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US EPA's NEW GUIDANCE ON WATERSHED-BASED PLANS FOR RESTORATION AND PROTECTION

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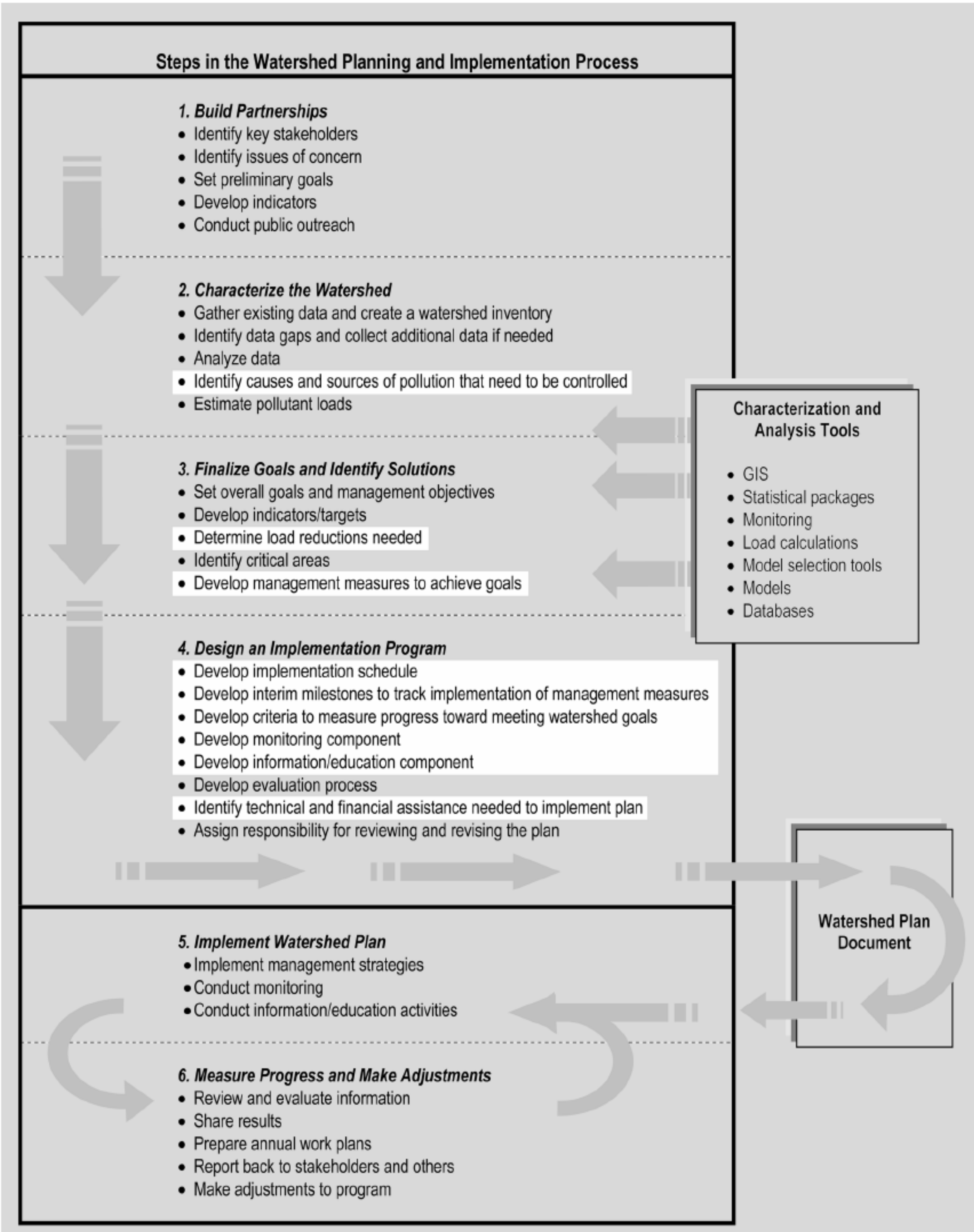
Over the past 15 years, organizations and agencies have moved toward managing water quality by using a watershed approach. A *watershed approach* is a flexible framework for managing water resource quality and quantity within specified drainage areas, or watersheds. This approach includes stakeholder involvement and management actions supported by sound science and appropriate technology. The *watershed planning process* works within this framework by using a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, develop protection or remediation strategies, and implement and adapt selected actions as necessary. The outcomes of this process are documented or referenced in a *watershed plan*, which provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to development and implementation of the plan.

