



US Army Corps
of Engineers®

DRAFT INTEGRATED LETTER REPORT AND PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Federal Participation in Aquatic Invasive Species Prevention and Control

Arkansas River Basin



Source: New Mexico Department of Game and Fish

Prepared in response to Section 104 of the River and Harbor Act of 1958, as amended by Section 1039(d) of the Water Resources Reform and Development Act of 2014, Section 1178 of the Water Infrastructure Improvements for the Nation Act of 2016, Section 1170 of the Water Resources Development Act of 2018, and Section 505 of the Water Resources Development Act of 2020.

April 2024

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EXECUTIVE SUMMARY

This Integrated Letter Report and Programmatic Environmental Assessment presents the results of economic and environmental impact evaluations performed to determine how the Federal government should participate in a cost share program for ongoing or future state-managed programs to prevent and control the spread of aquatic invasive species (AIS) in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas within the Arkansas River Basin (ARB). The ARB AIS program, if funded by Congress, would be cost shared at 50 percent with each state. Eligible activities would include, but are not limited to, the establishment and operation of watercraft inspection stations, monitoring programs, contingency planning, and rapid response planning and preparation. Federal participation in these activities would aid in the prevention, control, and progressive eradication of noxious aquatic plant growths and aquatic invasive species from the navigable waters, tributary streams, connecting channels, and other allied waters of the United States, in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and related purposes.

Currently, the ARB has a relatively low infestation of AIS such as zebra or quagga mussels (referred to as dreissenids) and invasive carp compared to waters east of the Mississippi River or the Great Lakes. However, the ARB is at high risk of infestation by AIS due to the mobility of watercraft transported between and within watersheds over interstate highways and other roadways. Additionally, the high survival rate of invasive species once established, paired with their ability to be hidden on or inside of boats and other structures, as well as the high financial and environmental costs of infestation, presents serious problems to infrastructure investments and those who live, work, or recreate in the ARB.

Existing AIS prevention efforts are primarily watercraft inspection stations run collaboratively by the states of Colorado and New Mexico. Watercraft are inspected for the presence of dreissenid, or other AIS, and decontaminated if they are determined to be a potential vector of AIS. Federal participation would provide an opportunity to further this work and encourage additional prevention activities by employing a regional cost share program to prevent the spread of AIS into and out of the ARB.

A wide range of measures to augment and improve the effectiveness and efficiency of the program were considered. These measures include U.S. Army Corps of Engineers participation in the regional coordination efforts, expanding the number of locations or hours of operation, adding canine detection capabilities, increasing public awareness, constructing site improvements, as well as augmenting existing monitoring efforts and contingency and rapid response planning and efforts. After formulation of alternatives and screening, Alternative 2, Comprehensive Adaptive Improvements, was identified as the Recommended Alternative. This Recommended Alternative would augment the existing state AIS prevention and control programs by incorporating a comprehensive range of measures that would function as a suite of tools. These measures would be applied and adjusted annually by each state based on its need and ability to fund its

portion of the program, the results of the regional coordination efforts, and the availability of Federal funding.

The study period length is 50 years. The economic analysis assumes that AIS prevention activities will stave off an infestation for a few years from the plan's inception. To account for these uncertainties and risks, economic modeling was performed assuming different years of future onset. For the final total benefit figure, it was assumed that the watercraft inspections could stave off a dreissenid infestation for at least 25 years from the project's inception.

Conservative estimates of average annual net operations and maintenance cost savings associated with deferring an infestation for 25-years is a little over \$81.1 million (Fiscal Year [FY] 2024). Estimated average annual costs of the inspection station program over 25 years is approximately \$45.2 million (FY 2024), based on the most likely projected outcome, resulting in a benefit-cost ratio of 1.8 to 1. These economic benefits do not include the ecosystem benefits associated with delaying an infestation.

Because Federal participation would augment existing state-managed AIS control efforts and watercraft inspection stations, which are operated primarily along developed portions of major highways or boat ramps, it is anticipated that there would be only minimal direct effects to the environment. The indirect environmental effects of Federal participation in the program would be beneficial. Based on limited scope and effects and the coordination performed for the study, no controversy is anticipated. Additionally, because the program has such a limited initial investment and scope, and can be terminated at any time, there is extremely low residual risk.

**INTEGRATED LETTER REPORT AND
PROGRAMMATIC ENVIRONMENTAL ASSESSMENT
FEDERAL PARTICIPATION IN AQUATIC INVASIVE SPECIES
PREVENTION AND CONTROL
ARKANSAS RIVER BASIN**

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ACRONYMS AND ABBREVIATIONS

AIS	Aquatic Invasive Species
ANSTF	Aquatic Nuisance Species Task Force
ARB	Arkansas River Basin
BCR	benefit-cost ratio
BLM	Bureau of Land Management
CEJST	Climate Change and Economic Justice Screening Tool
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DNA	deoxyribonucleic acid
DOI	U.S. Department of the Interior
eDNA	environmental DNA
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fahrenheit
FONSI	Finding of No Significant Impact
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal year
HQ	Headquarters (USACE)
IEAB	Independent Economic Analysis Board
IPCC	Intergovernmental Panel on Climate Change
KDHE	Kansas Department of Health and Environment
LR/Programmatic EA	Letter Report/Programmatic Environmental Assessment
MBTA	Migratory Bird Treaty Act
MICRA	Mississippi Interstate Cooperate Resource Association
MRB	Mississippi River Basin
MRBP	Mississippi River Basin Panel
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NWPCC	Northwest Power and Conservation Council
NWW	Walla Walla District (USACE)
NOAA	National Oceanic and Atmospheric Administration
O&M	operation and maintenance
QA/QC	Quality Assurance/Quality Control
PL	Public Law
PNWER	Pacific Northwest Economic Region
PSMFC	Pacific States Marine Fisheries Commission
Reclamation	U.S. Bureau of Reclamation
RHA	River and Harbor Act
SHPO	State Historic Preservation Officer

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System	Regional Watercraft Inspection and Decontamination Data Sharing System
TCEQ	Texas Commission on Environmental Quality
THPO	Tribal Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USGCRP	U.S. Global Change Research Program
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VM	Vacuolar Myelinopathy
WID	watercraft inspection and decontamination
WOTUS	Waters of the United States (as associated with the Clean Water Act)
WRDA	Water Resources Development Act
WRP	Western Regional Panel (on Aquatic Nuisance Species)

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SECTION 1 - INTRODUCTION

This Integrated Letter Report and Programmatic Environmental Assessment (LR/Programmatic EA) presents the results of U.S. Army Corps of Engineers (USACE) Walla Walla District planning efforts and evaluation of the potential environmental effects associated with a proposed Federal action to engage in several techniques to help prevent and control the spread of aquatic invasive species (AIS) into, out of, or within the Arkansas River Basin (ARB). The proposed action calls for USACE participation in a cost-shared program to prevent and control the spread of aquatic invasive species (AIS) into, out of, or within the Arkansas River Basin (ARB) by cost-sharing and coordinating the establishment of new (or bolster existing) watercraft inspection stations, invasive species monitoring, contingency planning, and rapid response planning and preparation (training exercises and drills) conducted and operated by non-Federal sponsors in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas. The proposed action could also include the reimbursement of costs associated with a rapid response action, were such an action to occur. Such rapid response actions may require completion of site-specific (tiered) environmental compliance (e.g., Endangered Species Act [ESA], etc.) once the location and scope of the rapid response action is known. This LR/Programmatic EA documents the environmental, planning, and economic considerations used to develop and support the concluding recommendations. It also documents the coordination and evaluations performed for the proposed Federal action to comply with Title 33 Code of Federal Regulations (CFR) Part 230, Procedures for Implementing the National Environmental Policy Act (NEPA) (USACE 1988), and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA, Title 40 CFR Part 1500-1508, updated May 20, 2022.

NEPA is a full disclosure law that provides opportunity for public involvement in the Federal decision-making process. All persons and organizations that have a potential interest in this proposed action—including the public, other Federal agencies, state and local agencies, Native American Tribes, and interested stakeholders—are encouraged to participate in the NEPA process. The programmatic scope of this LR/Programmatic EA allows necessary minor changes in the proposed action to be implemented in response to changing physical and environmental conditions and changes in state and Federal laws over time, including changes to program authorities.

This LR/Programmatic EA includes an evaluation of potential environmental effects of the proposed establishment of watercraft inspection stations; invasive species monitoring and contingency planning; and rapid response planning, preparation, and actions (generally) in the ARB. If such effects are less than significant, a Finding of No Significant Impact (FONSI) will be issued, and USACE will proceed with the proposed Federal program. If the environmental effects are determined to be significant, an Environmental Impact Statement (EIS) will be prepared before a decision is reached on whether to implement the program.

1.1 AUTHORITY AND GUIDANCE

This report was prepared pursuant to Section 104 of the River and Harbor Act (RHA) of 1958 (33 United States Code [USC] § 610), as amended by Section 1039(d) of the Water Resources Reform and Development Act (WRRDA) of 2014 (Public Law [PL] 113-121), Section 1178(b) of the Water Infrastructure Improvements for the Nation (WIIN) Act of 2016 (PL 114-322), Section 1170 of the Water Resources Development Act (WRDA) of 2018 (PL 115-270), and Section 505 of WRDA of 2020 (PL 116-260).

Since it was enacted in 1958, Section 104 of the RHA has authorized a comprehensive program to provide for prevention, control, and progressive eradication of noxious aquatic plant growths from the navigable waters, tributary streams, connecting channels, and other allied waters of the United States, in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and related purposes, including continued research for development of the most effective and economic control measures, to be administered by the Chief of Engineers, under the direction of the Secretary of the Army. Eradication of aquatic invasive species was added as an authorized purpose of the program by WRRDA 2014. The Aquatic Plant Control Program is governed by USACE policy and guidance located in Engineer Regulation 1130-2-500, Chapter 14; Engineer Pamphlet 1130-2-500, Chapter 14, and supplemental implementation guidance from WRRDA 2014, the WIIN Act of 2016, WRDA 2018, and WRDA 2020.

Beginning in 2014, Section 104 of the RHA was also amended to add Watercraft Inspection and Decontamination (WID) Stations, and Monitoring and Contingency Planning, as authorized programs. In carrying out Section 104, the Secretary shall establish (as applicable), operate, and maintain new or existing WID stations at locations that have the highest likelihood of preventing the spread of aquatic invasive species into and out of waters of the United States, as determined by the Secretary in consultation and coordination with states, tribes, and other Federal agencies. The program must be cost shared with the non-Federal sponsors at 50 percent. Section 104 also authorizes the program to cost share activities such as monitoring, contingency planning, and rapid response planning.

WRRDA 2014 amended Section 104 of the RHA to authorize USACE to cost share watercraft inspection stations within the Columbia River Basin. USACE Headquarters provided guidance (USACE, HQ 2016) to undertake an evaluation to determine the locations for establishing watercraft inspection stations for the basin. The guidance required documentation in the form of a letter report and an appropriate NEPA document and outlined eight specific content requirements.

The WIIN Act of 2016 further amended the authorization, and in March 2017, USACE Headquarters provided updated implementation guidance (USACE, HQ 2017). The guidance removed the within-river basin protection requirements and allowed for actions to occur anywhere in a state where the river basin is located, if the actions provide

protection to the authorized river basin. The guidance also provided direction to assist these states in rapid response planning, preparation, and response.

WRDA 2018 further amended Section 104 of the RHA by authorizing the addition of the Upper Missouri River, Upper Colorado River, and South Platte River Basins. The Assistant Secretary of the Army (Civil Works) issued Implementation Guidance for WRDA 2018 on April 12, 2019, that directed USACE to use previous implementation guidance from 2016 and 2017 for the newly added basins.

WRDA 2020 amended Section 104 of the RHA to replace the incorrect reference to the Arizona River Basin, with the Arkansas River Basin. It also changed the location criteria for inspection stations from those that prevented the spread of aquatic invasive species at reservoirs operated and maintained by USACE, to “locations with the highest likely of preventing the spread of AIS into or out of waters of the United States.”

Throughout Section 1, and in the Executive Summary, *waters of the United States* is used as a geographical term, rather than to describe waters under the regulatory jurisdiction of USACE, as associated with the Clean Water Act (CWA). In Sections 6.3.2 and 7.1.7, which address the CWA, the acronym for *waters of the United States* (WOTUS) is used to indicate the jurisdictional definition is intended. Section 1.3, Key Terminology, provides further information on this definition.

Due to the increasing concern of limiting further spread of zebra and quagga mussels (dreissenids) into, out of, or within the ARB and other western states, this report frequently calls out these species specifically. However, the Section 104 of the RHA, as amended, does allow actions to address any AIS, and therefore, other AIS are also mentioned throughout this report.

Letter reports and appropriate NEPA documentation for Federal participation in the Columbia, Upper Missouri, Upper Colorado, and South Platte River Basins watercraft and decontamination inspection station programs have been previously prepared and approved by USACE. The present letter report and NEPA document now focuses on Federal participation in watercraft and decontamination inspection station programs in the ARB.

1.2 STUDY AREA

The location of the proposed action (as defined by the legislative authority) is within the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas (sometimes referred to as “the study area states” throughout the report). The authorized basin is the ARB and is illustrated in Figure 1; however, the study area includes the state’s full political boundaries.

The ARB study area encompasses the drainage of approximately 168,000 square miles (440,000 kilometers²), flowing from the Sangre de Cristo Mountains and Great Plains, comprising portions of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas (Figure 1). The Arkansas River originates near Leadville, Colorado, and flows in an east-southeast direction over approximately 1,469 miles to near Napoleon,

Arkansas, and the confluence with the Mississippi River. The ARB is generally sparsely populated and dominated by agricultural industry and infrastructure. The largest city is Oklahoma City, Oklahoma, with a population estimated at approximately 681,054 in 2020. Other major cities include Colorado Springs, Colorado (population 478,961); Tulsa, Oklahoma (population 413,066); Wichita, Kansas (population 397,532); Amarillo, Texas (population 308,297); and Little Rock, Arkansas (population 204,405). Significant tributaries to the Arkansas River within the ARB include the Canadian River, the Cimarron River, the Neosho River, and the Verdigris River.

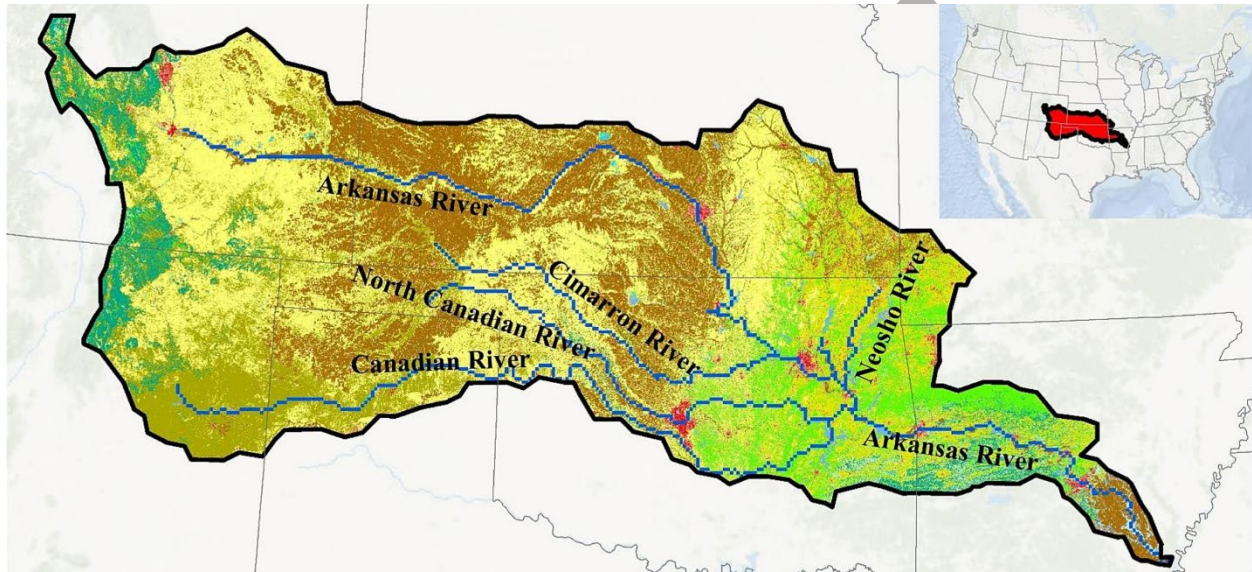


Figure 1. The Arkansas River Basin

Source: Yang et al. 2023

1.3 KEY TERMINOLOGY

Definitions of key terms used throughout this report are provided below.

Aquatic Invasive Species

An “invasive species” is defined with regard to a particular ecosystem, as a non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health (Executive Order [EO] 13751, Safeguarding the Nation from the Impacts of Invasive Species, December 5, 2016). Aquatic Invasive Species (AIS) are invasive species that inhabit the aquatic environment.

Dreissenids

Currently, an AIS of particular concern in the ARB are zebra (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*), which are freshwater mussels from the family Dreissenidae. Collectively, they are called dreissenids.

Due to the concern of a dreissenid infestation spreading into, out of, or within the ARB, a key focus of this LR/Programmatic EA is on dreissenids. However, methods used for preventing the spread of dreissenids are also effective for other types of AIS, such as flowering rush, bighead carp, silver carp, common carp, Eurasian water milfoil, hydrilla, giant salvinia, Brazilian elodea, purple loosestrife, and water hyacinth. Watercraft Inspection Stations, in particular, are a key approach to preventing the spread of invasive aquatic plants and invertebrates.

The term “dreissenids” is used throughout this document, unless the idea of AIS in general, or plant AIS is intended. In instances where information came from an outside source, the term mussel, zebra mussel, or quagga mussel was used, as applicable. Statements that pertain to a particular dreissenid species may or may not apply to the other species.

Establishing a Watercraft Inspection Station

Establishing a watercraft inspection station means to select and prepare the site, to provide and/or mobilize the equipment and materials needed to perform watercraft inspection activities, and to construct facilities, as needed for efficient inspections.

Facility Vulnerability Assessments

Facility vulnerability assessments are performed to determine the components of a water resource project or facility that would be affected in the event of an AIS infestation and how the function of those components would be affected (DeBruyckere and Phillips 2015).

Maintaining a Watercraft Inspection Station

Maintaining a watercraft inspection station includes any routine actions necessary to continue the station’s activities. Examples may include, but are not exclusive to, painting traffic control lines, replacing signage, and maintaining decontamination equipment. It may include demobilizing the equipment and materials from the site and placing equipment at storage facilities.

Operating a Watercraft Inspection Station

Operating a watercraft inspection station includes any activity necessary for the day-to-day function of the station. It may include, but not be exclusive to, the manpower needed to perform inspections, utility and communications, and any supplies or materials needed to set up and operate the station at a site for the duration of the season.

Regional Defense

Regional defense is defined as “using resources in a cost-effective, interjurisdictional, coordinated, and collaborative response to prevent mussels from entering uninfested areas and to contain aquatic invasive species at their source” (PNWER and PSMFC 2015).

Veliger

A veliger is the free-swimming larvae of freshwater mussels, including zebra and quagga mussels.

Waters of the United States

Most instances of *waters of the United States* throughout the report refer to waters within the boundaries of the United States; it is intended to represent geography only (an acronym is not used for this definition).

As associated with the CWA, waters of the United States (WOTUS) are the oceans, rivers, streams, lakes, creeks, marshes, and wetlands within the regulatory jurisdiction of USACE. They are roughly defined as follows:

- All waters currently used, or were used in the past, or could be susceptible to use in interstate or foreign commerce, including traditional navigable waters, which are water bodies subject to the tide's ebb and flow.
- Interstate waters, regardless of navigability.
- Other waters such as intrastate lakes, rivers, streams (including intermittent streams), which could affect interstate or foreign commerce.
- The territorial sea.
- Wetlands adjacent to other waters that have a continuous surface connection.

1.4 PURPOSE AND NEED FOR ACTION

The purpose of the proposed action is to assist the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas with establishing and operating watercraft inspection stations, monitoring, contingency planning, and rapid response planning, preparation, and actions (subject to necessary tiered environmental compliance) to aid in preventing the spread of AIS into, out of, or within the ARB. The proposed action would be under a cost-share program involving the measures identified above as part of a comprehensive defense strategy to protect water bodies in the ARB, pursuant to Section 104 of the RHA 1958 (33 USC 610).

The proposed action is needed because the risk of the spread of AIS into, out of, and within the ARB is high, and the introduction and establishment of AIS (particularly dreissenids) in uninfested water bodies within the basin has the potential to cause damage and increased operation and maintenance (O&M) costs to water-related

infrastructure, recreation, and potentially irreversible ecosystem effects. Dreissenids and other AIS present a direct threat to waters of the United States and USACE-authorized purposes, including hydropower, navigation, and fish and wildlife mitigation. Once a waterway is infested, dreissenids and other AIS can reproduce rapidly and spread.

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SECTION 2 - BACKGROUND

2.1 DREISSENID MUSSELS

As stated in Section 1, the main AIS of concern in the ARB at this time are zebra and quagga mussels (Figure 2), which are also known as dreissenids. Dreissenids are nonnative organisms that were first discovered in the Great Lakes in the late 1980s and quickly spread to the middle and northeastern United States. Since then, established populations have also been detected across the United States, including in the ARB (Figure 3 shows established populations in the eastern portion of the basin). According to the Pacific Northwest Economic Region (PNWER) and the Pacific States Marine Fisheries Commission (PSMFC) (2015), the Pacific Northwest is the only region without established populations of dreissenids. Figure 4 illustrates how they are distributed throughout the United States as of February 2022, including populations that were detected but subsequently did not become established.



Figure 2. Zebra and Quagga Mussels

Source: PSMFC GIS Center



Figure 3. Established Dreissenid Populations in the Arkansas River Basin
Red diamonds represent dreissenid populations.

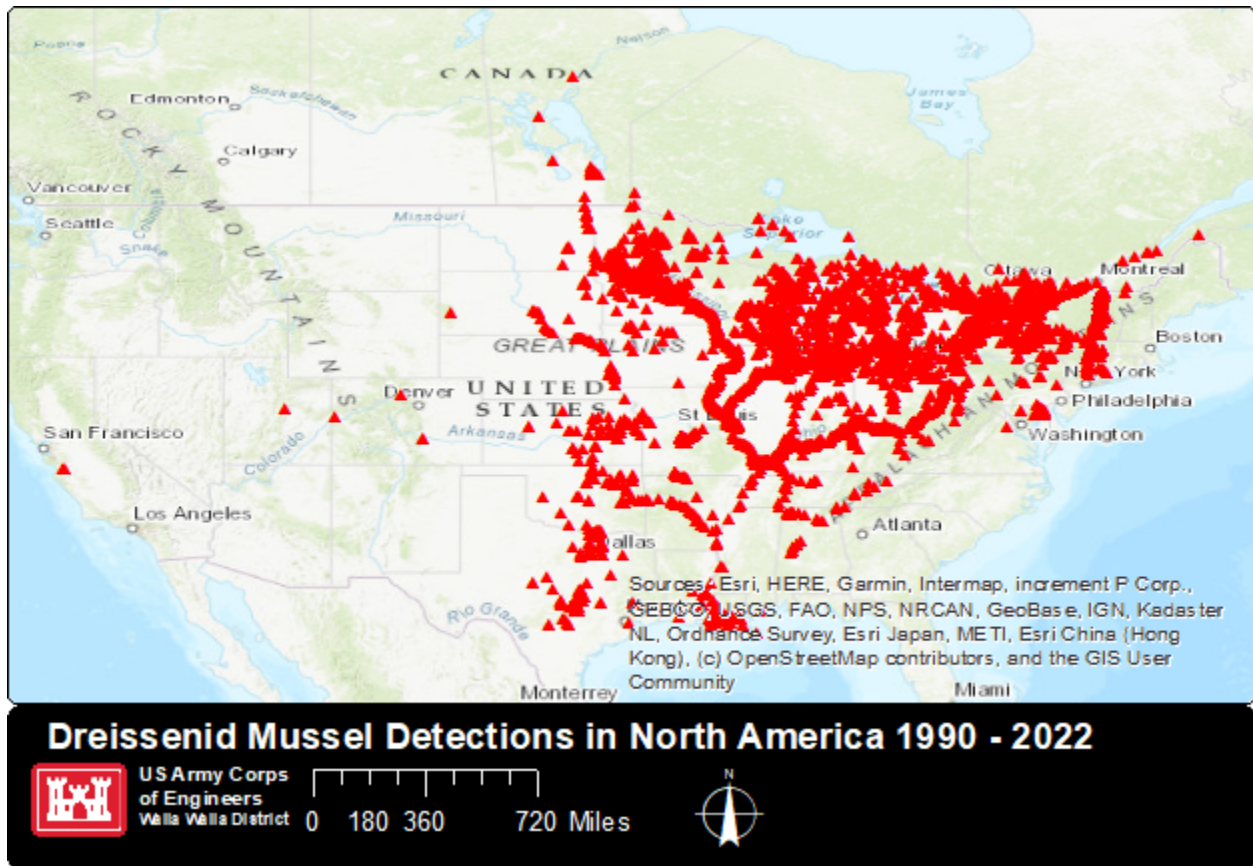


Figure 4. Dreissenid Detections, 1990 – 2022

Dreissenids have few natural predators, so introduced populations grow unchecked. According to the Cary Institute of Ecosystem Studies (2020), dreissenids are highly prolific and attach themselves to boats or any hard surface with their byssus, or beard. They can live out of water for 2 weeks, and their larvae, known as veligers, use currents to colonize new waters. As many as 700,000 mussels can live in a single square yard. Figure 5 and Figure 6 show examples of typical dreissenid densities.



