following:[6]

- All designated uses are supported, no use is threatened,
- Data indicate the some but not all designated uses are supported,
- Insufficient data to make a use support determination,
- Impaired or threatened for one or more designated uses but not requiring a TMDL:
    - TMDL has been completed,

[5] http://www.epa.gov/watertrain/cwa/cwa31.htm

[6] See, EPA, 2006, Integrated Reporting Guidance, http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-sec5.pdf See also E. Monschein &L Mann, Category 4b—Regulatory Alternative to TMDLs, http://www.epa.gov/owow/tmdl/results/pdf/36monschein_wef07_paper7.pdf

    - Expected to meet standards within a reasonable time through other pollution controls,
    - Not impaired by a "pollutant" although the water may be impaired by "pollution" such as lack of adequate flow or by stream channelization,
- Impaired or threatened by pollutant(s) for one or more designated uses and requiring a TMDL.

The Clean Water Act requires each state to monitor the health of all its waters and report their findings every two years to EPA. States must then, under section 303(d), use this monitoring data and other information to develop a list of "water-quality limited segments," i.e., waters that will not meet water quality standards for a particular pollutant even after a technology-based permit is in place. States must develop TMDLs for all water body/pollutant combinations on the 303(d) list.[7] Section 303 requires that states also establish priority rankings for waters on the 303(d) lists. EPA must review and approve TMDLs before they are finalized.

EPA considers water quality standards to be the foundation of the water-quality based control programs mandated by the Clean Water Act. Water quality standards define the goals for a water body by designating its uses, setting criteria to protect those uses, and establishing provisions to protect water quality from pollutants. More specifically, a water quality standard consists of four basic elements:[8]

1. designated uses of the waterbody (e.g., recreation, water supply, aquatic life, agriculture),
2. water quality criteria to protect designated uses (e.g., numeric pollutant concentrations and narrative requirements,
3. an antidegradation policy to maintain and protect existing uses and high quality waters, and
4. general policies addressing implementation issues (e.g. low flows, variances, mixing zones).

State water quality standards for wetlands are the subject of several companion papers including Jon Kusler, Water Quality Standards for Wetlands and Jon Kusler, Options for Wetlands That Fail to Meet Designated Use Criteria.

State water quality standards can help states determine which waters including wetlands need protection, which waters must be restored, and how much pollution reductions are needed.

State TMDL programs are to set forth plans for restoration of waters through Section 402 permitting, Section 319 grants, and implementation of best management practices. States are to provide a long term plan for completing TMDLs within 8 to 13 years from first listing of a water bodies on the 303(d) list. If the goal of meeting water quality standards

[7]But see, E. Monschein &L Mann, Category 4b—Regulatory Alternative to TMDLs, http://www.epa.gov/owow/tmdl/results/pdf/36monschein_wef07_paper7.pdf
[8]http://www.epa.gov/waterscience/standards/about/

is not practical within 10 years of establishing a TMDL, a state must demonstrate the reasons for such noncompliance.

Most TMDLs are adopted by states, territories, or authorized tribes and then approved by EPA. However, the Clean Water Act also authorizes EPA to establish TMDLs in some cases if EPA disapproves state, territory or tribal TMDLs or such TMDLs have not been developed in a timely manner. EPA may be required to do so by court action, or by a state request to EPA to adopt a TMDL for a particular water body.

States and tribes must submit TMDLs to EPA for review. EPA must review and approve or disapprove TMDLs within 30 days of submission. If EPA disapproves a state or tribal TMDL, EPA must establish such a TMDL within 30 days.

EPA lists the following elements of a typical TMDL document. See http://www.epa.gov/owow/tmdl/overviewoftmdl.html#tmdldocument:

- "Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking
- Applicable WQS & Numeric Water Quality Target
- Loading Capacity
- Load Allocations and Waste Load Allocations
- Margin of Safety
- Consideration of Seasonal Variation
- Reasonable Assurance for PS/NPS
- Monitoring Plan to Track TMDL Effectiveness
- Implementation Plan
- Public Participation"

EPA has, in recent years, encouraged the development of TMDLs on a watershed basis. EPA provides:[9]

> EPA is encouraging states, tribes, and territories to do TMDLs on a "watershed basis" (e.g., to "bundle" TMDLs together) in order to realize program efficiencies and foster more holistic analysis. Ideally, TMDLs would be incorporated into comprehensive watershed strategies. Such strategies would address protection of high quality waters (antidegradation) as well as restoration of impaired segments (TMDLs). They would also address the full array of activities affecting the waterbody. Finally, such strategies would be the product of collaborative efforts between a wide variety of stakeholders.

