Research, Technical Transfer, and Educational Needs for Water Quality Issues in Oklahoma

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Nutrient Enrichment and Algae

1. General guidelines showing biotic responses to algal increase (both rate of production and standing crop) in rivers and stream types around the state
   - Need to incorporate controls other than nutrients such as shade, water temp., velocity, depth, etc.
   - End use will be <u>nutrient and/or algal criteria</u> that will preserve and protect the biotic condition the State deems necessary

Nutrient Enrichment and Algae

2. **What is the Cause of Turbidity in the Illinois River?**
   - **Are nutrients involved?**
   - **What are the roles of periphyton and phytoplankton in nutrient cycling and as contributors to turbidity?**
   - **How much turbidity is purely mineral and what is its source?**
   - **How much of the turbidity is due to micelles of mineral particles, algae, fungus, bacteria, and what contributes to the formation of them.**
     - **How does this compare among tributaries? Baron Fork and other tribs. vs. the IR?**

Nutrient Enrichment and Algae

3. **What limits algal growth in the Illinois River given the surplus of Nitrogen and Phosphorus?**

Nutrient Enrichment and Algae

4. **Toxic Blue Green Algae-**
   - **What is their frequency of occurrence in concentrations toxic to livestock in farm ponds?**

Instream Flow and Sediment

1. **What instream flows and flow regimes are necessary to protect aquatic and semi-aquatic life of the prairie rivers?**
   - **Need to consider water itself and effects on river morphology**
   - **What are the effects on alluvial water withdrawals on flows in these rivers?**

Instream Flow and Sediment

2. **What are the effects of gravel delivery to Ozark and Ouachita Mountain stream surface flows?**
   - **What is the source of this gravel?**

Instream Flow and Sediment

3. **What gravel load can be delivered and still preserve channel stability?**
   - **What is the net bedload?**

Instream Flow and Sediment

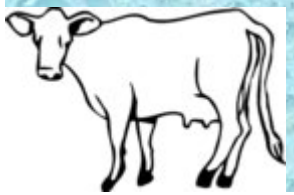
4. **What was the pre-settlement channel morphology of Ozark rivers? Did Ozark rivers & streams historically have the extensive gravel deposits of today?**

Toxics

- **Why are our urban streams so poor in diversity and density?**

Pathogens and Indicator Bacteria

1. What are the relative pathogenicities of pathogens and their indicators from different groups of non-human animals to humans? In particular, cattle, poultry, and avian and mammalian wildlife.
2. Need non-biological methods to estimate contributions from different sources to total load in water




Pathogens and Indicator Bacteria

3. Employ/develop a tool for modelling bacteria delivery to waterbodies.
   - SWAT model??
4. Explore non-library bacterial source tracking techniques
5. Epidemiological studies of water borne illnesses as a result of contact recreation in streams

Groundwater-Surface Water Interactions

1. Groundwater Nutrient Loading to Streams- Sources
2. Size of reservoir and lag-time for delivery to stream in different systems
3. Acceptable land uses in such areas

Wetlands

1. What wetlands should be associated with Oklahoma streams and rivers?
   - Morphology and frequency of occurrence?
   - Life that should be present?

Wetlands

2. **Develop Wetlands Landscape Level Assessment (Level 1) (Relies on GIS and Remote Sensing Data)**
   - **A method for identifying "potentially restorable wetlands" in the basin**
   - **A set of wetland-related "watershed metrics" that characterize ecological conditions in a watershed/basin**
   - **A wildlife habitat decision support tool that planners can use to evaluate the wildlife support provided by existing wetland habitats and a means of evaluating future land use scenarios- for example, a planner could evaluate where wetland restoration can generate the most benefit for wildlife**

Wetlands

2. Develop Wetlands Landscape Level Assessment (Level 1)- continued
   - A water quality decision support tool that planners can use to evaluate the relative contributions of existing wetlands to downstream water quality in different watersheds. This can also be used to evaluate future landuse scenarios and where wetland restoration can generate the most benefit for improving water quality
   - Floodwater Storage Decision Support

Wetlands

3. Develop Wetlands Rapid Assessment (Level 2) Monitoring Methods which uses relatively simple metrics for collecting data at specific wetland sites
   - This method should provide a single rating or score that rates a wetland on a continuum of full ecological integrity to highly degraded.
   - This protocol should be validated by and calibrated to the Level 3 Assessments
4. Develop Wetlands Intensive Site Assessment (Level 3) using a combination of HGM and IBI to determine wetland function and biological condition across the State within the wetland planning regions

Wetlands

5. Create an Oklahoma Biotic Index for macroinvertebrates in Wetlands by updating MN or WI IBIs values and taxa
6. Investigate wetland types and their hydrogeomorphology across the ecoregions to determine wetland planning regions that can be used as a framework to aggregate wetlands for reference determinations and bioanalysis

Other

1. Create an Oklahoma Biotic Index (OBI) for macroinvertebrates by updating the NCBI tolerance values for taxa which occur in Oklahoma and adding our own taxa
2. Investigate instream habitat variables through multivariate analyses to determine habitat regions or zones which drive communities

Other

3. Develop Observed/Expected models for fish and macroinvertebrate taxa in the State
4. Develop a computer program to calculate a host of IBI metrics for fish and macroinvertebrate- something similar to WI DNR's "BUGPROGRAM"
5. Explore characteristics such as Strahler order, drainage area, link magnitude, branch link, confluence link, downstream link, mean annual discharge, etc. to determine which exert the most influence on fish communities in OK.
   - Goal to correctly aggregate streams for reference determinations and bioanalysis

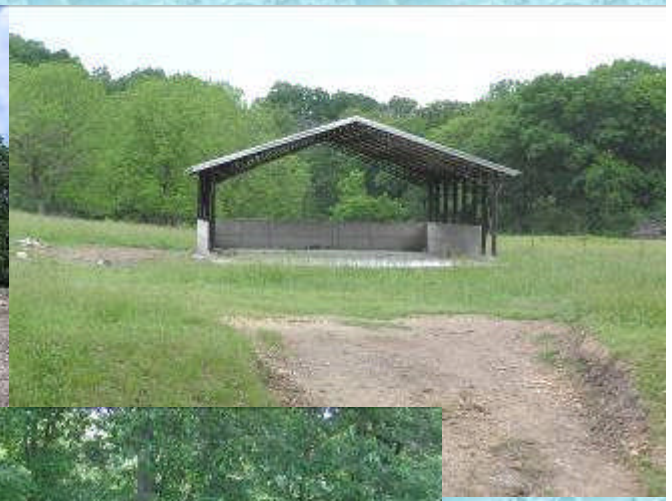
Other

6. Determine the most useful predictors of turbidity in streams- Surrogate for turbidity
7. Update/recalculate mean annual discharge for all blue line segments of GIS coverage where possible and interpolate through modeling the others
8. Cost/Benefit ratios for adoption of various best management practices to protect water quality

Other

9. BMP Effectiveness







People/Technical Support

- **The State always needs staff trained in natural resources with practical experience- Interns and FT Staff**
  - **Field staff**
  - **Writers**
  - **GIS Specialists**
- **Centralized Listings/Postings of University Expertise, Interests and current Research**

Carbon Sequestration

- Sequestration rates for various best management practices in different Oklahoma soils
- Carbon sequestration rates for wetlands/Oklahoma farm ponds
- Targeting for Carbon Sequestration