Figure 5. Adult Dreissenids Surface Attachment

Source: PSMFC 2024



Figure 6. Zebra Mussels Removed from Watercraft during Inspection and Decontamination at Lewis and Clark Lake, South Dakota

Source: South Dakota Game, Fish and Parks

An example of their ability to quickly colonize and rapidly achieve high densities is provided in Figure 7, which demonstrates the increase in quagga mussel densities in Lake Michigan over a 10-year period. Once established, they cause considerable impacts to the ecosystem and water-related infrastructure, as described in Section 3.1

of this report. The invasion of dreissenids has already generated extensive costs related to infrastructure, biodiversity, and water quality in other regions of the United States.

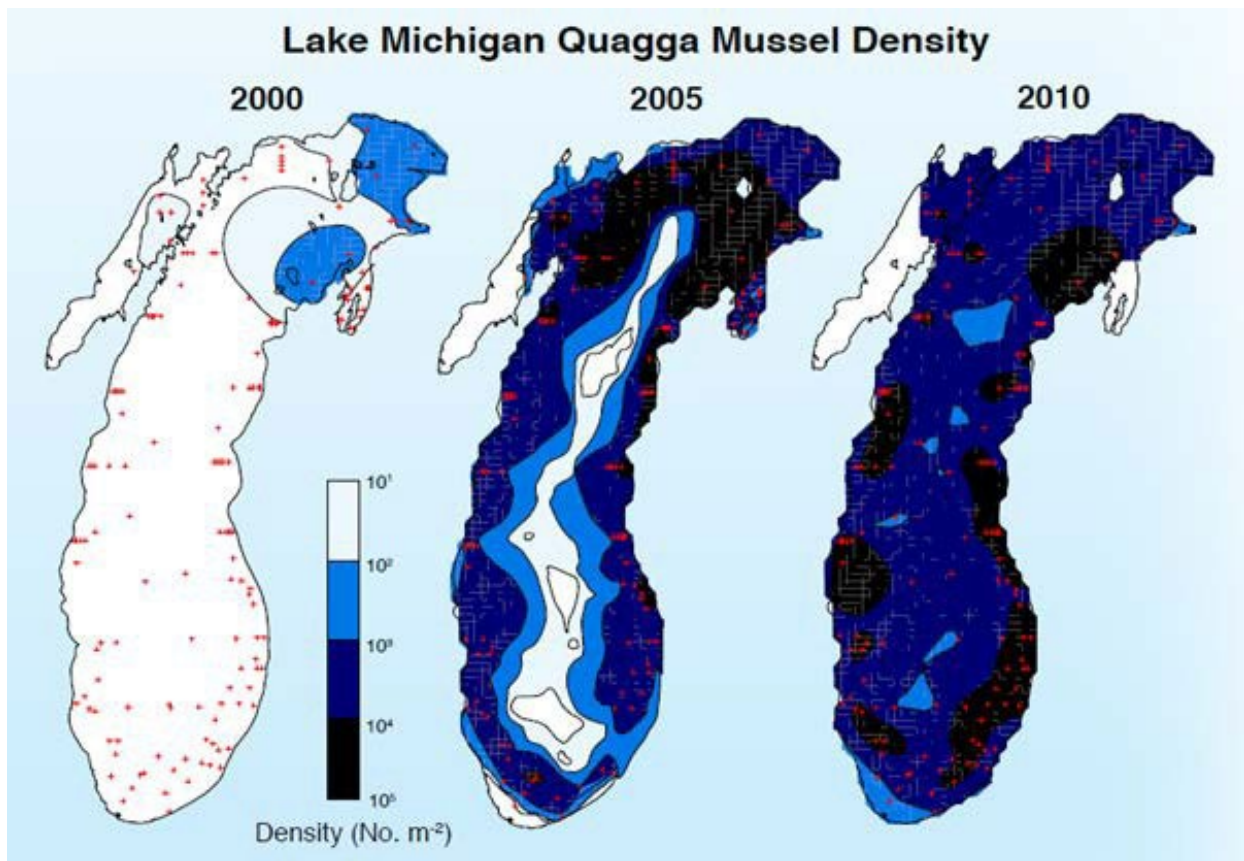


Figure 7. Quagga Mussel Density Lake Michigan 2000-2010

Source: NOAA Great Lakes Environmental Research Laboratory, n.d.

2.2 OTHER AQUATIC INVASIVE SPECIES

While there is a compelling interest in preventing the establishment of dreissenids in lakes and rivers where they do not yet occur, they are not the only AIS of concern in the ARB. Other AIS that have considerable impacts in the region include bighead carp, silver carp, common carp, Eurasian water milfoil, hydrilla, giant salvinia, Brazilian elodea, purple loosestrife, and water hyacinth. There are a number of other threats to the ARB within the Mississippi River Basin (MRB) that have the potential to cause large impacts in the future, including species such as black carp, northern snakehead, flowering rush, and didymo (rock snot).

2.2.1 Invasive Carp

In North America, the expression “invasive carp” refers to a collection of four invasive species: bighead carp (*Hypophthalmichthys nobilis*), silver carp (*H. molitrix*), black carp (*Mylopharyngodon piceus*), and grass carp (*Ctenopharyngodon idella*). Invasive carp were imported into the United States several decades ago primarily to be used in

aquaculture and wastewater treatment plants for control of algae (silver carp and bighead carp) and grubs and snails (black carp), but subsequently escaped and are an increasing threat to the ecological, recreational, and economic value of the ARB (Kolar et al. 2005). The Aquatic Nuisance Species Task Force (ANSTF) identified active control of invasive carp by natural resource agencies as a priority and developed the Management and Control Plan for Bighead Carp, Black Carp, Grass Carp, and Silver Carp in the United States (Conover et al. 2007) to identify strategies to address invasive carp.

Bighead and silver carp are voracious plankton consumers. Neither species has a true stomach, and both must feed continuously to survive. There is concern that competition for plankton can impact native planktivores and juveniles of many fish species (Sampson 2005, Schrank et al. 2003). DeBoer et al. (2018) found compelling evidence of system-wide effects from a silver carp invasion with quick and negative impacts to zooplankton populations and phytoplankton populations. Fish and birds that feed on prey fish species can be outcompeted, with substantial negative effects on recreational and economic opportunities in the ARB.

Invasive bighead carp and silver carp are increasing in abundance and expanding their range in the Lower Mississippi River Basin. Significant populations are established throughout many areas. Invasive carp rapidly and densely colonize river reaches affecting the native food web in large river ecosystems (Freedman et al. 2012; Irons et al. 2007).

2.2.2 Hydrilla

Hydrilla verticillata is one of the most problematic invasive aquatic plants in the United States. This plant, native to Africa, Australia, and parts of Asia, was introduced to Florida in 1960 via the aquarium trade. Once established, plant fragments can break off and re-establish in new locations. Boaters and anglers often incidentally transfer the plant from contaminated waterways into unestablished ones. It has been listed as a noxious weed in the United States since 1976 and is regulated at the state level by multiple states in the ARB. Hydrilla is now well established throughout water bodies in the southern states where control and management costs millions of dollars each year. From 2008 to 2015, Florida alone spent \$66 million on hydrilla control (FWC 2019). Hydrilla has already been established in some reservoirs in the ARB.

Hydrilla shades and outcompetes native plants, as its dense mats block sunlight to submerged vegetation (Hofstra and Clayton 2014; Langeland 1996). Popular sport fish grow smaller in waters infested with hydrilla (Colle and Shireman 1980), and infested waters also have smaller populations of aquatic invertebrates (Colon-Gaud et al. 2004). Boating, swimming, and fishing can become difficult or impossible in infested waters (Ramey 2001 et al.; Yeo et al. 1984). The plant clogs canals, pumping stations, and irrigation channels and affects hydroelectric power generation (Ramey 2001 et al.; Sousa 2011).

Hydrilla is the primary cause of Vacuolar Myelinopathy (VM), a neurological disease affecting birds of prey, waterfowl, amphibians, reptiles, fishes, and potentially mammals in the Southeastern United States. Cyanobacteria that grow on hydrilla produce a toxin that infects animals that forage on or in hydrilla, as well as the species that prey on the consumers. VM has been responsible for the death of more than 100 bald eagles and thousands of coots in Texas, Georgia, North Carolina, and South Carolina (Haram et al. 2020; Breinlinger et al. 2021).

2.3 NATIONAL AND REGIONAL RESPONSE

The discovery of adult quagga mussels at Lake Mead, Nevada in 2007 led many resource management agencies in the Western United States to initiate WID programs (Elwell and Phillips 2016). Since then, not only have watercraft inspection station programs expanded substantially, but state, Federal, provincial, Tribal, local, and non-governmental organizations are engaged in regionally coordinated efforts in the defense against dreissenids throughout the west.

Programs in central states have not scaled up as rapidly as those in the west, but regional coordinating bodies have been formed across the Great Plains and southeast. Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas, in cooperation with other states, coordinate efforts and make decisions as part of this regional strategy, while operating within the scope of their specific budgets and statutory authorities. Regional coordination occurs through collaboration with the AIS-prevention organizations described below.

Aquatic Nuisance Species Task Force

The Aquatic Nuisance Species Task Force (ANSTF) was established by the Nonindigenous Aquatic Nuisance Species Prevention and Control Act of 1990 (PL 101-636). The ANSTF is an interagency organization co-chaired by U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) (USFWS 2022). Activities of the ANSTF include aquatic nuisance species prevention, research, and control; public and stakeholder education; and state coordination efforts (USFWS 2022). The ANSTF works with six regional panels: Western, Great Lakes, Northeast, Mississippi River Basin, Mid-Atlantic, and Gulf and South Atlantic. The responsibilities of the Mississippi River Basin Regional Panel are to “identify priorities for activities in the Mississippi River Basin, develop and submit recommendations to the national Aquatic Nuisance Species Task Force, coordinate aquatic nuisance species program activities in the MRB, advise public and private interests on control efforts, and submit an annual report to the ANSTF describing prevention, research and control activities in the Basin (MRBP 2024).”

The Stop Aquatic Hitchhikers! (stopaquatic hitchhikers.org/) campaign was launched by the ANSTF in 2002. It is designed to raise awareness about aquatic invasive species with the “Clean. Drain. Dry.” message for recreational watercraft.

Mississippi River Basin Regional Panel on Aquatic Nuisance Species

The Mississippi River Basin Regional Panel (<http://www.mrbp.org/>) on Aquatic Nuisance Species meets annually to address the spread of invasive species in the waters of the western United States. The MRBP annual meeting brings together the public and private sector researchers, industry representatives, agency representatives, and legislators to discuss invasive species management from 26 states and 8 Federal agencies. The meeting focuses on AIS research and development, including the most innovative and forward-thinking research in the region. MRBP documents (<http://www.mrbp.org/resources>) provide stakeholders with standardized training for conducting inspections and monitoring, as well as model rapid assessment and response plans. Regional coordination efforts by the MRBP also include committees focused on outreach, education, prevention, and control.

Aquatic Invasive Species Network

The (Western) Aquatic Invasive Species Network website (<https://www.westernais.org/>), supported by the PSMFC, is collaborative source of information. It provides information on the efforts of states and provinces in the United States and Canada to prevent the introduction and spread of AIS. The network maintains links to a broad range of activities throughout western North America and around the world. The site complements information maintained by the Western Regional Panel (WRP) on Aquatic Nuisance Species and other organizations.

100th Meridian Initiative

The 100th Meridian Initiative was one of the first organizations with a goal of preventing the spread of AIS in the Western United States. The 100th Meridian Initiative provided the foundation for the AIS prevention and control efforts. While the 100th Meridian Initiative no longer exists, activities and efforts that were previously undertaken by the initiative are now being funded by the USFWS and undertaken by non-governmental agencies, Tribal, state, interstate, and Federal agencies.

Regional Watercraft Inspection and Decontamination Data Sharing System

In addition to participation in a number of cooperative organizations, the western-most states in the ARB states coordinate their watercraft inspection station efforts through the Regional WID Data Sharing System (System) in use at more than 200 locations across the West (Figure 8).

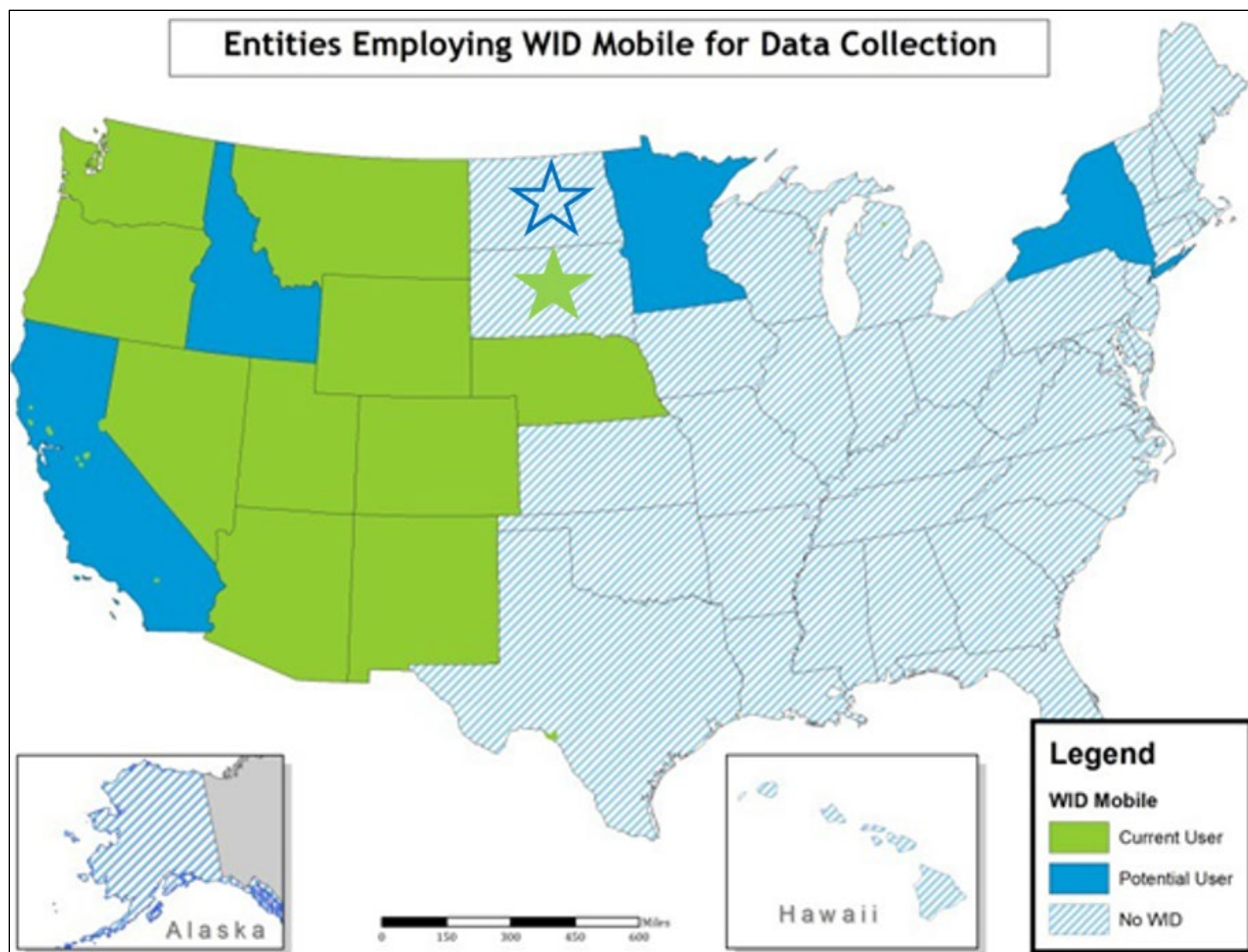


Figure 8. Map Showing States Using the Watercraft Inspection and Decontamination Data Sharing System as of 2019

Source: WID Data Sharing System

Note: Filled green star = South Dakota began implementing the WID mobile app during the 2020 season; Hollow blue star = North Dakota intends to begin implementation of the WID mobile app.

Colorado Parks and Wildlife developed the System to record WID information electronically and share information in a timely manner across jurisdictions to aid collaborative efforts to prevent the spread of zebra and quagga mussels and other AIS. The System consists of a website, shared database, and phone app for iOS and Android devices. The System reduces operating costs for mobile data collection while increasing accuracy and reliability, and it can be queried for on-demand reporting. The System includes a risk assessment tool to show where boats are moving after launching in mussel-infested waters, and it sends an alert to the next known destination. With the benefits of data sharing proving to be abundant, the states are beginning to utilize the technology and System to send out timely electronic alerts for watercraft leaving infested waters. This increased timely communication has directly increased the number of infested watercrafts being intercepted before launching into uninfested waters.

Mississippi Interstate Cooperate Resource Association

The Mississippi Interstate Cooperate Resource Association (MICRA) is an organization of 28 state natural resource departments organized in 1991 as a partnership to improve management of inter-jurisdictional fish and other aquatic resources in the Mississippi River Basin. To facilitate a basin-wide approach to manage threats to the Mississippi River Basin from AIS, MICRA is developing an Action Plan to Minimize Ecological Impacts of Aquatic Invasive Species in the Mississippi River Basin. The Action plan would guide coordinated efforts to prevent additional species invasions and contain and control populations of priority AIS established in the Mississippi River Basin. The Action Plan would focus the collaborative efforts of the Mississippi River Basin states to implement a strategic, action-oriented approach to minimize risks of AIS introductions by working with partners to sever pathways and to implement an integrated pest management approach to contain and control AIS.

Invasive Species Leadership Team

The Invasive Species Leadership Team was established by a Corps of Engineers Civil Works and Contingency Operations Memorandum dated 13 July 2005. Its intent is to provide oversight of the USACE invasive Species Program. The Invasive Species Leadership Team provides direction to achieve goals and objectives that complement the National Invasive Species Management Plan and the Aquatic Nuisance Species Task Force Strategic Plan and that are applicable to USACE Civil Works programs and projects. The Invasive Species Leadership Team provides support for the exchange and sharing of information, as well as support to develop and provide strategic recommendations to USACE and the U.S. Army Engineer Research and Development Center.

2.4 EXISTING WATERCRAFT INSPECTION STATIONS AT SOURCE WATER BODIES OUTSIDE THE ARB

Dreissenid-infested water bodies of significant concern include the Great Lakes; Lake Powell (Utah and Arizona), Lake Mead (Nevada and Arizona), and Lake Havasu (Arizona and California) on the lower Colorado River; and Lake Pleasant (Arizona) on the Aqua Fria River. In 2019, 8 of the 19 fouled vessels intercepted at watercraft inspection stations in Wyoming originated from one of these infested sources.

Currently, there are many watercraft inspection/cleaning stations in the Great Lakes states operated by a combination of state, county, city, and private organizations. Lakes Powell and Mead are both within National Recreational Areas (NRA) and are administered by the National Park Service. Lake Powell is within the Glen Canyon NRA, and Lake Mead within the Lake Mead NRA. Jurisdiction over Lake Havasu is complex, including Federal, state, and local government agencies. The roles and responsibilities of all these agencies at Lake Havasu are outlined in a memorandum of understanding (BLM 2014). Currently, fouled boats can leave the NRAs without requirement of decontamination.

In September 2018, the Arizona Game and Fish Department updated Director's Order 3 – R09/18 (originally issued May 2016), which establishes the mandatory conditions and protocols for all watercraft movement from AIS-infested waters and locations (AZGFD 2018). The protocols use exposure time in infested waters to determine which treatment to apply to watercraft, vehicles, conveyances, or other equipment. For example, if the watercraft was exposed or moored in infested waters less than 5 days, the watercraft is mandated for a partial decontamination. If the watercraft was exposed or moored in infested waters more than 5 days, the watercraft is mandated for a full decontamination with drying times up to 7 days during May through October and up to 18 days during November through April. The other states mentioned above with infested water bodies do not have mandatory conditions and protocols for watercraft movement from AIS-infested waters.

2.5 EXISTING AQUATIC INVASIVE SPECIES PREVENTION AND CONTROL PROGRAMS IN THE ARKANSAS RIVER BASIN

2.5.1 Watercraft Inspection Stations

Watercraft inspection stations are part of the national and regional response to the growing concern of dreissenids and other AIS infestations spreading into uninfested water bodies. However, despite the widespread deployment in western states, only Colorado and New Mexico in the ARB operate watercraft inspection programs at present. Watercraft inspection stations for these two states are operated by the following organizations:

- Colorado – Aquatic Nuisance Species Task Force, Colorado Parks and Wildlife.
- New Mexico – New Mexico Department of Game and Fish.

Though only Colorado and New Mexico are presently operating watercraft inspection stations, all seven study states have enforcement capabilities/jurisdiction over prohibited AIS and/or the possession or transportation of AIS that vary according to their statutes and regulations (enforcement programs are generally through fish and wildlife agencies and/or state/county police agencies). The common state law concerning mandatory watercraft inspection stations is that persons transporting watercraft and/or conveyances must stop for inspection or be subject to criminal prosecution in state courts. On the Federal side, zebra mussels are listed as an injurious species under the Lacey Act (18 USC §§ 42-43 *et seq.*; 16 USC §§ 3371-3378 *et seq.*), which makes importation (transportation) across state lines a violation and therefore federally enforceable.

2.5.1.1 *Types of Watercraft Inspection Stations and Operations*

Watercraft inspection sites in Colorado and New Mexico are established at strategic locations each year during the recreation season, which typically ranges from early spring to early fall, depending on the state and specific station. Implementation and management of station sites range from use of permanent or long-term sites to temporary or intermittently used sites. Each state has the option to use the

management strategy they determine best addresses their AIS objectives. For example, Colorado has permanent inspection and decontamination stations at heavily used recreational reservoirs such as Lake Pueblo, but New Mexico deploys mobile stations to address periods of increased boating activity at several heavily used recreational areas throughout the state. Hours of operation vary by state and specific station. Operations for most stations begin between approximately 7 a.m. and 10 a.m. and end between 5 p.m. and 9 p.m. Permanent stations are typically operated by two personnel for each shift, with additional personnel for high traffic areas or on weekends and holidays. Mobile stations are typically operated by one person per shift.

For this LR/Programmatic EA, watercraft inspection stations were separated into five types:

- Roadside inspection station, which is “conducted at a port of entry, major highway junction, management area, or other geographically relevant choke point. The roadside inspection is typically used to prevent AIS from entering a defined geographic area” (Elwell and Phillips 2016).
- Rampside inspection station, which is set up at a specific water body to inspect watercraft entering/exiting a lake or reservoir (Elwell and Phillips 2016).
- Inspection conducted by appointment at state agency offices, which is available in most of the ARB states.
- Authorized private inspections by appointment. Independent contractors identified by the state agency are available by appointment to inspect boats at locations throughout the state. These commercial inspections provide flexible options for inspection compliance.
- Roving station, which is typically assigned to a predetermined geographical area, sometimes remaining in a location for only hours at a time, making them effective for inspections at high-use boating recreational areas or during watercraft-related activities such as fishing tournaments or boating-related competitions.

2.5.1.2 Station Locations

All types of watercraft inspection stations are used within the study area, but efforts are focused on roadside and rampside stations associated with lakes and reservoirs. Roadside inspection stations are often strategically located along state borders, with an emphasis on major routes entering a state from areas in which dreissenids are well established. Many of these stations have a site arrangement that allows some equipment to remain onsite until the end of season. Rampside stations within the study area are best positioned to provide another layer of defense against dreissenids and prevent the spread of locally established plant AIS. Most watercraft inspection stations can easily be moved and placed in the most effective locations.

