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INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Determining Critical and Protection Areas in Watershed Management Plans

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PURPOSE

The purpose of this document is to provide guidance on selecting critical and protection areas for groups developing a watershed management plan (WMP) using Section 319(h) grant funds through the Indiana Department of Environmental Management's (IDEM's) Nonpoint Source (NPS) Program. Watershed management plans, also known as watershed-based plans, are required by U.S. EPA (EPA) in the Nonpoint Source Program and Grants Guidelines for States and Territories to address nine minimum elements. These elements must be addressed before the WMP may be implemented using Section 319 grant funds. Element c of the Nine Elements shown below (from pg. 2-16 in Handbook for Developing Watershed Plans to Restore and Protect Our Waters) relates to critical areas:

> *c. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in paragraph 2* [element b[1]]*, and a description of the critical areas in which those measures will be needed to implement this plan.*

Critical areas are defined by EPA as "areas experiencing the most or worst problems and impairments" (U.S. EPA 2008) and "where management practices are needed" (U.S. EPA 2013b), and "those [areas] producing disproportionately high pollutant loads" (U.S. EPA 2013a). Additionally, the Handbook for Developing Watershed Plans to Restore and Protect Our Waters indicates that critical areas may be identified "by pollutant or sector" (p B-17). In addition, the EPA Watershed Academy Web "Introduction to the Watershed Planning Process" module defines critical areas as "those areas that play a role in the watershed that is especially important to its ecosystems, to its people, or to both." However, as new tools and guidance continue to be developed by EPA (such as the Recovery Potential Tool and Healthy Watersheds guidance), confusion has arisen as to whether critical areas might encompass more opportunities than simply "the most and worst" pollution problems. Absent comprehensive national EPA guidance regarding critical areas, IDEM developed this guidance to assist groups who are developing WMPs in defining critical areas that meet EPA's definition and are reflective of local conditions.

Critical areas are important for defining priority actions for watershed management activities. Therefore, it is inappropriate for the entire area covered by the WMP to be considered critical. If everything is a priority, then nothing is a priority. Even where land use is homogeneous, all subwatersheds or areas covered by the WMP cannot be considered critical. Further prioritization will be needed to target areas for implementation.

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[1] Element b of the 9 Elements (or "Components of a Watershed-Based Plan") is *"an estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks)."*

CONSIDERATIONS FOR DETERMINING CRITICAL AREAS

Several considerations should be taken into account when determining critical areas. Following is a list of factors that might influence how critical areas are determined.

1. The goal of designating critical areas within the watershed is to better manage resources, such as money and staff, so that restoration takes place as quickly and effectively as possible.
2. In advance of the planning process, consider what methods or information are available to determine critical areas. Work with the IDEM Watershed Specialist assigned to the watershed to develop a sampling plan that will help pinpoint critical areas. If, after consultation with IDEM, it is determined that there are not enough resources for sampling at a resolution to define critical areas, modeling and desktop/windshield surveys are perfectly acceptable ways to gather information.
3. If planning or restoration activities have taken place in the watershed prior to or outside of the current project, that information should be taken into consideration when determining critical areas and referenced in the watershed plan.
4. Determine whether a specific land use (whether it is the majority land use or not) is contributing the most pollution and should be designated as a critical area. For example, in Plummer Creek (Grossman et al. 2016), forested land use comprises 72.6% of the watershed but does not appear to deliver the bulk of NPS pollutants to the receiving waters. Alternatively, 15.8% of the land is in agricultural use, and data analysis determined it to be the main contributor of NPS pollution in the watershed. Therefore, any agricultural land use that is significantly contributing nonpoint source pollutants (nutrient, sediment, and/or *E. coli*) was determined to be critical for this watershed (pg. 137).
5. Watershed plans are meant to be holistic plans for addressing pollution problems in the watershed. Funding sources other than 319 can be used to implement the WMP. Don't let potential sources of funding drive critical area decision-making.
6. Watershed planning is a cooperative, community effort that takes into account all stakeholder issues. Set critical area size to ensure the issue can be addressed comprehensively. Help folks who are not in a critical area to understand why they may not be eligible for 319 implementation funding.
7. Size/scope of project area: Critical areas should be based on areas no larger than a 12-digit Hydrologic Unit Code (HUC) watershed, consistent with IDEM's 2009 WMP Checklist. Where appropriate, multiple 12-digit HUC watersheds may be critical for the same issue(s). See discussion in the section below on how to further target priority areas within HUC 12 watersheds.
8. To fully meet Element c of the 9 Elements, the WMP needs to say how implementation in critical areas will meet the load reductions needed.

