



STRATUS CONSULTING

Draft Restoration Plan and Environmental Assessment, Portage Creek and Operable Unit 1 – Allied Paper Property, Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site

Prepared for:

Michigan Department of Natural Resources,
Michigan Department of Environmental Quality,
Michigan Attorney General,
U.S. Fish and Wildlife Service, and National Oceanic
and Atmospheric Administration

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1. Introduction

This Draft Restoration Plan/Environmental Assessment (Draft RP/EA) presents proposed restoration actions to address public natural resource losses caused by the release of hazardous substances from the Allied Paper Property (Operable Unit 1, OU1) at the Allied Paper, Inc. (Allied)/Portage Creek/Kalamazoo River National Priorities List (NPL) site (the Kalamazoo River Superfund Site, or the Site). This Draft RP/EA is being released by the Kalamazoo River Natural Resource Trustees (the Trustees) for public review and comment. This Draft RP/EA provides information regarding the affected environment, the natural resource injuries caused by releases of hazardous substances from OU1, the restoration actions proposed to compensate for these injuries, and the anticipated impacts of the restoration actions.

The Trustees believe it is important to integrate restoration planning with remediation actions selected for implementation at OU1. The Trustees are releasing the Draft RP/EA at this time to allow natural resource restoration actions to be coordinated with the planned remedial action at OU1 wherever possible. Release of the Draft RP/EA now will also make it possible to begin restoration activities sooner, resulting in the expected ecological benefits occurring sooner as well.

The restoration activities undertaken by the Trustees will depend on funds, property, and services made available through the resolution of natural resource damage claims. LyondellBasell Industries (the parent of Millennium Holdings, LLC, the primary potentially responsible party for releases of hazardous substances from OU1) filed for bankruptcy in January 2009. LyondellBasell Industries emerged from Chapter 11 bankruptcy in May 2010. As part of the bankruptcy settlement, an Environmental Trust was established into which \$2 million was deposited to be used to restore, replace, rehabilitate, or acquire the equivalent of the natural resources injured and services lost as a result of the release of hazardous substances from OU1.¹

The purpose of this Draft RP/EA is to inform and solicit comments from members of the public on an initial set of potential restoration actions that could be undertaken to compensate for natural resource injuries and associated lost services resulting from releases of hazardous substances at OU1. The Trustees do not expect to be able to implement all of the projects described here and welcome public input regarding which projects are favored. The ability of the Trustees to implement potential projects will depend on available funding from the settlement of natural resource damage claims. The Trustees also need to ensure that any proposed restoration actions will not conflict with EPA's proposed remedial actions at OU1.² After these uncertainties

1. These funds are distinct from the settlement received by the U.S. Environmental Protection Agency (EPA) for remediation at OU1.

2. EPA will first issue a proposed plan for public review and then a record of decision that will select remedial actions for OU1. The proposed plan has not yet been released.

are resolved, the Trustees will select projects for implementation according to the tiered project preferences presented in this document.

1.1 Trustee Responsibilities under CERCLA and Federal Agency Obligations under the National Environmental Policy Act

The natural resource Trustee agencies involved in developing this Draft RP/EA are the U.S. Department of the Interior (DOI) represented by the U.S. Fish and Wildlife Service (USFWS); the U.S. Department of Commerce represented by the National Oceanic and Atmospheric Administration (NOAA); and the State of Michigan represented by the Michigan Department of Natural Resources (DNR), the Michigan Department of Environmental Quality (DEQ), and the Michigan Attorney General. Authority to act on behalf of the public is given to trustees in the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601–9675 (CERCLA, commonly known as “Superfund”); the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (Clean Water Act, or CWA); and Part 31, Water Resources Protection, and Part 201, Environmental Remediation, of the Michigan Natural Resources and Environmental Protection Act (NREPA) (Public Act 451, as amended).

Actions to restore, replace, or acquire the equivalent of lost natural resources are the primary means of compensating the public for injuries to natural resources under these authorities. Actions undertaken by the federal Trustees to restore natural resources or services under CERCLA and other federal laws are subject to the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321-4370d, and the regulations guiding its implementation at 40 C.F.R. Parts 1500–1508. According to the regulations at 40 C.F.R. § 1508.9, an EA is a concise public document designed to (1) determine whether the anticipated impacts of an action on the human environment are significant enough to require an environmental impact statement (EIS; a more in-depth evaluation of impacts of the alternatives), (2) aid an agency’s compliance with NEPA when no EIS is necessary, and (3) facilitate preparation of a statement when one is necessary. At a minimum, an EA includes discussions of the need for the proposal, alternative actions, the environmental impacts of the proposed action and alternatives, and a list of agencies and persons consulted.

This Draft RP/EA describes the purpose and need for the proposed restoration actions; the restoration alternatives considered, including a no-action alternative; and the potential impacts of restoration actions on the quality of the physical, biological, and cultural environment. This Draft RP/EA is intended to satisfy the Trustees’ requirements under NEPA.

Under federal regulations for conducting a natural resource damage assessment (NRDA) (including DOI’s regulations codified at 43 C.F.R. Part 11) and for NEPA, natural resource Trustees must notify the public and any other federal, state, and local government agencies that

may have an interest in the activities analyzed in the RP/EA. The Trustees are to use whatever reasonable means will result in the interested public and other interested parties receiving notice and having ready opportunity to provide comment. The Trustees' plan for public notification and review is presented in Section 1.2.

1.2 Public Notification and Review

Notice of the availability of the Draft RP/EA will be published in the Kalamazoo Gazette.

Copies of the Draft RP/EA will be available for public review at the following locations:

Allegan Public Library
331 Hubbard Street
Allegan, MI 49010

Kalamazoo Public Library
315 South Rose Street
Kalamazoo, MI 49007

Otsego District Public Library
219 South Farmer Street
Otsego, MI 49078

Saugatuck-Douglas District Library
10 Mixer Street at Center Street
Douglas, MI 49406

Waldo Library
Western Michigan University
1903 West Michigan Avenue
Kalamazoo, MI 49008

Charles A. Ransom District Library
180 South Sherwood Avenue
Plainwell, MI 49080

An electronic version of the Draft RP/EA will be posted on the following websites:

http://www.michigan.gov/deq/0,4561,7-135-3311_4109_4217-84646--,00.html,
<http://www.fws.gov/midwest/es/ec/nrda/KalamazooRiver/index.html>, and
<http://www.darrp.noaa.gov/greatlakes/kalamazoo/>.

Comments on this Draft RP/EA will be accepted for a period of 30 days after the release of the document. The deadline for public comments will be published with the notice of availability for the Draft RP/EA. Comments can be provided to: Judith Alfano, DEQ, PO Box 30426, 525 West Allegan Street, Constitution Hall 4S, Lansing, MI 48933; or by e-mail submission to: Alfanoj@michigan.gov.

A public meeting will be scheduled to discuss this Draft RP/EA. At a minimum, notice will be provided in the Kalamazoo Gazette and in the official DEQ calendar that can be accessed at <http://www.michigan.gov/envcalendar>.

Information disseminated by federal agencies to the public after October 1, 2002 is subject to information quality guidelines developed by each agency pursuant to Section 515 of Public Law 106-554 that are intended to ensure and maximize the quality of such information (i.e., the objectivity, utility, and integrity of such information). This Draft RP/EA is an information product covered by information quality guidelines established by NOAA and DOI for this purpose. The information contained herein complies with applicable guidelines.

1.3 Organization of Document

The remainder of this document is organized as follows: Section 2 presents the purpose and need for restoration, which includes an overview of OU1 and a history of releases of hazardous substances from OU1. Section 3 presents the Trustees' process for developing and evaluating restoration alternatives, which includes a no-action alternative and a set of potential restoration actions that together make up the preferred alternative for restoration. Section 4 describes the physical, biological, cultural, and human environment that will be affected by the proposed restoration activities and includes a discussion of threatened and endangered (T&E) species. Section 5 describes the anticipated impacts of the preferred restoration alternative and the no-action alternative. Section 6 presents a description of how the preferred alternative will comply with federal, state, and local laws, regulations, and policies. Finally, Section 7 presents a list of preparers and Section 8 presents a list of agencies, organizations, and parties consulted in the preparation of this Draft RP/EA. References are provided at the end of the document.

2. Purpose and Need for Restoration

This section describes the purpose and need for restoration to address losses to natural resources caused by the releases of hazardous substances at OU1. In their Stage I Assessment Report (MDEQ et al., 2005a), the Trustees concluded, based on data readily available at that time, that surface water, sediment, soils, fish, benthic invertebrates, birds, and mammals had been injured in the Kalamazoo River and Portage Creek and their floodplains. The purpose of the restoration action proposed in this document is to compensate the public for injuries to natural resources that

are the result of releases of hazardous substances at OU1. As outlined under Section 107(f)(1) of CERCLA, funds recovered to address natural resource damages will be used only to restore, replace, or acquire the equivalent of natural resources injured, destroyed, or lost as a result of the release of hazardous substances.

2.1 Purpose and Need for the Proposed Action

The purpose of the proposed restoration action described in this Draft RP/EA is to compensate the public for losses to natural resources that have occurred in the past and the present and will occur in the future until those resources have been restored to the condition they would have been in absent the release of hazardous substances (“interim losses”). The proposed restoration actions are needed to restore natural resources and the services provided by those resources that are equivalent to those injured by releases of hazardous substances from OU1. Based on criteria in this Draft RP/EA and input from the public, the Trustees will select a preferred restoration alternative.

In contrast, the purpose of remedial activities at OU1 and removal activities along Portage Creek that are directed by EPA, with assistance from the State, is to protect public health and the environment. These activities will not compensate for past, ongoing, and future interim losses, for which the Trustees (not EPA) have the responsibility to seek compensation. Thus, the Trustees are pursuing restoration activities in order to compensate the public for interim losses.

2.2 Overview of the Site

OU1 is part of the Kalamazoo River Superfund Site, which is located in Kalamazoo and Allegan counties in Michigan. The Kalamazoo River Superfund Site was added to the NPL on August 30, 1990. The Site boundary includes a 3-mile stretch of Portage Creek from Cork Street to its confluence with the Kalamazoo River and the lower 80 miles of the Kalamazoo River. The DEQ estimates that the sediments and floodplain soils in the Site contain more than 110,000 pounds of polychlorinated biphenyls (PCBs; MDEQ, 2010).

EPA has divided the Kalamazoo River Superfund Site into five OUs plus two mill properties. OU1 (the Allied Paper Property) and the former Bryant Mill Pond Area, encompasses 89 acres and is located within the City of Kalamazoo, next to Portage Creek (Figure 1). OU1 is defined as areas between Cork Street and Alcott Street where contamination from paper operations exist (CDM, 2008). This Draft RP/EA addresses restoration projects that will compensate for natural resource injuries and damages in all of Portage Creek resulting from PCB releases from OU1. This RP/EA does not address restoration projects to compensate for injuries resulting from releases from the rest of the Kalamazoo River Superfund Site, nor does it address groundwater injury, which is a sole trust resource of the State.

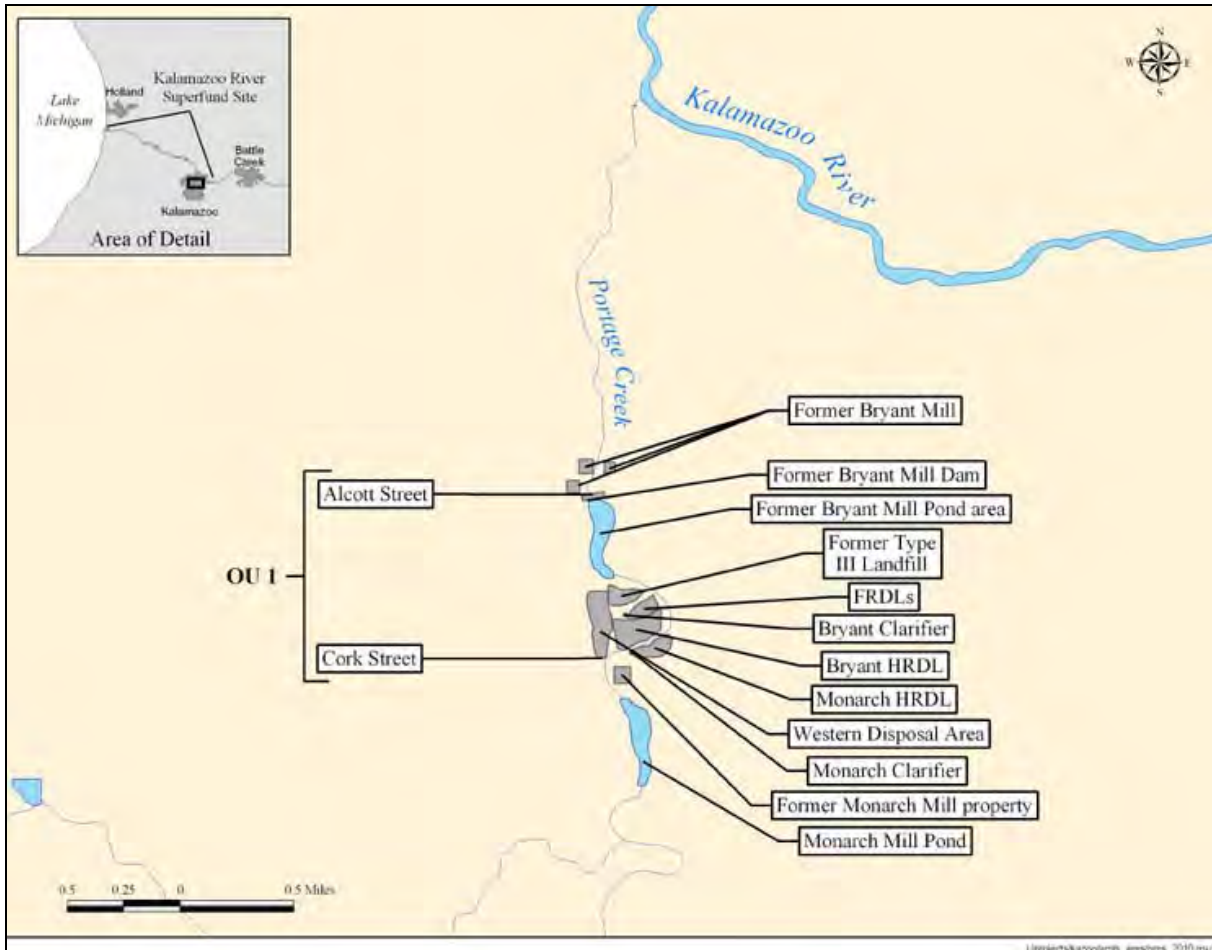


Figure 1. Overview of OU1 and location within greater Kalamazoo River Superfund Site.

The mills owned by Allied (Millennium Holdings, LLC) were originally built by the Kalamazoo Paper Company in 1875 (Monarch Mill) and the Bryant Paper Company in 1895 (Bryant Mills) (CDM, 2008). Allied acquired the Monarch Mill in 1922 and operated it until 1980. The St. Regis Paper Company owned and operated the Bryant Mills from 1946 to 1956 when they were leased to Allied. Allied eventually purchased the mills in 1966. By 1989, all mills had ceased operations and several had been demolished. No active mills remain.

Throughout their operating history, the mills made paper from raw pulp and recycled paper, including carbonless copy paper made with PCBs.³ PCBs are organic compounds that were used in many applications, including the production of carbonless copy paper. PCBs tend to concentrate in sediments and bioaccumulate in the food chain, where they can cause toxicity to biological organisms and humans. In the process of deinking and repulping recycled paper, the Allied paper mills produced substantial quantities of PCB-contaminated waste (referred to as “residuals”), which were released to Portage Creek [Kalamazoo River Study Group v. Rockwell Int’l Corp., 107 F. Supp. 2d 817 (W.D. Mich. 2000)]. Residuals are primarily a mixture of clay and wood fiber and often are observed as deposits of gray clay (Figure 2). The combined capacity of the Allied mills was listed at 100 tons of paper per day in 1960 and 1962 and at 350 tons of paper per day in 1965. It has been estimated that Allied released between 895,000 and 1,790,000 pounds of PCBs in its waste stream from 1960 to 1979 (Rockwell Int’l Corp., 107 F. Supp. 2d 817).

Residuals waste from the deinking and repulping process was disposed of at several facilities, including the Monarch Historic Residuals Dewatering Lagoon (HRDL), the Bryant HRDL and Former Residuals Dewatering Lagoons (FRDLs), and the former Bryant Mill Pond, formed by the former Bryant Mill Dam on Portage Creek (Figure 1).

2.3 Summary of Response Actions to Date

In 1998 and 1999, EPA removed approximately 146,000 cubic yards of contaminated sediments from the former Bryant Mill Pond in and along Portage Creek at OU1. These materials were placed into the Bryant HRDL and FRDLs at OU1, and subsequent actions were taken to restrict access to OU1 and provide erosion control and stabilization (CDM, 2008). These actions included installation of 2,600 linear feet of sheetpile along the west bank of Portage Creek to stabilize the Bryant HRDL and FRDLs in 2001, construction of a landfill cap between 2000 and 2004, and design and installation of a groundwater recovery system. In 2002, an additional 1,700 cubic yards of residuals were removed from the floodplain on the eastern side of Portage Creek and between the sheetpile and Portage Creek (Arcadis, 2009).

3. Although hazardous substances other than PCBs have been detected in various media at OU1, PCBs have been the primary focus of remedial and cleanup work in OU1, and are also the focus of the Trustees’ NRDA. Therefore, the discussion in this Draft RP/EA focuses on PCBs.



Figure 2. Example of residual paper waste deposited in floodplain. Photograph taken near Trowbridge Dam along the Kalamazoo River.

Source: J. Peers, Stratus Consulting.

In 2008, Camp Dresser & McKee (CDM, 2008) prepared a Remedial Investigation Report for OU1 to describe the nature and extent of remaining contamination. A Draft Feasibility Study, prepared by Arcadis on behalf of Millennium Holdings, LLC, described a range of remedial alternatives, ranging from taking no further action, to capping contaminated materials in place using a variety of technologies, to complete removal of contaminated materials off-site (Arcadis, 2009). As this Draft RP/EA is being prepared, the Draft Feasibility Study is currently under review by federal and state agencies, and EPA is preparing a Proposed Plan for remediation at OU1.

In September 2011, EPA initiated a time-critical removal action in the 1.8 miles of Portage Creek between Alcott Street and the confluence with the Kalamazoo River. Workers will dredge sediment from the creek, remove riparian soil adjacent to the creek, stabilize creek banks, and dispose of contaminated materials at a chemical waste landfill (U.S. EPA, 2011b). After contaminated material is removed, EPA will test and monitor the area to verify that cleanup goals have been met; then excavated areas will be filled with clean material and topsoil prior to revegetating the area with native plants (U.S. EPA, 2011b). This removal action is expected to remove approximately 17,000 cubic yards of contaminated soil and sediment (U.S. EPA, 2011a).

2.4 Summary of Contamination and Resulting Public Losses

PCBs have been found in soil and sediment throughout Portage Creek and OU1 and in groundwater at selected locations in OU1, including the Western Disposal Area and the Bryant HRDL/FRDLs (Arcadis, 2009). PCBs have also been transported by Portage Creek to areas downstream of OU1. An estimated 754 kilograms of PCBs were present in Portage Creek sediments (Blasland, Bouck & Lee, 2000). PCB concentrations measured in Portage Creek ranged from 0.07 to 54.3 parts per million (Blasland, Bouck & Lee, 2001). In 1994, Blasland, Bouck & Lee (2000) estimated that Portage Creek contributed 4.2 kilograms of PCBs each year to the Kalamazoo River.

The Trustees found that PCBs have injured biological resources in OU1 and Portage Creek (MDEQ et al., 2005a). PCBs in Portage Creek surface water exceed water quality criteria developed to protect aquatic life. PCBs in nearly 80% of sediment samples collected from Portage Creek exceed a site-specific toxicity threshold for effects on mink. Fish consumption advisories due to PCB contamination have been in place for multiple species in Portage Creek since 1979.

The contamination in OU1 and Portage Creek has resulted in losses of natural resources (including sediments, soils, groundwater, and biological resources) and the services that they provide. Natural resources and services have also been lost as a result of actions taken to address releases of hazardous substances (referred to as “indirect injuries”). For example, bank stabilization with sheetpile along the Bryant HRDL/FRDLs was performed to prevent re-releases

of contaminated material into Portage Creek. However, sheetpile walls essentially eliminate riparian and nearshore aquatic habitat, alter the hydrologic functions and temperature regimes of the creek, and affect sediment transport processes (MDEQ et al., 2005a). Sheetpile walls can also reduce the value of human use of the creek by altering its aesthetic quality. The quality of bird watching and fishing is also reduced due to a loss of shoreline vegetation and nearshore instream habitat types.