The process of selecting locations for watercraft inspection stations includes the following considerations: safety of personnel and public; ease of public access; infrastructure availability for setting up facilities (electricity, water, restrooms, etc.); and

where applicable, availability of a suitable space for conducting decontamination procedures that does not pose any threat to the environment. Although only water is used to decontaminate watercraft, watercraft inspection stations are set up in parking lots, gravel pits, or other areas where water runoff does not present an environmental concern. Some states use a containment mat that is placed under the vessel to capture the runoff, as shown in Figure 9, below.



Figure 9. A Portable Decontamination Unit with a Containment Mat for Wastewater

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Figure 10. Strategies Adopted among Western States and Provinces as of 2019 to Address Distribution of Watercraft Inspection and Decontamination Station Effort

Note: Green star represents that South Dakota began transitioning to the hybrid model in 2020.

Source: Western Regional Panel on Aquatic Nuisance Species.

2.5.1.3 Station Equipment and Inspection and Decontamination Procedures

The following section describes typical watercraft inspection stations, like those currently operating in Colorado and New Mexico. A typical station consists of a shelter/covering, such as a shipping container, a construction trailer, canopy, or tent; a transport vehicle; a hot water pressure washer; outreach and educational materials; directional devices such as cones and signage; and applicable personnel amenities (heaters for cold weather, portable restrooms, etc.). Figure 11 shows an example of a roadside inspection station.

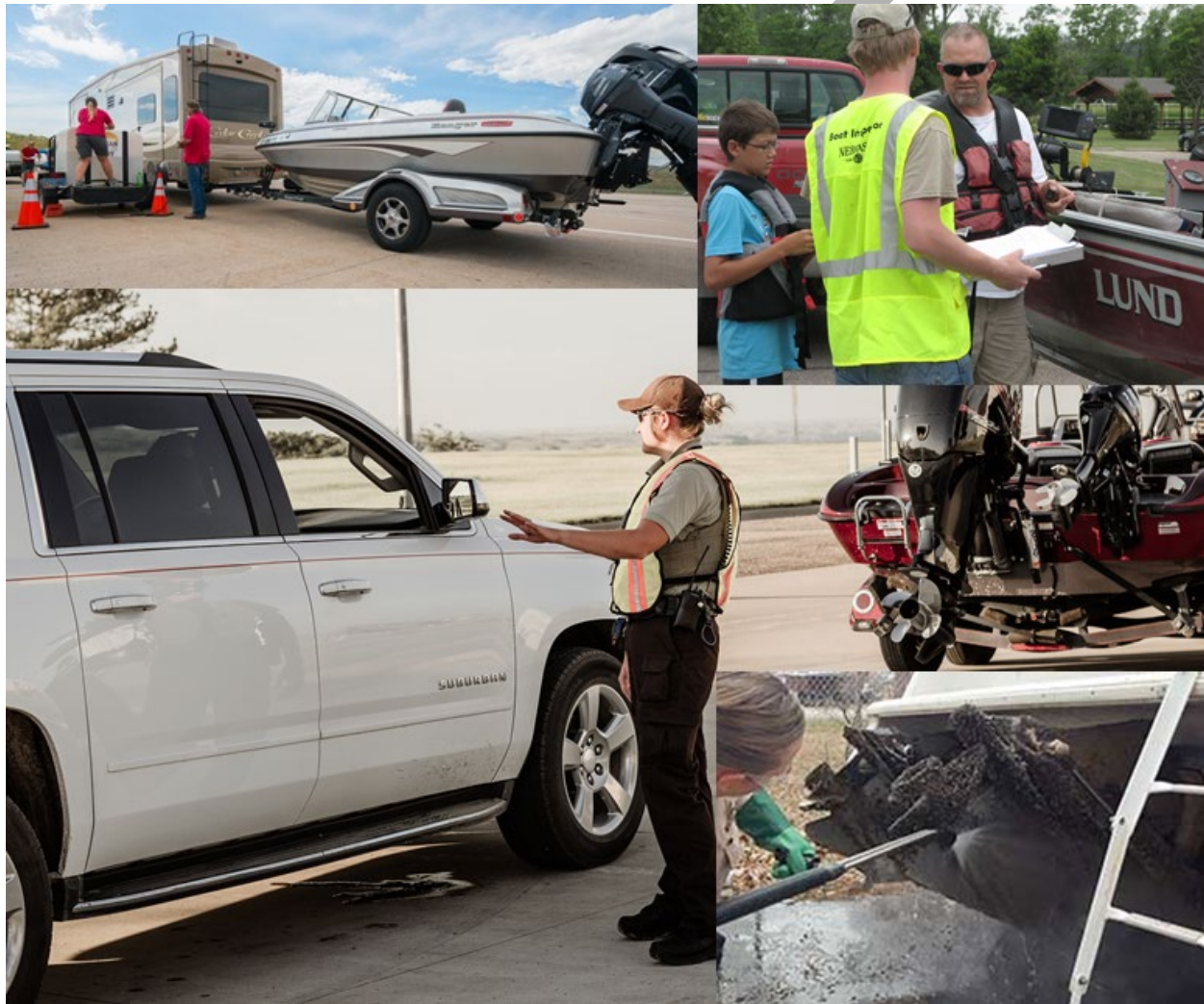


Figure 11. Example of Roadside Watercraft Inspection Station

The states follow similar protocols and standards for watercraft inspections based on the Uniform Minimum Standards and Protocols for Watercraft Inspection and Decontamination Programs for Dreissenid Mussels in the Western United States III (Elwell and Phillips 2016). Procedures include a screening interview to assess the risk level of the watercraft, distribution of information about AIS, and a boat inspection based on risk level.

The screening interview includes questions pertaining to watercraft origin, usage, including when and where it was last used, whether it was cleaned, drained, and dried, knowledge of AIS. Based on the interview, the inspector conducts an inspection ranging from a cursory investigation of key boat and trailer elements to a full investigation of all potentially infested areas. The outcome of the inspection results in either letting the boat pass through or performing a partial decontamination (often called a “hot wash”), or full decontamination.

A partial decontamination is typically performed when a vessel has recently been in a water body that is dreissenid infested, positive, or suspect. It entails using a pressure washer to spray hot water all over the surface of the vessel and into the engine to kill anything not seen and takes approximately 20 minutes to complete (USACE, NWW 2016).

A full decontamination is performed when live mussels are present. Full decontaminations involve the same equipment, but are more detailed, taking hours instead of minutes (USACE, NWW 2016). Some decontaminations can be performed onsite at the inspection station if equipment and situation allow, and some decontaminations require sending the boat to another location, such as a shipyard, impound lot, or other location. Following a full decontamination, additional dry time may be required to ensure no live mussels remain on the vessel, and a 30-day dry time is the typical protocol. In its simplest form, drying is a technique for desiccating dreissenids or other invasive species to decrease their viability (Morse 2009).

On occasion, watercraft owners request a decontamination if they have been at infested water bodies; these decontaminations may be performed at the owner’s home if there are adequate containment provisions.

To achieve effective decontaminations (partial or full), inspectors use water temperatures of 120°F for interior compartments and 140°F for the exterior (hull, engine, and trailer) for recommended contact times of 10 to 130 seconds depending on the component of the watercraft being treated (Elwell and Phillips 2016).

2.5.1.4 Magnitude of Existing Watercraft Inspection Programs

Data provided by Colorado and Mexico was used to characterize the existing watercraft inspection station effort during 2019 (Table 1). There were over 525,000 inspections completed in 2019, and at least 98 watercraft showed evidence of dreissenid contamination.

Table 1. 2019 Watercraft Inspection/Interception Program Data for Colorado and New Mexico

State	Number of Stations	Total Days	# Boats Inspected	Fouled Dreissenid Boats Intercepted
Colorado	72	9,900	481,453	86
New Mexico	8	1,124	42,363	12
Total	80	11,024	525,816	98

Data was provided by Colorado and New Mexico.

2.5.1.5 Current Costs

Of the seven states located within the ARB, only Colorado and New Mexico presently undertake preventative WID efforts. Consequently, assumptions were made in the calculation of the average annual costs for monitoring, operating, and maintaining WID stations in the ARB.

Proxy operation, monitoring, and maintenance costs were provided and referenced from the state of Colorado due to Colorado Parks and Wildlife (CPW) robust execution of its Aquatic Nuisance Species (ANS) Task Force, a statewide partnership coordination based on aquatic nuisance species prevention and containment. It was assumed ARB states in the future would work towards establishing and implementing individual state tailored aquatic nuisance species programs to a comparable organization level of CPW ANS, incurring similar program O&M costs.

During 2023, there were 75 WID stations authorized in the state of Colorado, with an annual operating cost of \$5,830,000. Using Engineering Manual 1110-2-1304 Civil Works Construction Cost Index System (CWCCIS) Table 3, State Adjustment Factors dated September 30, 2022 (USACE 2022a), Colorado WID cost was adjusted for the remaining six ARB states, computing an ARB WID operation cost of \$39,700,000. Since the 2023 Colorado WID cost is known, and a comparable cost for the other ARB states is unknown, the guidance provided state factors were used to estimate the 2023 annual operating cost for the remaining six states in the ARB.

As recently as 2022, there has been a noted upward trend in new infestations detected in Kansas, Texas, Oklahoma, and other eastern states that do not execute preventative WID activities (Colorado Parks and Wildlife 2023). From 2019 to 2023, CPW WID operation costs increased a little over 13 percent. To account for these two circumstances—of ARB states developing then executing new WID programs and eastern states combating comparably higher AIS infestations than western states—a 13 percent cost increase was applied. The total WID operation cost for the ARB is estimated at \$45.2 million. Annual costs for operating watercraft inspection stations in each state are detailed in Table 2 below.

Table 2. Annual Watercraft Inspection and Decontamination Station Operating Costs by State

State	Number WID Stations	Annual WID Cost (FY19)	Annual WID Cost (FY24)	WID Adjuster	Total Annual WID Cost (FY24)
Colorado 2019	72	\$5,300,000	-	-	-
Colorado 2023	75	-	\$5,990,000	-	\$5,990,000
New Mexico	-		\$5,730,000	13%	\$6,470,000
Missouri	No WIDs		\$6,360,000		\$7,180,000
Arkansas	No WIDs		\$5,480,000		\$6,190,000
Texas	No WIDs		\$5,540,000		\$6,260,000
Kansas	No WIDs		\$6,050,000		\$6,830,000
Oklahoma	No WIDs		\$5,540,000		\$6,260,000
Total			\$46,800,000		

Actions necessary to maintain a WID station include personnel labor, shelters, signage, water, electricity, etc. For example, one part of the larger maintenance cost incurred is \$1,500 annual expenditure for pressure washer units per WID station.

2.5.2 Public Awareness

Public awareness about the seriousness of AIS is an important element of the ongoing efforts to prevent further spread of dreissenids and other AIS into, out of, or within the ARB. The states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas and regional organizations work to educate the general public about AIS issues and ways individuals can help with prevention efforts. Public outreach includes ad campaigns such as “Clean. Drain. Dry.” and “Stop Aquatic Hitchhikers” and “Don’t Let it Loose,” which are aimed at keeping boats free from AIS. These and other AIS messages are communicated through targeted trainings and presentations, social media, news releases, videos, public service announcements, signage, materials included with fishing and boating licenses, and flyers and brochures distributed at sporting and boat shows, fairs, and other special events.

Watercraft inspection stations provide a valuable opportunity to increase public awareness. During the inspection, educating the public about AIS is a focus of every inspector/boat owner interaction, whether or not any type of AIS is found on the watercraft. Additionally, most inspection stations offer displays (Figure 12), posters, brochures, rack cards, or other materials to educate the public about AIS. Advances to more modern platforms in station technology (Figure 13) are also improving outreach and education. For example, mobile and fixed stations (e.g., CD3 units, cd3systems.com) can be wrapped like a public billboard, and closed-circuit WiFi accessible to the public can provide mobile device connectivity for digital education resources. Custom applications or platforms could provide interactive data and feedback from users, such as having the user certify that prevention or decontamination tasks were completed. Stations could also track the number and timing of users. Interactive technology may provide users a sense of belonging and purpose in the fight

against AIS and promote the outreach and education aspect as an increasingly effective tool.



Figure 12. Display Demonstrating How Mussels Can Attach to Watercraft



Figure 13. Example of an Advanced Technology Decontamination Station

In addition to educating recreational boaters about AIS, organizations such as PSMFC and PNWER are communicating with commercial entities on the issue. They are communicating with boat manufacturers about providing easy access to ballast water tanks on wakeboard boats, which would allow decontamination of water left in the ballast tanks. The regional partners are also communicating with commercial boat haulers, boat brokers, auctions, online sale sites, and marinas with moored boats in infested water bodies such as the Lower Colorado River and Great Lakes.

2.5.3 Monitoring Activities

Three kinds of monitoring, water chemistry monitoring, early detection monitoring, and environmental DNA (deoxyribonucleic acid) (eDNA) monitoring are currently being performed in the study states. Water chemistry monitoring includes monitoring water bodies to identify a variety of characteristics, including temperature, minerals, sedimentation, etc. Water chemistry information of infested and uninfested water bodies can be compared to determine if AIS in particular infested water bodies could pose a greater risk for establishment in uninfested water bodies due to similar water chemistry. When considered in conjunction with pathways (transportation routes and boater traffic) that exist between the water bodies, this information can help determine the level of risk different infested water bodies may pose to a specific uninfested water body, such as specific USACE reservoirs.

Early detection monitoring can include a variety of approaches, but the most frequent approach is to physically search for AIS in areas judged at high risk of infestation. This includes shoreline and dock surveys for invasive aquatic plants or invertebrates, snorkels surveys, as well as boat-based surveys. Tools used include nets, mini ponars, rakes, and other hand tools. Early detection is focused on searching for the presence of AIS before they are able to establish and begin reproduction.

In eDNA monitoring, biologists collect subsamples from surface tows at high-risk sampling sites into standardized eDNA collection vials. The eDNA subsamples are processed to detect presence of Dreissenid or other AIS DNA particles in the subsampled water, with the intent to increase efficiency and more rapid turn-around of results to improve response and reaction timing if results indicate the presence of dreissenid DNA.

Monitoring locations for dreissenids are generally determined by the proximity of watercraft recreation areas to river confluences and likely areas of introduction. Sampling typically starts in early June and runs until early October, which is when the number of veligers is expected to be the highest. Samples and data collected from these monitoring methods may be sent to contracted laboratories monthly, or more frequently as eDNA methods continue to be incorporated into the monitoring regime.

Monitoring supports WID and possible rapid response activities to halt the spread of AIS by identifying infested waters within the ARB and in adjacent river basins. Early detection monitoring is required to assess the efficacy of prevention efforts, such as watercraft inspection programs, and for the early detection of new AIS populations.

Under certain circumstances, small, isolated AIS populations could be controlled or eradicated. Failure to detect new populations through early detection programs would likely result in rapid uncontrolled spread of AIS throughout the ARB. Therefore, monitoring in the ARB is key to preventing the further spread of AIS.

The study area states perform early detection monitoring for AIS in the ARB. However, current monitoring efforts may be insufficient according to a report by Counihan and Bollens (2017) that discusses early detection monitoring for dreissenid veligers. Without adequate monitoring, dreissenids could go undetected and become established in locations where they are not yet established, while at the same time, watercraft inspections stations are established in locations based on inaccurate dreissenid population location data. As an example of the importance of monitoring, Montana tested positive for veligers in the Tiber Reservoir in November 2016, although they were previously not thought to be present in the state at all (Montana Fish, Wildlife and Parks 2016). With this information, appropriate measures can be taken to reduce the risk of them spreading.

2.5.4 Contingency and Response Planning

In 2008, PSMFC and USFWS, in cooperation with the Columbia River Basin Team of the 100th Meridian Initiative, completed the Columbia River Basin Interagency Invasive Species Response Plan: Zebra Mussels and Other Dreissenid Species (Heimowitz and Phillips 2008). The plan was updated in 2014. Wimbush et al. (2009) demonstrated the potential for eradicating zebra mussels with a robust rapid response plan. The WRP on Aquatic Nuisance Species developed the Quagga-Zebra Mussel Action Plan (QZAP) (WRP 2010) in response to the rising threat of invasive quagga and zebra mussels in the West. The QZAP summarizes strategies to address the invasion of zebra and quagga mussels in the west, and to identify and prioritize the specific actions that are needed to comprehensively prevent the further spread of quagga and zebra mussels, respond to new infestations, and manage existing infestations. The 2019 QZAP update (WRP 2019) documents progress made over the last ten years, provides direction, and informs future decision making for quagga and zebra mussel management.

Contingency planning in the ARB has so far been less focused on dreissenid mussels. The 2011 Action Plan to Minimize Ecological Impacts of Aquatic Invasive Species in The Mississippi River Basin was developed by MICRA with a broad focus on AIS within the greater Mississippi River basin (MICRA 2011). Species specific regional contingency planning in the ARB has been centered on invasive carp. The National Invasive Carp Management and Control Plan was developed by a USFWS-led multi-agency Invasive Carp Working Group and was approved for implementation by the national Aquatic Nuisance Species Task Force in 2007 (Conover et al. 2007). The National Plan includes seven complementary goals to manage and control invasive carp in United States waters, and 48 strategies and 131 recommendations to achieve those goals. The National Plan also serves as a guide and model for regional plans and led to the development of the Lower Mississippi River Basin Asian Carp Control Strategy Framework in 2019 (Rogers 2019).

SECTION 3 - PLAN FORMULATION

Development of this report generally followed the USACE six-step planning process. This process identifies and responds to problems and opportunities associated with the objective, as well as specified state and local concerns. The process provides a flexible, systematic, and rational framework to make determinations and decisions at each step based on constraints, objectives, and assumptions. This allows the interested public and decision-makers to be fully aware of the basic assumptions employed, the data and information analyzed, the areas of risk and uncertainty, and the significant implications of each plan that is considered.

3.1 PROBLEMS

Dreissenids are currently established in several reservoirs in the ARB (Figure 3), which is at high risk of further spread of dreissenid or other AIS infestations. The high risk is in large part due to the mobility of recreational boats and other watercraft that are trailered across watersheds over interstate transportation systems, which provides an easy mechanism for transferring infestations. Additionally, AIS have a high survival rate once established, and are easily hidden on or inside of boats and other structures. AIS can also have high financial and environmental costs due to infestations, which presents serious problems to infrastructure and those who live, work, or recreate in the ARB. Fundamentally, the problems can be divided into three categories: Impacts to Infrastructure, Impacts to Health and Safety, and Impacts to the Environment. These impacts are summarized below. Additional details related to the impacts are provided in the subsequent paragraphs and in Sections 4 and 6.

Infrastructure Impacts:

- Dreissenids attach to submerged hydropower, navigation, and water supply infrastructure, making them less efficient or entirely ineffective, resulting in substantial impacts to electrical generation; the movement of goods; and irrigation, municipal, and industrial water supplies.
- A dreissenid infestation is rapid and destructive and may not be noticed until it causes a failure of operations of critical infrastructure. By that time, considerable actions may be required to clean and restore infrastructure functions.
- Hydrilla can form dense mats that can choke water flow, clog culverts and pipes, and has been documented to alter water chemistry in drinking water reservoirs.

Health and Safety Impacts:

- Infestation could present safety issues for employees of utilities, dams, and other facilities if fire suppression systems are impacted or disabled by dreissenids.
- The presence of dreissenids and the shells of dead dreissenids present a waste stream disposal issue/impact, along with smell and decaying matter and a risk of physical injury (cuts and scrapes), albeit minor, to the recreating public. There is also increased risk of beach closures due to sanitation issues.

- Dense colonies of dreissenids attached to docks, buoys, and other recreational boating infrastructure can negatively impact the integrity of such structures and represent safety risks to the recreating public.
- Invasive carp can weigh up to 60 pounds and often jump up to 10 feet into the air when alarmed by the sound of an outboard motor. They often land in boats and sometimes strike the passengers. Jumping carp are known to have seriously injured many boaters and damaged boats.

Environmental Impacts:

- Dreissenids colonize rapidly and have potential to dramatically affect water quality once established. Their ability to filter and remove nutrients from the water affects the base of the food chain by significantly reducing the nutrients that are available to other organisms. There could be compounding effects with other AIS, leading to additional loss of resources for native biota.
- The habitat impacts of an infestation of dreissenids and the potential cascading effects to the food chain would be expected to negatively impact ESA-protected species in the ARB in a considerable way (see Federal Natural Resources Law Compliance and Biological Evaluation appendix for a list of threatened or endangered species). An uncontrolled infestation in the ARB could reduce the quality of designated critical habitat for ESA-listed bivalves and fish, diminish necessary aquatic resources that contribute to the critical habitat, and undo millions of dollars in Federal investment in pallid sturgeon recovery improvements made over the previous 20 years.
- An infestation of dreissenids in the ARB could disrupt hatchery operations, affecting sport fish abundance and commercial and Tribal fisheries.
- Invasive vegetation, such as hydrilla, displaces native plants, spreads rapidly, alters food webs, and harbors disease.

While the ARB has not yet experienced an invasion similar to the Great Lakes dreissenid infestation, the detection of mussels or veligers in many water bodies in the region shows the high potential for an infestation in the region. Zebra mussels have been detected in as many as 22 water bodies in Oklahoma, many within the ARB. This list includes the reservoirs on the lower Canadian, Cimarron, Arkansas, and Verdigris Rivers. In Kansas, zebra mussels have been detected in several rivers and lakes in the ARB including the Arkansas, Ninnescah, and Walnut Rivers. Dreissenid mussels have also been detected in Arkansas and Texas, though not yet in the ARB within those states. Finally, Pueblo Reservoir in Colorado tested positive for zebra or quagga mussel veligers in 2007, 2008, 2009, and 2011, but was delisted per regional standards in 2017 and is now considered negative.

The inherent potential for dreissenids and other AIS to spread within, into, and from the ARB via fouled watercraft, combined with the large adverse impacts to existing infrastructure and ecosystems that would result from an infestation, present significant

risks to the ARB. Once established in an area, dreissenids rapidly spread downstream within watersheds during their free-swimming larval stage.

Dreissenids have an ability to rapidly colonize, and their high-water filtration rate (Fanslow et al. 1995) causes dramatic effects on water quality and the base of the food chain. This causes detrimental effects to native fish populations and the entire food web, with the potential for cascading trophic effects. Invasive mussels filter particles from the water column and concentrate nutrients in their feces, changing the nutrient regime and enriching sediment. Water clarity can increase as plankton are filtered out of the water column, which can alter the prey base of native fishes. This can also lead to an increase in aquatic plants, as well as aquatic plants taking root in deeper water.

Conditions for invasive plants and non-native fish continue to improve, which further decreases habitat for native organisms and could result in increased competition and predation on native fishes, including ESA-listed species. In the Great Lakes, zebra mussels contributed to a bloom of toxic cyanobacteria (Vanderploeg et al. 2001), sometimes called blue-green algae, which can have a detrimental effect on water quality, as well as cause health impacts to people and pets.

The invasion curve (Figure 14) is a tool for understanding invasive species management. It shows that eradication becomes less likely and control costs increase as invasive species spread over time. Prevention is the most cost-effective solution, followed by eradication. If a species is not detected and removed early, intense and long-term control efforts will be unavoidable.

