

Monitoring Indicators

Performance of the implemented improvement measures can be evaluated by comparing site conditions pre- and post-implementation. For flood control measures, high water levels during extreme events should decrease after implementation. For water quality measures, various properties can be monitored for change including water color, turbidity, nutrient concentrations, odor, lake trophic indices, and presence of sensitive species (Cisco fish, etc.). Table 31 presents a summary of performance indicators for each improvement measure.

Measure	Performance Indicators
Stream Maintenance	Decrease in channel debris, improved channel conveyance.
Development Code Enforcement	Decrease in sedimentation / water quality / flood control related problems downstream of development sites.
Removal of Illicit Connections	Decrease in bacteria (E.Coli), improved water color, less turbidity.
Public Education	Improved water quality throughout the watershed.
Obtain IDNR Hydrologic and Hydraulic Models	Improved flood control planning.
Voluntary Buyout and Structure Elevation	Decrease in flood damages.
Wetland / Habitat Restoration	Improved overall water quality in vicinity of improvement project.
Site BMP Restoration / Retrofitting	Improved water quality in vicinity of improvement project.
Flood Access Plan	Improved emergency access during flood events.
Kankamp Property	Decrease in bacteria and overall improved water quality in Wood Ditch and Pigeon Creek upstream of Long Lake, decrease in high water levels in Wood Ditch during extreme rainfall events.
Bill Deller Road	Improved water quality in Pigeon Creek channel upstream of the Lake Chain, decrease in high water levels in Lake Chain during extreme rainfall events.
Sediment Basins – Long Lake Inlet	Decrease in sedimentation in Long Lake.
Sediment Basins – Other	Decrease in sedimentation in Lake Chain and along Pigeon Creek.
Rock Vortex Weirs	Increased dissolved oxygen downstream of RVW. Reduce channel erosion upstream of RVW.
Rock Cross Vanes	Decreased channel erosion near RCV.
Filter Strips	Improved water quality in vicinity of improvement project.
Monitoring Replacement of CR 150W Culvert	Flood storage maintained upstream. No increase in flood impacts downstream.
Shoreline Stabilization	Reduced shoreline erosion.
West Otter Lake Pump Station	Decrease in high water levels in West Otter Lake during extreme rainfall events.
Gravel Pits	Improved water quality in Pigeon Creek channel.
Hammond Ditch Culvert Modifications	Decrease in flood flow downstream of projects.
Arrowhead Lake Outlet	Decrease in flood flow downstream on Hammond Drain.

Table 31: Summary of Performance Indicators for Improvement Measures.

Monitoring Plan

Water quality testing within the Pigeon Creek Watershed is currently performed by the City of Angola, Hoosier Riverwatch, and volunteer groups. These efforts should be supplemented in the future by additional volunteers and testing locations supplemented by potential grant funding. Table 32 lists tracking or monitoring suggestions for evaluating the effectiveness of the proposed watershed improvement solutions.

Measure	Tracking or Monitoring Suggestions
Stream Maintenance	Track if there are any debris or log jams at road bridges within the watershed.
Development Code Enforcement	Monitor if there are any code or permit violations for development.
Removal of Illicit Connections	Monitor if there are any Health Department or NPDES violations.
Public Education	Track educational opportunities provided to the public by SWCD, IDEM, IDNR, NRCD, USDA and local agencies.
Obtain IDNR Hydrologic and Hydraulic Models	Monitor number of flood insurance claims or track the number of flooding complaints by residents for non-claim damages.
Voluntary Buyout and Structure Elevation	Track the number of buyouts.
Wetland / Habitat Restoration	Monitor water quality parameters and track improvement or degradation trends in the areas downstream of the improvement project.
Site BMP Restoration / Retrofitting	Monitor water quality parameters and track improvement or degradation trends in the areas downstream of the improvement project.
Flood Access Plan	Monitor number of instances that emergency access was inhibited.
Kankamp Property	Monitor water quality parameters and track improvement or degradation trends in Wood Ditch and Pigeon Creek upstream of Long Lake. Monitor water levels in Pigeon Creek and Long Lake during extreme rainfall events.
Bill Deller Road	Monitor water quality parameters and track improvement or degradation trends in the areas downstream of the improvement project. Monitor water levels Pigeon Creek and the Lake Chain during extreme rainfall events.
Sediment Basins – Long Lake Inlet	Track frequency that the Long Lake sediment basin needs servicing.
Sediment Basins – Other	Track frequency that the sediment basins need servicing.
Rock Vortex Weirs	Monitor dissolved oxygen, turbidity, and TSS and track improvement or degradation trends to channel erosion at the installation site of the RVW.
Rock Cross Vanes	Monitor turbidity and TSS and track improvement or degradation trends to channel erosion at the installation site of the RCV.
Filter Strips	Monitor water quality parameters and track improvement or degradation trends in the areas downstream of the filter strip project locations.
Monitoring Replacement of CR 150W Culvert	Monitor changes to flood impacts downstream of CR 150.
Shoreline Stabilization	Monitor shoreline erosion at the installation sites of the shoreline stabilization projects. Compare to shoreline erosion at non-project related areas.
West Otter Lake Pump Station	Monitor water level elevations in West Otter Lake during extreme rainfall events.
Gravel Pits	Monitor turbidity and TSS and track improvement or degradation trends to water quality within downstream portions of the watershed.
Hammond Ditch Culvert Modifications	Monitor flooding and water level elevations downstream of project location.
Arrowhead Lake Outlet	Monitor water level elevations in both Arrowhead Lake and West Otter Lake.

Table 32: Monitoring Plan Tracking or Monitoring Suggestions.