3. Restoration Alternatives

Restoration actions can include actions to restore, rehabilitate, replace, or acquire the equivalent of the injured resources and services they provide [43 C.F.R. § 11.80(b)].

To the extent that PCBs are causing injuries to natural resources, the elimination of exposure of the injured resources to PCBs can be part of restoring the resources to baseline over time; i.e., the condition they would have been in had the PCB releases not occurred. Response actions by EPA are expected to reduce PCB exposure and return the resources to baseline as much as is feasible in OU1 and Portage Creek. The Trustees will continue to coordinate with EPA to maximize the benefits of their response actions to natural resources in this area. Thus, the Trustees are not considering pursuing additional restoration actions to return the resources to baseline condition by eliminating exposure to PCBs.

The Trustees are proposing ecosystem-based restoration to compensate the public for natural resource damages with the available settlement funds. In the Kalamazoo River Environment (KRE), the different components of the ecosystem are inextricably linked to each other. Injuries to these linked natural resources can be offset by restoring or protecting habitats with characteristics that are similar to those of injured habitats. Ecosystem-based restoration actions can contribute both to restoring injured resources to baseline and to compensating the public for interim losses to the resources and services that have occurred in the past and will continue to occur until resources are restored to baseline condition.

Under NEPA, the Trustees must compare the proposed action to doing nothing. This is termed the no-action alternative. Understanding the impacts of a no-action alternative helps to define the need for action and helps decision-makers understand the comparative impacts of the proposed action.

The remainder of this section describes the Trustees' restoration objectives (Section 3.1), the restoration planning process (Section 3.2), project selection criteria (Section 3.3), and types of restoration projects considered (Section 3.4). In Section 3.5, two alternatives are presented: a no-action alternative and a preferred alternative. In Section 3.6, descriptions of projects proposed

under the preferred alternative are presented. Finally, in Section 3.7, the process of project evaluation is described, including the grouping of projects into proposed priority-level tiers.

3.1 Restoration Objectives

The Trustees developed preliminary restoration objectives for the Kalamazoo River NRDA, which are published on NOAA's website (NOAA, 2009). Because these objectives were developed for the Kalamazoo River as a whole, some are not as important to the Trustees for restoration specific to Portage Creek and OUI as they would be for the entire river system. For example, because recreational fishing in this area is expected to be minimal, the Trustees will not be focused on objectives related to recreational fishing access. However, these objectives are presented in their entirety because they are an important guide for the Trustees in planning for restoration (Table 1).

Table 1. Preliminary restoration objectives for the Kalamazoo River NRDA (adapted from NOAA, 2009)

Ecological	<ol style="list-style-type: none">1. Create a diverse healthy ecosystem dominated by native or naturalized species (i.e., a naturally vegetated riparian zone).2. Create a habitat that meets requirements for semi-aquatic species, such as turtles, amphibians, and reptiles, minimizing riprap or other hard synthetic surfaces.3. Note that restoration in the "riparian zone" encompasses the river valley between the upland forest on each side of river and is not limited to a specifically delineated floodplain.4. Create a riverine habitat that supports diverse, healthy mussel beds and key mussel host fish.5. Restore in-stream movement of fish to the maximum extent possible (pursuant to the DNR management goals).6. Ensure that the habitat supports important native important predators, such as mink, otter, and eagles.7. Strive for continuity of restored or protected riparian and forested habitat with protected habitat at the Yankee Spring State Recreation Area near Gun Lake and Fort Custer State Recreation Areas (to preserve genetic diversity of plant and animal communities).8. Ensure that a variety of wetland habitats are productive and harbor a natural suite of plants and wildlife.
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Table 1. Preliminary restoration objectives for the Kalamazoo River NRDA (adapted from NOAA, 2009) (cont.)

Geophysical/ chemical	<ol style="list-style-type: none"> 1. Enhance degraded areas and protect existing areas that provide important surface water/groundwater interchange (the hyporheic zone), often associated with diverse plant communities. 2. Restore natural river flow flux and channel forming geophysical forces to allow meandering channel and dynamic floodplain. 3. Provide substrate that supports ecosystem and species management objectives (not artificial or nonsupporting material). 4. Restore water, nutrient, and particulate input and flow to be consistent with vegetated watershed. 5. Achieve reductions in nonpoint source pollutant loading.
Recreational access	<ol style="list-style-type: none"> 1. Increase public access pursuant to decisions by state land managers. 2. Provide access without degradation to existing (or restored) habitat.
Other remediation goals	<ol style="list-style-type: none"> 1. Eliminate loading of PCBs to Lake Michigan. 2. Eliminate the fish consumption advisory for PCBs on the Kalamazoo River. 3. Balance short-term habitat losses with overall restoration objectives. 4. Consider potential habitat uses in contained areas (e.g., prairie). 5. Ensure that remedy does not “transfer” or create problems in adjacent areas.

3.2 Restoration Planning Process

The Trustees presented their initial restoration planning process in the Stage I Assessment Report (MDEQ et al., 2005b). These Stage I restoration planning activities included compiling information on potential restoration projects for river-wide restoration on the Kalamazoo River based on ideas solicited from resource managers, members of community and environmental groups, and private citizens. This initial list, first presented to the public as Appendix A in MDEQ et al. (2005b), is presented as Appendix A in this report as well. As part of the Stage I restoration planning process, the Trustees also developed criteria for evaluating projects (the criteria are described in Section 3.3). The criteria include a set of threshold screening criteria to determine whether potential restoration projects are acceptable. Projects that are determined to be acceptable are then evaluated using a set of focus criteria, implementation criteria, and benefits criteria.

After the publication of the Stage I Assessment Report, the Trustees continued to receive input from local, state, and federal agencies, including information on new specific projects that meet restoration criteria and Trustee preferences described in Section 3.3. For this Draft RP/EA, the Trustees then identified a list of candidate restoration projects (described in Section 3.6) that relate specifically to resources injured as a result of releases from OU1 and that meet the

threshold acceptability criteria. The Trustees acknowledge, however, that they may not have sufficient funding to be able to implement all of these candidate projects. To prioritize funding decisions, the Trustees evaluated the candidate projects in the list against the project evaluation criteria. This evaluation was used to group the projects into three priority-level tiers. The Trustees will use the tiered prioritization to guide the selection of projects both in coordination with EPA's actions at OU1 and based on combinations of projects that can be implemented with the available funding. An explanation of the evaluation process is presented in Section 3.7.

3.3 Restoration Selection Criteria

As part of the Stage I Assessment (MDEQ et al., 2005b), the Trustees developed criteria to select restoration projects designed to enhance, restore, or replace injured resources and the services they provide (Table 2). These criteria were developed to be consistent with the NRDA regulations at 43 C.F.R. Part 11, and Trustee mandates and preferences. The criteria are also consistent with many of the goals presented in the Portage & Arcadia Creeks Watershed Management Plan (Forum of Greater Kalamazoo, 2006).

To compensate for injuries in OU1 and Portage Creek, the Trustees prefer projects that are located within the Kalamazoo River Watershed and thus may have a more direct link to the injured natural resources and lost services. The Trustees also prefer projects that improve aquatic and riparian habitats or protect and enhance habitats (including upland, wetland, and riparian habitats) because these types of actions will restore habitats that are similar to those injured at OU1 and Portage Creek.⁴ Finally, the Trustees prefer a mixture of project types that, when combined, would generate a broad suite of benefits associated with the range of natural resource injuries caused by releases from OU1.

3.4 Potential Restoration Project Types

Restoration activities will focus on restoring the natural resources injured by the release of PCBs and other hazardous substances from OU1. Specifically, restoration projects that restore or enhance ecological services in aquatic, riparian, and upland habitats will be pursued. Restoration projects would provide ecological functions similar to, but not necessarily the same as, those injured by OU1 hazardous substance releases. Although we describe categories in terms of these three habitat types, a single project may improve more than one type of habitat and a project focused on one habitat category may also benefit species predominantly associated with a different habitat category.

4. Note that other types of projects, like endangered species protection programs, environmental education, and increased recreational access are not preferred to compensate for losses caused by releases from OU1, but may be considered by the Trustees to compensate for losses in other parts of the Kalamazoo River Superfund Site.

Table 2. Summary of Trustee criteria for evaluating restoration projects (from MDEQ et al., 2005b)

	Criteria	Description
Threshold acceptance criteria	A1: Complies with applicable and relevant federal, state, local, and tribal laws and regulations.	Projects must be legal, likely to receive required permits, and must consider public health, welfare, and the environment.
	A2: Addresses resources injured by hazardous substances or services lost because of injuries in the KRE.	Projects must restore, rehabilitate, replace, or acquire the equivalent of injured natural resources, as measured by their physical, chemical, or biological properties or their services.
	A3: Is technically feasible.	Projects must be likely to meet Trustee objectives within a reasonable period of time.
Project focus criteria	F1: On-site restoration.	Projects most directly benefiting resources associated with the Kalamazoo River and Portage Creek are preferred over projects with less direct or more distant benefits. For the OU1 RP/EA, projects benefiting resources in OU1 or Portage Creek are preferred over projects providing benefits to other parts of the KRE.
	F2: Addresses/incorporates restoration of “preferred” trust resources and services as evidenced in Trustee mandates and priorities based on law and policy.	Trustee priorities include dynamic floodplain/riverine habitats, wetlands, habitat continuity, water quality, soil/sediment quality, public game/wildlife/recreation areas, T&E species, native species, important food-web species, and recreationally significant species.
	F3: Focuses restoration on resources that are unlikely to be addressed by other programs.	Ecologically valuable restorations that are often not considered because they need long-term inputs will be favored over quicker, more routine actions typically addressed by other programs.
Project implementation criteria	I1: Benefits can be measured for success by evaluation/comparison to baseline.	Projects will be evaluated in terms of whether the benefits can be quantified and the success of the project determined.
	I2: Benefits achieved at reasonable cost (i.e., project is cost-effective).	Projects will be evaluated as to whether they will: (a) achieve desired benefits at a reasonable cost; and (b) whether it is cost-effective relative to other projects that could provide the same or similar benefits.
	I3: Uses established, reliable methods/technologies known to have a high probability of success.	Project methodology will be evaluated for likelihood of success. Factors that will be considered include whether the proposed technique is appropriate to the project, whether it has been used before, and whether it has been successful. Projects incorporating wholly experimental methods, research, or unproven technologies will be given lower priority.

Table 2. Summary of Trustee criteria for evaluating restoration projects (from MDEQ et al., 2005b) (cont.)

	Criteria	Description
Project implementation criteria (cont.)	I4: Takes into account completed, planned, or anticipated response actions.	Projects that restore or enhance habitat impacted by response actions will be preferred over those not associated with response actions. Projects proposed in areas likely to be impacted by response actions must be coordinated with response actions to provide cost savings and to take advantage of the availability of mobilized equipment on-site during remediation, if possible, and to avoid damage to the restoration project by any subsequent response actions.
	I5: Takes into account regional planning and federal and state policies.	Projects will be evaluated for consistency with federal and state policies. Projects should also be justified relative to existing regional plans such as species recovery plans and fisheries management plans.
Project benefits criteria	B1: Provides the greatest scope of ecological, cultural, and economic benefits to the largest area or population.	Projects that benefit more than one injured resource or service will be given priority. Projects that avoid or minimize additional natural resource injury, service loss, or environmental degradation will be given priority.
	B2: Provides benefits not being provided by other restoration projects being implemented/funded under other programs.	Preference is given to projects, or aspects of existing projects, that are not already being implemented or have no planned funding under other programs. Although the Trustees may use restoration planning efforts by other programs, preference is given to projects that would not otherwise be implemented without NRDA restoration funds.
	B3: Aims to achieve environmental equity and environmental justice.	Low-income and ethnic populations (including Native Americans) may suffer losses from environmental pollution, and sometimes benefit the least from restoration programs. Therefore, a restoration program should not have disproportionate high costs or low benefits to low-income or ethnic populations. Further, where there are specific service injuries to these populations, such as subsistence fishing, restoration programs should target benefits to these populations.
	B4: Maximizes the time over which benefits accrue.	Projects that provide benefits sooner are preferred. Projects that provide longer-term benefits are preferred.

The general types of natural resource restoration activities that the Trustees propose to conduct with NRDA funding are described in the following sections. Although NRDA only addresses injuries resulting from the release of hazardous substances, restoration with NRDA funding can be used to address other types of habitat degradation that have occurred as long as the restoration will benefit the natural resources injured by hazardous substances.

3.4.1 Aquatic habitat restoration or enhancement

Aquatic restoration or enhancement projects would focus on reestablishing or providing improved habitat for benthic invertebrates, fish, and fish-eating birds and mammals.

A number of factors have contributed to the degradation of aquatic habitat in the vicinity of OU1 and in the KRE more broadly, including the release of hazardous substances, nonpoint source agricultural and urban pollution, dam-related impoundments, and development. A combination of these factors has led to stream channelization and habitat degradation or destruction. These types of degradation provide restoration opportunities that will benefit natural resources injured by the release of hazardous substances from OU1.

The Trustees anticipate a range of possible restoration activities, including:

- ▶ Restoring the hydrological connection among upland, wetland, and aquatic ecosystems
- ▶ Reestablishing stream sinuosity and/or floodplains in degraded, channelized streams or rivers
- ▶ Enhancing benthic invertebrate and fish habitat quality and diversity by introducing rock riffles, habitat structures, or wetland vegetation
- ▶ Improving the connectivity of fish habitat through the installation of fish passage structures at dams, where appropriate to do so, and with appropriate controls on invasive species.

3.4.2 Riparian habitat protection, restoration, or enhancement

Riparian habitat protection, restoration, or enhancement projects would focus on protecting, creating, or improving riparian vegetation within the KRE. Riparian vegetation provides critical habitat for resident and migrating birds and resident mammals and shading for streams and rivers. Fallen tree limbs and plant rooting systems can also provide habitat for fish.

Riparian areas in the vicinity of Portage Creek and the Kalamazoo River have been impacted by development-related habitat destruction and the introduction of invasive species and are continually threatened by both of these as well. These areas of degraded habitat, therefore, provide increased potential for restoration.

The Trustees anticipate a range of possible riparian habitat restoration activities, including:

- ▶ Protecting existing riparian forests under near-term development threat
- ▶ Enhancing existing riparian habitat through supplemental plantings and/or invasive species removals
- ▶ Reestablishing riparian vegetation in degraded or denuded areas
- ▶ Restoring native vegetation and controlling invasive species
- ▶ Stabilizing stream banks with vegetation
- ▶ Reestablishing riparian habitat by removing hardened shorelines
- ▶ Extending riparian corridors for wildlife.

For habitat protection, the final selection of sites for preservation will depend on multiple factors including the ecological value of the habitat and the nature of threat it faces, local/regional planning, citizens' concerns, and the ability to find willing sellers (for land or easement purchases).

3.4.3 Upland habitat protection, restoration, or enhancement

Upland habitat protection, restoration, or enhancement projects would focus on protecting, creating, or improving upland grassland or forests within the KRE. Forests and grasslands provide important habitat for birds and mammals and provide recreational opportunities for hikers, wildlife viewers, and hunters.

Threats to grasslands and forests in the KRE are similar to those described for riparian habitat (development and invasive species).

The Trustees will consider a range of possible restoration activities, including:

- ▶ Protecting grasslands or forests under near-term development threat
- ▶ Enhancing existing upland habitat through supplemental plantings and/or invasive species removals
- ▶ Reestablishing grassland or forest vegetation in degraded or denuded areas.

3.5 Restoration Alternatives

This section presents two restoration alternatives: a no-action alternative, which would include no habitat restoration or preservation, and the preferred alternative for habitat restoration and preservation.

3.5.1 No-action alternative

NEPA [40 C.F.R. § 1052.14(d)] requires the consideration of a no-action alternative. Selection of this alternative would mean that the Trustees would not take any action to restore injured natural resources and services.

EPA has taken some remedial actions at OU1 and is currently conducting a Time Critical Removal Action to remove contamination from Portage Creek (see Section 2.3). EPA is also evaluating additional remedial actions at OU1 as described in the Draft Feasibility Study Report (Arcadis, 2009). However, remedial and removal actions do not provide any compensation for natural resource service losses that will occur until resources are fully restored to baseline conditions. Therefore, under this alternative, the public would not receive compensation for losses that occurred in the past, for ongoing losses, and for indirect losses caused by the remedial actions.

However, this alternative can be used as a benchmark to evaluate the comparative benefit of other actions. This alternative would not have any cost but also would not provide any ecological or economic benefits.

3.5.2 Preferred alternative

The preferred alternative is to implement restoration projects that benefit the types of natural resources that have been injured by releases of hazardous substances from OU1. The Trustees prefer a mix of projects that will provide a broad array of natural resource services. The proposed projects that could be conducted by the Trustees using natural resource damage funds are listed in Table 3 and grouped into priority tiers for funding (see Section 3.7 for project evaluation). The Trustees will use the prioritization in Table 3 to guide the selection of projects in coordination with EPA's actions at OU1 and based on combinations of projects that can be implemented with the available funding.

Table 3. Proposed restoration projects, grouped into priority tiers for funding

Project title	Type of project	Main habitat type affected	Other habitats affected	Location	Estimated cost	Expected benefits	Timeframe of benefits
Priority Tier 1							
Alcott Street Dam removal	Habitat restoration/enhancement	Aquatic	Riparian	Downtown Kalamazoo	\$450,000	Improved connectivity between habitat upstream and downstream of the existing dam	Benefits would begin immediately after dam removal and continue indefinitely
Establishment of an urban nature park in downtown Kalamazoo, Phase I	Habitat restoration/enhancement	Riparian	None	Downtown Kalamazoo	\$100,000	Wetland restoration on habitat currently in poor condition	Full benefits would be reached when vegetation matures and would continue for as long as the habitat is maintained
Establishment of an urban nature park in downtown Kalamazoo, Phase II	Habitat restoration/enhancement	Upland	Riparian	Downtown Kalamazoo	\$150,000 to \$1.4 million	Upland and riparian restoration on adjacent parcels	Full benefits would be reached when vegetation matures and would continue for as long as the habitat is maintained
Wetland creation/floodplain storage along Portage Creek	Habitat restoration/enhancement	Riparian	None	Portage Creek	TBD	Wetland habitat in channelized section and floodplain storage	Full benefits would be reached when vegetation matures and would continue for as long as the habitat is maintained

Table 3. Proposed restoration projects, grouped into priority tiers for funding (cont.)

Project title	Type of project	Main habitat type affected	Other habitats affected	Location	Estimated cost	Expected benefits	Timeframe of benefits
Priority Tier 2							
Wetland restoration in Rice Creek	Habitat restoration/enhancement	Riparian	Aquatic	Calhoun County	TBD, but rough estimate of \$1,000/wetland acre restored ^a	Improve hydrological connectivity between the creek and its floodplain to restore native wetlands	Full benefits would be reached when vegetation matures and would continue indefinitely as long as connectivity is maintained
Riparian habitat preservation on the lower Kalamazoo River	Habitat protection	Riparian	Aquatic	TBD	TBD ^a	Protect riparian habitat to benefit wildlife	Timeframe for benefit of habitat protection depends on how soon development would have occurred in absence of protection
Priority Tier 3							
Upland habitat preservation in the Pitchfork Valley	Habitat protection	Upland	Riparian, aquatic	Barry County	\$2.4 million	Protect upland and riparian habitat to benefit wildlife	Development of parcel within 10 years viewed as highly likely, in absence of protection
Hardwood forest protection near Fair Lake	Habitat protection	Upland	Riparian, aquatic	Barry County	\$750,000	Protect upland habitat to benefit wildlife	Development of parcel within 10 years viewed as highly likely, in absence of protection
Upland habitat preservation in Wilderness Hills	Habitat protection	Upland	Riparian, aquatic	Allegan County	\$1.7 million	Protect upland habitat to benefit wildlife	Development of parcel within 10 years viewed as highly likely, in absence of protection

TBD = To be determined.

a. Total cost dependent on site and number of acres restored or preserved, which have not yet been determined.

Trustees will collaborate with EPA on remedial actions to maximize the long-term benefits to resources and services provided by the remedy. In addition to the specific projects described under this alternative, the Trustees will explore opportunities to conduct appropriate restoration actions that expand on EPA's remedial actions. As with other restoration projects, any such opportunities would need to include assurances that ecological benefits would be protected in perpetuity.