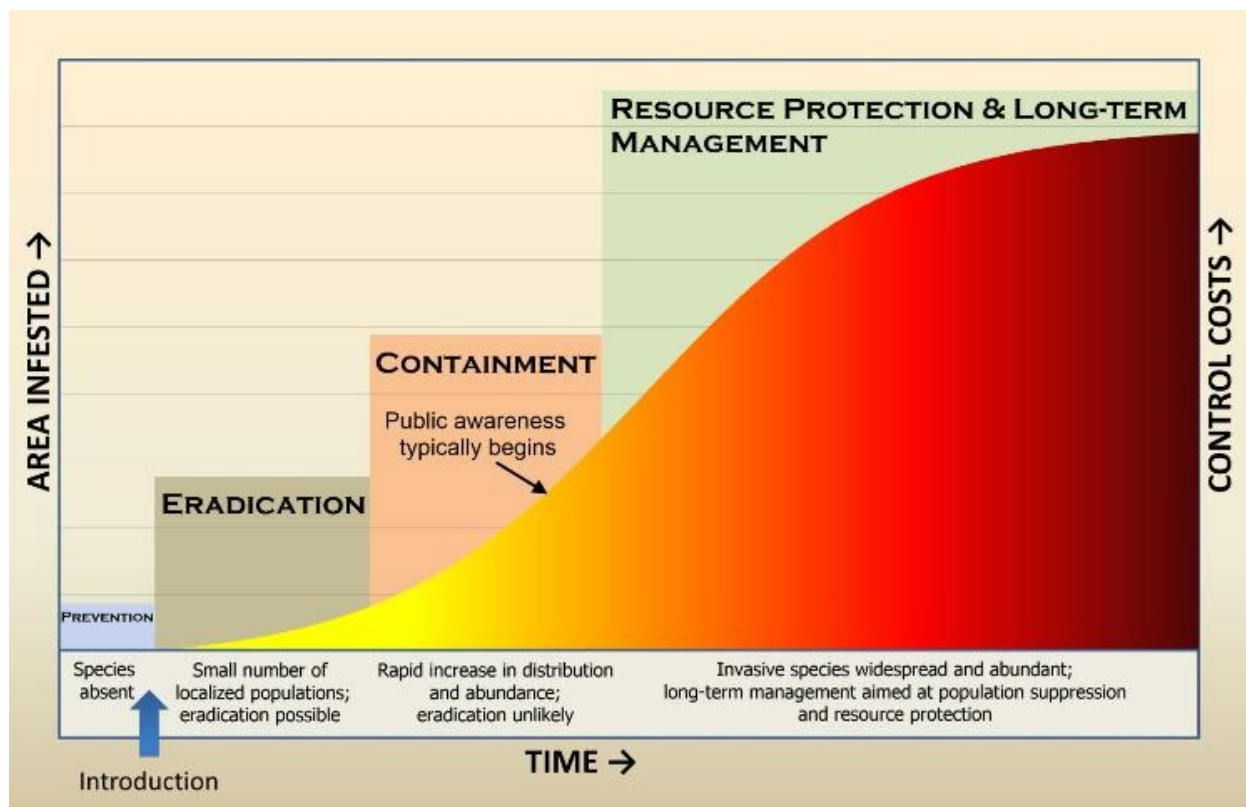


Figure 14. Invasive Curve – Area Infested vs. Time

Adult dreissenids attach to surfaces, and as they colonize, they can biofoul all types of water-related infrastructure. Many facilities located in basins already infested by dreissenids face costs from control measures and additional O&M required to manage the impacts of an infestation. These costs are typically passed on to consumers or taxpayers. From 1989 to 2006, estimated direct costs associated with zebra mussels in the Great Lakes and Mississippi Basin ranged from \$1 billion to \$1.5 billion, and similar costs are expected in the west in the event of an invasion (Connelly et al. 2007).

Based on the facility vulnerability assessments completed by the Bureau of Reclamation (Reclamation), authorized purposes at USACE projects (e.g., hydropower, navigation, and fish and wildlife mitigation) are all vulnerable to the impacts of a dreissenid infestation. Examples of infestation impacts are described below:

- Major hydropower components at risk of being fouled, or damaged, by a dreissenid infestation include:
 - Raw water systems, which could result in a powerhouse shutdown.
 - Flap gates, which could result in water entering protected areas.
 - Instrumentation, which could result in plant operation problems.
- Major water control components at risk of being fouled, or damaged, by a dreissenid infestation include raw water systems, instrumentation, and gate seals.

- Major fish passage and hatchery facility components at risk of being fouled, or damaged, by a dreissenid infestation include all submerged surfaces in low velocity areas, screens, and fish bypass systems.
- Major water supply and treatment facilities components at risk of being fouled, or damaged, by a dreissenid infestation include all submerged surfaces and screens.
- Dreissenid establishment in the bypass system and piping of juvenile and adult fish bypass and monitoring facilities would cause extraordinary stress on ESA-listed fish due to injury, descaling, and impact trauma.
- Due to their water filtration abilities, dreissenids can affect the food chain, decreasing the food supply for young and small fish and increasing habitat for fish that prey on ESA-listed fish.
- Recreation and Tourism: a dreissenid infestation affects the recreational fishery by altering fish population dynamics, and the freshwater beaches, turning sandy beaches to jagged shorelines due to the life cycle of dreissenids. The negative effects to the recreational and commercial fishing, as well as the quality of freshwater beaches would reduce recreation, industry, and tourism in the affected area.

An example of the degree of damage they can impose is shown in Figure 15. More detailed descriptions of impacts and associated estimated costs to USACE authorized purposes, as well as to water supply, recreation, and tourism, are provided in Sections 4 and 6.



Figure 15. Quagga Mussels on the Davis Dam in California

Source: Reclamation 2007

3.2 OPPORTUNITIES

Within the limits of the authorizing legislation, several opportunities were identified to address the significant problems associated with dreissenids and other AIS by decreasing the risk of infestations within the ARB and at USACE-owned and operated reservoirs. The opportunities, which were developed by collaborating with the study area states, include augmenting the AIS detection and decontamination efforts and expanding monitoring and contingency planning activities.

USACE has the opportunity to collaborate in a multi-state and multi-agency partnership that will achieve the following:

- Use existing knowledge to identify high risk infestation areas, to address ARB vulnerabilities to further infestation by the use of watercraft inspection stations.
- Educate recreational users of watercraft and public lands about the risk and damages caused by AIS.
- Intercept dreissenids and other AIS to reduce the risk of spreading AIS into, out of, or within the ARB.
- Monitor the water chemistry in the ARB and compare it to the water chemistry of infested water bodies to help determine the risk of AIS from specific infested water bodies becoming established in uninfested water bodies within the ARB. This provides an opportunity to inform risk management decisions.
- Detect veligers before populations of dreissenids become established in uninfested water bodies in the ARB.
- Prevent organisms from infesting new waters through strategically placed watercraft inspection stations, public education, and effective rapid response plans.
- Develop response plans, which could be implemented upon detection of dreissenids or other AIS in water bodies in the ARB.

3.3 PLANNING OBJECTIVES AND CONSTRAINTS

Planning Objectives

Planning objectives are generated to describe how problems could be addressed by taking advantage of available opportunities. The following objectives for the ARB were identified for this evaluation and cover a 50-year period of analysis (2023-2073):

- Intercept watercraft on existing pathways between infested and non-infested water bodies to detect AIS on the watercraft and decontaminate the watercraft to reduce the risk of further infestation.
- Identify water chemistry of the ARB and compare it to the water chemistry of infested water bodies to better understand the risks uninfested water bodies in the ARB, and to prioritize areas for development of follow-up actions.

- Increase monitoring for AIS within the study area states.
- Prepare rapid response plans in the event AIS are detected.

Planning Constraints

Planning constraints include resource, legal, or policy considerations that limit the range or type of actions that could be implemented to meet planning objectives. The following constraints were identified for this evaluation:

- Comply with Federal, state, and local laws, and regulations and policies.
- Implement the program consistent with the authorizing legislation and guidance.
- Avoid adverse effects to threatened and endangered species and other environmental and cultural resources.

3.4 MEASURES

Sections 3.4 through 3.6 show potential measures and alternatives developed to be implemented under a cost-share program to augment and/or improve AIS prevention and control activities. This report does not attempt to precisely define the future program and assumes optimization would occur annually at the regional level. Instead of attempting to define an optimal set of conditions, this report assumes that providing Federal funding to assist the state programs across the region would result in an increase in investment and effectiveness of the overall program, as well as decrease the risk of further infestations. The measures discussed below were developed in cooperation with state AIS coordinators.

Measure 1 – Federal Participation in the Process to Strategically Select and Prioritize Locations to Establish Watercraft Inspection Stations in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by allowing USACE to participate in the process used to select locations to establish watercraft inspection stations to reduce the risk of dreissenids or other AIS being spreading into, out of, or within the ARB (see Section 2.4.1.2 Station Locations, for further description).

Measure 2 – Increase the Number of Watercraft Inspection Stations in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by increasing the number of watercraft inspection stations in the program to reduce the risk of AIS spreading into, out of, or within the ARB. The type of inspection locations would be roadside, rampside, and roving (see Section 2.4.1.2, Station Locations, for further description). New inspection locations would be established, depending on the availability of Federal funding and each state's need to increase program effectiveness and its ability to share in the associated costs.

Measure 3 – Extend Daylight Inspection Hours of the Watercraft Inspection Program in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by extending daylight inspection hours to reduce the risk of AIS spreading into, out of, or within the ARB. Daylight inspection hours would be expanded based on each state's need to increase program effectiveness and its ability to share in the associated costs.

Measure 4 – Increase Nighttime Watercraft Inspections in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by adding or increasing the number of nighttime inspections that are performed. Nighttime inspections would be added depending on the availability of Federal funding and each state's need to increase program effectiveness and its ability to share in the associated costs. If a Federal partnership is established, the nighttime operations could be phased in as states establish agreements with law enforcement and as inspection personnel are hired and trained. The nighttime inspection locations and nighttime shift durations would be further developed based on the regional strategy.

Measure 5 – Construct Site Improvements at Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by helping to construct site improvements such as, but not limited to, utility connections and pavement.

Installing utilities at watercraft inspection stations provides several benefits, including lighting for expanded hours of operation, electricity without the need for portable generators, and increased reliability of systems that require electricity, such as data input and real-time communications. Utility connections would be implemented depending on the availability of Federal funding and each state's need to increase program effectiveness and its ability to share in the associated costs.

Paving and otherwise developing site conditions at watercraft inspection stations has the potential to increase the efficiency and effectiveness of the existing inspection stations. Hardening the stations by adding pavement (concrete or asphalt) or gravel would provide additional safety buffers and ease ingress and egress at the inspection stations. Site improvements would be implemented depending on the availability of Federal funding and each state's need to increase program effectiveness and its ability to share in the associated costs.

Providing electrical hookups and constructing trailer pads would have the added benefit in remote areas of attracting potential watercraft inspectors requiring living quarters. Inspectors could either bring their own trailers, or trailers could be provided.

The details of site improvements would be developed after the Federal partnership is established. When improvements are planned at an inspection station location that

involves any ground disturbance, USACE would need to tier from this LR/Programmatic EA and complete site-specific NEPA analysis, to include National Historic Preservation Act (NHPA) Section 106 review.

Measure 6 – Add Canine Detection Capabilities to the Existing Watercraft Inspection Program in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

Utilizing canines at stations could assist with the various challenges of inspections, particularly nighttime stations with inadequate lighting. Dogs can use their keen sense of smell to detect dreissenids and have been shown to be more effective than human inspectors. The Canadian Province of Alberta, and the states of California and Washington, have trained dogs to successfully locate dreissenids at watercraft inspection stations and have demonstrated substantial results through their K-9 programs. K-9 programs in California have also intercepted hydrilla and other noxious aquatic weeds. Montana has also collaborated with Alberta in training dogs for use in some of their watercraft inspection stations. This measure would augment the future program by increasing canine detection capabilities and would be implemented depending on the availability of Federal funding and each state's needs to increase program effectiveness and its ability to share in the associated costs.

Measure 7 – Increase Public Awareness and Education Related to the Existing Watercraft Inspection Program in the States of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

This measure would augment the future program by increasing public awareness and education efforts, which could include ad campaigns, communication with commercial boat haulers and marinas, and the addition of permanent signs at locations where inspection stations are routinely established each year (such as at points of entry along interstates and major highways). Informing the public of the risks of AIS can increase their involvement in prevention efforts and potentially decrease the numbers of infested boats that enter or travel within the ARB. Increasing public awareness and education efforts would be implemented depending on the availability of Federal funding and each state's needs to increase program effectiveness and its ability to share in the associated costs.

Measure 8 – Require Watercraft Inspections at Federal Facilities at Infested Lakes

This measure would require that watercraft leaving infested water bodies (e.g., Great Lakes in the Midwest, Mississippi River Basin, and multiple Federal lakes in the southwest) be inspected and decontaminated.

Measure 9 – Monitor to Identify ARB Water Chemistry and Compare to Water Chemistry of Infested Water Bodies

This measure would augment the future program by identifying water chemistry of the ARB for comparison to the water chemistry of infested water bodies. This would help inform early monitoring locations and risk management decisions within the ARB. Using

these monitoring results, USACE would develop a risk assessment matrix of infested water bodies of similar water chemistry to the ARB to determine the risk of those dreissenid populations becoming established in the ARB.

Measure 10 – Monitoring

This measure would augment the future program by leveraging both states' and USACE efforts to engage in monitoring activities to support early detection, population extent or dynamics, infestation impacts, or risk assessments of dreissenids and other AIS in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas, with a focus on protecting the ARB.

Monitoring activities provide an additional level of defense in the event prevention measures fail and live mussels or other AIS invade an uninfested water body in the ARB. Monitoring for early detection increases the chances that invasive plants such as hydrilla can be discovered before entering their seasonal reproductive period. Early detection monitoring and having appropriate response plans in place increase the chances of initiating an effective response before new establishments of an AIS occur.

Water quality measurements, environmental DNA (eDNA), and Petite Ponar grab sampler are some indirect methods of monitoring for dreissenid mussels, invasive carp, and invasive macrophytes. Water quality parameters, including calcium, temperature, salinity, pH, dissolved oxygen, and visibility, are measurements at each site to help identify the highest-risk water bodies and the times of year that water bodies are at greatest risk of a viable introduction. Monitoring for eDNA would require two liters of lake water to be collected at sample sites. Environmental DNA analysis would then be performed in a lab or in the field. Benthic samples would be collected using a petite Ponar grab sampler at each site from a watercraft for the presence of invertebrate AIS such as dreissenid mussels during their post-veliger life history stage (post settlement to adults).

Section 104 of the RHA, as amended, provided authority to conduct fish tissue sampling; however, dreissenids and other regional AIS of concern do not require a host fish during their larval development, and therefore fish tissue samples are not included as part of the proposed action.

Measure 11 – Regional Watercraft Inspection and Decontamination Data Sharing System

This measure would encourage participating agencies to use the Regional WID Data Sharing System (System) to document inspections and share data with other agencies throughout the United States.

Colorado Parks and Wildlife developed the system to record WID information electronically and share information in a timely manner across jurisdictions to aid collaborative efforts to prevent the spread of zebra and quagga mussels and other AIS. The System consists of a website, shared database, and app for iOS and Android devices. The System reduces operating costs for mobile data collection while increasing

accuracy and reliability, and it can be queried for on-demand reporting. The System includes a risk assessment tool that shows where boats are moving after launching in mussel-infested waters and sends an alert to the next known destination. With the benefits of data sharing proving to be abundant, the states of Arizona, Nevada, and Utah have been using the System to send out timely electronic alerts of watercraft leaving infested waters. This increased timely communication has directly increased the number of infested watercraft being intercepted within the western region before launching in uninfested waters.

Measure 12 – Develop and Implement Real-time Tracking of Watercraft Transportation

This measure would support the program through future development of a real-time tracking system by the states for watercraft traveling between lakes across the region, both within and outside the ARB. The system would direct boaters toward inspection and cleaning stations to decrease the risk of introduction of invasive species into uninfested waters.

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Measure 13 – Evaluate Traffic Patterns for Recreational Boating

This measure would support the future program by periodically funding regional traffic studies for identifying highway use patterns by the boating public traveling between lakes within and outside the ARB. Understanding movement patterns of boaters would help identify effective locations for permanent or roving inspection stations, support public awareness and education campaigns, and provide information for contingency and rapid response planning.

Measure 14 – Contingency Planning

This measure would augment the future program by helping to develop site-specific plans for water resource facilities, based on the facility vulnerability assessments conducted by Reclamation (2012; 2016; 2017a-g) (see Section 3.1 for information about vulnerability assessments).

Measure 15 – Rapid Response Planning and Preparation

This measure would augment the future program by helping develop rapid response measures to find and eradicate dreissenids and other AIS before they further spread and cause damage to other areas of the ARB.

Preventing the introduction of invasive species is the first line of defense against biological invasion (Draheim et al. 2017; PSFMC 2019). However, for invasive species that circumvent prevention systems, early detection and rapid response—a coordinated set of actions to find and eradicate potential invasive species before they spread and cause harm—can help stop the next lionfish, cheatgrass, or invasive carp (DOI 2016).

Where monitoring detects the presence of dreissenids or other AIS, rapid response is the next most cost-effective management tool to quickly eliminate or minimize infestation impacts (Reclamation 2010). Rapid response measures include prevention, containment, control, eradication, enforcement, and education/training and outreach actions. Interagency (Federal, state, local) exercises are essential for testing the strengths and identifying the weaknesses of rapid response plans. USACE, in collaboration with the study area states, must be prepared to quickly respond to contain and limit any infestation in the entire water system in the ARB.

3.5 MEASURES SCREENING

Table 3 shows how each of the measures identified for this report was screened by the individual planning objectives and the purpose and need statement. All measures met at least one of the identified objectives and satisfied the purpose and need statement. Table 4 shows how each of the measures was screened by the planning constraints. Measure 8, Require Watercraft Inspections at Federal facilities at Infested Lakes, was eliminated from further consideration because federally managed facilities are not included in the cost-share authority of Section 104 of the RHA. As such, USACE does not have the authority to execute Measure 8. All other measures were carried forward for consideration (alone or in combination).

Table 3. Screening Measures by Objectives and Purpose and Need

Measures	Intercept Watercraft	Water Chemistry	Rapid Response	Contingency Planning	Purpose & Need
Measure 1 – Federal Participation in Selection of Watercraft Inspection Station Locations	X				X
Measure 2 – Increase Watercraft Inspection Stations	X				X
Measure 3 – Extend Daylight Inspection Hours	X				X
Measure 4 – Increase Nighttime Inspections	X				X
Measure 5 – Construct Site Improvements	X				X
Measure 6 – Add Canine Detection	X				X
Measure 7 – Increase Public Awareness and Education	X				X
Measure 8 – Require Watercraft Inspections at Federal Facilities at Infested Lakes	X				X
Measure 9 – Monitor to Identify Water Chemistry		X		X	X
Measure 10 – Monitor for Early Detection		X	X		X
Measure 11 – Regional WID Data Sharing System	X		X		X
Measure 12 – Develop and Implement Real-time Tracking of Watercraft Transportation	X		X		X
Measure 13 – Evaluate Traffic Patterns for Recreational Boating	X			X	X
Measure 14 – Contingency Planning				X	X
Measure 15 – Rapid Response Planning and Preparation			X		X

Table 4. Screening Measures by Constraints

Measures	Consistent with Authorizing Legislation (Sec. 104 RHA)	Avoid Effects to Threatened and Endangered Species	Comply with Federal, State, and Local Laws, Regulation, and Policies	Retained
Measure 1 – Federal Participation in Selection of Watercraft Inspection Station Locations	Yes	Yes	Yes	Yes
Measure 2 – Increase Watercraft Inspection Stations	Yes	Yes	Yes	Yes
Measure 3 – Extend Daylight Inspection Hours	Yes	Yes	Yes	Yes
Measure 4 – Increase Nighttime Inspections	Yes	Yes	Yes	Yes
Measure 5 – Construct Site Improvements	Yes	Yes	Yes	Yes
Measure 6 – Add Canine Detection	Yes	Yes	Yes	Yes
Measure 7 – Increase Public Awareness and Education	Yes	Yes	Yes	Yes
Measure 8 – Require Watercraft Inspections at Federal Facilities at Infested Lakes	No	Yes	Yes	No
Measure 9 – Monitor to Identify Water Chemistry	Yes	Yes	Yes	Yes

Measures	Consistent with Authorizing Legislation (Sec. 104 RHA)	Avoid Effects to Threatened and Endangered Species	Comply with Federal, State, and Local Laws, Regulation, and Policies	Retained
Measure 10 – Monitor for Early Detection	Yes	Yes	Yes	Yes
Measure 11 – Regional WID Data Sharing System	Yes	Yes	Yes	Yes
Measure 12 – Develop and Implement Real-time Tracking of Watercraft Transportation	Yes	Yes	Yes	Yes
Measure 13 – Evaluate Traffic Patterns for Recreational Boating	Yes	Yes	Yes	Yes
Measure 14 – Contingency Planning	Yes	Yes	Yes	Yes
Measure 15 – Rapid Response Planning and Preparation	Yes	Yes	Yes	Yes

3.6 ALTERNATIVES

For this LR/Programmatic EA, Section 104 of the RHA of 1958, as amended, serves as a guide for determining the range of alternatives to be considered. When an action is taken pursuant to a specific statute, the statutory objectives of the project serve as a guide by which to determine the reasonableness of objectives outlined in the NEPA document. This LR/Programmatic EA presents economic justification to support the Federal interest determination in establishing or maintaining a cost-shared program to prevent and control the spread of AIS into, out of, or within the ARB by cost-sharing and coordinating the establishment of new (or bolster existing) watercraft inspection stations, invasive species monitoring, contingency planning, and rapid response planning and preparation (training exercises and drills), conducted and operated by non-Federal sponsors in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas. And in compliance with NEPA, the alternatives analysis,

therefore, focuses on identification of measures/alternatives that can be implemented under such a program.

NEPA does not require an agency to consider all alternatives; rather, it requires only the “reasonable alternatives” to be explored and objectively evaluated. As such, USACE considered a number of alternatives (see Section 3.6.1 below) but screened them until only two remained: the No Action Alternative and Alternative 2, Comprehensive Adaptive Improvements, which contains all measures identified in Section 3.4, except Measure 8. Alternatives containing discrete subsets of measures would not be holistically applicable to the ARB and would not satisfy the purpose and need of the proposed action. Therefore, Alternative 2, Comprehensive Adaptive Improvements, was carried forward for further analysis, including the broad list of measures with the flexibility to address the varying and unique regional/local scenarios for watercraft inspection.

It is important to note that the No Action Alternative is the result of a decade of iterative planning on the part of the states, as a few have developed their own AIS programs and often work together towards a regional strategy. Several of the measures listed above have been considered and/or implemented to greater or lesser extents, with different timing, locations, and scale, and subject to the constraint of available funding. Absent Federal partnership, the states would continue to refine their AIS programs, with the scale and components of those programs evolving from year to year. That is why the No Action Alternative can also be referred to as “No Change to Current Practice.”

Similarly, while Alternative 2 provides for comprehensive improvements subject to the constraint of available funding and each state’s individual program authorities, policies, and preferred methods, it is more of a framework (toolbox) for an annual adaptive planning process, with input provided by USACE at a regional scale. The measures listed are ones that were developed through prior regional experiences and by states that already have established programs. It would be possible to construct alternatives that included the listed measures separately, or in various combinations other than the final combination presented here, but they would not present a complete solution for all the jurisdictions in the basin.

While existing programs in the study area states, as outlined in detail in Section 2.4, do not define the proposed alternative, which includes any of the actions described in the Comprehensive Adaptive Improvements Alternative, they do become a component of the proposed alternative when the states are reimbursed for those actions. As these programs are already active in some of the study area states, they are the first examples of actions in the ARB that would be part of the cost reimbursement program. It should be noted however that the intent of the Comprehensive Adaptive Improvements Alternative is to expand state efforts to prevent and control AIS. It is expected that new programs, within the scope of the Comprehensive Adaptive Improvements Alternative, would be initiated to prevent and control AIS within the study area states. However, new programs across the ARB are likely to be substantially similar to those already operated in some states in the ARB and those already operated by regional partners. The actions identified in Section 3.6.3, while not the entirety of the

Comprehensive Adaptive Improvements Alternative, can serve as potential examples of the Alternative in action.

3.6.1 Alternative 1, No Change to Current Practice (No Action Alternative)

Alternative 1 represents a continuation of the states' current practice (see Section 2.4), in which USACE would not partner with the states to establish watercraft inspection stations, conduct monitoring, develop contingency plans, and conduct rapid response planning and preparation to help prevent further spread of AIS into, out of, and within the ARB.

3.6.2 Alternative 2, Comprehensive Adaptive Improvements

Alternative 2, Comprehensive Adaptive Improvements, is made up of all measures identified in Section 3.5 (except Measure 8) that meet the study objectives without violating any planning constraints. This alternative assumes USACE would partner with the states and their agencies using Federal funding to expand and support existing state programs (Section 2.4), resulting in increased effectiveness in the AIS prevention and control programs to decrease the vulnerability of dreissenid or other AIS infestations spreading into, out of, or within the ARB. In coordination with their regional partners, the states would use the data gathered during the inspection season to develop a strategy and adjust the program to provide a more effective regional defense. The states would continue to implement existing quality assurance and quality control (QA/QC) protocols in their AIS programs, and revise or adapt QA/QC protocols towards improved AIS prevention and control efficacy during periods of strategy development, for example, partnering with local interest groups or universities to evaluate accuracy in following inspection station protocols.

