

## **12.0 BEST MANAGEMENT PRACTICE SELECTION BY SUBWATERSHED**

Best Management Practices (BMPs) were selected by for each priority subwatershed using several criteria. Table 20 summarizes some of the criteria used for making decisions on BMP selections in each subwatershed. Topics listed in the table are related to current land use and existing load conditions. The table includes such information as predominate land use, NPDES dischargers, and prevalence of hydric soils and floodplain. Topics such as buffer restoration potential, wetland restoration potential, and floodplain restoration potential indicate that there are many areas where this could occur. In addition to this table, BMPs were also selected based on Steering Committee input and water quality issues within the subwatersheds that caused them to be selected as priority subwatershed.

Once the makeup of the watershed was understood, several BMP selections were made for each subwatershed. At this time BMPs are not being targeted to specific areas within critical subwatersheds due to the number and total acreage of the subwatersheds. The Steering Committee will continue to work with the local SWCDs and NRCS to identify landowners willing to participate in the implementation of BMPs. These selections are listed in Table 21.

### **12.1 Load Reduction Targets – BMP Options**

Table 22 lists BMP installation recommendation options for load reductions in the priority subwatersheds. BMP load reductions were calculated using several different formulas based on the type of BMP and nutrient/sediment removal efficiencies for each type of BMP. Once general reductions for each BMP were calculated, the options were formulated based on load reduction quantity and time goals set in Section 10.2. Each option combination shown below reduces load parameters of nitrate, total phosphorus, total suspended solids, and *E. coli* below the targeted pollutant goal amount in the timeframe desired.

**Table 20: BMP Selection Criteria**

	Priority Subs	Current Land Use	NPDES Discharger	Wetland Restoration Potential (hydric soils)	Buffer Restoration Potential	CFO/Livestock in Streams	Floodplain Restoration Potential
B	Big Walnut Creek - Dry Branch	Agriculture	Int'l Business Machines	Low	Low	Low	Medium
D	Big Walnut Creek - Greencastle	Suburban/ Forest	Greencastle Dept of Water; Greencastle STP; United (Speedway Gas)	Low	Low	Medium	High
G	Big Walnut Creek - Snake Creek/Maiden Run	Forest	Reelsville Elem School; Reelsville Water Treatment Plant	Low	Low	High	High
H	Clear Creek Headwaters (Putnam)	Agriculture	Clear Creek Conservancy District - Sewerage System	Low	Medium	Low	High
I	Clear Creek - Miller Creek	Agriculture		Low	Medium	High	Medium
K	Deer Creek - Leatherwood Creek	Forest		Low	Low	Low	Low
M	Deer Creek - Mosquito Creek	Forest	Putnamville Correctional Facility	Low	Low	Low	High
N	Deer Creek - Owl Branch	Suburban/ Forest		Low	Low	High	Medium

**Table 20: BMP Selection Criteria (cont)**

	Priority Subs	Current Land Use	NPDES Discharger	Wetland Restoration Potential (hydric soils)	Buffer Restoration Potential	CFO/Livestock in Streams	Floodplain Restoration Potential
O	Deweese Creek	Suburban/Forest	Lone Star Industries Landfill; Buzzi Unicem	Low	Low	Low	Low
S	Jones Creek	Agriculture		Low	Low	Medium	Low
T	Limestone Creek	Agriculture/Forest	Martin Marietta; South Putnam HS; Altra Indiana	Low	Low	Medium	Low
X	Main Edlin Ditch - Grassy Branch	Agriculture		High	Medium	Low	High
Y	Main Edlin Ditch - Smith Ditch	Agriculture		High	High	Low	High
AA	Owl Creek	Agriculture	Van Bibber Conservancy District - Sewerage System; Van Bibber Water Treatment Plant	Low	Low	Low	Low
CC	West Fork Big Walnut Creek Headwaters	Agriculture		High	Medium	Low	High
DD	West Fork Big Walnut Creek - Lower	Agriculture	Jamestown WWTP	Medium	Low	High	High

