

CHAPTER SIX INFORMATION GAPS

I. Introduction

In order to identify the current status of use impairments, describe causes of these impairments, and quantify sources, additional studies of all components of habitat within the Area of Concern must be completed. A great number of studies are either currently underway, or have been completed. Future studies will fill in data gaps present within information which is currently available regarding the Area of Concern. This chapter presents a list of the types of studies needed to gather the requisite information. The factors for consideration are:

- a) Identification of data gaps the study is meant to fill (e.g., status of use impairment unknown, sources and/or causes unknown or uncertain),
- b) Description of study,
- c) Cost,
- d) Sequence of actions and time required to complete,
- e) Relative priority, and
- f) Responsible entity.

Integrity of an ecosystem includes the health of the biological populations and interactive communities of the ecosystem and the ecosystem's ability to withstand stress or adapt to it. Studies of the habitat in the Area of Concern can determine whether ecological communities are thriving and whether they exist within ranges of conditions that occur as the result of natural forces. Stressors, which adversely affect the health of an ecosystem, must also be identified. Finally, human factors or actions, that are the main source of ecosystem stress, must be identified. This chapter sets out the information gaps to be filled to address these layers of the Area of Concern's ecosystem.

II. Implementation: Transitioning from Stage II to Stage III

This document provides a framework for addressing the 14 beneficial use impairments in an ecosystem context and presents the current environmental conditions in the Area of Concern. While the Stage II document provides a draft matrix of actions underway and beneficial use impairments, an analysis of the matrix has yet to be completed. Further, prioritization of the beneficial use impairments and actions underway is needed and will be submitted as an addendum to the Stage II document.

The CARE Committee and IDEM have begun to address these issues by compiling the matrix of actions underway and beneficial use impairments as a starting point for a more in depth analysis. The table defining each beneficial use impairment, its listing and delisting guidelines, rationale, and source or cause of problem will be used. The two tables that illustrate the connections between ecological processes, environmental stresses and the beneficial use

impairments are central to this analysis. In addition, CARE committee members attended an introductory Comparative Risk workshop in October 1997 and will be evaluating that process as a possible tool to assist in prioritizing the 14 beneficial use impairments and the actions to restore them.

A Stage II Addendum will be prepared by IDEM and the CARE Committee and will be submitted to the International Joint Commission by the fall of 1998. The Addendum will establish priorities and timelines for restoring each of the 14 beneficial use impairments in an ecosystem approach.

III. Studies Proposed

A. Inventory of habitats, locations, and species now occupying the habitats

Description of Study: This category of study focuses on the need to build a complete picture of the current state of the environment in general and habitats in particular within the Area of Concern. Information on wetlands, fish and macroinvertebrates, birds, dune and swale areas, wet prairie, and other habitat components exist, but have not been drawn together into a cohesive format. Phase I of this study involves locating all available information and compiling this information for use in computer mapping and report forms. Information must be collected from federal, state, and local agencies, as well as Area of Concern businesses, non-governmental organizations, land trusts and educational institutions. Phase II will take this information and build maps or other assessments about the following components:

1. Spatial distribution of benthic, aquatic, terrestrial, and avian biota, focusing on breeding, foraging, and nesting areas of native and non-native species.
2. Spatial distribution of habitat types, including wetlands, open water, forests, dune/swale, and prairie. This distribution assessment should also show marginal areas such as the CITGO asphalt wetland, and areas which are currently protected, such as state parks and nature preserves.
3. Spatial distribution of beneficial, non-invasive plant and animal species, including native species found currently within the Area of Concern.

Phase III will include compiling a list of all components not currently assessed or for which no information is available. This information, needed to complete a present-day picture of the Area of Concern, will be the basis of studies needed to show the present condition of habitat and species within the Area of Concern. Studies needed to complete these gaps will include analysis of satellite imagery, use of U.S. Army Corps of Engineers Advanced Identification of Wetland studies, biological assessments of fish communities performed by IDEM for Index of Biotic Integrity metrics, as well as overlays of USGS topographic maps, soil surveys, and county and city plat maps.

a. Assessment of the overall "health" or condition of habitats and species within the Area of Concern.

