Conservation Plan for the Black Sandshell and Butterfly Mussels

(In Proposed Sediment Dredging Area, Upper Mississippi River, Pool 12, East Dubuque, Illinois)

Ligumia recta (black sandshell)

Ellipsaria lineolata (butterfly)

Frentress Lake Marine Center
East Dubuque, IL
April 2014

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Cover photos: Live *Ligumia recta* from 2013 survey, and shell of *Ellipsaria lineolata* from Bob Schanzel's reference collection.

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The following appendices are available electronically through the website provided below.

Appendix 5. Call, D. J. and M. J. Malon. 2013. Mussel Community Survey in the Upper Mississippi River, Pool 12 (Frentress Lake Area). Final report to the U.S. Fish & Wildlife Service and the Illinois Department of Natural Resources. 29 pp. Available at www.enviro-analysts.com under "Related Links" and "2013 Mussel Survey".

Appendix 6. Call, D. J. and M. J. Malon. 2013. Photo Addendum: 2013 Mussel Community Survey in the Upper Mississippi River, Pool 12 (Frentress Lake Area). 4 pp. Available at www.enviro-analysts.com under "Related Links" and "2013 Mussel Photo Addendum".

1. DESCRIPTION OF IMPACT

A. Project Location

The prop**osed** dredging project is located in Pool 12 of the Upper Mississippi River (River Mile 575.7-576.0), at the entrance to Frentress Lake (42.460807, -90.611248). The legal description for this area is Section 4, Township 28 North, Route 2West, 4th Principle Meridian.

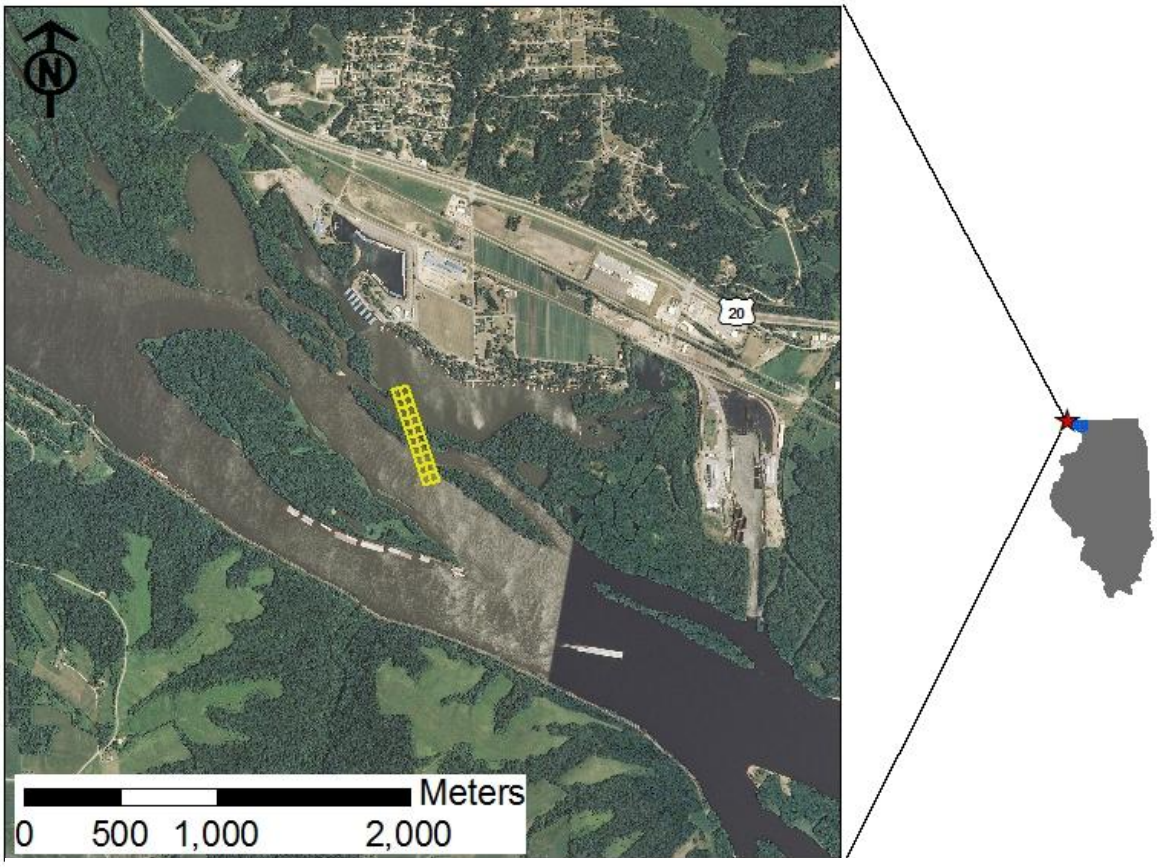

Figure 1. Location map of the project area.