**Table 21: BMP Selections**

Priority Subs		Preferred BMPs to Address Water Quality Issues in Priority Subwatersheds	Other Recommendations
B	Big Walnut Creek - Dry Branch	livestock fencing; alternative watering; streambank stabilization; cover crops; nutrient management for cropland; CNMPs; fertilizer storage	
D	Big Walnut Creek - Greencastle	urban practices (rain gardens); buffers/floodplain restoration; livestock fencing; alternative watering; nutrient management for cropland; CNMPs; fertilizer storage; streambank stabilization	septic system education; forest stand improvement; grazing practices
G	Big Walnut Creek - Snake Creek/Maiden Run	livestock exclusion fencing; floodplain restoration; nutrient management for cropland; CNMPs; fertilizer storage; manure management - pit closure (CFO)	septic system education; forest stand improvement; grazing practices
H	Clear Creek Headwaters (Putnam)	urban residential practices (rain gardens); livestock fencing; alternative watering sources; buffers; manure management; cover crops	septic system education
I	Clear Creek - Miller Creek	livestock fencing; alternative watering sources; buffers; manure management; nutrient management for cropland; CNMPs; fertilizer storage; cover crops	septic system education
K	Deer Creek - Leatherwood Creek	instream grade stabilization	additional monitoring to isolate location of pollution impacts (landuse does not reconcile with large nutrient and sediment loads)
M	Deer Creek - Mosquito Creek	buffers/floodplain restoration	NPDES Dischargers compliance

**Table 21: BMP Selections (cont)**

Priority Subs		Preferred BMPs to Address Water Quality Issues in Priority Subwatersheds	Other Recommendations
N	Deer Creek - Owl Branch	urban practices (rain gardens); bioswales/parking lot islands; livestock fencing; alternative watering sources; nutrient management for cropland; CNMPs; fertilizer storage; buffers/floodplain restoration	forest stand improvement; grazing practices
O	Deweese Creek	urban practices (rain gardens); manure management; nutrient management for cropland; CNMPs; fertilizer storage	NPDES Dischargers compliance; septic system education
S	Jones Creek	livestock fencing; alternative watering sources; cover crop	additional monitoring to isolate location of pollution impacts
T	Limestone Creek	livestock fencing; alternative watering sources; manure management; cover crop	NPDES Dischargers compliance
X	Main Edlin Ditch - Grassy Branch	wetland restoration; buffer/floodplain restoration; cover crop; mulch and no-till; manure management	
Y	Main Edlin Ditch - Smith Ditch	wetland restoration; buffer/floodplain restoration; cover crop; mulch and no-till; manure management	
AA	Owl Creek	land use planning/zoning	septic system education; NPDES Discharger compliance; additional monitoring south of reservoir
CC	West Fork Big Walnut Creek Headwaters	wetland restoration; buffer/floodplain restoration; cover crop; mulch and no-till	junkyard clean-up/compliance
DD	West Fork Big Walnut Creek - Lower	wetland restoration; buffer/floodplain restoration; cover crop; livestock fencing; alternative watering; nutrient management for cropland; CNMPs; fertilizer storage; urban practices	NPDES Dischargers compliance

**Table 22: BMP Installation Recommendations for Load Reduction**

BMP	Option A	Option B	Option C	Option D
Livestock Exclusion Fencing	3000 linear feet	-----	10000 linear feet	15000 linear feet
Streambank Stabilization	1000 linear feet	-----	10000 linear feet	5000 linear feet
No-Till Conversion	5500 contributing acres	7800 contributing acres	2500 contributing acres	4000 contributing acres
Buffer/Filter Strips	2500 contributing acres	-----	5000 contributing acres	1500 contributing acres
Grassed Waterways	12500 linear feet	-----	15000 linear feet	17500 linear feet
Bioretention	5000 contributing acres	-----	15000 contributing acres	10000 contributing acres
Wetland Restoration	2000 contributing acres	-----	11000 contributing acres	3000 contributing acres