Under the Clean Water Act, TMDLs are not self-implementing. EPA cannot force implementation of a TMDL once the state's analysis is complete and the state or tribe has adopted a TMDL. If the TMDL requires more stringent permit limits for point sources, these must be implemented in the appropriate NPDES permits at the time of their renewal. If the TMDL identifies nonpoint sources as a major cause of impairment, states

[9] http://www.epa.gov/watertrain/cwa/cwa31.htm

can apply for EPA funded Section 319 grants. These grants can be used to fund state programs for nonpoint sources assessment and control as well as individual projects although the amount of such funding is limited.

Overall the goal of a TMDL is to end up with an implementation plan or a watershed plan designed to meet water quality standards and restore impaired water bodies. See generally http://www.epa.gov/OWOW/tmdl/overviewoftmdl.html. A TMDL is a "clean up" plan for a watershed. It typically includes the following elements:

- A written and, if possible, quantitative assessment of water quality problems including point and nonpoint pollution sources,
- A specification of the amounts of pollutants which must be reduced to meet water quality standards, and
- An allocation of responsibility to particular polluters to reduce their pollutants.

TMDLs and the Courts

The Clean Water Act has required the development of TMDLs for impaired waters since 1972. However, EPA did not require states to adopt TMDLs until environmental not-for-profit organizations sued EPA in 38 states in 1996 arguing that TMDLs were not being implemented in a timely manner. The environmental organizations won. See, e.g., Alaska Center for the Environment v. Reilly, 796 F.Supp. 1374 (W.D. Wash. 1992). In April 2002 EPA agreed in a consent degree under court order to establish TMDLs in 22 states if the states do not adopt TMDLs. See http://www.epa.gov/owow/tmdl/lawsuit.html. Maryland was not one of them.

In 2000 EPA published a TMDL rule. This rule was widely criticized and EPA with withdrew the rule in 2002. Since then the rule has been revised but not formally adopted.

TMDLs continue to be an active area for litigation. It is clear, however, that states and EPA have considerable discretion in implementing the TMDL program. See, e.g. Potomac Riverkeeper, Inc. v. U.S. EPA, RDB 04-38845, 2006 WL. 890755 (D. Md. March 31, 2006); Thomas v. Jackson, 08-2152 (8th Cir. 9-10-2009). Courts have suggested that EPA might base 303(b) listing on Clean Water Act issues broader than water quality (pollutants) although it does not have a mandate to do so. Id.

Given existing successful law suits, states and EPA may be successfully challenged at some point in the future if they fail to adopt TMDLs based upon water quality considerations for wetlands as well as other waters. This is particularly true if a state has adopted water quality standards for wetlands and particular wetlands fail to comply with such standards.

Contexts in Which Wetlands May Be Addressed by TMDLs

States and tribes may adopt TMDLs for wetlands in a number of quite different contexts:

--**Pollution or other discharges into a wetland.** A state, tribe, or EPA may adopt a TMDL to establish load limits for specific discharges of particular pollutants into a wetland such as a TMDL applying to nitrogen, phosphorous, bacteria, mercury, selenium, salinity, pH exceedences, dissolved oxygen, sediment, or trash. More than one TMDL total load limit may be applied to a specific wetland. For example, one TMDL for a wetland might set a discharge limit for phosphorous. Another TMDL for that wetland might address sediment.

States and EPA have to date adopted a small number of TMDL's specifically establishing load limits for wetlands. For example, in September 2001, EPA adopted Ballona Creek and Ballona Creek Wetlands Trashed Total Maximum Daily Load (TMDL) which established the amount of trash allowed in Ballona Creek. The City of Los Angeles met its first milestone in compliance by achieving a 20% reduction in trash by September 30, 2006. See also Appendices A, B, C, D for other examples of TMDLs to reduce pollutant discharges into wetlands.

