

Appendix B: Eight-Step Approach to Watershed Planning¹

Watershed and subwatershed plans provide a framework for managers and decision-makers to determine what the goals and strategies of the plan should be and how and where various management and protection tools need to be implemented to achieve the goals and strategies. Developing watershed and subwatershed plans should ideally occur in a rapid, cost effective manner. It is important to remember throughout the process that it is critical to have public involvement and “buy in.” Without community support, it may be difficult to implement a plan.

A suggested eight-step approach to watershed planning is discussed below and includes the following:

- Step 1: Identify initial goals and establish a baseline
- Step 2: Set up a watershed management structure
- Step 3: Determine budgetary resources available for planning
- Step 4: Project future land use changes in the watershed and its subwatersheds
- Step 5: Fine tune goals for the watershed and its subwatersheds
- Step 6: Develop watershed and subwatershed plans
- Step 7: Adopt and implement the plan
- Step 8: Revisit and update the plan

Step 1: Identify initial goals and establish a baseline

Prior to initiating a watershed plan, some broad goals should be identified that define the purpose of the plan initiative. For example, a goal of a plan may be to preserve and maintain a high quality segment of stream in a community, protect drinking water quality in a water supply watershed, or meet a water quality Total Maximum Daily Loads (TMDL). Other goals may be a response to negative impacts being observed within a watershed such as property flooding or channel erosion and degradation. Prior to addressing the initial goals, it is necessary to gather basic information to determine a starting point to develop the plan. Information about possible stakeholders, current land use and impervious cover, and technical (e.g., previous hydrologic/hydraulic studies, floodplain studies, water quality studies, etc.), staffing, and financial resources can help guide the first steps of the plan. Once the broad goals have been identified and defined, specific tasks that may need to be performed are describe below.

Task 1: Define watershed and subwatershed boundaries

Defining the watershed and subwatershed boundaries sets the stage for completing the rest of the watershed baseline. The product of this task is a simple map that outlines the boundaries of the watershed and each of its subwatersheds. Producing this map is a necessary first step to answering questions such as “Which political jurisdictions and citizens should participate in this watershed planning effort?” and “What are the land use patterns in the watershed and each of its subwatersheds?”

Task 2: Identify possible stakeholders

Early on, it is important to identify the partners, or stakeholders, that will be involved in some way to make watershed plans happen. Early stakeholder involvement guides the development of the watershed plan to incorporate the needs of the community and promote resource protection. By involving possible stakeholders early on in the process, managers can gage who wants to participate in developing the plan, what they can offer to the process, or what obstacles participants may present. Stakeholders might include other government agencies, businesses and industry, nonprofits, and neighborhood leaders and interested citizens.

The watershed and subwatershed boundaries delineated in Task 1 are a good place to start identifying possible stakeholders. A quick review of the map helps determine which jurisdictions and neighborhoods fall within the watershed boundaries. Direct outreach to citizens living within the watershed boundaries can also spark interest within the community. Stakeholders can provide resources, expertise, or

knowledge to guide the development of the plan. Also, it is important to include stakeholders from the local development community since some decisions of the plan, such as new ordinances or zoning, will directly impact them. It is also wise at this time to look beyond the boundaries of the watershed under study to see how the plan may help achieve the broader goals of larger river basins.

Task 3: Estimate existing land use and impervious cover

Estimating existing subwatershed land cover is a recommended baseline task in preparing a watershed plan. Existing impervious cover provides an estimate of current conditions in each subwatershed and serves as an important benchmark to assess future land use changes. Land use and impervious cover percentages can be used to initially categorize subwatersheds, help managers set expectations about what can be achieved in each subwatershed, and guide decisions in the watershed.

Task 4: Assemble historical monitoring data in the watershed

Good monitoring data that accurately characterize the resource quality in a subwatershed are needed throughout the watershed planning process. Historical monitoring or modeling data are often available from past efforts. For example, the Texas Parks and Wildlife Department (TPWD) Resource Protection Division may possess fishery data and water quality data that may have been collected for a host of regulatory programs. Collecting historical data may significantly reduce the costs of initial baseline monitoring. Historical data may also provide information about the response of the water resource to land use change over time. This record can help managers evaluate current decisions in the context of the impacts of past decisions on the resource.