The potential for monitoring, contingency planning, and rapid response planning at USACE facilities and reservoirs (Measure 8) was considered for this alternative. However, actions conducted at USACE facilities and waters are not currently eligible for cost-sharing and would not be reimbursed under current authorities and therefore removed from consideration in Alternative 2. The measures in Alternative 2 and corresponding cost share are listed in Table 5.

Table 5. Measures Included in Alternative 2

Measures	Cost Share 50% Federal / 50% Non-Federal
Measure 1 – Federal Participation in Selection of Watercraft Inspection Station Locations	X
Measure 2 – Increase Watercraft Inspection Stations	X
Measure 3 – Extend Daylight Inspection Hours	X
Measure 4 – Increase Nighttime Inspections	X
Measure 5 – Construct Site Improvements	X
Measure 6 – Add Canine Detection	X
Measure 7 – Increase Public Awareness and Education	X

Measures	Cost Share 50% Federal / 50% Non-Federal
Measure 9 – Monitor to Identify Water Chemistry	X
Measure 10– Monitor for Early Detection	X
Measure 11 – Regional WID Data Sharing System	X
Measure 12 – Develop and Implement Real-time Tracking of Watercraft Transportation	X
Measure 13 – Evaluate Traffic Patterns for Recreational Boating	X
Measure 14 – Contingency Planning	X
Measure 15 – Rapid Response Planning	X

Under the future program, each of the measures identified in Table 5 would be adjusted annually by each state based on its need and ability to fund its portion of the program, the results of the regional coordination effort, and the availability of Federal funding. Over time, the locations of stations and the nature and timing of their operations may change considerably as the states continue to refine and optimize the program’s overall effectiveness.

3.6.3 Alternatives Considered but Eliminated

USACE briefly considered, but ultimately screened out an alternative (Alternative 3) that was similar to Alternative 2, but with a smaller scale and fewer measures. Alternative 3 did not include Measure 4 (increasing nighttime inspections) or Measure 6 (adding canine detection). As mentioned elsewhere in this report, nighttime inspections are more expensive due to the need to secure law enforcement personnel. Canine detection also requires specially trained personnel, and while having a long history of use in drug interdiction efforts, is a relatively new tool for enhancing the effectiveness of watercraft inspection stations. Alternative 3 was originally considered because of the increased cost associated with these measures. However, Alternative 3 failed to address the significant and documented concern that a high number watercraft could be transported within the basin at night, a concern that these two measures directly addressed: the first by having inspection stations open at night, and the second by making these stations more effective, due to the canine ability to detect the presence of mussels without the need for light. USACE determined that Alternative 3 would not effectively address a significant percentage of the watercraft that could potentially be transferring AIS into or within the ARB, and therefore it was eliminated from further consideration and evaluation.

A fourth alternative (Alternative 4) that was briefly considered focused on locating new watercraft inspection stations at USACE reservoirs and having USACE employees or staff contracted by USACE operate and maintain them. However, Alternative 4 was eliminated from further consideration very early in the process because it was determined that locating these stations at USACE reservoirs did not provide the highest likelihood of preventing the spread of AIS into, out of and within the ARB. As previously mentioned, the states refine their station location selection process yearly, based on

previous years' experience and data tracking. An important part of their selection process is to determine not only where boat traffic is most prevalent, but also where boats originate. Their focus is on a more efficient regional strategy that aims to intercept fouled boats before they reach uninfested waters within the ARB. USACE and the states share a common goal of preventing infestations in the ARB, as infestations would result in high financial and environmental costs to Federal and state interests.

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SECTION 4 - ECONOMIC AND ECOSYSTEM CONSIDERATIONS

The ARB is not free from AIS, as dreissenids have gained a foothold in several isolated reservoirs in the ARB (Figure 3), and hydrilla and other invasive aquatic plants are established in water bodies across the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas. There is a nationwide and regional effort to reduce the economic damages and impacts that would result from AIS moving into uninfested water bodies. Expansion of AIS populations from isolated water bodies in the ARB, Great Lakes, Lower Colorado River Basin, and the Lower Missouri River/Mississippi River Basin to other parts of the United States, along human-assisted pathways that exist between nearby infested waters, present a risk of AIS infestations increasing throughout the ARB.

Although the ARB currently has infestations of dreissenids and other AIS, this economic analysis is based on multiple scenarios of staving off a dreissenid infestation at some point in the future and assumes that the risk-reduction efforts described in the previous sections would lower the overall risks. It further assumes that investments in AIS prevention activities would be re-evaluated and adjusted, depending on infestation levels. ARB watercraft inspection expansion specifically would focus on risk and damage reduction and aim to limit the spread of dreissenids and other AIS into, out of, and within the ARB.

Unless stated otherwise, values in the economic analysis are presented at the fiscal year (FY) 2024 price level. Annualized computations used the FY 2024 Federal discount rate of 2.75 percent and a 50-year period of analysis. Slight discrepancies in computations may exist due to rounding.

This section evaluates and describes the costs and benefits of the proposed action to address the economic elements of the Federal Objective. As stated in the Economic and Environmental Principles for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council 1983), the Federal Objective is, “to contribute to national economic development while protecting the nation’s environment.” For there to be Federal interest, the benefits must exceed the costs. These analyses rely on the policy and guidance published in Engineer Regulation 1130-2-500¹ (USACE 1996).

4.1 ECONOMIC AND ECOSYSTEM CONSIDERATIONS

4.1.1 Infestation Impacts

The economic benefits and costs calculations in this section are intended to present the most recent information regarding dreissenids, potentially impacted infrastructure, and associated economic activities and business lines. The study extent for this report

¹Project Operations Partners and Support (Work Management Policies): “...establishes the policy for the management of operation and maintenance activities of U.S. Army Corps of Engineers personnel performing civil works functions related to flood control, navigation, dredging, hydroelectric power generation, environmental stewardship, and recreation services at water resource, waterway, and other USACE projects...”

includes thousands of miles of river in the ARB. Because of time and other constraints (budget, data availability, interstate data comparability), the information collected is not a representation of every possible economic cost that could come as a result of an AIS infestation. This section monetizes large-level impacts to water-related resources in the study area using dreissenids as a proxy for all AIS species. The economic costs of dreissenid infestation are so substantial that dreissenids alone may be used to assess the costs averted from delaying the spread of AIS. The reduction in risk of infestation by non-dreissenids species is an unquantified benefit. The associated impact estimates are based on current available data related to additional O&M costs. Additional O&M costs are defined as “the increased average annual cost incurred to maintain current levels of performance in an infested watershed.” These costs include accelerated cleaning schedules involving clearing any potential raw water treatment plant fouled piping, hydropower dam anti-fouling chemical applications, and other routine maintenance schedules impacted by the aquatic invasive species.

Estimates for benefits were derived from several academic studies, as well as previous USACE reports, including the Columbia River Basin watercraft inspection report, which addressed stations in Oregon, Washington, Idaho, Montana, Nevada, and Wyoming (USACE, NWW 2022).

4.1.1.1 Hydropower Facilities and Flood Control

The Arizona Game and Fish Department has estimated that, “zebra mussels alone cost the power industry \$3,100,000,000 in the 1993-1999 period, with their impact on industries, businesses, and communities more than \$5,000,000,000” (AZGFD 2016). Many of the important components of the hydropower system are at risk of being damaged due to dreissenid infestation in their impounded water bodies. The systems that are the most vulnerable to impacts are the raw water systems, water conveyance systems, and flood management infrastructure. The raw water systems are used to provide water for cooling and fire suppression purposes and could be clogged, resulting in a complete powerhouse shutdown. Flood control infrastructure such as emergency spillway gates, stoplogs, and flap gates are not only susceptible to an infestation, but they may be difficult to inspect. If a gate or stoplog is fouled and becomes inoperable, high river stage flood waters could enter protected areas. Various hydropower facility pools supply water to the local area for municipal use, fish hatcheries, irrigation, and other requirements, which could all be impacted.

Cost estimates referenced by a BPA-commissioned study indicate that an expected average annual cost for additional O&M implementation could be as high as \$100,000 (FY 2005) per facility (Phillips et al. 2005). Although the estimates were derived from Columbia River Basin facilities, and not directly from ARB facilities, it is reasonable to anticipate similarities among the basins. These costs represent recurring fees expected for labor and capital requirements involved in anti-fouling paint applications and parts replacement for all susceptible systems. Additionally, maintenance schedules for pipe and intake cleaning are likely to increase due to the threat of fouling.

Based on the Willet 2010 study, dams with hydropower plants will incur a one-time cost at the beginning of an infestation in order to retrofit to better handle an infestation onset. These one-time costs in 2010 ranged between \$1,000 and \$2,000 per megawatt generated, translating into an estimated 2024 cost of \$2,500. The total ARB one-time retrofit costs come to \$609,000.

The Philips et al. 2005 study projected the cost to install a bleach injection system, \$62,599 (FY 2005), and apply anti-antifouling paint, \$81,000 (FY 2005), to each hydropower plant generator would result in a \$16,000 (FY 2024) yearly cost per megawatt, with an average 18 megawatts per generator.

Referencing Federal Energy Regulatory Commission conventional hydropower active licenses in the ARB states, there are approximately 240 megawatts generated from six dams that may be affected.

The total anticipated cost to clean and inspect these power plants in the case of a dreissenid infestation would be \$3,850,000 per year. In other words, if a dreissenid infestation was to occur to maintain current hydropower operations while addressing said infestation, it is estimated on average per year hydropower dams would expend an additional \$3.85 million. This average annual expenditure would be viewed as a cost savings benefit, if infestation is prevented in the ARB. See Table 6, below, for the hydropower dams within the ARB, their related megawatt generation, anticipated yearly benefits, and projected one-time retrofit cost.

Table 6. Arkansas River Basin Hydropower Dams Average Annual Benefits

Dams	State	Megawatts (MW)	Number of Generators	MW / Generator	Yearly Benefits* (FY24)	One-Time Retrofits** (FY24)
Lock & Dam No. 9	AR	32.4	3	10.8	\$519,000	\$82,000
Dam No 2	AR	102.6	3	34.2	\$1,640,000	\$260,000
Lock & Dam Number 13	AR	33.2	3	11.07	\$532,000	\$84,000
Murray Lock & Dam	AR	39	2	19.5	\$625,000	\$99,000
Salida Hydro No. 1 & 2	CO	1.31	1	1.31	\$21,000	\$3,300
Kaw	OK	31.43	1	31.43	\$504,000	\$80,000
Total		240	13		\$3,850,000	\$609,000

*(FY 2024) \$16,000 yearly cost per generator per megawatt for sodium hypochlorite (NaOCl) injection system and anti-fouling paint application.

** (FY 2024) \$2,500 yearly retrofit cost per megawatt.

4.1.1.2 Hatcheries

Fish hatcheries are also at risk for incurring dreissenid-related costs. One of the biggest impacts to hatcheries would be the clogging of surface water supply systems. O’Neill’s (1997) base costs estimates were escalated to present dollars, and these new estimates indicate that hatcheries may be forced to spend, on average, \$14,000 per year in the event of an infestation. Inventorying the various state wildlife conservation departments in the basin tallied 28 state operated fish hatcheries; three in Arkansas, eight in Colorado, three in Kansas, two in Missouri, four in New Mexico, and eight in Oklahoma. The estimated total yearly cost to these facilities in the event of an infestation at all facilities is approximately \$403,000.

4.1.1.3 Water Supply and Treatment Facilities

Many studies, including those cited in the Columbia River Basin watercraft inspection report, calculate the cost to clean water pumping facilities using a per-gallon cost for different sized pumping systems. The Thomas (2010) study cited the New York Sea Grant and National Zebra Mussel Information Clearinghouse Study (O’Neill 1997) that surveyed power plants and water drinking facilities. Their results indicated that the costliest control measures that dominated the average repairs were bleach injectors and anti-fouling paint.

They estimate the average cost per facility per year is around \$30,000 (FY 2004), translating into \$64,000 (FY 2024). A Google Maps search and a visual count of the number of ARB water treatment facilities estimated 53 water intake stations. Using a cost of \$64,000 per year per station, infestations at all facilities it would result in a total yearly cost of nearly \$3,405,000. The number of water treatment plants per state in the ARB and their associated estimated annual costs are presented in Table 7.

Table 7. Number of Water Treatment Facilities and Costs per State in Arkansas River Basin

ARB States	Number Water Treatment Facilities	Cost per Intake Facility per Year (FY24)	Total Cost per Year (FY24)
Colorado	4	\$64,000	\$257,000
New Mexico	1	\$64,000	\$64,000
Texas	6	\$64,000	\$385,000
Oklahoma	14	\$64,000	\$899,000
Kansas	12	\$64,000	\$771,000
Missouri	3	\$64,000	\$193,000
Arkansas	13	\$64,000	\$835,000
Total	53		\$3,405,000

4.1.1.4 Boats and Marine Infrastructure

Dreissenid infestation represents a serious cost for boaters and requires time and money once the boat has been put in infested waters and mussels become attached to the hull, propeller, or motor of a boat. Rogers (2008) suggests, “without regular maintenance to brush away the fingernail-sized mussels, colonies can build up on the hull and in the cooling water intake of outdrives,” which could result in “serious safety problems caused by drag on the boat and lack of cooling water.” Research from Lake Erie suggests that per-boat costs were \$265 in 1994 (Vilaplana and Hushak 1994). When these costs are escalated to 2024 dollars, the cost becomes a little over \$800 per boat. The yearly indices of Engineer Manual 1110-2-1304, dated September 30, 2022, were used to future date the FY 1994 cost since the month of the original FY 1994 cost figure is unknown.

Boat counts were estimated using state title counts for the number of boats in each basin state. The number of boats for each state used in the benefits estimation was calculated by taking the population in the counties adjacent to the river and dividing by the state population to obtain the percentage of people living in the river basin. The USACE 2022 National Structure Inventory database (USACE 2022c), which includes 2010 U.S. Census Bureau data, was used to summate the basin county population, and the 2010 U.S. Census Bureau data was referenced for the state population counts. This percentage, multiplied by the number of boats registered in each state, was the number of boats assumed within proximity of the basin. While there are likely many boaters from out-of-state that travel to use Oklahoma, Kansas, or Arkansas river reservoirs for recreation, very few formal counts are recorded.

By using precedent from previous studies such as the Thomas report (2010), the number of boats in adjacent counties is an accurate proxy for the number of boats that will be placed in the river each year. For a boat to be infested it only needs to be in the infested waters once; however, a longer duration and more trips increases the likelihood of an infestation. For this estimate, it was assumed there was an 80 percent chance a boat from an adjacent county would be placed into the watershed (Big Thompson, USACE Great Lakes) and a 90 percent chance of the boat becoming infested if placed in infested waters. To estimate the total cost per state, the computation follows as $0.8 \times 0.9 \times$ number of ARB boats \times cost per boat.

The total number of boats for the ARB is estimated to be 222,000. When multiplying this by the average yearly cost the boater will incur from an infestation, the average annual cost becomes approximately \$128,000,000. The total costs anticipated to be incurred by boaters due to an AIS infestation in the ARB are detailed in Table 8.

*Integrated Letter Report and Programmatic Environmental Assessment
Federal Participation in Aquatic Invasive Species Prevention and Control, Arkansas River Basin*

Table 8. Arkansas River Basin State Boat Count and Associated Average Annual Benefits

State	State Registered Boats	NSI ARB County Population 2020	State Population 2020	ARB County Population / State Population 2020	ARB Boats	Cost per Boat (FY24)	Total Cost (FY24)
New Mexico	30,918	196,873	2,117,522	9.30%	2,875	\$800	\$1,660,000
Missouri	287,820	420,841	6,154,913	6.84%	19,680	\$800	\$11,400,000
Arkansas	185,378	410,541	3,011,524	13.63%	25,271	\$800	\$14,600,000
Texas	577,144	410,541	29,145,505	1.41%	8,130	\$800	\$4,700,000
Kansas	84,468	1,364,601	2,937,880	46.45%	39,234	\$800	\$22,700,000
Colorado	94,385	1,555,383	5,773,714	26.94%	25,426	\$800	\$14,700,000
Oklahoma	199,129	2,016,788	3,959,353	50.94%	101,431	\$800	\$58,700,000
Total					222,000		\$128,000,000

4.1.1.5 Boat Ramps and Marinas

Boating facilities on the lakes and rivers in the ARB will also face costs associated with a dreissenid infestation. Using estimates from Thomas (2010) and other reports like the 1995 New York Sea Grant and National Zebra Mussel Information Clearinghouse Study (O'Neill 1997), the cost per boating facility in 2024 dollars will be a little over \$1,300. There are approximately 612 public and semi-private boat ramps on the ARB, resulting in a total yearly cost of \$820,000.

There are also 621 marinas located throughout the ARB that would require similar cleaning activities of \$1,300, which would result in \$832,000 of related costs per year for infestations at all facilities. The cost for commercial marinas is not different from other boat ramps, as cleaning costs for the dock and pylons is the same.

4.1.1.6 Qualitative Effects

While many of the impacts on the resources in ARB have quantitative impacts that can show damages in terms of a decrease in the National Economic Development (NED), a dreissenid infestation can cause numerous other economic impacts that cannot be easily shown as a cost. Many of the impacts are related to passive use and recreation damages. Passive use is an economic term that describes the value people receive from something when they are not using the resource in a monetary way. In the ARB, passive use benefits come from viewing a clean watershed that has not been visually damaged from a dreissenid infestation. Many people hike and walk along the lakes and rivers that make up this watershed and enjoy the current and natural condition of the water. A dreissenid infestation would hurt native fish and plant species that currently reside in the water, thereby reducing the benefit many people receive from this watershed.

Anglers could also see a decrease in the number and size of fish they catch in dreissenid-infested waters. Dreissenids compete with both fish and aquatic plants for food and minerals, which often results in decreased native fish populations. This would reduce the benefit that anglers receive from fishing, and they may choose not to travel to this watershed, which is famous for fly fishing. The effects of a dreissenid infestation on fishing is not well-studied and could have varying levels of impact between basins. There is also a large uncertainty in the number of anglers in a given area, as well as the change in their benefits due to a decrease in the native fish population.

4.1.1.7 Benefit Calculation

The total yearly benefits, or costs that would be avoided by the implementation of WID inspections, for the watercraft inspection implementation plan is \$138,000,000, excluding the \$609,000 one-time hydropower retrofits cost (Table 9). The one-time retrofits would be performed at the onset of infestation.

Table 9. Arkansas River Basin Infestation Total Average Annual O&M Cost Avoided

Benefit Category	Average Annual O&M Cost Avoided (FY24)
Boat Counts	\$128,000,000
Hydropower	\$3,850,000
Water Treatment Facilities	\$3,405,000
Marinas	\$832,000
Boat Ramps	\$820,000
Hatcheries	\$403,000
Total	\$138,000,000

The total benefits of the implementation of watercraft inspections in the ARB utilizes the 2024 2.75 percent Federal discount rate, over a 50-year study period of analysis. The economic analysis assumes that AIS prevention activities will stave off an infestation for a few years from the plan’s inception. To account for these uncertainties and risks, economic modeling was performed assuming different years of future onset.

For the final total benefit figure, it was assumed that the watercraft inspections could stave off a dreissenid infestation for at least 25 years from the project’s inception. A 25-year assumption is based on biological rates of infestation from the Thomas (2010) study, as well success rates of the states’ program implementation. In some areas, watercraft inspection stations are highly effective; the Idaho Invasive Species Law of 2008 enabled the Idaho State Department of Agriculture to run state-wide inspection and prevention programs. These programs have shown to successfully intercept infested watercraft and points to a direct decrease in risk for watersheds within the state (Quagga-Zebra Mussel Action Plan for Western U.S. Waters [WRP 2010]).

The calculation of benefits assumes all benefit categories (annual costs avoided via hydropower, hatcheries, water intakes, etc.) occur at the same time. There are two key reasons for inclusion of an instantaneous infestation (less than or equal to one year’s time) across a watershed. The first is the possibility, without mitigation efforts, that multiple infested watercraft could be placed in the waterways in the same year, leading to an infestation of aquatic invasive species that spread from multiple vectors. This was deemed to be a reasonable assumption based on the expertise of watershed managers and USACE biologists. Second, it would be difficult to determine what portion of the watershed an infestation of aquatic invasive species may occur in. Because an infestation could occur from the most remote portion or the most populated portion of the region (where a majority of the affected facilities are), it could spread slower or faster than the 1-year time frame. Regardless, the majority of the basin has the ability to get infested. If it is adult (breeding) introduction of infestation, it is constant introduction until water temperature and other breeding factors are no longer conducive to veliger production. Adult introduction could lead to a large window in which veliger spread can inhabit, spread, and establish in the system. This could be multiple events and locations within a year, leading to the lost benefits categories all occurring in one year as a large

portion or majority of the system can be impacted. Furthermore, while the relevant facilities may not all be infested at once, it is reasonable to assume they would take precautionary measures. Because the lost benefits are measured in terms of cleaning costs, the 10-year ramp-up period, where the cleaning costs are slowly applied, can be viewed as the beginning of precautionary cleanings to infrastructure in preparation for a full infestation of aquatic invasive species. Preventative measures include costs to operations that reduce and keep veligers out, as well as reducing adult establishment, and creating overlap between prevention and cleaning costs that typically occur simultaneously.

However, the success of these programs and inspections cannot be guaranteed, as there are thousands of watercraft that travel across the country every week. Inspection stations and targeted risk reduction can only reduce a portion of the long-term risk that dreissenid infestations pose to the basin. Table 10 shows a sensitivity analysis of the avoided costs associated with delaying an infestation for 10 years, versus 25 or 50 years.

Table 10. Avoided Costs Associated with Differing Levels of Infestation Delay

Benefits	No Infestation Delay	10-Year Infestation Delay	25-Year Infestation Delay	50-Year Infestation Delay
Average Annual Net Benefits	-	\$39,100,000	\$81,000,000	\$117,000,000
Total Net Benefits	-	\$1,060,000,000	\$2,190,000,000	\$3,150,000,000
Average Annual Total Benefits	\$117,000,000	\$77,700,000	\$35,800,000	-
Total Benefits	\$3,150,000,000	\$2,100,000,000	\$966,000,000	-

The costs represented in the benefit category would begin to occur after year 25. It is unlikely that the costs would reach the 100 percent full infestation figure in the first year, and it would take some time for the infestation to spread. Therefore, it was assumed that the one-time hydropower retrofits would occur in year one, while the yearly total costs would increase from 10 percent in year one to 100 percent in year ten.

Total net benefits for the 25-year protection of \$2.19 billion were calculated by summing the present values of the 25-year infestation delay total benefits of \$966 million, which was then subtracted from the sum of the no-protection present values of \$3.15 billion. It was assumed under the no infestation delay option the onset would start in year zero, which is what would occur in the absence of any watercraft inspection program in the ARB. Similar total net benefits computations were repeated for the 10-year and 50-year level of protection scenarios.

The average annual net benefits per delay scenario were calculated as the difference between the no infestation scenario and individual infestation delay scenario average annual total benefits. Where the total benefits per delay scenario is computed by summing the present values per delay scenario and multiplying the resulting summed figure by a 0.037041 capital recovery rate.

4.1.1.8 Documentation of Comprehensive Benefits

National Economic Development (NED) Benefits - The proposed action and No Action Alternative NED evaluation is detailed within Section 4, Economics and Ecosystem Considerations, of this LR/Programmatic EA.

Other Social Effects (OSE) - A set of difficult to quantify impacts from a water resource project is lumped into the OSE account. These impacts can range widely but typically include considerations of public safety and environmental justice. The OSE account describes alternative effects on social aspects such as community impacts, health and safety factors, displacement, energy conservation and others (USACE ER 1005-2-100; IWR Report 2013-R-03, Applying Other Social Effects in Alternatives Analysis). An ARB OSE evaluation was undertaken to describe alternative effects to community well-being, and to identify potentially vulnerable or disadvantaged populations adversely effected.

Under the No Action Alternative, it is anticipated surrounding communities would experience the negative effects of invasive mussel shell accumulation on shorelines and beaches, which would limit beach-goers' ability to fully enjoy the nature and beauty of basin beaches. Following a dreissenids infestation in the ARB, beach users would need to wear protective footwear while walking near the water line, or local communities would need to organize a program to remove hazardous shells from recreational beach areas. With implementation of the Proposed Action Alternative, such actions would not be necessary.

(See Section 6.9 for the environmental justice analysis completed for the No Action Alternative and Proposed Action Alternative.)