TYPES OF CRITICAL AREAS

There are different ways to go about choosing critical areas. Below are three types of critical areas, with examples of how they were determined in different watersheds. Any combination of these types of critical areas may be present in any given WMP, as long as the combination of all critical areas does not make up the entire watershed.

Project-Area Based, Tiered Watersheds (By Pollutant or Source)

When load reductions are based on the entire watershed (project area), subwatersheds or smaller drainage areas designated as critical areas should be prioritized (e.g. using tiers or implementation priorities such as “high”, ”medium”, ”low”) corresponding to their level of need. Watershed implementation would then be focused on the subwatersheds with the highest need for improvement (often referred to as “Tier 1” watersheds) and funds should not be spent (and 319 funds are not eligible to be spent) on BMP implementation in other tiers until opportunities for water quality improvement in Tier 1 subwatersheds have been exhausted. All watersheds, regardless of their priority, may receive targeted outreach and education.

Watershed plans developed at the HUC 10 or multi 10-digit level may have 12-digit watersheds or smaller drainage areas as critical areas. Factors that might make one subwatershed higher in priority than another could be based on pollutant parameter exceedances of targets, proportion of pollutant loadings, magnitude of sources, or a combination of the above.

If 12-digit HUC watersheds are designated as critical areas, the WMP must further describe how smaller areas/individual sites within the watershed will be prioritized for implementation. Individual sites need not be identified in the WMP, however, the process that will be used for prioritizing the sites containing the critical source or pollutant must be explained. Note: A description of the decision-making process for determining where BMPs will be targeted within the critical areas is also a requirement of the cost-share program for Section 319 grant projects implementing a WMP (see Section 319(h) Cost-Share Program Development Guidelines).

Example: Deer Creek-Sugar Creek WMP (WREC 2015).

Land use in the Deer Creek-Sugar Creek watershed is fairly homogeneous, and many inventoried issues appear throughout the watershed, such as: agricultural land use, tile drained soils, soils used for septic treatment, hydric soils, and wetland loss. Though these issues contribute to pollution and degraded water quality, due to their widespread nature they cannot be used to narrow down critical areas which contribute the most loading and pollution.

The steering committee was able to identify inventoried issues of high concern however, including high density of regulated and unregulated farm animals, high percentage of unstable streambanks, high density of manure application, water quality monitoring data exceeding targets during high flow events, and impaired waterbody locations. Modeled load reductions needed to meet targets and were also taken into consideration. When comparing the ten HUC 12 subwatersheds in a table format, the extent and type of inventoried issues per watershed illuminated the subwatersheds generating the most of each pollutant (Tables 41-43 in the WMP).

The steering committee prioritized issues of water quality before addressing those areas critical for impaired natural aquatic habitat. The combined extent of all areas critical for nutrients, *E. coli*, or sediment covers 8 of the 10 HUC 12 subwatersheds. In an effort to further prioritize and target an implementation plan, the pollutant critical areas were stacked to create a tiered hierarchy of priority areas. Areas that are critical for all three parameters are considered “high priority” and will be the first to receive targeted actions. Implementation will then be targeted in areas critical for 2 parameters (“medium priority”), and then areas critical for 1 parameter (“low priority”). Areas that are not critical for any of the parameters are considered “no priority”. Figure 1 below (Figure 102 in the WMP) shows the priority critical areas in the watershed.