B. Biological Description of Affected Species

***Ligumia recta* (Black Sandshell)**. The black sandshell mussel is listed as a state threatened species by the Illinois Department of Natural Resources (IDNR; Illinois Endangered species Protection Board, 2011). This status indicates that the species has suffered serious population declines over time, and is likely to become a state endangered species in the foreseeable future. Consequently, efforts are under way by State and federal agencies, in cooperation with university biologists within the State, to maintain and improve the status of populations of this species in Illinois. In the case of the proposed dredging activity by FLMC, a conservation plan is herein presented with an application for an incidental take authorization (ITA) permit to minimize any adverse effects upon this species.

A review of the Illinois Natural History Survey (INHS) collection records for locations where *L. recta* has been collected show that it has been widely distributed throughout the rivers of the State (INHS, 2014). It is reported as being widely distributed but uncommon in the Midwest (INHS, 2014). Records for the INHS collection include specimens that have been collected in the Mississippi River off the following counties of western Illinois: Jo Daviess, Carroll, Whiteside, Rock Island, Mercer, Henderson, Hancock, Adams, Pike and Calhoun. Three records for Jo Daviess County are included in the overall record of the INHS, with specimens having been collected in 1985 (1) and 2001 (2). Specimens are also included in the INHS collection from adjacent counties in Wisconsin and Iowa. Specimens were added to the INHS collection from Grant County, WI, in 1995, 1996 and 2006. Dubuque County, IA, is directly across the Mississippi River from Jo Daviess County, IL. Specimens from Dubuque County were added to the INHS collection from individual mussels collected in 1999, 2009 and 2010. The collection also includes black sandshells collected from the Mississippi River in Clinton and Scott Counties, IA, which are downstream of Dubuque County and separated from Dubuque County by Jackson County. Clinton County has two specimens in the INHS collection, added in 1996 and 2006; while Scott County has one specimen from 1990. The intervening Jackson County, which is also directly west of Jo Daviess County, IL, did not have any representative specimens in the INHS collection. However, a mussel survey was conducted in 2000 in this county just below Lock and Dam 13 (RM 556 in the City of Bellevue, IA (Marangelo and Dunn, 2000). This location is approximately 20 miles downstream from the site of our mussel survey near RM 576, and on the Iowa side of the River. Of 389 mussels collected, 82 were live black sandshells, representing 21.1% of the mussel community. While the black sandshell was relatively abundant at the Bellevue location, it represented only 0.1 percent of the mussel community in a survey conducted in 1994-95 in the immediate vicinity of the Quad Cities, approximately 60 miles further downstream (Whitney et al. 1997).

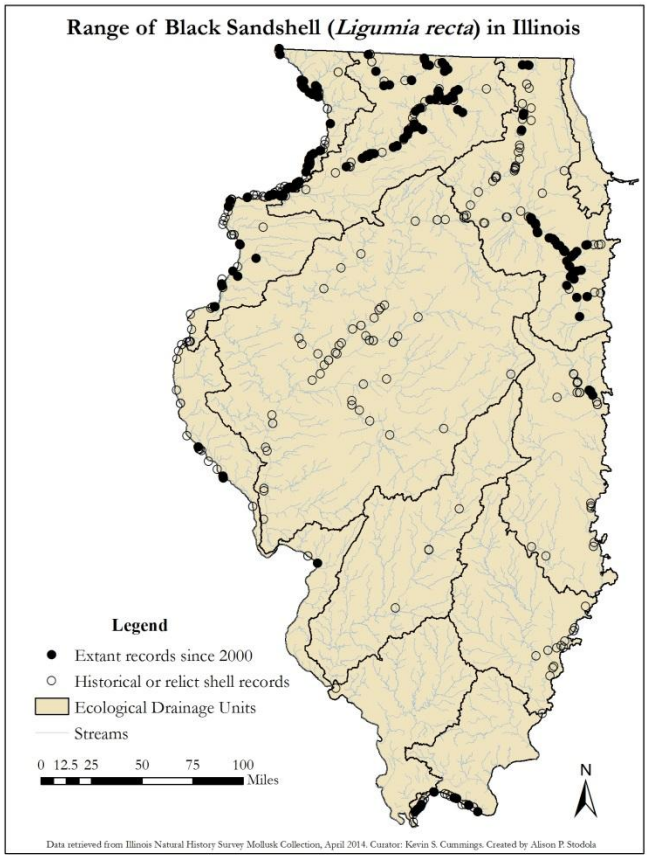

Figure 2. Range of black sandshell (*Ligumia recta*) in Illinois (INHS, April 2014).