Regional Economic Development (RED) Benefits - The RED analysis assesses how construction spending associated with the alternatives would affect regional economic conditions. The RED analysis estimates the direct, indirect, and induced effects to local regions as measured through jobs, gross regional product, labor income, and sales. "Sales" is the sum total of transactions that take place as a result of the construction project, including both value-added and intermediate goods purchased in the economy. "Labor Income" includes all forms of employment income, including employee compensation (wages and benefits) and proprietor (self-employment) income. "Gross Regional Product (GRP)" is the value-added of all produced units in the region or the value of all goods and services produced in the study area. "Jobs" is the estimated worker-years of labor required to build the project. In the USACE Regional Economic Systems, employment is presented as full-time equivalent jobs.

These regional economic effects are also expressed in monetary values or other numeric units (i.e., number of jobs) and are classified as either a direct or secondary (indirect and induced) effects. Direct effects represent the impacts of construction spending, including supervision and administration, planning, and engineering. Indirect effects represent the impacts caused by the iteration of industries purchasing goods and services to support the directly affected industries. These are industries in the supply chain of the construction sector, such as materials manufacturing, trucking, fuel, and others.

Induced effects represent the economic impacts from the directly and indirectly affected workers spending their income in the local or regional economy. For example, the additional income may be spent on clothing, groceries, dining out, and other items in the area. Secondary effects are described as the multiplier or rollover effects and include the indirect and induced effects in the defined economic impact areas.

The expenditures associated with All Work Activities, with Ability to Customize Impact Area and Work Activity at Large are estimated to be \$52,707,131. Of this total expenditure, \$48,358,793 will be captured within the local impact area. The remainder of the expenditures will be captured within the state impact area and the nation. These direct expenditures generate additional economic activity, often called secondary or multiplier effects. The direct and secondary impacts are measured in output, jobs, labor income, and gross regional product (value added) as summarized in the following tables. The regional economic effects are shown for the local, state, and national impact areas. In summary, the expenditures \$52,700,000 support a total of 760 full-time equivalent jobs, \$40,500,000 in labor income, \$49,400,000 in the gross regional product, and \$99,400,000 in economic output in the local impact area. More broadly, these expenditures support 940 full-time equivalent jobs, \$78,400,000 in labor income, \$97,100,000 in the gross regional product, and \$148,000,000 in economic output in the nation.

4.1.1.9 Benefit Cost Analysis

The current benefit-cost ratio (BCR) range for the ARB is between 0.9 and 2.6 for the different sensitivities, which is above the 1.0 threshold needed to federally justify the implementation of a project. These calculations are shown in Table 11. The most likely projected outcome is the 25-year protection plan, which results in a BCR of 1.8.

Table 11. Benefit-Cost Ratios for Incremental Deferrals

Protection Plan	Average Annual Cost	Average Annual Net Benefits	BCR
No Infestation Delay	0	0	0
10-Year Infestation Delay	\$45,200,000	\$39,100,000	0.9
25-Year Infestation Delay	\$45,200,000	\$81,100,000	1.8
50-Year Infestation Delay	\$45,200,000	\$117,000,000	2.6

4.2 ECOSYSTEM CONSIDERATIONS

If dreissenids were to become further established in the ARB, many changes to the aquatic environment would occur. As the density of dreissenids increases, water clarity would increase due to plankton being consumed. This would decrease the food supply for young and small fish. As water clarity increases, light penetration would also increase, which would lead to aquatic plants being able to take root in deeper water. The area of rooted aquatic plants would increase, which would provide additional habitat for fish that might prey on young pallid sturgeon. The bottom substrate would become covered with live and dead mussels. Shorelines would be lined with sharp shells. Dreissenids would also attach to native mussels, competing with them for food and eventually killing them.

Hundreds of millions of dollars have been invested within the ARB to protect, restore, and recover riparian and riverine aquatic habitat to support native plant and animal populations. An infestation of dreissenids would not only change the ecosystem but could cause physical injury as fish migrate. Recreational fisheries could also be affected. Modified water quality could lead to habitat changes, which affect fish populations and composition. Native fish populations could also be negatively affected.

It may not be possible to avoid further infestation and associated impacts forever, but even delaying the further establishment of dreissenids would allow additional time for preparation. Implementation of additional education programs to reach a wider audience of the potential effects of transporting invasive species would be beneficial. Additional monitoring in the ARB would allow for implementation of rapid response plans in an effort to suppress AIS spread.

4.3 CONCLUSION

Based on the information evaluated in this LR/Programmatic EA, USACE has determined that there is Federal interest in partnering with the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas to address the vulnerability of the ARB to an AIS infestation. As described in Section 4.1, a conservative estimated annual cost avoided by delaying an infestation by 25 years exceeds the estimated annual costs associated with the watercraft inspection station program, thus demonstrating an economic benefit. Alternative 2 helps to address the vulnerability issues indicated in this section. The risk reduction efforts would also protect the environment by delaying potential impacts described in Section 4.2 (effects of the prevention efforts on the environment is provided in Section 6).

As previously described in Section 4.2 and later in Section 6, Alternative 2 would also generate significant ecosystem quality benefits that have not been quantified. Although they have not been quantified, these benefits are considered in the USACE decision making process.

Consistent with the USACE planning process, alternatives must be formulated in consideration of four criteria described in the Principle and Guidelines Report (U.S.

Water Resources Council 1983) for completeness, effectiveness, efficiency, and acceptability, which are described below.

- **Completeness.** Alternative 2, Comprehensive Adaptive Improvements, is the most complete solution available to reduce the risk of a dreissenid and other AIS infestations. It includes every potential measure considered except Measure 8, which is outside existing authority. Together these measures address all planning objectives, without violating any planning constraints. This creates powerful preventive actions, including monitoring, educational opportunities, planning for contingencies, and preparing for quick response to potential infestations. While this alternative cannot completely eliminate the possibility of a dreissenid or other AIS infestation, it is the most comprehensive solution available.
- **Effectiveness.** Alternative 2, Comprehensive Adaptive Improvements, includes a combination of different actions to prevent the spread of dreissenids or other AIS, while allowing watercraft to be transported between infested and uninfested areas of the country. In addition, the alternative promotes collaboration between the states to continue developing methods to reduce the risk of AIS infestations. This alternative is not 100 percent effective, but it is a broad solution that will do much to prevent a dreissenid infestation.
- **Efficiency.** Based on the current level of knowledge, if dreissenids or other AIS continue to expand through the waters of the ARB, it is likely they will become permanently established. For every year an infestation is deferred through the actions that comprise Alternative 2, Comprehensive Adaptive Improvements, significant costs associated with an infestation can be avoided. The costs of improvements detailed in Alternative 2 would be a small fraction of the O&M costs resulting from an infestation.
- **Acceptability.** Alternative 2, Comprehensive Adaptive Improvements, is acceptable to all entities per applicable laws, regulations, and public policies. The collaborative effort between the states allows for effective communication about relative laws and regulations, and how to best intercept and prevent potential infestations, educate the public, and lead to continuous improvements in the early detection of dreissenids and other AIS within the ARB. While the solution is not all-encompassing, it is accepted as the most complete and effective solution available.

4.3.1 Proposed Action Alternative

Using this guidance, each alternative was evaluated to determine if it met the four criteria described above. Using these criteria, it was determined that only Alternative 2 meets the study objectives and will contribute to an effective and efficient plan to defer dreissenid and other AIS infestations and the associated negative impacts to the environment and infrastructure in the ARB. There are no significant technical or engineering challenges associated with any of the measures. Compared to Alternative 1 (the No Action Alternative), Alternative 2 reduces the risk of dreissenid and other AIS infestations by delaying the rate of development through the proposed measures such

as Federal participation in the selection of watercraft inspection station locations, increasing the number of watercraft inspection stations, extending daylight inspection hours, and more. If successful, risk would be reduced by staving off a dreissenid infestation for at least 25 years from the project's inception. From that point, an infestation would develop gradually and thus incur costs at Year 26 from project inception, as opposed to Year 1 with the No Action Alternative. Based on the Federal interest and environmental acceptability, Alternative 2, is the Proposed Action Alternative to be considered further during the environmental consequences and compliance analysis.

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SECTION 5 - EXISTING CONDITIONS

This section provides general information about the environmental conditions within the approximately 168,000-square-mile study area. The background environmental information provided is limited due to a general lack of impacts associated with existing inspection stations, monitoring, and rapid response planning and preparation in other areas of the country where these programs are currently very active (USACE 2022b).

5.1 FISHERIES/AQUATIC RESOURCES

The ARB study area contains habitat for hundreds of species of native and non-native aquatic organisms. A diversity of trout species (Salmonidae) occupy the Rocky Mountain eastern slope rivers and streams in the upper reaches of the ARB, and the Arkansas River above Lake Pueblo is considered to be one of the best trout streams in the country (Ross 2005). Fisheries are characterized as cold to cool water species, and sport fishes such as rainbow and brown trout are present in many waterways. Reservoirs support a wider range of fish species, ranging from cool water to warm water fish communities. Sport fish such as sauger (*Sander canadensis*), crappie (*Pomoxis spp*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*M. salmoides*), and channel catfish (*Ictalurus punctatus*) are common in ARB water bodies. In addition, there are several species listed as threatened or endangered under the ESA (see Federal Natural Resources Law Compliance and Biological Evaluation appendix).

5.2 WATER QUALITY

Surface water in the ARB is similar to other regions in the eastern half of the nation. However, concerns about the water quality of the ARB have emerged. Population growth, mining, ranching, agriculture, and industry have created, and are continuing to create water quality issues and concerns.

In the upper reaches of the system, mining and ranching have adverse effects on water quality. In the ARB in Colorado, as much as 68 percent of river miles and 77 percent of lake and reservoir acres fail to fully support state water quality standards (CDPHE 2022). Arsenic, E. coli, selenium, and manganese are the most common sources of impairment for rivers and streams. Selenium, arsenic, and dissolved oxygen are the most common sources of impairment in lakes and reservoirs (CDPHE 2022). In New Mexico, as many as 2,041.67 river miles and 16,459.2 acres of lakes and reservoirs within the ARB are listed as impaired (NMED 2022). The most common sources of impairment include temperature, nutrients, E. coli, flow regime modification, turbidity, and heavy metals in rivers; and mercury, PCBs, and nutrients in lakes and reservoirs (NMED 2022).

As the Arkansas River flows through the Great Plains, different factors stress water quality. Aquifer withdrawals and evaporation in irrigation diversions drive high concentrations of total dissolved solids in eastern Colorado and western Kansas. The Arkansas River in this area is one of the most saline rivers in the United States (KGS 2001). Across central Kansas, agriculture and industry contribute to water quality

impairment. Common sources of impairment in the Arkansas River system in Kansas include lead, sulfates, and eutrophication (KDHE 2022). In Texas, several segments within the Canadian River system are listed as impaired. Common sources of impairment include mercury, chloride, and sulfate (TCEQ 2022).

In Oklahoma, agricultural, industry, development, and channel modification for navigation are common factors in water quality impairment within the ARB. Slack-water reservoirs downstream of Tulsa, Oklahoma, change water quality characteristics of the Arkansas River due to the large volume of stored water. Temperatures do not fluctuate as much as in a natural river and the reservoirs warm slower in the summer and cool slower in the fall. Daily temperature fluctuations are also depressed.

5.3 WILDLIFE/TERRESTRIAL RESOURCES

Common mammals present in the study area include: white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), least shrew (*Cryptotis parva*), southern short-tailed shrew (*Blarina carolinensis*), pine vole (*Microtus pinetorum*), eastern mole (*Scalopus aquaticus*), gray squirrel (*Sciurus carolinensis*), fox squirrel (*Sciurus niger*), eastern cottontail rabbit (*Sylvilagus floridanus*), swamp rabbit (*Sylvilagus aquaticus*), muskrat (*Ondatra zibethicus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale putorius*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), mink (*Mustela vison*), long-tailed weasel (*Mustella frenata*), nine-banded armadillo (*Dasyus novemcinctus*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), and white-tailed deer (*Odocoileus virginianus*).

A wide variety of birds are known to occur within the study area due to the size, the geographic location, and the diversity of habitats present. Common resident birds include the bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*) (Rio-Grande and Eastern), roadrunner (*Geococcyx californianus*), robin (*Turdus migratorius*), and northern cardinal (*Cardinalis cardinalis*). Most of the birds that frequent the study area are considered migratory, and they may be seasonal residents or simply transient migrants. Many of the neotropical migrants, land birds that breed in temperate America and winter in the New World tropics, are considered breeders and common summer residents in Oklahoma.

Migratory waterfowl such as mallards (*Anas platyrhynchos*), northern pintails (*Anas acuta*), gadwalls (*Anas strepera*), American widgeons (*Anas americana*), lesser scaup (*Aythya affinis*), and ringneck ducks (*Aythya collaris*) utilize the wetlands, ponds, and other water bodies during their annual migrations. Wood ducks (*Aix sponsa*) and hooded mergansers (*Lophodytes cucullatus*) are known cavity nesters throughout the Arkansas River Valley. Multiple species of geese are also common during their annual migrations. Snow (*Chen caerulescens*), Ross's (*Chen rossii*), Canada (*Branta canadensis*), and White-fronted (*Anser albifrons*) geese migrate through the area. Canada geese are also residents within the study area.

Common raptors that frequent the study area include the barred owl (*Strix varia*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), sharp shinned hawk (*Accipiter striatus*) and American kestrel (*Falco sparverius*).

Many species of reptiles and amphibians inhabit the diverse habitats along the Arkansas River. Common reptiles include the western ribbon snake (*Thamnophis proximus*), eastern hognose snake (*Heterodon platyrhinos*), timber rattlesnake (*Crotalus horridus*), common snapping turtle (*Chelydra serpentina*), red-eared slider (*Chrysemys scripta*), and the three-toed box turtle (*Terrapene carolina*). Most of the amphibians that inhabit the area are associated with aquatic environments such as intermittent and permanent streams, vernal pools, ponds, lakes, and wetlands. The southern leopard frog (*Rana utriculata*), northern spring peeper (*Pseudacris crucifer*), bullfrog (*Rana catesbeiana*), and green frog (*Rana clamitans*) can be found throughout the region.

There are several species listed as threatened or endangered under the ESA (see Federal Natural Resources Law Compliance and Biological Evaluation appendix). Other terrestrial resources, such as plants, including a variety of trees, shrubs, forbs, and grasses, can be found near the many and diverse habitat types throughout the states in the study area.

5.4 AESTHETICS/VISUAL RESOURCES

Aesthetics or visual resources are the natural and artificial features of the landscape that can be seen and contribute to one's appreciative enjoyment of the environment. The aesthetic quality of an area is a subjective measure of one's perception of how pleasing an area is. The ARB consists of a complex tapestry of mountains, high plateaus, semi-arid plains, rolling grassland prairie with uplands and wetlands, and riparian river valleys woven together by the Arkansas River and its tributaries. Mountains are a major and dramatic presence in ARB, which originates in the southern Rockies and passes through the Ozarks before joining the Mississippi. However, the aesthetic values of the Arkansas River, the mountains, and surrounding landscapes vary based on the viewer's perspectives and values.

5.5 RECREATION

Due largely to its rural nature and scenic terrain, the ARB provides a wide variety of opportunities for outdoor recreation, which in turn provides genuine value to residents, as well as economic opportunities through tourism. A considerable industry has been established due to the availability and establishment of water- and land-based recreational opportunities. Depending on the location, popular activities include boating, swimming, water skiing, jet skiing, fishing, camping, hunting, walking, biking, and bird and wildlife viewing.

5.6 CULTURAL RESOURCES

The rivers and tributaries in the ARB travel through a variety of unique environments and physiographic regions of central North America. People have been living along these rivers since the first peopling of the region at least 11,500 years ago (Wood 1998). Archaeologically, the ARB and its spectrum of physiographic regions resulted in a variety of cultural manifestations within its expanse resulting in a multitude of important cultural resources. Early Spanish and French explorers were some of the first foreigners to document native peoples within the Basin. They encountered an equally diverse set of people and cultures, from the Comanche and Apache in Southeast Colorado, the Wichita and Osage of the Great Plains and into the Ozark Plateau, and groups like the Quapaw near the confluence with the Mississippi River; amongst many, many others. Many of these great Nations were relocated to Indian Territory (present day Oklahoma) as westward expansion of the United States occurred. This expansion is also in evidence on the landscape in the form of multiple cultural resources associated with the historically significant Santa Fe Trail, which followed the Arkansas River from its 'Great Bend' in Kansas on into Colorado near La Junta.

5.7 CLIMATE AND CLIMATE CHANGE

The climate of the study area is "humid subtropical" characterized by long summers, relatively mild winters, and a wide range in temperatures. Generally, there is a considerable amount of precipitation in every month and temperatures tend to be mild compared with the northern part of the country. The average annual temperature is 60°Fahrenheit (F), with an average annual high temperature of 71°F, and average annual low temperature of 49°F. Each year the area receives about 47 inches of rain, with January typically being the driest month. Late spring and late fall to early winter are typically the wettest periods.

The U.S. Global Change Research Program (USGCRP) looks at potential impacts of climate change globally, nationally, regionally, and by resource (e.g., water resources, ecosystems, human health). Following drought over the last 50 years, there have been significant flooding and rainfall events in the Southern Great Plains region. This contrasts with the early 1900s. There has been an increase in the magnitude of flooding following an extreme drought. Populations, as they grow, will become subject to these extreme rainfall events. However, the Southern Great Plains flood frequency has decreased over the last 30 years while specific record-breaking flood events have increased. USGCRP predicts relatively small changes regarding average annual precipitation within the Southern Great Plains with slightly wetter winters within the northernmost section of the region, and drier summers. Increases in frequency and intensity of heavy precipitation events are expected (Kloesel et al. 2018). Extreme heat events are expected to increase in frequency, duration, and intensity as well as an overall increase in average temperatures. Extreme cold events are expected to reduce over time due to climate change. The Southern Great Plains' annual average temperatures are projected to increase by 3.6°-5.1° and 4.4°-8.4°F in the mid to late 21st century due to probable increased greenhouse gas emissions. Similarly, to the summer of 2011, if no changes to emissions occur, the Southern Great Plains will most

likely experience an additional 30-60 days per year above 100°F than what occurs at this point in time (Kloesel et al. 2018).

5.8 ENVIRONMENTAL JUSTICE

EO 14008, Tackling the Climate Crisis at Home and Abroad, states that environmental and economic justice are key concerns for the Federal government and its implementing agencies. It further directs agencies to develop programs to address disproportionately high and adverse impacts to disadvantaged communities. A key tool for achieving these goals is the Justice40 Initiative which established a goal that 40 percent of the overall benefits of Federal investments flow to disadvantaged communities.

The Council on Environmental Quality (CEQ) has developed a Climate Change and Economic Justice Screening Tool (CEJST) (Version 1.0) to identify disadvantaged communities. The tool identifies census tracts that are burdened in one or more categories, including climate change, energy, health, housing, pollution, transportation, water, and workforce. A community is highlighted as disadvantaged on the CEJST map if it is in a census tract that is (1) at or above the threshold for one or more environmental, climate, or other burdens, and (2) at or above the threshold for an associated socioeconomic burden. Federally Recognized Tribes, including Alaska Native Villages, are also considered disadvantaged communities.

The tool is also available as a geographic information system (GIS) dataset. This dataset was downloaded on 12 April 2023, and census tracts within the ARB were selected for analysis. According to the CEQ CEJST, 1,340 of the 2,164 census tracts in the ARB are disadvantaged in at least one category, and many are disadvantaged across multiple burden categories (Table 12). The most common category of burden was workforce development, with 1,195 tracts identified as disadvantaged. The second most commonly burdened category was climate change, which identifies low-income tracts with high agriculture or building loss rate risks, flood or wildfire risks, or population loss risks. There were 699 tracts in the ARB identified as disadvantaged in the climate change category; 624 tracts were identified as disadvantaged in the health category, which indicates low-income tracts with very high rates of asthma, diabetes, heart disease, or low life expectancy. Another 479 tracts were identified as disadvantaged due to overlap with Tribal areas.

Table 12. Summary of Environmental Justice Statistics

State	Tracts in ARB	DA Tracts	Climate	Energy	Traffic	Housing	Pollution	Water	Health	Workforce
Arkansas	395	289	157	48	60	53	55	8	137	273
Colorado	255	111	39	22	14	47	37	17	35	78
Kansas	343	196	75	45	9	50	48	25	58	170
Missouri	198	142	80	41	35	27	28	10	74	127
New Mexico	17	16	12	6	2	1	8	1	4	14
Oklahoma	893	539	309	154	79	126	93	10	303	487
Texas	63	47	27	4	2	13	9	0	13	46
Grand Total	2164	1340	699	320	201	317	278	71	624	1195

Geographically, Oklahoma has the greatest number of disadvantaged tracts, and the greatest number of tracts identified as disadvantaged due to overlap with Tribal communities. Geographically, there are proportionally fewer disadvantaged communities found in the Great Plains than the eastern slope of the Rockies or the most eastern portion of the ARB. There is no distinct skew between cities and rural areas, with numerous disadvantaged tracts to be found in both.

SECTION 6 - ENVIRONMENTAL CONSEQUENCES

While Section 4 describes the economic and ecosystem effects of widespread dreissenid and other AIS infestation in the ARB, this section addresses the environmental and social consequences of the proposed Federal action. Specifically, this section discusses effects anticipated to occur over a wide range of environmental resources and social considerations as a result of implementation of the proposed action. The anticipated effects associated with the No Action Alternative are compared to those of the Proposed Action Alternative. The USACE analysis did not identify any adverse environmental effects.

Federal participation in the program would be dependent on the states beginning to or continuing to fund the program and Congress specifically appropriating funds for the program. The commitment of resources may increase if risks increase, or it may decrease, or the program may be eliminated if an infestation becomes permanently established within the ARB.

As of a result of coordination with the states, USACE did not identify any conflicts to land-use plans. The process of selecting locations for watercraft inspection stations (see Section 2.4.1.2) accounted for existing land uses.

USACE considered but did not identify any potential effects to threatened and endangered species, noise pollution, vegetation, air quality, or hazardous/toxic materials. Therefore, those resource areas are not detailed below. However, a biological evaluation is included as an appendix, which describes the threatened and endangered species analysis and determinations.

The proposed action is intended to reduce the risk of invasive species infestations and, as a result, avoid or delay the adverse economic, environmental, and social consequences of such infestations.

Rapid response actions are eligible for cost reimbursement under the authority for the proposed action. Given the uncertainty regarding the need for, timing and location of, and methods used in a rapid response effort, the effects of rapid response are not considered in this document. Should a state engage in a rapid response action, the effects of that action would be evaluated at that time, and prior to reimbursing the costs of the effort.

6.1 ALTERNATIVES

6.1.1 Description of the No Action Alternative (No Change to Current Practice)

The existing conditions (Affected Environment) are described in Section 5. The No Action Alternative represents a continuation of the states' current practice, in which USACE would not augment state AIS control and prevention programs to protect the ARB and USACE water-related infrastructure therein. Section 2.4 provides information pertaining to existing AIS prevention and control operations.

6.1.2 Description of the Proposed Action Alternative, Comprehensive Adaptive Improvements

Implementation of the Proposed Action Alternative would mean that USACE, in collaboration with the AIS coordinators of the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas, would establish watercraft inspection stations at locations anywhere within the seven-state area provided they help prevent the spread of AIS into or out of the ARB (refer to Section 2.4). Monitoring reservoirs within and outside the ARB for early detection of dreissenid veligers would occur independent of watercraft inspection stations. USACE would also collaborate with the study states to reimburse expenditures for contingency planning as well as rapid response planning and preparation. Rapid response planning and preparation would include training exercises and drills as well as purchase of equipment required to implement a rapid response to include such items as trucks, boats, trailers, application equipment, solid turbidity curtains, bubble curtains, and bladder dams, as well as support equipment to anchor in place, transport, and deploy the curtains and/or dams.

USACE would partner with the state's AIS coordinators to establish watercraft inspection stations very similar to the states' existing watercraft inspection station program in terms of configuration and operations. States would also coordinate and direct the operation of inspection stations within their boundaries that fall outside the watershed boundary of the ARB with the intent to best protect ARB waters from cross-basin transfer of dreissenids on, for example, trailered watercraft. If WID stations are proposed for a Federal cost share program outside of the seven ARB states, a site-specific environmental assessment, to include a NHPA Section 106 review, tiered from this LR/Programmatic EA would be required to analyze that action outside of the ARB study area. Similarly, implementation of rapid response plans may require emergency environmental and ESA compliance documentation.

6.1.3 Relationship Between Short-Term Use and Long-Term Productivity

The ARB is at high risk of further AIS infestation due to the mobility of watercraft transported between and within watersheds over interstate highways and other roadways. The short-term protection of natural resources through prevention will eliminate the long-term need for control and management of AIS. Prevention will protect the long-term recreational, commercial, and environmental interests of the ARB over time.