Coupled with studies characterizing the existing habitats, species composition, and spatial relationships, is the need to gather information regarding the environmental condition or health of these areas. Data, which must be collected for this section, will first provide a spatial overview of pollutants and sources, showing the movement of these pollutants through the Area of Concern. Studies needed include ground water modeling, surface water run off patterns, identification of NPDES outfalls and the types of pollutants which are introduced, locations of hazardous and non-hazardous landfills, including slag and municipal solid waste, locations and characterization of underground storage tanks and materials handling facilities, and any other study which provides information as to the location, vector, and intensity of pollutant loading to a given habitat. This layer of information is currently being compiled by other Remedial Action Plan teams, and a GIS-based overlay of this information with data collected from Study 1 will provide a complete picture of habitats and their current state or condition.

b. Inventory of existing habitat areas and criteria used for ranking parcels to be preserved, enhanced, or restored.

An application of data collected in Study 1 will be an analysis of information regarding areas which may still have all or some of the impaired habitat functions present or intact. Areas which have non-impaired habitat functions have been identified and will be rank-ordered for eventual protection through Remedial Action Plan-sponsored initiatives. This inventory can also be used to identify adjacent areas which may require pollution remediation but could be restored and added to current habitat parcels.

B. Assessment of the tolerances of native and beneficial plant and animal species to pollutants located within the Area of Concern

Data Gaps: This information, which needs to be assembled for computer analysis, can be paired with the aforementioned layers to develop feasibility studies for pollution remediation and habitat restoration. Areas identified by other Remedial Action Plan teams that are to be cleaned of pollutants must be evaluated after clean up to determine the potential for successful habitat restoration. There will be areas that are restored to human health standards, but may not support beneficial habitat functions.

Description of Study: Much information is available now to assess potential effects and violations of Indiana's environmental standards.

A second important aspect of this study is to identify a pollutant or suite of pollutants which are having an adverse physiological, reproductive, survivability, or fertility effect on a given species. The study will then relate that information to the spatial distribution of that species and the spatial distribution of the pollutants in question. This information will then be

used to target cleanups and remediation efforts to sites where pollution is having the greatest adverse effect on existing habitats, especially globally endangered habitats.

Cost of Study: To be determined

Sequence of Actions: Compile current information; identify pollutants or in situ effects; relate information; target cleanups

Relative Priority: To be determined

Responsible Entity: IDEM

C. Assessment of migration or patterns of movement of mobile species, including interactions of species within habitats

Description of Study: As areas within the Area of Concern are targeted for habitat restoration, and other areas are protected by Remedial Action Plan initiatives, information regarding the movement of species within habitats will be needed.

Data Gaps: It will also be necessary to compile information regarding colonization of newly restored habitats by both desirable and exotic species so that short- and long-term land management decisions will allow for the control of exotic species and encourage the propagation of desirable species. This information will be used to create appropriate corridors and islands of protected and restored habitat, which will provide nesting and breeding areas, and also to appropriate foraging ranges and nature lanes to allow movement from habitat to habitat.

Cost of Study: To be determined

Sequence of Actions: To be determined

Relative Priority: To be determined

Responsible Entity: To be determined

D. Studies which evaluate the feasibility of restoring, enhancing, or recreating habitat types, to a level determined by the Remedial Action Plan committees

Description of Study: Once information is collected that allows the Remedial Action Plan participants to assemble a picture of the current state of impaired habitat functions, Remedial Action Plan activities will focus on remediation of pollution and contamination. As areas are cleaned or restored to standards set by the Remedial Action Plan, each area will require a site investigation and analysis to determine the feasibility of restoring, enhancing, or recreating viable fish and wildlife habitat.

Data Gaps: Previously identified

Cost of Study: To be determined

Sequence of Actions: To be determined

Relative Priority: To be determined

Responsible Entity: IDEM

E. Total Maximum Daily Load (TMDL)

The Grand Calumet River Watershed has been targeted for initiation of a Total Maximum Daily Load (TMDL) model prior to the year 2000 for renewal of the NPDES permits issued. It will be coordinated with completion of dredging projects, since existing conditions will change markedly after dredging and will significantly influence the calibration and verification of this model. This step is as specified in the 303(d) List of Impaired Waters of the State issued by the Assistant Commissioner of IDEM's Office of Water Management. A TMDL is used to establish a regulatory basis for allocating loadings of pollutants for discharges, including nonpoint sources on the river system. It is in accordance with 40 CFR 130 et seq. and U.S. EPA guidance documents. (U.S. EPA, Office of Water, 1991).