EPA is working with states, tribes, and watershed groups to realign agency programs and strengthen support for watershed-based environmental protection programs, which feature local stakeholders joining forces to develop and implement watershed-based plans that make sense for the conditions found in local communities. In the initial stages of the national nonpoint source program, some states and EPA regions focused their nonpoint source programs narrowly on demonstrations of particular technologies supported by section 319 grants. In upgrading their nonpoint source programs, many states have incorporated watershed-based approaches as a significant and sometimes central organizing theme of their programs. As a result, state nonpoint source programs have improved their ability to solve nonpoint source pollution problems at the watershed level.

Although each watershed plan will emphasize different issues and reflect unique goals and management strategies, some common features are included in every watershed planning process. By definition, the watershed planning process is iterative, holistic, geographically defined, integrated, and collaborative. EPA recognizes that the processes involved in watershed assessment, planning, and management are iterative and that targeted actions might not result in complete success during the first or second cycle. It is expected, however, that through adjustments and adaptations made during the management cycles, water quality improvements can be documented and continuous progress toward attainment of water quality standards can be achieved. Watershed plans should address all the sources and causes of waterbody impairments and threats; that is, plans should address not only the sources of the immediate water quality impairment but also any pollutants and sources of pollutants that need to be addressed to ensure the long-term health of the watershed.

EPA recognizes the difficulty in obtaining watershed-related information with precision and acknowledges that a balanced approach is needed to address this concern. Preliminary information and loading estimates might need to be modified over time, accompanied by midcourse corrections in the watershed plan and the projects it promotes. In many cases, several years of implementation will be required for a project to achieve its goals.

Figure 1. Steps in the Watershed Planning and Implementation Process and EPA's Nine Minimum Elements for Watershed-Based Plans (shown in unshaded area).



LOUISVILLE WATER COMPANY – WELLHEAD PROTECTION PLAN

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The Louisville Water Company, (LWC), has provided high quality drinking water to the residents of the city since the 1879, when the Crescent Hill Reservoir was built as a sedimentation basin for water withdrawn from the Ohio River. By 1908, the water company had installed a 'rapid sand filter', which combined filtration with the use of chlorine. The company has participated in research performed by the USGS along the Ohio River valley since the 1940s, and was a leader in the use of fluoride to prevent tooth decay in the 1950s.

Along with other improvements to the water system, LWC began a program to use river bank filtration wells as an alternative means of supply in the 1980s. This natural pre-treatment program has enabled LWC to more easily meet current water quality standards. At present, LWC serves over a million customers per day, in three counties.

LWC has one riverbank infiltration well located at the B. E. Payne Plant next to the Ohio River in northeastern Jefferson County. The well was constructed in 1999, and was designed as a collector well: it contains a primary caisson, with lateral, horizontal screens extending outward from the central caisson in all directions. While several laterals extend into the aquifer within the valley, other laterals extend under the Ohio River, to induce surface water infiltration from the Ohio River into the well. Water produced from the well, (approximately 18 MGD), is considered a groundwater source, the majority of which is directly influenced by surface water. Therefore, the well falls under the Wellhead Protection Regulation for the State of Kentucky.

In accordance with Kentucky's Wellhead Protection Program, LWC has completed a comprehensive and highly detailed Wellhead Protection Plan. A Wellhead Protection Plan, (WHPP), is comprised of five steps. The Phase I portion of the plan involves forming a Local Planning Team to develop the plan, and completing a delineation of the Wellhead Protection Areas, (WHPAs), to determine the area that must be protected. This portion of the plan was approved by the KY DOW on June 20, 2003. The Phase II portion of the plan involved locating and listing all potential contaminant sources within the WHPAs, developing management strategies to control potential sources of contamination, and developing a plan for the future. Phase II was accepted on November 23, 2004. Currently, LWC is working to implement the plan.

<u>Local Planning Team</u>

Members of the local planning team included representatives of highly diverse interests within the community. Local government officials represented both the City of Louisville and Jefferson County government agencies, which has since merged into Metro Government. City of Prospect personnel represented the local government in the area immediately within the WHPA. Additional members included local business owners and residents of the area, (those with a vested interest in the WHPA), as well as local environmental watchdog groups. State Department of Transportation and Division of Water personnel were also members of the LPT.

Delineation of the WHPA

Delineation of the Wellhead Protection Areas was completed by an outside consultant retained by LWC, to determine the relative times of travel for potential contaminants moving into the area.

Inventory of Potential Contaminants

A comprehensive inventory of potential contaminants has been completed and is constantly updated within the WHPAs. First, available data bases were searched for information detailing specific contaminants, and practices located within the WHPA. Local, state and federal data bases were searched for information about the WHPA. Next, a windshield or ‘drive-by’ survey was completed on all properties found within the WHPAs. Local Planning Team members drove by individual homes, businesses, and government properties to determine specific potential contaminants or practices that may adversely affect the groundwater that is a source of supply for the riverbank infiltration well. Over 1,000 properties are currently listed within the inventory, with over fifty, (50) different types of point source and nonpoint source potential pollutants.

