- Animal/human waste (including septic systems)

BOD –
- Conventional cropping practices
- Waste water treatment discharges
- Industrial discharges
- Landfill leachate
- Algae (induced by fertilizers)
- Animal/human waste (including septic systems)
- Grass/lawn clipping or natural plant matter

E. coli –
- Human waste (including septic systems)
- Animal waste (including livestock in stream and poor manure management)
- Urban runoff (pet waste)
- Wildlife

Sediment –
- Conventional cropping practices
- Industrial discharges
- Mining operations
- In-stream erosion
- High velocities or increased urban run-off
- Construction activities
- Cattle trampling banks

As noted in Section 4.4, the Big Walnut Creek watershed has several NPDES point source dischargers, many of which are regularly out of compliance. These industrial or municipal dischargers should also be approached as part of the overall watershed planning and implementation process. With these point sources regularly present in some of the priority subwatersheds it becomes harder to narrow down suspected nonpoint sources of pollutants.

10.0 GOALS

10.1 Broad Project Goals Based on Public Concern

The Steering Committee reviewed the concerns raised by the public, as well as early-stage water quality findings to arrive at broad concerns and project goals. Specific concerns outlined in Section 9.1 were lumped together and can be found listed under the broad goals outlined below.

Sediment Concern = Erosion Goal
- Land use and practices in headwaters (Boone and Hendricks Counties)
- Land use practices (impacts on velocity of water and erosion)
- Sedimentation (brown water)

- Saving Soil
- Erosion from in-stream meandering, bridge building, and location of erodible soils
- Mining Activities (quarries)

Pollutants = Water Quality Goal(s)
- *E. coli* bacteria levels higher than the State standards in many locations
- Elevated nutrient levels especially in the headwaters and around Greencastle
- High loads of organic matter (elevated BOD at some locations)
- Low flow water quality (stagnant water, algae blooms)

Resource Protection and Loss = Habitat and Recreation Goal
- Location, connection, and protection of conservation areas/natural areas
- Habitat is degraded in certain areas/habitat improvement may improve water quality
- Corridor and floodplain protection
- Trail Connections (along streams, public access)

Growth Impacts = Land Use / Future Development Goal
- Strategic placement/planning for development (i.e. "controlled sprawl")
- Increased run-off from urban areas
- Ground water withdrawal and recharge
- Growth rate and sewers – need for commercial growth
- Failing septic systems (homeowner regulatory fears, cost or repairs, no cost share programs, education on maintenance practices

Lack of Knowledge = Education/Outreach Goal
- Lack of public education on environmental topics (timing of impacts, who is affected and how, drinkability and recreation potential or limitations)
- Isolated approach to solving local problems (Conservancy District Boundaries)

10.2 Specific Goals and Water Quality Targets

After review of the above-mentioned broad goals, the Steering Committee worked to refine the project goals and develop pollution reduction targets. The following five major goals address all of the issues raised and articulated in the Problem Statements in Section 9.2. Water quality data collected as part of this project was used to determine target load reductions.

Goal reductions are to be met in terms of loads. The concentration values mentioned in the below goals were used as references in order to calculate the load reduction necessary to achieve the goal.

<u>Goal 1:</u> Reduce soil erosion and sediment inputs into streams that result in a 1% TSS reduction in 5 years.

This goal and water quality target was determined by a brief literature review and conversations with a local expert (Mr. Greg Bright). Bright actually suggested a higher concentration value of 50 mg/l; however, the current water quality data for most sample sites already displayed concentrations lower than this value. Literature (Holbeck-Pelham and Rasmussen, 1997) helped identified a more applicable target

concentration (25mg/l) that would be indicative of healthy to above average aquatic life in similar Mid-western streams. Upon comparison of this concentration to current data concentrations, the above load reduction target was established by substituting 25 mg/l TSS in for all sites that exceeded this value, then recalculating loads. The difference in the newly calculated load was then subtracted from the true/original load. The difference between loads was compared to arrive at an appropriate reduction target.

Goal 2: **Reduce Total Phosphorus and Nitrate inputs by 20% in 5 years and Nitrate inputs by 40% in 10 yrs.**

This goal was determined by a brief literature review and conversations with a local water quality expert (Mr. Greg Bright) that helped identified target concentrations (0.2 mg/l Total Phosphorus, 2.0 mg/l Nitrate) that would be indicative of healthy to above average aquatic life in similar Mid-western streams. Upon comparison of this concentration to current data concentrations, the above load reduction target was established as described above for TSS. It should be noted that the Steering Committee intentionally did not link the water quality target directly to future concentration values due to concerns about low flow impacts creating conditions that make achieving the goal a moving target that can be seasonally affected.

A 20% reduction in Total Phosphorus represents what would be needed to have all sample sites display target concentration. The Steering Committee felt this reduction would be possible in 5 years of BMP implementation. Nitrate reduction is the biggest challenge among the various parameters. If all sites displayed target concentrations, a 40% load reduction would result. The Steering Committee thought this percent reduction would require a longer time frame and a variety of BMP and compliance solutions; thus, a stepped approach was outlined over a ten year period.

Goals 3: **Reduce *E. coli* inputs such that all sample sites meet the State water quality standard of 235 cfu/100ml during base flow conditions and no more than 15% of the sites exceed the standard during storm flow conditions in 5 years. The long-term goal (10 years) is for all storm flow events to meet State water quality standards.**

Since so few of the sites exceed State standards in base flow conditions, the Steering Committee felt a reduction of E. coli inputs resulting in all sites meeting State standards during base flow was achievable in five years. However, since the inputs are much larger during storm events, a stepped approach was outlined over a ten year period for storm event samples/conditions. Currently, about 30% of all sites exceed State standards in storm flow conditions. A 50% reduction is targeted in the first five years of BMP implementation, with the remaining 50% being achieved in ten years.

Goal 4: **Protect and enhance important and unique natural aspects of Big Walnut Creek and its watershed (endangered and high quality species/natural areas).**

This goal was developed in response to public concerns about protection of existing conservation areas/natural areas, habitat degradation, corridor and floodplain protection and trail connections (along streams, public access sites). Several land holding stakeholders (IDNR, CILTI, TNC) participate on the Steering Committee and are interested in protecting and restoring several areas in the watershed. Water quality monitoring data also helped identify the functional role of some of the unique aspects of Big Walnut natural areas in Subwatersheds A, C, and F.

Goal 5: Develop public awareness on how individual activities and actions will/do impact the watershed.

This goal was developed in response to public concerns about the lack of public education on environmental topics. Several of the problems and sources of pollution are a direct result of limited public awareness regarding the negative impacts individuals and the collective behavior of a community can have on water quality. Awareness and education is needed regarding septic systems, water use, fertilizers, and managing animal waste. Concerns related to pollutant loads and stormwater runoff could be address using education as the primary BMP.

11.0 STRATEGIES

The Steering Committee then developed strategies to help address the project goals. The strategies are designed to help mold public outreach throughout the project and develop a work plan for various stakeholders, particularly the local Soil and Water Conservation Districts to begin targeted BMP implementation into the future. Action items associated with each strategy were identified by the Steering Committee and a rough schedule was assigned. The schedule was defined by three timeframes: 2009-2010 (immediate), 2010-2012 (near future/next grant cycle), 2012-2019 (later, planning or earlier steps required). Table 19 reflects these strategies and action items. The following section, Section 12.0, works to identify more specifically where the strategies related to Best Management Practices (BMPs) could or should be targeted based on the characteristics and water quality concerns of each priority subwatershed.