6.1.4 Natural or Depletable Resource Requirements and Conservation Potential

Minor consumption of natural resources would result from construction, operation, and/or maintenance of the watercraft inspection stations. This may include the loss of water used during for AIS removal. Because Federal participation would augment existing state-managed watercraft inspection stations, which are operated primarily along developed portions of major highways or boat ramps, it is anticipated that there would be only minimal direct effects to natural or depletable resources.

6.1.5 Energy Requirements and Conservation Potential

The consumption of energy supplies (such as coal for electricity; natural gas and liquid petroleum for heating and gasoline for ground vehicles) is required for operating inspection stations, associated vehicles and AIS cleaning equipment. The remote location of many of these stations may necessitate the use of solar energy and gasoline fueled generators for operations. The energy requirements for controlling and long-term management of AIS in the ARB greatly exceeds the energy needs of operating the inspection station needed to prevent establishment of AIS.

6.1.6 Irreversible or Irrecoverable Commitments of Resources

Water, fuels, materials, and various forms of energy would be utilized during the construction and operation of watercraft inspection stations. The geographic footprint of watercraft inspection stations and access roads may affect vegetative and wildlife productivity which is considered irretrievable and irreversible. No other aspects of the proposed action are considered irreversible.

6.2 FISHERIES/AQUATIC RESOURCES

6.2.1 No Action Alternative (No Change to Current Practice)

AIS are a direct threat to native aquatic resources. A further spread of dreissenid infestations would adversely impact fisheries and aquatic resources within the ARB, to include impacting species and habitats protected under the ESA. The amount of food and shelter for fish and aquatic resources would be altered, changing the types and abundance of species able to survive. Spawning and rearing habitat, including critical habitat, for some species would also be negatively impacted. Physical injury to fish could occur from abrasion. Freshwater mussels could be starved and suffocated by colonization of their shells by dreissenids. Dreissenids have extirpated native freshwater mussels from the Great Lakes (Strayer and Malcom 2007).

Invasive carp are also an especially dangerous threat to fisheries and aquatic resources. Invasive carp grow rapidly and consume a large quantity of food every day. This reduces plankton abundance and alters the ecosystem by removing the base of the aquatic food web (Casper et al. 2018; Görgényi et al. 2016). Invasive carp outcompete other filter feeders, and in turn, eliminate prey for popular sportfish (Casper et al. 2018; Sass et al. 2014).

Invasive aquatic plants can have notable adverse effects to fisheries and aquatic resources. Eurasian watermilfoil forms thick mats in shallow areas, quickly spreading to block sunlight, killing off native aquatic plants that native fish rely on for food and shelter (Boyllen et al. 1999). Hydrilla grows in dense mats and can become several feet thick displacing native plants that provide food and shelter. Hydrilla grows so densely that it disrupts water flow and decreases dissolved oxygen in the water, which results in fish kills. The size and weight of sport fish such as largemouth bass are also reduced in areas infested with hydrilla (Colle and Shireman 1980).

If the No Action Alternative was implemented, the risk of an AIS infestation affecting fisheries and other aquatic resources would increase. The AIS Coordinators in the seven ARB states would continue with their programs; however, a lack of funding may limit how much they can do. Taking no action would increase environmental effects to aquatic resources, as the risk of an AIS infestation would escalate. The No Action Alternative would limit the benefits to fisheries and other aquatic resources.

6.2.2 Proposed Action Alternative

Similar to the existing programs in Colorado and New Mexico, watercraft inspection stations would be established in paved or gravel areas. Any runoff from cleaning a vessel would be contained. It would either be collected, percolate directly into the ground, evaporate, or go into a retention basin where it would percolate into the ground or be decontaminated for re-use. No new ground disturbance would occur to establish watercraft inspection stations without further environmental review. Monitoring reservoirs for the early detection of dreissenid veligers and other AIS would have no effect on fisheries or aquatic resources.

There would be no threat of runoff into any water body, as inspection stations would not be located close enough to any water body. On occasion, watercraft owners may request a decontamination at their home if they have been at infested water bodies. In such instances, trained staff would evaluate the location, including where any runoff could go. If there is any chance of discharging to an uninfested water body, the watercraft would be hauled to an area where no water or debris from the wash/decontamination would be discharged into a water body.

Contingency planning and rapid response preparation and planning would not have significant adverse effects to fisheries or aquatic resources. Most planning activities are administrative in nature and would not have direct effects to the environment. Purchased equipment would be stored in existing facilities. Rapid response training exercises could have minimal, short-term effects to water bodies if training included in-water activities such as deployment of silt barriers or isolation bladders. These effects could include brief periods of localized turbidity. Training locations would be chosen to minimize adverse effects to aquatic ecosystems and to avoid ESA-listed species. Rapid response implementation could have effects to aquatic species. Further environmental review would be completed prior to the reimbursement of costs incurred during a rapid response action.

The proposed action would not negatively affect fisheries or other aquatic resources in the ARB either directly or indirectly over the short-term or long-term. There would be no additional cumulative effects on this resource. The proposed action would be expected to positively affect fisheries and other aquatic resources due to the reduced risk of infestation and spread of AIS provided by the additional funding allocated to support prevention and control programs.

6.3 WATER QUALITY

6.3.1 No Action Alternative (No Change to Current Practice)

A dreissenid or other AIS infestation would adversely impact water quality at water bodies within the ARB. The adult mussels would filter huge quantities of water as they feed. While dreissenids can improve the appearance of a water body by increasing clarity, they actually degrade water quality in the lakes and rivers they infest. Their high density and rapid metabolism consume available oxygen and loads the water with nutrients (Strayer et al. 1999). Some eastern rivers have been categorized as impaired due to low dissolved oxygen levels or excess phosphates following infestation by dreissenids (Effer et al. 1996). Water clarity increases can have negative effects on the ecosystem, by alternating food chains and increasing predation. In addition to the negative effects to aquatic resources, rooted aquatic plants would persist into deeper water than normal.

Other AIS threaten water quality as well. Eurasian watermilfoil grows so densely that it can consume all the dissolved oxygen in a water body during its nightly respiration period (Unmuth et al. 2000). Black and common carp stir sediment, uproot native vegetation, and destabilize shorelines while feeding (McCormick et al. 2009, Li et al. 2021). AIS can outcompete native species and disrupt ecosystems leading to adverse effects to water quality.

If the No Action Alternative was implemented, the risk of an AIS infestation that would affect water quality would increase. The AIS Coordinators in the seven ARB states would continue with their programs; however, a lack of funding may limit how much they can do. Taking no action would increase environmental effects to water quality, as the risk of an AIS infestation would escalate. The No Action Alternative would limit any benefits to water quality.

6.3.2 Proposed Action Alternative

The potential effects on water quality when establishing and operating watercraft inspection stations, would be the same as discussed in the fisheries/aquatic resources section. The watercraft inspections stations, monitoring, and planning would not negatively affect water quality in the ARB directly in either the short term or long term. Because no fill material would be placed in wetlands, or other WOTUS (refer to definition in Section 1.3), a Clean Water Act Section 404(b)(1) Evaluation is not required, and therefore, no Least Environmentally Damaging Practicable Alternative (LEDPA) needs to be identified. There would be no additional cumulative effect on this resource. The indirect effects would be positive due to the reduced risk of infestation and spread of AIS provided by the Federal cost-share program.

6.4 WILDLIFE/TERRESTRIAL RESOURCES

6.4.1 No Action Alternative (No Change to Current Practice)

A dreissenid or other AIS infestation at a currently uninfested water body within the ARB would adversely impact wildlife and terrestrial resources. Ducks that consume mussels could be poisoned (Petrie et al. 2002). Invasive aquatic vegetation adversely affects wildlife, especially waterfowl and raptors that live near infested water bodies. Invasive vegetation disrupts ecosystems and reduces the amount of forage available for fish-eating birds. Eurasian watermilfoil and hydrilla grow so thickly that they impair the ability of diving birds to swim and find food (Unmuth et al. 2000). Both species are key drivers of avian disease. Hydrilla, and to a lesser extent Eurasian watermilfoil, host a cyanobacteria (*Aetokthonos hydrillicola*) that produces a neurotoxin (*Aetokthonotoxin*) that causes the disease Vacuolar Myelinopathy (VM) when consumed by animals, including birds, fish, reptiles, amphibians, and mammals (Haram et al. 2020; Breinlinger et al. 2021). In reservoirs in the southeastern U.S., VM directly affects waterfowl and fish, but also infects birds of prey that feed on infected prey. VM is responsible for the death of more than 100 bald eagles and thousands of coots (Haram et al. 2020). Those adverse impacts would be expected to be conveyed through the ecosystem.

If the No Action Alternative was implemented, the risk of an AIS infestation that would affect wildlife and terrestrial resources would increase. The AIS Coordinators in the seven ARB states would continue with their programs; however, a lack of funding may limit how much they can do. Taking no action would increase environmental effects to wildlife and terrestrial resources, as the risk of an AIS infestation would escalate. The No Action Alternative would limit any benefits to wildlife and terrestrial resources.

6.4.2 Proposed Action Alternative

Under the proposed action, some wildlife could be present near a new inspection station from time to time. However, most inspection sites are established in areas that have constant human presence and wildlife would not be present. Some additional forbs or grasses could be trampled if shelters, equipment, or work vehicles are parked in vegetated areas alongside the watercraft inspection site.

The proposed action incorporates the following stipulations, which while designed to eliminate any impacts to ESA-listed and other protected species, would also be generally protective of all terrestrial wildlife:

1. No new ground disturbance would occur to establish watercraft inspection stations without performing a survey of the area for ESA-listed species or protected migratory bird nests if they might be present in the area (see Table 13 in Section 7). If surveys indicate the presence of listed species or active nests, then a minimum buffer distance of 250-feet will be observed. No runoff associated with ground disturbing activities will enter any waterbody.
2. Water or debris from a hot wash or other decontamination would be prevented from entering any water body.

3. Wash water would not be allowed to flow over land covered by any type of vegetation without performing a survey of the area for ESA-listed plants in specific areas (see Table 13 in Section 7.1.2).
4. Any runoff from washing/decontaminating a vessel would either evaporate, percolate directly into the ground, be collected in a retention basin with no possibility of reaching water bodies or wetlands or be captured and transferred to a location away from any water body.
5. There could be instances where a wash/decontamination would be performed at a watercraft owner's residence. In such instances, trained staff would evaluate the location, including where any runoff could go. If there is any chance of discharging to an uninfested water body, the watercraft would be hauled to an area where no water or debris from the wash/decontamination would be discharged into a water body.
6. There would be no wetland disturbances or other negative effects to wetlands.
7. Watercraft inspection station sites would be assessed/surveyed to determine presence/absence of suitable habitat/location of ground-nesting or shrub-nesting birds. No trees, shrubs, or other bird habitat is proposed to be cut or damaged by the establishment of watercraft inspection stations.
8. Watercraft inspection stations would be located a minimum of 250 feet away from known roosting trees or culverts for species listed in Table 2 of the Biological Evaluation (see Federal Natural Resources Law Compliance and Biological Evaluation appendix).
9. Training activities would not be conducted on water bodies where species protected by the ESA may be present.

By following the above stipulations to avoid impacts to wildlife and terrestrial resources there would be no direct or indirect, short-term or long-term, or cumulative effects caused by implementation of the proposed action. In the absence of adverse impacts on terrestrial resources overall, the proposed action would be expected to be positive due to the reduced risk of infestation provided by the additional funding allocated to support the program.

6.5 AESTHETICS/VISUAL RESOURCES

6.5.1 No Action Alternative (No Change to Current Practice)

The spread of AIS within the ARB would have notable adverse effects to aesthetics/visual resources. If a dreissenid infestation occurred, there would be negative impacts on this resource. Small mussels would attach to virtually all hard surfaces, including rocks and manmade structures such as water intake pipes, boats, etc. The shoreline would become filled with dead mussel shells. Silver and bighead carp remove zooplankton and larger phytoplankton from the water column, leaving behind smaller phytoplankton, which results in unpleasantly green water (McCormick et al. 2009). If these invasive carp were to establish in the ARB, this would impair aesthetics. The

spread of invasive aquatic vegetation would also have adverse impacts to aesthetics at water bodies in the ARB. Eurasian watermilfoil and hydrilla form dense mats on the surface of lakes and reservoirs and inhibit water movement leading to stagnant and unattractive waters.

If the No Action Alternative was implemented, the risk of an AIS infestation that would affect aesthetics and visual resources would increase. The AIS Coordinators in the seven ARB states would continue with their programs; however, a lack of funding may limit how much they can do. Taking no action would increase environmental effects to aesthetics and visual resources, as the risk of an AIS infestation would escalate. The No Action Alternative would limit any benefits to aesthetics and visual resources.

6.5.2 Proposed Action Alternative

Implementation of the proposed action would cause minimal changes to the aesthetic or visual resources of areas where watercraft inspection stations would be located, as the stations would be placed in already developed areas. Most travelers on major interstates may not notice a station. Inspection stations would include signage along the travel route requiring watercraft haulers to stop for an inspection. This is the only visual difference most travelers would notice. At the inspection location, there would most likely be a storage container or canopy, a portable restroom, and various equipment such as a pickup truck and wash-water tank, which would not be notably aesthetically displeasing. Equipment associated with inspection stations is part of the expected viewshed at likely station locations.

Monitoring reservoirs for the early detection of dreissenid veligers would have no effect on aesthetic/visual resources. Training exercises would briefly introduce unfamiliar equipment into the viewshed, but training would be brief in nature, likely taking less than a full day.

Implementation of the proposed action would not substantially affect aesthetic or visual resources in the ARB directly or indirectly in either the short term or long term. There would be no additional significant cumulative effect on this resource.

6.6 RECREATION

6.6.1 No Action Alternative (No Change to Current Practice)

Infestation of water bodies within the ARB by AIS would have adverse effects to recreation. If dreissenid infestations were to become widespread in the ARB, recreationists would be negatively impacted. Anyone walking along the shoreline or in the water would need to wear shoes, or risk being cut by sharp shells. Dreissenids reduce the productivity of the waters they infest by filtering the plankton that forms the base of the food web. As a result, the types, size, and abundance of fish sought by anglers would likely change. Additional impacts to the quality of recreation from an infestation would be due to subsequent cleanup and maintenance at the infested water body. Cleanup and maintenance could include a range of actions, from closure of the water body from boat traffic and swimming to drawing down water levels to allow winter

freeze kill of dreissenids. These impacts would likely endure for multiple years following dreissenid infestation and establishment.

Other invasive animals would also adversely affect recreation should they infest water bodies in the ARB. Invasive carp can affect food chains in a similar manner as dreissenids due to their efficient filter feeding and rapid growth. Invasive carp can outcompete and crowd out sport fish species and are not a desirable sport fish for anglers. Silver carp, in particular, can impede recreational boating. Silver carp can weigh up to 60 pounds and often jump up to ten feet into the air when alarmed by the sound of an outboard motor. They often land in boats and sometimes strike the passengers. Jumping carp have seriously injured many boaters and damaged boats. Water skiing on the Missouri River is now exceedingly dangerous because most of the fish jump behind the boat (Conover et al. 2007).

Invasive aquatic vegetation can also impair recreation should it infest new water bodies in the ARB. Hydrilla and Eurasian watermilfoil can grow so dense as to impair boating. The dense mats of vegetation can be impossible to pass through and can foul water intakes, damaging boat motors. It is also unpleasant to swim through vegetation choked waterways, though the unattractive appearance would likely discourage most swimmers.

If the No Action Alternative was implemented, the risk of an AIS infestation that would affect recreation would increase. The AIS Coordinators in the seven ARB states would continue with their programs, however, a lack of funding may limit how much they can do. Taking no action would increase environmental effects to recreation, as the risk of an AIS infestation would escalate. The No Action Alternative would limit any benefits to recreation.

6.6.2 Proposed Action Alternative

USACE involvement in establishing watercraft inspection stations would have negligible effects on recreation and the recreating public in the proposed action area. Because the state AIS coordinators have been conducting watercraft inspections in some of the study states for the past ten years, many people hauling boats and other watercraft are accustomed to the routine of stopping for inspections. However, in the majority of the ARB, these would be new programs, and initially unfamiliar to boaters.

Some people transporting watercraft may initially have a negative reaction to the inspection stations due to the feeling they are being inconvenienced or being required to stop for additional or multiple stations. However, many of these people may change their position once they learn the importance of stopping the spread of AIS (especially dreissenids) and that taking the necessary cleaning actions and precautions will shorten the length of their delay. In states with active watercraft inspection programs, compliance is generally very high, which would indicate that the programs are not viewed as a notable impairment to recreation.

Neither monitoring, nor planning and preparation would affect recreation.

The proposed action would therefore not negatively affect recreational activities in the ARB directly or indirectly in either the short term or long term. There would be no additional cumulative effect on this resource. The indirect effects would be positive due to the reduced risk of infestation provided by the additional funding allocated to support the program.

6.7 CULTURAL AND HISTORIC RESOURCES

6.7.1 No Action Alternative (No Change to Current Practice)

If dreissenid infestations and other AIS were to become widespread in within the ARB, cultural and historic resources would be negatively impacted. AIS displace and outcompete native species that are the foundations of first foods and indigenous traditions. Research indicates that sixty-two percent of Native Americans surveyed were “very concerned” about the impacts of invasive species on both local food systems and communal traditional ecological knowledge, and 53 percent were “very concerned” about impacts on cultural identity (Reo et al. 2017). If AIS were to infest Traditional Cultural Properties or Historical Properties of Religious and Cultural Significance to Indian Tribes, they could alter the character of these properties or inhibit traditional uses.

6.7.2 Proposed Action Alternative

The proposed action would require USACE to collaborate with AIS coordinators of the study area states to establish watercraft inspection stations at locations anywhere within the seven-state area provided they help prevent the spread of AIS into or out of the ARB. These inspection stations would be located where infrastructure would support the facilities, and where a suitable space for decontamination exists that prevents contaminated runoff from reaching ARB waters. This would, therefore, limit inspection stations to parking lots, gravel pits, and other previously disturbed localities. All proposed improvements, particularly if they include any new ground-disturbing activity, would require USACE to complete a separate NEPA analysis to include NHPA Section 106 review.

After the site-specific analysis is complete, USACE would initiate the corresponding consultation with appropriate entities (State Historic Preservation Officers [SHPOs], Tribal Historic Preservation Officers (THPOs), concerned Tribes, and other interested parties). If the appropriate SHPOs or THPOs concur with the findings for the proposed undertakings, the improvements would be authorized.

There would be no additional cumulative effects to cultural or historic resources.

6.8 CLIMATE CHANGE

6.8.1 No Action Alternative (No Change to Current Practice)

Aquatic invasive species are invasive precisely because they can adapt to a wide range of conditions and thrive. Most AIS of concern have thermal tolerances well within the range of temperatures seen in ARB water bodies, including dreissenids, invasive carp, Eurasian watermilfoil, and hydrilla (Mills et al. 1996, Kolar et al. 2005, True-Meadows et al. 2016, Mikulyuk et al. 2020). Due to their invasive nature and wide temperature tolerances, these invasive species are more likely to thrive under a changing climate than native species. Climate change is likely to benefit AIS in several ways.

First, climate change increases the likelihood of AIS becoming established in new water bodies by reducing cold temperatures or winter hypoxia that currently prevent survival. Climate change may also promote additional water storage and the construction of new reservoirs that serve as hotspots for invasive species (Rahel and Olden 2008). Climate change could also modify the ecological impacts of invasive species by enhancing their competitive and predatory effects on native species and by increasing the virulence of some diseases (Havel et al. 2015). As a result of climate change, enhanced prevention and control strategies are likely to be needed to control AIS (Mainka and Howard 2010).

There would not be any effects to climate change as a result of implementing the No Action Alternative. Gradual climate change would continue, in correlation with increasing carbon emissions worldwide. In addition, climate change would not affect implementation of the No Action Alternative.

6.8.2 Proposed Action Alternative

There would be extremely negligible effects on climate change as a result of implementing the proposed action. Vehicles idling at watercraft inspection stations is part of world-wide cumulative contributions to change in climate by way of increases in greenhouse gas emission. Likewise monitoring, training exercises, and equipment purchases would have de minimus carbon emissions. Given the minuscule contribution of carbon emissions resulting from the proposed action to overall global emissions, effects are insignificant. Therefore, there would be no significant direct, indirect, short-term, long-term, or cumulative effects to climate change.

As with the No Action Alternative, climate change would not affect implementation of the proposed action.

6.9 ENVIRONMENTAL JUSTICE

6.9.1 No Action Alternative (No Change to Current Practice)

A dreissenid or other AIS infestation could adversely impact environmental justice within the ARB. A new infestation could reduce tourism to the ARB or to specific lakes within the ARB, which could lead to income or job loss. Infestations of infrastructure could also create job loss or increase energy costs. Infestations of aquaculture facilities would

increase expenses for facility operators, which could directly drive agriculture loss, a key component of the climate change burden category. While not all of the state's production is in the ARB, Arkansas is one of the top ten states in terms of aquacultural production, and total aquacultural production in the ARB generated over 76 million dollars in sales in 2017 (USDA 2018).

6.9.2 Proposed Action Alternative

There would be negligible to minor effects to environmental justice from implementing the proposed action. Delaying new infestations in the ARB would preserve present economic opportunities and be protective of aquaculture in the ARB. These are direct beneficial effects, but difficult to quantify. Monitoring, planning, and rapid response planning and preparation would have no additional effects to environmental justice.

The watercraft inspection stations may have negligible effects to environmental justice. Inspection stations are along roadways and highway and may contribute slightly to traffic burdens. However, inspection stations would not meaningfully contribute to traffic burdens as they are few in number when compared to traffic as a whole and would not be noticed by most motorists. Inspection stations would increase travel time for those towing boats, but this is also a very small fraction of total roadway traffic and would have extremely minor impacts to overall traffic burdens. Therefore, there would be no significant direct, indirect, short-term, long-term, or cumulative effects to environmental justice.

6.10 CUMULATIVE EFFECTS

NEPA and the CEQ regulations for implementing NEPA require Federal agencies to consider the cumulative effects of their actions. Cumulative effects are defined as effects "on the environment which result from incremental impact of an 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. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (40 CFR § 1508.7).

The primary goal of a cumulative effects analysis is to determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative effects of other past, present, and reasonably foreseeable future actions.

Past and Present: Prior to 2007, there were no regional organizations whose primary missions were focused on aquatic invasive species prevention in the ARB. The 100th Meridian Initiative was one of the first organizations with a goal of preventing the spread of AIS (specifically zebra and quagga mussels) in the west and was for many years the cornerstone of consistent efforts between the United States and Canada. Currently, the activities and efforts of the 100th Meridian Initiative are being funded by the USFWS and undertaken by non-governmental agencies, Tribal, state, interstate, and Federal agencies.

Since 2020, USACE has implemented a cost reimbursement program similar to the proposed action in other river basins in the Western United States. The program began in the Columbia River Basin, with the first reimbursements distributed in 2017. Since then, USACE has been working to set up reimbursement programs in multiple basins across the west, including the Upper Missouri River basin, the South Platte River basin, and the Russian River basin.

Reasonably Foreseeable Future: Federal investment in the proposed action would further expand and support existing state programs, resulting in increased effectiveness in the AIS prevention and control programs to decrease the existing vulnerability of dreissenid and other AIS infestations spreading into, out of, or within the ARB. It is likely that the program would expand into the future to address a wide suite of aquatic pests.

The analysis of the environmental resources above concludes that implementation of the proposed action would not result in significant adverse effects, either individually or cumulatively with other effects.

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SECTION 7 - COMPLIANCE WITH APPLICABLE ENVIRONMENTAL LAWS AND REGULATIONS

This section identifies the legal, policy, and regulatory requirements applicable to the Recommended Alternative and discusses the implications for each of those requirements. Summaries of compliance and coordination activities for each of the laws, policies, or regulation are also provided. Also included in this section are additional authorities and guidance related to the Recommended Alternative.

7.1 FEDERAL LAWS

7.1.1 National Environmental Policy Act

As required by NEPA and subsequent implementing regulations promulgated by the CEQ, this Programmatic EA was prepared to determine whether the proposed action constitutes a "...major Federal action significantly affecting the quality of the human environment..." and whether an EIS is required. This LR/Programmatic EA documents the evaluation and consideration of potential environmental effects associated with the proposed action.

