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# **Occurrence of Silver, Bighead, and Black Carp in Waters Managed by the US Army Corps of Engineers**

Amanda J. M. Oliver, William T. Slack,  
and Alan W. Katzenmeyer

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## Abstract

This technical report (TR) documents the distribution of Invasive Carp - Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*Hypophthalmichthys nobilis*), and Black Carp (*Mylopharyngodon piceus*) in US Army Corps of Engineers (USACE) managed waters. Invasive carp were introduced into the US nearly half a century ago. As they spread across the US, they compete with and consume native species and Silver Carp jumping behavior reduces recreational use. The USACE is responsible for management of waterbodies at more than 440 projects. Information on these projects including the presence of Invasive Carp is reported in the USACE Operations and Maintenance Business Information Link (OMBIL) database. To supplement the Invasive Carp information from OMBIL, 47 online ichthyology collection and observation databases were searched; 18 had information on Invasive Carp locations. Combining the collection, observation and OMBIL reporting information, 82 USACE projects in 19 districts in 6 of 8 divisions have Silver/Bighead Carp and 19 projects in 9 districts and 3 divisions have Black Carp. Understanding the distribution of Invasive Carp is important to enable managers to be proactive: planning control efforts, posting informational signs, instituting live bait restrictions, and thus reducing the chances of species introduction or limiting species impact.

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# Contents

<b>Abstract</b> .....	<b>ii</b>
<b>Figures and Tables</b> .....	<b>iv</b>
<b>Preface</b> .....	<b>vi</b>
<b>1 Introduction</b> .....	<b>1</b>
1.1 Background.....	1
1.2 Objective .....	2
1.3 Approach .....	2
<b>2 Methods</b> .....	<b>3</b>
2.1 Operations and Maintenance Business Information Link (OMBIL) .....	3
2.2 OMBIL waterbody Geographic Information Systems (GIS) file.....	3
2.3 Silver, Bighead, and Black Carp collections and observations.....	4
2.3.1 <i>Analysis</i> .....	4
2.3.2 <i>Map creation</i> .....	5
<b>3 Results</b> .....	<b>8</b>
3.1 OMBIL.....	8
3.2 Collections/observations .....	9
3.3 Collections/observations in OMBIL waters.....	10
3.4 Invasive Carp and USACE .....	11
<b>4 Discussion</b> .....	<b>14</b>
<b>5 Conclusions</b> .....	<b>16</b>
<b>References</b> .....	<b>17</b>
<b>Appendix A: Invasive Carp Records</b> .....	<b>19</b>
<b>Report Documentation Page</b>	

# Figures and Tables

## Figures

Figure 1. Distribution of Silver/Bighead Carp in relation to waterbodies within the Operations and Maintenance Business Information Link (OMBIL) databases. Waterbodies in red reported the presence of carp in OMBIL. Points represent collections or observations recorded in ichthyological and other online databases..... 6

Figure 2. Distribution of Black Carp in relation to waterbodies within the Operations and Maintenance Business Information Link (OMBIL) databases. Waterbodies in red reported the presence of Black Carp in OMBIL. Points represent collections or observations recorded in ichthyological and other online databases..... 7

Figure 3a & b. From 2005 – 2017, U.S. Army Corps of Engineers (USACE) employees consistently reported the presence/absence of a. Silver/Bighead and b. Black Carp in USACE managed sites in the Office Management Business Information Link (OMBIL) database. The severity (minor, moderate, significant/major) of the carp impacts was also reported. No Black Carp were reported in 2005. .... 9

Figure 4a & b. Number of individual a. Silver/Bighead or b. Black Carp collected or observed each year starting with the first record in 1974. For OMBIL projects, the number of sites with carp present determined from collections or determined from the 2005 – 2017 OMBIL database reports assuming that once carp were collected/observed or reported for a project they were present at that project from then on..... 12

## Tables

Table 1. The number of Silver/Bighead Carp and Black Carp collections or observations (Coll./Obs.), individuals, and records with geographic coordinates from a 2021 search of 47 online databases..... 10

Table 2. Divisions and districts where Silver Carp (unformatted), Black Carp (*italics*) and both species (*underlined italics*) were reported in OMBIL and/or collected. .... 13

Table A1. Projects by district within the 05-17, 18, 19, and 20 fiscal year Operations and Maintenance Business Information Link (OMBIL) databases. Some projects are repeated because they occur in multiple districts. Within the OMBIL databases, Black Carp have been reported from 6 projects (*underlined*) and Silver/Bighead at 48 projects (**bold**). OMBIL projects were linked using the project ID to Geographic Information Systems waterbody files. The OMBIL waterbody files were related to Silver/Bighead (S/B), and Black Carp (Blk) collection and observation locations and the earliest year of collection/observation for each project listed. There are OMBIL carp reports with no collection/obs. and collection/obs. with no OMBIL reported carp. This represents the incomplete nature of both datasets. .... 19

Table A2. Ichthyology collections and data aggregators found while searching for collections listed in Poss and Collette 1995 and investigated to determine if there

were online databases (Yes, No). Online databases were searched using the terms carp, *Mylopharyngodon*, and *Hypophthalmichthys*. Records with geographic coordinates were imported into a Geographic Information System (GIS) point location file. Collections and aggregators used to create this GIS file are in bold. Collections in italics had carp records within one of the downloaded data aggregator files. Many collections' online databases did not have online records for carp, *Mylopharyngodon*, or *Hypophthalmichthys* indicating either no Silver, Bighead, or Black Carp in the collection or the data were not electronically available. .... 36

## Preface

This study was conducted for the Aquatic Nuisance Specie Research Program under AMSCO 008284, Funding Account U4382185, “Dispersal Capabilities of Asian Carp.” The technical monitor was Dr. Christine VanZomeren.

The work was performed by the Aquatic Ecology and Invasive Species Branch of the Ecosystem Evaluation and Engineering Division US Army Engineer Research and Development Center, Environmental Laboratory (ERDC-EL). At the time of publication, Mr. Alan Katzenmeyer was Branch Chief; Mr. Mark Farr was Division Chief; and Dr. Jennifer Seiter-Moser was the Technical Director for ERDC-EL. The Deputy Director of ERDC-EL was Dr. Brandon J. Lafferty, and the Director was Dr. Edmond J. Russo.

Ms. Dena Williams (ERDC) provided the OMBIL database files used in this study. Dr. Jan Hoover (ERDC) assisted in development of the research. This study would have been much more limited without the carp specimen data collected, maintained, digitized, and made publicly available through the effort of 1,000s of individuals. The publicly available geospatial data compiled by the Army Geospatial Center and US Geological Survey was also a valuable resource. Supplementary geospatial data layers and museum collection records compiled for this report can be downloaded at the following URL:

<http://dx.doi.org/10.21079/11681/44984>

The Commander of ERDC was COL Christian Patterson and the Director was Dr. David W. Pittman.

# 1 Introduction

## 1.1 Background

Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*Hypophthalmichthys nobilis*), and Black Carp (*Mylopharyngodon piceus*), collectively referred to as Asian Carp or Invasive Carp (Kolar et al. 2007), were introduced into US waters in the 1970s (Nico and Neilson 2021; Nico et al. 2021a, b). Once introduced, they are competitive feeders with high reproductive rates (Nico and Neilson 2021; Nico et al. 2021a, b). The growing population of Invasive Carp and potential expansion through natural dispersal, flood water connections, disposal of bait fish, and intentional introduction threatens recreational usage of Corps' projects, boater safety, and fish and mussel populations. Additionally, concern is increasing about Invasive Carp movement through freshwater plumes in typically brackish or saltwater environments; and management of US Army Corps of Engineers (USACE) sites can directly affect the size and duration of these plumes.

Silver/Bighead Carp were introduced to control phytoplankton in commercial fishponds and escaped into the wild a decade later (Ma et al. 2010; Nico et al. 2021a, b). Successful wild reproduction has been observed for both species and individuals have been found in 30 states (Nico et al. 2021a, b). Both species compete with native fish for food, potentially negatively impacting state listed American Paddlefish (*Polyodon spathula*) (Kinlock et al. 2020; Schrank et al. 2003) and reducing the abundance and size of commercially important Bigmouth Buffalo (*Ictiobus cyprinellus*) and Gizzard Shad (*Dorosoma cepedianum*), an important food for many sport fish (Pendelton 2017). Additionally, Silver Carp can jump, escaping containment (Stell et al. 2020), causing injuries to boaters and water skiers, and decreasing recreational usage (Spacapan et al. 2016).

Black Carp were accidentally introduced with Grass Carp (*Ctenopharyngodon idella*) and have subsequently been introduced and maintained for pest control and food in seven states (Nico and Neilson 2021). Black Carp have spread through the Mississippi Basin (Kroboth et al. 2019), occur in the Atchafalaya basin (Fuller et al. 1999), and in 2019 were found on the Lake Ponchartrain side of the Bonnet Carré Spillway

(Slack and Killgore 2020). The continued maintenance of the species within the US is mired in controversy. Aquaculture facilities incorporate Black Carp as a tool to control snail-borne parasites that negatively impact Channel Catfish production (Nico et al. 2005). Established wild populations threaten native mussel communities (Nico et al. 2005). Recent dietary studies focused on Mississippi Basin populations found Black Carp consume native mussels and other aquatic fauna (Poulton et al. 2019). In their current range within the Lower Mississippi River, Black Carp may consume the Federally endangered Fat Pocketbook mussel (*Potamilus capax*) and several state-listed species (Jones et al. 2021). If they spread into southeastern watersheds, they could threaten the most diverse mussel assemblage in North America (Haag 2012; Lydeard and Mayden 1995).

## **1.2 Objective**

The USACE is challenged in its management of Invasive Carp because: (1) the distribution in relation to USACE waters has not been summarized or evaluated; (2) USACE navigation and flood risk reduction operations can result in new movement pathways; (3) salinity tolerance has not been evaluated to predict coastal dispersal; and (4) effects of changing climate, sea level, and hydrology have not been determined. Expanding USACE knowledge is critical to Invasive Carp prevention, containment, and control. The first step is to fully understand the extent of carp distribution to develop future management plans. This report addresses the current extent of carp distribution. Salinity tolerance, climate change, and impacts associated with USACE operations will be addressed in future publications.

## **1.3 Approach**

This report summarizes the distribution of Silver, Bighead, and Black Carp in relation to USACE managed waterbodies (USACE sites). USACE waterbodies were determined from the combined 2005 – 2017 and individual 2018, 2019, and 2020 Operations and Maintenance Business Information Link (OMBIL) databases. The OMBIL database and records from ichthyology collections were used to determine Invasive Carp distribution.

## **2 Methods**

### **2.1 Operations and Maintenance Business Information Link (OMBIL)**

The OMBIL system was developed to provide a single standardized data entry system for the USACE Operations and Maintenance project areas to promote data sharing and reduce information requests. Each USACE mission (navigation, hydropower, recreation, environmental stewardship, flood damage reduction, and regulatory) has trained individuals who input data. One of the many things the database tracks is the occurrence severity of invasive species (minor, moderate, major/significant) from 2005 – 2017 replaced by impact (T&E management, infrastructure impacts, habitat improvement, habitat loss, impacts to recreation and other) from 2019-2020.

For this project, program managers supplied four versions of the OMBIL database in Microsoft Excel for 2005 – 2017, 2018, 2019, and 2020 fiscal years. The 2018 OMBIL database contained information on 58 target plant species and no information on Invasive Carp. The four copies were combined and all unique entries for Project Name/Project Site and Project ID were retained. Subsequently, projects with no waterbodies and outside the continental US were removed (Table A1). There are instances where projects have the same name (e.g., Mississippi River between Missouri River and Minneapolis) but unique project IDs for each district.

### **2.2 OMBIL waterbody Geographic Information Systems (GIS) file**

To develop the line and polygon GIS files of OMBIL waterbodies, OMBIL projects were matched to GIS files and OMBIL Project IDs added to the GIS files to allow the OMBIL databases to be joined to the GIS files. USACE Reservoirs, Channel Area, and Recreation Area GIS files were downloaded in January 2021 from the USACE Geospatial Platform (<https://geospatial-usace.opendata.arcgis.com/>). The SDSFeatureName, Name, and Dam Name attributes contained in these files were matched to the OMBIL Project Name/Project Site. If the names matched, it was assumed that the GIS feature represented the OMBIL project. For those that did not match, OMBIL project names were visually compared to the GIS attributes in the three GIS files and similar names with matching locations were considered matches. For example, the GIS name Wright Patman Lake corresponded to the OMBIL project name WRIGHT PATMAN DAM AND

LAKE. For the remaining unmatched OMBIL projects, the USACE district website detailing the project was investigated to determine waterbodies included in the project. The following files/methods were used to delineate these remaining OMBIL waterbodies and incorporate them into the OMBIL GIS files: (1) USACE Geospatial files, (2) Teleatlas waterbody files, (3) National Hydrography Dataset (NHD) files, or when not present in any file, digitized from the most current National Agriculture Imagery Program (NAIP) imagery.

