Final Restoration Plan and Environmental Assessment for Terrestrial and Aquatic Habitat Restoration in the Viburnum Trend

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1 Introduction

The U.S. Department of the Interior (DOI), acting through the U.S. Fish and Wildlife Service (USFWS), the U.S. Department of Agriculture, acting through the U.S. Forest Service (USFS), and the State of Missouri, represented by the Missouri Department of Natural Resources (MoDNR), collectively the Viburnum Trend Trustee Council, or Trustees, have prepared this Final Restoration Plan and Environmental Assessment (RP/EA) to address natural resources injured and ecological services lost due to releases of hazardous substances, including heavy metals from mines, mills, smelters, and tailings impoundments within the Viburnum Trend Mining District (VT). This document selects a restoration Alternative that will restore natural resources and the services those resources provide, injured from the release of hazardous substances from the VT.

The goals of the Selected alternative within this Final RP/EA include restoration and enhancement of terrestrial and aquatic resources including habitat supportive of migratory songbirds through undesirable invasive vegetative removal, selective tree thinning or forest management, use of prescribed fire, and restoration of lead contaminated soils. Aquatic restoration activities focus on the improvement of water quality and habitat supportive of crayfish, fish, and other aquatic biota through sedimentation reduction by stabilizing eroding streambanks, reforesting riparian buffers, and excluding livestock from streams. The selected restoration activities will be implementation on public lands and through voluntary enrollment on interested private landowner property. The selected Alternative identifies priority terrestrial and aquatic restoration focus areas designated as Tier 1 and Tier 2 areas in and around the VT (Figures 1 and 2).

For decades hazardous substances, including but not limited to, lead, zinc, copper, and silver, have been mined, milled, and smelted at a number of facilities within the VT. Natural resources, including surface water, sediments, fish, and migratory birds, have been exposed to and adversely affected by releases of hazardous substances from these facilities into nearby soils, sediments, and surrounding waters, including tributaries of the Black, Meramec, and St. Francis Rivers. Currently, response actions proposed and implemented in the VT by the U.S. Environmental Protection Agency (EPA) and the USFS have focused on the reduction of threats to human health including the removal and disposal of contaminated yard soils by the EPA. These response actions are not intended to address ecological risks or compensate the public for the ecological services lost in the interim under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). As a result, the Trustees undertook restoration planning activities described in this Final RP/EA.

This Final RP/EA has been developed in accordance with CERCLA and its implementing regulations at 43 C.F.R § 11.93, in addition to the National Environmental Policy Act (NEPA, 42 U.S.C. § 4321, *et seq*.) to inform the public as to the types and scale of restoration to be undertaken towards compensating for injuries to natural resources and their associated services. The Trustees solicited comments on this Final RP/EA during a 30-day public comment period and held a public meeting in to inform the public of the proposed restoration Alternatives. There were no comments received during the public comment period. The Trustees have selected Alternative C for implementation. The selected Alternative C will allow the Trustees to restore terrestrial resources including woodlands, glades, and fens, particularly areas supportive of

migratory birds as well as aquatic resources including stream banks, riparian forests, and floodplains within priority sub-watersheds of the Meramec River, Upper Black River, and Upper St. Francis.

1.1 Purpose and Need for Restoration

In 2014, the Trustees produced the Southeast Missouri Ozarks Regional Restoration Plan and Environmental Assessment (SEMORRP), which provides a process framework governing the approach for restoration project identification, evaluation, selection, and implementation. In the SEMORRP, the Trustees selected Alternative D as the Preferred Alternative (see Section 3.5, pages 23 and 24 of SEMORRP for a description), in which the Trustees will consider a combination of restoration actions and projects to accomplish restoration goals at or near the site(s) of injury.

The purpose of the selected restoration action is to address injured natural resources and services lost due to release(s) of hazardous substances including heavy metals. The need for the selected action is to compensate the public for the lost resources and services.

The Trustees evaluated a range of alternatives to identify those that best meet the natural resource damage assessment and restoration (NRDAR) objectives to restore, replace, rehabilitate, or acquire the equivalent of the terrestrial and aquatic resources, their habitats, and the services they provide that have been injured from releases of hazardous substances while minimizing adverse impacts from the restoration projects themselves. Specifically, the goal of the selected restoration is to 1) restore or enhance upland forest and fen and glade habitats (sensitive habitats) to support migratory songbird resting, foraging, and nesting activities in the Terrestrial Restoration Project Areas (Figure 1 and 2) improve water quality and instream habitat to support benthic organisms, including crayfish, riffle fish, and invertebrates through sediment reduction and habitat improvements in the Aquatic Restoration Project Areas (Figure 2). This Final RP/EA tiers from (40 C.F.R. §1502.20, 40 C.F.R. § 1508.28, and 43 C.F.R. § 46.140) and incorporates by reference (40 C.F.R. §1502.21 and 43 C.F.R. § 46.135) portions of the SEMORRP for expediency and efficiency, as appropriate. The selected restoration activities associated with this Final RP/EA are aligned with the goals and Preferred Alternative of the SEMORRP.

1.2 Summary of NRDAR Settlements

The Trustees have recovered monetary damages to settle certain legal claims concerning injuries to natural resources and their services, including migratory birds, riffle fish, and crayfish, associated with releases of hazardous substances from multiple mine, mill, and smelter facilities in the VT. Settlements have been made in association with the Buick Mine, Mill and Smelter, Magmont Mine and Mill, Sweetwater, West Fork, and Glover facilities in the VT. The Trustees have funded a diverse group of terrestrial and aquatic restoration projects to restore injured natural resources from the associated settlement funds. Currently, there is approximately $6.2 million available across the various settlements in the VT. Due to ongoing need for restoration in the VT, the Trustees will fund the selected restoration projects described in this Final RP/EA from these remaining VT settlement funds.

1.3 Restoration Goals

Based on the nature of the natural resource injuries and losses, the restoration goals listed below were identified by the Trustees and guided development of this Final RP/EA. These goals are in alignment with the project types described under the Preferred Alternative of the SEMORRP.

Goal 1: Enhance or restore terrestrial habitats adversely affected, or substantial similar to those habitats, particularly those supportive of migratory birds and sensitive species; and

Goal 2: Enhance or restore portions of the adversely affected stream segments or substantially similar aquatic habitats, and associated fish, wildlife, and supporting habitats.

1.4 Natural Resource Trustee Authority

Under CERCLA and the National Oil and Hazardous Substances Contingency Plan (400 C.F.R. Part 300), the natural resource trustees are authorized to act on behalf of the public to assess injuries to natural resources and services resulting from the release of hazardous substances into the environment. The NRDAR process allows Trustees to pursue claims against responsible parties for monetary damages based on these injuries in order to compensate the public.

1.5 Coordination and Public Participation

The Trustees held a public meeting on November 14, 2023 in Steelville, Missouri to inform the public of the proposed projects. The meeting occurred within a 30-day public comment period which began on November 7th and closed on December 7, 2023. The Trustees did not receive any comments during that time.

2 Summary of Injury to Natural Resources

Mining in the VT is ongoing, and the district remains a major producer of metals. Missouri's mines have yielded much of the United States' national production of lead (e.g., USGS 2018), and since 1997, all metals produced in Missouri originated in The Doe Run Company's VT mines (MoDNR 2004). In addition to lead, the mines produce substantial amounts of zinc and lesser quantities of copper and silver.