The black sandshell has an elongate shell of up to 8 inches in length that is pointed at the posterior end in males, and saber-shaped in females (INHS, 2014). It has a smooth and shiny shell, with the exterior color commonly being black, dark green or dark brown. Rays are often visible, as well (MN DNR, 2014). The umbo is low, and only slightly elevated above the hinge line. The nacre is variable in color, being white, pink, salmon or purple, becoming iridescent posteriorly.

The black sandshell prefers medium to large rivers or raceways with fairly swift current and substrates of gravel or firm sand (INHS, 2014). The life cycle of this species starts with fertilization of the eggs within the female's body. This typically occurs in August (MN DNR, 2014). The embryos develop within the female for the better part of a full year (bradytictic development), having developed into glochidia larvae by the following July. At this time, they are ready to be released by the female onto the gills or fins of a suitable fish host species. Fish may be attracted to the specialized swollen white gill tissue that has developed (www.gpnc.org/mrepro.htm), as well as an undulating mantle flap with short tentacles. Fish species that are known to serve as hosts include the bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), sauger (*Stizostedion canadense*) and white crappie (*Pomoxis annularis*) (MN DNR, 2014). In laboratory trials, glochidia have metamorphosed to the juvenile life stage on several other fish species, including the walleye (*Stizostedion vitreum*), yellow perch (*Perca flavescens*), several other *Lepomis* species and members of the cyprinid family (Mulcrone, 2006). The glochidia continue to develop, living as parasites on the host fish until they metamorphose into juvenile mussels, which drop off of the fish to grow in the substrate of the river. There, they grow into adults, adding some growth each year. Neither the age to sexual maturity nor the longevity under normal healthy environmental conditions is well known. However, the age to sexual maturity may be assumed to be in the vicinity of 7-8 years, based on estimates for five other unionid species from Pool 15 (Whitney et al., 1997).

***Ellipsaria lineolata* (Butterfly).** The butterfly mussel is listed as a state threatened species by the Illinois Department of Natural Resources (IDNR; Illinois Endangered Species Protection Board, 2011), indicating that this species has also suffered serious population declines over time, and is likely to become a state endangered species within the foreseeable future. Due to the limited numbers of extant viable populations of this species within the State, special precautions are taken by the IDNR to protect live individuals from harm, as well as to provide assistance in the re-establishment of populations in areas where they formerly existed. In the case of the proposed dredging activity by Frentress Lake Marine Center (FLMC), a conservation plan is herein presented for this species in conjunction with an application for an ITA permit to minimize any adverse effects upon this species.

The historic geographic distribution for *E. lineolata* within Illinois has mainly included reaches within the larger border rivers of the state, such as the Mississippi, Ohio and Wabash; as well as the larger interior rivers, such as the Illinois and Rock. The vast majority of specimens that have

been collected and logged into the record of the Illinois Natural History Survey since 2001 have been collected in the Mississippi River (INHS, 2014). Records for the INHS collection include specimens that have been collected in the Mississippi River off the following counties of western Illinois, proceeding from north to south: Jo Daviess, Carroll, Whiteside, Rock Island, Mercer, Henderson, Hancock, Adams, Pike, Calhoun, Jersey and Madison. Four records are available for Jo Daviess County for specimens that were collected from the Mississippi River. These were collected in 1979, 2001 (2), and 2010. Single specimens were added to the INHS collection from the Mississippi River in Grant County, WI, in 1995; from Dubuque County in 1999; and from Jackson County, IA, in 2010. In a survey conducted in 2000 in the Mississippi River at Bellevue, IA (Jackson County) immediately below Lock and Dam 13 at RM 556, 2 live butterfly mussels were collected, representing 0.5% of the 389 mussels that were collected (Marangelo and Dunn, 2000). Further downstream (RM 485.8-492.4; Quad Cities), the results for three sites surveyed in 1994-95 showed that the butterfly was the second most abundant unionid species overall, representing from 12.7 to 30.0 percent of the mussel community at each of the three sites (Whitney et al., 1997). A total of 218, 248 and 1,133 live butterfly mussels were collected at the three sites. Recruitment of mussels < 30 mm was variable between sites, with two sites having juvenile mussels present at a density of 0.6/m2, and the third site with 3.3/m2.