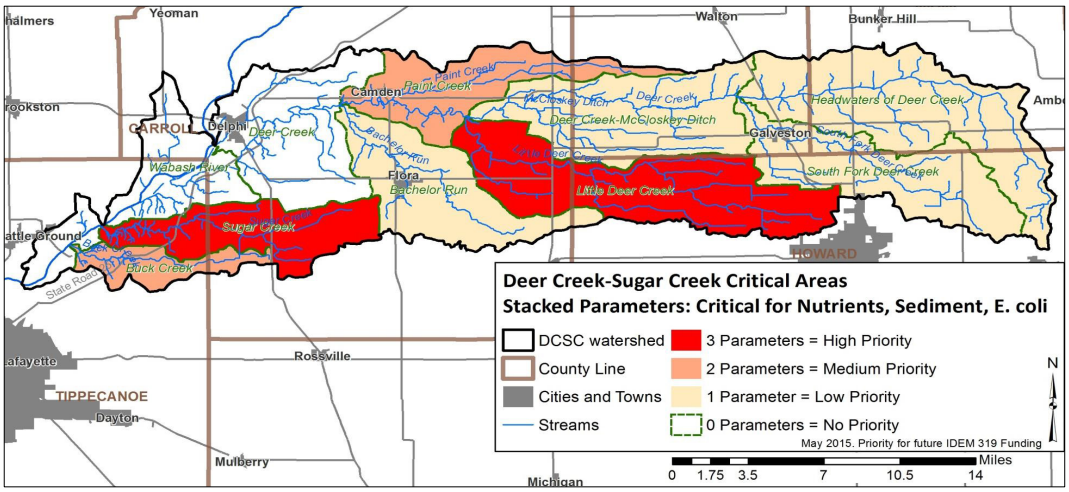

Figure 1. High, Medium, and Low Priority Critical Areas in the Deer Creek-Sugar Creek Watershed.

Prioritized by Sources

Nonpoint source pollution sources (*e.g.* livestock with stream access, conventionally-tilled fields, and pet waste) may be considered critical across the watershed if the source is contributing a significant amount of a documented problem, and if the WMP includes the process or procedures (criteria) by which sources will be targeted for financial and technical assistance. For example, livestock access areas may be considered critical, but the WMP must describe what process will be used to determine if a particular site is critical – such as looking at herd size, severity of bank erosion, etc. Critical areas may or may not be part of the predominant land use(s), depending upon the causes and sources of pollution.

Before addressing a particular pollutant source, it is important to consider any upland or upstream issues that may influence the effectiveness of the BMP. For example, before addressing a streambank erosion problem, make sure all cattle are excluded from the stream, necessary buffer strips are in place, and upstream hydrology issues have been addressed so the BMP is not damaged or destroyed.

Example: Upper Maumee WMP (Quandt 2014)

The Upper Maumee WMP identified lack of stream buffers and streambank erosion in the headwaters as significant sources of sediment in waterbodies throughout the watershed. They designated headwater streams that lacked adequate stream buffers or exhibited stream bank erosion as critical areas. They then prioritized locations for treatment by 12-digit watershed based on the magnitude of missing buffers and streambank erosion in the watershed. This method was used to identify Priority 1 (high), 2 (medium) and 3 (low) subwatersheds. Further, within the Priority 1 watersheds, the steering committee decided to make all stream buffers less than 60 feet in width at headwater streams critical for the installation of riparian buffer strips. The steering committee followed the NRCS recommended widths for an adequate riparian buffer: land with a 0 – 2% slope should have a minimum of a 20 foot buffer; land with a 2 – 4% slope, a minimum of a 40 foot buffer; and land with a slope greater than 4%, a minimum buffer of 60 feet. While slope in relation to stream buffers was not inventoried at the time the WMP was written, it will be assessed on a case by case basis at the time of implementation; at which time priority will be given to those areas where the most significant runoff and erosion potential exists.

Figure 2 (Figure 5.1 in the WMP) depicts the buffer inventory and Priority 1, Priority 2, and Priority 3 critical areas for buffer replacement. A close-up of Trier Ditch reveals the high amount of 0-10 ft. buffer in the watershed that was uncovered as part of the inventory, and Trier Ditch ends up being designated as a Priority 1 critical area. In contrast, Bullerman Ditch has less headwater streams overall, but the streams there generally have larger buffers than those seen in Trier Ditch. While some are 0-10 ft. buffers in the Bullerman Ditch watershed, there are not as many as in Trier Ditch. Bullerman Ditch is still a critical area for riparian buffer, but a low priority area.

In the Upper Maumee River Watershed, implementation will be focused on Priority 1 watersheds until all opportunity to implement the plan has been exhausted. The group will then focus on Priority 2 areas and so on.