The Trustees believe that restoration projects conducted under this alternative would best utilize available funds to compensate the public for injuries caused by releases of hazardous substances from OU1. Although the Trustees may not have sufficient funding to implement all the projects in Table 3 (either in whole or in part), for the purpose of this RP/EA, the full suite of projects in Table 3 is considered the preferred alternative.

The proposed restoration projects for each major habitat type are described in the remainder of this section. Information about the goals, locations, activities, scale, timeframe, and benefits for each project is provided. Project implementation will only occur when funding is available, site-specific designs are written, clearances and permits are obtained, and site-specific compliance with all laws is completed as appropriate.

3.6 Descriptions of Projects Proposed under the Preferred Alternative

As described in the restoration planning process (Section 3.2), the Trustees developed a set of proposed restoration projects that are located in the Kalamazoo River Watershed (Figure 3) and would restore or protect habitats similar to those injured at OU1 and Portage Creek. These projects are based on input from the public and local, state, and federal agencies and reflect the restoration criteria and Trustee preferences described in Section 3.3. The Trustees recognize the possibility that only a subset of these projects may be implemented.

The Trustees will ensure that any projects that include land transactions will be consistent with the Trustees' land transaction policy (Appendix B). Land acquired will be deeded to the appropriate entity (local, state, or federal government; land Trustee; or conservation nongovernmental organizations) after following the specific procedures and standards required by each entity. Payment in lieu of taxes (also called Impact Assistance Grant payments) will be made on land deeded to government parties. The remainder of this section presents descriptions of each potential project, its expected benefits, and likely environmental and socioeconomic impacts.

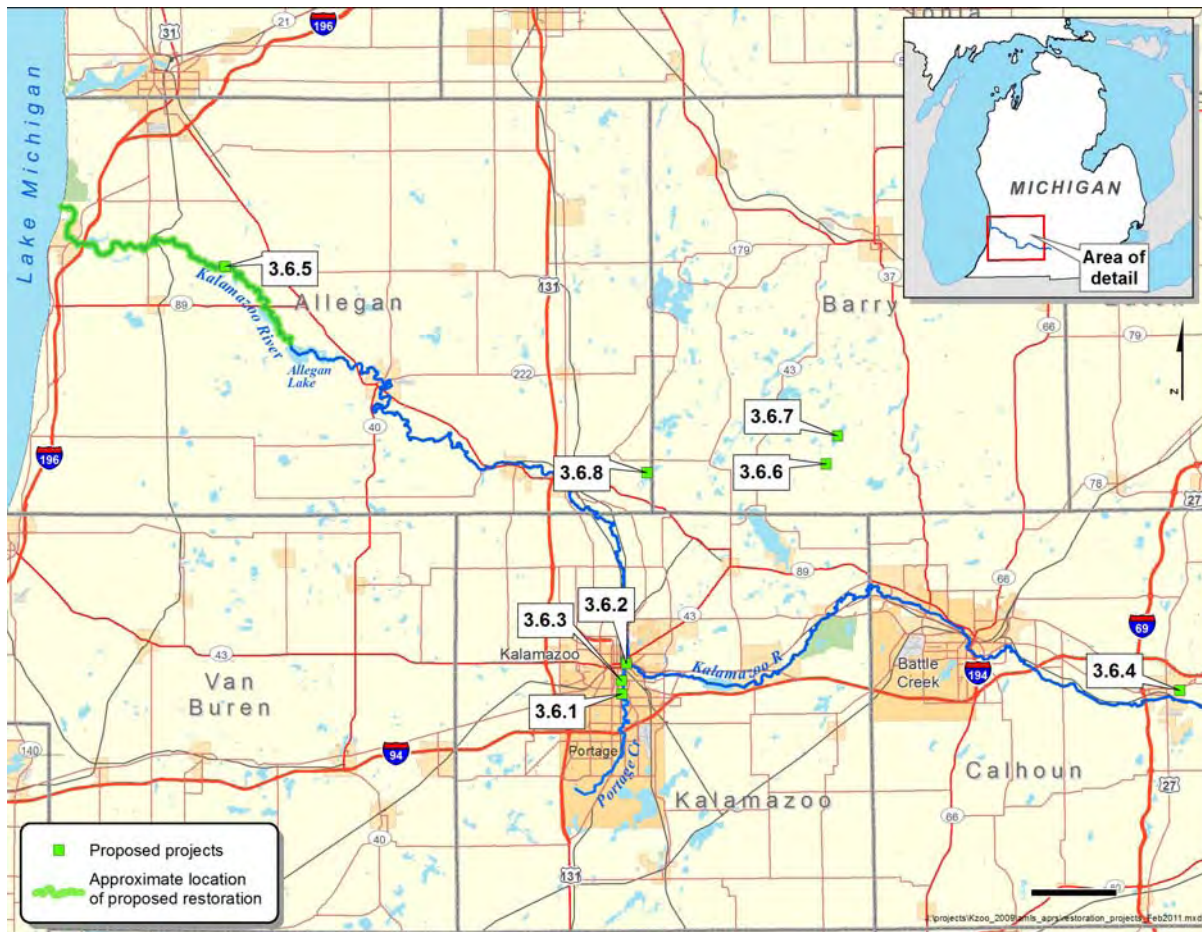


Figure 3. Map of potential restoration projects in the Kalamazoo River Watershed. Note that the numbers on the map refer to the section numbers in this report where the projects are described. Since Projects 3.6.2 and 3.6.5 do not have a specific geographic location identified yet, an approximate location is identified on this map.

3.6.1 Alcott Street Dam removal

Description: This project would remove the remaining structure of the Alcott Street Dam, which is located on Portage Creek in downtown Kalamazoo. The dam, constructed in 1927, created the 29-acre Bryant Mill Pond. The dam was partially deconstructed when the gates to the dam were lowered in 1976. The area of sediment exposed after dam decommissioning was contaminated with large amounts of PCBs, and 146,000 cubic yards of sediment were removed in 1998 and 1999. The former Bryant Mill Pond area has since been restored with native riparian and wetland vegetation. The dam, which is currently down to sill level, is approximately 8 feet high, preventing the upstream dispersal of fish and other aquatic wildlife.

Downstream of the dam, the creek has sections that are highly degraded and channelized with minimal fish habitat as well as sections of moderate stream quality. In 2011, DEQ and partners completed a significant restoration of the highly degraded, channelized section immediately downstream of Alcott Street using funding from the Great Lakes Restoration Initiative. They removed the concrete channel and created meander bends, riffles, and a contoured floodplain for Portage Creek. Upstream of the dam, the creek water is cooler, there are deeper pools, and much more protected riparian habitat is present; all of which provide improved aquatic habitat. Thus, removing the dam would significantly improve habitat connectivity and provide fish access to a significant stretch of improved upstream habitat.

Project location: Portage Creek in downtown Kalamazoo.

Project benefits: The main benefit would be improved connectivity between the upstream and downstream segments of Portage Creek. In particular, fish downstream of Alcott Street Dam would be able to access the superior habitat located upstream of the river and fish and other aquatic biota throughout the reach would benefit from the greater habitat connectivity.

Timeframe of benefits: Benefits would begin immediately after project completion and would continue in perpetuity. The timing of the project would be coordinated with remediation work as necessary.

Area affected: Removal of Alcott Street Dam would allow downstream fish to access 1 + miles of upstream habitat. Movement of fish further upstream would be impeded by Monarch Dam, another sill-level dam.

Estimated cost: Cost is estimated at \$450,000, which includes project design, permit acquisition, demolition, and construction of the new control structure (Mark Ducharme, DEQ, personal communication, October 25, 2010).

Environmental and socioeconomic consequences: This project would yield positive ecological and socioeconomic benefits. The biological benefits would result primarily from the improved connectivity between habitat upstream and downstream of the existing dam. Fish would be able to find suitable habitat more easily, which would reduce stress and improve survival and reproductive fitness. Soil and sediment would be disturbed during construction, so proper engineering controls would be put into place to minimize creek sedimentation and reduced water quality. In addition, construction-related noise would disturb local wildlife. However, these negative effects are expected to be short-lived and would be outweighed by the long-term benefits of the project.

Potential socioeconomic impacts include local employment opportunities for design- and construction-related work. In addition, recreational fishing may also improve if enhanced habitat connectivity leads to an increase in locally desirable fish populations.

3.6.2 Establishment of an urban nature park in downtown Kalamazoo

Description: This project would expand efforts to reestablish native vegetation in former brownfield sites within the former floodplain of the Kalamazoo River and Portage Creek. The Kalamazoo Nature Center has developed a project focused on restoring upland habitat on a 4-acre site previously owned by the Norfolk Southern Railroad (NSR). The project has been funded and is in the early stages of being implemented. The quality of the habitat on the NSR site and all property in the surrounding area is generally poor because it is dominated by exotic grasses, weeds, and exotic woody plants. The NSR project is replacing poor-quality habitat dominated with invasive species with native grasslands and trees. In addition, a footbridge is being built over Portage Creek with foot trails, interpretive signage, and lighting to provide easy access for local visitors.

NRDA settlement funding could be used to expand this project into two distinct phases. In the first phase, settlement funds could be used to support the restoration of wetlands at the four-acre site described above (wetlands would cover approximately one of the four acres). In the second phase, settlement funds could be used to expand restoration efforts onto other properties near this brownfield site. If any properties are restored but not sold to the Kalamazoo Nature Center, conservation easements would be put in place to prevent future development.

Project location: Downtown Kalamazoo near the confluence of Portage Creek and the Kalamazoo River.

Project benefits: This project would restore habitat in a highly degraded former brownfield site in downtown Kalamazoo. Phase I would involve the restoration of wetland habitat, revegetating degraded shoreline with native grasses, sedges, and rushes, in order to provide improved habitat for birds, fish, and invertebrates that utilize wetland habitat. In Phase II, specific actions would depend on the parcel being restored. However, activities would likely include removing invasive species, planting upland areas with native grasses and sedges, and interspersing native trees in the upland habitat. In wetland areas, native grasses, sedges, and rushes would be planted. These efforts would help establish a natural oasis in a heavily developed section of the Kalamazoo urban center along Portage Creek. This would benefit local wildlife, including songbirds, birds of prey, water birds, reptiles, and mammals. It would also improve the quality of life for residents and workers in Kalamazoo. Public access to trails throughout the property would provide access to wildlife and nature viewing, offering a unique recreational opportunity in a highly urbanized area.

Timeframe of benefits: In Phases I and II, benefits to wildlife and citizens would begin to accrue immediately after project completion. However, it would take several years for grassland and wetland vegetation to mature and full habitat-related benefits to be realized.

Area affected: For Phase I, approximately \$100,000 is needed to fully fund wetland restoration on approximately one acre of land. For Phase II, the expansion onto other properties, the project could occur on a range of parcel sizes, ranging from about one acre to about seven acres (Bill Rose, Kalamazoo Nature Center, personal communication, February 20, 2009).

Estimated cost: Phase I, wetland restoration on the four-acre parcel, would cost \$100,000. For Phase II, approximately \$150,000 to \$200,000 per acre would be needed for the entire project, including property purchase, clean-up, permitting, and restoration (Bill Rose, Kalamazoo Nature Center, personal communication, February 20, 2009).

Environmental and socioeconomic consequences: This project would have important biological and socioeconomic benefits that will be similar across both phases of the project. Biological benefits stem from the conversion of highly degraded upland and wetland habitat to high-quality native habitat that would support a greater abundance and diversity of wildlife. The location of the project provides a “stepping stone” toward improving connectivity along the Portage Creek corridor. During site preparation and construction, vegetation, soil, and sediment would be disturbed, which would reduce habitat quality and availability for wildlife. Parcels considered for acquisition and/or restoration would need to be screened for hazardous substances. If identified, the feasibility of actions necessary to prevent human and wildlife exposure would be a significant consideration in evaluating the potential for acquisition. Construction-related noise would also disturb local wildlife. However, these negative effects are expected to be short-lived. Over the long-term, the positive effects of the project on upland- and wetland-associated wildlife are expected to outweigh any negative effects.

This project would have positive socioeconomic impacts. The restoration of a brownfield site to a nature park would enhance recreational opportunities for local residents. More specifically, this urban park would support and enhance housing and business redevelopment efforts in the area by providing nearby low-income families, business owners, and customers with an opportunity to experience nature in an urban environment. No adverse socioeconomic impacts are expected.

3.6.3 Wetland creation/floodplain storage on Portage Creek

Description: This project would entail full wetland restoration of a five-acre site next to Portage Creek. The five acres are serving as a staging area for EPA’s ongoing Portage Creek Area Time Critical Removal Action. After the EPA removal action is completed, this staging area would be closed and the wetland habitat would be restored. The project would (1) replace existing on-site “fill” with hydric soils, and (2) establish native wetland vegetation at the staging area site. Landowner permission would need to be obtained prior to the implementation of the project.

Project location: Bronson Hospital Property at Portage Creek River Mile 1.

Project benefits: This project would provide valuable wetland habitat for a broad range of species, including plants, invertebrates, amphibians, reptiles, birds, and mammals in Portage Creek in a section of the creek which is currently highly channelized and degraded. Additionally, creation of the wetland would provide an area of floodwater storage, which would reduce the impacts of flooding along the creek. The project would also provide important hydrological connections between upland ecosystems and the creek, which are lacking in the affected area. The design of the restored wetland and the topography of the creek will determine the extent to which the project will reduce local water temperatures, reduce water velocity, and reduce suspended sediments, all of which would benefit aquatic wildlife.

Timeframe of benefits: Project benefits would begin to accrue immediately after project completion. However, full habitat related benefits would not be realized until vegetation matures and the ecosystem is fully functioning.

Area affected: Approximately five acres.

Estimated cost: To be determined.

Environmental and socioeconomic consequences: While this project is expected to yield both biological and socioeconomic benefits, there may be some short-lived negative impacts. During site excavation and restoration, nearby wildlife may be disturbed and small areas of habitat could be degraded. However, these impacts are expected to be short-lived. The Trustees would require implementation of best management practices to minimize short-term impacts. Upland and aquatic wildlife would benefit significantly from the establishment of native wetlands, which would provide rare habitat in an industrialized area, and could also improve stream water quality.

Small, positive socioeconomic impacts are expected from this project. Over the short term, designing and implementing the project could create local jobs. Over the long-term, the improved habitat may increase local wildlife viewing and/or recreational fishing opportunities, thereby providing ancillary socioeconomic benefits.

3.6.4 Wetland restoration in Rice Creek

Description: Rice Creek, a tributary of the Kalamazoo River, is located in Calhoun County near the site of the July 2010 Enbridge oil spill, but upstream of any oil contamination. Like many tributaries in the Kalamazoo River Watershed, many sections of Rice Creek are highly channelized and disconnected from their natural floodplains. Work has recently begun to identify specific locations where stream banks need to be altered in order to allow the reestablishment of native wetlands. To that end, the Calhoun Conservation District supported the completion of a stream elevation survey and identified 12 potential areas for reshaping bank morphology and

restoring natural wetlands. The District has sufficient funds to restore three high-priority areas. However, funding is lacking for further wetland restoration.

Project location: Various locations on Rice Creek in Calhoun County.

Project benefits: The project would improve hydrological connectivity between the creek and its floodplain, which improves water storage during high flows, reduces creek velocity, and provides more flow variability. Wetland vegetation provides aquatic habitat for fish and aquatic invertebrates as well as for local water birds and mammals (e.g., mink) that are dependent on aquatic resources.

Timeframe of benefits: Project benefits would begin to accrue immediately after project completion. However, it would take several years for vegetation to mature and full habitat-related benefits to be realized.

Area affected: The area affected would depend on the specific sites supported with NRDA funding.

Estimated cost: Costs would be highly dependent on the sites involved. A rough cost estimate is \$1,000 per wetland acre restored, based on costs for a current 80-acre project at this site. Wetland restoration costs are based on the assumption that improving hydrological connectivity between the creek and its floodplain would allow wetland vegetation to reestablish naturally without intensive management actions. This estimate may not necessarily apply to future wetland restoration areas, however, if conditions vary or more intensive management or revegetation efforts are required.

Environmental and socioeconomic consequences: This project would benefit the environment, first through the improvement of hydrological flow patterns, including enhancing water storage, reducing stream energy, and reducing the likelihood of local flooding. Ecological benefits would be realized by invertebrates, fish, birds, and mammals that utilize the wetland habitat. In the short term, bank restructuring may lead to increased sedimentation of the creek, but this effect is expected to be short-lived and minimal relative to project benefits.

The specific socioeconomic impacts of this project would depend on the sites restored. Benefits may include a reduction in flooding frequency/severity for local landowners and improved wildlife viewing. Regardless of site location, the project would likely benefit the community through the employment of local companies and residents. No adverse socioeconomic impacts are expected.

3.6.5 Riparian habitat preservation on the lower Kalamazoo River

Description: This project entails identification and acquisition of a potential parcel or parcels that would protect primarily riparian habitat on the lower Kalamazoo River below the Calkins Bridge Dam (also known as the Lake Allegan Dam), which is the first barrier upstream from Lake Michigan. The project assumes that a long-term, trustworthy land steward (e.g., the State of Michigan) would be responsible for managing the property.

Project location: To be determined.

Project benefits: The project would protect riparian habitat along the lower Kalamazoo River, which would benefit riparian-dependent wildlife, including local and migrating birds and other wildlife. Specific benefits would depend on the parcel identified.

Timeframe of benefits: The timeframe of the benefits that would result from preserving habitat depends on the timeframe of when the habitat would be lost or degraded if it were not preserved. Estimating the development threat to a parcel is difficult because local real estate markets are in flux. However, there is always the potential for private development on any piece of property.

Area affected: To be determined.

Estimated cost: To be determined.

Environmental and socioeconomic consequences: Protecting a parcel of riparian land would have positive environmental impacts. Preventing development protects valuable riparian habitat for local and migrating birds and other wildlife. The project would also be likely to protect water quality by preventing vegetative disturbance and nonpoint source pollution associated with development of the site. If the public is able to access the property, wildlife disturbance may result. To the extent feasible, it would be important to minimize disturbance to breeding birds on the property, particularly water birds given their sensitivity to human disturbance. Disturbance could be limited by restricting the presence of dogs or limiting use during breeding periods.

Protecting riparian property would also provide socioeconomic benefits. If purchased by the State of Michigan, the public would be provided public access to the area for recreation. No negative socioeconomic impacts are anticipated.

3.6.6 Upland habitat preservation in the Pitchfork Valley

Description: This project entails purchasing approximately 600 acres of land in the Pitchfork Valley that are connected to the headwaters of Augusta Creek. The area is owned by several generations of a private family. Although the area has been conserved over the past few decades, the likelihood of the family selling the land for development has increased. The project assumes

that a long-term, trustworthy land steward (e.g., the State of Michigan) would be responsible for managing the property.

Project location: The Pitchfork Valley, near the headwaters of Augusta Creek in Barry County.

Project benefits: The project would protect upland habitat proximal to lakes that directly feed into Augusta Creek. Wildlife, including birds and mammals, would benefit from forest and wetland protection. Protection of the upland and wetland habitats on the site would also benefit aquatic habitat and wildlife in nearby lakes and in Augusta Creek by protecting water quality. About 200 acres of the site contain high-quality habitat, with the remaining acres being of marginal quality or consisting of agriculture. About 80% of the high-quality habitat (160 acres), most of which lies next to the small lakes that feed Augusta Creek, would be destroyed or extremely degraded if the site were developed (Peter Ter Louw, Southwest Michigan Land Conservancy, personal communication, March 25, 2010).

Timeframe of benefits: Based on the judgment of a local natural resource expert, the site is unlikely to be developed within the next year, has a 50% chance of being developed in 5 years, and would certainly be developed in 10 years unless habitat protections are put into place (Peter Ter Louw, Southwest Michigan Land Conservancy, personal communication, March 25, 2010).

High-quality habitat protected: 160 acres protected directly; 440 acres of additional habitat could be improved in the future.

Estimated cost: \$2.4 million.⁵

Environmental and socioeconomic consequences: Protecting the habitat on this property is expected to benefit wildlife. In addition, protection of the property from development would help protect water quality in Augusta Creek. Since the property is adjacent to the creek, development of the site would likely lead to vegetation and soil disturbance, wetland degradation, and nonpoint source pollution; these negative impacts would be prevented through protection. No negative environmental impacts are expected.