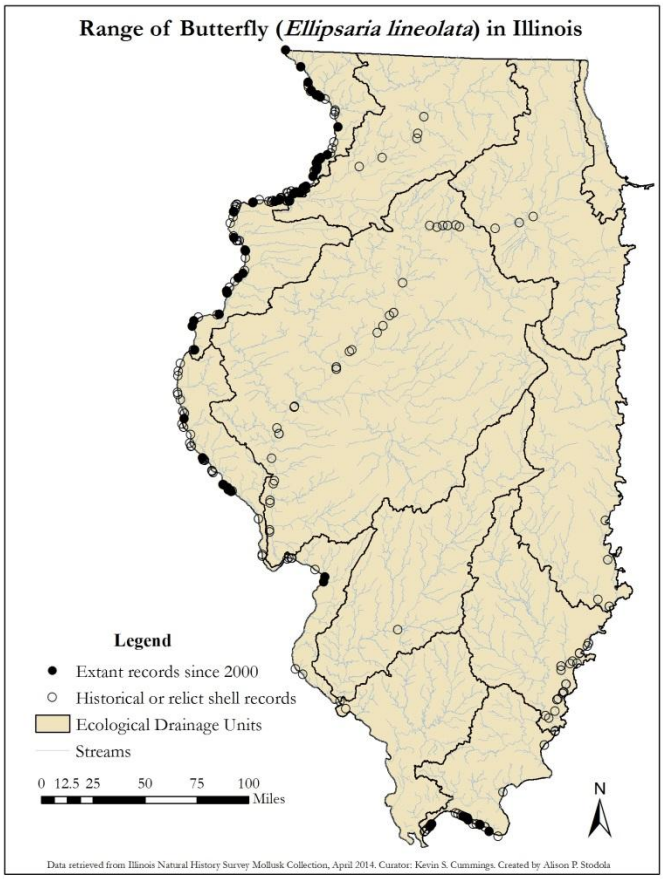

Figure 3. Range of butterfly (*Ellipsaria lineolata*) in Illinois (INHS, April 2014).

The butterfly has a unique appearance, being yellow to yellowish-brown or yellowish-green in color, with scattered broken brown rays (INHS, 2014). The broken rays leave a distinctive pattern of V-shaped or rectangular brown markings within the rays. The unique coloration of this species aids in its ready identification upon collection. It has been described as having a "dazzling golden-yellow shell with dark, broken radiating rays", with the overall shape, when viewed from a distance, as resembling a butterfly at rest (Great Plains Nature Center, www.gpnc.org/butterfly.htm). The nacre layer on the inside of the shell is white in color. It grows to a length of approximately 5 inches.

Various online documents regarding the preferred habitat of the butterfly have stated that it prefers a substrate of coarse sand and gravel in larger rivers, where the current is fairly swift. This type of substrate is typical of river stretches with a higher current velocity, as compared to stretches with less velocity, which are more depositional in nature, with substrates consisting of greater proportions of the finer silt and clay particles.

The life cycle of the butterfly starts with fertilization of the eggs, when sperm from a male are taken into the female's body via the incurrent siphon. This typically occurs in the summer months. The butterfly mussel is bradytictic, with females brooding their young long-term, from August of one year to July of the following year (MN DNR, 2014). The resultant embryos develop into glochidia larvae, which the female retains in her marsupial tubes within the gill region. Once they have reached this stage, they are ready to be discharged onto a fish. Several fish species may assume the role as a host for the larvae for a short period of time, including the freshwater drum (*Aplodinotus grunniens*), green sunfish (*Lepomis cyanellus*) and sauger (*Stizostedion canadense*). It is thought that the walleye (*Stizostedion vitreum*) and other sunfish in the genus *Lepomis* may also serve as host species. When a fish of a suitable species is attracted to a female mussel, she forcibly ejects the glochidia into the water, and the glochidia latch onto the gills or fins with their valves. Their attachment is aided by one or more tooth-like projections on each valve. After a time of further development as a fish parasite, the glochidia metamorphose into juvenile mussels, and drop off of the gills into the sediment of the river to continue development as a more sedentary mussel. While it is not exactly known at what age this species reaches sexual maturity, Whitney et al. (1997) estimated the mean number of years to range from 7.2 to 8.4 for five other Unionid species in the Mississippi River from Pool 15. Their nutrition for growth is derived from plankton that is taken in via their incurrent siphon, with subsequent digestion and assimilation.