This study will determine the total allowable loading for each pollutant in Grand Calumet River and Indiana Harbor Ship Canal. This loading will then be allocated among the various point and nonpoint sources along the river, except for a loading necessary to guarantee a margin of safety. A portion of this allowable loading may also be reserved for use by future discharges.

The U.S. Army Corps of Engineers has issued a contract for development of a sediment transport model to estimate loadings to the water column during dredging. The estimates of sediment transport will be used as inputs to the GIS in preparation of TMDL modeling. IDEM is currently addressing this issue in relation to the Great Lakes Initiative and the effect these rules may have on the loading allocation process.

Cost: Currently being developed by the IDEM Office of Water Management.

Sequence of Actions: Currently being developed by IDEM's OWM.

Relative Priority: Currently being developed by IDEM's OWM.

Responsible Entity: IDEM

F. Storm water runoff and sediment contamination

Data Gaps: Storm water runoff is a known source of sediment accumulation/contamination. The *Grand Calumet River Basin BMP Demonstration* stated that the loss (of soils and sand) amounts to 10,000 tons annually. More work needs to be done to determine the total impact.

Description of Study: To be determined

Cost of Study: To be determined

Sequence of Actions: To be determined

Relative Priority: Low, the Nonpoint Source group at IDEM is implementing procedures to reduce the overall effect of storm water runoff.

Responsible Entity: IDEM

G. Assessment of Dewatering Characteristics of Odor Impacts of Grand Calumet River Sediment

Data Gaps: The removal and handling of highly contaminated sediments from the Grand Calumet River and Indiana Harbor Ship Canal has the potential for significant odor and volatile organic impacts. In addition, the dewatering and stability of the sediments will have impacts on their placement within a CDF and on overall sediment management.

In federal fiscal year 1997, the U.S. Army Corps of Engineers plans to have laboratory studies conducted to evaluate the odor impacts and dewatering/stability characteristics of sediments collected from the federal navigation channel. The sediments from outside the federal channel, particularly those from the Grand Calumet River, will likely have different properties. Therefore, it is recommended that the same analyses be conducted with sediments from other locations to provide information necessary for the remediation of sediments from other areas of the Grand Calumet River and Indiana Harbor Ship Canal.

Description of Study: Analyze sediment from the Grand Calumet River to determine its suitability for dewatering and disposal in a CDF. Address the production of odors and volatilized organic contaminants as a result of handling and disposal.

This work consists primarily of physical testing of the sediment. Bench scale tests will be conducted to determine the dewatering and stability characteristics of sediment from selected reaches. Prediction of the volume occupied by the dredged material will be made using the Primary Consolidation, Secondary Compression, and Desiccation of Dredged Fill (PSDDF) model. The model will be used to aid selection of the more viable sediment management

alternatives. The scope of the alternatives will be developed in conjunction with the investigation on dredging and placement methods. Bench scale tests will also be conducted using VOC flux chambers to assess the contaminant emissions of PCB's, PAH's, TRPH's, ammonia, and other parameters of health and nuisance concerns.

Cost of Study: \$140,000

Sequence of Actions: To be determined

Relative Priority: To be determined

Responsible Entity: U.S. Army Corps of Engineers

H. Grand Calumet River and Indiana Harbor Ship Canal Mass Balance

Data Gaps: Pollutants find their way to the Grand Calumet River and Indiana Harbor Ship Canal from a variety of sources: CSOs, point source discharges, Nonpoint source runoff, atmospheric deposition, and contaminated ground water are included in this group of sources. Loadings of selected pollutants to the river from some sources, such as NPDES outfalls, can be easily quantified because data is readily available. Information on other sources is more difficult to obtain or does not exist. IDEM acknowledges that the resuspension/re-release of contaminants in place sediments pose a problem for this study, and requests information on procedures for measuring these sediments. IDEM will discuss with U.S. EPA the difficulties associated with this work.

Description of Study: Choose a small segment of the river. Collect data on pollutant loadings during wet and dry weather from this segment. Information will be collected from:

<u>Information Source</u>	<u>Type of Information</u>
stream gages	1) elevation of river during wet and dry weather. 2) duration
Combined Sewer Overflows	1) chemical analysis 2) flow 3) duration
NPDES Outfalls	1) chemical analysis 2) flow 3) duration
dry weather atmospheric deposition	1) chemical analysis
wet weather atmospheric deposition	1) chemical analysis

ground water	1) potentiometric surface 2) hydraulic conductivity 3) chemical analysis 4) sample depth
nonpoint source runoff	1) flow 2) duration 3) chemical analysis
rain gages	1) amount of rainfall 2) duration

Pollutant loading values will be calculated for each source. This information will be used to prioritize source control efforts for the river segment studied.