The Trustees completed a Damage Assessment Plan (DAP) for the Southeast Missouri Lead Mining District (SEMOLMD) in 2009, including the VT. The DAP summarized existing information on natural resource injuries and described proposed studies to evaluate past, current, and future impacts to natural resources and the services they provide. In addition, the DAP outlined how information gathered from the studies would be used to determine the types and scale of restoration needed to address these injuries. Since 2009, the Trustees and others conducted a variety of studies at or near the VT to document natural resource exposure to lead, zinc, and/or cadmium released from the facilities in the VT and the presence of injury to natural resources and their supporting habitats. The results of these studies indicated that releases of heavy metals likely caused injuries to geologic resources (sediment and soil), aquatic resources (crayfish, macroinvertebrates, and benthic fish), and terrestrial resources (songbirds and plants). Evidence to support injury determination in the VT includes:

- Exceedances of water quality criteria due to elevated heavy metals in sediment (MacDonald et al 2000);
- Sediment and pore water toxicity to crayfish (Allert et al. 2009; Besser et al. 2009);

- Reduction in macroinvertebrate communities associated with mining impacted waterbodies (Poulton et al 2001);
- Lead concentrations in songbird tissues in excess of levels found to have adverse effects (Beyer 2013); and
- Evidence of phytotoxicity and reduced floristic quality (Struckhoff 2013)

Please see Section 2.2 of the SEMORRP for further information related to the history of lead mining and NRDAR in the SEMOLMD.

3 Restoration Alternatives

The Trustees prioritized restoration goals within and adjacent to the VT in a tiered approach to ensure funds are expended with a clear nexus to the injury. The Trustees have selected a combination of terrestrial and aquatic restoration activities to restore or enhance natural resources substantially similar to those injured from hazardous substances in the VT. Restoration project areas in this Final RP/EA are categorized as Tier 1 or Tier 2 priority areas (Figures 1 and 2). Tier 1 priority areas include public and interested private landowner properties in counties or sub-watersheds where direct injuries to natural resources by releases of hazardous substances occurred; Tier 2 priority areas include public and interested private landowner properties in select counties or sub-watersheds directly adjacent to affected areas. The Trustees' priority restoration areas include those identified in Alternative D of the SEMORRP.

Terrestrial restoration activities in the selected Alternative (C) of this Final RP/EA include enhancement or restoration of habitats supportive of migratory birds and other wildlife (floristic quality and vegetative communities). These benefits will be achieved through invasive vegetative species removal, selective tree thinning or forest management, prescribed fire application, and fencing to protect sensitive habitats within restoration areas on public and interested private landowner property in Terrestrial Restoration Project Areas (Figure 1). Selected restoration activities reflect findings from recent studies in the Ozark Highlands showing increased nest survival of shrub-nesting and canopy-nesting birds in response to prescribed fire and tree thinning restoration activities in pine-oak savanna and woodland habitats (Roach et al. 2018). Restored or enhanced woodlands will provide critical habitat to migratory bird populations that use these areas during the breeding season. Restoration of sensitive habitats, including glades and fens, will also provide habitat critical to the threatened Mead's Milkweed (*Asclepias meadii)* and the endangered Hine's emerald dragonfly (*Somatochlora hineana*). Further, fencing of these sensitive habitats will provide needed protection from feral hog disturbance, which is common within these habitats and throughout the Terrestrial and Aquatic Restoration Project Areas.

Selected stream restoration activities will improve water quality and restore riparian and instream habitats supportive of crayfish, riffle fish, and other benthic organisms. Reduction of sediment loading into stream systems through streambank stabilization, riparian forest re-establishment and conservation agricultural practices designed to reduce erosion will occur within priority sub-watersheds on public and interested private landowner property in the Aquatic Project Areas (Figure 2). Restored riparian areas will also help to provide habitat for migratory birds and important foraging and roosting areas for federally listed bat species including Indiana bats (*Myotis sodalis*) and Northern long-eared bats (*Myotis septentrionalis*).

Numerous restoration opportunities exist within public lands in the Project Areas. However, agencies have limited staff resources available to dedicate to large-scale restoration activities, leaving degraded or overgrown but otherwise high-quality habitats unrestored, as available

resources are dedicated to higher priority areas. Private lands in this geography also provide important habitat for terrestrial and aquatic resources and potential opportunities for agencies to coordinate with interested landowners on restoration projects. Current participation in state and federal cost share programs for conservation agricultural practices and wildlife enhancement programs demonstrate public interest in beneficial habitat practices within these counties and watersheds. However, restoration activities including prescribed fire, restoration on sensitive habitat types, and stream bank stabilization can be difficult or complex and are less frequently implemented with currently available resources. Summary information about Southeast Missouri Ozarks' physical, biological, and socioeconomic resources are contained in Section 4 of the SEMORRP. Summary information about the Upper Black, Meramec, and St. Francis River watersheds, including physical resources (geology, topography, soil, surface water, and groundwater), aquatic habitat, and biological resources, including sensitive species, is contained in Appendix D of the SEMORRP (see pages 4-7, 14 – 17, 22-24, 25, 26, 27, 28, 29 and 32). These sections of the SEMORRP are incorporated by reference herein.

3.1 Restoration Alternatives Evaluated

To compensate the public for injuries to natural resources resulting from releases of metals from facilities in the VT, the Trustees developed alternatives for the "restoration, rehabilitation, replacement, and/or acquisition of the equivalent of the natural resources and the services those resources provide" (42 C.F.R. §11.82 (a)). The Trustees evaluated the alternatives to determine if they provide sufficient type, quality, and quantity of ecological services to compensate for those lost due to contamination in the context of regulatory evaluation criteria (43 C.F.R. §11.82 (d)). The Trustees have also developed additional selection criteria to rank potential restoration projects. See Appendix A of the SEMORRP for the Decision Criteria evaluated by the Trustees for project selection.

Table 1. Brief description of restoration alternatives evaluated.

Alternative	Description
A	No Action/Natural Recovery; No projects implemented
B	Woodland and Sensitive Habitat Restoration – Non-fire Conservation Practices
C	Selected Alternative - Woodland, Stream, and Sensitive Habitats - Conservation Practices and Prescribed Fire

The Trustees also evaluated whether significant effects may be associated with the proposed alternatives to restore the natural resources and services injured or lost due to the release of hazardous substances as required by NEPA (40 C.F.R. §1508.9(b)). See Section 4.2 below for evaluation of the environmental consequences.

3.2 Restoration Evaluation Criteria

To ensure the appropriateness and acceptability of restoration options addressing ecological losses, the Trustees evaluated each alternative against restoration evaluation criteria as described in 43 C.F.R. § 11.82(d)(1-10). The criteria below are included in factors to consider when selecting restoration alternatives to pursue (43 C.F.R. § 11.82(d)(1-10)). See Table 4 for a comparative analysis of alternatives using restoration evaluation criteria.

Technical Feasibility (43 C.F.R § 11.82(d)(1)):
Consider whether the technology and management skills necessary to implement an Assessment Plan or Restoration and Compensation Determination Plan are well known and that each element of the plan has a reasonable chance of successful completion in an acceptable period of time.

Cost Benefit Comparison (43 C.F.R § 11.82(d)(2)):
Comparison of the expected costs of the restoration alternative to its expected benefits.

Cost Effectiveness (43 C.F.R. § 11.82(d)(3)):
When two or more restoration activities provide the same or similar benefits, the least costly activity providing that level of benefits will be selected.

Results of Actual/Planned Response Action (43 C.F.R. § 11.82(d)(4)):
Consider both direct and indirect impacts resulting from any response action on the restoration alternative.

Potential for additional Injury (43 C.F.R. § 11.82(d)(5)):
The selected alternative(s) should avoid or minimize adverse impacts to the environment and the associated natural resources. The Trustees shall consider the potential for additional injury resulting from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources.

Natural Recovery Period and Ability of Resources to Recover without Restoration (43 C.F.R. § 11.82(d)(6-7)):
Consider the time required for injured resources to recover if no restoration is undertaken, beyond response actions anticipated or performed, with the time required for injured natural resources to recover if the restoration alternative is implemented.

Public Health and Safety (43 C.F.R. § 11.82(d)(8)):
The selected alternative(s) should not pose a threat to the health and safety of the public.