C. Description of Activities

The proposed maintenance dredging activity involves the removal of sediment to maintain adequate depth for safe passage of boats between the FLMC marina and the side channel of the River that is immediately adjacent to the main channel. Hydraulic dredging is proposed in a side channel area (Fig. 4), with the dredged sediment disposed of in an existing State-approved confined disposal facility for hydraulically dredged material. This disposal permit (No. 2009-EA-2742) was issued to FMLC by Illinois Environmental Protection Agency, Water Management Section (BOW # 15) on November 6, 2009. It expires on October 31, 2014.

One live black sandshell and 3 dead specimens of this species were collected in a preliminary mussel community survey funded by FMLC in September, 2013 (Appendix 5). These four mussels represented 0.40 percent of the 998 mussel total, living and dead, that were collected. The single live black sandshell that was collected represented 0.11 percent of the 942 live mussels that were collected. Since the live black sandshell represents a very small component of

the mussel community at this location, the chance is small for the loss of this species from this area due to dredging.

One dead butterfly was collected in the preliminary mussel survey of 2013 (Appendix 5). This represents 0.10 percent of the 998 mussel total, living and dead, that were collected. Since the butterfly represents a very small component of the mussel community at this location, the chance is small for the loss of this species from this area due to dredging.

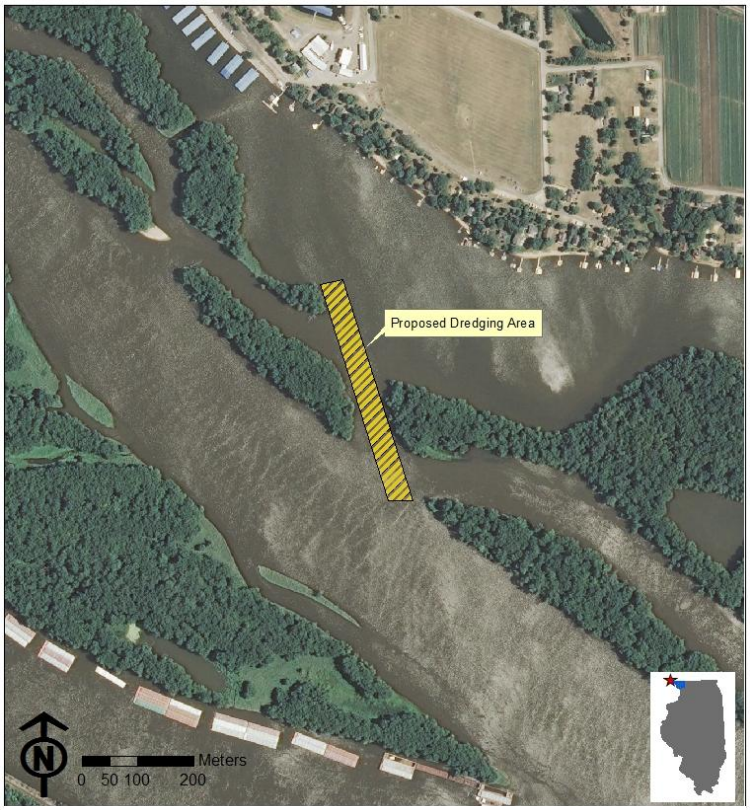

Figure 4. Location of proposed dredging.

D. Explanation of Adverse Effects on Listed Species

The potential exists for the incidental take of some individuals of the listed species due to the nature of hydraulic dredging and sediment disposal. However, the chance for this to occur is small due to the very low relative abundances for each of these species as determined in the mussel survey at this location in 2013 (Appendix 5).

The proposed dredging activity should not result in the extirpation of either of these species from this area of the Upper Mississippi River. As noted in the species descriptions, live individuals for both of these species have been collected at sites in the Mississippi River not far distant from the site proposed for dredging. The black sandshell was the second most abundant species in a survey approximately 20 miles downstream at Bellevue, IA; and the butterfly was the second most abundant species in a survey conducted in the River at the Quad Cities, approximately 70 miles downstream from the site proposed for dredging.