This project would also yield socioeconomic benefits. If the property is purchased by the State of Michigan, recreational opportunities, including hiking, hunting, and fishing, would increase. This project could also have positive economic impacts by increasing recreation-related tourism. No negative socioeconomic impacts are anticipated.

5. If the actual cost is greater than the Trustees' available funding, the Trustees would need to seek additional funding sources to complete this project.

3.6.7 Hardwood forest protection near Fair Lake

Description: This project entails purchasing approximately 90 acres of upland hardwood forest next to Fair Lake. Augusta Creek begins as a direct outflow of Fair and Gilkey lakes; thus, the project would indirectly benefit Augusta Creek as well. The project assumes that a long-term, trustworthy land steward (e.g., the State of Michigan) would be responsible for managing the property.

Project location: Directly next to Fair Lake, about 15 miles northeast of Kalamazoo in Barry County.

Project benefits: The project would ensure the protection of valuable upland forests that provide habitat for local birds and mammals. Protection of these forests would also preserve the quality of nearby wetlands, which in turn would help protect water quality in Fair Lake and Augusta Creek. The project would have indirect benefits for invertebrates and fish in Fair Lake, the piscivorous birds and mammals that depend on the fish, and aquatic habitat and wildlife in Augusta Creek. Ninety percent of the property, or about 80 acres, is covered by high-quality hardwood forests; the remainder, which is next to the lake, is wetland forests. All of the forests would likely be destroyed or extremely degraded if the site were developed (Peter Ter Louw, Southwest Michigan Land Conservancy, personal communication, March 25, 2010).

Timeframe of benefits: The timeframe of benefits depends on the timeframe of development if the property were not preserved. Based on the judgment of a local natural resource expert, the site is unlikely to be developed within the next year, has a 50% chance of being developed in 5 years, and would certainly be developed in 10 years unless habitat protections are put into place (Peter Ter Louw, Southwest Michigan Land Conservancy, personal communication, March 25, 2010).

Area affected: 80 acres.

Estimated cost: \$750,000.

Environmental and socioeconomic consequences: Protection of the high-quality habitat on this property would benefit forest-dependent wildlife. In addition, protecting the property from development would help protect water quality in Fair Lake and Augusta Creek. If not protected, development of the site could disturb upland and wetland vegetation, increase soil erosion, and/or increase nonpoint source pollution. No negative environmental impacts are expected to result from protecting this land.

This project is also expected to yield socioeconomic benefits. If the property is purchased by the State of Michigan, recreational opportunities, including hiking and hunting, will increase. Since

recreation-related tourism is an important part of the local economy, this project could also have positive economic impacts. No negative socioeconomic impacts are anticipated.

3.6.8 Upland habitat preservation in Wilderness Hills

Description: This project entails purchasing approximately 266 acres of steep, rolling terrain that includes upland oak-hickory hardwood forest and open grasslands, as well as extensive wetland areas, ponds, and frontage along Lake Doster. In addition, Silver Creek originates near the property's western boundary and eventually flows into the Kalamazoo River. A dense residential development project was approved for this site, but the recent economic decline initially stalled the project and the developer eventually backed out. However, the approved development plan is valid for five years and the same developer has shown interest in resuming the project in coming years. The current landowner is most interested in seeing the land protected and has made that objective a priority. The project assumes that a long-term, trustworthy land steward (e.g., the State of Michigan) would be responsible for managing the property.

Project location: Directly north of Lake Doster in Gunplain Township in Allegan County. The property is about 15 miles northeast of Kalamazoo.

Project benefits: The project would ensure protection and restoration of wetlands, grasslands, and prime upland forest. This would be a direct benefit to the abundant wildlife that utilize this large, intact upland/wetland complex. Aquatic wildlife would also benefit from this project. Protecting the site from development would reduce vegetative disturbance and associated water quality degradation. Approximately 50% of the site is steep, forested slopes and wetlands, which would be unsuitable for development. The remaining portion is relatively level open field and early successional forest. All open areas and some of the wetlands would be extremely degraded if the site were developed.

Timeframe of benefits: Based on the judgment of a local natural resource expert, the site is unlikely to be developed within the next 12 months, has a 70% chance of being developed in the next 5 years, and would almost certainly be developed in 10 years unless habitat protections are put into place (Peter Ter Louw, Southwest Michigan Land Conservancy, personal communication, March 26, 2010).

Area affected: 260 acres.

Estimated cost: \$1.7 million.

Environmental and socioeconomic consequences: Protection of the habitat on this property would benefit wildlife. In addition, protection of the property from development would help protect water quality in Silver Creek and Lake Doster. Given the proximity of the property to these water bodies, development of the site would likely lead to vegetation and soil disturbance,

wetland degradation, and nonpoint source pollution; these negative impacts would be prevented through protection. No negative environmental impacts are expected.

This project is also expected to yield socioeconomic benefits. If the property is purchased by the State of Michigan, recreational opportunities, including hiking, hunting, and fishing, would increase. No negative socioeconomic impacts are anticipated.

3.7 Project Evaluation

The Trustees evaluated the potential restoration projects using the criteria described in Section 3.3. Each project was rated as providing below-average, average, or above-average benefits for each criterion. Projects grouped into the top tier received a majority of above-average ratings and no below-average ratings. Projects grouped into the second tier received a majority of average ratings and no below-average ratings. Projects grouped into the third tier received a mix of above-average, average, and below-average ratings.

A short description of the rationale for project evaluation is provided below.

Tier 1 projects

Alcott Street Dam removal

Alcott Street Dam removal was grouped into the top tier with a majority of above-average ratings and no below-average ratings. Restoration, which would take place on Portage Creek, would benefit a wide range of natural resources including upstream habitat, the Kalamazoo River, and associated aquatic resources. Dam removal projects have a high likelihood of success, and the benefits are permanent. Removing the dam and opening access to aquatic habitat is consistent with regional planning and Trustee goals. In order to maximize benefits, the removal would be coordinated with remedial actions.

Establishment of an urban nature park in downtown Kalamazoo

Establishment of an urban nature park in downtown Kalamazoo was grouped into the top tier with a majority of above-average ratings and no below-average ratings. An urban nature park would be developed in the former floodplain of the Kalamazoo River and Portage Creek. It would include restoration of wetlands and would help increase habitat continuity and water quality and improve conditions for native species. Additionally, low-income and ethnic populations living in downtown Kalamazoo would have access to this urban nature park. This project can be implemented independent of response actions and would build on initial restoration work in the area. It is consistent with regional planning, especially regarding wetland restoration and invasive species control. If properly managed, the benefits of this restoration

would be long lasting. Limitations include uncertainties related to cost effectiveness and the scope of benefits.

Wetland creation/floodplain storage on Portage Creek

The creation of wetlands and floodplain storage on Portage Creek was grouped into the top tier with a majority of above-average ratings and no below-average ratings. An approximately five-acre wetland would be created from a currently unvegetated area adjacent to Portage Creek. This would provide new wetland and floodplain habitat, increase habitat continuity, improve conditions for native species, and benefit water quality. Although there is uncertainty about the cost of the project, it would likely be cost-effective as it would be conducted in conjunction with EPA's Time Critical Removal Action. The benefits of the project are likely to begin immediately after project completion, and persist over the long-term.

Tier 2 projects

Wetland restoration in Rice Creek

Wetland restoration in Rice Creek was grouped into the second tier with a majority of average ratings and no below-average ratings. Wetlands would be restored upstream of OU1 on a tributary to the Kalamazoo River. The restoration would address dynamic floodplain and riverine habitats, wetlands, habitat continuity, and water quantity – these benefits are consistent with regional planning goals that emphasize the need for hydrologic connectivity to floodplains and wetlands. Similar projects have been successfully completed in other locations. The benefits of this project are long-term but primarily focused in the discrete area addressed by the restoration. Limitations include uncertainty about cost effectiveness.

Riparian habitat preservation on the lower Kalamazoo River

Riparian habitat preservation on the lower Kalamazoo River was grouped into the second tier with a majority of average ratings and no below-average ratings. This project would preserve quality riparian habitat on the Kalamazoo River downstream of OU1. Preserving riparian habitat is a Trustee priority and would benefit a wide range of resources in the preserved area. The preserved land would likely be owned by the State of Michigan, making the chances of project success very high and long-term. A specific location has not yet been identified for this project. Some limitations include uncertainty about cost effectiveness, the potential that other sources of funding could be used to preserve land, uncertainty about development pressure, and limits to the extent of project benefits outside of the discrete, preserved area.

Tier 3 projects

Upland habitat protection in the Pitchfork Valley

Upland habitat protection in the Pitchfork Valley was grouped into the third tier with a mixture of above-average, average, and below-average ratings. This project would preserve habitat at a site removed from the Kalamazoo River and Portage Creek. This project does have the potential to restore habitat to preferred trust resources on former agricultural land. The benefits of the project likely would be long-term and successful. Limitations associated with this project include uncertainty about the full scope of benefits relative to development pressure, and the extent to which project benefits would extend outside of the discrete, preserved area. This project lies outside the expansion boundary of existing state and federal protected areas.

Hardwood forest protection near Fair Lake

Hardwood forest protection near Fair Lake was grouped into the third tier with a mixture of above-average, average, and below-average ratings. This project would preserve upland hardwood forest that is not directly adjacent to the Kalamazoo River and Portage Creek; it does not focus on preservation of preferred trust resources and services. The benefits of the project likely would be long-term and successful. Limitations associated with this project include uncertainty about development pressure and the extent to which project benefits would extend outside of the discrete, preserved area.

Upland habitat protection in Wilderness Hills

Upland habitat protection in Wilderness Hills was grouped into the third tier with a mixture of above-average, average, and below-average ratings. This project would preserve habitat at a site removed from the Kalamazoo River and Portage Creek. Preservation is the main focus of this project; it does not directly restore or replace preferred trust resources or services. The project benefits a wide range of resources and the benefits are expected to be long-term and successful. This project is expensive relative to other proposed projects, making cost-effectiveness a limitation. This project also lies outside of the expansion boundary of existing state and federal protected areas. Other limitations associated with this project include uncertainty about development pressure and the extent to which project benefits would extend outside of the discrete, preserved area.

4. Affected Environment

As required by NEPA, this section briefly describes the physical, biological, and cultural environment that would be affected by the proposed restoration activities in the Kalamazoo River Basin.

4.1 Physical Environment

Proposed restoration activities would occur in the Kalamazoo River Basin, which drains approximately 2,000 square miles of southwestern Michigan, flowing generally westward into Lake Michigan, near Saugatuck (Figure 4; MDNR, 1981). The north and south branches of the Kalamazoo River originate at more than 1,000 feet above sea level, join at Albion, and drop to approximately 580 feet above sea level at the mouth of the river. The watershed contains approximately 400 miles of stream tributaries, most notably Rice Creek, Battle Creek, Portage Creek, and the Rabbit River (MDNR, 1981; Blasland, Bouck & Lee, 1992). The average discharge rate of Portage Creek is 40.6 cubic feet per second and the average rate of the Kalamazoo River just upstream of Portage Creek is 868 cubic feet per second (Blasland, Bouck & Lee, 1992).

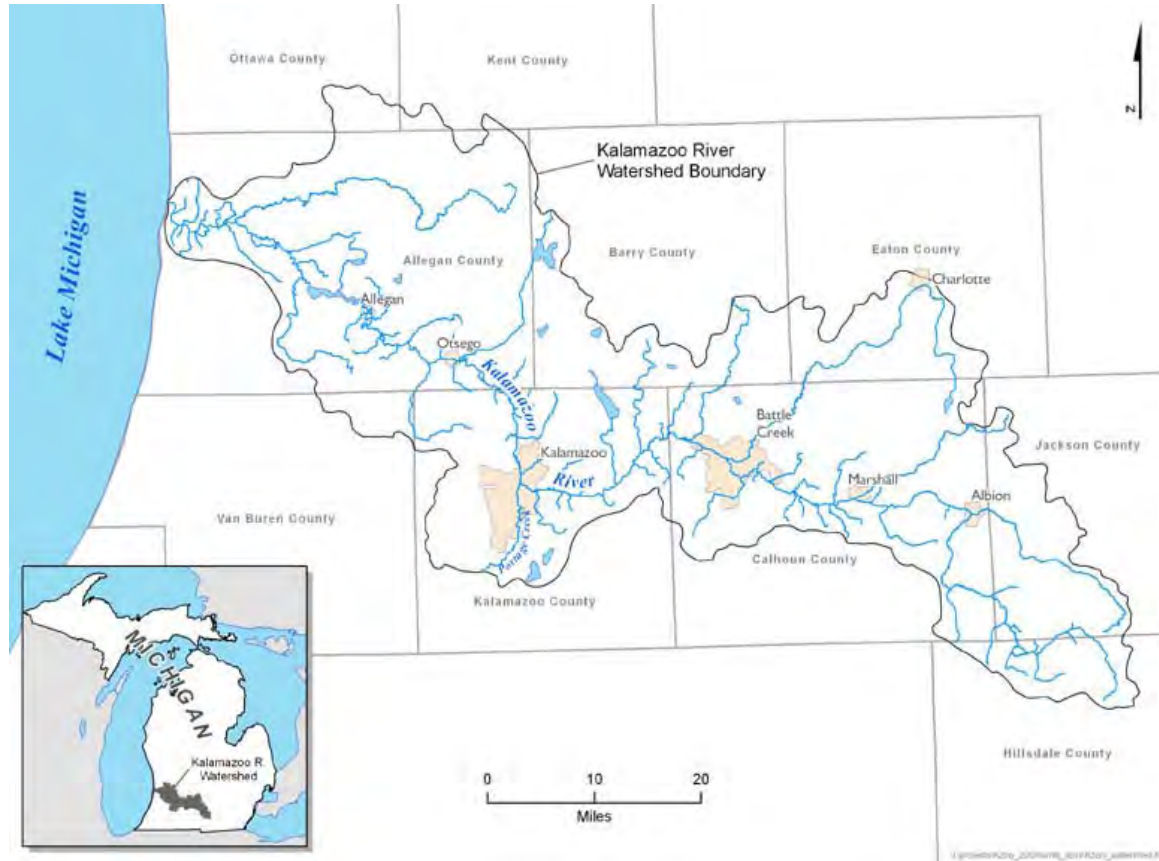


Figure 4. Kalamazoo River Watershed.

The lower portion of the river, between the Towns of Battle Creek and Saugatuck, has been heavily impounded by a series of dams; the Plainwell, Otsego, and Trowbridge dams were removed to their sill levels by the DNR, and the Plainwell Dam was eventually removed in 2007–2009 (Figure 5). This portion of the river is still impounded by the Morrow, Otsego City, Otsego, Trowbridge, Allegan City, and Lake Allegan (or Caulkins) dams. The lower Kalamazoo River, downstream of Lake Allegan, has been designated a Wild and Scenic River by the Michigan Natural Resources Commission under the Natural Rivers Act (Act 231 of the Public Acts of 1970) (MDNR, 1987).

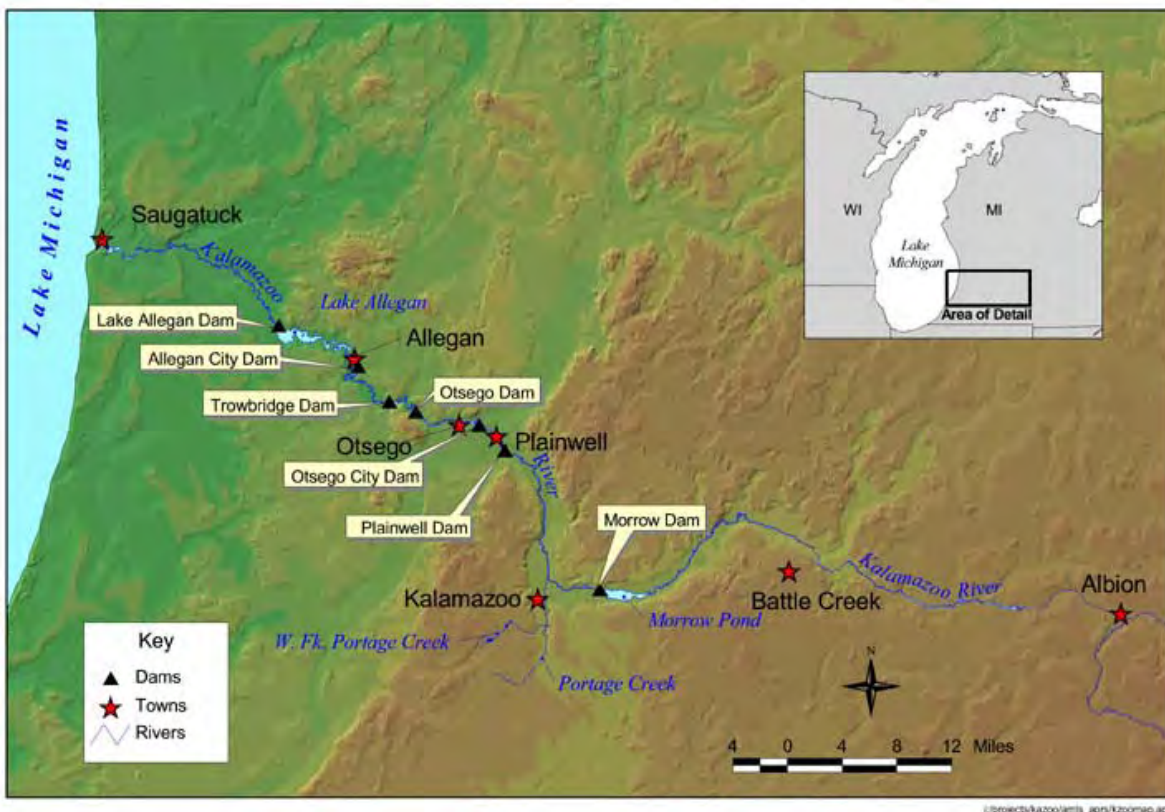


Figure 5. Dams along the lower portion of the Kalamazoo River.

The topography in the lower portion of the river was derived by the recession of continental glaciers during the Wisconsin period, approximately 15,000 to 17,000 years ago (Blasland, Bouck & Lee, 1992). When these glaciers retreated, they left behind sand and gravel deposits that form the hills, valleys, plains, ponds, and lakes of today's surface landscape. The sand and gravel varies in thickness from approximately 50 feet to 200 feet and is underlain by a shale bedrock formation.

The climate in the Kalamazoo area is temperate, with average winter temperatures of approximately 30°F and average summer temperatures of approximately 70°F (Blasland, Bouck & Lee, 1992). Kalamazoo County receives about 35 inches of precipitation each year, with nearly 60% of it falling between April and September.

4.2 Biological Environment

The lower portion of the river is part of the South Michigan/Indiana Till Plains ecoregion, which is characterized as irregular plains with mixed deciduous vegetation (Blasland, Bouck & Lee, 1992). Because the majority of the Kalamazoo River corridor downstream of the Cities of Kalamazoo, Plainwell, and Otsego is relatively undeveloped, it provides a variety of habitats for biological organisms. Sections of the Kalamazoo River corridor, including the Allegan State Game Area and the private Pottawattamie Fish and Game Club, are reserved and managed for wildlife resources (Blasland, Bouck & Lee, 2000).

4.2.1 Aquatic habitat

Aquatic habitat consists of surface water and sediments that support all or a portion of the lifecycles of benthic invertebrates, fish, and fish-eating birds and mammals. Benthic invertebrates live or feed on the bottom of aquatic habitats. Examples include clams, snails, mussels, and the larval forms of some insects (e.g., dragonflies, midges, mayflies). These invertebrates are vitally important in the aquatic food chain, playing essential roles in energy and nutrient transfer from primary producers, such as algae and phytoplankton, to predatory fish and as decomposers.

A number of factors have contributed to the degradation of aquatic habitat in the vicinity of OU1 and Portage Creek and in the Kalamazoo River more broadly, including the release of hazardous substances, nonpoint source agricultural and urban pollution, dam-related impoundments, and development, which has led to stream channelization and habitat degradation or destruction. Remediation activities undertaken at OU1 have also physically disturbed aquatic ecosystems, resulting in losses of ecological services during and soon after remedial actions. While additional disturbance is likely to occur during future remedial actions, the Trustees are assisting the response agencies in developing appropriate mitigation plans to minimize potential construction-related impacts.