--**"Restoring/enhancing" wetlands to reduce pollutants in another water body, segment of a water body or watershed to meet TMDL limits.** Some states are proposing to adopt TMDLs for watershed or portions of a water body or watershed to reduce nitrogen, phosphorous, bacteria, dissolved oxygen, sediment, or other pollutant levels to acceptable TMDL limits in other water bodies, segments of water bodies, or watersheds. See, for example, Appendix E, the Wisconsin TMDL for the Lower Fox and Green Bay. For a watershed based TMDL where wetland restoration is used to reduce nutrients, sediment in the watershed see Upper Newport Bay Reserve, CA, http://oaspub.epa.gov/tmdl/enviro.control?p_list_id=CAE801.110UPPER%20NEWPORT%20B; Chagrin River Watershed TMDL in Ohio (restoration of riparian and headwater areas) http://www.epa.ohio.gov/portals/47/nr/2007/august/ChagrinRiverTMDL.pdf

Restoring wetlands can reduce pollutants flowing to other water bodies and help a state meet overall TMDL goals. On the other hand, it is not clear how much pollution, filling, or drainage is acceptable if a restored wetland is to be used to improve water quality for other waters.

--**"Creating" wetlands to reduce pollutants in a water body, segment of a water body or watershed.** Some states are proposing to create wetlands (establishing wetlands where none existed before) to help meet TMDL limits for another water body, portion of a water body or watershed to reduce nitrogen, phosphorous, bacteria, dissolved oxygen, sediment, or other pollution levels to acceptable TMDL limits. See, for example, Sunnyside Valley Irrigation District, Wetland Project 2002 Preliminary Results, http://www.svid.org/wetland_charts.htm in which created wetlands are used for treatment of polluted waters subject to a TMDL

States and tribes have more flexibility in what they do with "created" rather than natural, restored or enhanced wetlands. Created wetlands do not, by definition, qualify as a water of the U.S. in many circumstances. However, many created wetlands involve blockage of a small stream or other drainage which are regulated waters of the U.S. and they too may become waters of the U.S.

--**Wetlands as a source of pollutants.** In a small number of situations, wetlands may be sources of pollutants. For example, wetlands have often been used in the past as "dump" sites and pollutants may be leaching from the sites. Mercury from a broad range of natural and man-made source may be concentrated in wetlands. Naturally occurring pollutants such as selenium may also be released from wetlands as well as nitrogen, phosphorous, and sediment. Waterfowl usage of wetlands may result in nutrient enrichment to the degree that waters flowing from such wetlands may be considered pollution sources. Carp feeding in a wetland with water flowing into an adjacent lake may increase sediment and nutrients in the adjacent lake. See, e.g., Ventura Marsh, Iowa, TMDL, http://www.epa.gov/region07/water/pdf/public_notice/ventura_marsh_hancock_ia_public_notice.pdf Implementation of TMDLs for such wetlands may involve "Superfund" or other toxic waste clean-up, removal of fill, reestablishment of hydrology (for drainage), and wetland restoration or enhancement.

Why Few States Have Adopted Wetland-related TMDLs

States and tribes have adopted relatively few TMDLs to date for a number of reasons:

--**A small number of the states have included wetlands on their 305(b) and 303(d) lists.** Because wetlands are not "listed" waters, states and tribes have not felt the need to adopt TMDLs for them. States have not "listed" wetlands in part because EPA has not required them to list wetlands when an impairment is due flow alterations rather than a "pollutant."

--**Only one quarter of the states have adopted water quality standards for wetlands.** See companion paper Jon Kusler, Water Quality Standards for Wetlands. Where states have adopted water quality standards for wetlands these standards have generally been narrative in nature and do not establish quantified load limits of the sorts required for TMDLs.

--**Many of the impairments to wetlands involve past fills, drainage, or various forms of historical discharges of pollution or pollutants.** A wetland may be degraded from fills, drainage, or pollution many years ago but there is no continued discharge which needs to be stopped.

--**Wetland restoration, creation, or enhancement are viewed as "part of the solution" to watershed pollution** because they may remove nitrogen, phosphorous, sediment or other pollutants from lakes, streams, estuaries or other waters. Agencies have, therefore, been reluctant to establish limits on these pollutants and discharges into wetlands.