### 12.2 Cost Estimates

The Steering Committee has identified a number of different types of BMPs that they would like to see implemented to meet goals. Several of these practices are listed above in Table 22. General costs have been estimated for the installation of these practices. Table 23 reflects the costs for each of the options shown above. The costs for BMP options listed in Table 23 are calculated using the highest estimated cost available. Also, reduction options for several of the BMPs in Table 23 are (no-till conversion, buffer/filter strips, wetland restoration) calculated based on contributing of acres as seen in Table 21: BMP Installation Recommendations for Load Reductions. BMPs for these options are typically installed on per acre, per foot, or linear foot basis, not the number of contributing acres. Therefore if costs were calculated for these options, they would not be representative of actual costs for installation. If one of these BMP options is selected for installation and a location is determined the number of acres contributing to the BMP can be determined and the chosen BMP sized as necessary.

In addition to the costs for Table 23, there are numerous other practices that can be implemented to educate the public on water quality and related issues. These practices include such things as workshops, demonstration sites, and many others. Table 24 lists these BMPs in addition to a variety of other practices and associated costs that might be implemented in the watershed to reach goals.

### 12.3 Technical Assistance

A number of the BMPs selected for implementation will need assistance from technical specialists. The type and amount of technical assistance will vary from project to project. Below is a list of just a few of the technical resources available.

- Soil and Water Conservation Districts
- Natural Resource Conservation Service
- County Health Departments
- Resource Conservation and Development Council
- Indiana Department of Natural Resources

- Indiana Department of Environmental Management
- United States Geological Survey
- Central Indiana Land Trust, Inc.
- The Nature Conservancy
- County Surveyor's Offices
- County Drainage Boards

#### **12.4 Financial Assistance**

Financial assistance will be needed to implement a number of the BMPs. Assistance can come in the form of actual monetary notes or in the form of in-kind or technical services. Several funding options are available for BMP implementation, most of which are in the form of grants. Agencies that provide grants for BMP implementation include, but are not limited to:

- IDEM – Section 319 watershed management program for watershed implementation projects, staff and education programs/projects
- IDNR – Division of Fish and Wildlife Lake and River Enhancement (LARE) Program for watershed implementation projects and future monitoring, Division of Nature Preserves Heritage Trust Program for easements and restoration projects
- EPA – Several topical grant programs (stormwater projects, research projects, environmental justice projects, Community Action for a Renewed Environment (CARE) program, etc.)
- USGS – Topical research grants for nutrient transport or other nonpoint source water quality studies
- USACE – Some limited restoration funding
- Hoosier Riverwatch (IDNR) – Grants for advanced monitoring equipment
- Clean Water Indiana – Small grants to SWCDs for water quality, conservation and education projects
- United Way – Planning and restoration funds for flood stricken areas
- National Fish and Wildlife Foundation – Five-Star Restoration Matching Grants Program for watershed restoration projects, water quality and habitat projects
- Local developers – Mitigation projects/dollars associated with planned wetland or stream impacts

In addition to these sources, Appendix B of the Indiana Watershed Planning Guide put together by the IDEM Office of Water Quality Watershed Management Section, lists other sources and websites of potential funding sources.

#### **13.0 SUCCESS MEASURES**

The overall success of a watershed management plan depends up on the implementation of action items as set up by goals. Below are measureable success indicators or milestones which will help the BWCWA track its progress and aid in updating and revising the Plan as accomplishments/goals are met. Some of the goals are long term and regular monitoring will be necessary to make certain that stakeholder actions and prescribed strategies are helping realize the actual water quality targets.