4.2.2 Riparian habitat

Riparian zones along the Kalamazoo River provide food and cover for both aquatic organisms and terrestrial organisms (Blasland, Bouck & Lee, 2000). The riparian wetland habitat of the

Kalamazoo River supports many birds, including waterfowl, game birds, raptors, and songbirds (Blasland, Bouck & Lee, 2000). Extensive marshes, especially downstream of Lake Allegan, provide important resting and feeding habitat for waterfowl, shorebirds, and other birds during migration. Bird surveys conducted in 1992–1994 by the Kalamazoo River Nature Center found approximately 100 species each year. A high proportion (about 60%) of birds observed along the Kalamazoo River are neotropical migrants, which breed in the United States or Canada and migrate to Central or South America for winter. Other species use the Kalamazoo River area as winter habitat. Resident species are also present (Adams et al., 1998).

Waterfowl observed in the Kalamazoo Valley include mallard duck, black duck, wood duck, Canada goose, blue-winged teal, American coot, blue goose, whistling swan, redhead duck, canvasback, goldeneye, American merganser, bufflehead, lesser scaup, American gallinule, Wilson's snipe, baldpate, pintail, gadwall, and green-winged teal (MDNR, 1981). Other species using riparian habitat in the area include mink, muskrat, red fox, skunk, opossum, weasel, and woodchuck (MDNR, 1981).

Some of the riparian areas of the Kalamazoo River that contain high concentrations of PCBs deposited by the river also serve as habitat for wildlife. The former impoundments behind the Plainwell, Otsego, and Trowbridge dams include approximately 510 acres of former sediments as floodplain soils; much of these soils contain relatively high concentrations of PCBs (Blasland, Bouck & Lee, 1992, 2000). These former impoundment areas also support wildlife habitat, creating the potential for wildlife to be exposed to PCBs in these areas.

4.2.3 Upland habitat

In general, the upland habitat of the area is forest interspersed with lakes and streams (U.S. EPA, 2000). Upland forests in the Kalamazoo River Basin are dominated by oak (red, white, black, bur, northern pin, and swamp white), hickory (shagbark), hackberry, box elder, and black walnut trees. Conifers are generally absent from the upland forest areas. Sugar maple, basswood, American beech, ironwood, American elm, and white ash are also found in the region.

Historically, a large portion of the Portage Creek watershed was dominated by mixed oak savannah prairies (Kieser & Associates, 2009). Oak openings, which are fire-dependent savannahs dominated by oak species, existed in the area at the time of white settlement (Michigan State University Board of Trustees, 2004).

Upland species include a variety of mammals, including fox, squirrel, raccoon, skunk, red fox, coyote, cottontail rabbit, and white-tailed deer, and birds, including American woodcock, ring-necked pheasant, bobwhite quail, and wild turkey (MDNR, 1981; U.S. EPA, 2000).

4.3 Threatened and Endangered Species

A number of federally listed endangered or threatened species have been identified by the USFWS as occurring in the counties of the Kalamazoo River Basin (Table 4; USFWS, 2012). Several species on this list are found in drier upland habitat. The Indiana bat is known to occupy wooded areas that are located along or within one to three miles of small to medium river and stream corridors or upland forests. The Karner blue butterfly is found on pine barrens and oak savannas where their larvae's only known food source, wild lupine, is located. The Poweshiek skipperling butterfly is found in remnants of native prairie. The pitcher's thistle grows on beaches and grasslands along the shores of Lake Michigan.

Table 4. Federally listed endangered, threatened, and candidate species in the vicinity of the Kalamazoo River

Species	Status
Indiana bat (<i>Myotis sodalis</i>)	Endangered
Reptiles	
Eastern massasauga (<i>Sistrurus catenatus catenatus</i>)	Candidate
Copperbelly water snake (<i>Nerodia erythrogaster neglecta</i>)	Threatened
Invertebrates	
Karner blue butterfly (<i>Lycaeides Melissa samuelis</i>)	Endangered
Mitchell's satyr butterfly (<i>Neonympha mitchellii mitchellii</i>)	Endangered
Poweshiek skipperling (<i>Oarisma powesheik</i>)	Candidate
Clubshell (<i>Pleurobema clava</i>)	Endangered
Rayed bean (<i>Villosa fabalis</i>)	Endangered
Snuffbox (<i>Epioblasma triquetra</i>)	Endangered
Plants	
Eastern prairie fringed orchid (<i>Plantathera leucophaea</i>)	Threatened
Pitcher's thistle (<i>Cirsium pitcheri</i>)	Threatened
Source: USFWS, 2012.	

Several of the T&E species are associated with wetland and riparian areas. The Mitchell's satyr butterfly is found in fens and wetlands with carbonate-rich water. The Eastern prairie fringed orchid is also found in wet prairies and meadows. The copperbelly water snake is found in wooded, permanently wet areas such as oxbows, sloughs, ditches, and wooded floodplains. The eastern massasauga rattlesnake, a candidate species, also lives in wet areas such as wet prairies, marshes, and low riparian areas along rivers and lakes.

Three aquatic species are also on this list. The clubshell, rayed bean, and snuffbox are endangered mussels found in coarse sand and gravel areas of freshwater streams and small rivers, where they dig burrows up to 4 inches deep.

In addition to federally listed T&E species, the Wildlife Division of the State of Michigan DNR has listed T&E species in the Michigan Administrative Code (Rules 299.1021–1028). A list of these species that have been observed in the counties of the Kalamazoo River Basin is presented in Appendix C.

4.4 Cultural and Human Environment

The Kalamazoo River flows through 10 counties in southwest Michigan (Allegan, Barry, Calhoun, Eaton, Hillsdale, Jackson, Kalamazoo, Kent, Ottawa, and Van Buren). As of 2000, approximately 400,000 people lived in the watershed (Kalamazoo River Watershed Public Advisory Council, 2000). The populations of each county in 2000 are presented in Table 5. The majority of the population in the watershed resides in the municipalities of Kalamazoo (77,145) and Battle Creek (53,364) (U.S. Census Bureau, 2010). According to the Census for 2000, approximately 82% of the population of Kalamazoo County was white (not Hispanic), 10% was black, 3% was Hispanic, 2% was Asian, and a small percentage was of Native American or mixed race (U.S. Census Bureau, 2010).

Table 5. Populations of Kalamazoo River Basin counties according to Census for 2000. Note that only a portion of the population of each county resides in the watershed.

County	Population
Allegan	105,665
Barry	56,756
Calhoun	137,985
Eaton	103,665
Hillsdale	46,527
Jackson	158,422
Kalamazoo	238,603
Kent	574,339
Ottawa	238,314
Van Buren	76,263

Source: U.S. Census Bureau, 2010.

Humans have used the Kalamazoo River Basin for more than 11,000 years (Kalamazoo River Watershed Public Advisory Council, 2000). Artifacts dating back to approximately 10,000 BC have been found along the lower Kalamazoo River (MDNR, 1981). However, few permanent settlements have been found along the river. There is evidence that the Potawatomi Tribe, which lived throughout the upper Mississippi River region, used the Kalamazoo River for transportation and resided on its banks in the vicinity of the current City of Kalamazoo (Kalamazoo Public Library, 2010). The Potawatomi and Ottawa tribes hunted seasonally in Allegan County (MDNR, 1981). Small Native American communities remain in Allegan County (Kalamazoo River Watershed Public Advisory Council, 2000).

The first Europeans came to the area in the late 1600s, and the area was frequented by fur traders in the late 1700s (Kalamazoo River Watershed Public Advisory Council, 2000). By the early 1800s, small communities, including Kalamazoo, were established and farming replaced fur trapping as the main industry. The river was used to ship goods downstream until a railroad was built in the 1840s. By the mid-1800s, other mill towns and commercial centers developed along the river, including Battle Creek, Parchment, Plainwell, and Otsego.

From May 1 to October 31, all waters of Michigan, including Portage Creek and the Kalamazoo River, are designated for the following uses: agriculture, navigation, industrial water supply, public water supply, warm water fishery, other indigenous aquatic life and wildlife, partial body contact recreation, and total body contact recreation (MDEQ, 1994). Year-round, the river provides important natural resource and recreational services. A broad array of recreational opportunities are available in the Kalamazoo River Watershed, including camping, fishing, wildlife observation, hunting, canoeing, and boating (MDNR, 1981). Sport fishing is a popular recreational activity in Michigan. Anglers target cold water sport fish such as salmon and trout, as well as walleye, smallmouth bass, bluegill, and catfish, in the lower part of the Kalamazoo River below Lake Allegan Dam (MDEQ et al., 2005b). Warm water species caught further upstream include northern pike, largemouth bass, panfish, carp, and suckers (MDNR, 1981).

The Kalamazoo River Basin currently supports a mixture of agricultural production, light and heavy industry, and recreational businesses (Kalamazoo River Watershed Public Advisory Council, 2000). Rural areas are dominated by agricultural and forest land uses (Blasland, Bouck & Lee, 1992). Cropland and pasture account for the majority of land use (57%) in the Kalamazoo River Watershed, followed by forested land (21%; MDNR, 1981). The remaining 22% of land is composed of urban areas (8%), wetlands (3%), surface water (2%), and other uses (9%). The main agricultural crops are corn, soybeans, wheat, and oats; specialty crops include fruit, maple syrup, honey, wine, nursery plants, and Christmas trees (Kalamazoo River Watershed Public Advisory Council, 2000). Dairy and beef cattle, sheep, pigs, and poultry are also raised in the watershed. Industries include paper products, pharmaceuticals, cereal and food products, parts for automobiles and aircraft, and office furniture. Commercial areas are centered in Kalamazoo and Battle Creek. Recreational businesses include golf courses, archery ranges, horseback riding, boat and canoe rentals and charters, marinas, fishing, skiing, snowmobiling, and sledding. The

median household income in the City of Kalamazoo in 2008 was \$46,968 (U.S. Census Bureau, 2010).

5. Impacts of Alternatives

As required by NEPA, this section describes the cumulative environmental and socioeconomic impacts of the two alternatives. Not all of these impacts are quantifiable, and they differ from benefits that would be quantified through restoration scaling. Table 6 summarizes these impacts for each alternative.

Table 6. Comparison of impacts by alternative

Category of impact	No-action alternative	Preferred alternative
Aquatic habitat	No improvements to aquatic habitat.	Aquatic habitat would be enhanced.
Riparian habitat	No improvements to or preservation of riparian habitat.	Riparian and wetland habitats would be preserved, restored, and enhanced.
Upland habitat	No improvements to or preservation of upland habitat.	Upland habitat would be preserved, restored, and enhanced.
Biological resources	No improvements for fish and wildlife.	Improvements for fish and wildlife resulting from habitat improvements and preservation and increases in fish passage.
Historical resources	No impacts to cultural resources.	No impacts anticipated.
Native American cultural resources	No impacts.	No impacts anticipated.
Environmental justice	No benefits to residents of the Kalamazoo River Watershed, including underserved, minority, and low-income populations	Benefits to residents of the Kalamazoo River Watershed, including underserved, minority, and low-income populations, from improved fishing resources and increased recreational opportunities.
Socioeconomic condition	No positive indirect impacts on the local economy.	Short-term benefits to the local economy through construction activities. Long-term benefits from improved fishing, other recreational opportunities, an increase in “green space” (natural areas that have been restored or protected), and an environment that is more conducive to outdoor tourism.
Cumulative impacts	No environmental or socioeconomic benefits.	Net positive environmental and socioeconomic impacts.

5.1 No-Action Alternative

Under this alternative, no habitat would be restored or preserved and habitat connectivity would not be improved. Portage Creek at the Alcott Street Dam would continue to experience a loss of habitat connectivity. The areas along Portage Creek, Rice Creek, and the Kalamazoo River that are proposed for restoration under the preferred alternative would not benefit from increased flood storage and ecological benefits that could be provided by habitat enhancements in the riparian corridors. Because no natural resources, including fish and wildlife, would be improved, the public would not be compensated for injuries to natural resources caused by the release of hazardous substances into the environment.

Additional negative impacts to habitat could occur under the no-action alternative. For example, habitat that might be protected and/or restored under the preferred alternative could potentially be developed and/or degrade to a lower quality.

This alternative also would not generate any socioeconomic benefits. Recreational and economic opportunities would not be enhanced for the public, including underserved, minority, and low-income populations.

5.2 Preferred Alternative

Overall, the preferred restoration projects presented in the proposed alternative would provide positive environmental and socioeconomic benefits. The analysis of impacts assumes that all of the projects would be implemented. However, if funding is insufficient to implement all projects, then the cumulative impacts of restoration (both positive and negative) would be decreased.

5.2.1 Environmental impacts

The restoration projects in the preferred alternative would have a net positive impact on water resources, vegetation, and fish and wildlife species.

Habitat

The proposed projects would provide benefits to aquatic, riparian, and upland habitats.

The Alcott Street Dam removal would provide direct improvements to the quality of aquatic habitat. During implementation of the in-stream project, there would likely be temporary increases in turbidity and disturbance of aquatic substrate. However, these impacts would be of short duration and are expected to be minimal.

All habitat protection projects would protect some riparian habitat from development. Additionally, the wetland restoration in Rice Creek and Portage Creek and the urban nature park in downtown Kalamazoo projects would enhance riparian habitat through reconnection of the creek or river to its floodplain, natural methods for bank stabilization, and revegetation with native species. During construction of these two projects, vegetation and soils in riparian habitat would be disturbed, temporarily reducing habitat quality. However, these impacts would be of short duration and are expected to be minimal in comparison to the long-term benefits of improving riparian habitat.

The Fair Lake, Pitchfork Valley, and Wilderness Hills projects would protect high-quality upland habitat from development. The urban nature park in downtown Kalamazoo project would enhance upland habitat by removing invasive species and restoring native grasses, sedges, and trees. During construction of this project, vegetation and soils would be disturbed, temporarily reducing habitat quality. However, these impacts would be of short duration and are expected to be minimal in comparison to the long-term benefits of improving upland habitat.

Biological resources

All of the proposed restoration projects would provide benefits for biological resources, including T&E species. The habitat protection projects would preserve riparian and upland habitats that are currently utilized by a wide variety of species. The habitat restoration projects would remove invasive species and restore native species and would enhance aquatic, riparian, and upland habitats for the benefit of invertebrates, fish, and wildlife species. Finally, the Alcott Street Dam fish passage project would enhance the amount and variety of habitat available to fish in the Kalamazoo River.

5.2.2 Cultural and socioeconomic impacts

The proposed restoration projects would provide an overall net positive cultural and socioeconomic impact. There are no anticipated impacts on historical resources or Native American cultural resources. Any active habitat restoration or land transactions would be conducted with willing landowners and would not displace or negatively affect any underserved, minority, or low-income populations. The active habitat restoration projects may result in localized disturbances of air quality and increases in sound pollution due to the use of heavy equipment. However, these impacts are expected to be of short duration and of minimal impact.

The overall quality of life for the surrounding communities would improve with this alternative, through increased economic and recreational opportunities. For example, the two restoration projects at brownfield sites are expected to make the surrounding areas more desirable for redevelopment. Demolition activities related to removal of the Alcott Dam could have positive impacts through job creation (or additional work for existing positions) and/or the purchase of construction materials.

Several of the projects would also enhance public use through increased opportunities for recreational and educational activities related to fishing and wildlife viewing.

5.2.3 Cumulative impacts

Project effects will be cumulative in the sense that the re-establishment, enhancement, and creation of habitats at this site will provide ecological services into the future. The proposed projects in the preferred alternative are not expected to have a significant cumulative effect on the human environment since the preferred alternative alone, or in combination with other restoration projects in the vicinity, should not change the larger current pattern of hydrologic discharge, economic activity, or land-use in the watershed. The actions will only restore habitat that originally existed and occurred naturally in the watershed. Further, the actions are intended to compensate the public, namely make the public and the environment whole, for resources injured by releases of hazardous substances into the watershed. The proposed projects in the preferred alternative are consistent with the MDNR Kalamazoo River Assessment (Wesley, 2005) and the Kalamazoo River Watershed Area of Concern Remedial and Preventative Action Plan (Kalamazoo River Watershed Public Advisory Council, 2000), both of which are comprehensive plans for the restoration of natural resources in the Kalamazoo River watershed.

6. Compliance with Other Authorities

The following federal, state, and local laws, regulations, and policies may affect completion of the restoration projects. All project sponsors that receive natural resource damage funding will be responsible for obtaining necessary permits and complying with relevant local, commonwealth, and federal laws, policies, and ordinances.

6.1 Laws

6.1.1 Federal laws

National Environmental Policy Act (NEPA; 42 U.S.C. § 4321 *et seq.*)

NEPA requires that federal agencies consider the environmental impacts of proposed actions and reasonable alternatives to those actions. The Authorized Official will determine, based on the facts and recommendations in this document and input from the public, whether this EA supports a “Finding of No Significant Impact,” or whether an “EIS” will need to be prepared.

Federal Water Pollution Control Act, 33 U.S.C. § 1251 *et seq.* (also known as the Clean Water Act)

The CWA is intended to protect surface water quality, and regulates discharges of pollutants into waters of the United States. All proposed restoration projects will comply with CWA requirements, including obtaining any necessary permits for proposed restoration actions. Restoration projects that move material in or out of waterways and wetlands, or result in alterations to a stream channel, typically require CWA Section 404 permits. Dam removal actions also require 404 permits. Project sponsors will be required to obtain the appropriate permits before restoration work begins.

As part of the Section 404 permitting process, consultation under the Fish and Wildlife Coordination Act, 16 U.S.C. § 661 *et seq.* generally occurs. This act requires that federal agencies consult with the USFWS, the National Marine Fisheries Service (NMFS), and state wildlife agencies to minimize the adverse impacts of stream modifications on fish and wildlife habitat and resources.

Compliance with the Rivers and Harbors Act, 33 U.S.C. § 401 *et seq.*, generally occurs as part of the Section 404 permitting process. The Rivers and Harbors Act prohibits unauthorized obstruction or alteration of navigable waters. Any required permits under the Rivers and Harbors Act are generally included with the Section 404 permitting process.

Clean Air Act (CAA) of 1970, as amended, 42 U.S.C. § 7401 *et seq.*

The CAA regulates air emissions from stationary and mobile sources to protect human health and the environment. Any activities associated with the restoration projects that result in air emissions (such as construction projects) will be in compliance with the CAA and any local air quality ordinances.

CERCLA, 42 U.S.C. § 9601 *et seq.*, and the Superfund Amendments and Reauthorization Act (SARA) of 1986 (P.L. 99-499)

CERCLA provides authorization to EPA to seek the cleanup of uncontrolled or abandoned hazardous waste sites as well as other emergency releases of pollutants and contaminants into the environment. As discussed previously in this document, the Trustees will ensure that restoration projects are coordinated with CERCLA-authorized remedial actions at the Site.

Federal Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. §§ 1531 *et seq.*

The federal ESA was designed to protect species that are threatened with extinction. It provides for the conservation of ecosystems upon which these species depend and provides a program for identification and conservation of these species. Federal agencies are required to ensure that any actions are not likely to jeopardize the continued existence of a T&E species. Federally listed

endangered, threatened, and candidate species in the vicinity of the Kalamazoo River are listed in Table 4 in this document. Where appropriate, project sponsors will consult with the Endangered Species Program of the USFWS before project implementation.

Fish and Wildlife Conservation Act, 16 U.S.C. § 2901 *et seq.*

The Fish and Wildlife Conservation Act authorizes financial and technical assistance to state governments to develop, revise, and implement conservation plans and programs for nongame fish and wildlife. The Trustees will seek to coordinate their restoration efforts with relevant conservation plans and programs in the State of Michigan.

Fish and Wildlife Coordination Act, 16 U.S.C. § 661 *et seq.*

The Fish and Wildlife Coordination Act authorizes the involvement of the USFWS in evaluating impacts to fish and wildlife from proposed water resource development projects. Federal agencies that construct, license, or permit water resource development projects are required to consult with the USFWS, and in some instances with NMFS, concerning the impacts of a project on fish and wildlife resources and potential measures to mitigate these impacts. The Trustees will engage in coordination if relevant to any of their projects.

Migratory Bird Treaty Act of 1918, as amended, 16 U.S.C. §§ 703–712

The Migratory Bird Treaty Act protects all migratory birds and their e.g.gs, nests, and feathers and prohibits the taking, killing, or possession of migratory birds. The proposed restoration actions would not result in the taking, killing, or possession of any migratory birds.

Migratory Bird Conservation Act, 16 U.S.C. § 715 *et seq.*

The Migratory Bird Conservation Act established a commission and conservation fund to promote the conservation of migratory waterfowl and offset or prevent serious loss of important wetlands and other waterfowl habitat. The Migratory Bird Conservation Fund could potentially provide a source of additional funding to expand on Trustee efforts to conserve or restore migratory waterfowl habitat.