Consistency and Compliance with Laws, Regulations, and Policies (43 C.F.R. § 11.82(d)(9-10)):
Development of this Final RP/EA requires consideration of a variety of legal authorities and their potentially applicability to the selected Alternative. As part of the restoration planning process, the Trustees initiated steps to ensure compliance with applicable laws, regulations, and policies. Implementation of the selected Alternative remains subject to complying with all applicable laws and regulations, which for this Final RP/EA, may include: Clean Water Act, Endangered Species Act, National Historic Preservation Act. Work performed as part of the selected Alternative is subject to meeting all permitting and other environmental compliance requirements to ensure the projects are implemented in accordance with all applicable laws and regulations.

Additional criteria for restoration alternative selection, developed through discussions with natural resource managers at each of the Trustee agencies, were also evaluated and are consistent with the criteria identified in Sections 6.4 and 6.5 of the SEMORRP, incorporated by reference herein.

Relationship to Injured Resources and Services:
Alternatives that restore the resources and services injured by the release are preferred to alternatives that benefit other comparable resources or services. Preferred alternative(s) should consider the types of resources or services injured, the location of the resources, and the connection or nexus of project benefits to those injured resources.

Consistency with the Trustees' Restoration Goals:
The selected alternative(s) should meet the Trustee's intent to restore the injured resources or the services those resources provide. Included in this criterion is the potential for success and the level of expected return of resources and resource services.

Time to Provide Benefits:
Consider the time expected for the project to begin providing benefits to the target ecosystem and/or public. A more rapid time to delivery of benefits is favorable.

Duration of Benefits:
Consider the expected duration of benefits from the restoration alternatives. Projects expected to provide longer-term benefits are more favorable.

3.3 Alternative A-No Action Alternative (Natural Recovery)

Under this alternative, the Trustees would rely on natural recovery and would take no direct action to restore natural resources or compensate for interim lost natural resource services. This alternative would include the continuance of ongoing restoration and monitoring programs but would not include additional activities aimed at enhancing ecosystem biota or processes. Under this alternative, no compensation would be provided for lost natural resource services.
Under the No Action Alternative, no habitats would be restored, or enhanced beyond what agencies and organizations are already doing in the area with limited existing resources. Habitats would continue to be un-managed and invasive species prevalence would increase, shifting away from native vegetative communities. Wildlife and migratory bird individuals and/or populations would continue to be adversely impacted by degradation of resting, foraging, and nesting habitats on both public and private lands. Aquatic and riparian habitats would continue to degrade along streams in the Black, Meramec, and St. Francis River watersheds and in adjacent habitats. Water quality would continue to be degraded or impaired. Local citizens and visitors recreating in the areas would not benefit from improved ecological resources, such as restored or enhanced aquatic and terrestrial habitat providing wildlife viewing opportunities.

3.4 Alternative B –Woodland and Sensitive Habitats – Non-fire Conservation Practices

This alternative focuses on the restoration and enhancement of sensitive habitats and woodlands on public (National Forest or Conservation Areas) or willing private landowner property using non-fire restoration activities, particularly in areas supportive of migratory birds that are substantially similar to habitats injured from the releases of hazardous substances from mining and milling facilities in the VT. The Trustees have worked with Project Partners (Section 3.6) to identify priority geographies within the Terrestrial Restoration Project Areas (Figure 1) where

restoration/enhancement to glade, fen, and woodland habitats would benefit migratory birds and other wildlife. Specific restoration goals and objectives include but are not limited to:

- Support interested landowners and agencies to implement restoration to benefit migratory birds in areas where resources to conduct these activities are limited;
    i. Coordinate and lead, or supplement restoration activities on public lands and interested private landowner property within the Terrestrial Project Areas.
- Restore or enhance and protect migratory bird habitat;
    i. Implement a multi-agency program of restoration in the Terrestrial Project Areas focused on restoring sensitive habitats and woodlands on state, federal, and interested private property;
    ii. Creation of contiguous blocks of restored habitat important for terrestrial resources that support migratory bird foraging and nesting habitats and to enhance native vegetative communities;
    iii. Conduct non-fire restoration activities, including mechanical and chemical invasive species removal, forest stand improvement, and native seeding (as appropriate);
    iv. Provide mechanisms for the long--term protection of terrestrial resources with private landowners.

3.4.1 Restoration Methods

Specific restoration methods proposed to restore or enhance upland forest and sensitive habitats on public and interested private landowner property to benefit migratory birds will include:

- Reduce invasive non-native plants through chemical and mechanical removal;
- Woodland thinning and cedar removal to reduce vegetative competition and promote native herbaceous vegetation growth in woodlands and sensitive habitats;
- Construction of fencing around select sensitive habitats for protection against feral hog damage.

3.4.1.1 Project Benefits

The Trustees propose conservation and restoration activities directly related to injuries from which restoration funds from settlements in the VT are derived. Specific benefits provided by these projects include:

- Restores or enhances sensitive and woodland habitats and improves native plant diversity. This will increase suitable habitat for migratory birds and other wildlife, including species of conservation concern and thus increase bird diversity and abundance;
- Reduces invasive species competition and establishes native vegetative communities which will increase wildlife habitat diversity and robustness;
- Fencing of select sensitive habitats (glades and fens) will protect restored or enhanced sensitive habitats from local feral hog activity known to degrade these habitats within Tier 1 or 2 Project Area.

3.4.1.2 Proposed Budget

The Trustees anticipate the cost of this project will be approximately $1,550,996 and will generally follow the budget categories below. In addition to funds provided by the Trustees, the USFS will provide necessary training and certifications required for prescribed fire qualifications to assist with implementation of prescribed burns. They will also provide equipment and staff support for projects occurring on the Mark Twain National Forest (MTNF) which makes up a large portion of the public land within the Terrestrial Project Areas. The Missouri Department of Conservation (MDC) will provide botanical identification training, focusing on sensitive species known within the Project Area and common invasive vegetative species targeted for removal. They will also provide additional equipment and staff support for projects occurring on MDC public lands and outreach and oversight for projects on interested private landowner property.

Table 2. Cost Estimates for Woodland and Sensitive Habitat Restoration (Alternative B)

Costs Description	Anticipated Activities	Estimated 3 Year Total Costs
Terrestrial Restoration	Terrestrial restoration implementation, equipment, monitoring and adaptive management	$1,250,996
Restoration Effectiveness Monitoring and Adaptive Management	Migratory bird and vegetation baseline monitoring and bird community response study, soil restoration monitoring and adaptive management	$300,000
Total*		$1,550,996

* The distribution of the budget from this Financial Plan may vary as necessary to accomplish the purpose of this agreement but is not anticipated to exceed $1,550,996 over 3 years. However, factors such as inflation and unknown conditions encountered during field work may require future adjustments to this budget.

3.5 Alternative C – Woodland, Stream, and Sensitive Habitats -Conservation Practices and Prescribed Fire (Selected)

This alternative focuses on the restoration, enhancement, and protection of terrestrial and aquatic natural resources within the VT. Terrestrial resources for restoration include woodlands and sensitive habitats (i.e. glades and fens), particularly areas supportive of migratory birds that are substantially similar to habitats injured from the releases of hazardous substances from mining and milling facilities in the VT. Aquatic resources to be restored include stream banks, riparian forests and floodplains within priority sub-watersheds of the Meramec River, Upper Black River, and Upper St. Francis. The Trustees will work closely with Project Partners, including state and federal agencies, non-government (NGO) agencies, and interested local landowners to identify specific project locations within the Terrestrial and Aquatic Restoration Project Areas (Figures 1

and 2) where enhancements and restoration to woodlands, glades, fens, floodplain, riparian, streambank, or wetlands would benefit terrestrial and aquatic biota and their supporting habitats. It is anticipated that restoration activities will be conducted on public lands and with interested private landowners whose properties are within Tier 1 or Tier 2 Project Areas.
Project Partners, in coordination with the Trustees, will implement restoration in priority areas where restoration opportunities exist but have not been addressed due to limited resources (i.e., personnel) or, in the case of soil restoration, where soils continue to adversely affect birds due to contamination. The suite of restoration practices selected for implementation at each project site may be interdependent and overlapping, potentially occurring in similar or the same locations. Site selection will proceed in accordance with the following prioritization:

<u>Tier 1 Project Areas:</u>
Terrestrial

- Iron County
- Reynolds County

Aquatic

- Meramec Watershed
    i. Courtois Creeks and tributaries
    ii. Huzzah Creek and tributaries
- Upper Black River Watershed
    i. Middle Fork Black River and tributaries
    ii. West Fork Black River and tributaries
    iii. Logan Creek and Tributaries
- Upper St. Francis Watershed
    i. Big Creek

<u>Tier 2 Project Areas:</u>
Terrestrial

- Washington County
- Crawford County
- Dent County
- Shannon County

Aquatic

- Meramec River Watershed
    i. Headwaters Meramec River
- Upper Black River Watershed
    i. Black River above Clearwater Lake
    ii. East Fork Black River and Tributaries
- Upper St. Francis Watershed
    i. Twelvemile Creek
    ii. Otter Creek

Both Tier 1 and Tier 2 Project Areas are known for their high biodiversity and support a number of federally protected species and Missouri Species of Conservation Concern (SEMORRP Appendix E). They are also in close proximity to a large network of managed public lands and conservation areas. Specific restoration goals and objectives for the proposed project include but are not limited to:

- Support interested landowners and agencies to implement restoration to benefit migratory birds and aquatic resources in areas where resources to conduct these activities are limited;
    i. Coordinate and lead, or supplement restoration activities on public lands and interested private landowner property within the Terrestrial and Aquatic Project Areas.
- Restore or enhance migratory bird and instream habitats;
    i. Implement a multi-agency program of restoration in the Terrestrial and Aquatic Project Areas focused on restoring sensitive habitats, woodlands, reduction of sediment inputs through riparian corridor establishment or enhancement, stream bank stabilization, and conservation practices on state, federal, and interested private lands;
    ii. Creation of contiguous blocks of restored habitat important for terrestrial and resources which support migratory bird foraging and nesting habitats and to enhance native vegetative communities;
    iii. Increase the availability and application of prescribed fire on the landscape as a tool to open and invigorate upland forests and sensitive habitats and mimic natural processes to encourage habitat shifts toward historic ecological communities;
    iv. Restore soils and reduce toxic effects of lead to ground feeding birds by stabilizing contaminated soils through application of high phosphate soil amendments and lime;
    v. Provide mechanisms for the long-term protection of terrestrial and aquatic resources with private landowners.

3.5.1 Restoration Methods

Specific restoration methods to restore or enhance woodlands, sensitive habitats, and streams will include:

- Woodland thinning and cedar removal to reduce vegetative competition and promote native herbaceous vegetation in woodlands and sensitive habitats;
- Re-forestation of riparian corridor through the establishment of native grasses, shrubs and trees appropriate for the area;
- Fire line preparation and application of prescribed fire to the landscape;
- Fencing around sensitive habitats to protect against feral hog damage;
- Stabilization of eroding stream banks;
- Installation of riparian corridor fencing to exclude cattle;
- Alternative water sources for livestock;
- Reinforced stream crossings and upgrades to existing water crossings to promote aquatic organism passage and/or facilitate more natural flow regimes;

- Mechanical and chemical reduction of invasive vegetation;

- Application of phosphate and lime amendments to contaminated soils to reduce bioavailability and toxicity to ground feeding songbirds and other wildlife. Application of soil amendments at rates consistent with the agronomic properties of the project area followed by mulching with natural material or covering with a biodegradable landscape fabric.

3.5.2 Project Benefits

Proposed conservation and restoration activities are directly related to injuries from which settlements in the VT are derived. Specific benefits provided by these projects include:

- Restores native habitat to woodlands, sensitive habitats, floodplains and riparian habitats injured from historical releases of metals from mining practices in the VT;
- Prescribed fire and selective thinning of woody vegetation will mimic natural processes that encourage new growth of native vegetation and reduce competition;
- Reduced bio-availability of lead in contaminated soils will reduce toxic effects to ground-feeding birds and other organisms;
- Fencing of glades and fens will protect restored or enhanced sensitive habitats from feral hog activity known to degrade these habitats within Tier 1 or 2 Project Areas;
- Stabilization of streambanks and reduction of erosional processes will improve water quality and reduce land lost;
- Reduced invasive species competition and establishment of native vegetative communities will increase wildlife habitat diversity and robustness including important habitat for migratory birds and other terrestrial species;
- Complements existing conservation agricultural and restoration practices and creates large contiguous blocks of restored habitat which will benefit resources including migratory birds and bats;
- Restored riparian corridor will help stabilize in-stream habitat necessary to support aquatic species and their habitats including non-game and sport fish.
- Restored areas of high quality and ecological significance will be preserved and protected through voluntary conservation easements or other contractual mechanisms to require the property or area to be managed as a natural area in accordance with the goals of the project.
- Implementation of restoration through a multi-agency partnership will efficiently and sustainably improve priority habitats and ensure activities complement existing restoration programs.

3.5.3 Proposed Budget

The Trustees anticipate the cost of this project will be up to $4,000,000 and will generally follow the budget categories below. In addition to funds provided by the Trustees, qualifying cost share programs, grants, staff time, and equipment will be provided by partnering agencies or NGOs.

Table 3 Cost Estimates for Stream Enhancement and Restoration (Alternative C)

Costs Description	Anticipated Activities	Estimated Costs
Terrestrial Restoration	Terrestrial restoration implementation, equipment, monitoring and adaptive management	$2,150,000
Stream Restoration and Enhancements	Aquatic restoration implementation, monitoring, and adaptive management	$1,850,000
Total*		$4,000,000

***The distribution of the budget from this Financial Plan may vary as necessary to accomplish the purpose of this agreement but is not anticipated to exceed $4,000,000. However, factors such as inflation and unknown conditions encountered during field work may require future adjustments to this budget.

3.6 Project Partners

Projects identified in this Final RP/EA are intended to compliment restoration and management activities implemented by state, federal, and NGO agencies active within the Terrestrial and Aquatic Project Areas. These agencies, in coordination with the Trustees (collectively "Project Partners"), will work to establish local work crew(s), and prioritize site specific opportunities that meet the objectives outlined within this Final RP/EA. The Project Partners will work collaboratively to coordinate restoration activities on private lands with interested landowners in the Project Areas.

3.7 CERCLA NRDAR Evaluation

Restoration Criteria	Alternative A: No Action	Alternative B: Woodland and Sensitive Habitats – Non-Fire Restoration Practices	Alternative C: Woodland, Stream and Sensitive Habitats – Conservation Practices and Prescribed Fire (Selected Alternative)
Technical Feasibility	The No Action alternative is technically feasible.	The Trustees have experience with terrestrial projects to improve ecological condition supportive of wildlife and published literature demonstrates the technical feasibility of the proposed project.	Activities included in this alternative are technically feasible and likely to result in the desired condition, including improved ecological function of terrestrial habitats, water quality, riparian, and instream habitats.
Cost Benefits	The No Action alternative has no associated costs and provides no additional resource benefits. It is unlikely injured resources will recover on their own within a reasonable timeframe.	Restoration or enhancement of terrestrial habitats using non-fire restoration practices will provide long-term benefits to natural resources. However, without prescribed fire to suppress invasive species and reduce understory vegetation at a large spatial scale, restoration benefits may not outweigh the costs of project implementation.	The Selected Alternative provides the most benefits to natural resources and is anticipated to outweigh the cost of project implementation. Synergistic effects between aquatic and terrestrial activities translates to greater long-term capacity for ecological health and provides more benefits to biota that require large, high-quality areas to thrive and reproduce.