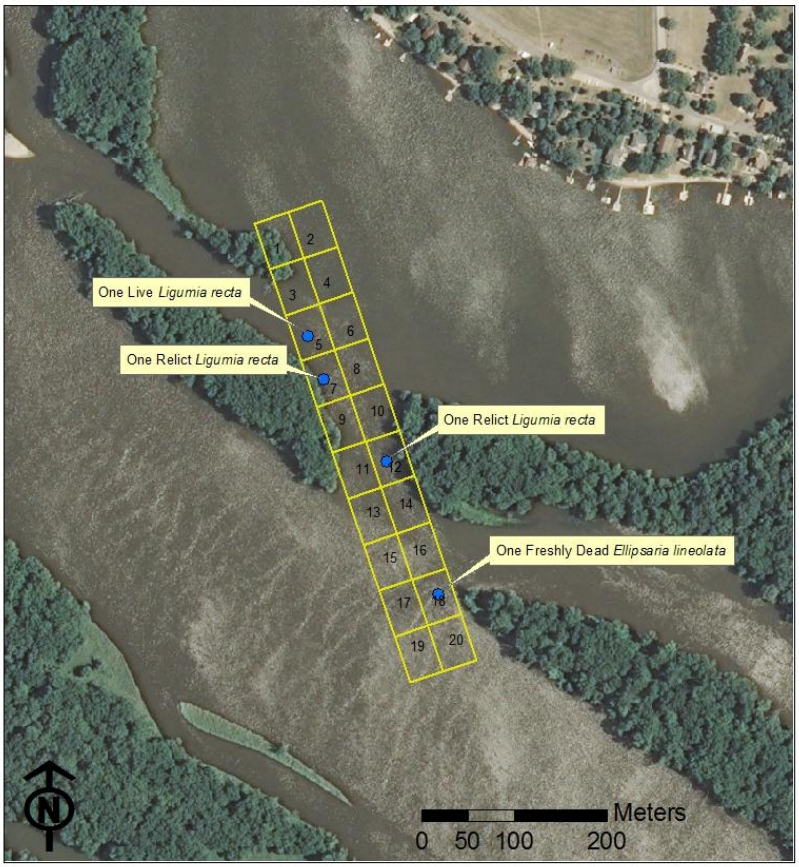

Figure 5. Location map of 2013 survey area depicting plots where State threatened mussels were collected.

The substrate that is proposed to be dredged consists mainly of smaller sized particles. In the mussel survey that was conducted in 2013, samples of sediment were collected from each of the 20 plots. These sediment samples were characterized by drying, sieving into several size-class fractions, and weighing the fractions. None of the sites had size-class fractions that would be characterized as coarse sand, gravel, cobble or rock. Rather, the substrates from all sites were characterized as consisting of the following smaller size-classes: medium sand (>425µm), fine sand (425-75 µm), and silt & clay (<75 µm). The substrate types that were present in the 20 plots of the proposed area for dredging were not consistent with the substrate types that are commonly stated as the preferred substrates for the black sandshell or butterfly; namely, coarse sand and gravel. The proposed area for dredging appears to be an area of sediment deposition, and hence the need for removal of this finer-sized material by dredging. Due to the nature of the substrate, it is thought that the likelihood is small for the occurrence of black sandshell and butterfly mussels in the immediate area of the proposed dredging activity.

2. IMPACT MINIMIZATION AND MITIGATION MEASURES

A. Plans to Minimize the Affected Area and Number Taken

The area that is to be physically dredged cannot be minimized. The proposed dredging area has already been reduced to the minimum width and length to accommodate the existing traffic to and from FLMC. However, effects upon the immediate surrounding habitat are minimized by the nature of the hydraulic dredging process and the disposal of the dredged sediment into a confined disposal area.

A concerted effort is proposed to minimize the number of black sandshell and butterfly mussels taken from the area to be dredged. The single live black sandshell that was collected in the mussel survey of 2013 was collected in Plot 5 of the survey area. The shells of dead specimens of this species were collected from Plots 7 and 12. The single butterfly that was collected was a dead specimen having intact valves. It was collected from Plot 18. We propose to minimize the incidental take of these two species by conducting 40-minute collection dives within each of these plots, and relocating any black sandshell or butterfly mussels that are collected to safe and suitable habitat in the Mississippi River at a site that is within one river mile from their collection sites. The GPS coordinates of this relocation site will be recorded for possible use in future dives. Suitability of the new habitat will include consideration of substrate type, depth, current velocity, and the likelihood for safety from human disturbance.

The mussels that are collected will be placed into tanks of regularly renewed Mississippi River water that will be monitored for temperature and dissolved oxygen to maintain these parameters at values similar to those for the River water from which the mussels were collected. Any collected black sandshell or butterfly mussels will be carefully hand-placed into the sediment. Other non-listed species will be gently released into the water over the side of the boat outside of the dredging area.

The greatest numbers of total mussels in the 2013 survey were collected in Plots 5 and 8, where a 20-minute dive in each plot resulted in total counts of 175 and 163 mussels, respectively. A quantitative 0.25 m^2 quadrat survey was conducted in Plot 8, which yielded a mean density of 5.2 ± 2.4 mussels/sample, or 20.8 ± 9.6 mussels/m^2. This conservation plan also proposes to conduct a 40-minute collection dive in Plot 8 for the purpose of collecting and relocating all collected mussels. This will further minimize the possibility for incidental take of either the black sandshell or butterfly, and also minimize possible adverse effects on non-listed mussel species.