Site interviews were conducted with selected businesses to determine specific contaminants on site, practices that may affect the groundwater, and to provide educational material about risks, modes of contamination, and Best Management Practices, (BMPs). This information is updated constantly by mailed surveys, additional drive-by surveys, reports from the Local Planning Team members, direct communication with property owners, and communications with local, state, and federal agencies. A susceptibility analysis was completed on the potential contaminants found within the area, in order to prioritize the potential contaminants for management purposes.

Management Plan

The management plan focuses on compliance with existing laws, and education to encourage understanding of the risks and modes of contamination, voluntary compliance with regulations, and the use of BMPs. Specific potential contaminants were addressed, as well as general groups of potential contaminants. Both point and nonpoint sources were also addressed. For example, heating oil tank owners, distributors of heating oil, and realtors have been contacted, provided with educational materials, (voluntary use of BMPs), and a Groundwater Protection Plans have been requested, (compliance). LWC is also working closely with the Metropolitan Sewer District and the Metro Health Department to replace existing septic systems with sewers, or to update existing systems to current building codes.

Plan for the Future

Existing emergency operation plans developed by the Louisville Metro Government and LWC were used to develop a contingency plan, should contamination occur. Emergency personnel including local HazMat teams, firefighters, and LWC personnel, contributed to the plan. These plans will be updated and enhanced as the WHPP is developed through implementation.

LESSONS LEARNED REFORESTING THE BLUEGRASS

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The Federal Clean Water Act (CWA) requires a municipality with a population greater than 10,000 to have a permit that creates and maintains programs and projects to address stormwater pollution reduction and prevention in urban stormwater discharges. These programs are to identify and reduce or eliminate stormwater pollution using best management practices to the maximum extent practicable.

The streams of Fayette County (560 miles) suffer from two major causes of impairment: (1) abnormally high background concentrations of phosphorus and (2) the "Bluegrass Aesthetic." One is a problem of natural origins and the other is a problem associated with the perceptions of man.

Phosphorus – the streams in central Kentucky are limestone based streams. Only 7% of the streams in the United States are of this type. In Fayette County, the Tanglewood Member of the Lexington Limestone series is the most abundant and contributes greatly to the phosphatic nature of the soils (Ormsbee, et. al, 2003, 12). It has long been held that a concentration of 0.10 mg/L of phosphorus will result in unwanted algal growth that can impair a stream ecosystem. Testing information has shown that the background levels for phosphorus in Lexington are between 0.20 and 0.38 mg/L (Ibid, 18).

From a qualitative analysis, a "stroll" along a stream in Fayette County will reveal that once shade is removed from a stream, algal growth is problematic – resulting in thick algal mats that alter aquatic habitat and deplete oxygen concentrations leading to numerous fish kills. Where there is shade, there is a viable aquatic community.

The Bluegrass Aesthetic – for the past two hundred years, it has been the goal of every land owner to have a floodplain free of forests. Trees are "nice" when they line driveways and fencerows but they seldom line streams – "You can't see the stream that way and being able to see the pretty creek is what sells the property."

The solution was the Reforest the Bluegrass program. Its purpose is to put back native forests along denuded stream corridors and involve the public to the maximum extent practicable. The project is seen more as a public outreach and education event than it is a

BMP to the MEP for erosion control; habitat improvement; and urban forestry. If the mindset of the citizens does not change, then no program will succeed.

During the eight (8) years of the program, over 150,000 tree seedlings have been planted in over 150 floodplain acres. Over 5,000 regional citizens have been trained to plant these trees. First year survival rates have been phenomenal – over 85%!

But there have been many valuable lessons learned – lessons that transcend this program and can apply to numerous watershed management programs:

1) "Health Forests, Healthy Streams." Teaching the principles of urban stormwater management and urban forestry to a varied audience. It has been important to get all interested parties to see the value of healthy urban forests and how that translates into healthy streams and healthy communities. Also, it has been challenging to help people understand the fundamental goals and objectives of the CWA and how the simple act of planting a tree can accomplish those goals.
2) Citizen Input. There are many willing citizens who stand ready to participate in making their watersheds a healthier place to live. But many times government officials are "concerned" about all of that citizen input – "You can't control it." Most people want to do the right thing most of the time. Most people know that something is wrong – they *used* to be able to go to the park and play in and around the creek – they *used* to see dragonflies and butterflies all over the place. Reforest the Bluegrass has provided a successful venue for people to learn and be empowered to do things that will have a lasting impact on their communities.
3) "Keep 'em happy." Many things have been tried – some are successful and some fail. But many lessons have been learned about how to take care of our volunteers and make them glad they came and looking forward to the next opportunity to improve their communities.
4) Maintenance Coordination. When you plant tens of thousands of small "twigs" in areas of park property that have been mowed for decades, sometimes you loose a few trees to miscommunication.
5) Being too successful. Sometimes, by doing so much for so long with so little, you find it difficult to get additional funding to expand your efforts.