--**Data gathering for wetlands to establish existing pollution levels and desirable future levels of pollution has proven to be difficult particularly for pollutants such as nitrogen and organic matter leading to dissolved oxygen deficits because conditions vary seasonally and year to year in wetlands.**

The Pros and Cons for State Adoption of TMDLs for Wetlands

State adoption of TMDLs for wetlands is subject to a number of "pros" and "cons."[10]

Pros

- The Clean Water Act requires states to adopt remedial measures for "impaired" waters. Wetlands are waters. If these waters are subject to "impairment," states have the obligation to address impairment although the definition of "impairment" and what actions must be taken to address impairment is somewhat unclear.

- TMDLs allow the establishment of watershed/water quality planning goals for both point and nonpoint discharges. Such goals can facilitate the tightening of state point source pollution controls and the regulation of nonpoint pollution sources.

- TMDLs allow states to address specific threats and problems with specific wetlands by establishing quantitative standards for discharges into individual wetlands.

- TMDLs can encourage wetland restoration, creation and enhancement to help solve and prevent watershed problems.

Cons

- Different goals and measures of success are needed for wetlands than for lakes, streams and the oceans. Protection and restoration of the ability of wetlands to produce "goods and services" such as flood storage and pollution control are needed, not simply biological integrity or swimmable, drinkable condition.

- Establishment of "total maximum daily loadings" is difficult for many activities threatening wetlands such as fills, drainage, and cutting of vegetation. For example, the "total maximum daily loading" concept simply does not fit for drainage, levees, dams, and many other impacts to wetlands.

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[10]For many detailed recommendations not specific to wetlands concerning the use of TMDLs to address nonpoint sources of pollution see The TMDL Program in Transition, The NPS Problem: Designing TMDLs for Implementation
http://www.eli.org/pdf/tmdl/ELI_Final_Report_2009_NPS_TMDL_Workshop_Project.pdf

- Potentially, hundreds of thousands or millions of wetlands in a state are already impaired due to fills, drainage, cutting of vegetation, flooding, altered hydrologic, invasive species or other activities. States lack the funding needed to address this number of impairments.

Conclusions and Recommendations

Based upon EPA requirements and state experiences to date, the following conclusions and recommendations may be suggested for states:

- TMDLs are a technique designed to address quantifiable sources of point and nonpoint pollutants. They have less applicability to fills, drainage, vegetation removal, flooding and other wetland problems that are not traditionally thought of as pollutants and are not susceptible to a specific, quantifiable "loading" analysis. Nevertheless, many activities impacting wetlands (e.g., fills, drainage) have a water quality component. Over time, this component may be quantified and serve as the basis for better protecting and restoring wetland functions and values through TMDLs or other approaches.

- TMDLs may be used in some circumstances to address wetland-specific point source pollution, sediment, trash and other nonpoint pollution problems as has been done by Los Angeles County for trash discharges into wetlands and streams.

- A state may best should adopt wetland-specific water quality regulations for both pollutants and other nonpollutant activities (e.g., draining) with a water quality component. Adoption of wetland water quality standards would facilitate adoption of TMDLs on both a watershed and wetland specific basis. However, once a state adopts water quality standards for wetlands, EPA or a court may conclude that the state must adopt a TMDL if specific wetlands do not meet water quality standards.

- Cooperative state/local watershed planning efforts designed in part to reduce pollution and other stressors to wetlands may allow a state to "go directly to the solution" of stressors and not need to list wetlands as "impaired" which could trigger the TMDL requirement.

- Constructed and restored wetlands may be used as part of a TMDL to help reduce nutrient, sediment, and toxic chemical pollution of rivers, streams and other water bodies and help achieve TMDL goals for those water bodies. This may be the most important use of TMDLs for wetlands. However, use of restored and constructed wetlands for pollution control and other purposes may also result in long term degradation of wetlands and should be subject to careful review procedures and mitigation requirements.

- For more detailed recommendations concerning the use of TMDLs to address nonpoint sources of pollution, see Environmental Law Institute, The TMDL Program in Transition, The NPS Problem: Designing TMDLs for Implementation, Environmental Law Institute (2009), http://www.eli.org/pdf/tmdl/ELI_Final_Report_2009_NPS_TMDL_Workshop_Project.pdf

Appendix A: Los Angeles River and Ballona Creek California TMDL for Trash Discharges into a Stream and Wetlands

The Los Angeles River and Ballona Creek are the primary waters in the Los Angeles Basin discharging water into Santa Monica Bay. Ballona Creek serves a watershed of 130 square miles and flows for 10 miles. Of this, 9 miles are a flood control channel. The Creek formerly drained a large wetland complex but now has limited direct connection to the remaining wetlands. The Los Angeles River and Ballona Creek receive dry and wet weather runoff from an estimated 4 million people plus discharges from public treatment works.