Restoration Criteria	Alternative A: No Action	Alternative B: Woodland and Sensitive Habitats – Non-Fire Restoration Practices	Alternative C: Woodland, Stream and Sensitive Habitats – Conservation Practices and Prescribed Fire (Selected Alternative)
Cost Effectiveness	The No Action alternative is cost effective.	The use of mechanical or chemical restoration techniques without prescribed fire is anticipated to have the same or increased restoration costs per acre as the Preferred Alternative.	The Selected Alternative is cost effective as it seeks to leverage several sources of funding and in-kind contributions from Project Partners.
Results of Actual/Planned Response Action	Response actions in the Project Areas is focused on reductions for human health and do not address ecological risks or compensate the public for the ecological services lost.	Restoration activities under Alternative B are not anticipated to overlap with current or future response actions.	Restoration activities under the Selected Alternative are not anticipated to overlap with current or future response actions.

Restoration Criteria	Alternative A: No Action	Alternative B: Woodland and Sensitive Habitats – Non-Fire Restoration Practices	Alternative C: Woodland, Stream and Sensitive Habitats – Conservation Practices and Prescribed Fire (Selected Alternative)
Potential for Additional Injury	The No Action alternative would allow injuries to natural resources to continue into the future and will also provide no benefit to offset interim losses.	This alternative will not cause significant injury in the proposed Project Areas, but has the potential to result in short-term, minor to moderate, adverse impacts in nearby areas. This alternative reduces future injury to natural resources that have been and may continue to be exposed to hazardous substances.	Same analysis as Alternative B. No additional injury will occur due to activities within the Selected Alternative.
Natural Recovery Period and Ability of Resources to Recover without Restoration	Under the No Action alternative, natural recovery would be relied upon to improve ecological services, but recovery time is unknown. Given the persistence of heavy metals, natural resources are not likely to recover without restoration in a meaningful timeframe.	The restoration of woodland and sensitive habitats will provide benefits to injured resources that cannot be achieved through natural recovery alone. Restored habitats will result in increased nesting and foraging opportunities for migratory birds and other wildlife.	The restoration components within the Selected Alternative will provide extended natural resource benefits due to the greater magnitude of activities to be implemented. These benefits to injured resources cannot be achieved through natural recovery alone. This will result in benefits to migratory birds, increased water quality, recovery of aquatic biota, and benefits to supporting habitats over time.

Restoration Criteria	Alternative A: No Action	Alternative B: Woodland and Sensitive Habitats – Non-Fire Restoration Practices	Alternative C: Woodland, Stream and Sensitive Habitats – Conservation Practices and Prescribed Fire (Selected Alternative)
Public Health and Safety	Any potential public health and safety issues or concerns that exist under current and future natural resource management activities would likely remain the same.	Restoration activities and long-term management would not pose elevated risk to workers and any other people accessing restoration areas. Best Management Practices will be used to reduce potential risk of injury resulting from timber stand improvement.	Restoration activities and long-term management would not pose elevated risk to workers and any other people accessing restoration areas.
Consistency and Compliance with Laws, Regulations and Policies	The No Action alternative does not meet the requirements and goals of the CERCLA NRDAR process to provide for restoration that compensates the public for the injury and loss of the natural resources and services caused by releases of hazardous substances.	Alternative B meets the requirements and goals of the CERCLA NRDAR process to provide for restoration that compensates the public for the injury and loss of natural resources and services caused by releases of hazardous substances. Proposed activities under this Final RP/EA are subject to requirements of other laws, regulations, and applicable statutes.	The Selected Alternative meets the requirements and goals of the CERCLA NRDAR process to provide for restoration that compensates the public for the injury and loss of natural resources and services caused by releases of hazardous substances. Proposed activities under this Final RP/EA are subject to requirements of other laws, regulations, and applicable statutes.

Table 4 Comparative analysis of alternatives using restoration criteria

4 Environmental Assessment

Actions taken by federal Trustees to restore natural resources or services under CERCLA are subject to NEPA, and the regulations guiding its implementation (40 C.F.R. §§1500-1508). NEPA and its implementing regulations set forth a process of environmental impact analysis, documentation, and public review for federal actions, including restoration. NEPA provides a framework for federal agencies to consider reasonably foreseeable environmental effects of a proposed actions and inform and involve the public in the decision--making process.

4.1 Affected Environment

This Final RP/EA evaluates restoration options to compensate the public for the natural resource injuries and associated losses in ecological services resulting from exposure to VT related hazardous substances. As part of the evaluation, the Trustees assessed the current physical, biological, socio-economic, and cultural resources of the area within which restoration is likely to occur (terrestrial restoration - Iron, Reynolds, Washington, Crawford, Dent, Shannon County. Stream restoration – the Meramec River, Upper Black River, Upper St. Francis River watersheds). This information will ensure that potential restoration projects are designed to both maximize ecological benefits while minimizing or eliminating project-related adverse environmental consequences.

4.1.1 Watersheds

The Final RP/EA covers three primary watersheds including the Upper Black, Meramec, and Upper St. Francis River watersheds which have been injured by the release of hazardous substances from the VT (Figure 2). In addition to the hazardous substances released from hard rock mining, environmental stressors in the VT also include other point source pollutants and industrial wastes, inadequately treated sewage, and agricultural and urban run-off and erosion from poor sedimentation control.

Evaluation of environmental stressors are important when selecting restoration projects and areas to identify and prioritize areas within the watershed most in need of restoration, areas most at risk, where restoration will be most likely to succeed, etc. Environmental stressors are also considered in the evaluation of injury when establishing the baseline conditions of the area. Summary information about Southeast Missouri Ozarks' physical, biological, and socioeconomic resources is contained in Section 4 of the SEMORRP. Summary information about the Black River, Meramec River, and St. Francis River Watersheds of the Southeast Missouri Ozarks, including physical resources (geology, topography, soil, surface water, and groundwater), aquatic habitat, and biological resources, including sensitive species, is contained in Appendix D of the SEMORRP. Areas particularly relevant to the Selected restoration projects in the Black River Watershed include the sub-watersheds of the Middle and West Fork of the Black River, Logan Creek and adjacent sub-watersheds. In the Meramec River, relevant areas include the sub-watersheds of Huzzah Creek, Courtois Creek and the adjacent headwaters of the Meramec. Relevant areas in the St. Francis River Watershed include Big Creek and its tributaries.

4.1.2 Demographics

A summary of demographic data is provided in Table 5. In general, the Selected projects areas are rural where agriculture, including pastured cattle, hay cropping, and timber, produce jobs for local populations. Areas of fastest growth are in commercial and services sector along major road transportation corridors and larger cities.

Table 5 Project Area demographics by county.

Demographic Category	Iron	Reynolds	Shannon	Washington	Crawford	Dent	Madison	Wayne	Phelps
Population (2016 estimate)	10,150	6,274	8,207	24,819	23,984	15,518	12,176	13,058	44,587
Minority Population	571	416	514	1,565	1,237	1,038	651	836	5,452
Percent Minority	6%	7%	6%	6%	5%	7%	5%	6%	12%
Low Income Population**	50%	42%	54%	47%	42%	45%	38%	49%	40%
% persons in poverty (estimate)	21.7	15.6	23.4	19.2	16.5	16.9	11.6	23.6	18.8
Households	4,102	2,580	3,063	9,278	9,798	6,355	4,851	5,438	18,213
Population per square mile	18	8	8	33	32	21	25	17	66

* Statistics generated using 2016-2020 U.S. Census Bureau data and EPA's Environmental Justice Screening and Mapping Tool (Version 2.1) https://ejscreen.epa.gov/mapper/
** State average is 31%

4.1.3 Executive Order 12898 Analysis

Executive Order 12898 (Feb. 11, 1994) requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. In a memorandum to heads of departments and agencies that accompanied Executive Order 12898, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum states that "each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by [NEPA]" and emphasizes the importance of NEPA's public participation process in particular, directing that "each federal agency shall provide opportunities for community input in the NEPA process." The CEQ has oversight of the federal government's compliance with Executive Order 12898 and NEPA.