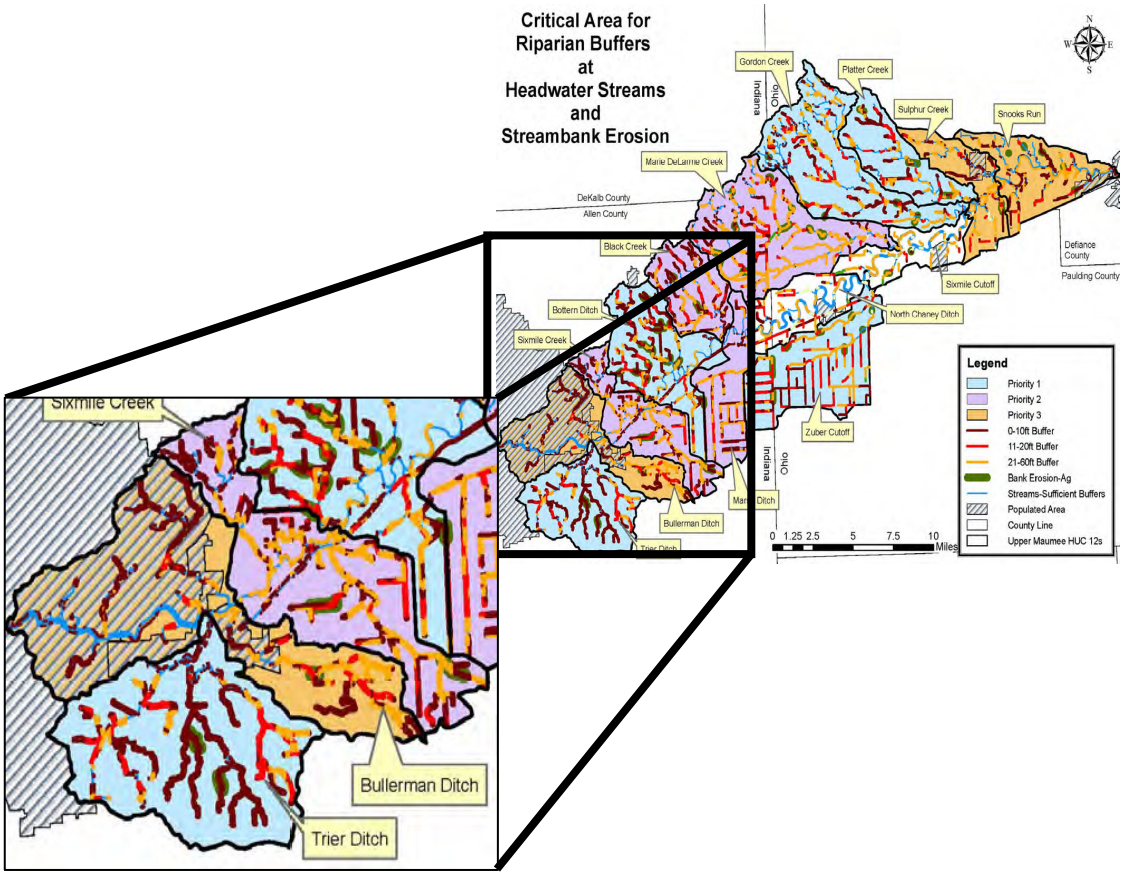

Figure 2. Critical Buffer Areas in the Maumee River Watershed.

Regional Critical Areas (Subwatershed and Catchment Goals – No Prioritizing Needed)

Where there are areas of localized pollution sources, water quality improvements may be realized more quickly when implementation is concentrated in these "hotspots." This method of identifying critical areas works well when pollution is being generated by several sources in a relatively concentrated area. It also provides some of the most accurate load reductions because calculating the treatments needed to correct the problem can be done with more precision in a smaller area.

Example: Upper St. Joseph WMP (Quandt 2015)

The Upper St. Joseph WMP defines critical areas in several ways – pollutant-based at the 12-digit HUC, source-based, and specific points where a pollutant is known to be a problem. When the group was considering critical areas for dissolved reactive phosphorus, one potential source they focused on was turf-based fertilizer use, especially in urban areas and residential lakes. They designated all urban areas (including Reading, Camden, and Montgomery Michigan; Pioneer, Holiday City, Montpelier, Edon, and Blakeslee Ohio; and Clear Lake and Hamilton, Indiana) critical for the use of lawn fertilizer. In addition, they designated the large built-up lakes of Clear Lake (807.74 acres), Long Lake (148.64 acres), Hamilton Lake (802 acres), Ball Lake (84.40 acres), Nettle Lake (100.70 acres), Bird Lake (115.07 acres), and Lake Seneca (240.83 acres) as critical for dissolved reactive phosphorus that enters the lake through lawn fertilizer.