In response to a 1999 consent degree the Regional Water Quality Control Board required, the city of Los Angeles to develop a TMDL for the Ballona Creek watershed and Ballona Creek Wetlands.[11] In 2001 EPA adopted a Ballona Creek Wetlands Trash Total Maximum Daily Load which limited the amount of trash allowed into Ballona Creek. The TMDL required southern California cities discharging into Ballona Creek to reduce their trash contributions by 10% each year for a period of 10 years with the goal of zero trash in the waterway by 2015.

The first milestone was a 20% trash reduction in Ballona Creek by September 30, 2006 which the city achieved. The City has met the yearly milestone since then based primarily on structural measures.

The Los Angeles Bureau of Sanitation carried out a study of trash generation for the period of 1999 to 2003. The study identified high, middle and low trash generation areas. The City's strategy for compliance is to focus on the high and medium trash generation areas. The City's implementation strategy has been two-pronged: (1) implement institutional measures such as education, street sweeping, catch basin cleaning, and enforcement with an emphasis upon high trash generation areas, and (2) install structural trash control devices in the storm drain system, targeting first the high trash generating areas of the City followed by the medium and low trash generating areas.

As of September 2008, the City had installed over 7,700 catch basin inserts in the high trash generating areas and 14,900 catch basin opening screen covers in the high and medium trash generating areas.

[11] http://www.lacitysan.org/wpd/Siteorg/program/TMDLs/tmdl_ballona_trash.htm; http://ladpw.org/wmd/watershed/BC/; http://www.environmental-expert.com/Files%5C5306%5Carticles%5C9005%5C184.pdf

The first TMDL, the Trash TMDL, was developed without much stakeholder involvement and resulted in strong resistance from the development community and a law suit. To avoid future conflicts the EPA and California Water Control Board developed a strategy document inviting stakeholder participation in the drafting and implementation of TMDL. A stakeholder effort was formed in 2004 called CREST (Cleaner Rivers through Effected Stakeholder TMDLs). The stakeholder group has cooperated on the development of three TMDLs: Ballona Creek Bacteria, Ballona Creek Toxics, and LA River Toxics.

In addition to trash, other pollutants of concern for the LA River and Ballona Creek include nitrogen, metals, bacteria, pesticides, polychlorinated biphenyls, polynuclear aromatic hydrocarbons, tibuty1tin, volatile organic compounds, and other organics. The Consent Degree requires development of TMDLs for all of these between 2004 and 2012.

Appendix B: Ventura Marsh, Iowa, TMDL for Exotic Fish, Sediment and Nutrients

On January 29, 2010 EPA, Region 7, issued a public notice for a TMDL for Ventura Marsh in Iowa.[12] This TMDL has been developed by EPA in cooperation with the Iowa Department of Natural Resources to meet the milestones of a 2001 Consent Decree, Sailores, et. al. v. EPA, Consolidated Case No. C98-134-MJM, December 17, 2001.[13]

Ventura Marsh is located in the headwaters of Clear Lake, Hancock County, Iowa. It is approximately 200 acres in extent. Most of the watershed is in agricultural use. Clear Lake, which the Marsh adjoins, is the third largest of Iowa's 35 natural, glacial lakes. The Marsh has historically served as the prime spawning habitat for the fish population of Clear Lake. The Marsh is in public ownership and is being managed as a wildlife refuge. Water levels are controlled by small dams. No point sources of pollution have been identified. However, the Marsh is subject to a variety of nonpoint sources of pollution.

Over the past decade a number of studies have been carried out to understand the water quality conditions in the Marsh and the relationship of the Marsh to quality of Clear Lake. These studies indicate the Marsh is a net contributor of sediments and nutrients (phosphorus) to Clear Lake due to the turbidity caused by the carp.