## 2.3 Silver, Bighead, and Black Carp collections and observations

Poss and Collette (1995) documented around 150 ichthyology collections within the US. In addition, there are data aggregation websites which compile fisheries observation and collection locations (hereafter referred to as records). Although the US Geological Survey (USGS) Nonindigenous Aquatic Species database includes many Silver, Bighead, and Black Carp records (USGS 2021), the database is not comprehensive. An online search was performed from Jan. – Mar. 2021 for each of the Poss and Collette (1995) collections, known data aggregators, and any collections and aggregators that appeared during web searches (Table A2). If the collection had a searchable online database, it was searched using the terms: *Hypophthalmichthys*, *Mylopharyngodon*, and carp and any US records downloaded. All downloaded records were compiled into a single file and duplicates removed. Records labeled as Bighead Carp, Silver Carp, *Hypophthalmichthys* sp., *Hypophthalmichthys nobilis*, and *Hypophthalmichthys molitrix* were grouped as Silver/Bighead Carp. Silver and Bighead were grouped because small individuals are difficult to distinguish, and the two species hybridize and co-occur (Nico et al. 2021a, b). Records labeled Black Carp, *Mylopharyngodon* sp., *Mylopharyngodon piceus*, and *Hypophthalmichthys piceus* were labeled as Black Carp. Records with geographic coordinates were used to create the carp record GIS file and no attempt was made to create locations for records without coordinates.

### 2.3.1 Analysis

The carp record GIS file was matched to the OMBIL waters GIS file to add OMBIL project IDs to those carp records which occurred within OMBIL waters (Table A1). Carp record locations within dam tailwaters were not assigned the reservoir's project ID. Carp record locations were compared to the OMBIL water project name as a quick check of location accuracy.

When noticed, carp records whose coordinate location did not match the descriptive location were moved to the described location and the Coordinate Uncertainty attribute changed to (Very high, High, Moderate, and Minimal) depending on the distance moved. Some descriptive locations were insufficient to correct the coordinate location and only the Coordinate Uncertainty was changed. A full location quality check was not performed since this would involve comparing all text describing location (e.g., nearby towns, depth, waterbody size etc.) to all geospatial data that could be found or generated for the coordinate location.

### **2.3.2 Map creation**

Once all OMBIL projects had been investigated, matched to GIS waterbody(s), and OMBIL Project IDs added to the GIS waterbodies, the GIS files were joined to the OMBIL sites reporting Silver, Bighead, and Black Carp (Table A1). This allowed map creation illustrating OMBIL project waterbodies with those sites reporting Silver/Bighead or Black Carp in the OMBIL database colored in red (Figures 1 and 2). The point locations of Silver/Bighead and Black Carp records from online data aggregators and ichthyology collections were also added to the maps and provide a more comprehensive picture of Invasive Carp distribution. These maps serve to summarize the distribution in relation to USACE managed waters (Figures 1 and 2).

Figure 1. Distribution of Silver/Bighead Carp in relation to waterbodies within the Operations and Maintenance Business Information Link (OMBIL) databases. Waterbodies in red reported the presence of carp in OMBIL. Points represent collections or observations recorded in ichthyological and other online databases.

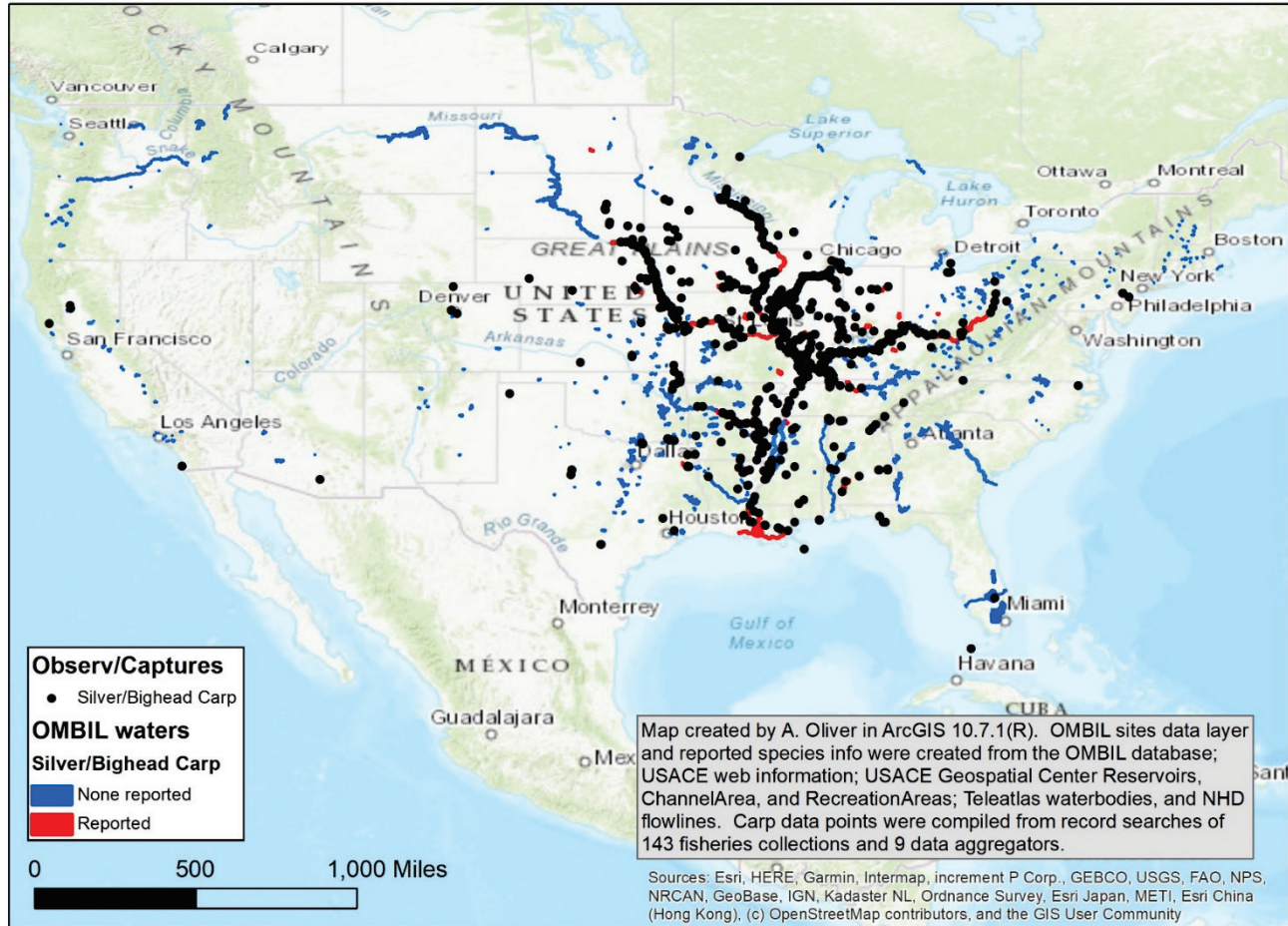
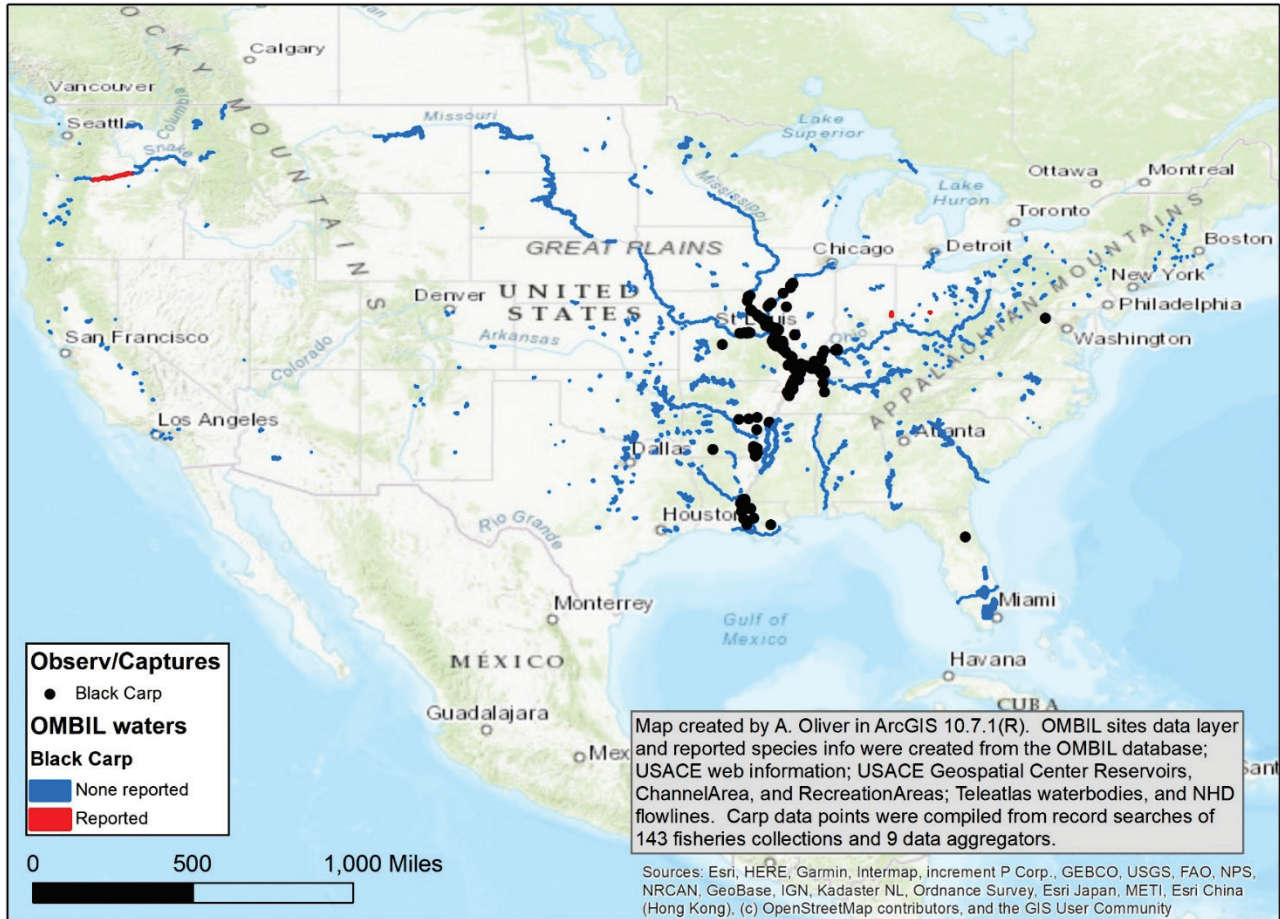


Figure 2. Distribution of Black Carp in relation to waterbodies within the Operations and Maintenance Business Information Link (OMBIL) databases. Waterbodies in red reported the presence of Black Carp in OMBIL. Points represent collections or observations recorded in ichthyological and other online databases.

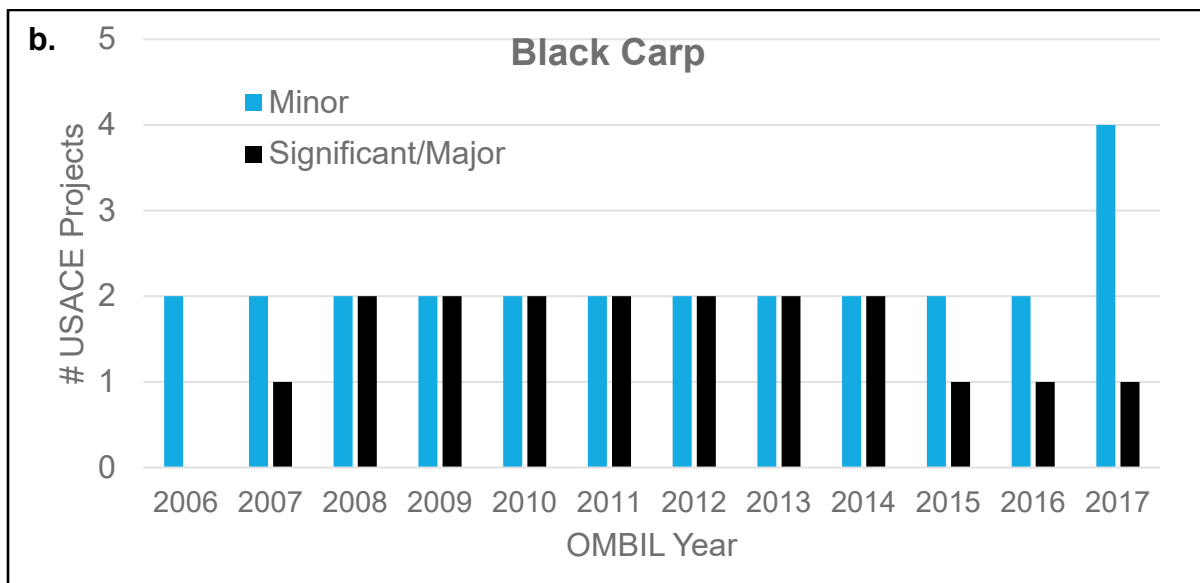
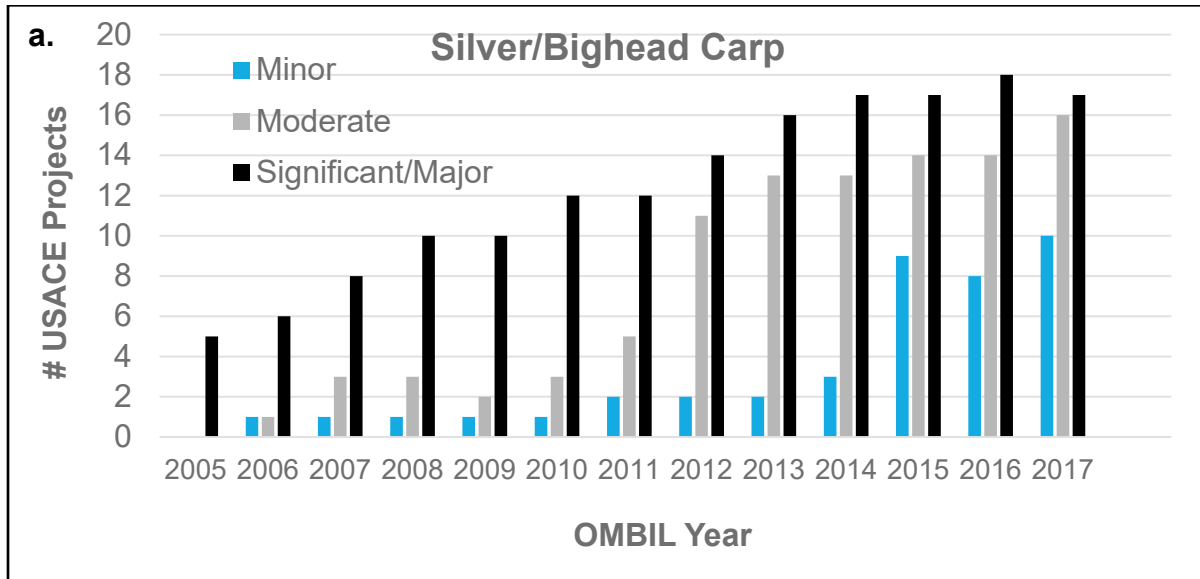