A note on landowner willingness: IDEM has been advised by EPA that landowner willingness to implement practices should not be a consideration for critical area determinations. Instead, this information should be used in developing an education / outreach strategy to persuade landowners to include water quality considerations in their land management planning. Landowner willingness may, however, play a role in determining priorities for implementation.

PROCESS FOR DETERMINING CRITICAL AREAS

1. Gather data. Consider all available data, including data from the windshield/desktop survey, water quality data from the project, water quality data from sources outside the project, historical data, pollutant loads, potential sources, stakeholder concerns, anecdotal evidence, etc. If for some reason a data source is not used, justify its exclusion from the plan.
2. Analyze data. Come up with a system to compare the different types of data that are available. For example, the group may decide to rank possible sources, compare loadings, or sum rankings/scores for multiple categories for an overall ranking/score.
3. Show work. Clearly articulate the methods used to analyze and prioritize within the watershed(s). If IDEM cannot clearly determine that all data were considered and how they were used, the plan will not be approved.
4. Map it. IDEM's 2009 WMP Checklist (Element 24) requires mapping of critical areas. It is much, much easier to know if a project is in a critical area of the plan if there is a map.

PROTECTION AREAS

EPA's Nonpoint Source Program and Grants Guidelines (U.S. EPA 2013) allows for the inclusion of protection areas in WMPs to protect unimpaired/high quality waters from degradation. Defining protection areas is the reciprocal of defining critical areas – finding the best areas instead of the worst.

Indiana's landscape has been highly modified by human activity, so not all watersheds may have protection areas. Nonetheless, IDEM strongly suggests selecting protection areas where:

1. Category 1 waters have been identified by IDEM's 303(d) process[2]
2. Endangered, threatened, or rare (ETR) aquatic species have been identified
3. Outstanding state resource waters (OSRWs)[3] exist

[2] Category 1 waters are defined as those waters for which the available data indicate that all designated uses are supported and no use is threatened. Category 1 waters are identified on IDEM's Consolidated List, which is an appendix of the Integrated Water Monitoring and Assessment Report.

[3] OSRWs are listed in Indiana Administrative Code at 327 IAC 2-1-11(b), 327 IAC 2-1.3-3(d), and 327 IAC 2-1.5-19(b)

4. Other uses, such as source water for drinking water, need protecting
5. Vulnerable habitat or geology has been identified (e.g. pristine area, wetlands, karst areas in an urbanizing landscape)

WMPs covering watersheds without these features may still identify protection areas where there is good water quality or habitat relative to the watershed. However, be aware that EPA continues to focus Section 319 funds on restoration activities to delist impaired waterbodies. While protection areas are allowable and appropriate in WMPs, consider whether the watershed is in greater need of restoration or protection. Not every watershed has protection areas.

Implementation in protection areas will likely differ from implementation in restoration areas. To protect sensitive areas, a group may seek to implement ordinance changes, land acquisitions, easements, and integration of these areas into local or regional comprehensive plans. Additionally, areas of high quality aquatic habitat can be enhanced by additional conservation actions in the floodplain and adjacent to the stream. Restoration efforts may branch off of areas with high quality habitat in order to expand the length of contiguous habitat and corridors. Best management practices may also be used to prevent degradation from encroaching development.

Example: Deep River Watershed Restoration Plan

Stakeholders in the Deep River watershed of northwestern Indiana gathered data on nine 12-digit subwatersheds in their watershed of interest (NIRPC 2016). They analyzed all potential sources of pollution in order to identify critical restoration areas and protection areas. The Deep River Watershed Restoration Plan (WRP) includes two priority preservation areas, based on:

- higher water quality compared to other locations
- healthier fish and macroinvertebrate assemblages
- higher quality stream and riparian habitat
- land area included in the Green Infrastructure Vision ecological network
- concentrations of natural habitat features that provide important ecosystem functions (ex. water purification, groundwater recharge, and stream flow regulation)
- concentrations of high quality natural areas and Heritage Database species
- habitats most at risk to invasive species

Priority preservation areas described in the Deep River WRP include the Deep River Outstanding River reach and Hobart Marsh. The Plan describes the rationale for naming the Outstanding River reach as a priority preservation area:

> "Monitoring sites located on this reach had significantly (statistically) higher IBI scores; greater number of fish species; lower number of tolerant species; better QHEI channel morphology sub-metric scores; higher dissolved oxygen concentrations and lower *E. coli* and ammonia concentrations. The higher quality of this reach can likely be attributed to its natural, meandering river channel upstream of Lake George and the contiguous tracts of forest, wetland and floodplain buffering it from adjacent human land uses."