Beneficial uses for the marsh under state water quality standards include "aquatic life" and "human health." The Marsh was on Iowa's 1998 303(d) list due to exotic species impairment (carp). In addition, the Marsh was on the 2006 303(d) list of impairments to aquatic life beneficial uses due to algae and turbidity. The TMDL uses inorganic suspended soils and total phosphorous as a surrogate for water quality targets.

[12]See Public Notice, EPA, Region 7, Notice of Availability, Total Maximum Daily Load (TMDL) For Ventura Marsh, in the State of Iowa, January 29, 1010.
[13]See generally, EPA, Region 7, Ventura Marsh, Total Maximum Daily Load for Algae and Turbidity

Restoration of Ventura Marsh to help improve the water quality in Clear Lake is supported by many groups including the Project Clear Lake Enhancement and Restoration Project. The U.S. Army Corps of Engineers, Rock Island District is providing restoration assistance pursuant to its aquatic ecosystem restoration program.[14]

A variety of restoration activities are underway for Ventura Marsh.[15] The first phase of the Ventura Marsh project is expected to be constructed in 2010. It will include replacing the existing stop log outlet structure, installing a new pumping station, and then de-watering the marsh. The Department of Natural Resources wildlife staff anticipates keeping the marsh in a dry condition for two seasons to allow the marsh to re-vegetate. While the marsh is dry, it will allow for the second phase of the construction activities to take place such as building a sediment control basin and creating a flow channel.

Nearly all funding for the project has been secured. Congress appropriated $2.5 million for the project in FY'08 and an additional $910,000 was appropriated in FY'09 to complete the federal funding. The state cost share amount is estimated to be about $500,000.

The ultimate goal of the project is to reduce carp populations to improve the water quality and wildlife habitat the marsh provides. The Marsh is currently inputting about 40% of the sediment Clear Lake receives annually, so it is a vital part of the overall lake restoration project.

Appendix C: TMDL for Intermittent Tributary to Belden Hill Brook, Wilton, Connecticut to Help Reduce Chlorine Pollution in a Wetland

In 2000 the Connecticut Department of Environmental Protection developed a TMDL for wetlands adjacent to an "unnamed tributary" in Wilton, Connecticut.
See http://www.ct.gov/dep/lib/dep/water/tmdl/tmdl_final/beldenhilltmdlfinal.pdf. The tributary originates in filled wetlands near property owned by the School Sisters of Notre Dame in Wilton. Flow of the unnamed tributary is intermittent into this wetland. Drainage from the School Sisters enters the wetlands during precipitation events and periods of high water table.

The School Sisters operate a retirement home, medical care facility, and childcare facility on their lands. Historically the sanitary wastes from the school were treated by a septic tank and leach field. However, these failed due to the high ground water. A small wastewater treatment facility was built to replace the septic tank system. This facility has a NPDES permit to discharge 20,000 gallons/day of treated and chlorinated waste water

[14]See Army Corps of Engineers and Iowa DNR, Feasibility Report with Integrated Environmental Assessment, Ventura Marsh (September 2009).
[15]For more detailed description of marsh restoration activities see http://www.clearproject.net/marsh.html; see also http://www.clearproject.net/VenturaMarshFeasibilityCOE.pdf.

to the unnamed tributary. Effluent constitutes the majority of surface water flow in the unnamed tributary and the entire flow during the dry weather.

The unnamed tributary is a Class A surface water pursuant to the Connecticut water quality standards and surface water and sanitary wastewater discharges are not allowed into Class A surface waters. Numerical water quality criteria for "aquatic life support" have been adopted in Connecticut's water quality standards.

This TMDL has been developed for chlorine which is used to disinfect the wastewater. It is anticipated that chlorine will be eliminated from the discharge as a condition in a reissued NPDES permit. The School Sisters facility will then use ultraviolet disinfection. The point source discharge will also be eliminated by redirecting the final effluent into an "underground spreader".