Reforest the Bluegrass has been an outstanding success. It has spawned similar efforts from Richmond, Kentucky to Galveston, Texas. And the lessons learned will continue to ensure its success into the future.

References

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LOW-FLOW CHARACTERISTICS OF STREAMS IN KENTUCKY

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ABSTRACT

A new 2-year investigation of low-flow characteristics of streams in Kentucky has been initiated by the U.S. Geological Survey, Kentucky Water Science Center. This investigation is a component of the Water Budget Approach for Managing Water Supply Resources in Kentucky, a statewide hydrologic model currently (2006) under development. Detailed analyses using enhanced statistical techniques and additional periods of low-flow data collected in additional stream reaches distributed statewide will improve the reliability of water-supply assessments that can be developed from the Water Budget Approach. Information on low-flow characteristics of streams is used in water-resource modeling, planning, and management to assess a stream's (1) adequacy for use as a water supply, (2) capacity for assimilation of liquid wastes, and (3) suitability as habitat for aquatic life (Riggs, 1972). Kentucky's surface waters are the primary source for drinking-water supplies and the primary sink for wastewater-effluent disposal. Therefore, reliable, up-to-date estimates of low-flow characteristics are needed for making critical decisions concerning the location, design, and operation of water- and wastewater-treatment facilities.

The previous statewide low-flow investigation for Kentucky (Ruhl and Martin, 1991) was based on data collected through March 1987 at 136 long-term continuous-record streamflow-gaging stations and 212 short-term low-flow partial-record stations. Up to 18 years of additional low-flow data, some collected during severe drought periods, are available for many of the long-term continuous-record stations used in the previous investigation. In addition, several new long-term continuous-record stations have been established since 1987, which now have sufficient data for analysis. During the 2005 and 2006 low-flow seasons, data are being collected at a low-flow network that includes approximately 80 new partial-record stations distributed across the Commonwealth where data collection was first begun in the severe drought of 1987-88. This low-flow network currently (2006) includes over 40 percent more unregulated streamflow-gaging stations than were available for the previous low-flow investigation.

The investigation is designed to increase the current knowledge and understanding of hydrologic processes that control the low-flow characteristics of streams in Kentucky, a critical component of the streamflow regime for the water-budget model. Streamflow data from long-term continuous-record streamflow-gaging stations with 10 or more complete years of homogeneous daily streamflow record through 2005 will be analyzed

to determine low-flow characteristics, and low-flow characteristics for short-term low-flow partial-record stations will be estimated by correlative methods from low-flow characteristics determined for the continuous-record gaging stations.

Regional regression equations can be used by water-resource engineers, planners, and managers to estimate pertinent low-flow characteristics, such as the 7-day, 10-year low flow, at stream sites where little or no hydrologic data are available. Regional estimating equations define a relation between the streamflow characteristic of interest and one or more basin characteristics, such as drainage area. In certain settings, low-flow characteristics are difficult to estimate accurately by use of regression equations because of the difficulty in quantitatively representing the effects on low flows of various localized geologic features. The accuracy of the regional estimating equations generally is improved by collecting additional data at partial record sites to obtain a data set that is representative of a wider variety of basin types and characteristics.

Relevant basin characteristics will be determined by use of a geographic information system with the best available digital coverages for the new and historical gaging stations, and these basin characteristics will be tested as explanatory variables in the regression analyses. Drainage area and streamflow-variability index were used as explanatory variables in the most recent regional regression equations for estimating low-flow characteristics (Ruhl and Martin, 1991). The streamflow-recession and streamflow-variability indexes will be updated to include the daily mean discharge data collected since 1987 at the continuous-record stations. The indexes, if appropriate, will be regionalized as a function of geology and evaluation of residuals from the regression analysis. Maps delineating areas of similar indexes and lithology will be reviewed, and if appropriate, updated in the case of streamflow-variability index and incorporated into revised regional regression equations for estimating low-flow characteristics at ungaged, unregulated, rural stream sites in Kentucky. This investigation will be completed in June 2007.

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