**Table 23: BMP Installation Recommendation Costs**

BMP	Costs*	Option A Costs	Option B Costs	Option C Costs	Option D Costs
Livestock Exclusion Fencing	\$1.60/linear foot	\$4,800.00	\$0.00	\$16,000.00	\$24,000.00
Streambank Stabilization	\$22-\$32/linear foot	\$32,000.00	\$0.00	\$320,000.00	\$160,000.00
No-Till Conversion**	\$10/acre	**	**	**	**
Buffer/Filter Strips**	dependent on type	dependent on type	dependent on type	dependent on type	dependent on type
filter strips or	\$190/acre	**	**	**	**
forested buffer or	\$500/acre	**	**	**	**
herbaceous buffer	\$225/acre	**	**	**	**
Grassed Waterways	\$2-\$3.50/linear foot	\$43,750.00	\$0.00	\$52,500.00	\$61,250.00
Bioretention**	\$5-\$40/square foot	**	**	**	**
Wetland Restoration**	\$1000-\$2000/acre	**	**	**	**

NOTES: \*Costs are calculated using highest value listed.

\*\*Options for these BMPs were calculated based on contributing number of acres as seen in Table 21: BMP Installation Recommendations for Load Reductions. BMPs for these options are typically installed on a per acre, per foot, or linear foot basis, not the number of contributing acres. Therefore if costs were calculated for these options, they would not be representative of actual costs for installation. If one of these BMP options is selected for installation and a location is determined the number of acres contributing to the BMP can be determined and the chosen BMP sized as necessary.

**Table 24: Other BMP Costs**

BMP	Cost	Notes
Training Sessions/Workshops	\$500 each	Variable depending on size and scope.
Newsletter/Mailing	\$500 each	Variable depending on size and scope.
Newspaper Article	Free	Does not include staff/volunteer preparation time.
Educational Signage	Variable	Variable
Volunteer Water Quality Monitoring Program	\$15,000/year	Includes part-time staff person and cost of test kits.
Nutrient Management	\$9.00/acre	Costs related to technical assistance.
Chemical Management	\$5.00/acre	Costs related to technical assistance.
Critical Area Planting	\$1300/acre	Includes grading, planting, herbicides, mulch, and labor.
Water and Sediment Control Basin	\$1700 each	
Grade Stabilization Structure	\$1000 each	
Stripcropping	\$12.00/acre	
Detention Ponds	\$35,000-\$110,000/acre	Cost includes engineering, excavation, fill, compaction, inlet and outlet installation, landscaping, and legal fees.
Field Windbreaks, Hedgerows	\$1.50/linear foot	
Cover Crops	\$14.00/acre	
Pasture/Hay Planting	\$120-\$150/acre	Cost dependent on type of grasses used.
Rain Garden/Bioretenion Cell	\$5.00-\$40.00/square foot	Cost dependent on site requirements. Industrial and commercial sites may require professional engineering and control structures

**Table 24: Other BMP Costs (cont)**

BMP	Cost	Notes
Rain Barrel	\$75-\$200/each	Dependent on size and features.
Green Roof	\$12.00-\$24.00/square foot	Includes root repellent/waterproof membranes, and irrigation. Cost dependent on site requirements.
Streambank Stabilization	\$22.00-\$32.00/square foot	Dependent on site and method used.
Tree Planting	\$0.50-\$300/per tree	Dependent on size and species of tree, and if mulching and staking are involved.
Check Dams	\$15.00/linear foot	
Parking Lot Islands/Bioswales	\$0.04-\$2.50/square foot	Cost dependent on site conditions and are based on seeding.
Downspout Disconnections	\$15.00-\$25.00/downspout	
Infiltration Trench	\$4.00/linear foot	Assumes a 2 foot wide trench. Costs are variable depending on site requirements
Permeable Surfaces	\$1.00-\$5.00/square foot	Dependent on material type
Retrofit Detention Basin	\$0.05-\$3.00/square foot	Cost dependent on site conditions and are based on seeding.