Cost: Unknown

Sequence of Actions: The U.S. Army Corps of Engineers is under contract from IDEM to complete a study entitled Sediment Cleanup and Restoration Alternatives Project. As part of their work they are going to identify the sequence in which selected river segments will be remediated. This study should mirror their recommendations for sequence. If possible information should be collected from all sources during the same time period.

Relative Priority: The priority of this study is high because it can be used as a tool to prioritize source control activities.

Responsible Entity: IDEM and the U.S. Army Corps of Engineers

I. Study Sediment Toxicity Sources in the Indiana Harbor Ship Canal

Data gaps: Contaminants reach the sediment via NPDES outfalls, combined sewer overflows, ground water contamination, and storm water discharges. It is not known to what extent NPDES outfalls, even if substantially compliant, contribute to sediment accumulation and contamination.

Description of Study: A series of samples should be taken from the Indiana Harbor Ship Canal using a statistically valid grid. The sediments should then be analyzed for both toxicity and chemistry. The data will then be plotted on the grid and contours (similar to a topographic map) to determine if trends in the data exist. The Remedial Action Plan committees recommend that the study be conducted using the following criteria:

- Sites should be chosen that will be free of transport of upstream contaminants. There are several possible study locations of which the Hammond Sanitary District, U.S. Steel, and

the East Chicago Sanitary District are included.

- A pre-remediation assessment should be made. This might include more than one sampling effort.
- A post-remediation assessment should be made. This effort should be continued until the data show that no impact is occurring.
- Sampling should include chemical analysis, sediment toxicity, and benthic community analysis.

Sequence of Actions: Data assessment; investigation; corrective measure

Cost of the study: This depends upon the sampling plan which has not been developed.

Relative priority: The team has classified this as medium to high because of the pending U.S. Army Corps of Engineers project and because of the many remedial activities under way outside of the river channel. The team believes that it is crucial to get a handle on the sources so that the sediments do not re-contaminate.

Responsible entity: IDEM and the U.S. EPA using the U.S. EPA Fields Computer System; the NPDES permit holder.

J. Bedload and Suspended Sediment Discharge Study at the Grand Calumet River and Indiana Harbor Canal

Data Gaps: Estimates of the sediment loadings from the Grand Calumet River system indicate that it is one of the largest sources of contamination to Lake Michigan. The U.S. Army Corps of Engineers developed these estimates with funds from its confined disposal facility (CDF) project based on theory and supported by historical dredging records. Unfortunately, there is currently little or no data for loads of suspended sediment, or for bedload sediment discharge for the Grand Calumet River and Indiana Harbor Canal.

Description of Study: Calculate the loads of bedload and suspended sediment through the harbor and estimate suspended sediment discharge for the East and West Reaches of the Grand Calumet River. This information can be used to establish sediment loads for the Grand Calumet River and Indiana Harbor.

Cost of Study: \$110,000

Sequence of Action: During a one year period, suspended sediment samples, bedload sediment samples, and near bottom suspended sediment samples will be collected in the Indiana Harbor Canal near the mouth of the harbor, and additional suspended sediment samples will be

collected at sites near East Chicago and Gary. This information will be used to calculate sediment loads and bedload sediment discharge. A report containing a description of the study methods, the data, and results of the data analysis will be written and published at the end of the study.

Relative Priority: To be determined

Responsible Entity: U.S. Army Corps of Engineers and IDEM

K. Fill Material Location and Assessment

Data gaps: Identify location and potential impact of pre-regulation sediment disposal.

Description of Study: Both the Indiana Harbor Ship Canal and the Grand Calumet River have been subject to periodic dredging in the past 100 years. Anecdotal evidence and oral history revealed that a great deal of material was removed from the river after the onset of industrial activity and prior to the implementation of environmental regulations. It is probable that these sediments were disposed in a manner that is not protective of the environment. It is possible that dredging activities may disturb old disposal areas. This study will locate and assess the potential impact of this material.

Cost of Study: Unknown at this time.