B. Plans for Management of the Area Affected

No specific plans are proposed to manage the dredged area. The upstream and downstream areas will remain the same. Recolonization of mussels in the dredged area will likely occur naturally. In fact, from the 2013 mussel survey, this appears to have occurred in Site 8, where the number of collected mussels in 20-minute dives was the second greatest out of 20 plots. A sharp drop-off line in the river bed at this site suggested to the diver that it may have demarcated the dredged area from previous permitted dredging.

C. Description of Measures Implemented to Minimize Effects

The proposed dredging activity is scheduled to occur in August and early September, 2014. The proposed dives for the purpose of relocating mussels from Plots 5, 7, 8, 12 and 18 are scheduled

for July or early August, 2014. It is anticipated that the collection and relocation of mussels will be completed in the course of one work day.

Possible sites for the relocation of collected mussels will be selected by Dan Call and Mike Malon prior to the arrival of the divers and mussel experts, Bob Schanzle and Dan Sallee. From the possible sites, a final single site for the relocation of the collected mussels will be determined in consultation with the dive team.

In the event that we collect one or more live individuals of any species that is listed with the State of Illinois other than the black sandshell or butterfly, or that is listed with the U.S. Fish & Wildlife Service, we request authorization to relocate these individuals out of the proposed area to be dredged to the safe site that has been selected for relocation. Jenny Skufca, Endangered Species Project Manager, IDNR, and Jon Duyvejonck, Rock Island Ecological Services Field Office, USFWS, will be contacted immediately regarding the collection and relocation of other listed species.

D. Plans for Monitoring Effects of Measures

There are no specific plans proposed to monitor the mussel community following the proposed dredging activity.

E. Adaptive Management Practices to be Implemented

While the proposed conservation plan is designed specifically for the state threatened black sandshell and butterfly mussels, there is a small chance that other species of State or federally listed mussels will be collected. In that event, appropriate personnel from the IDNR and USFWS will be contacted to alert them of the collection of any such mussels. Our proposed adaptive management practice will be to handle all mussels with care, hold them in water that is of suitable temperature and dissolved oxygen concentration, and carefully release them to the selected relocation site. All individuals of mussels that are State or federally listed will be hand-placed into the sediment at the relocation site. All of these species will be photographed prior to relocation. Age, length and height will be recorded, and GPS coordinates of the relocation site will be documented. Any colonization by *D. polymorpha* will be counted, removed, and destroyed.

F. Verification of Funding and Support for Mitigation

Frentress Lake Marine Center, Inc. (FLMC) is committed to funding the operation of the dredging operation and all costs associated with the requirements for obtaining a permit to dredge, including this conservation plan. FLMC funded the mussel survey of 2013, which covered 20 plots within the proposed dredging area. In this survey, the presence of 1 dead butterfly, l live and 2 dead black sandshell mussels were collected.

FLMC is committed to providing the funding for a dive team of mussel experts (Bob Schanzle and Dan Sallee) and the conservation plan developers (Dan Call and Mike Malon) to proceed with the conservation plan. The conservation plan developers will take responsibility for ensuring that the plan is implemented as proposed.

3. ANALYSIS OF ALTERNATIVES

Several alternatives were considered in preparation of the proposed plan. Those options include:

1. Abandoning the dredging effort.
2. Reducing the proposed dredging area.
3. Relocating mussels in the dredging area
4. Taking no action to reduce impact on the potentially impacted species.

Alternative 1. Eliminating the proposal for hydraulic dredging would have severe economic consequences on FLMC as well as affecting public safety. With shipping, fishing, recreational river access, and research use through Frentress Lake, eliminating access to Frentress Lake could have an impact of over $1 million annually. Frentress Lake Marina also performs recovery work for boats, vehicles and machinery which must be recovered from the Mississippi River and its backwaters. Eliminating access from Frentress Lake will make recovery more difficult. Over 80 homes are located around FLMC using the lake as a recreational area. Cutting off access to the Mississippi River would reduce property values on these homes. Additionally, the filling of the original dredge cut is creating a public safety concern as users of Frentress Lake can bottom out their boats in shallower areas. The channel accessing FLMC may not completely fill with sediment and block access to FLMC, but the consistency in both width and depth of the channel has been compromised.