## **3 Results**

### **3.1 OMBIL**

The combined OMBIL databases with non-continental US and dry projects removed contained 443 unique projects which matched 747 GIS waterbodies. There were more waterbodies than projects because some projects contained multiple waterbodies or waterbodies were segmented (e.g., river reaches). Fifty projects reported having Invasive Carp, Silver/Bighead (n = 48) and Black Carp (n = 6) (Table A2). Lake Umatilla and Lake Celilo on the Columbia River were the only two lakes with Black Carp that did not also report Silver/Bighead Carp. Black Carp were not reported in the 2019 or 2020 OMBIL and Silver/Bighead Carp were reported infrequently. The earliest possible report year in the provided OMBIL databases was 2005 and five projects reported Silver/Bighead Carp with significant/major impacts (Figure 3a). By 2017, 43 projects reported Silver/Bighead Carp with 10 reporting minor impacts, 16 moderate, and 17 significant/major. Black Carp were first reported in 2006 in two projects with minor impacts (Figure 3b). Five projects reported Black Carp in 2017: four reporting minor and one significant/major impacts. Six projects in total reported Black Carp; Lake Umatilla reported Black Carp from 2008 to 2014.

Figure 3a & b. From 2005 – 2017, U.S. Army Corps of Engineers (USACE) employees consistently reported the presence/absence of a. Silver/Bighead and b. Black Carp in USACE managed sites in the Office Management Business Information Link (OMBIL) database. The severity (minor, moderate, significant/major) of the carp impacts was also reported. No Black Carp were reported in 2005.



### 3.2 Collections/observations

Of the 150 collections noted by Poss and Collette (1995), 143 could be located and 38 had online searchable databases. Thirteen additional collections indicated their data had been submitted to one of the nine data aggregators. Combining these two sources, 47 databases were searched for Silver, Bighead, and Black Carp records and information was downloaded from 18. The remaining online databases had no digital Invasive Carp

records or no record from the contiguous US. The downloaded data from the aggregation websites had data from 58 sources. Of these 58, 19 were collections investigated (Table A1) and the remaining 39 were other collections not included in the Poss and Collette (1995) list.

Once duplicates were removed from the downloaded carp records, there were 4,858 collection/observation records representing 5,296 individual Invasive Carp. Some records represented the collection of multiple individuals. There were 4,699 records with geographic coordinates (Table 1). Of the 159 records with no geographic coordinates, 57 were Black Carp and 102 were Silver/Bighead Carp. Of these, 90 had no locality information.

**Table 1.** The number of Silver/Bighead Carp and Black Carp collections or observations (Coll./Obs.), individuals, and records with geographic coordinates from a 2021 search of 47 online databases.

	Coll./Obs.	Individuals	With Coordinates
Silver/Bighead Carp	4,070	4,477	3,968
Black Carp	788	819	731
Total	4,858	5,296	4,699

### 3.3 Collections/observations in OMBIL waters

For the collections/observations, 3,565 records occurred within 69 OMBIL waterbodies (3,102 Silver/Bighead records in all 69 waterbodies and 463 Black Carp in 15) (Table A2). There were collections/observations from 34 projects (Silver/Bighead Carp) and 13 projects (Black Carp) with no OMBIL reports of their presence (Table A1). Within the collections data, the first Silver/Bighead Carp record was from a fishpond in 1974; the first wild collection in 1980 from a power plant reservoir in Colorado. The first record of Black Carp is a 1994 wild collection from the Osage River, MO (Figures 4a and b). Silver/Bighead Carp were first reported within a USACE managed waterbody in 1981 in the Ohio River below the Smithland Lock and Dam. Black Carp appeared in 2004 in the Upper Mississippi River near Lock and Dam 24, the Red River, and the Atchafalaya River.

### **3.4 Invasive Carp and USACE**

Combining the collection/observations and OMBIL reports, 82 OMBIL sites had Silver/Bighead reported, collected, or observed and 19 OMBIL sites had Black Carp (Table A1). The USACE projects that have Invasive Carp are spread across 19 districts and 6 of 8 divisions. Silver/Bighead Carp are found in 18 districts and 6 divisions (Figure 1, Table 2). Black Carp occur in 9 districts and 3 divisions (Figure 2, Table 2). Invasive Carp have been found in non-project waterbodies in an additional 10 districts and 1 division.

Figure 4a & b. Number of individual a. Silver/Bighead or b. Black Carp collected or observed each year starting with the first record in 1974. For OMBIL projects, the number of sites with carp present determined from collections or determined from the 2005 – 2017 OMBIL database reports assuming that once carp were collected/observed or reported for a project they were present at that project from then on.

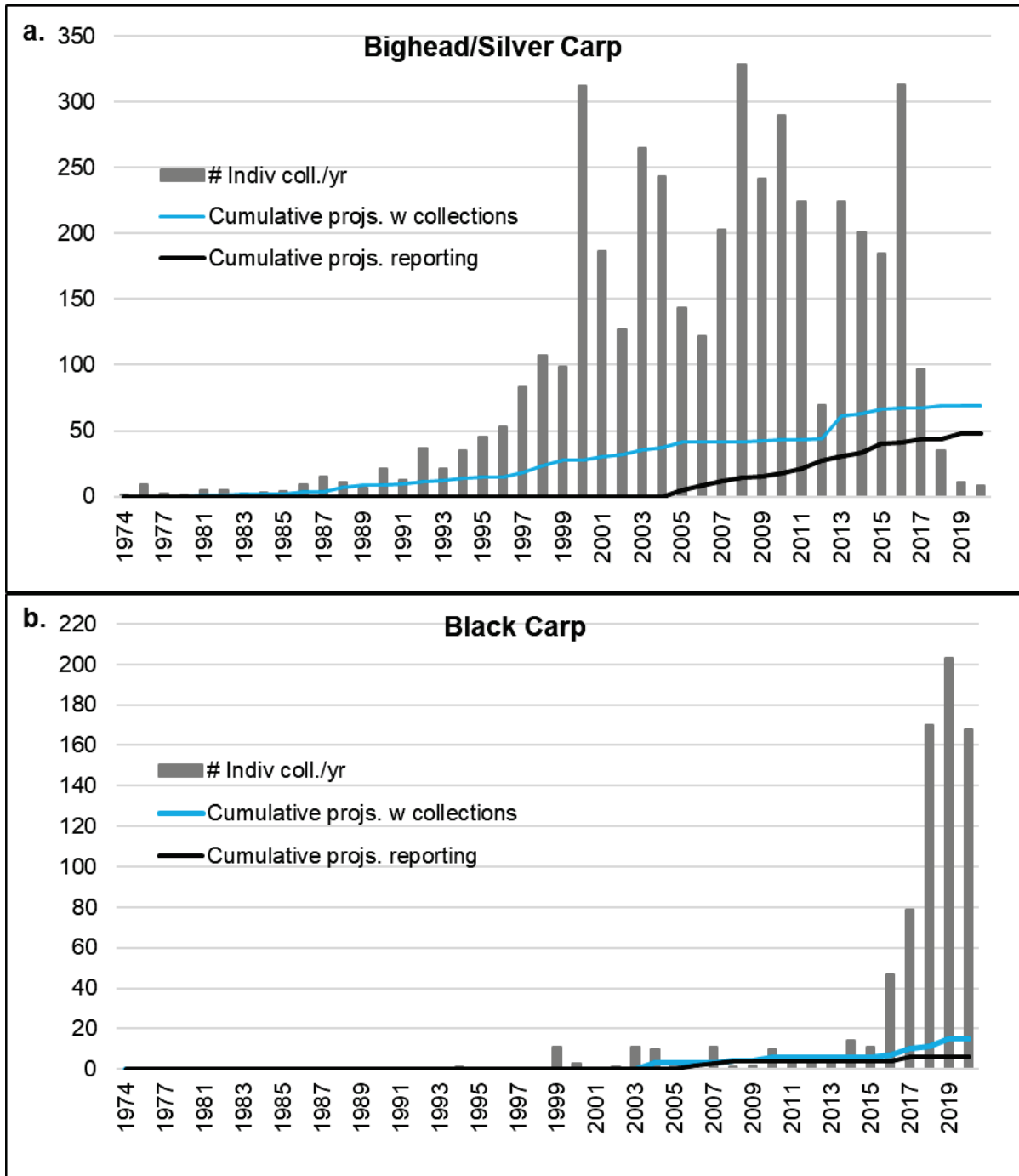


Table 2. Divisions and districts where Silver Carp (unformatted), Black Carp (*italics*) and both species (underlined italics) were reported in OMBIL and/or collected.

Division	District	Division	District
Great Lakes & Ohio River	Chicago	Northwestern	<u><i>Kansas City</i></u>
	Detroit		Omaha
	<u><i>Huntington</i></u>		<u><i>Portland</i></u>
	<u><i>Louisville</i></u>	South Atlantic	Jacksonville
	<u><i>Nashville</i></u>		Mobile
	Pittsburgh	South Pacific	San Francisco
Mississippi Valley	<u><i>New Orleans</i></u>	Southwestern	Fort Worth
	<u><i>Rock Island</i></u>		Little Rock
	<u><i>St. Louis</i></u>		
	St. Paul		
	<u><i>Vicksburg</i></u>		

## 4 Discussion

Continued monitoring of Silver/Bighead and Black Carp distribution is important as the number of projects reporting carp and the severity of their impacts is increasing. From the 1970s to current, Silver/Bighead Carp have spread from their original point of introduction across the US. They now occur in over 82 projects, 19 districts, and 6 divisions. Carp presence in non-project waterbodies of an additional 10 districts indicates further invasion potential. Although Black Carp were introduced around the same time as Silver/Bighead Carp, they appear to have spread more slowly to other waters. After 2000, and more notably after 2010, their abundance and distribution have increased. This surge is of special concern because it increases the probability that Black Carp will continue to spread to new waters and feed on the mussel populations. Mussel populations throughout the country are already imperiled (Haag 2012) and the spread of Black Carp could result in further species decline (Poulton et al. 2019).

Monitoring the distribution of a species, especially an aquatic species, is an inexact task. Carp can travel up to 80 km to spawn, live a relatively long time (10 years possibly up to 30 years) and persist in a wide variety of habitats (Kolar et al. 2007). Carp can be intentionally introduced for pest control and as a food source. Because they are an aquatic species found in turbid waters, small populations may not be captured or observed. In addition, Silver, Bighead, and Black Carp are not generally caught by anglers. The difficulty in documenting aquatic species presence/absence is reflected in the OMBIL reports and collections/observations. Each database had Silver/Bighead Carp in project sites that were not included in the other. Silver/Bighead Carp were found in 69 project sites in the ichthyology collections/observations database; only 35 of these project sites reported carp in the OMBIL database. An additional 13 sites reported Silver/Bighead Carp in the OMBIL database but had no collections or observations. These data indicate the distribution of Bighead, Silver, and Black Carp is continually evolving, and the distribution maps must be considered with this in mind.

While the USGS nonindigenous aquatic species database is not a comprehensive source of all Silver, Bighead, and Black Carp records, it is the best available and updated daily. The GIS file of OMBIL waterbodies can be related to data from the USGS database to update distribution

information. Additionally, the Excel file of collection records provides location specific information. Individual projects can utilize the file to determine dates and number of carp collected within the project and from nearby waterbodies. It is hoped that these data will be useful to employees and managers to aide carp management, understanding of carp distribution, and assist with funding requests.

## 5 Conclusions

- From the 1970s to current, Silver/Bighead Carp have spread from their original point of introduction to 82 projects, 19 districts, and 6 divisions.
- Carp presence in non-project waterbodies of an additional 10 districts indicates further invasion potential.
- Black Carp appear to have spread more slowly.
- Black Carp after 2000, and more notably after 2010, are spreading.
- The expansion of Black Carp to new waters is especially concerning because it could result in mussel population decline and listing of additional species.
- Because Invasive Carp are an aquatic species found in turbid waters and not often caught by anglers, small populations may go un-noticed. Thus, the distribution of Bighead, Silver, and Black Carp is continually evolving.
- Data compiled for this report, along with the USGS nonindigenous aquatic species database, can be used by USACE employees and managers to aide carp management, understanding of carp distribution, and assist with funding requests.