Task 5: Assess Existing Mapping Resources

Maps depicting current conditions—including land use, potential pollution sources, problem areas, etc.—in each subwatershed, as well as management decisions made during the planning process, are an integral part of the watershed plan. The effort to produce these maps depends on what data are already mapped, and in what form. Also, some field measurements may not be required if recent maps of these features already exist.

Regional development authorities, state agencies, universities, or environmental agencies may already have some maps, either in paper or digital form. The North Central Texas GIS Data Clearinghouse (www.dfwmaps.com/clearinghouse) is a good source of existing digital GIS data. Stakeholders are also a source to find existing mapping resources. Assigning one individual or a small group the task of assembling and manipulating mapping data is an effective way to set this baseline.

Task 6: Conduct an audit of local watershed protection capability

The final element of the watershed baseline is a critical evaluation of the local capability to implement watershed protection tools and management alternatives. This evaluation or audit examines whether existing local programs, regulations, and staff resources are capable of implementing the watershed plan. If not, it identifies key areas that need to be improved. The scope of the audit can include an analysis of local master plans, ordinances, the development review process, performance criteria for stormwater controls and management practices, program funding, and staffing levels. The effort needed for the watershed audit depends to a great extent on the size and complexity of the local program(s), the number of staff employed, and the pace of development activity.

Step 2: Set up a watershed management structure

Establish the institutional organization responsible for the overall management and implementation of the watershed plan. Choosing the most effective watershed management structure to guide the development of the watershed and subwatershed plans is one of the more complex decisions a community or watershed planning team confronts. Successful watershed planning requires a strong organization to act as the driving force to focus the resources of a diverse group of stakeholders to implement the plan.

It is crucial to choose a watershed management structure that can be sustained over the life of the watershed planning and implementation process, as well as to revisit and update the plan as project goals are achieved or circumstances change.

A core set of features are needed to make watershed management structures effective:

- Adequate permanent staff to perform facilitation and administrative duties
- A consistent, long-term funding source to ensure a sustainable organization
- Including all stakeholders in planning efforts
- A core group of individuals dedicated to the project who have the support of local governmental agencies
- Local ownership of the watershed plan fostered throughout the process
- A process for monitoring and evaluating implementation strategies
- Open communication channels to increase cooperation between organization members

The first two features, permanent staffing and long-term funding, are probably the most important. Clearly, having a permanent staff and adequate funding go hand in hand. Regardless of the size, a successful management structure should define inter-agency and governmental partnerships and agreements needed to support the organization over the long term.

Step 3: Determine budgetary resources available for planning

One of the most important challenges confronting a community or watershed planning group is how to develop watershed and subwatershed plans within existing budget constraints. The watershed planning team needs to identify what sources of funding are available and to develop budgets for the subwatershed and watershed plans. Several current and future revenue sources may be available to finance the development of a watershed plan. This revenue may include both staff time and general funds. In early meetings, it is important to get clear commitments from each involved agency or group as to what resources they can commit to the watershed planning effort. Substantial savings can be realized if volunteers are available to conduct some of the analyses, if existing staff time is reallocated to work on the plan, or if the plan is part of a larger planning effort where some costs can be shared.

Step 4: Project future land use change in the watershed and its subwatersheds

Forecast future development, land use, and impervious cover in each subwatershed. This analysis will influence the goal setting process in Step 5.

As previously mentioned, land use in a watershed and its individual subwatersheds have a strong influence on water quality and aquatic ecosystems. In this step, it is recommended that the community forecast future land use and impervious cover based on available planning information such as future land use plans or master plans. Local comprehensive plans required under state law can be a valuable source of information for future land use projections.

Impervious cover projection is one indicator that can be used to determine if the quality of water resources will degrade from current conditions. If the analysis indicates that impervious cover will increase to such an extent that it will likely cause subwatershed quality to decline, a management plan to mitigate these future impacts should be developed.

Step 5: Fine tune goals for the watershed and its subwatersheds

Use known information about impacts to the watershed, and the goals of larger drainage units (e.g. river basins), to refine and develop goals for the watershed. In addition, determine objectives for each subwatershed to achieve watershed goals. The general goals identified in Step 1 should be added to and

modified to reflect the results and inferences of the data collected and analyses performed in Steps 1 to 4.

Goal setting is among the most important steps in watershed planning, and the management structure should ensure full involvement from stakeholders at this stage. Goal setting should proceed from the broad basin and sub-basin goals to the more specific goals needed for the watershed. These goals, in turn, need to be translated into even more specific objectives for each individual subwatershed. To set appropriate and achievable goals, the watershed planning team needs to perform several tasks, as outlined below.