Appendix D: Four Wetlands Listed on Minnesota Pollution Control Agency 2008 List of Impaired Waters

In 2008 Minnesota listed four emergent, depressional wetlands on its 2008 list of impaired waters. To be listed, the wetlands needed to meet two criteria:[16] "(1) biologically impaired as determined by plant and macroinvertebrate indices of biological integrity (IBIs), and (2) hydrologically connected to downstream impaired waters currently on the TMDL list." In describing these four wetlands, the MPCA observed that "when the goal is to maintain or restore the health of a watershed, both wetland quantity and quality need to be integrated into the overall management plan." [17]

The MPCA proposed to list the following four wetlands in its draft TMDL:

Lake Jones. This 33.6 acre wetland in Ramsey County has an extensive emergent plant community. IBI studies indicated that the wetland was not supporting its "aquatic life" designated use. Downstream lakes were also "listed" as impaired due to excess nutrients.

Trappers. Trappers is a 26.8 acre open water wetland in Pope county in an agricultural area. Invertebrate IBIs indicated that this wetland was not supporting its aquatic life designated use. Downstream lakes were also subject to excessive nutrients.

Morraine. Morraine is a 3 acre emergent marsh in Hennepine County. IBIs indicated that this wetland is not supporting its aquatic life use. Downstream waters are subject to excess nutrients and mercury.

Wooland WMA is a 617 acre open water and emergent wetland in Wright County. The watershed has been extensively ditched and has many feedlots. IBIs indicated that this wetland is also not supporting its aquatic life use. Downstream waters have low dissolved oxygen contents.

[16] http://www.pca.state.mn.us/publications/wq-iw12-05-08.pdf
[17] Id.

Appendix E: Watershed-Based TMDL for the Lower Fox River and Green Bay in Wisconsin

The Wisconsin Department of Natural Resources is working with many agencies and groups to develop a TMDL for the Lower Fox River (LFR) Basin, including the Green Bay Area. Pollutants are widespread in the area and include sediment, phosphorus, PCBs and mercury. The Lower Fox River Basin was chosen for a TMDL due, in part, to the number of waters including wetlands which are impaired. It was also chosen because of the large amount of water quality data collected over the past 40 years by the DNR, GBMSD, USGS, UW-GB, UW-Sea Grant, UW-Milwaukee (Great Lakes Water Institute) and the Oneida Tribe of Indians.

Fourteen waterbodies in the LFR Basin are polluted (or impaired) due to excessive total suspended solids (such as sediment and soil from runoff) and phosphorus. Additional pollutants include PCBs and mercury; however, these will not be addressed in the TMDL. PCBs are currently being addressed through the Comprehensive Environmental Remediation and Liability Act.

The TMDLs developed for the Lower Fox River Basin and Green Bay will identify sediment and phosphorus reductions needed from both nonpoint and point sources to achieve water quality standards. Excessive sediment and phosphorus can cause low dissolved oxygen levels, poor water clarity, loss of submerged aquatic plants, degraded habitat for fish and wildlife, beach closings, harmful algal blooms, loss of recreational opportunities, and decreased property values.

It is not anticipated that individual wetlands will be listed as impaired as part of this TMDL but the watershed plan for addressing pollution will call for "(r)estoring wetlands throughout the basin to improve degraded habitat."[18] The plan will also call for stabilizing natural hydrology through "planning and reclamation of wetlands."

Appendix F: Recommended Readings and Sources: Wetlands and TMDLs

General Sources

(The following bibliography and list of literature sources has been derived, in part, from a selective, web-based bibliography prepared by Julia Gelfand, " Adaptive Implementation of TMDLs: Interpretation & Adaption, Urban Water Resource Center, University of California, Irvine, 2005, http://www.uwrc.uci.edu/documents/TMDL%20Bibliog%202005%20UWRC.doc). It is also based upon web search of TMDL-related literature and sites.

[18]See fact sheet, Wisconsin Department of Natural Resources, A TMDL: Creating a Better Future for the Lower Fox and Green Bay, http://dnr.wi.gov/org/water/wm/WQS/303d/FoxRiverTMDL/documents/LFRfactsheet4pg.pdf

National Academies Press, Assessing the TMDL Approach to Water Quality Management (2001); http://www.nap.edu/openbook.php?record_id+10146&page=1

The TMDL Program in Transition, The NPS Problem: Designing TMDLs for Implementation http://www.eli.org/pdf/tmdl/ELI_Final_Report_2009_NPS_TMDL_Workshop_Project.pdf

Selective Federal & State Government Websites

U.S. Environmental Protection Agency, Guidance for Water Quality-based Decisions: The TMDL Process (1991)
http://nepis.epa.gov/Exe/ZyNET.exe/00001KIO.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1991+T