## References

- Fuller, P. L., L. G. Nico, and J. D. Williams. 1999. "Nonindigenous fishes introduced into inland waters of the United States." *American Fisheries Society, Special Publication 27*, Bethesda, MD. 613 p.
- Haag, W. R. 2012. *North American freshwater mussels: Natural history, ecology and conservation*. Cambridge University Press. 505 p.
- Jones, R. L., M. D. Wagner, W. T. Slack, S. Peyton, and P. D. Hartfield. 2021. *Guide to the identification and distribution of freshwater mussels (Bivalvia: Unionidae) in Mississippi*. Jackson, MS: Mississippi Department of Wildlife, Fisheries, And Parks.
- Kinlock, N. L., A. J. Laybourn, C. E. Murphy, J. J. Hoover, and N. A. Friedenberg. 2020. "Modelling bioenergetic and population-level impacts of invasive bigheaded carps (*Hypophthalmichthys* spp.) on native paddlefish (*Polyodon spathula*) in backwaters of the lower Mississippi River." *Freshwater Biology* 00:1– 15. doi:10.1111/fwb.13494
- Kolar, C. S., D. C. Chapman, W. R. Courtenay Jr., C. M. Housel, J. D. Williams, and D. P. Jennings. 2007. "Bigheaded Carps: A Biological Synopsis and Environmental Risk Assessment." *American Fisheries Society, Special Publication 33*, Bethesda, MD. 240 p. 10.47886/9781888569797.
- Kroboth, P. T., C. L. Cox, D. C. Chapman, and G. W. Whitley. 2019. "Black Carp in North America: A description of range, habitats, time of year, and methods of reported captures." *North American Journal of Fisheries Management* 39(5):1046-1055 doi:10.1002/nafm.10340
- Lydeard, C., and R. L. Mayden. 1995. "A diverse and endangered aquatic ecosystem of the southeast United States." *Conservation Biology* 9(4): 800-805.
- Ma, H., F. Cui, Z. Liu, Z. Fan, W. He, and P. Yin. 2010. "Effect of filter-feeding fish silver carp on phytoplankton species and size distribution in surface water: A field study in water works." *Journal of Environmental Sciences* 22(2): 161-167.
- Nico, L. G., J. D. Williams, and H. L. Jelks. 2005. "Black carp: biological synopsis and risk assessment of an introduced fish." *American Fisheries Society Special Publication 32*. Bethesda, MD. 337 p.
- Nico, L., P. Fuller, and J. Li. 2021a. *Hypophthalmichthys molitrix* (Valenciennes in Cuvier and Valenciennes, 1844): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, <https://nas.er.usgs.gov/queries/factsheet.aspx?speciesID=549>, Revision Date: 12/3/2019, Peer Review Date: 1/22/2015, Access Date: 6/23/2021
- Nico, L., P. Fuller, and J. Li. 2021b. *Hypophthalmichthys nobilis* (Richardson, 1845): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=551>, Revision Date: 12/3/2019, Peer Review Date: 1/22/2015, Access Date: 6/23/2021

- Nico, L. G., and M. E. Neilson, 2021. *Mylopharyngodon piceus* (Richardson, 1846): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=573>, Revision Date: 10/1/2019, Peer Review Date: 3/15/2012, Access Date: 6/23/2021
- Poss, S. G., and B. B. Collette. 1995. "Second survey of fish collections in the United States and Canada." *Copeia* 1:48-70.
- Poulton, B. C., P. T. Kroboth, A. E. George, D. C. Chapman, J. Bailey, S. E. McMurray, and J. S. Faiman. 2019. "First examination of diet items consumed by wild-caught Black Carp (*Mylopharyngodon piceus*) in the U.S." *The American Midland Naturalist* 182:89-108. doi:10.1674/0003-0031-182.1.89
- Schrank, S. J., C. S. Guy, and J. F. Fairchild. 2003. "Competitive interactions between age-0 Bighead Carp and Paddlefish." *Transactions of the American Fisheries Society* 132:1222-1228. doi:10.1577/T02-071
- Slack, W. T., and K. J. Killgore. 2020. *Evaluation of Pallid Sturgeon Entrainment during the 2020 Bonnet Carré Opening*. New Orleans District. 20p.
- Spacapan, M. M., J. F. Besek, and G. G. Sass. 2016. *Perceived influence and response of river users to invasive Bighead and Silver Carp in the Illinois River*. INHS Tech. Report 20. Champaign, IL: Illinois Natural History Survey, 20p.
- Stell, E., J. J. Hoover, L. Fuller, and G. R. Parsons. 2020. "Analyzing leap characteristics and water escape velocities of Silver Carp using in situ video analysis." *North American Journal of Fisheries Management* 40(1):163-174.
- USGS (United States Geological Survey). 2021. *Nonindigenous Aquatic Species database*. Wetland and Aquatic Center, Gainesville, Florida. Accessed at <http://nas.er.usgs.gov>.

## Appendix A: Invasive Carp Records

Table A1. Projects by district within the 05-17, 18, 19, and 20 fiscal year Operations and Maintenance Business Information Link (OMBIL) databases. Some projects are repeated because they occur in multiple districts. Within the OMBIL databases, Black Carp have been reported from 6 projects (underlined) and Silver/Bighead at 48 projects (**bold**). OMBIL projects were linked using the project ID to Geographic Information Systems waterbody files. The OMBIL waterbody files were related to Silver/Bighead (S/B), and Black Carp (Blk) collection and observation locations and the earliest year of collection/observation for each project listed. There are OMBIL carp reports with no collection/obs. and collection/obs. with no OMBIL reported carp. This represents the incomplete nature of both datasets.

Project ID	Division	District	Project Site/Name	S/B	Blk
1072	GREAT LAKES & OHIO RIVER	BUFFALO	BLACK ROCK CHANNEL AND TONAWANDA HARBOR		
H511940	GREAT LAKES & OHIO RIVER	BUFFALO	MT MORRIS LAKE		
H207910	GREAT LAKES & OHIO RIVER	CHICAGO	J. EDWARD ROUSH LAKE		
H211570	GREAT LAKES & OHIO RIVER	CHICAGO	<b>MISSISSINEWA LAKE</b>	2013	
H215930	GREAT LAKES & OHIO RIVER	CHICAGO	<b>SALAMONIE LAKE</b>		
1172	GREAT LAKES & OHIO RIVER	DETROIT	DETROIT RIVER MICHIGAN		
H705040	GREAT LAKES & OHIO RIVER	DETROIT	DULUTH-SUPERIOR HARBOR	2015	
1169	GREAT LAKES & OHIO RIVER	DETROIT	FOX RIVER WISCONSIN		
1168	GREAT LAKES & OHIO RIVER	DETROIT	GRAND HAVEN HARBOR MICHIGAN		
1141	GREAT LAKES & OHIO RIVER	DETROIT	KEWAUNEE HARBOR WISCONSIN		
H708960	GREAT LAKES & OHIO RIVER	DETROIT	KEWEENAW WATERWAY		
H774224	GREAT LAKES & OHIO RIVER	DETROIT	ST MARYS RIVER		
H717660	GREAT LAKES & OHIO RIVER	DETROIT	STURGEON BAY & LAKE MICHIGAN SHIP CANAL		
H100280	GREAT LAKES & OHIO RIVER	HUNTINGTON	ALUM CREEK LAKE		
H171138	GREAT LAKES & OHIO RIVER	HUNTINGTON	ATWOOD LAKE		
H175046	GREAT LAKES & OHIO RIVER	HUNTINGTON	BEACH CITY LAKE		
H101280	GREAT LAKES & OHIO RIVER	HUNTINGTON	BEECH FORK LAKE		
H101300	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>BELLEVILLE LOCK - OHIO RIVER LOCKS AND DAMS HUNTINGTON</b>		
H101830	GREAT LAKES & OHIO RIVER	HUNTINGTON	BLUESTONE LAKE		
H171140	GREAT LAKES & OHIO RIVER	HUNTINGTON	BOLIVAR DAM		
H102270	GREAT LAKES & OHIO RIVER	HUNTINGTON	BURNSVILLE LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
H102680	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>CAPTAIN ANTHONY MELDAHL LOCK - OHIO R. LOCKS AND DAMS HUNT.</b>	2005	
H171141	GREAT LAKES & OHIO RIVER	HUNTINGTON	CHARLES MILL LAKE		
H171142	GREAT LAKES & OHIO RIVER	HUNTINGTON	CLENDENING LAKE		
H104520	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>DEER CREEK LAKE</b>		
H104580	GREAT LAKES & OHIO RIVER	HUNTINGTON	DELAWARE LAKE		
H104740	GREAT LAKES & OHIO RIVER	HUNTINGTON	DEWEY LAKE		
H104810	GREAT LAKES & OHIO RIVER	HUNTINGTON	DILLON LAKE		
H171143	GREAT LAKES & OHIO RIVER	HUNTINGTON	DOVER DAM		
H105190	GREAT LAKES & OHIO RIVER	HUNTINGTON	EAST LYNN LAKE		
H105900	GREAT LAKES & OHIO RIVER	HUNTINGTON	FISHTRAP LAKE		
H106790	GREAT LAKES & OHIO RIVER	HUNTINGTON	GRAYSON LAKE		
H107020	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>GREENUP LOCK - OHIO RIVER LOCKS AND DAMS HUNTINGTON</b>	2014	
H108550	GREAT LAKES & OHIO RIVER	HUNTINGTON	JOHN W FLANNAGAN DAM AND RESERVOIR		
348768	GREAT LAKES & OHIO RIVER	HUNTINGTON	LEESVILLE LAKE		
H100786	GREAT LAKES & OHIO RIVER	HUNTINGTON	LONDON LOCK - KANAWHA RIVER LOCKS AND DAMS		
H100785	GREAT LAKES & OHIO RIVER	HUNTINGTON	MARMET LOCK - KANAWHA RIVER LOCKS AND DAMS		
H122190	GREAT LAKES & OHIO RIVER	HUNTINGTON	MOHAWK DAM		
H171146	GREAT LAKES & OHIO RIVER	HUNTINGTON	MOHICANVILLE DAM		
H112690	GREAT LAKES & OHIO RIVER	HUNTINGTON	NORTH BRANCH KOKOSING RIVER LAKE		
H112710	GREAT LAKES & OHIO RIVER	HUNTINGTON	NORTH FORK OF POUND LAKE		
H113550	GREAT LAKES & OHIO RIVER	HUNTINGTON	PAINT CREEK LAKE		
H113570	GREAT LAKES & OHIO RIVER	HUNTINGTON	PAINTSVILLE LAKE		
348763	GREAT LAKES & OHIO RIVER	HUNTINGTON	PIEDMONT LAKE		
H171148	GREAT LAKES & OHIO RIVER	HUNTINGTON	PLEASANT HILL LAKE		
H114780	GREAT LAKES & OHIO RIVER	HUNTINGTON	R D BAILEY LAKE		
H114810	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>RACINE LOCK - OHIO RIVER LOCKS AND DAMS HUNTINGTON</b>		
H106310	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>ROBERT C. BYRD LOCK - OHIO RIVER LOCKS AND DAMS HUNTINGTON</b>	2013	
H171149	GREAT LAKES & OHIO RIVER	HUNTINGTON	SENECAVILLE LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
H117740	GREAT LAKES & OHIO RIVER	HUNTINGTON	SUMMERSVILLE LAKE		
H117840	GREAT LAKES & OHIO RIVER	HUNTINGTON	SUTTON LAKE		
H171150	GREAT LAKES & OHIO RIVER	HUNTINGTON	TAPPAN LAKE		
H118300	GREAT LAKES & OHIO RIVER	HUNTINGTON	TOM JENKINS DAM		
H120000	GREAT LAKES & OHIO RIVER	HUNTINGTON	<b>WILLOW ISLAND LOCK - OHIO RIVER LOCKS AND DAMS HUNTINGTON</b>		
H120010	GREAT LAKES & OHIO RIVER	HUNTINGTON	WILLS CREEK LAKE		
H100784	GREAT LAKES & OHIO RIVER	HUNTINGTON	WINFIELD LOCK - KANAWHA RIVER LOCKS AND DAMS		
H120310	GREAT LAKES & OHIO RIVER	HUNTINGTON	YATESVILLE LAKE		
H200970	GREAT LAKES & OHIO RIVER	LOUISVILLE	BARREN RIVER LAKE		
H202060	GREAT LAKES & OHIO RIVER	LOUISVILLE	<b><u>BROOKVILLE LAKE</u></b>		
H202130	GREAT LAKES & OHIO RIVER	LOUISVILLE	BUCKHORN LAKE		
H202350	GREAT LAKES & OHIO RIVER	LOUISVILLE	CAESAR CREEK LAKE		
H202360	GREAT LAKES & OHIO RIVER	LOUISVILLE	CAGLES MILL LAKE		
H202550	GREAT LAKES & OHIO RIVER	LOUISVILLE	CANNELTON LOCK - OHIO RIVER LOCKS AND DAMS	1999	
H202720	GREAT LAKES & OHIO RIVER	LOUISVILLE	CARR CREEK LAKE		
H202780	GREAT LAKES & OHIO RIVER	LOUISVILLE	CAVE RUN LAKE		
H210570	GREAT LAKES & OHIO RIVER	LOUISVILLE	CECIL M HARDEN LAKE		
H203310	GREAT LAKES & OHIO RIVER	LOUISVILLE	CLARENCE J BROWN DAM		
H276135	GREAT LAKES & OHIO RIVER	LOUISVILLE	<b>FALLS OF THE OHIO NATIONAL WILDLIFE CONSERVATION AREA</b>	2013	
H206960	GREAT LAKES & OHIO RIVER	LOUISVILLE	GREEN RIVER LAKE		
H218840	GREAT LAKES & OHIO RIVER	LOUISVILLE	JOHN T. MYERS LOCK - OHIO RIVER LOCKS AND DAMS	1997	2019
10176	GREAT LAKES & OHIO RIVER	LOUISVILLE	LOCK #1 - GREEN AND BARREN RIVERS	1999	
10177	GREAT LAKES & OHIO RIVER	LOUISVILLE	LOCK #2 - GREEN AND BARREN RIVERS	1999	
10174	GREAT LAKES & OHIO RIVER	LOUISVILLE	LOCK #52 - OHIO RIVER LOCKS AND DAMS	1998	2018
H210690	GREAT LAKES & OHIO RIVER	LOUISVILLE	MARKLAND LOCK - OHIO RIVER LOCKS AND DAMS	2005	
H210880	GREAT LAKES & OHIO RIVER	LOUISVILLE	MCALPINE LOCK - OHIO RIVER LOCKS AND DAMS	1998	