National Historic Preservation Act (NHPA) of 1966, as amended, 16 U.S.C. §§ 470 *et seq.*

NHPA is intended to preserve historical and archaeological sites. Compliance with the NHPA would be undertaken through consultation with the Michigan State Historic Preservation Office. If an eligible historic property is within the area of the proposed restoration project, then an analysis will be made to determine whether the project would have an adverse effect on this historic property. If the project will have an adverse effect on historic properties, then the agency proposing the restoration project will consult with the State Historic Preservation Office to minimize the adverse effect.

Occupational Safety and Health Act (OSHA) of 1970, as amended, 29 U.S.C. §§ 651 *et seq.*

OSHA governs the health and safety of employees from exposure to recognized hazards, such as exposure to toxic chemicals, excessive noise, mechanical dangers, and unsanitary conditions. All work conducted on the proposed restoration actions will comply with OSHA requirements.

Information Quality Act of 2001 (guidelines issued pursuant to Public Law 106-554)

As the lead federal natural resources Trustee for this document, USFWS confirms that this information product meets its Information Quality Act guidelines, which are consistent with those of the DOI and the Office of Management and Budget.

6.1.2 State laws**Natural Resources and Environmental Protection Act, 1994, Public Act 451, as amended**

Michigan's environmental protection and natural resource management authorities have been codified in NREPA. Several parts of NREPA would be applicable to restoration work undertaken by the Trustees. The most significant parts are described below. Permits, where required, are administered by the DEQ, and permit application and review requirements would be consolidated whenever possible. All restoration actions undertaken by the Trustees would comply with relevant provisions of this Act.

Part 31, Floodplain Regulatory Authority Water Resources Protection, requires that a permit be obtained prior to any alteration or occupation of the 100-year floodplain of a river, stream, or drain. The Floodplain Regulatory Authority deals with the floodplains of rivers, streams, and drains that have a drainage area of two square miles or greater. A permit is not required under Part 31 for alterations within the floodplains of the Great Lakes, inland lakes, or watercourses that have a drainage area of less than two square miles.

Part 55, Air Pollution Control, provides authority to the DEQ to engage in a variety of activities to protect air quality, including the regulation of fugitive dust sources and emissions, in accordance with the provisions of M.C.L. 324.5524.

Part 91, Soil Erosion and Sedimentation Control, requires that a permit be obtained to protect against the loss of soil to surface waters including wetlands. A permit is generally required for any Earth change that disturbs one or more acres or is within 500 feet of a lake or stream. Counties have the primary responsibility for issuing permits. In some cases, cities, villages, and townships have assumed permitting responsibility within their jurisdictions. Permit applications can be obtained from the respective county or municipal agencies.

Part 115, Solid Waste Management, regulates companies and businesses that dispose of solid waste. The solid waste program performs inspection, evaluation, permitting, and licensing of solid waste disposal areas in the state, including evaluation of groundwater monitoring data and corrective actions associated with releases from solid waste landfills.

Part 201, Environmental Remediation, provides legislative authority for Michigan’s cleanup program for hazardous waste sites. The purpose of this authority is “to provide for appropriate response activity to eliminate unacceptable risks to public health, safety, or welfare, or to the environment from environmental contamination at facilities within the state” (M.C.L. 324.20102). The authority also includes “additional administrative and judicial remedies to supplement existing statutory and common law remedies” (M.C.L. 324.20102), including making claims against liable parties for “the full value of injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing the injury, destruction, or loss resulting from the release” (M.C.L. 324.20126a).

Part 301, Inland Lakes and Streams, requires a permit from the Land and Water Management Division of the DEQ for certain construction activities on inland lakes and streams. The Inland Lakes and Streams Program is responsible for the protection of the natural resources and public trust waters of the inland lakes and streams of the state. The program oversees the following activities: dredging, filling, constructing, or placing a structure on bottomlands; constructing or operating a marina; interfering with the natural flow of water; and connecting a ditch or canal to an inland lake or stream.

Part 303, Wetlands Protection, requires that a person obtain a permit to perform certain activities in a wetland (Table 7).

Table 7. Examples of types of activities that require a wetlands protection permit

Activity	Example (partial list only)
Deposit or permit the placing of fill material	Bulldozing, grading, dumping
Dredge, remove, or permit the removal of soil or minerals	Removing tree stumps, bulldozing, digging a pond
Construct, operate, or maintain any use or development	Constructing buildings, structures, boardwalks; mining peat, treating water
Drain surface water	Diverting water to another area via ditch, pump, or drain

The programs in DEQ that administer these parts have the objective of protecting human health and the environment in Michigan.

A joint state and federal permit process has been established between the DEQ and the U.S. Army Corps of Engineers for proposed projects in areas that have both state and federal jurisdiction.

Michigan Occupational Safety and Health Act, 1975, Public Act 154

The Michigan OSHA (Public Act 154 of 1974) is an act to prescribe and regulate working conditions, and places and conditions of employment to provide for occupational health and safety. The Departments of Labor and Public Health are responsible for implementing the provisions of this act. All activities conducted under this RP would comply with provisions of this act.

6.1.3 Local laws

As appropriate, restoration actions will consider and comply with local plans and ordinances. Relevant local plans could include shoreline and growth management plans. Relevant ordinances could include, but not be limited to, zoning, construction, noise, and wetlands.

6.2 Policies and Directives

6.2.1 Federal policies and directives

The following federal policies and Presidential Executive Orders may be relevant to the proposed restoration projects in the proposed alternative:

▶ **USFWS Mitigation Policy (Fish and Wildlife Service Manual, 501 FW 2)**

This policy of the USFWS seeks to ensure “no net loss” of fish and wildlife habitat as a result of USFWS actions. The Trustees do not anticipate that any of the proposed projects will result in adverse impacts to habitat.

▶ **Executive Order 11514 – Protection and Enhancement of Environmental Quality, as Amended by Executive Order 11911 Relating to Protection and Enhancement of Environmental Quality**

These Executive Orders require federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the Nation’s environment. These Executive Orders also require agencies to inform the public about these activities and to share data on environmental problems or control methods, as well as to cooperate with other governmental agencies. The actions described in this RP/EA address the intent of these Executive Orders.

▶ **Executive Order 11988 – Floodplain Management**

This Executive Order directs federal agencies to avoid the occupancy, modification, and development of floodplains, when there is a practical alternative. For all projects, the Trustees will work to ensure that any floodplain impacts are minimized.

▶ **Executive Order 11990 – Protection of Wetlands**

This Executive Order instructs federal agencies to avoid adverse impacts associated with destruction or modification of wetlands. The Trustees will work to ensure that projects minimize any wetlands impacts and that all necessary permits are obtained.

▶ **Executive Order 12898 – Environmental Justice**

This Executive Order instructs federal agencies to assess whether minority or low-income populations would be disproportionately impacted by agency actions. The proposed projects are not expected to adversely affect the environment or human health for any environmental justice populations in the vicinity of the proposed projects.

▶ **Executive Order 12962 – Aquatic Systems and Recreational Fisheries**

This Executive Order requires that federal agencies, where practicable and permitted by law, work cooperatively to improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities. The Trustee agencies worked cooperatively to identify potential projects that would benefit aquatic resources and recreational fishing opportunities, in compliance with the intent of this Executive Order.

▶ **Executive Order 13112 – Invasive Species**

This Executive Order requires that federal agencies, where practicable and permitted by law, should identify any actions that may affect the status of invasive species and take actions to address the problem within their authorities and budgets. Agencies also are required not to authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species, unless a determination is made that the benefits of actions outweigh potential harms and measures are taken to minimize harm. The Trustees do not expect to select any restoration projects that would promote the introduction or spread of invasive species.

▶ **Executive Order 13186 – Protection of Migratory Birds**

This Executive Order requires federal agencies to evaluate the effects of their actions on migratory birds, to take actions to avoid or minimize the impacts of their actions on migratory birds, and to help promote conservation of migratory birds if actions are likely

to have a measurable negative effect on migratory bird populations. None of the projects proposed here are expected to have a negative effect on migratory bird populations.

▶ **DOI Departmental Manual, Parts 517 and 609 – Pesticides and Weed Control**

Implementation of any of the projects described in this RP/EA will be consistent with DOI policy to use integrated pest management strategies for control of insect and weed pests. Pesticides or herbicides will only be used after a full consideration of other control alternatives; the material selected and method of application will be the least hazardous of available options.

▶ **DOI Departmental Manual, Part 518 – Waste Management**

If implementation of any alternatives generate waste (e.g., through cleanup of PCB hotspots), the Trustees will comply with all relevant DOI directives and policies.

▶ **DOI Departmental Manual, Part 602 – Land Acquisition, Exchange, and Disposal**

If the federal government acquires any real property through implementation of these restoration projects, appropriate pre-acquisition standards – particularly the American Society for Testing and Materials standard for Environmental Site Assessments for Commercial Real Estate – will be complied with.

6.2.2 State and local policies

Proposed restoration projects will consider and comply with other relevant state and local policies and directives.

7. List of Preparers

This Draft RP/EA was prepared by:

Stratus Consulting
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It was prepared under contract to the State of Michigan and in consultation with the Trustees. Specifically, the following Trustee representatives provided report preparation assistance:

- ▶ Judith Alfano, Michigan Department of Environmental Quality
- ▶ Todd Goeks, National Oceanic and Atmospheric Administration
- ▶ Lisa Williams, U.S. Fish and Wildlife Service.

8. List of Agencies, Organizations, and Parties Consulted

The Trustees consulted with a number of agencies, organizations, and parties on potential restoration alternatives in the KRE in the preparation of the Stage 1 assessment plan and this Draft RP/EA, as listed in Table 8. Because the information presented in this plan was developed over many years, a number of the individuals listed below no longer have the titles or positions recorded in Table 8.

Table 8. Agencies, organizations, and parties consulted by the Trustees

Party	Individual
Government agencies	
Michigan Department of Natural Resources	Michael Bailey, Kalamazoo-Allegan District Wildlife Supervisor John Lerg, Wildlife Biologist Dave Johnson, Fisheries Division Sharon Hanshue, Natural Resource Manager Bill Schmidt, Office of Land and Facilities Jay Wesley, Fisheries Manager Kregg Smith, Fisheries Biologist
Michigan Department of Environmental Quality	Mark Ducharme, Senior Environmental Quality Analyst
Kalamazoo County	Mary Powers, Kalamazoo County Drain Commissioner
U.S. Fish and Wildlife Service	Lisa Williams, Contaminant Specialist
Charleston Township	Jerry Vander Roest
City of Galesburg	Fran Bell
City of Kalamazoo	Gary Niemeck, Office of the City Manager Don Paulsen, Parks and Grounds Division Chad Howell, Development Manager Richard Skalski
City of Parchment	
City of St. Louis	Bob McConkie
Comstock Township	Joe Van Bruggen
Allegan County	Tim Redder, Soil and Water Conservation District
Wisconsin Department of Natural Resources	

Table 8. Agencies, organizations, and parties consulted by the Trustees (cont.)

Party	Individual
Organizations and stakeholder groups	
CEO Council, Inc.	Norm Terry
Downtown Kalamazoo, Inc.	Dave Feehan
Galesburg/Augusta Community Education	Bob Duke
James River Corporation	Vern Fanke
Kalamazoo Central High School	Alta Lahner
Kalamazoo Nature Center	Dr. Willard Rose
Land Trust Alliance	Renee Kivikko, Regional Director
Land Conservancy of West Michigan	April Scholtz
Michigan Nature Conservancy	April Oja, East Lansing Office John Legge, Michigan Chapter Rich Tuzinsky, Michigan Chapter
Western Michigan University	Charles Ide, Environmental Institute Director
Southwest Michigan Land Conservancy	Peter Ter Louw
Davis Creek Watershed Steering Committee	
Michigan State University	Stephen Hamilton, Kellogg Biological Station
Kalamazoo River Protection Association	Dayle Harrison
Augusta Creek Watershed Association	Wes Knollenberg
Kalamazoo River Watershed Council	Eric Kerney Jeff Spoelstra
Private citizens	
Robert Beck	Dr. Charles Mehne
Marc Elliot, Prein & Newhof (former watershed planner for Davis Creek)	Mark Huth

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A. Summary of Potential KRE Restoration Projects

(This appendix was first presented to the public as Appendix A in MDEQ et al., 2005b. It is reproduced here for the convenience of the reader.)

Table A.1. Summary of potential KRE restoration projects

Project description	Source organization
Acquire riparian land parcels along Kalamazoo River to preserve the existing natural corridor and potentially to enhance broader nature corridor development in the area (e.g., look to link with areas like Fort Custer and Gun Lake wilderness areas).	Land Trust Alliance regional director
Determine whether additional restoration activities are warranted in the area around Bryant's Mill pond to enhance the recovery of the natural resources there. Could be considered a "demonstration" restoration project to address the post cleanup conditions likely to exist if other contaminated shore areas are addressed.	Land Trust Alliance regional director
Acquire riparian land parcels along Kalamazoo River to preserve the existing natural corridor.	DNR – Kalamazoo-Allegan district wildlife supervisor
Control the loading of paper waste into the Kalamazoo River (regardless of associated PCB contamination) in order to limit adverse effect on benthic resources and help return sediments to their natural condition.	DNR – Kalamazoo-Allegan district wildlife supervisor
Remove the three sill-level DNR controlled dams on the Kalamazoo River to restore a free flowing waterway to benefit fishery and recreators.	DNR – Kalamazoo-Allegan district wildlife supervisor
Provide increased recreational access to the Kalamazoo River (ideally after PCB cleanup and access facilities could be linked with infrastructure needed to remove sill level dams, e.g., roads for equipment and staging areas).	DNR – Kalamazoo-Allegan district wildlife supervisor
Expand and enhance the use of marsh lands adjacent to the Kalamazoo River (e.g., increase the number of nesting platforms in the areas for raptors while maintaining the forested aspect of the areas).	DNR – Kalamazoo-Allegan district wildlife supervisor
Acquire land in the Lake Allegan shoreline area to limit waterside development and to link existing DNR parcels in the area – have prioritized sites but not formally disclosed (willing seller-willing buyer restrictions and avoid driving up price).	DNR – Kalamazoo-Allegan district wildlife supervisor
Continue and expand the prairie redevelopment projects currently under way on close to 200 acres in the Augusta Creek area near Kalamazoo.	DNR – Kalamazoo-Allegan district wildlife supervisor
Enhance the Oak Barrens area (note: mentioned that this is complicated by the presence of wildlife already in the area).	DNR – Kalamazoo-Allegan district wildlife supervisor
Explore potential conversion of agricultural lands adjacent to area waterways (e.g., buffer conversion) to control nonpoint source pollution loading to the area.	DNR – Kalamazoo-Allegan district wildlife supervisor
Undertake projects to remove invasive nonnative species in DNR lands and to restore native vegetation in those areas.	DNR – Kalamazoo-Allegan district wildlife supervisor
Acquire existing farmlands to create wildlife corridors between existing state game areas, e.g., corridor to link the Allegan and Yankee Springs areas (note the land around these isolated game areas is coming under increasing development pressure from Grand Rapids population).	DNR – Kalamazoo-Allegan district wildlife supervisor

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Acquire lands adjoining existing state game and wildlife areas to enhance their potential carrying capacity and potential species diversity.	DNR – Kalamazoo-Allegan district wildlife supervisor
Remove the three sill-level DNR controlled dams on the Kalamazoo River to restore a free flowing waterway to benefit fishery and recreators.	Private citizen
Incorporate restoration of prairie grass at on site disposal areas that are capped to contain paper waste that is removed and consolidated.	Private citizen
Acquire land along the Kalamazoo River to preserve the existing riverine corridor that serves as a critical migratory bird habitat and as a migratory corridor between the various state game areas (Allegan to Fort Custer and Allegan to Yankee Springs-Barry-Gun Lake).	Private citizen
Acquire land to increase the size of the Allegan State Game area which is under pressure from increased recreational use.	Private citizen
Incorporate features into paper waste excavation, where feasible, that would promote their use by ducks. For example, in areas that are excavated perhaps leave depressions after excavation that could be filled with water and attract ducks. This will benefits the ducks but also will help attract raptor species that prey on ducks such as hawks, falcons, and eagles.	Private citizen
Incorporate features into dam removal projects that would enhance the value of the site to recreators such as sportfishermen or kayakers.	Private citizen
Remove three sill-level DNR controlled dams on the Kalamazoo to restore a free flowing waterway to benefit fishery resources first; any additional recreator benefits a bonus but should not be primary consideration.	Kalamazoo County Drain Commissioner (elected 11/00) – former county commissioner
Acquire land along the Kalamazoo River to preserve the existing riverine corridor and to prevent development of projects with potentially adverse environmental impacts (e.g., the proposed and approved auto junk yard in the floodplain in Comstock).	Kalamazoo County Drain Commissioner (elected 11/00) – former county commissioner
Address oily contamination in Davis Creek.	Kalamazoo County Drain Commissioner (elected 11/00) – former county commissioner
Clean out sediment backups in Arcadia Sewer focusing on the backups between downtown Kalamazoo and Western Michigan University (WMU).	Kalamazoo County Drain Commissioner

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Remove the three sill level dams along the Kalamazoo River to restore a free flowing waterway to the Kalamazoo – also consider two additional dams in the area – this is top priority and has been a DNR objective for a number of years.	DNR
Acquire property and restore wetlands in floodplain properties along the Kalamazoo River.	DNR
Acquire marsh habitat property at the mouth of the Kalamazoo River where it enters Lake Michigan in Saugatuck; area provides excellent fisheries spawning and rearing sites. Project facilitated because relevant land is under control of one owner. If possible, enhance river access from the site as well.	DNR
Implement watershed protection projects addressing erosion control, groundwater protection, and reduction in surface water removals all with goals of improving water quality and to avoid reducing instream flow below critical levels.	DNR
Acquire floodplain and other lands to establish natural wildlife corridors that would then link the various state wilderness and game areas with each other.	DNR
Take actions to enhance the colonization and reproduction of freshwater mussels that should be found in the river but are currently lacking.	DNR
Attempt to remove and subsequently prevent the return of or minimize the spread of aquatic nuisance species (e.g., purple loosestrife and zebra mussels).	DNR
Develop a trust fund for feasibility investigations and ultimately the restoration of species.	DNR
Acquire land in upstream part of Kalamazoo River geared at conversion of agricultural land to riparian habitat to reduce nonpoint source nutrient and pollutant loads as well as to restore beneficial riparian habitat.	DNR
Develop public education programs aimed at providing information on the nature and benefits of a fully functioning watershed and of the different types of plants and animals found in the system.	DNR
Dredge shallow areas behind the present state-owned dams to create some diversity in wetlands, by providing some open water shallow pools.	DNR – Kalamazoo-Allegan district wildlife supervisor
Preserve the existing, and where necessary, restore the natural riparian zone along the Kalamazoo River.	USFWS
Restore freshwater mussel beds in suitable areas of the river once appropriate conditions for success exist.	USFWS
Establish natural wildlife corridors to connect Kalamazoo with Gun Lake and Fort Custer state game areas.	USFWS
Preserve and restore wetland habitat.	USFWS
Reduce nonpoint source pollutant loadings to the river.	USFWS
Increase public recreational access to the river and resources following the recommendations of local wildlife managers.	USFWS

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Pursue habitat restoration in areas where waste disposal cells are established, e.g., attempt to restore native prairie grasses on the caps of on-site waste disposal cells that are established.	USFWS
Acquire floodplain and other lands to establish natural wildlife corridors that would then link the various state wilderness and game areas with each other while preserving the current characteristics of the Kalamazoo River corridor.	DNR – wildlife biologist out of Allegan area, also effective property manager for Allegan state game area
Acquire existing in-holdings in the Allegan state game area to bring the entire area under the control of the DNR.	DNR – wildlife biologist out of Allegan area, also effective property manager for Allegan state game area
Acquire lands that provide opportunities for road access to the current DNR bottomland holdings obtained from Consumers Power along the river between Allegan and Plainwell. These lands currently lack road access and must be visited by boat.	DNR – wildlife biologist out of Allegan area, also effective property manager for Allegan state game area
Promote remedial alternatives that allow for a free-flowing Kalamazoo River and avoid creating open areas that could attract currently vulnerable species and increase the predation upon them (e.g., turtles).	DNR – wildlife biologist out of Allegan area, also effective property manager for Allegan state game area
Undertake a “Battle Creek” type program consisting of a major cleanup, bank protection to reduce erosion, linear parks, and walkways.	CEO Council, Inc.
Recognize and preserve existing habitat before adversely affected by development.	CEO Council, Inc.
Provide for public ownership of property adjoining river (suggested 200-foot width), which is then reserved as green space or for parks.	CEO Council, Inc.
Conduct environmental assessment of the resources in the river area.	CEO Council, Inc.
Expand ordinances that prevent development within the floodplain as in Charleston Township.	Charleston Township
Consider the purchase of riverfront property for use as a community park.	City of Galesburg
Increase public recreational development along the Kalamazoo River in Galesburg – reflects Galesburg residents survey preferences (67% respond Yes, 24% No).	City of Galesburg
Construct a bicycle-pedestrian bridge to cross the river at the site of the old auto bridge that had been removed in Galesburg – incorporate extensions for sitting-fishing areas.	City of Galesburg
Preserve and acquire lands of at least 100 feet adjoining the river in the city of Kalamazoo to accommodate a publicly accessible green space.	City of Kalamazoo – Office of the city manager