USACE is providing this LR/Programmatic EA and Draft FONSI to Federal and state agencies, Tribes, and the public for a 30-day review and comment period beginning on or about May 20, 2024. USACE identified no impacts significantly affecting the quality of the human environment in the analysis contained herein and prior to the review and comment period of the LR/Programmatic EA. If no significant effects are identified during the review and comment period, the FONSI will be issued, and USACE will proceed with the Recommended Plan. If the environmental effects are determined to be significant, an EIS will be prepared before a decision is reached on whether to implement the Recommended Plan.

7.1.2 Endangered Species Act

The ESA established a national program for the conservation of threatened and endangered fish, wildlife, and plants and the habitat upon which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the USFWS and National Marine Fisheries Service (NMFS) if an action may affect a listed species to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats. Section 7(c) of the ESA and the Federal regulations on endangered species coordination (50 CFR § 402.12) require that Federal agencies prepare biological assessments of the potential effects of major actions on listed species and critical habitat.

There are 52 ESA-listed species that could potentially be present in the ARB study area (see the Federal Natural Resources Law Compliance and Biological Evaluation appendix for a detailed assessment of each species): 10 mammals, 11 birds, 8 clams, 1 crustacean, 9 fish, 3 insects, 1 reptile, and 9 plants. If any ESA-listed small mammal or plant species could be in a county or watershed where watercraft inspection stations are

established and any ground-disturbing or vegetation-disturbing activity is planned, surveys for their presence would be conducted and impacts to the protected species would be avoided. Table 13 lists the ESA-listed species and the locations where watercraft inspection activities (e.g., roadside and rampside) would have a possibility of encountering them, so that surveys would be conducted to ensure there would be no effect to them.

Table 13. ESA-Listed Species Requiring Site-Specific Survey for Any Projects with Ground-Disturbing or Vegetation-Disturbing Activities

Additional Survey/Habitat Assessment Potentially Required for Ground Disturbance	
Location	Species
Arkansas, Kansas, Missouri, Oklahoma	Red Knot
Arkansas, Kansas, Missouri, Oklahoma	Northern Long-eared Bat
Arkansas, Kansas, Oklahoma	American Burying Beetle
Arkansas, Missouri, Oklahoma	Ozark Big-eared Bat
Arkansas, Missouri, Oklahoma	Indiana Bat
Arkansas, Missouri	Missouri Bladderpod
Arkansas, Oklahoma	Harperella
Kansas	Lesser Prairie-chicken

USACE determined that the establishment of watercraft inspection stations would have no effect on ESA-listed species or designated or proposed critical habitat. Monitoring at water bodies for the early detection of dreissenids would have no effect on terrestrial or aquatic ESA-listed species. Rapid response planning and preparation would also have no effect to ESA-listed species. Rapid response implementation could have effects to ESA-listed species. Section 7 consultation would be completed prior to the reimbursement of costs incurred during a rapid response action.

7.1.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) (16 USC. §§ 703-712 *et seq.*, as amended) prohibits the taking of and commerce in migratory birds (live or dead), any parts of migratory birds, their feathers, or nests. Take is defined in the MBTA to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof.

Watercraft inspection station sites would be assessed/surveyed to determine presence/absence of suitable habitat/location of ground-nesting or shrub-nesting birds. No trees, shrubs, or other bird habitat is proposed to be cut or damaged by the establishment of watercraft inspection stations. Birds would not be affected. There would be no take of migratory birds.

7.1.4 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) (16 USC §§ 668-668c *et seq.*) prohibits anyone, without a permit issued by the Secretary of the Interior from taking bald or golden eagles, including their parts, nests, or eggs. Take is defined in the BGEPA as any attempt to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. Disturb is defined the BGEPA as, to agitate or otherwise bother a bald or golden eagle such that it is likely to cause (1) injury, (2) interference with breeding, or (3) nest abandonment.

Watercraft inspection station sites would be assessed/surveyed to determine presence/absence of suitable habitat/location of bald or golden eagles. No trees, shrubs, or other bald or golden eagle habitat is proposed to be cut or damaged by the establishment of watercraft inspection stations. Bald or golden eagles would not be affected. There would be no take of bald or golden eagles.

7.1.5 National Historic Preservation Act

The NHPA of 1966, as amended (54 USC §§ 300101 *et seq.*), directs Federal agencies to assume responsibility for all historic properties under their jurisdiction. Section 106 of the NHPA (54 USC § 306108) requires agencies to consider the potential effect of their actions on properties that are listed, or are eligible for listing, on the National Register of Historic Places. The NHPA implementing regulations, 36 CFR Part 800, require that the Federal agency consult with the SHPO, Tribes, and interested parties to ensure that all historic properties are adequately identified, evaluated, and considered in planning for proposed undertakings.

All proposed improvements, particularly additional amenities requiring ground-disturbing activity must first meet compliance requirements of the National Historic Preservation Act, as amended, and associated Section 106 review.

7.1.6 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (25 USC 3001 *et seq.*) addresses the discovery, identification, treatment, and repatriation of Native American and Native Hawaiian human remains and cultural items (i.e., associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony).

Although not expected, in the event of an inadvertent discovery during any activities associated with the Recommended Alternative, work would immediately halt, and reasonable resource protective measures would be implemented. After the area is secured, the appropriate authorities should be contacted, including local law enforcement, the land manager, appropriate SHPO, and regional Tribal groups.

7.1.7 Clean Water Act

The Federal Water Pollution Control Act (33 USC §§ 1251 *et seq.*, as amended) is more commonly referred to as the Clean Water Act. This Act is the primary legislative vehicle for Federal water pollution control programs and the basic structure for regulating discharges of pollutants into WOTUS (refer to definition in Section 1.3). The Act was established to restore and maintain the chemical, physical, and biological integrity of the Nation's waters and sets goals to eliminate discharges of pollutants into navigable water, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment. The Act has been amended numerous times and given a number of titles and codifications.

Section 402 of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES) Program, which regulates the discharge of pollutants and storm water runoff. No pollutants would be discharged into WOTUS by activities proposed in this LR/Programmatic EA; therefore, a NPDES permit would not be needed. A Construction General Permit would not be required because ground disturbance is expected to be less than an acre.

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into wetlands or other WOTUS. Because no dredged or fill material would be placed in wetlands or WOTUS under Alternative 2, a Section 404 permit and Section 401 certification from the affected state is not required.

7.2 EXECUTIVE ORDERS

7.2.1 Executive Order 11988, Floodplain Management

EO 11988 of 1977 requires Federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. The EO has an objective—the avoidance, to the extent possible, of long- and short-term adverse impacts associated with the occupancy and modification of the base floodplain and the avoidance of direct and indirect support of development in the base floodplain wherever this a practicable alternative. Each Federal agency must evaluate the potential effects of actions on floodplains and avoid undertaking actions that directly or indirectly induce development in the floodplain or adversely affect natural floodplain values.

Due to the very nature of the proposed cost-share program (assisting states in bolstering existing and/or building new) watercraft inspection stations, it is probable that some watercraft inspection stations are currently, or would be, located in the designated floodplain throughout the ARB in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas. However, because a typical station only consists of a shelter/covering, such as a shipping container, a construction trailer, canopy, or tent; a transport vehicle; a hot water pressure washer; outreach and educational materials; directional devices such as cones and signage; and applicable personnel amenities (heaters for cold weather, portable restrooms, etc.), or is a roving station, there would

be no long-or short-term adverse impacts, no alteration of the floodplain, and development in the floodplain would not be induced or promoted.

7.2.2 Executive Order 11990, Protection of Wetlands

EO 11990 of 1977 directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. Section 2 of this order states that, in furtherance of the NEPA, agencies shall avoid undertaking or assisting in new construction located in wetlands unless there is no practicable alternative.

No wetlands would be impacted by the Recommended Alternative.

7.2.3 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

This EO of 1994 directs Federal agencies to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

USACE determined that implementation of the Recommended Alternative would comply with this EO.

7.2.4 Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks

This EO of 1997 directs Federal agencies to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

USACE determined that implementation of the Recommended Alternative would comply with this EO.

7.2.5 Executive Order 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government

This EO of 2021 directs Federal agencies with advancing equity for all, including communities that have long been underserved, and addressing systemic racism in our Nation's policies and programs. By advancing equity, the Federal Government can support and empower all Americans, including the many communities in America that have been underserved, discriminated against, and adversely affected by persistent poverty and inequality.

USACE determined that implementation of the Recommended Alternative would comply with this EO.

7.2.6 Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis

This EO of 2021 directs Federal agencies to immediately review, and take action to address, Federal regulations promulgated and other actions taken during the previous 4 years that conflict with national objectives to improve public health and the environment; ensure access to clean air and water; limit exposure to dangerous chemicals and pesticides; hold polluters accountable, including those who disproportionately harm communities of color and low-income communities; reduce greenhouse gas emissions; bolster resilience to the impacts of climate change; restore and expand national treasures and monuments; and prioritize both environmental justice and employment.

USACE determined that implementation of the Recommended Alternative would comply with this EO.

7.2.7 Executive Order 14008, Tackling the Climate Crisis at Home and Abroad

EO 14008 of 2021 states that environmental and economic justice are key concerns for the Federal government and its implementing agencies. It further directs Federal agencies to develop programs to address disproportionately high and adverse impacts to disadvantaged communities.

Implementation of the Recommended Alternative would not have adverse effects to human health or the environment, nor to any particular socioeconomic group. The effects of the proposed program are expected to be broadly positive due to the reduced risk of infestation provided by the additional funding allocated to support the program. The Recommended Alternative would not adversely or disproportionately affect minority or low-income populations.

7.2.8 Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All

This EO of 2023 builds on and supplements the foundational efforts of EO 12898 and directs Federal agencies, as appropriate and consistent with applicable law, to identify, analyze, and address disproportionate and adverse human health and environmental effects and hazards of Federal activities, including those related to climate change. It also directs agencies to actively facilitate meaningful public participation and just treatment of all people in agency decision-making.

USACE determined that implementation of the Recommended Alternative would comply with this EO.

7.3 ADDITIONAL AUTHORITY AND GUIDANCE

Additional authority and guidance related to the Recommended Alternative includes the following:

EO 13751, Safeguarding the Nation from the Impacts of Invasive Species. Under EO 13751, Federal agencies are required to prevent the introduction, establishment, and spread of invasive species, as well as to eradicate and control populations of invasive species that are established. (See also EO 13112, Invasive Species).

USACE Invasive Species Policy. USACE Invasive Species Policy of February 21, 2023, compliments the National Invasive Species Act (and related laws) and directs Civil Works to address invasive species concerns in analyses of project impacts, and authorizes permits to include stipulations regarding control of invasive species.

USACE Environmental Operating Principles. The USACE Environmental Operating Principles (EOPs) (<https://www.usace.army.mil/Missions/Environmental-Operating-Principles>) have been taken into consideration throughout the study process and would continue to be part of the implementation of the Recommended Alternative. Below are the USACE EOPs:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

In coordination with the agencies and other stakeholders, USACE proactively considered the environmental consequences of several measures and developed a comprehensive solution that supports economic and environmentally sustainable solutions.

SECTION 8 - COORDINATION, TRIBAL CONSULTATION, AND PUBLIC INVOLVEMENT

In preparation for developing this LR/Programmatic EA, AIS coordinators from the ARB study area states provided information on their respective watercraft inspection station programs and reviewed and consulted on the development of data summaries and other sections of the document during development.

Tribal Coordination and Consultation

The U.S. Government has a unique legal relationship with Tribal Nations, governed by treaties, statutes, EOs, court decisions, and the U.S. Constitution. The United States works with Indian Tribes on a Government-to-Government basis to address issues concerning Indian Tribal self-government, trust resources, and Indian Tribal treaty and other rights. As such, USACE will make good faith efforts to engage Tribes to ascertain interest in USACE projects and obtain information relevant to USACE Federal decisions.

The USACE Tribal Consultation Policy is composed of the following six principles: Tribal Sovereignty, Tribal Responsibility, Government to Government Relations, Pre-Decisional and Honest Consultation, Self-Reliance, Capacity Building and Growth, Natural and Cultural Resources. Specific to this action, USACE Walla Walla District strives to establish relationships that focus on successful communications and a collaborative process that ensures Tribal involvement in project development and implementation.

USACE is providing information letters to points of contact for Native American Tribes in the ARB and to the Advisory Council for Historic Preservation to notify them of the proposed action and opportunity to review the NEPA documents. In the letter to Tribes, USACE also extended the invitation for government-to-government consultation.

Public and Agency Review and Comment Period

The Draft FONSI and this LR/Programmatic EA will be released to Federal and state agencies, Tribes, and the public for a 30-day review and comment period beginning on or about May 20, 2024. The documents will be available on the USACE Walla Walla District website, <https://www.nww.usace.army.mil/Missions/Environmental-Compliance/>. Any other information or announcements regarding this study will also be posted on the website.

SECTION 9 - RECOMMENDATIONS

Based on the information evaluated in this LR/Programmatic EA, USACE selects Alternative 2, Comprehensive Adaptive Improvements, as the Recommended Alternative. The features of the Recommended Alternative include augmenting the future AIS programs with the potential cost-shared measures below:

- Measure 1 - Federal Participation in Selection of Watercraft Inspection Station Locations
- Measure 2 – Increase Watercraft Inspection Stations
- Measure 3 – Extend Daylight Inspection Hours
- Measure 4 – Increase Nighttime Inspections
- Measure 5 – Construct Site Improvements
- Measure 6 – Add Canine Detection
- Measure 7 – Increase Public Awareness and Education
- Measure 9 – Monitor to Identify Water Chemistry
- Measure 10– Monitor for Early Detection
- Measure 11 – Regional WID Data Sharing System
- Measure 12 – Develop and Implement Real-time Tracking of Watercraft Transportation
- Measure 13 – Evaluate Traffic Patterns for Recreational Boating
- Measure 14 – Contingency Planning
- Measure 15 – Rapid Response Planning

The following recommendations include actions within the authority of Section 104 of the RHA of 1958 (33 USC § 610), as amended by Section 1039(d) of the Water Resources Reform and Development Act of 2014 (PL 113-121), Section 1178(b) of the Water Infrastructure Improvements for the Nation Act of 2016 (PL 114-322), Section 1170 of WRDA of 2018 (PL 115-270), and Section 505 of WRDA of 2020 (PL 116-260), as well as actions that will require additional authority to implement.

9.1 Watercraft Inspection Stations in Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas

Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas annually establish seasonal watercraft inspection stations in strategic locations both in and outside the ARB based on several factors: safety of personnel and public; ease of public access; infrastructure availability for setting up facilities (electricity, water, restrooms, etc.); and where applicable, availability of a suitable space for conducting decontamination procedures that does not pose any threat to the environment. Although only water is used to decontaminate watercraft, watercraft inspection stations are set up in parking lots, gravel pits, or other areas where water runoff does not present an environmental concern.

The states' goal, as part of a regional strategy, is to build a multi-layered line of defense, first by intercepting fouled boats coming across state lines (within and outside of the

ARB), and then providing additional protection closer to and within the ARB. The states would continue to implement existing quality assurance and quality control (QA/QC) protocols in their inspection station programs and revise or adapt QA/QC protocols towards improved station efficacy during periods of strategy development, for example, partnering with local interest groups or universities to evaluate accuracy in following station protocols. It is recommended that states report their QA/QC results and include plans for improving QA/QC procedures, as necessary, in their annual scope of work review and/or submissions for cost share requests. USACE has deemed this strategy to be the most effective means of protecting all waters in the ARB, including those maintained and operated by USACE. To focus only on preventive efforts inside the basin excludes a critical layer of protection.

The Recommended Alternative assumes the Federal investment would augment state funds, resulting in increased effectiveness in the AIS prevention and control programs to decrease the risk of a dreissenid or other AIS infestation. In accordance with the regional strategy, the states would use the data gathered during the inspection season to adjust the program to provide a more effective regional defense. With a BCR of 1.8 (derived as the most likely outcome protection projections from Table 11), USACE has determined that there is Federal interest in partnering with the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas to address the vulnerability of water bodies in the ARB to an AIS infestation. The Recommended Alternative also includes regional data sharing efforts, real-time tracking of watercraft transportation and traffic pattern evaluation (measures 1-8 & 11-13).

9.2 MONITORING

Identification of water chemistry within the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas and comparison to water chemistry of infested water bodies could be used to inform risk management decisions within and outside the ARB. Monitoring water bodies within the ARB states could provide early detection of dreissenids and other AIS and facilitate rapid response measures to minimize infestation impacts. Therefore, monitoring in the ARB is key to preventing the further spread of AIS (measures 9-15).

9.3 CONTINGENCY PLANNING AND RAPID RESPONSE PLANS AND PREPARATION

Prevention remains the first priority for addressing the threat of AIS in the ARB. This includes keeping contaminated watercraft from entering uninfested water bodies in the basin. However, as prevention efforts fail, and invasive species continue to invade water bodies within the ARB. Advanced planning is needed to ensure an effective inter-jurisdictional response. USACE recommends the development of site-specific plans at water resource facilities using the facility vulnerability assessments conducted by Reclamation (2012; 2016; 2017a-g), with a focus on priority areas identified in the risk assessment matrix. USACE also recommends continued development of rapid response measures in coordination with the states of Arkansas, Colorado, Kansas,

Missouri, New Mexico, Oklahoma, and Texas to find and eradicate AIS in the event a new introduction occurs (measures 9-15).

Rapid response planning exercises provide opportunities for Federal, state, and local agencies to prepare for a dreissenid or other AIS invasion and go through the processes to develop action plans. These exercises, which are typically 2- to 5-day events, include developing invasion scenarios and responses, identifying response teams, and going through “dry run” scenario-driven exercises to improve planning and preparation to increase efficacy for when an actual invasion occurs.

Planning exercises have been occurring in the Columbia River Basin, and the Columbia River Basin Dreissenid Incident Response Toolkit (<https://www.crdirt.com>) provides a valuable framework and suite of resources to improve rapid response efforts for the ARB. The goal of the framework is to improve regional understanding of the roles and responsibilities of the primary managing entities, in the event of a dreissenid discovery. Identifying appropriate and necessary points of primary engagement at Federal, state, and local levels, as well as secondary and tertiary participation and awareness from entities at other water bodies and water users throughout the basin, are fundamental to the rapid response and containment process. The objectives of the exercise are as follows:

- Demonstrate the ability to engage, prioritize, coordinate, and complete emergency response activities.
- Demonstrate an ability to conduct and disseminate information on the detection, response, and conclusion of a dreissenid emergency.
- Demonstrate ability to respond to a dreissenid emergency and explore the utilization of an emergency resources, as identified during the exercise.
- Utilize the Columbia River Basin Dreissenid Mussel Rapid Response Plan (crbdirt.com) elements and the Columbia River Basin ESA Manual for Rapid Response in the exercise process, and provide feedback on their functionality for ARB applicability in addition to using rapid response plans that have been or will be developed for individual basin states.

If an emergency dreissenid scenario occurs, all necessary and appropriate agency representatives will be involved and consulted, and operations will be adaptively organized to comply with all environmental laws. An outcome of the planning exercises will be to establish and update important points of contact, and outline procedures for communicating with agency leadership, and conduct outreach with media.

Supplemental NEPA would be performed as necessary and appropriate to address the prescribed response treatment developed by the response team.

9.4 PUBLIC AWARENESS

As previously mentioned, public awareness about the seriousness of AIS is an important element of the ongoing efforts to prevent further spread of dreissenids and other AIS into, out of, or within the ARB. USACE recommends the following pertaining to public awareness (measure 7):

- Continue AIS ad campaigns, with collaboration among states, where possible, to obtain greater consistency and better recognition as boaters travel through the ARB.
- Target outreach efforts to commercial boat haulers and other boat vector pathways such as boat brokers, auctions, online sale sites, and marinas with moored boats in infested hot spots such as the Lower Colorado River and Great Lakes. For example, PSMFC and partners including Idaho Department of Agriculture, Montana Park, Fish and Wildlife, Nevada Department of Wildlife, and others will be performing an outreach project in the coming year to provide messaging to these sources/haulers on the dreissenid issue and what they can do to reduce the risk of spreading dreissenids and lessen their chances of unknowingly (or knowingly) breaking state and Federal laws.
- Increase efforts to communicate and work with boat manufacturers, especially to provide easy access to ballast water tanks on wakeboard boats, which would allow decontamination of water left in the ballast tanks.
- Continue to provide brochures, literature, and ads about AIS in state fishing and boating license applications and at recreational boating outlets, events, inspection stations, as well as visitor centers.

9.5 WATERCRAFT INSPECTION STATIONS – IN OTHER STATES (WOULD REQUIRE ADDITIONAL AUTHORITY)

USACE recommends that states adjacent to ARB states implement similar or reciprocal laws governing watercraft movement from AIS-infested water bodies as Arizona Game and Fish Department Director's Order 3 – R09/18 (AZGFD 2018). Additionally, all watercraft inspection stations in states that border the ARB should have mandatory inspections, especially at infested water bodies.

Considering the numerous access points at the Great Lakes, the establishment of the watercraft inspection program in that area may be impracticable or infeasible; however, there is still a need to inspect watercraft leaving the Great Lakes traveling to the ARB. Performing regional inspections with a decontamination database system with standard protocols potentially could be a first step. This would allow the other states to accept the inspections and decontamination performed in other locations.

SECTION 10 - ROLES AND RESPONSIBILITIES

This section generally describes how the program would function. Upon review and approval of the LR/Programmatic EA, USACE will execute the AIS Prevention and Control Program Project Partnership Agreement (PPA) with non-Federal sponsors in the ARB. PPAs expire 5 years after their effective date and must be renewed.

Annually, if Federal funds for the cost-share program are available and have been received by USACE, USACE would send a letter to participating non-Federal sponsors asking for an annual work plan for the upcoming AIS WID and monitoring season. During the annual work plan preparation, USACE and the non-Federal sponsor would engage in an evaluation process to ensure AIS prevention and control activities are eligible for the WID and monitoring cost-share program. This evaluation process includes coordination among non-Federal sponsors and considers their specific budgets and statutory authorities. To be considered for this cost-share program, the AIS activities must be located in the states of Arkansas, Colorado, Kansas, Missouri, New Mexico, Oklahoma, and Texas and provide the highest likelihood of preventing the spread of AIS into, out of, or within the ARB.

USACE, with the non-Federal sponsor's assistance, shall complete all environmental compliance requirements, obtain all applicable licenses and necessary permits, and comply with applicable Federal labor laws covering non-Federal construction. The non-Federal sponsor is responsible for ensuring that any real property or less-than-fee property interests acquired for the placement of a watercraft inspection station or related activity meet USACE Real Estate appraisal standards. Sponsors are encouraged to identify potential property purchases in their annual work plans so that USACE can provide guidance and insight on the documentation needed to help ensure reimbursement can be made. When using lands already within the state or non-Federal sponsors' control (fee or less than fee interests) they shall provide the real property interests required for the inspection station activities at no cost to the Government.

When site improvements are planned at an inspection station location that involves any ground disturbance, USACE may need to tier from this LR/Programmatic EA and complete site-specific NEPA analysis, to include NHPA Section 106 review, depending on the nature and magnitude of proposed work and associated impacts. USACE would review any planned construction activities and the associated environmental compliance documentation before the construction activity is advertised for bids or executed with states' in-house labor forces. After the analysis is complete, the improvements would be allowed to proceed.

After the annual work plan has been reviewed and approved by the USACE project manager and environmental compliance groups, USACE would then work with each non-Federal sponsor to (1) ensure Federal appropriations can cover the requested budget amount and (2) to draft a statement of work that contains their anticipated AIS prevention and control activities for the period of performance (typically 1 year). After the statement of work is finalized and approved by USACE, the statement of work will be signed by the non-Federal sponsor and USACE. Signing the statement of work will

obligate the funds to make them available for reimbursement for the period of performance covered by the statement of work.

No more often than every 30 days, the non-Federal sponsors shall submit properly executed and duly certified invoices covering AIS WID and monitoring activities performed during the preceding month. Appropriate documentation includes invoices and certification of specific payments to contractors, suppliers, and state employees that are performing inspection station activities. USACE shall review such documentation to determine and certify the AIS activities costs as either allowable costs, not allowable costs, or costs that require additional supporting information. The submission must include sufficient information to support a determination by USACE that the costs are necessary to establish, operate, and maintain those inspection stations to protect the ARB at locations with the highest likelihood of preventing the spread of AIS into, out of, or within the ARB. Such written certification by USACE is required in order to support any payments under this authority. Following such certification, and subject to the availability of funding appropriated for watercraft inspection stations, USACE shall make payment in accordance with the authority and PPA.

DRAFT

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