Project ID	Division	District	Project Site/Name	S/B	Blk
H211770	GREAT LAKES & OHIO RIVER	LOUISVILLE	MONROE LAKE		
H212560	GREAT LAKES & OHIO RIVER	LOUISVILLE	NEWBURGH LOCK - OHIO RIVER LOCKS AND DAMS	1999	2019
H212760	GREAT LAKES & OHIO RIVER	LOUISVILLE	NOLIN LAKE		
H213730	GREAT LAKES & OHIO RIVER	LOUISVILLE	PATOKA LAKE		
H215610	GREAT LAKES & OHIO RIVER	LOUISVILLE	ROUGH RIVER LAKE		
H216950	GREAT LAKES & OHIO RIVER	LOUISVILLE	SMITHLAND LOCK - OHIO RIVER LOCKS AND DAMS	1981	2019
H218010	GREAT LAKES & OHIO RIVER	LOUISVILLE	TAYLORSVILLE LAKE		
H219200	GREAT LAKES & OHIO RIVER	LOUISVILLE	WEST FORK OF MILL CREEK LAKE		
H205180	GREAT LAKES & OHIO RIVER	LOUISVILLE	WILLIAM H HARSHA LAKE		
H300940	GREAT LAKES & OHIO RIVER	NASHVILLE	BARKLEY DAM AND LAKE BARKLEY	2002	2017
H302840	GREAT LAKES & OHIO RIVER	NASHVILLE	CENTER HILL LAKE		
H303040	GREAT LAKES & OHIO RIVER	NASHVILLE	CHEATHAM LOCK AND DAM	2003	
H303940	GREAT LAKES & OHIO RIVER	NASHVILLE	CORDELL HULL DAM AND RESERVOIR		
H304390	GREAT LAKES & OHIO RIVER	NASHVILLE	DALE HOLLOW LAKE		
H308370	GREAT LAKES & OHIO RIVER	NASHVILLE	J PERCY PRIEST DAM AND RESERVOIR		
H309550	GREAT LAKES & OHIO RIVER	NASHVILLE	LAUREL RIVER LAKE		
H310740	GREAT LAKES & OHIO RIVER	NASHVILLE	MARTINS FORK LAKE		
H313280	GREAT LAKES & OHIO RIVER	NASHVILLE	OLD HICKORY LOCK AND DAM	2009	
H320140	GREAT LAKES & OHIO RIVER	NASHVILLE	WOLF CREEK DAM - LAKE CUMBERLAND		
H401400	GREAT LAKES & OHIO RIVER	PITTSBURGH	BERLIN LAKE, OH		
H403750	GREAT LAKES & OHIO RIVER	PITTSBURGH	CONEMAUGH RIVER LAKE - PA		
H404280	GREAT LAKES & OHIO RIVER	PITTSBURGH	CROOKED CREEK LAKE		
H405150	GREAT LAKES & OHIO RIVER	PITTSBURGH	EAST BRANCH CLARION RIVER LAKE PA		
H6131802	GREAT LAKES & OHIO RIVER	PITTSBURGH	HANNIBAL LOCKS AND DAM	1997	
H409050	GREAT LAKES & OHIO RIVER	PITTSBURGH	KINZUA DAM AND ALLEGHENY RESERVOIR PA		
H410250	GREAT LAKES & OHIO RIVER	PITTSBURGH	LOYALHANNA LAKE PA		
H410400	GREAT LAKES & OHIO RIVER	PITTSBURGH	MAHONING CREEK LAKE PA		
H6117402	GREAT LAKES & OHIO RIVER	PITTSBURGH	MAXWELL LOCKS AND DAM		

Project ID	Division	District	Project Site/Name	S/B	Blk
H419660	GREAT LAKES & OHIO RIVER	PITTSBURGH	MICHAEL J KIRWAN DAM AND RESERVOIR OH		
H411870	GREAT LAKES & OHIO RIVER	PITTSBURGH	MOSQUITO CREEK LAKE OH		
H6131801	GREAT LAKES & OHIO RIVER	PITTSBURGH	NEW CUMBERLAND LOCKS AND DAM	2018	
H6117401	GREAT LAKES & OHIO RIVER	PITTSBURGH	OPEKISKA LOCK AND DAM		
H6131803	GREAT LAKES & OHIO RIVER	PITTSBURGH	PIKE ISLAND LOCKS AND DAM	2001	
H416700	GREAT LAKES & OHIO RIVER	PITTSBURGH	SHENANGO RIVER LAKE, PA AND OH		
H417580	GREAT LAKES & OHIO RIVER	PITTSBURGH	STONEWALL JACKSON LAKE WV		
H418260	GREAT LAKES & OHIO RIVER	PITTSBURGH	TIONESTA LAKE PA		
H418730	GREAT LAKES & OHIO RIVER	PITTSBURGH	TYGART LAKE WV		
H418790	GREAT LAKES & OHIO RIVER	PITTSBURGH	UNION CITY LAKE PA		
H420190	GREAT LAKES & OHIO RIVER	PITTSBURGH	WOODCOCK CREEK LAKE PA		
H420380	GREAT LAKES & OHIO RIVER	PITTSBURGH	YOUGHIOGHENY RIVER LAKE PA		
B577054	MISSISSIPPI VALLEY	NEW ORLEANS	ATCH BASIN FLOODWAY SYSTEM	1989	2004
B501920	MISSISSIPPI VALLEY	NEW ORLEANS	BONNET CARRE SPILLWAY	2013	2019
B513301	MISSISSIPPI VALLEY	NEW ORLEANS	OLD RIVER, LA (MR&T)	2013	
B500062	MISSISSIPPI VALLEY	NEW ORLEANS	PORT ALLEN LOCK-GULF INTRACOASTAL WATERWAY		
B503910	MISSISSIPPI VALLEY	ROCK ISLAND	CORALVILLE LAKE IA	2013	
259	MISSISSIPPI VALLEY	ROCK ISLAND	FARM CREEK RESERVOIRS IL		
B508010	MISSISSIPPI VALLEY	ROCK ISLAND	ILLINOIS WATERWAY IL AND IN	1986	2017
B511550	MISSISSIPPI VALLEY	ROCK ISLAND	MISSISSIPPI RIVER BETWEEN MISSOURI RIVER AND MINNEAPOLIS	1986	2016
B515070	MISSISSIPPI VALLEY	ROCK ISLAND	RED ROCK DAM - LAKE RED ROCK	2013	
B516510	MISSISSIPPI VALLEY	ROCK ISLAND	SAYLORVILLE LAKE IA		
B302700	MISSISSIPPI VALLEY	ST. LOUIS	CARLYLE LAKE IL	1994	
B302560	MISSISSIPPI VALLEY	ST. LOUIS	CLARENCE CANNON DAM & MARK TWAIN LAKE MO	2013	
B308040	MISSISSIPPI VALLEY	ST. LOUIS	ILLINOIS WATERWAY IL	2001	2010

Project ID	Division	District	Project Site/Name	S/B	Blk
B308770	MISSISSIPPI VALLEY	ST. LOUIS	KASKASKIA LOCK - KASKASKIA RIVER NAVIGATION IL	1998	2017
B316691	MISSISSIPPI VALLEY	ST. LOUIS	LAKE SHELBYVILLE IL	1997	
B511380	MISSISSIPPI VALLEY	ST. LOUIS	<u>MISSISSIPPI R BETWEEN OHIO R &amp; MISSOURI R (REGULATING WORKS)</u>	1983	2010
B311370	MISSISSIPPI VALLEY	ST. LOUIS	<u>MISSISSIPPI RIVER BETWEEN MISSOURI RIVER AND MINNEAPOLIS</u>	1991	2004
B315190	MISSISSIPPI VALLEY	ST. LOUIS	REND LAKE IL	2013	
B319420	MISSISSIPPI VALLEY	ST. LOUIS	WAPPAPELLO LAKE MO		
279	MISSISSIPPI VALLEY	ST. PAUL	BIGSTONE LAKE WHETSTONE RIVER		
B614081	MISSISSIPPI VALLEY	ST. PAUL	CROSS LAKE - RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER		
B605270	MISSISSIPPI VALLEY	ST. PAUL	EAU GALLE RIVER LAKE WISCONSIN		
B614085	MISSISSIPPI VALLEY	ST. PAUL	GULL LAKE - RESERVOIRS AT HEADWATERS OF MISSISSIPI RIVER		
B607640	MISSISSIPPI VALLEY	ST. PAUL	HOMME LAKE AND DAM NORTH DAKOTA		
B609220	MISSISSIPPI VALLEY	ST. PAUL	LAC QUI PARLE LAKES MINNESOTA		
B609300	MISSISSIPPI VALLEY	ST. PAUL	LAKE ASHTABULA AND BALDHILL DAM NORTH DAKOTA		
B609390	MISSISSIPPI VALLEY	ST. PAUL	LAKE TRAVERSE AND BOIS DE SIOUX SD AND MN		
B614083	MISSISSIPPI VALLEY	ST. PAUL	LEECH LAKE - RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER		
B674280	MISSISSIPPI VALLEY	ST. PAUL	MISSISSIPPI RIVER - ST. ANTHONY FALLS POOL		
B674295	MISSISSIPPI VALLEY	ST. PAUL	<u>MISSISSIPPI RIVER BETWEEN MISSOURI RIVER AND MINNEAPOLIS</u>	2002	
B613410	MISSISSIPPI VALLEY	ST. PAUL	ORWELL LAKE MINNESOTA		

Project ID	Division	District	Project Site/Name	S/B	Blk
B614082	MISSISSIPPI VALLEY	ST. PAUL	POKEGEMA LAKE- RESERVOIRS AT HEADWATERS OF MISSISSISSIPPI RIVER		
B614080	MISSISSIPPI VALLEY	ST. PAUL	SANDY LAKE - RESERVOIRS AT HEADWATERS OF MISSISSIPPI RIVER		
B614084	MISSISSIPPI VALLEY	ST. PAUL	WINNIBIGOSH LAKE - RESERVOIRS AT HEADWATERS OF MISS RVR MN		
B400600	MISSISSIPPI VALLEY	VICKSBURG	<b>ARKABUTLA LAKE</b>		
B400105	MISSISSIPPI VALLEY	VICKSBURG	BAYOU BODCAU RESERVOIR		
103477	MISSISSIPPI VALLEY	VICKSBURG	BIG SUNFLOWER RIVER YAZOO BASIN MS (MR&T)	2003	
B401730	MISSISSIPPI VALLEY	VICKSBURG	BLAKELY MT DAM- LAKE OUACHITA		
B402330	MISSISSIPPI VALLEY	VICKSBURG	CADDO LAKE		
B400214	MISSISSIPPI VALLEY	VICKSBURG	COLUMBIA LOCK AND DAM - OUACHITA AND BLACK RIVERS		
B404530	MISSISSIPPI VALLEY	VICKSBURG	DEGRAY LAKE		
B405590	MISSISSIPPI VALLEY	VICKSBURG	ENID LAKE		
B427043	MISSISSIPPI VALLEY	VICKSBURG	FELSENTHAL LOCK AND DAM - OUACHITA AND BLACK RIVERS	2014	
B407090	MISSISSIPPI VALLEY	VICKSBURG	GRENADA LAKE		
B427042	MISSISSIPPI VALLEY	VICKSBURG	H. K. THATCHER LOCK AND DAM - OUACHITA AND BLACK RIVERS	2016	
B400065	MISSISSIPPI VALLEY	VICKSBURG	J. BENNETT JOHNSTON WATERWAY	2013	2004
B400225	MISSISSIPPI VALLEY	VICKSBURG	JONESVILLE LOCK AND DAM - OUACHITA AND BLACK RIVERS		
103479	MISSISSIPPI VALLEY	VICKSBURG	MAIN STEM YAZOO BASIN MS (MR&T)	1995	
103473	MISSISSIPPI VALLEY	VICKSBURG	MISSISSIPPI RIVER LEVEES AR IL KY LA MS MO TN (MR&T)		
B412170	MISSISSIPPI VALLEY	VICKSBURG	NARROWS DAM- LAKE GREESON		
B416370	MISSISSIPPI VALLEY	VICKSBURG	SARDIS LAKE	1999	