For the purpose of evaluating environmental justice issues associated with implementation of the Preferred Alternative, demographic data were obtained from the U.S. Census Bureau and the State of Missouri. In this analysis, a county is considered to have a minority population if its non-white population is greater than 50 percent or is meaningfully larger than the general (statewide) non-white population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50 percent or is meaningfully greater than the general population (average statewide poverty level).

To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone;

- A high and adverse impact must exist;
- The impact must be disproportionately high and adverse on the minority or low-income population.

Based on the census data for the counties of Iron, Reynolds, Shannon, Washington, Crawford, Dent, Madison, Wayne, Carter, Phelps, and Texas, the minority population in the areas of the Selected projects does not meet the condition of being classified having a minority population since the minority population comprises only 5 to 12% of the population for each county. The project areas could be considered low-income because close to half (38-54%) of the population in counties where projects will occur are classified as low income. In addition, poverty levels exceed the statewide average (estimate of 13%) for all but one county (Madison) where projects will occur.

4.1.4 Recreation

Recreational resources are highlighted in the SEMORRP in Section 4.3.1 and a list of public lands in the SEMO provided in Appendix F. These sections of the SEMORRP are incorporated by reference herein.

4.1.5 Cultural and Historic Resources

Selected projects are located in Reynolds, Shannon, Washington, Crawford, Dent, Madison, Wayne, Carter, Phelps, and Texas Counties of Missouri. Significant historical and cultural resources, including Civil War battlefields and related historic sites, many of which are protected through Missouri State Parks system are found in the vicinity of the restoration areas.

Prior to the implementation of the Selected restoration projects, potential impacts to historic and archaeological resources will be reviewed. Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of preferred alternatives on historic properties. Historic properties must also be given consideration under NEPA. The National Register of Historic Places is a federally-maintained list of districts, sites, buildings, structures, objects, and landscapes significant in American history, prehistory, architecture, archaeology, engineering, and culture. Archaeological sites are places where past peoples left physical evidence of their occupation. Sites may include ruins and foundations of historic-era buildings and structures. Native American cultural resources may include human skeletal remains, funerary items, sacred items, and objects of cultural patrimony. Historic properties can also include traditional cultural properties.

The USFWS' representative on the Trustee Council will consult with the appropriate Historic Preservation Office to complete Section 106 review and compliance prior to taking on-the-ground restoration actions. In areas where projects occur on the MTNF, the USFS's Trustee Council representative will facilitate and oversee the Section 106 compliance.

4.2 Environmental Consequences

The following sections evaluate anticipated environmental consequences of restoration Alternatives A, B, and C. The Trustees will continue to evaluate environmental impacts as project details are identified, designed, and implemented, and determine whether additional analysis under NEPA is warranted. The following definitions will be used to characterize the

nature of the various environmental consequences evaluated in this Final RP/EA:

- *Short-term or long-term impacts.* In general, short-term impacts are those that would occur only with respect to a particular activity or for a finite period. Long-term impacts are those that are more likely to be persistent and chronic.
- *Direct or indirect impacts.* A direct impact is caused by a proposed action and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action.
- *Negligible, minor, moderate, or major impacts.* These relative terms are used to characterize the magnitude of an impact. Negligible impacts are generally not quantifiable and do not have perceptible impacts on the human environment. Minor impacts are generally those that might be perceptible but, in their context, are not amenable to measurement because of their relatively inconsequential effect. Moderate impacts are those that are more perceptible and, typically, more amenable to quantification or measurement. Major impacts are those that, in their context and due to their intensity (severity), have the potential to meet the thresholds for significance set forth under NEPA (40 C.F.R. § 1508.27) and, thus, warrant heightened attention and examination for potential means for mitigation to fulfill the requirements of NEPA.
- *Adverse or beneficial impacts.* An adverse impact is one having unfavorable or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.
- *Cumulative impacts.* Cumulative impacts are defined as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 C.F.R. § 1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time within a geographic area.

4.2.1 Environmental Consequences of Alternative A: No Action/Natural Recovery

The No Action/Natural Recovery Alternative is described on page 16 of the SEMORRP and compared to other SEMORRP alternatives pages 25 and 26 of that plan. Environmental consequences of the No Action alternative are described on pages 35 and 36 of the SEMORRP, incorporated by reference herein.

4.2.1.1 Conclusion of Alternative A

The No Action Alternative does not provide the environmental benefits described in the other alternatives. Due to the lack of restored or enhanced terrestrial and aquatic habitat in the VT, this alternative would not benefit migratory birds, aquatic biota, or their supporting habitats. Therefore, the No Action Alternative is not a preferred restoration alternative.

4.2.2 Environmental Consequences of Alternative B: Woodland and Sensitive Habitats – Non-Fire Conservation Practices

Environmental consequences associated with implementation of Alternative B have been evaluated at a programmatic level on pages 36-40 of the SEMORRP. However, this document provides a more in-depth analysis of the alternative as described in Section 3.4.
Components of Alternative B could have short-term negative impacts to terrestrial biota. Wildlife present during these activities may be temporarily displaced or negatively impacted. Soil compaction associated with the use of heavy equipment will occur. However, best management practices and restoration implementation during fall and winter months will reduce short-term negative impacts to soil and wildlife. Invasive species reduction and supplemental native seeding and/or plantings will have negligible to minor short-term direct and indirect adverse effects on the environment.
Overall, minor to moderate long-term benefits across a broad geographic scope are anticipated, including reduction of invasive species and increases in local native wildlife species, particularly migratory birds. Long-term, moderate beneficial impacts to resources and associated flora and fauna are expected due to increased native habitat quality and potential to reduce adverse effects from lead. Alternative B will result in new or improved habitat in woodlands, glades, fens, and other sensitive habitats. Improved habitat conditions will lead to improved resource-based recreational activities on public lands, including hunting, hiking and bird watching.

4.2.2.1 Conclusion on Alternative B

The Trustees evaluation of Alternative B found that it meets the purpose and need identified in this Final RP/EA and the Trustees' restoration goal to preserve and/or enhance conservation value of upland habitats supportive of injured resources. The Trustees anticipate Alternative B to have primarily beneficial direct and indirect long-term impacts in the form of improved land management activities, enhancing wildlife populations and recreation opportunities. However, this alternative by itself does not provide the level of benefits provided by the Selected Alternative.

4.2.3 Environmental Consequences of Alternative C: Woodland, Stream and Sensitive Habitats – Conservation Practices and Prescribed Fire (Selected Alternative)

Environmental consequences associated with implementation of Alternative C have been evaluated at a programmatic level on pages 37 through 40 of the SEMORRP. However, this document provides a more in-depth analysis of the alternative as described in Section 3.5.
Selected woodland, stream, and sensitive habitat enhancement and restoration activities are expected to cause minor to moderate, short-term, localized adverse impacts to existing natural resources, and result in long-term benefits that are expected to outweigh these impacts. Components of woodland and sensitive habitat restoration, including prescribed fire and tree thinning, could have short-term negative impacts to terrestrial biota. Wildlife may be temporarily displaced or negatively impacted. Soil compaction from heavy equipment will occur. However, best management practices and restoration implementation during fall and winter months will reduce short-term negative impacts to soil and wildlife. Invasive species reduction and supplemental native seeding and/or plantings will have negligible to minor short-term direct and indirect adverse effects on the environment.