Task 1: Interpret goals at the river basin level that may impact the watershed

Watershed plans should be developed within the context of regional management goals for river basins. The Texas Commission on Environmental Quality (TCEQ) and other applicable resource agencies should be consulted early in the process to assist managers with these goals. Although not every river basin goal or objective may impact the watershed plan, managers should be aware of larger basin plan, and consider them when developing their own goals and objectives. Some examples of river basin goals that may directly influence the goal setting process at the watershed level include:

- Flood control
- Meeting state water quality standards/designated use
- Wildlife habitat enhancement
- Greenway establishment

Task 2: Develop specific goals for the watershed

The goals set at the watershed level are the “bottom line” of the watershed plan. While these goals may be similar to those developed at the river basin level, they are usually more specific and quantifiable. Examples of watershed goals include:

- Reduce flood damage from current levels
- Reduce pollutant loads from the current level
- Maintain or enhance the overall aquatic diversity in the watershed
- Maintain or improve the current channel integrity in the watershed
- Prevent development in the floodplain
- Allow no net loss of wetlands
- Maintain a connected buffer system throughout the watershed
- Accommodate economic development in the watershed
- Promote public awareness and involvement

These goals apply to the watershed as a whole, but may not always apply to every subwatershed within it. In addition, a watershed plan may have more unique multi-objective goals, such as developing a trail system for walking, biking, and jogging, preserving historically significant areas, and establishing outdoor education programs to foster community awareness and involvement. With diverse goals such as these, the importance of broad-based stakeholder involvement becomes all the more apparent.

Task 3: Assess if subwatershed management objectives can be met with existing zoning

Controlling and managing land use is an important tool to meet watershed management objectives. If a target development or impervious cover goal has been established for a watershed, managers will need to review current zoning and/or projected future land use to determine if these goals can be met. One method is to conduct a built out analysis of current zoning to determine the projected land use and/or impervious cover in each subwatershed. This analysis can be used to identify which management objectives can be met with existing zoning.

Task 4: Determine if land use patterns can be shifted among watersheds

If the current zoning is not compatible with the management objectives, development may need to be shifted to other watersheds or subwatersheds. One way to accomplish this goal is by upgrading the zoning in watersheds that are designated to accommodate growth, while downgrading the zoning in those watersheds that exceed the management goals. The effect is to shift development away from the streams and other water resources that will be most impacted by development, and toward areas where there is not as great of an impact. Other possible options include preserving undisturbed conservation areas (e.g., through land trusts, conservation easements, etc.) in a watershed, or by implementing strategies to reduce impervious cover.

The process described above is not simple. While controlling land use may be the most effective way to protect watersheds and subwatersheds, it can also be the most controversial recommendation in a watershed or subwatershed plan. Any change in zoning will require input from citizens, the development community, and local government. Furthermore, actually changing zoning can take a long time. Communities will need to use the legal tools they have available to change zoning appropriately, such as transfer of development rights, overlay zones, and floating zones.

Step 6: Develop watershed and subwatershed plans

A watershed plan is a detailed blueprint to achieve objectives established in the last step. A typical plan may include: revised zoning, stormwater design criteria and requirements, potential regional structural stormwater control locations, description of new programs proposed, stream buffer widths, monitoring protocols, and estimates of budget and staff needed to implement the plan. The four tasks needed to establish the watershed plan are described below.

Task 1: Select watershed indicators

Indicator monitoring provides timely feedback on how well aquatic resources respond to management efforts. Simple indicators can be selected to track changes in stream geometry, biological diversity, habitat quality, and water quality. For example, macroinvertebrate sampling is a relatively quick and inexpensive method to assess biological diversity. It can also be used to qualitatively assess aquatic habitat and water quality. A wide range of indicators can be used to assess the performance of management plans. The most appropriate indicators will depend largely on the management categories of the individual watersheds.