Project ID	Division	District	Project Site/Name	S/B	Blk
B419370	MISSISSIPPI VALLEY	VICKSBURG	WALLACE LAKE		
103482	MISSISSIPPI VALLEY	VICKSBURG	YAZOO BACKWATER YAZOO BASIN MS (MR&T)	1994	
E100240	NORTH ATLANTIC	BALTIMORE	ALMOND LAKE		
E127023	NORTH ATLANTIC	BALTIMORE	ALVIN R BUSH DAM		
13	NORTH ATLANTIC	BALTIMORE	ARKPORT		
E100800	NORTH ATLANTIC	BALTIMORE	AYLESWORTH		
E104150	NORTH ATLANTIC	BALTIMORE	COWANESQUE LAKE		
E104370	NORTH ATLANTIC	BALTIMORE	CURWENSVILLE		
E105230	NORTH ATLANTIC	BALTIMORE	EAST SIDNEY LAKE		
E117050	NORTH ATLANTIC	BALTIMORE	FOSTER J SAYERS		
E101770	NORTH ATLANTIC	BALTIMORE	JENNINGS RANDOLPH LAKE		
E114900	NORTH ATLANTIC	BALTIMORE	RAYSTOWN LAKE		
391	NORTH ATLANTIC	BALTIMORE	STILLWATER LAKE		
E140102	NORTH ATLANTIC	BALTIMORE	TIOGA-HAMMOND LAKES		
E119900	NORTH ATLANTIC	BALTIMORE	WHITNEY POINT LAKE		
382	NORTH ATLANTIC	BALTIMORE	YORK INDIAN ROCK DAM		
E600850	NORTH ATLANTIC	NEW ENGLAND	BALL MOUNTAIN LAKE		
E600960	NORTH ATLANTIC	NEW ENGLAND	BARRE FALLS DAM		
E601560	NORTH ATLANTIC	NEW ENGLAND	BIRCH HILL DAM		
E600282	NORTH ATLANTIC	NEW ENGLAND	BLACK ROCK LAKE		
E601720	NORTH ATLANTIC	NEW ENGLAND	BLACKWATER DAM		
E602180	NORTH ATLANTIC	NEW ENGLAND	BUFFUMVILLE LAKE		
E600406	NORTH ATLANTIC	NEW ENGLAND	CAPE COD CANAL		
75257	NORTH ATLANTIC	NEW ENGLAND	CHARLES RIVER NATURAL VALLEY STORAGE AREA		
E603650	NORTH ATLANTIC	NEW ENGLAND	COLEBROOK RIVER LAKE		
E603730	NORTH ATLANTIC	NEW ENGLAND	CONANT BROOK DAM		
E605120	NORTH ATLANTIC	NEW ENGLAND	EAST BRIMFIELD LAKE		
E605310	NORTH ATLANTIC	NEW ENGLAND	EDWARD MACDOWELL LAKE		
E606150	NORTH ATLANTIC	NEW ENGLAND	FRANKLIN FALLS DAM		
E607280	NORTH ATLANTIC	NEW ENGLAND	HANCOCK BROOK LAKE		
E607580	NORTH ATLANTIC	NEW ENGLAND	HODGES VILLAGE DAM		
E607680	NORTH ATLANTIC	NEW ENGLAND	HOP BROOK LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
E607700	NORTH ATLANTIC	NEW ENGLAND	HOPKINTON- EVERETT LAKES		
E609080	NORTH ATLANTIC	NEW ENGLAND	KNIGHTVILLE DAM		
E610000	NORTH ATLANTIC	NEW ENGLAND	LITTLEVILLE LAKE		
E610560	NORTH ATLANTIC	NEW ENGLAND	MANSFIELD HOLLOW LAKE		
E612850	NORTH ATLANTIC	NEW ENGLAND	NORTH HARTLAND LAKE		
E612870	NORTH ATLANTIC	NEW ENGLAND	NORTH SPRINGFIELD LAKE		
E612900	NORTH ATLANTIC	NEW ENGLAND	NORTHFIELD BROOK LAKE		
E613450	NORTH ATLANTIC	NEW ENGLAND	OTTER BROOK LAKE		
1248	NORTH ATLANTIC	NEW ENGLAND	STAMFORD HURRICANE BARRIER		
E617780	NORTH ATLANTIC	NEW ENGLAND	SURRY MOUNTAIN LAKE		
E618160	NORTH ATLANTIC	NEW ENGLAND	THOMASTON DAM		
E618400	NORTH ATLANTIC	NEW ENGLAND	TOWNSHEND LAKE		
E618610	NORTH ATLANTIC	NEW ENGLAND	TULLY LAKE		
E618830	NORTH ATLANTIC	NEW ENGLAND	UNION VILLAGE DAM		
E619690	NORTH ATLANTIC	NEW ENGLAND	WEST HILL DAM		
E619760	NORTH ATLANTIC	NEW ENGLAND	WEST THOMPSON LAKE		
E619780	NORTH ATLANTIC	NEW ENGLAND	WESTVILLE LAKE		
E501340	NORTH ATLANTIC	PHILADELPHIA	BELTZVILLE LAKE		
E501780	NORTH ATLANTIC	PHILADELPHIA	BLUE MARSH LAKE		
E573825	NORTH ATLANTIC	PHILADELPHIA	FRANCIS E WALTER DAM		
E573502	NORTH ATLANTIC	PHILADELPHIA	PROMPTON LAKE		
G503480	NORTHWESTERN	KANSAS CITY	<b>CLINTON LAKE KANSAS</b>	2013	
G507330	NORTHWESTERN	KANSAS CITY	HARLAN COUNTY LAKE NEBRASKA		
G508840	NORTHWESTERN	KANSAS CITY	HARRY S. TRUMAN DAM AND RESERVOIR MISSOURI		
G507540	NORTHWESTERN	KANSAS CITY	HILLSDALE LAKE KANSAS		
G508730	NORTHWESTERN	KANSAS CITY	KANOPOLIS LAKE KANSAS		
G572277	NORTHWESTERN	KANSAS CITY	<b>LITTLE BLUE RIVER LAKES MISSOURI</b>	2013	
G510030	NORTHWESTERN	KANSAS CITY	<b>LONG BRANCH LAKE MISSOURI</b>	2013	
G510950	NORTHWESTERN	KANSAS CITY	MELVERN LAKE KANSAS		
G511140	NORTHWESTERN	KANSAS CITY	MILFORD LAKE KANSAS		

Project ID	Division	District	Project Site/Name	S/B	Blk
721	NORTHWESTERN	KANSAS CITY	MISSOURI RIVER RULO TO MOUTH	1988	2008
G513920	NORTHWESTERN	KANSAS CITY	PERRY LAKE KANSAS		
G514270	NORTHWESTERN	KANSAS CITY	POMME DE TERRE LAKE MISSOURI		
G514280	NORTHWESTERN	KANSAS CITY	POMONA LAKE KANSAS		
G514880	NORTHWESTERN	KANSAS CITY	<b>RATHBUN LAKE IOWA</b>	2012	
G516980	NORTHWESTERN	KANSAS CITY	SMITHVILLE LAKE MISSOURI		
G517560	NORTHWESTERN	KANSAS CITY	STOCKTON LAKE MISSOURI		
G518660	NORTHWESTERN	KANSAS CITY	TUTTLE CREEK LAKE KANSAS		
G520060	NORTHWESTERN	KANSAS CITY	WILSON LAKE KANSAS		
G672285	NORTHWESTERN	OMAHA	BEAR CREEK LAKE		
G601420	NORTHWESTERN	OMAHA	BIG BEND DAM LAKE SHARPE SD		
G601970	NORTHWESTERN	OMAHA	BOWMAN HALEY LAKE NORTH DAKOTA		
G603020	NORTHWESTERN	OMAHA	CHATFIELD LAKE COLORADO		
G603070	NORTHWESTERN	OMAHA	CHERRY CREEK LAKE	2004	
G605780	NORTHWESTERN	OMAHA	COLD BROOK LAKE SD		
G604060	NORTHWESTERN	OMAHA	COTTONWOOD SPRINGS LAKE SD		
G606230	NORTHWESTERN	OMAHA	FT PECK DAM AND LAKE MT		
G606270	NORTHWESTERN	OMAHA	FT RANDALL DAM LAKE FRANCIS CASE SD		
G606400	NORTHWESTERN	OMAHA	GARRISON DAM LAKE SAKAKAWEA ND		
G606440	NORTHWESTERN	OMAHA	<b>GAVINS POINT DAM LEWIS AND CLARK LAKE NE AND SD</b>	1998	
750	NORTHWESTERN	OMAHA	MISSOURI RIVER SIOUX CITY IA TO RULO NE	1988	
G612960	NORTHWESTERN	OMAHA	OAHE DAM LAKE OAHE SD AND ND		
G672296	NORTHWESTERN	OMAHA	<b>PAPILLION CREEK AND TRIBUTARIES LAKES NE</b>	2013	
G614120	NORTHWESTERN	OMAHA	<b>PIPESTEM LAKE ND</b>		
G660019	NORTHWESTERN	OMAHA	<b>SALT CREEK AND TRIBUTARIES NE</b>	2013	

Project ID	Division	District	Project Site/Name	S/B	Blk
645	NORTHWESTERN	PORTLAND	APPLEGATE LAKE OR		
7006	NORTHWESTERN	PORTLAND	BIG CLIFF LAKE		
G201810	NORTHWESTERN	PORTLAND	BLUE RIVER LAKE OR		
G273459	NORTHWESTERN	PORTLAND	BONNEVILLE LOCK AND DAM-LAKE BONNEVILLE		
G204020	NORTHWESTERN	PORTLAND	COTTAGE GROVE LAKE OR		
G204080	NORTHWESTERN	PORTLAND	COUGAR LAKE		
G204690	NORTHWESTERN	PORTLAND	DETROIT LAKE		
G279008	NORTHWESTERN	PORTLAND	DEXTER LAKE		
G204910	NORTHWESTERN	PORTLAND	DORENA LAKE OR		
4939282	NORTHWESTERN	PORTLAND	ELK CREEK		
G207770	NORTHWESTERN	PORTLAND	FALL CREEK LAKE OR		
G205830	NORTHWESTERN	PORTLAND	FERN RIDGE LAKE OR		
G268002	NORTHWESTERN	PORTLAND	FOSTER LAKE		
G206940	NORTHWESTERN	PORTLAND	GREEN PETER LAKE		
G207530	NORTHWESTERN	PORTLAND	HILLS CREEK LAKE		
G208480	NORTHWESTERN	PORTLAND	<u>JOHN DAY LOCK AND DAM - LAKE UMATILLA</u>		
G273101	NORTHWESTERN	PORTLAND	LOOKOUT POINT LAKE OR		
G210090	NORTHWESTERN	PORTLAND	LOST CREEK LAKE OR		
G204400	NORTHWESTERN	PORTLAND	<u>THE DALLES LOCK AND DAM - LAKE CELILO</u>		
G272731	NORTHWESTERN	PORTLAND	WILLOW CREEK LAKE		
G300200	NORTHWESTERN	SEATTLE	ALBENI FALLS DAM		
G373462	NORTHWESTERN	SEATTLE	CHIEF JOSEPH DAM		
681	NORTHWESTERN	SEATTLE	HOWARD A HANSON DAM		
G372920	NORTHWESTERN	SEATTLE	KEYSTONE HARBOR		
G309400	NORTHWESTERN	SEATTLE	LAKE WASHINGTON SHIP CANAL		
G309750	NORTHWESTERN	SEATTLE	LIBBY DAM		
G311990	NORTHWESTERN	SEATTLE	MUD MOUNTAIN DAM		
G455120	NORTHWESTERN	WALLA WALLA	BENNINGTON LAKE, MILL CREEK, WA		
G405090	NORTHWESTERN	WALLA WALLA	DWORSHAK DAM AND RESERVOIR		
G400608	NORTHWESTERN	WALLA WALLA	ICE HARBOR LOCK AND DAM		