United States, Environment Protection Agency TMDL site
http://www.epa.gov/owow/tmdl/

Purdue University, "Know Your Watershed," TMDLs
http://www.ctic.purdue.edu/KYW/tmdl/tmdlhome.html

Water Quality Information Center, National Agricultural Library
http://www.nal.usda.gov/wqic/TMDL.html

Maryland TMDL Webpage
http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/index.asp

Local Government Processes in Maryland's TMDL Development Program
http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/tmdl_localgov.asp

EPA Region 3 Total Maximum Daily Load (TMDL) Website
http://www.epa.gov/reg3wapd/tmdl/

Zakia Swamp TMDL, Nutrients, suspended sediments, copper, lead, zinc, and selenium.
http://www.epa.gov/reg3wapd/tmdl/MD_TMDLs/ZekiahSwampWQA/Zekiah%20Swamp_WQA_ltr.pdf

TMDLs and Water Quality Protection in Maryland,
http://www.dnr.state.md.us/bay/tribstrat/monitor/fall97/tmdls.html

New Mexico Surface Water Quality Research Bureau, TMDLs
http://www.nmenv.state.nm.us/swqb/tmdl_idx.htm

Nevada Division of Environmental Protection, Bureau of Water Quality Planning, TMDLs
http://ndep.nv.gov/bwqp/tmdl.htm

Colorado Department of Public Health and Environment, TMDLs
http://www.cdphe.state.co.us/op/wqcc/SpecialTopics/303(d)/303dtmdlpro.html

Montana Department of Environmental Quality, TMDLs
http://www.deq.state.mt.us/wqinfo/TMDL/index.asp

National Association of Homebuilders, TMDL Toolkit
http://www.nahb.org/publication_details.aspx?sectionID=478&publicationID=150

EPA, Handbook for Developing Watershed Plans to Restore and Protect Our Waters
http://www.wq.uiuc.edu/wtshhdbk/biblio.pdf

Georgia Water Coalition, Bibliography of Riparian Buffer Studies
http://www.garivers.org/gawater/pdf%20files/GA%20Buffer%20Bibliography.pdf

Efforts to Close the SWANNC Gap Using Water Quality Statutes: Lessons from Indiana
http://www.aswm.org/calendar/legal/pelloso.pdf

Neponset River Watershed Association Stormwater Program, Fact Sheet: the Wetlands Act and TMDLs
http://www.neponset.org/Reports/9.09.BacteriaTMDLFactSheet.pdf

Remedial Action Plan addressing Nickel Prepared for Unnamed Wetland in Michigan and Wetland Removed from TMDL list
http://www.gis.iwr.msu.edu/tmdl98/tmdl.htm

Pennsylvania TMDL website
http://www.dep.state.pa.us/watermanagement_apps/tmdl/

Georgia Water Coalition, Bibliography of Riparian Buffer Studies
http://www.garivers.org/gawater/pdf%20files/GA%20Buffer%20Bibliography.pdf

The Role of Total Daily Maximum Loads (TMDLs) in Planning and Managing Stream Restoration Projects in Urbanizing Watershed: New Jersey Case Study, Phase B
Witherill, American Geophysical Union, Spring Meeting 2005, abstract #NB24E-06
http://adsabs.harvard.edu/abs/2005AGUSMNB24E.06W

Protocol for Developing Pathogen TMDLs. Washington, DC: United States Environmental Protection Agency, Office of Water, 2001. EPA 841-R-00-002.
http://purl.access.gop.gov/GPO/LPS50982

Trash Total Maximum Daily Loads for the Los Angeles River Watershed. Los Angeles, CA: California Regional Water Quality Control Board, Los Angeles Region, 2001.

Association of State and Interstate Water Pollution Control Administrators, TMDLs.net -
http://www.tmdls.net/

Watershed Academy Web, Introduction to the Clean Water Act, U.S. EPA
http://www.epa.gov/watertrain/cwa/cwa29.htm

Restoring Our Water Heritage, Wisconsin DNR, A TMDL: Creating a Better Future for the Lower Fox River and Green Bay
http://www.eastcentralrpc.org/planning/compplan/milestone3/MS3Final/APPENDICES/AppendixG_WNDR%20TMDL%20Fact%20Sheet.pdf