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Develop riverside linear park with viewing areas and access for canoeing and walkways paralleling the river (schematic plan provided).	City of Parchment
Develop a walkway and bridge that would circle Morrow Pond along the telephone company easement and connect with the existing River Oaks Park.	Comstock Township
Increase access and opportunities for recreationalists interested in exploring the Kalamazoo River (e.g., walkways, bike paths, x-county ski trails).	Downtown Kalamazoo Inc.
Explore options for increasing salmonid access up to Battle Creek – requires combination of fish ladders and desired removal of Department of Natural Resources dams – all fisheries projects subject to the addressing of the PCB contamination in the Kalamazoo.	DNR Fisheries Division
Explore opportunities to expand interactive learning with increased facilities, access, and connectors between local schools and school-owned lands adjacent to the Kalamazoo River (model after Galesburg River project).	Galesburg/Augusta Community Education
Increase access and opportunities for recreationalists interested in exploring the Kalamazoo River (e.g., walkways, bike paths, x-county ski trails).	James River Corporation
Consider development of a riverside learning platform for use by schoolchildren.	Kalamazoo Central High School
Develop a linear park in Kalamazoo along the river.	Kalamazoo City Parks and Grounds Division
Acquire additional lands to expand the Kalamazoo Nature Center.	Kalamazoo Nature Center
Increase trail access and viewing areas along the Kalamazoo River on Kalamazoo Nature Center lands – link where possible with other trails to create a comprehensive trail system.	Kalamazoo Nature Center
Acquire additional lands to expand the Nature Conservancy holdings in Charleston township between Galesburg and August (have a parcel of floodplain forest – waters at the site support a healthy freshwater mussel population).	Michigan Nature Conservancy (E. Lansing office)
Conduct a survey of macro-invertebrates in the Rabbit River to assess its potential for again supporting an active sport fishery based around bass and northern pike.	Private citizen
Explore options for reduction of nonpoint source loading of silt and sediment to the Rabbit River (main tributary to the Kalamazoo River). A 319 watershed grant with EPA is in place to evaluate the issue. Benefits would include potential restoration of a once thriving sportfishery for small mouth bass, creek chubs, shiners, and ultimately northern pike.	Private citizen

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Restore mink populations in the area.	Private citizen
Restore fish habitat and a healthy fishery where PCB contamination is held to 0.05 parts per million or lower of PCBs.	Private citizen
Look to enhance recreational boating opportunities with the removal of the dams on the Kalamazoo River (exception of Lake Allegan Dam), and look for opportunities to include white water sections as well.	Private citizen
Removal of the waste along the shores of Lake Allegan (e.g., tires, drums, lawn chairs) to enhance the perception of the river being a “clean” resource.	Private citizen
Increase the amount of deepwater areas in the nearshore part of Lake Allegan by conducting additional dredging if equipment is going to be onsite anyway as part of a remedial action.	Private citizen
Implement the Kalamazoo River Valley Trailway plan to provide non-motorized means of access along the Kalamazoo River – would go from Battle Creek to city of Allegan and out to Portage. Envisioned trails would complete links with other existing trail systems already in place.	City of Kalamazoo
Acquire and preserve floodplain forest lands along the Kalamazoo River and its tributaries. Benefits would be helping to ensure the biodiversity of the Great Lakes in general and potential ecological benefits for aquatic species and improved water quality.	The Nature Conservancy, Michigan Chapter
Control the loading of PCBs into the Kalamazoo River and its tributaries.	DNR
Remove remaining sill level dams on the Kalamazoo to eliminate fish blockages that will improve the local fishery.	DNR
Undertake habitat restoration projects on the tributaries of the Kalamazoo – have lacked attention as a result of the ongoing PCB contamination but the tributaries could support viable fisheries and in several cases, could potentially support trout fisheries with the cold water flows.	DNR
Increase public access to the Kalamazoo River and its tributaries; need for access to the Kalamazoo River is especially acute in the region between Plainwell and Kalamazoo.	DNR
Develop fish passage structures for Allegan Dam to allow upstream migration of species (e.g., salmonids) currently blocked from these areas (requires assessment of potential impact on existing fishery resources upstream of Allegan Dam as a result of creating access, e.g., impact on trout or salmon).	DNR
Reduce sand and silt loadings from unpaved county roads into the tributaries of the Kalamazoo River (e.g., selected paving or development of buffer strips).	DNR
Address the culverts in tributaries on county roads that currently present a barrier to fish.	DNR
Develop a public information and education program designed to increase awareness of local waterway resources and increase sense of stewardship and responsibility for these resources.	DNR

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Remove all dams on the Kalamazoo River with the exception of the one at Lake Allegan.	Private citizen
Remove any PCB contaminated soils and sediments, including floodplains, that would be left following the eventual implementation of a remedy (i.e., ensure all PCB contamination is removed).	Private citizen
Restore wetlands adversely impacted from PCB-related contamination.	Private citizen
Restore eagle populations in the area.	Private citizen
Provide resources necessary for improvement of the lake sturgeon fishery on the Kalamazoo River (e.g., remove dams) – note that the Kalamazoo River was given the top rating of “high” in the evaluation of suitability of Michigan streams draining into the Great Lakes in terms of its suitability to support a lake sturgeon population in the 1997 Lake Sturgeon Committee report.	USFWS
Provide resources necessary to complete actions outlined in original city of Kalamazoo grant proposal to the Clean Michigan Initiative program (original request for \$6 million – grant of \$2.6 million received).	City of Kalamazoo – Development Manager
Provide funding to continue the remediation and restoration of the former refinery site on Davis Creek. Possible actions could include restoring stream hydrology, restoring native vegetation, and funding the cleanup of the remaining contaminated resources (e.g., terrestrial and aquatic including free product on groundwater) – depending on timing could be considered a demonstration project where the funds are used to provide the required match for the Corps to proceed with any actions.	City of Kalamazoo – Development Manager
Continue to establish greenways along the waterfront of the Kalamazoo River and other waterways in the city.	City of Kalamazoo – Development Manager
Improve public access to the Kalamazoo River (e.g., canoe launch).	City of Kalamazoo – Development Manager
Remove remaining sill level dams on the Kalamazoo.	WMU – Environmental Institute director
Eliminate and/or control the loading of PCBs into the waters of the Kalamazoo River.	WMU – Environmental Institute director
Public education and awareness – initiate a graphic design competition to create a Davis Creek Watershed signage.	Davis Creek Watershed Steering Committee
Public education and awareness – install Davis Creek signage at major creek crossings and other appropriate locations.	Davis Creek Watershed Steering Committee
Public education and awareness – stencil urban storm sewer inlets.	Davis Creek Watershed Steering Committee

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Public education and awareness – prepare and distribute a Davis Creek watershed newsletter for the Davis Creek watershed implementation project.	Davis Creek Watershed Steering Committee
Public education and awareness – promote streambank revegetation and bioengineering techniques.	Davis Creek Watershed Steering Committee
Public education and awareness – implement a property owner nonpoint source education and on-site assistance program targeted toward industrial, commercial, and concentrated residential properties.	Davis Creek Watershed Steering Committee
Public education and awareness – create a public speakers list of water quality protection and related topics to be made available to public/private organizations seeking program speakers.	Davis Creek Watershed Steering Committee
Public education and awareness – support ongoing community environmental programs that provide water quality benefits (e.g., soil conservation and groundwater protection, household hazardous waste collection, and recycling).	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – seek to create annual “river” or “watershed” festival similar to the famous Kalamazoo Flower Festival.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – expand the Creek Watch Hot Line of the River Partners Program to include periodic meetings with designated liaisons of responsible agencies.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – create a self sustaining adopt-a-creek program for Davis Creek.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – host in-county workshops and/or conferences on water quality issues.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – encourage school districts to incorporate watershed education and an annual watershed appreciation day into the curricula.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – assist citizen groups and neighborhood associations in self-directed efforts to engage members in watershed protection.	Davis Creek Watershed Steering Committee
Community involvement; effective citizen stewardship – create an annual Citizen Award program for watershed protection efforts.	Davis Creek Watershed Steering Committee
Watershed master planning and public stewardship – create an empowered interagency committee to further the initiatives of the Davis Creek implementation project.	Davis Creek Watershed Steering Committee
Watershed master planning and public stewardship – initiate integrated engineering redesign of the Davis Creek drainage corridor to creatively mitigate the detrimental effects of the disturbed hydraulics of Davis Creek (i.e., restore natural hydrology of Davis Creek including meanders and vegetation).	Davis Creek Watershed Steering Committee

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Watershed master planning and public stewardship – develop a long-term data collection strategy for monitoring the Davis Creek watershed.	Davis Creek Watershed Steering Committee
Watershed master planning and public stewardship – seek grant funding to evaluate contaminated groundwater impacts to the water quality of Davis Creek.	Davis Creek Watershed Steering Committee
Watershed master planning and public stewardship – use the Davis Creek Watershed Project as a model with which to encourage similar watershed planning efforts.	Davis Creek Watershed Steering Committee
Municipal storm water management – implement a structured storm drainage system inspection and maintenance program to protect the public’s safety, water quality, and the infrastructure investment.	Davis Creek Watershed Steering Committee
Municipal storm water management – initiate an appropriately scaled water quality management program for all municipal storm water drainage systems.	Davis Creek Watershed Steering Committee
Municipal storm water management – seek creative funding mechanism to finance regular drainage system inspection, maintenance, and water quality management programs.	Davis Creek Watershed Steering Committee
Municipal storm water management – pursue cost-shared implementation of site-specific nonpoint source remediation projects through the DEQ grant funded Davis Creek Implementation Project and other assistance programs.	Davis Creek Watershed Steering Committee
Earth movement, soil erosion, and sedimentation control – pursue improved coordination and enhanced enforcement of Act 347 of 1972 Soil Erosion and Sedimentation Control.	Davis Creek Watershed Steering Committee
Earth movement, soil erosion, and sedimentation control – assure Act 347 permitting officers possess Michigan Department of Environmental Quality certification and receive annual training.	Davis Creek Watershed Steering Committee
Earth movement, soil erosion, and sedimentation control – notify municipal storm water owners/operators of any Act 347 permits issued within their system service areas.	Davis Creek Watershed Steering Committee
Earth movement, soil erosion, and sedimentation control – train on-street employees to recognize and report soil erosion control problems.	Davis Creek Watershed Steering Committee
Earth movement, soil erosion, and sedimentation control – fund expanded Act 347 monitoring through monthly permit fees adjusted for total area of unstable soils per month.	Davis Creek Watershed Steering Committee
Site development design standards – develop minimum stream corridor setbacks and other critical area site design standards to provide water quality protection.	Davis Creek Watershed Steering Committee
Site development design standards – promote drainage management strategies which consider both the quantity and the quality impacts of storm water runoff.	Davis Creek Watershed Steering Committee
Site development design standards – develop storm water management requirements which encourage on-site management whenever possible.	Davis Creek Watershed Steering Committee

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Site development design standards – monitor temporary erosion controls concurrent with building construction inspections.	Davis Creek Watershed Steering Committee
Site development design standards – complete dye or other positive testing of waste drains prior to issuing a certificate of occupancy.	Davis Creek Watershed Steering Committee
Land use planning – identify stream corridor environmental features (e.g., flood control, water quality protection, habitat) to be protected through local land use planning.	Davis Creek Watershed Steering Committee
Land use planning – protect significant features through local land development standards.	Davis Creek Watershed Steering Committee
Land use planning – preserve urban stream corridor greenways.	Davis Creek Watershed Steering Committee
Intergovernmental cooperation and coordination – restrict environmental high-risk land use activities from locating in critical watershed areas.	Davis Creek Watershed Steering Committee
Intergovernmental cooperation and coordination – seek to implement the community retention basins recommended in the Olmsted-Davis Creek Drainage Study.	Davis Creek Watershed Steering Committee
Intergovernmental cooperation and coordination – initiate dialogue and establish working liaisons among the ten local agencies with Act 347 permitting authority.	Davis Creek Watershed Steering Committee
Intergovernmental cooperation and coordination – provide public trash/litter containers at high pedestrian traffic locations along the creek.	Davis Creek Watershed Steering Committee
Intergovernmental cooperation and coordination – initiate coordinated interjurisdictional development of model ordinances for stream corridor land use; drainage, construction details for stream crossings, roadways, and parking lots; nonpoint source nuisance pollution; and guides for street sweeping, roadway deicing, etc.	Davis Creek Watershed Steering Committee
Remediation of contaminated sites; urban redevelopment; and sustainable growth – establish a local governmental liaison group to coordinate local involvement in state/federal led environmental cleanups.	Davis Creek Watershed Steering Committee
Remediation of contaminated sites; urban redevelopment; and sustainable growth – seek to reconstruct natural riparian conditions concurrently with any brown field redevelopment.	Davis Creek Watershed Steering Committee
Remediation of contaminated sites; urban redevelopment; and sustainable growth – seek removal of trapped sediment and dismantle the Davis Creek Dam at Lakeside.	Davis Creek Watershed Steering Committee
Remediation of contaminated sites; urban redevelopment; and sustainable growth – establish training certification programs for bulk chemical users, similar to certification required for restricted use pesticides.	Davis Creek Watershed Steering Committee

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Site development design standards – restrict new, potentially significant nonpoint source polluting facilities (e.g., industrial/commercial sites, parking lots) from conveying runoff directly to a water body.	Davis Creek Watershed Steering Committee
Site development design standards – provide public authority or other legal arrangements to assure long-term maintenance of privately installed storm water management systems.	Davis Creek Watershed Steering Committee
Establish wildlife corridors linking existing game areas to the Kalamazoo River (e.g., develop a wildlife corridor along Augusta Creek).	Michigan State University (MSU) – Kellogg Biological Station (professor with emphasis on aquatic system ecology)
Acquire existing lands with unique natural resource features for preservation and enhancement (e.g., use Nature Conservancy, Southwest Michigan Land Conservancy, and Michigan Natural Features Inventory information as a guide for acquisition targets).	MSU – Kellogg Biological Station (professor with emphasis on aquatic system ecology)
Implement any remaining activities from the Master Plan for the Lakeside Refinery Site/Davis Creek which look to turn the former refinery site into an area emphasizing passive recreation and restoration of natural habitats to the area.	Prepared for Davis Creek Watershed Steering Committee
Ensure complete removal of PCB-contaminated sediments and soil deposits from the wetlands and floodplains in the assessment area.	Kalamazoo River Protection Association
Undertake means to increase the populations of all species adversely affected by the PCB contamination (e.g., fish, eagles, mink).	Kalamazoo River Protection Association
Removal of dams along Portage Creek and Kalamazoo River to restore free-flowing waterways to benefit fishery and recreational users.	Kalamazoo River Protection Association
Increase the depth of Lake Allegan and all the navigational channels and marinas downstream of the Kalamazoo River – conduct after cleanup operations are completed.	Kalamazoo River Protection Association
Acquire lands to protect existing habitat and to create green spaces and wildlife migration corridor.	Kalamazoo River Protection Association
Implement best management practices (BMPs) to reduce nonpoint source loads of sediment and other pollutants to waterways from agricultural lands (BMPs such as buffer strips, grassed waterways, conservation tillage, animal waste storage structures).	Allegan County Soil and Water Conservation District
Acquire lands to preserve and protect existing habitat and riparian corridor along the Kalamazoo River (i.e., prevent riverfront development that is likely if the PCB contamination issue can be adequately addressed).	Private citizen

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Acquire lands along tributaries to the Kalamazoo River to preserve and protect existing habitat.	Private citizen
Examine opportunities to use NRDA restoration funds to set up a revolving fund to purchase tradable pollution permits under the trading regime that is to be set up on the Kalamazoo River – could also use funds for direct purchase and retirement of the permits.	Private citizen
Implement BMPs to reduce nonpoint source loads of sediment and other pollutants to waterways from agricultural lands (BMPs such as buffer strips, grassed waterways, conservation tillage, animal waste storage structures).	Private citizen
Examine opportunity to establish watershed-based working groups or organizations that would be comprised of local government officials with current authority to oversee land use and land management – perspective is problems are dealt with at primarily the local or state level so a cohesive strategy for a watershed is hard to develop and/or implement.	Private citizen
Develop a wildlife corridor around Augusta Creek that would preserve its existing wetlands and riparian zone prior to the encroachment of human activity and structures.	Augusta Creek Watershed Association (Augusta)
Protect/restore northern pike spawning habitat with metal weirs designed to exclude carp that would disrupt the emergent vegetation (little sign of success in field studies in Green Bay, WI, e.g., algae builds up on weirs reducing wave action in enclosure which stimulates additional algae growth).	Wisconsin Department of Natural Resources
Restore pooled wetland and tributary stream northern pike spawning and rearing habitat through elimination of “perched” culverts and other impediments that restrict access to spawning/rearing sites, and active habitat restoration such as reshaping roadside ditches and providing hydrologic buffers with conversion of agricultural lands to wetlands, shallow scrapes and development of water control structures and supplemental sources for spawning/rearing areas.	Wisconsin Department of Natural Resources
Lower part of Kalamazoo River is a designated natural river which requires a 300-foot buffer from the bank for new structures – model for upper Kalamazoo River potentially.	DNR
Lower part of Kalamazoo River is a designated natural river which requires a 50-foot buffer of natural vegetation on private land (150 feet on public land) with some provisions for cutting to maintain views and remove dead vegetation – model for upper Kalamazoo potentially.	DNR
Remove PCB waste plus paper waste and all dam implements and then remove the dam structures entirely.	Kalamazoo River Watershed Council
Establish safe portages until the dams are removed.	Kalamazoo River Watershed Council

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
If dams are not removed, introduce ways for wildlife to migrate up/downstream (i.e., fish ladders).	Kalamazoo River Watershed Council
Establish a 300–500 foot setback for all development on the Kalamazoo River to establish/protect a riparian corridor.	Kalamazoo River Watershed Council
Restrict agriculture and animal use within a 500-foot distance from river edge.	Kalamazoo River Watershed Council
Increase public awareness of and opportunities for continued education on the functioning and role of the Kalamazoo River ecology.	Kalamazoo River Watershed Council
Revisit zoning along the river to establish designated places for new development and to clear standards for what will be allowed in locations and how it should look.	Kalamazoo River Watershed Council
Purchase conservation easements along existing undeveloped tracts of the river, perhaps in proximity of proposed trailway.	Kalamazoo River Watershed Council
Purchase properties adjacent to the river with existing, nonconforming (i.e., undesirable) uses.	Kalamazoo River Watershed Council
Assure sufficient contiguous wetlands of high quality to support the Kalamazoo River fishery.	Kalamazoo River Watershed Council
As river is cleaned of PCBs, harvest contaminated fish and plant/transplant fish free from PCBs.	Kalamazoo River Watershed Council
Re-establish a thriving eagle population.	Kalamazoo River Watershed Council
Promote purchases and donations and offering agreements to landowners who agree to limit sale for development of riverfront.	Kalamazoo River Watershed Council
Buy back lands near (and within – in section titled remove inholdings) public holdings and then remove the extensive two track systems.	Kalamazoo River Watershed Council
Encourage sale or donation of private lands to Nature Conservancies.	Kalamazoo River Watershed Council
Teach farmers and animal growers new and better ways to control runoff (i.e., look to increase awareness and implementation of BMPs among the farming and livestock communities).	Kalamazoo River Watershed Council
Create farm fences to prevent livestock wastes in river and also to prevent the animals from getting into the river (example of a specific BMP for controlling nonpoint source – also helps limit streambank erosion).	Kalamazoo River Watershed Council

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Promote residential rain gardens and groundwater infiltration as opposed to stormwater flows; commercial rain gardens (check vs. the EPA's existing stormwater regulations that were being implemented at this time and that communities were looking for funding for, e.g., settlement and recharge ponds).	Kalamazoo River Watershed Council
Limit use of salt on roads and around facilities (e.g., apartment buildings and college campuses).	Kalamazoo River Watershed Council
Parking lots and other indirect discharges must be identified and retrofitted with swirl technology.	Kalamazoo River Watershed Council
Construct wetland wastewater treatment plants.	Kalamazoo River Watershed Council
Encourage and facilitate residential, commercial, and industrial grey water systems.	Kalamazoo River Watershed Council
Explore options for water quality and discharge trading systems, development of total maximum daily loads (TMDLs).	Kalamazoo River Watershed Council
Promote habitat restoration in urban areas by use of creative landscaping, as at the University of Washington.	Kalamazoo River Watershed Council
Link land (i.e., habitat corridors with planned or proposed bicycle corridors – wider bike easements).	Kalamazoo River Watershed Council
Increase efforts for education and implementation to increase the amount of prairie restoration in the area, e.g., look at controlled burns and establishment of the large contiguous tracts needed to make the restoration work.	Kalamazoo River Watershed Council
Remove existing steel cladding of PCB removal sites along the Kalamazoo River and avoid the use of similar cladding at future sites.	Kalamazoo River Watershed Council
Improve the number and safety of boat launch (currently canoe and kayak) sites and increase the management at existing put-in sites to limit the informal creep of the sites and the accompanying erosion.	Kalamazoo River Watershed Council
Ensure river trail way for access on land and along water.	Kalamazoo River Watershed Council
Improve rural road crossings to prevent salt runoff during snow falls and remove the trash and debris build up along bridges and loading areas.	Kalamazoo River Watershed Council
Acquire lands for preservation, habitat, and recreation.	Kalamazoo River Watershed Council

Table A.1. Summary of potential KRE restoration projects (cont.)