The Hobart Marsh Area includes 750 acres of permanently protected land with high quality upland and aquatic habitats. The site includes critical habitat for nine state threatened or rare plant species; one state endangered reptile species; over 40 state ETR insect species; and four state endangered bird species. Implementation strategies may include increasing vegetative cover, low impact designs, and habitat restoration to prevent degradation in these

areas. Figure 3 (Figure 204 in the Jan 2016 draft WMP) depicts the priority protection areas in the Deep River watershed.

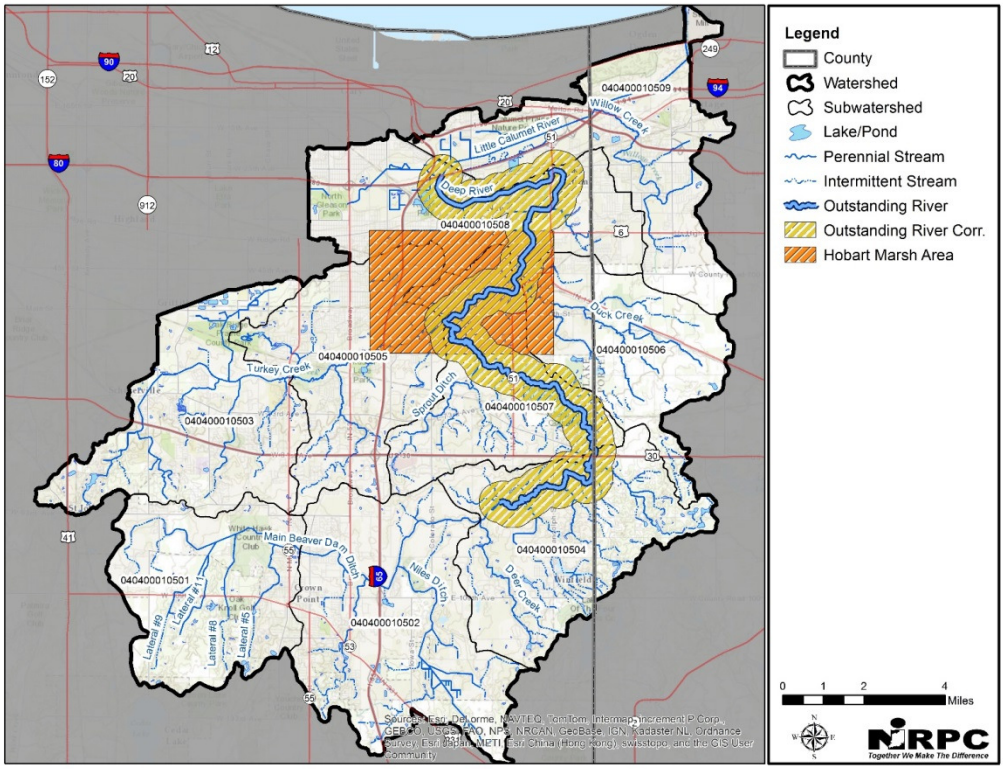

Figure 3. Priority Protection Areas in the Deep River Watershed.

SUMMARY

An important part of watershed planning is identifying the critical areas in the watershed so that implementation money and efforts can be focused on areas that will achieve the greatest water quality benefits. Watershed groups will need to look at and discuss inventoried watershed data, current pollutant loads, and potential pollutant sources in order to identify critical areas where BMPs are needed to meet the goals in the WMP. This process is not easy, and some tough choices will have to be made. However, if the group works together to determine the best solutions for the problems in the watershed, the WMP will be a great roadmap for effective implementation.

Resources are available to help groups develop watershed management plans and identify critical areas, including the IDEM Watershed Specialists. These staff members are responsible for coordinating, advising, and assisting locally led watershed management activities within assigned watersheds. Watershed Specialists work closely with watershed groups throughout the planning and implementation process and serve all groups in the state, regardless of how the group is funded.

A WMP is a living document which requires periodic evaluation and assessment. As land-use and water quality changes in the watershed, and BMPs and measures are implemented, critical areas may change as well.

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