Project ID	Division	District	Project Site/Name	S/B	Blk
G409880	NORTHWESTERN	WALLA WALLA	LITTLE GOOSE LOCK AND DAM		
G410180	NORTHWESTERN	WALLA WALLA	LOWER GRANITE LOCK AND DAM		
G410210	NORTHWESTERN	WALLA WALLA	LOWER MONUMENTAL LOCK AND DAM		
G410260	NORTHWESTERN	WALLA WALLA	LUCKY PEAK LAKE		
G410920	NORTHWESTERN	WALLA WALLA	MENARY LOCK AND DAM		
J472738	PACIFIC OCEAN	ALASKA	CHENA RIVER LAKES		
K302860	SOUTH ATLANTIC	JACKSONVILLE	CENTRAL AND SOUTHERN FLORIDA		
K313240	SOUTH ATLANTIC	JACKSONVILLE	OKEECHOBEE WATERWAY FL	1989	
K538889	SOUTH ATLANTIC	MOBILE	<b>ALABAMA RIVER LAKES</b>	2003	
K500220	SOUTH ATLANTIC	MOBILE	ALLATOONA LAKE		
K516801	SOUTH ATLANTIC	MOBILE	BLACK WARRIOR AND TOMBIGBEE RIVERS		
K502200	SOUTH ATLANTIC	MOBILE	BUFORD DAM - LAKE SIDNEY LANIER		
K502730	SOUTH ATLANTIC	MOBILE	CARTERS DAM AND LAKE		
K551270	SOUTH ATLANTIC	MOBILE	GEORGE W ANDREWS L&D- APALACHICOLA CHATTAHOOCHEE & FLINT RVS		
K508450	SOUTH ATLANTIC	MOBILE	JIM WOODRUFF L&D- LAKE SEMINOLE- APALACHICOLA CHAT. & FLINT RS		
K513220	SOUTH ATLANTIC	MOBILE	OKATIBBEE LAKE		
K501040	SOUTH ATLANTIC	MOBILE	TENNESSEE - TOMBIGBEE WATERWAY	2004	
906002	SOUTH ATLANTIC	MOBILE	TENNESSEE - TOMBIGBEE WATERWAY WILDLIFE MITIGATION		
K519190	SOUTH ATLANTIC	MOBILE	WALTER F. GEORGE L&D- APALACHICOLA CHATTAHOOCHEE & FLINT RS		
K519710	SOUTH ATLANTIC	MOBILE	WEST POINT LAKE		
K607380	SOUTH ATLANTIC	SAVANNAH	HARTWELL DAM AND LAKE		
K603350	SOUTH ATLANTIC	SAVANNAH	J STROM THURMOND DAM AND LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
K618530	SOUTH ATLANTIC	SAVANNAH	RICHARD B RUSSELL DAM AND LAKE		
K616450	SOUTH ATLANTIC	SAVANNAH	SAVANNAH RIVER BELOW AUGUSTA		
K712410	SOUTH ATLANTIC	WILMINGTON	B EVERETT JORDAN DAM AND LAKE		
K774346	SOUTH ATLANTIC	WILMINGTON	CAPE FEAR RIVER		
K705800	SOUTH ATLANTIC	WILMINGTON	FALLS LAKE NC		
K708350	SOUTH ATLANTIC	WILMINGTON	JOHN H KERR DAM AND RESERVOIR VA AND NC		
K713990	SOUTH ATLANTIC	WILMINGTON	PHILPOTT LAKE VA		
K719220	SOUTH ATLANTIC	WILMINGTON	W KERR SCOTT DAM AND RESERVOIR		
L400070	SOUTH PACIFIC	ALBUQUERQUE	ABIQUIU DAM		
L403520	SOUTH PACIFIC	ALBUQUERQUE	COCHITI LAKE		
L403740	SOUTH PACIFIC	ALBUQUERQUE	CONCHAS LAKE		
L406290	SOUTH PACIFIC	ALBUQUERQUE	GALISTEO DAM		
L408440	SOUTH PACIFIC	ALBUQUERQUE	JEMEZ CANYON DAM		
L408510	SOUTH PACIFIC	ALBUQUERQUE	JOHN MARTIN RESERVOIR		
L410080	SOUTH PACIFIC	ALBUQUERQUE	SANTA ROSA DAM AND LAKE		
L418480	SOUTH PACIFIC	ALBUQUERQUE	TRINIDAD LAKE		
L418720	SOUTH PACIFIC	ALBUQUERQUE	TWO RIVERS DAM		
L100190	SOUTH PACIFIC	LOS ANGELES	ALAMO LAKE DAM, AZ		
L174726	SOUTH PACIFIC	LOS ANGELES	BREA DAM		
L174727	SOUTH PACIFIC	LOS ANGELES	CARBON CANYON DAM		
L174729	SOUTH PACIFIC	LOS ANGELES	FULLERTON DAM		
794086	SOUTH PACIFIC	LOS ANGELES	HAINES CANYON DEBRIS BASIN		
L175234	SOUTH PACIFIC	LOS ANGELES	HANSEN DAM		
794092	SOUTH PACIFIC	LOS ANGELES	LOPEZ DAM		
L111700	SOUTH PACIFIC	LOS ANGELES	MOJAVE RIVER RESERVOIR CA		
598	SOUTH PACIFIC	LOS ANGELES	PAINTED ROCK DAM AZ		
L114090	SOUTH PACIFIC	LOS ANGELES	PINE-MATHEWS CANYONS DAMS, NV		
L174732	SOUTH PACIFIC	LOS ANGELES	PRADO DAM		
789516	SOUTH PACIFIC	LOS ANGELES	SAN ANTONIO DAM		
L100761	SOUTH PACIFIC	LOS ANGELES	SANTA FE DAM		
L175232	SOUTH PACIFIC	LOS ANGELES	SEPULVEDA DAM		
L119880	SOUTH PACIFIC	LOS ANGELES	WHITLOW RANCH DAM AZ		

Project ID	Division	District	Project Site/Name	S/B	Blk
L174743	SOUTH PACIFIC	LOS ANGELES	WHITTIER NARROWS DAM		
L201600	SOUTH PACIFIC	SACRAMENTO	BLACK BUTTE LAKE		
L268004	SOUTH PACIFIC	SACRAMENTO	BUCHANAN DAM H.V. EASTMAN LAKE		
L215810	SOUTH PACIFIC	SACRAMENTO	ENGLEBRIGHT LAKE (SACRAMENTO RIVER DEBRIS CHANNEL)		
L268006	SOUTH PACIFIC	SACRAMENTO	HIDDEN DAM HENSLEY LAKE		
567	SOUTH PACIFIC	SACRAMENTO	ISABELLA LAKE		
L210750	SOUTH PACIFIC	SACRAMENTO	MARTIS CREEK LAKE		
L212390	SOUTH PACIFIC	SACRAMENTO	NEW HOGAN LAKE		
L212460	SOUTH PACIFIC	SACRAMENTO	NEW MELONES LAKE (STANISLAUS RIVER)		
L214040	SOUTH PACIFIC	SACRAMENTO	PINE FLAT LAKE		
L217680	SOUTH PACIFIC	SACRAMENTO	SUCCESS LAKE		
L218090	SOUTH PACIFIC	SACRAMENTO	TERMINUS DAM LAKE KAWEAH		
553	SOUTH PACIFIC	SACRAMENTO	YUBA RIVER DEBRIS TREATMENT		
L374645	SOUTH PACIFIC	SAN FRANCISCO	<b>COYOTE VALLEY DAM, LAKE MENDOCINO</b>	2013	
L304990	SOUTH PACIFIC	SAN FRANCISCO	LAKE SONOMA / WARM SPRINGS DAM (DRY CREEK LAKE AND CHANNEL)		
M274786	SOUTHWESTERN	FORT WORTH	AQUILLA LAKE		
M200930	SOUTHWESTERN	FORT WORTH	BARDWELL LAKE		
M201330	SOUTHWESTERN	FORT WORTH	BELTON LAKE		
M201350	SOUTHWESTERN	FORT WORTH	BENBROOK LAKE		
M202590	SOUTHWESTERN	FORT WORTH	CANYON LAKE		
M203820	SOUTHWESTERN	FORT WORTH	COOPER DAM AND JIM CHAPMAN LAKE		
M205850	SOUTHWESTERN	FORT WORTH	<b>FERRELLS BRIDGE DAM - LAKE O' THE PINES</b>	2013	
M275357	SOUTHWESTERN	FORT WORTH	GRANGER DAM AND LAKE		
M206760	SOUTHWESTERN	FORT WORTH	GRAPEVINE LAKE		
M207710	SOUTHWESTERN	FORT WORTH	HORDS CREEK LAKE		
M209420	SOUTHWESTERN	FORT WORTH	JOE POOL LAKE		
M209580	SOUTHWESTERN	FORT WORTH	LAVON LAKE		
M209740	SOUTHWESTERN	FORT WORTH	LEWISVILLE DAM AND LAKE		
M212260	SOUTHWESTERN	FORT WORTH	NAVARRO MILLS LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
M275358	SOUTHWESTERN	FORT WORTH	NORTH SAN GABRIEL DAM AND LAKE GEORGETOWN		
M216090	SOUTHWESTERN	FORT WORTH	O C FISHER DAM AND LAKE		
M214580	SOUTHWESTERN	FORT WORTH	PROCTOR LAKE		
M274787	SOUTHWESTERN	FORT WORTH	RAY ROBERTS LAKE		
M216040	SOUTHWESTERN	FORT WORTH	SAM RAYBURN DAM AND RESERVOIR		
M217110	SOUTHWESTERN	FORT WORTH	SOMERVILLE LAKE		
M217530	SOUTHWESTERN	FORT WORTH	STILLHOUSE HOLLOW DAM AND LAKE		
M274871	SOUTHWESTERN	FORT WORTH	TOWN BLUFF DAM AND BA STEINHAGEN LAKE		
M219250	SOUTHWESTERN	FORT WORTH	WACO LAKE		
M219920	SOUTHWESTERN	FORT WORTH	WHITNEY LAKE		
M218110	SOUTHWESTERN	FORT WORTH	<b>WRIGHT PATMAN DAM AND LAKE</b>	2010	
M302160	SOUTHWESTERN	GALVESTON	BUFFALO BAYOU AND TRIBUTARIES		
M319380	SOUTHWESTERN	GALVESTON	WALLISVILLE LAKE - TRINITY RIVER AND TRIBUTARIES		
M400749	SOUTHWESTERN	LITTLE ROCK	<b>ARTHUR B. ORMOND LOCK (J.W. ROCKEFELLER) - POOL 9</b>	1998	
M401230	SOUTHWESTERN	LITTLE ROCK	BEAVER LAKE		
M401800	SOUTHWESTERN	LITTLE ROCK	BLUE MOUNTAIN LAKE		
M474912	SOUTHWESTERN	LITTLE ROCK	BULL SHOALS LAKE	2018	
M403420	SOUTHWESTERN	LITTLE ROCK	CLEARWATER LAKE		
M404450	SOUTHWESTERN	LITTLE ROCK	DARDANELLE LOCK AND DAM (DARDANELLE LAKE)	2015	
M400746	SOUTHWESTERN	LITTLE ROCK	DAVID D. TERRY LK (POOL 6) - MCCLELLAN-KERR ARK RVR SYS	1992	
M404620	SOUTHWESTERN	LITTLE ROCK	DEQUEEN LAKE		
M404770	SOUTHWESTERN	LITTLE ROCK	DIERKS LAKE	2015	
M400744	SOUTHWESTERN	LITTLE ROCK	EMMETT SANDERS LOCK (POOL 4) - MCCLELLAN-KERR ARK RVR SYS	1988	
M406550	SOUTHWESTERN	LITTLE ROCK	GILLHAM LAKE		
M407070	SOUTHWESTERN	LITTLE ROCK	GREERS FERRY LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
M400753	SOUTHWESTERN	LITTLE ROCK	JAMES W. TRIMBLE LK (J.P. HAMMERSCHMIDT) - MCC-KERR ARK RVR		
M400743	SOUTHWESTERN	LITTLE ROCK	JOE HARDIN LOCK (POOL 3) - MCCLELLAN-KERR ARK RVR NAV SYS		
M400742	SOUTHWESTERN	LITTLE ROCK	LOCK #2 (POOL 2) - MCCLELLAN-KERR ARK RVR NAV SYS	2005	
M400745	SOUTHWESTERN	LITTLE ROCK	LOCK AND DAM #5 (POOL 5) - MCCLELLAN-KERR ARK RVR NAV SYS		
M411240	SOUTHWESTERN	LITTLE ROCK	MILLWOOD LAKE		
135461	SOUTHWESTERN	LITTLE ROCK	MONTGOMERY POINT LOCK AND DAM		
M400747	SOUTHWESTERN	LITTLE ROCK	<b>MURRAY LOCK (POOL 7) - MCCLELLAN-KERR ARK RVR NAV SYS</b>		
M412620	SOUTHWESTERN	LITTLE ROCK	NIMROD LAKE		
M412830	SOUTHWESTERN	LITTLE ROCK	NORFORK LAKE		
M400741	SOUTHWESTERN	LITTLE ROCK	NORRELL LOCK (POOL 1) - MCCLELLAN-KERR ARK RVR NAV SYS		
M413520	SOUTHWESTERN	LITTLE ROCK	OZARK JETA-TAYLOR L&D & PWRHSE- MCCLELLAN-KERR ARK R NAV SYS	2005	
M418030	SOUTHWESTERN	LITTLE ROCK	TABLE ROCK LAKE		
M400748	SOUTHWESTERN	LITTLE ROCK	<b>TOAD SUCK FERRY LOCK (POOL 8) - MCCLELLAN-KERR ARK RVR NAV</b>	1993	
M575012	SOUTHWESTERN	TULSA	ARCADIA LAKE		
M501540	SOUTHWESTERN	TULSA	BIRCH LAKE		
M502040	SOUTHWESTERN	TULSA	BROKEN BOW LAKE		
M502570	SOUTHWESTERN	TULSA	CANTON LAKE		
M500787	SOUTHWESTERN	TULSA	CHOUTEAU L&D- MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM		
M503890	SOUTHWESTERN	TULSA	COPAN LAKE		
M504100	SOUTHWESTERN	TULSA	COUNCIL GROVE LAKE		