During stream restoration implementation, there would be minor to moderate short-term, direct disruptions to habitat due to the movement of sediments and soils as a result of stream bank reshaping, trenching associated with alternative water systems, instream placement of materials for reinforced stream crossings or crossings to improve aquatic organism passage, grading activities, and other related actions. These impacts are expected to be localized and limited to the project area through the use of best management practices. Further, project implementation would appropriately adhere to all federal, state, and local laws, regulations, and policies. The use of heavy machinery or other equipment would likely increase noise and diesel emissions in the surrounding area during construction. However, these disturbances would be temporary and minor. In addition, fish and wildlife may be disturbed by the increase in turbidity and noise but could avoid the area during construction and are likely to resume normal patterns of movement shortly after implementation is complete. Though these construction-related impacts would be adverse, they are anticipated to be minor to moderate, and short-term in nature. Long-term beneficial impacts to aquatic resources and riparian plants and animals would occur due to the reduced erosion, and increased shelter and foraging opportunities provided by riparian plantings, and beneficial impacts would span a large geographic area downstream. Stabilizing streambanks and implementing conservation agricultural practices (i.e., cattle exclusion fencing, instillation of alternative water sources, riparian corridor revegetation, reinforced stream crossing and aquatic organism passage) will reduce detrimental impacts to aquatic organisms associated with long-term sediment and soil erosion, and result in enhanced condition of aquatic habitats and the organisms they support, including crayfish and riffle fish.

Stabilization of contaminated soils through phosphate amendments to reduce effects to wildlife exposed to hazardous substances will result in direct and indirect, short-term, localized adverse impacts on natural resources such as soil, sediment, soil-dwelling organisms, and vegetation. Existing habitat may in some cases be substantially modified to create the vegetation necessary for the successful development of terrestrial habitats supportive of native plants and wildlife. This may include use of forestry machinery and other equipment, resulting in soil compaction, localized emissions from heavy equipment, removal or crushing of understory vegetation, and/or increased soil erosion in the immediate area of construction operations. However, the long-term direct and indirect benefits expected from soil excavation, regrading, and soil restoration activities outweigh the potential adverse impacts. Phosphate amendments have been shown to reduce soil lead leaching and plant lead uptake while having negligible to minor adverse effects on the environment (Tang et al. 2009; Weber et al. 2015). The Trustees are currently overseeing two restoration projects where this activity is being implemented: the Calico Creek Project and the Doe Run VT Restoration Project. Pending successful results from those projects, the Trustees may elect to implement soil restoration under this Final RP/EA if warranted.

4.2.3.1 Conclusion on Alternative C

The Trustees found Alternative C to best meet the purpose and need identified in this Final RP/EA. The Trustees anticipate Alternative C to have primarily beneficial direct and indirect long-term impacts in the form of improved land management activities and stream conditions which will enhance fish and wildlife communities and recreation opportunities.

4.2.4 Cumulative Impacts

Cumulative impacts associated with the Selected Alternative of the SEMORRP can be found in Section 5.5.1 of that restoration plan. Information in the SEMORRP is incorporated by reference herein. The section that follows tiers from and expands upon the SEMORRP analysis to a project-specific level.

The Selected Alternative in this Final RP/EA is anticipated to have a cumulative impact that is long-term and beneficial. The synthesis of terrestrial and aquatic restoration projects presented in Alternative C would contribute most to the efforts of the Trustees to restore natural resources in the VT and would result in the greatest positive impact for the VT as a whole. Restoration and enhancements to terrestrial and aquatic habitats, such as reduction of invasive species, increased native habitat quality and reduction of sediment loading into streams will serve to increase habitat diversity, suitability, and robustness for terrestrial and aquatic biota, including migratory birds, crayfish, riffle fish, and numerous other species of conservation concern. Also, habitat enhancement within public natural areas have been shown to improve human physical and psychological health and to strengthen communities.

The Selected Alternative is not expected to result in significant cumulative impacts on the human environment since it alone, or in combination with other current and future activities in the vicinity, would not change the larger current hydrologic patterns of discharge in the Black, Meramec, and St. Francis Rivers and their tributaries and would cause only a negligible to minor change in recreation, economic activity, and land-use in the project area. Future activities within the scope of the Selected Alternative, either completed by the Trustees or other organizations, agencies, or groups, will enhance habitat that exists naturally in the area. Regulatory activities ongoing in the VT that, in combination with the proposed restoration activities described herein, will provide additional cumulative benefits to the environment include MoDNR oversight of air pollution control actions at Buick mine/mill, hazardous waste clean-up actions at Glover and Sweetwater mines/mills, and closure at all the tailings impoundments. The Doe Run Company has implemented waste-water treatment measures that are expected to improve water quality to VT streams under the oversight of the MoDNR Water Protection Program. Additionally, the Doe Run Company is implementing terrestrial and aquatic restoration projects throughout the VT as part of the Viburnum Trend Lead Mining District Natural Resource Damage Assessment and Restoration Project. Restoration activities in this Final RP/EA have been designed to integrate or complement these planned environmental controls and restoration activities. Other ongoing non-regulatory land-use activities that will likely have cumulative impacts on the area would include continued mining, milling, and smelting activities, and limited logging and cattle grazing operations.

5 Monitoring

Restoration within the proposed project areas presents an opportunity to utilize a standard monitoring framework to collect data that will inform the ongoing project success relative to the goals of each restoration project. Ultimately, the outcomes of restoration projects, as determined through monitoring data, will assist the Trustees in determining the best restoration techniques and how to adaptively manage projects over time.

Monitoring plans will be guided by performance criteria, or measures that assess the progress of restoration sites toward restoration goals. In this way, the Trustees will be able to determine

which project attributes are not on target, and what actions and course corrections are needed to achieve project success. Monitoring information may also be used by the Trustees as an outreach tool to illustrate to the public continued success over time (quantitatively and qualitatively).
Terrestrial restoration monitoring will include pre-restoration bird and vegetation inventories, followed by post-restoration monitoring conducted on a subset of restoration sites. Monitoring sites should represent a range of habitat management conditions and the Trustees and their contractors, in coordination with the Project Partners, will conduct pre-restoration bird surveys prior to restoration implementation. Point count and other methods may be used to determine migratory bird use within each selected site and will be conducted during the primary breeding season (generally May-June). Pre-restoration vegetation surveys will be conducted at monitoring sites by the Trustees or their contractor using established methods to characterize vegetative communities and identify dominant plant species. Results will inform restoration targets for the monitoring sites and provide pre-restoration data for comparison to post-restoration vegetative communities. Bird and vegetation surveys will be conducted at set intervals following restoration activities to determine whether restoration techniques shift vegetation composition, impact bird community composition, and whether target restoration objectives have been met. Monitoring will occur for a period of time designated in the contractual agreement with the implementing group/agency. Pre and post-restoration photo points will be collected at monitoring sites over the designated monitoring period. At the end of the outlined monitoring timeframe, a final report will be produced, summarizing the status of the restoration practice, shifts in vegetative communities (i.e., growth of desirable native trees/shrubs or growth of invasive plant species), shifts in migratory bird communities, and overall success of the project. Monitoring will inform whether adaptive management activities are necessary. Examples of adaptive management could include increasing follow up invasive species removal, change in planned burning regimes due to bird response, etc.
Aquatic restoration monitoring will include annual inspections of a subset of restoration sites for a period of time designated in the contractual agreement with the implementing group/agency. Restoration activities will be documented, and monitored using pre and post-photo points over the designated monitoring period. Pre-restoration vegetation surveys will be conducted to obtain current ecological conditions where applicable. Follow up monitoring will be conducted following implementation. Additional details on specific restoration monitoring protocols and criteria will be developed following finalization of the RP/EA.