Sequence of actions: Locate material with suspected contamination; identify pathways to sediment; assess potential for contamination (present and historical).

Relative priority: The priority of this project is medium to low because the U.S. Geological Survey is currently performing a similar project. Furthermore, the Natural Resource Damage Assessment will also address these issues.

L. Handling of Materials and Storage Practices

Data Gaps: No data is available at this time.

Description of Study: The study of materials handling and storage practices at industrial facilities and how they effect the quality of sheet runoff from these areas.

Cost of Study: To be determined.

Sequence of Actions: Before beginning this project, IDEM will evaluate information currently generated from existing NPDES permits to determine if this data is sufficient for sheet pile runoff and material storage areas. Inventory all facilities with outside handling and storage areas of raw materials; identify contaminants to be monitored and over what period of time; identify

criteria for monitoring; develop a strategy for sampling frequency; prepare procedures and personnel to begin monitoring process; assess data collected and other site-related data available.

Relative Priority: Medium to low.

Responsible Entity: To be determined.

M. Underground Storage Tanks

An updated inventory of the total number of underground storage tanks in the Area of Concern is needed. Due to the high level of industrialization and urbanization in the Area of Concern, it is possible that a number of underground storage tanks may not yet be identified and some of these unidentified tanks may be leaking and contributing to the ground water contamination in the area. In addition, a study is needed to assess the nature and extent of ground water contamination related to leaking underground storage tanks in order to evaluate the effectiveness of remedial measures taken to date.

N. Air Deposition (Wet and Dry) Studies

There is currently a study under way that is monitoring dry deposition of atmospheric pollutants which is a continuation of monitoring efforts completed under a previous project. (See Chapter Five for more information about this project). Further study of wet deposition should be undertaken to compile enough data to adequately reflect the impacts of air quality regulations as they ultimately affect water quality. The following study proposals for wet and dry deposition will need to be done as outlined below.

Data Gaps: Wet deposition should be collected once the current project is completed. To date, the study area for this work has been at one location. Also no dry deposition data has been collected at any location.

Description of study: Following the study methods and parameters of the current study for wet deposition for the continuation study and adopting those methods and parameters for a new dry deposition study would provide consistency for analyses of all data collected over time. Additional sampling sites will be chosen to aid in determining the extent of water quality impacts from atmospheric deposition.

Cost of Study: The costs of the wet deposition studies from 1991 and 1994 have totaled approximately \$422,000. Costs for the future, continuing study of wet deposition and the new study of dry deposition are yet to be determined.

Sequence of Actions: Identify contaminants to be monitored and over what period of time; identify criteria for site selection of monitoring stations; develop a strategy for sampling frequency for both wet and dry; prepare procedures and personnel to begin monitoring process;

assess data collected with historic and other current data available.

Relative Priority: With adequate funding, the USGS could possibly continue with their efforts to monitor atmospheric deposition. While there is a minimum level of monitoring taking place at this time, the priority for this type of study has been medium to low.

Responsible Entity: USGS and IDEM

IV. Conclusion

To determine what information is lacking in reaching the ultimate goal of delisting the impaired uses in the Area of Concern, information regarding the state of biological health must be developed, the state of the habitat must be assessed and the source of stress must be uncovered through studies developed in the Area of Concern. This chapter presents a list of the types of studies needed to gather the information required to fill data gaps, thus allowing each layer of the Area of Concern ecosystem to be addressed.

These studies are as follows:

- Inventory of habitats, locations, and species now occupying the habitats
- Assessment of the tolerances of native and beneficial plant and animal species to pollutants located within the Area of Concern
- Assessment of migration or patterns of migration of mobile species, including interactions of species within habitats
- Studies which evaluate the feasibility of restoring, enhancing, or recreating habitat types
- Initiation of a Total Maximum Daily Load
- Storm water runoff and sediment contamination
- Combined Sewer Overflows (CSOs) as a known source of sediment accumulation/contamination
- Assessment of dewatering characteristics of odor impacts of Grand Calumet River sediment
- Grand Calumet River and Indiana Harbor Ship Canal mass balance
- Study sediment toxicity sources in the Indiana Harbor Ship Canal
- Bedload and suspended sediment discharge study at the Grand Calumet River and Indiana Harbor Canal
- Fill material loading and assessment
- Handling of materials and storage practices
- Air deposition (wet and dry) studies