Project description	Source organization
Acquire lands for canoe launch sites and primitive camping.	Kalamazoo River Watershed Council
Restore existing sites for habitat uses – Bryant Mill Pond PCB cleanup area.	Kalamazoo River Watershed Council
Promote bike pathways and parks between major cities – bring Portage Trailway to the river and link it with the Kal Haven and other trailways.	Kalamazoo River Watershed Council
Create riparian buffers to improve fish habitat (additional benefit of controlling nonpoint source pollution loading).	Kalamazoo River Watershed Council
Purchase existing pollution credits and retire them (check on status of the TMDL Agreement for the Kalamazoo River).	Kalamazoo River Watershed Council
Remove non-native species of nuisance plants.	Kalamazoo River Watershed Council
Evaluate impact of county drains on the river including its pollutant and sediment loading and the impact high flow drains have on river scouring.	Kalamazoo River Watershed Council
Install passageways under roads to enable/facilitate animal movement.	Kalamazoo River Watershed Council
Encourage brownfield development as an alternative to control sprawl from development.	Kalamazoo River Watershed Council

B. Kalamazoo River Natural Resource Trustees – Land Transaction Policy

The purpose of this policy is to provide guidance to the Trustees, their staff, and other interested parties involved in the transfer of real property, property easements, and development rights to be used as restoration, rehabilitation, replacement and/or acquisition of the natural resources associated with the Kalamazoo River Superfund Site NRDA case. The Kalamazoo River Natural Resource Trustees intends to follow this guidance when making its final decisions about funding for the purchase of property, property easements, and development rights to achieve the goals of the RP/EA for OU1.

This policy will apply to all real property transactions for the restoration, rehabilitation, replacement and/or acquisition of the natural resources injured by the release of hazardous substances from Kalamazoo River Superfund Site, as outlined in the Draft RP/EA.

Criteria for land transactions:

- ▶ The property must address the goals established in the RP/EA.
- ▶ The Kalamazoo River Natural Resource Trustees will not retain title to any properties purchased. All properties must have a partnering Trustee agency, nonprofit organization, or other governmental unit willing to accept all responsibilities for maintenance and associated liability inherent in property ownership. The Trustees shall be held harmless for all liability associated with the property.
- ▶ Any interests in the property acquired with Trustee funds must be consistent with the RP/EA.
- ▶ All properties purchased through negotiated settlements or using NRDA settlement funds must be from willing sellers, except in the case of property purchased through foreclosure proceedings.
- ▶ The Trustees may commit funds for property purchase; however, funds will not be released until the appropriate documentation is supplied to the Trustees and to the partnering Trustee agency or other organization or agency that will hold title to the land. Each partnering Trustee agency may require different documentation prior to accepting a parcel for acquisition; the group requesting funding for land acquisition must contact the partnering Trustee to determine what documentation is needed. At a minimum, the entity purchasing the property must have already submitted to the Trustees Coordinator an

appraisal prepared and completed by an individual possessing a certified general real property appraiser's license. In the some situations, the appraiser may need to be certified by the DOI.

- ▶ Any interests purchased with Trustee funds by third parties must include a recorded notice of agreement (see the attachment).
- ▶ If the property purchased results in a clouded title or if the title cannot be cleared, purchase funds will be reimbursed to the Kalamazoo River Natural Resource Trustees.
- ▶ This policy incorporates by reference all of the project selection criteria detailed in the RP/EA.
- ▶ Land acquisition requirements include:
 - An environmental site assessment has been conducted for the property by the DOI
 - Appropriate title documentation and/or title insurance has been obtained.

(This form may be modified to meet local land recording requirements)

ATTACHMENT: NOTICE OF COOPERATIVE (GRANT) AGREEMENT

[GRANT RECIPIENT/COOPERATOR] is the owner of [a conservation easement interest in] a certain parcel of land located in [TOWN, COUNTY, STATE] more particularly described in Attachment A (the "Property").

Notice is hereby given that [GRANT RECIPIENT/COOPERATOR] acquired the [conservation easement interest in the] Property with financial support from the [GRANTOR NATURAL RESOURCE TRUSTEE AGENCY] pursuant to a [GRANT/COOPERATIVE] Agreement with the [NATURAL RESOURCE TRUSTEE AGENCY] dated _____, Agreement Number: _____, included in this Notice along with any addenda or task orders, as Attachment B.

The purpose of the [GRANT/COOPERATIVE] Agreement is to provide financial support to partially fulfill the natural resource restoration objectives developed pursuant to the Kalamazoo River Superfund Site Operable Unit 1 Restoration Plan/Environmental Assessment (RP/EA), a copy of which is kept at [NATURAL RESOURCE TRUSTEE AGENCY OFFICE] and at the offices of the [GRANT RECIPIENT/COOPERATOR].

[GRANT RECIPIENT/COOPERATOR] is placing this notice on record as confirmation of its obligation to ensure the protection and conservation of the Property for the purpose of natural resource restoration as specified by the Kalamazoo River Superfund Site Operable Unit 1 RP/EA. [GRANT RECIPIENT/COOPERATOR] hereby agrees that this [conservation easement interest in the] Property may not be encumbered in any way that affects the purpose of the [GRANT/COOPERATIVE] Agreement and may only be transferred to another entity incorporated under the provisions of 503(c)3 of the Internal Revenue Code or to an acceptable local government entity (e.g., state, county, or watershed district), provided the [GRANTOR NATURAL RESOURCE TRUSTEE AGENCY] determines in writing the entity is an acceptable successor, and provided further that the entity will manage the property in accordance with the Kalamazoo River Superfund Site Operable Unit 1 RP/EA published under the authority of CERCLA. If the [GRANT RECIPIENT/COOPERATOR] sells or encumbers the Property in violation of this obligation of the purposes of this [GRANT/COOPERATIVE] Agreement, the proceeds of such sale or encumbrance will be used to pay the [GRANTOR NATURAL RESOURCE TRUSTEE AGENCY], the percentage of the fair market value of the Property attributable to the [GRANT/COOPERATIVE] Agreement.

In witness whereof the [GRANT RECIPIENT/COOPERATOR] has set its hand and seal this _____ day of _____, 2-__.

[GRANT RECIPIENT/COOPERATOR]

By: _____

Its: _____

STATE OF)
)ss.
COUNTY OF)

On this ____ day of _____, 20__, before me personally appeared _____
_____, to me personally known, who, being by me duly sworn did say that
_____ is the _____ of the corporation named in the foregoing
instrument; that the seal affixed to said instrument is the corporation seal of said corporation: and
acknowledged said instrument to be the free act and deed of said corporation.

Notary Public

**C. Michigan Endangered and Threatened Species
Observed in the Vicinity of the Kalamazoo River**

Scientific name	Common name	State status
<i>Acipenser fulvescens</i>	Lake sturgeon	T
<i>Acris crepitans blanchardi</i>	Blanchard's cricket frog	T
<i>Agalinis gattingeri</i>	Gattinger's gerardia	E
<i>Agrimonia rostellata</i>	Beaked agrimony	T
<i>Alasmidonta viridis</i>	Slippershell	T
<i>Ambystoma opacum</i>	Marbled salamander	E
<i>Ambystoma texanum</i>	Smallmouth salamander	E
<i>Ammocrypta pellucida</i>	Eastern sand darter	T
<i>Ammodramus henslowii</i>	Henslow's sparrow	E
<i>Arabis perstellata</i>	Rock cress	T
<i>Aristida tuberculosa</i>	Beach three-awned grass	E
<i>Aristolochia serpentaria</i>	Virginia snakeroot	T
<i>Asclepias hirtella</i>	Tall green milkweed	T
<i>Asclepias purpurascens</i>	Purple milkweed	T
<i>Asio flammeus</i>	Short-eared owl	E
<i>Aster drummondii</i>	Drummond's aster	T
<i>Aster sericeus</i>	Western silvery aster	T
<i>Astragalus canadensis</i>	Canadian milk vetch	T
<i>Baptisia leucophaea</i>	Cream wild indigo	E
<i>Bartonia paniculata</i>	Panicled screwstem	T
<i>Berula erecta</i>	Cut-leaved water parsnip	T
<i>Besseyia bullii</i>	Kitten-tails	E
<i>Bouteloua curtipendula</i>	Side-oats grama grass	E
<i>Buteo lineatus</i>	Red-shouldered hawk	T
<i>Calamagrostis stricta</i>	Narrow-leaved reedgrass	T
<i>Carex albolutescens</i>	Sedge	T
<i>Carex conjuncta</i>	Sedge	T
<i>Carex lupuliformis</i>	False hop sedge	T
<i>Carex oligocarpa</i>	Eastern few-fruited sedge	T
<i>Carex platyphylla</i>	Broad-leaved sedge	E
<i>Carex seorsa</i>	Sedge	T
<i>Carex straminea</i>	Straw sedge	E
<i>Castanea dentata</i>	American chestnut	E

Scientific name	Common name	State status
<i>Catinella protracta</i>	A land snail (no common name)	E
<i>Catocala amestris</i>	Three-staff underwing	E
<i>Cirsium pitcheri</i>	Pitcher's thistle	T
<i>Clemmys guttata</i>	Spotted turtle	T
<i>Clinostomus elongatus</i>	Redside dace	E
<i>Clonophis kirtlandii</i>	Kirtland's snake	E
<i>Coregonus artedi</i>	Lake herring or Cisco	T
<i>Coreopsis palmata</i>	Prairie coreopsis	T
<i>Corydalis flavula</i>	Yellow fumewort	T
<i>Cryptotis parva</i>	Least shrew	T
<i>Cyclonaias tuberculata</i>	Purple wartyback	T
<i>Cypripedium candidum</i>	White lady slipper	T
<i>Dendroica cerulea</i>	Cerulean warbler	T
<i>Dendroica discolor</i>	Prairie warbler	E
<i>Dendroica dominica</i>	Yellow-throated warbler	T
<i>Dennstaedtia punctilobula</i>	Hay-scented fern	T
<i>Diarrhena obovata</i>	Beak grass	T
<i>Dichanthelium leibergii</i>	Leiberg's panic grass	T
<i>Draba reptans</i>	Creeping whitflow grass	T
<i>Dryopteris celsa</i>	Small log fern	T
<i>Echinodorus tenellus</i>	Dwarf burhead	E
<i>Eleocharis compressa</i>	Flattened spike rush	T
<i>Eleocharis microcarpa</i>	Small-fruited spike-rush	E
<i>Eleocharis tricostata</i>	Three-ribbed spike rush	T
<i>Epioblasma triquetra</i>	Snuffbox	E
<i>Erimyzon claviformis</i>	Creek chubsucker	E
<i>Eryngium yuccifolium</i>	Rattlesnake-master or button snakeroot	T
<i>Erynnis persius persius</i>	Persius dusky wing	T
<i>Eupatorium fistulosum</i>	Hollow-stemmed Joe-pye weed	T
<i>Eupatorium sessilifolium</i>	Upland boneset	T
<i>Euphorbia commutata</i>	Tinted spurge	T
<i>Euphyes dukesi</i>	Dukes' skipper	T
<i>Falco peregrinus</i>	Peregrine falcon	E

Scientific name	Common name	State status
<i>Filipendula rubra</i>	Queen-of-the-prairie	T
<i>Fraxinus profunda</i>	Pumpkin ash	T
<i>Fuirena pumila</i>	Umbrella-grass	T
<i>Galearis spectabilis</i>	Showy orchis	T
<i>Gallinula chloropus</i>	Common moorhen	T
<i>Gavia immer</i>	Common loon	T
<i>Gentiana flavida</i>	White gentian	E
<i>Gentiana puberulenta</i>	Downy gentian	E
<i>Gentianella quinquefolia</i>	Stiff gentian	T
<i>Geum triflorum</i>	Prairie smoke	T
<i>Gillenia trifoliata</i>	Bowman's root	E
<i>Helianthus mollis</i>	Downy sunflower	T
<i>Hesperia ottoe</i>	Ottoe skipper	T
<i>Hieracium paniculatum</i>	Panicled hawkweed	T
<i>Hiodon tergisus</i>	Mooneye	T
<i>Hydrastis canadensis</i>	Goldenseal	T
<i>Incisalia henrici</i>	Henry's elfin	T
<i>Incisalia irus</i>	Frosted elfin	T
<i>Isoetes engelmannii</i>	Engelmann's quillwort	E
<i>Isotria verticillata</i>	Whorled pogonia	T
<i>Ixobrychus exilis</i>	Least bittern	T
<i>Juncus brachycarpus</i>	Short-fruited rush	T
<i>Juncus scirpoides</i>	Scirpus-like rush	T
<i>Juncus vaseyi</i>	Vasey's rush	T
<i>Justicia americana</i>	Water willow	T
<i>Lampsilis fasciola</i>	Wavyrayed lampmussel	T
<i>Lanius ludovicianus migrans</i>	Migrant loggerhead shrike	E
<i>Lechea pulchella</i>	Leggett's pinweed	T
<i>Ligumia recta</i>	Black sandshell	E
<i>Linum virginianum</i>	Virginia flax	T
<i>Ludwigia sphaerocarpa</i>	Globe-fruited seedbox	T
<i>Lycaeides melissa samuelis</i>	Karner blue butterfly	T
<i>Lycopus virginicus</i>	Virginia water-horehound	T

Scientific name	Common name	State status
<i>Lygodium palmatum</i>	Climbing fern	E
<i>Mertensia virginica</i>	Virginia bluebells	E
<i>Microtus ochrogaster</i>	Prairie vole	E
<i>Morus rubra</i>	Red mulberry	T
<i>Moxostoma carinatum</i>	River redhorse	T
<i>Muhlenbergia richardsonis</i>	Mat muhly	T
<i>Myotis sodalis</i>	Indiana bat	E
<i>Myrica pensylvanica</i>	Northern bayberry	T
<i>Nelumbo lutea</i>	American lotus	T
<i>Neonympha mitchellii mitchellii</i>	Mitchell's satyr	E
<i>Nerodia erythrogaster neglecta</i>	Copperbelly water snake	E
<i>Notropis anogenus</i>	Pugnose shiner	E
<i>Notropis photogenis</i>	Silver shiner	E
<i>Oarisma poweshiek</i>	Poweshiek skipperling	T
<i>Obliquaria reflexa</i>	Threehorn wartyback	E
<i>Obovaria olivaria</i>	Hickorynut	E
<i>Opsopoeodus emiliae</i>	Pugnose minnow	E
<i>Panax quinquefolius</i>	Ginseng	T
<i>Panicum longifolium</i>	Panic grass	T
<i>Panicum verrucosum</i>	Warty panic grass	T
<i>Papaipema silphii</i>	Silphium borer moth	T
<i>Penstemon calycosus</i>	Beard tongue	T
<i>Plantago cordata</i>	Heart-leaved plantain	E
<i>Platanthera ciliaris</i>	Orange- or yellow-fringed orchid	E
<i>Platanthera leucophaea</i>	Prairie white-fringed orchid	E
<i>Pleurobema clava</i>	Clubshell	E
<i>Poa paludigena</i>	Bog bluegrass	T
<i>Polemonium reptans</i>	Jacob's ladder	T
<i>Polygonum careyi</i>	Carey's smartweed	T
<i>Polymnia uvedalia</i>	Yellow-flowered leafcup	T
<i>Populus heterophylla</i>	Swamp or Black cottonwood	E
<i>Potamilus ohiensis</i>	Pink papershell	T
<i>Potamogeton bicupulatus</i>	Waterthread pondweed	T

Scientific name	Common name	State status
<i>Potamogeton pulcher</i>	Spotted pondweed	E
<i>Potamogeton vaseyi</i>	Vasey's pondweed	T
<i>Proserpinaca pectinata</i>	Mermaid-weed	E
<i>Pterospora andromedea</i>	Pine-drops	T
<i>Pyganodon subgibbosa</i>	Round lake floater	T
<i>Rallus elegans</i>	King rail	E
<i>Ranunculus ambigenus</i>	Spearwort	T
<i>Ranunculus rhomboideus</i>	Prairie buttercup	T
<i>Rhexia mariana</i>	Maryland meadow beauty	T
<i>Rhynchospora nitens</i>	Short-beak beak-rush	E
<i>Rhynchospora recognita</i>	Globe beak-rush	E
<i>Rhynchospora scirpoides</i>	Bald-rush	T
<i>Sabatia angularis</i>	Rosepink	T
<i>Schoenoplectus americanus</i>	Three-square bulrush	E
<i>Schoenoplectus hallii</i>	Hall's bulrush	T
<i>Scleria pauciflora</i>	Few-flowered nut rush	E
<i>Scleria reticularis</i>	Netted nut rush	T
<i>Scutellaria nervosa</i>	Skullcap	E
<i>Scutellaria ovata</i>	Forest skullcap	T
<i>Scutellaria parvula</i>	Small skullcap	T
<i>Seiurus motacilla</i>	Louisiana waterthrush	T
<i>Silene stellata</i>	Starry campion	T
<i>Silphium integrifolium</i>	Rosinweed	T
<i>Silphium laciniatum</i>	Compass plant	T
<i>Silphium perfoliatum</i>	Cup plant	T
<i>Sisyrinchium atlanticum</i>	Atlantic blue-eyed-grass	T
<i>Solidago missouriensis</i>	Missouri goldenrod	T
<i>Speyeria idalia</i>	Regal fritillary	E
<i>Spiranthes ovalis</i>	Lesser ladies'-tresses	T
<i>Sporobolus clandestinus</i>	Dropseed	E
<i>Stellaria crassifolia</i>	Fleshy stitchwort	E
<i>Toxolasma lividus</i>	Purple lilliput	E
<i>Toxolasma parvus</i>	Lilliput	E

Scientific name	Common name	State status
<i>Trichostema dichotomum</i>	Bastard pennyroyal	T
<i>Trillium nivale</i>	Snow trillium	T
<i>Trillium sessile</i>	Toadshade	T
<i>Triphora trianthophora</i>	Nodding pogonia or three birds orchid	T
<i>Truncilla donaciformis</i>	Fawnsfoot	T
<i>Utricularia subulata</i>	Bladderwort	T
<i>Valeriana edulis</i> var. <i>ciliata</i>	Edible valerian	T
<i>Valerianella chenopodiifolia</i>	Goosefoot corn salad	T
<i>Villosa fabalis</i>	Rayed bean	E
<i>Viola pedatifida</i>	Prairie birdfoot violet	T
<i>Zizania aquatica</i> var. <i>aquatica</i>	Wild rice	T
<i>Zizia aptera</i>	Prairie golden alexanders	T

Source: Compiled from county lists (Allegan, Barry, Calhoun, Eaton, Hillsdale, Jackson, Kalamazoo, Kent, Ottawa, and Van Buren) current as of 11/7/2011. Available at <http://mnfi.anr.msu.edu/data/county.cfm>.