6 Agencies, Organizations, and Parties Consulted for Information

U.S. Fish and Wildlife Service
Columbia Ecological Services Field Office
101 Park DeVille Drive, Suite A
Columbia, MO 65203

Missouri Department of Natural Resources
Environmental Remediation Program
P.O. Box 176
Jefferson City, MO 65102-0176

U.S Forest Service
Mark Twain National Forest
401 Fairgrounds Rd
Rolla, MO 65401

Missouri Department of Conservation
Southeast Regional Office
2302 County Park Dr.
Cape Girardeau, MO 63701

Pheasant Forever/Quail Forever
1315 Webster St.
Chillicothe, MO 64601

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8 Figures

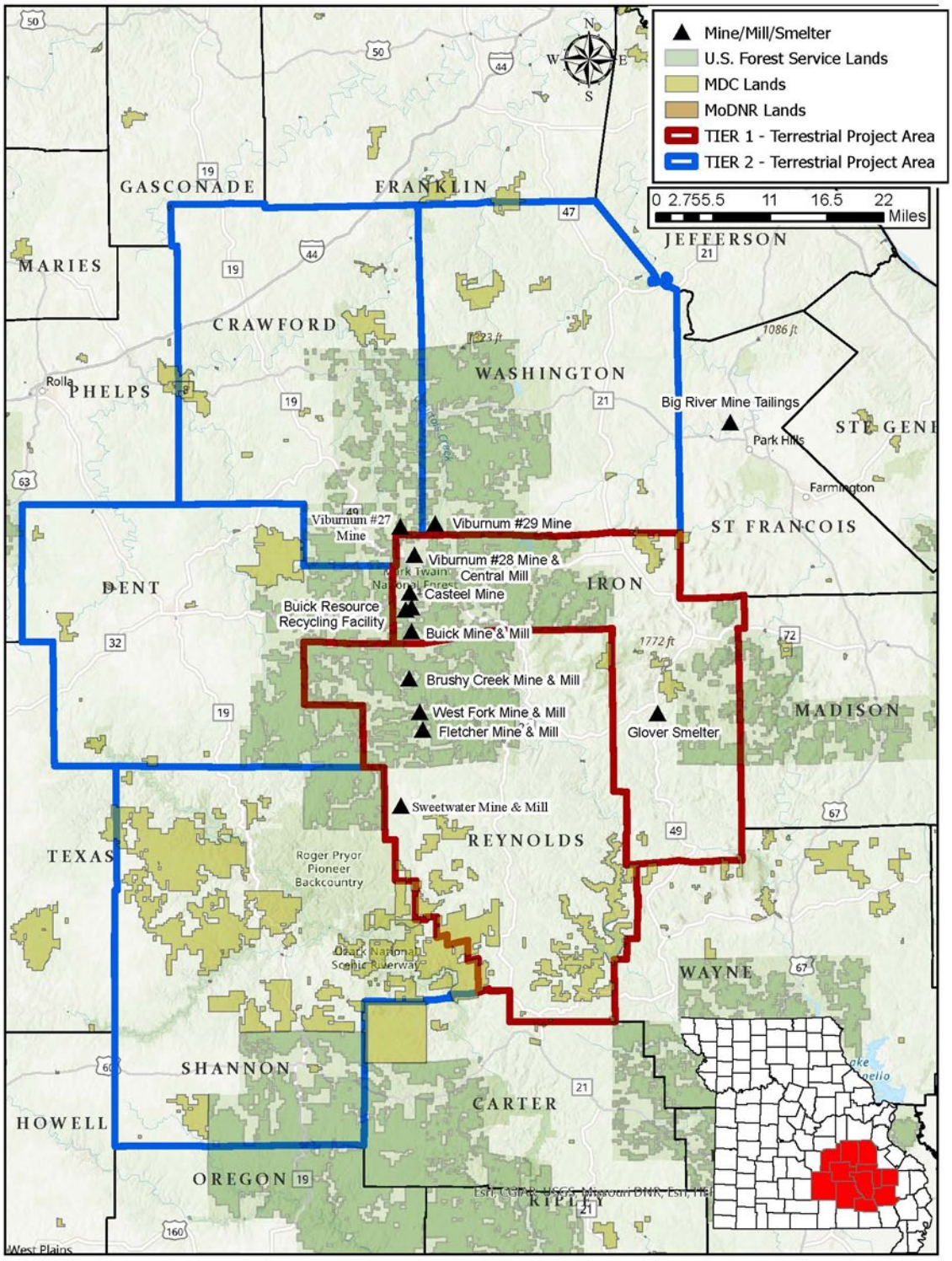

Figure 1. Terrestrial Restoration Project Areas

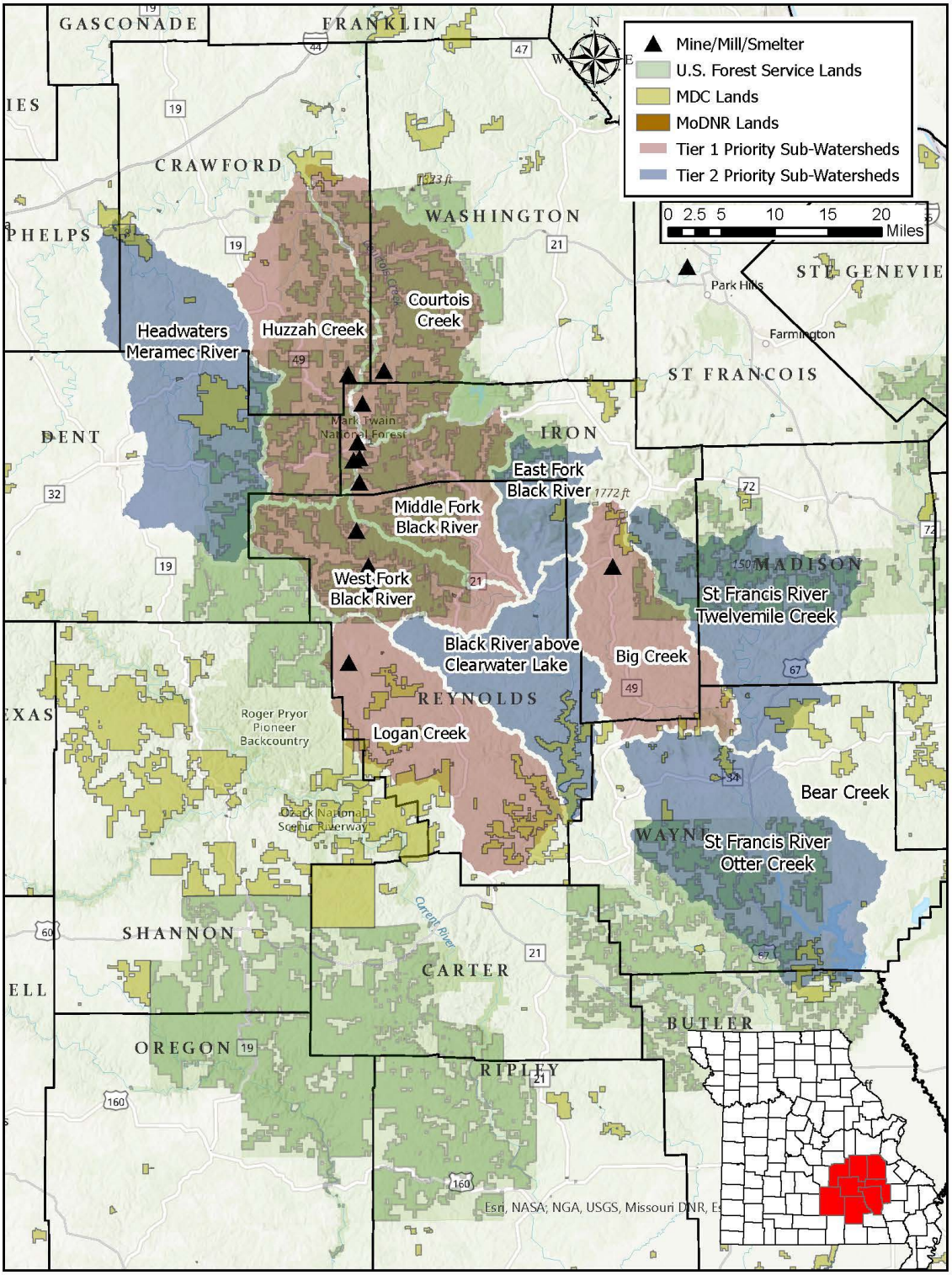

Figure 2. Priority sub-watersheds for Aquatic Restoration Project Areas.