Task 2: Conduct watershed-wide analyses and surveys, if needed

In some situations, a watershed plan may need to incorporate special analyses at the watershed level to supplement basic monitoring and analyses. A manager may decide to include a flood management analysis, pollutant load reduction analysis, or recreational greenway analysis. Other analyses that may be desirable include:

- Fishery and habitat sampling
- Stream reconnaissance surveys
- Stormwater structural control performance monitoring
- Bacteria source surveys
- Stormwater outfall surveys
- Detailed wetland identification
- Pollution prevention surveys
- Nutrient budget calculations
- Surveys of potential contaminant source areas
- Hazardous materials surveys
- Stormwater retrofit surveys
- Shoreline littoral surveys

- In-lake monitoring
- Hydro-geologic studies to define surface/groundwater interactions

Task 3: Prepare subwatershed and aquatic corridor management maps

Maps that present the plan in a clear, uncomplicated manner are a key product of the subwatershed planning process. Maps range from highly sophisticated GIS maps to simple overlays of U.S. Geological Survey (USGS) quadrangle sheets. Mapping can generally be conducted at two scales, the subwatershed scale, and the aquatic corridor scale.

Subwatershed maps represent an entire sub-basin on a single map, and should be a component of all watershed plans. These maps represent the natural features and institutional information needed to produce a watershed plan. Aquatic corridor maps are produced at a much finer scale than subwatershed maps, and represent only the area immediately adjacent to the stream corridor or shoreline. Aquatic corridor maps are highly recommended, particularly when stream buffers or floodplain development limits are an important consideration in the watershed plan.

Task 4: Adapt and apply watershed protection tools

Just as different goals need to be established depending on a watershed's management category, so do the various tools used to protect that resource. For example, while structural stormwater controls are recommended as a component of all stormwater management plans, the types of controls used will be different depending on the specific characteristics of a given watershed.

Step 7: Adopt and implement the plan

Determine what steps are needed to effectively implement the plan. Implementation of the recommendations of a local watershed management plan can take place through a number of related mechanisms:

- In some communities the watershed or master plan is adopted (often by reference) in ordinances and essentially becomes an overlay district wherein development decisions must follow plan recommendations for various parts of the watershed. In others it is not mandatory, but is referred to when rezoning and plans approval decisions are made by staff and zoning boards.
- The local long-term capital improvement plan can be derived from the recommendations of the plan. Special assessment districts, fee-in-lieu charges, system development charges, or other funding mechanisms can be established to help pay for specific improvements identified in the plan.
- Comprehensive plans can be modified to incorporate the recommendations of the watershed or stormwater master plan into long-term land use planning, transportation plans, etc. Parks and open space plans can use the results of the plan to ensure the multi-objective nature of the plans is implemented combining engineering function with aesthetics and recreational opportunities.
- Some communities use the computer models of the drainage system developed in a watershed or master plan in a real-time format as tools to assist in decision making about the need for detention, downstream impact assessment, zoning approvals, etc.
- An ad hoc inter-staff team is often effective in coordinating the provisions of the plan across local government departments. Various recommendations in the plan may be implemented through non-profit citizen groups who "adopt" the watershed. These groups can be instrumental in gaining public acceptance and involvement, carrying out the recommendations of the plan, obtaining funding, and providing surveillance and reporting of watershed activities.

The best ways to ensure that a plan is implemented are to incorporate the right stakeholders, realistically assess budgetary resources, develop a scientifically and economically sound plan, and mandate its use in the development process. A good plan in itself does not guarantee implementation. As the plan is being developed, and afterwards, watershed planners need to work to ensure that local governments have both

the regulatory authority and the resources to implement the plan. It is important that the plan is not isolated from other government planning and construction activities.

The implementation of a watershed plan typically costs about ten times as much as the planning process. Some stable funding source needs to be identified to support plan implementation. One of the greatest costs of watershed implementation is the staff resources needed to continue monitoring in the watershed, design and build structural controls and retrofits, and enforce the ordinances and laws that might be called for in the plan.

Step 8: Revisit and update the plan

Periodically update the plan based on new development in the watershed or results from monitoring data. A one-time watershed study only identifies what problems exist in a watershed. Many local governments, for one reason or another, take on watershed planning without realizing that it is an ongoing process rather than a report.

Each subwatershed or watershed plan should be prepared with a defined management cycle of five to seven years. Individual plans are prepared in an alternating sequence, so that a few are started each year with all plans within a given region or jurisdiction ideally being completed within a five to seven year time span. A management cycle helps balance workloads of watershed staff and managers, by distributing work evenly throughout the cycle's time period.

References

- ¹North Central Texas Council of Governments. "Program Guidance: Stormwater Master Planning." 2010, http://iswm.nctcog.org/program_guidance.asp.