Project ID	Division	District	Project Site/Name	S/B	Blk
M574945	SOUTHWESTERN	TULSA	DENISON DAM - LAKE TEXOMA, TX AND OK		
M505350	SOUTHWESTERN	TULSA	EL DORADO LAKE		
M505360	SOUTHWESTERN	TULSA	ELK CITY LAKE		
126	SOUTHWESTERN	TULSA	ESTELLINE SPRINGS EXPERIMENTAL PROJECT		
M505650	SOUTHWESTERN	TULSA	EUFAULA LAKE		
M505790	SOUTHWESTERN	TULSA	FALL RIVER LAKE		
M506000	SOUTHWESTERN	TULSA	FORT GIBSON LAKE		
M506040	SOUTHWESTERN	TULSA	FORT SUPPLY LAKE		
M506850	SOUTHWESTERN	TULSA	GREAT SALT PLAINS LAKE		
M507500	SOUTHWESTERN	TULSA	HEYBURN LAKE		
M507830	SOUTHWESTERN	TULSA	HUGO LAKE		
M507850	SOUTHWESTERN	TULSA	HULAH LAKE		
M508530	SOUTHWESTERN	TULSA	JOHN REDMOND DAM AND RESERVOIR		
M508790	SOUTHWESTERN	TULSA	KAW LAKE		
M508990	SOUTHWESTERN	TULSA	KEYSTONE LAKE		
M510650	SOUTHWESTERN	TULSA	MARION RESERVOIR		
M500788	SOUTHWESTERN	TULSA	NEWT GRAHAM L&D-MCCLELLAN-KERR ARKANSAS R NAVIGATION SYSTEM		
M513340	SOUTHWESTERN	TULSA	OOLOGAH LAKE		
86	SOUTHWESTERN	TULSA	OPTIMA LAKE		
M513700	SOUTHWESTERN	TULSA	PAT MAYSE LAKE		
M501450	SOUTHWESTERN	TULSA	PEARSON-SKUBITZ BIG HILL LAKE		
M514030	SOUTHWESTERN	TULSA	PINE CREEK LAKE		
102	SOUTHWESTERN	TULSA	RED RIVER CHLORIDE CONTROL - AREA VIII TX		
M515370	SOUTHWESTERN	TULSA	ROBERT S KERR L&D, RES & PWRHSE-MCCLELLAN-KERR ARK R NAV SYS		
M574925	SOUTHWESTERN	TULSA	SARDIS LAKE		
M575378	SOUTHWESTERN	TULSA	SKIATOOK LAKE OK		
M518050	SOUTHWESTERN	TULSA	TENKILLER FERRY LAKE		
M518350	SOUTHWESTERN	TULSA	TORONTO LAKE		
M574773	SOUTHWESTERN	TULSA	W D MAYO L&D-MCCLELLAN-KERR		

Project ID	Division	District	Project Site/Name	S/B	Blk
			ARKANSAS RVR NAVIGATION SYSTEM		
M519570	SOUTHWESTERN	TULSA	WAURIKA LAKE		
M519590	SOUTHWESTERN	TULSA	WEBBERS FALLS L&D & POWERHOUSE- MCCLELLAN-KERR ARK R NAV SYS		
M520120	SOUTHWESTERN	TULSA	WISTER LAKE		

Table A2. Ichthyology collections and data aggregators found while searching for collections listed in Poss and Collette 1995 and investigated to determine if there were online databases (Yes, No). Online databases were searched using the terms carp, *Mylopharyngodon*, and *Hypophthalmichthys*. Records with geographic coordinates were imported into a Geographic Information System (GIS) point location file. Collections and aggregators used to create this GIS file are in bold. Collections in italics had carp records within one of the downloaded data aggregator files. Many collections' online databases did not have online records for carp, *Mylopharyngodon*, or *Hypophthalmichthys* indicating either no Silver, Bighead, or Black Carp in the collection or the data were not electronically available.

Ichthyology Collection, Data Aggregator or Research Center	Online
<b>Arctos</b>	Yes
<b>EDDMaps</b>	Yes
<b>FishBase</b>	Yes
<b>Fishes of Texas</b>	Yes
<b>FishNet2</b>	Yes
<b>GBIF</b>	Yes
IDigBio	Yes
<b>USGS Nonindigenous Aquatic Species database</b>	Yes
<b>VertNet</b>	Yes
<b>Academy of Natural Sciences of Drexel University</b>	Yes
Alaska Fisheries Science Center National Marine Fisheries Service	No
<i>American Museum of Natural History</i>	Yes
Arkansas State University	No
Arkansas Tech Fisk Collection	No
Auke Bay Fisheries Laboratory	No
Baylor University Mayborn Museum Ichthyology Collection	Yes
Bernice P. Bishop Museum Zoology Department	No
Bowdoin College Fish Collection	No
Brigham Young University Monte L. Bean Life Science Museum	No
California Academy of Sciences	Yes
California Museum of Natural History	Yes
California State Polytechnic University Fish Collection	No
California State University Sacramento, Ichthyology Collection	No
Canadian Museum of Nature	Yes

Ichthyology Collection, Data Aggregator or Research Center	Online
Clemson University Vertebrate Collection	No
College of Charleston Grice Marine Biological Laboratory	No
Colorado State University Fish Collection	No
Cornell University Ichthyology Collection	Yes
Dartmouth College Fish Collection	No
Dayton Museum of Natural History Fish Collection	No
Duke University Vertebrate Collections Department of Zoology	No
Eastern Kentucky University Museum Fish Collection	No
<i>Field Museum of Natural History Division of Fishes</i>	Yes
Florida Atlantic University	No
Florida Department of Natural Resources Marine Research Fish Collection	Yes
Florida Marine Research Institute	No
<b><i>Florida Museum of Natural History</i></b>	Yes
Grinnell College Biology Department Fish Collection	No
<i>Gulf Coast Research Laboratory Museum</i>	Yes
Harvard University Museum of Comparative Zoology	Yes
Humboldt State University Fisheries Collection	Yes
Huntsman Marine Science Centre	No
Idaho State University Idaho Museum of Natural History	No
<b><i>Illinois Natural History Survey</i></b>	Yes
Indiana State University Fish Collection	Yes
Jacksonville University Vertebrate Division Fish Collection	No
KU Biodiversity Institute & Natural History Museum	Yes
Louisiana State University Division of Fishes, Museum of Zoology	Yes
Louisiana Tech University Vertebrate Museum	No
Louisiana Wildlife and Fisheries Marine Biological Laboratory Museum	No
Marine Resources Research Institute Larval Fish Collection	No
Memorial University	No
Michigan State University Museum Collection of Fishes	Yes
Milwaukee Public Museum	Yes
Mississippi State University Ichthyological Collection	No
Missouri Department of Conservation	No
Montana State University Fish Collection	No
Moss Landing Marine Laboratories Ichthyology Collection	No
Murray State University Biology Department	No
National Ecology Research Center, Biology Survey/Fort Collins	No
National Marine Fisheries Service La Jolla Laboratory	No
National Marine Fisheries Service Northeast Fisheries Center Fish Collection	No
National Marine Fisheries Service, American Fisheries Society Fish Photo Collection	No
Natural History Museum of Los Angeles County	Yes
New York State Museum Biological Survey Laboratory	No
Newark Museum Fish Collection	No
North Carolina State Fish Collection Museum of Natural History	Yes
<b>North Carolina Museum of Natural Sciences</b>	Yes

Ichthyology Collection, Data Aggregator or Research Center	Online
Occidental College Fish Collection	No
Oklahoma State University Collection of Vertebrates	No
Old Dominion University Fish Collection	No
Oregon State University Fish Collection	Yes
Pennsylvania Academy of Natural Sciences Department of Ichthyology	Yes
Pennsylvania State University Fish Museum	No
Roanoke College Fish Collection	Yes
Royal British Columbia Museum	Yes
Royal Ontario Museum	Yes
San Diego State University Fish Collection	No
San Francisco State University Vertebrate Museum	No
San Jose State University Ichthyology Collection	No
Sandy Hook Marine Laboratory MARMAP Larval Fish Collection	No
<b><i>Smithsonian National Museum of Natural History</i></b>	Yes
Smithsonian Tropical Research Institution	Yes
Southeast Fisheries Center	No
Southeastern Louisiana University Fish Museum	No
Southern Arkansas University	No
<i>Southern Illinois University Ichthyology Collection</i>	No
Texas A & M University Kingsville John E. Connor Museum	No
Texas A&M University Texas Cooperative Wildlife Collection	Yes
<i>Texas Tech University Museum Ichthyology Collection</i>	Yes
The Charleston Museum Fish Collection	No
The University of Chicago Marine Biological Laboratory Fish Collection	No
The University of Memphis Ecological Research Center	No
<b><i>The University of Tennessee Etnier Ichthyological Collection</i></b>	Yes
Truman State University Department of Zoology	No
<i>Tulane University Museum of Natural History</i>	Yes
University of Alaska Museum Aquatic Collection	No
University of Alberta Museum of Zoology	Yes
University of Arizona Fish Collection	No
University of Arkansas Fayetteville	No
University of British Columbia Fish Museum/Beaty Biodiversity Museum	Yes
University of California Davis Museum of Wildlife and Fish	No
University of California Fish Museum	No
<b><i>University of California San Diego, Scripps Institution of Oceanography</i></b>	Yes
University of Central Florida Fish Collection	No
University of Colorado at Boulder	No
University of Connecticut Ichthyology Museum	Yes
University of Florida Florida Museum of Natural History Ichthyology Collection	Yes
University of Georgia Museum of Natural History	No
University of Louisville Collection of Fishes	No
University of Maine Zoology Fish Collection	No
University of Manitoba, Fish Collection	No

Ichthyology Collection, Data Aggregator or Research Center	Online
University of Massachusetts Dartmouth Fish Collection	No
University of Miami Fish Collection	No
<i>University of Michigan Museum of Zoology Division of Fishes</i>	Yes
<b><i>University of Minnesota J.F. Bell Museum of Natural History</i></b>	Yes
University of Mississippi Ichthyological Collection	No
University of Missouri Museum of Zoology Fish Collection	No
University of Montana Philip L. Wright Zoological Museum	Yes
University of Nebraska at Omaha Fish Collection	No
University of Nebraska State Museum	No
University of Nevada, Reno Museum of Natural History	Yes
University of New England Teaching and Research Fish Collection	No
<i>University of New Mexico Museum of Southwestern Biology</i>	Yes
University of New Orleans Vertebrate Collection	No
University of North Carolina Institute of Marine Sciences	No
<i>University of North Carolina Zoological Museum Collection</i>	No
<i>University of Oklahoma, Oklahoma Museum of Natural History Fish Range</i>	Yes
University of Rhode Island	No
University of Richmond Fish Collection	Yes
University of South Dakota W.H. Over Museum	No
University of South Florida Zoology Collection - Fish	No
<b><i>University of Southern Mississippi Museum of Ichthyology</i></b>	Yes
University of Tennessee at Martin Fish Collection	No
University of Texas at Arlington Fish Collection Merriam Museum	No
<i>University of Texas, Texas Memorial Museum, Texas Natural History Collection</i>	No
University of Tulsa Fish Collection	No
<i>University of Washington Fish Collection, Burke Museum</i>	Yes
University of West Florida Fish Collection	No
University of Wisconsin Fish Collection	No
University of Wisconsin Museum of Natural History George Becker Ichthyological Collection	No
University of Wisconsin Zoological Museum Fish Collection	Yes
University of Wyoming Fish Collection	Yes
Vanderbilt Museum	No
Ventura College Fish Collection	No
Virginia Institute of Marine Science Fish Collection	Yes
Washington State University Fish Collection	No
Westark Community College Fish Collection	No
Wichita State University Fish Collection	No
Wilfrid Laurier University Zoological Museum Ichthyological Collection	No
Yale University Peabody Museum of Natural History	Yes
York College Fish Collection	No

# REPORT DOCUMENTATION PAGE

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				<b>5b. GRANT NUMBER</b>	
				<b>5c. PROGRAM ELEMENT NUMBER</b>	
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<b>13. SUPPLEMENTARY NOTES</b> AMSCO 008284; Funding Account U4382185; "Dispersal Capabilities of Asian Carp"					
<b>14. ABSTRACT</b>  This technical report (TR) documents the distribution of Invasive Carp - Silver Carp ( <i>Hypophthalmichthys molitrix</i> ), Bighead Carp ( <i>Hypophthalmichthys nobilis</i> ), and Black Carp ( <i>Mylopharyngodon piceus</i> ) in US Army Corps of Engineers (USACE) managed waters. Invasive carp were introduced into the US nearly half a century ago. As they spread across the US, they compete with and consume native species and Silver Carp jumping behavior reduces recreational use. The USACE is responsible for management of waterbodies at more than 440 projects. Information on these projects including the presence of Invasive Carp is reported in the USACE Operations and Maintenance Business Information Link (OMBIL) database. To supplement the Invasive Carp information from OMBIL, 47 online ichthyology collection and observation databases were searched; 18 had information on Invasive Carp locations. Combining the collection, observation and OMBIL reporting information, 82 USACE projects in 19 districts in 6 of 8 divisions have Silver/Bighead Carp and 19 projects in 9 districts and 3 divisions have Black Carp. Understanding the distribution of Invasive Carp is important to enable managers to be proactive: planning control efforts, posting informational signs, instituting live bait restrictions, and thus reducing the chances of species introduction or limiting species impact.					
<b>15. SUBJECT TERMS</b> Aquatic habitats – Introduced organisms Silver carp		Bighead carp Black carp United States.Army.Corps of Engineers – Reservoirs – Environmental management		United States.Army.Corps of Engineers – Rivers – Environmental management	
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