Altenative 2. The dredging area has already been reduced for minimal impact. The maximum width of the dredging area has been reduced to approximately 50 meters wide needed to accommodate two directions of boat travel and some larger boats which access the marina. The areas where *L. recta* and *E. lineolata* specimens were recovered were outside of the proposed dredging area but included in the study area as recommended by the draft sampling guidelines provided by the U.S. Fish and Wildlife Service (2012). Because of the high sediment bedload, characteristic of the Mississippi River, smaller alterations in substrate associated with smaller dredging impact areas could result in faster deposition to the proposed dredging area, causing the need for more frequent dredging to occur, and causing greater disturbance to the mussel community in the area.

Alternative 3. The proposed effort to identify and relocate affected mussel species in the impact area balances and optimizes the probable locations for encountering any threatened and endangered species as indicated by the 2013 mussel survey, as well as large numbers of individuals which could be relocated, with the lowest cost alternative for FLMC. Mussel

collections will take place in plots 5, 7, 8, 12 and 18 (as demarcated in the 2013 survey, Appendix 5) with divers spending a total of 40-minutes for collecting in each plot. Any species identified as threatened or endangered by the U.S. Fish and Wildlife Service or State of Illinois will be documented and relocated to a suitable relocation site. Authorities will be notified if threatened or endangered species are found.

Alternative 4. FLMC would not take any action to identify or relocate any individuals of the mussel community. Dredging would take place the full width of the channel to maximize boat passage.

4. DATA AND INFORMATION ON SURVIVAL OF THE THREATENED SPECIES IN THE EVENT OF INCIDENTAL TAKE

Black sandshell. Records for the black sandshell within Illinois show that is has been collected over the years from throughout the state in rivers of large and medium size (INHS, 2014). Since 2000, specimens of this species have been collected in many rivers of the state, including the Apple, Fox, Illinois, Iroquois, Kankakee, Kishwaukee, Mackinaw, Mississippi, Ohio, Rock, Sangamon, and Vermilion. It is considered to be a widely distributed, but uncommon, species, indicating that its relative abundance in any given mussel community is generally low. This appears to be the case in the habitat of the proposed dredging activity, based on the survey that was conducted in 2013. However, it may be noted that its relative abundance was high (21.1%) in the mussel community in the Mississippi River at Bellevue, IA, 20 miles downstream from the Frentress Lake site. The threeridge (*Amblema plicata*) and black sandshell were the two most abundant species at Site 1 in the Mississippi River near Sabula, IA, and Savana, IL, in a survey conducted in 2001 (Elzinga and Dunn, 2002). There, in seven undisturbed thalweg sites, 14 black sandshells were collected out of 313 mussels total, representing 4.5% of the entire live mussel community.

Host species for glochidia of the black sandshell include the bluegill, largemouth bass, white crappie and sauger. Several other fish species have successfully served as hosts in laboratory studies, as well. As these fish species are known to exist as healthy populations in the Mississippi River, it is not likely that the proposed dredging activity will negatively impact their populations or their capabilities to serve as hosts for the larval life-stage of the black sandshell.

While efforts will be undertaken to minimize the incidental take of the black sandshell by searching for the species in plots where it was collected in the 2013 survey, a slight chance exists for the incidental take of individuals of this species. Should this occur, it is thought that the take will not negatively impact the survival of the species. It is possible that the survival of the black sandshell population could be enhanced with the relocation of males and female in closer proximity to one another at the relocation site, should any mussels of both sexes be collected prior to dredging.

Butterfly. Records for the butterfly within Illinois show that it has been collected over the years from the larger rivers in the state (INHS, 2014). Most of the records are from the Mississippi, Illinois and Ohio Rivers. In the Mississippi River, specimens have been collected from 10 western counties starting with Jo Daviess in the northwestern corner of the state down to Calhoun County. In a survey at Bellevue, IA, two live butterflies were collected, out of a total of 389 mussels (Marengelo and Dunn, 2000). One live butterfly out of a total of 313 live mussels, or 0.3% of the mussel community, was collected in 2001 near Savana, IL, and Sabula, IA (Elzinga and Dunn, 2002). Further downstream at the Quad Cities, the butterfly was the second most abundant species in a study conducted in 1994-95 (Whitney et al., 1996). There, it comprised from 12.7% to 30.0% of the total mussel community at each of three sites. From the survey at the proposed dredging site near FLMC that was conducted in September, 2013, one dead butterfly was collected out of a total of 998 mussels, representing 0.10% of the total. Due to the nature of the sediment substrate over much of the proposed area to be dredged (i.e., fine sand, silt and clay) in comparison to the preferred habitat of the butterfly (coarse sand and gravel), and the small representation of this species in the mussel community of the immediate area, it is anticipated that the likelihood for incidental take of the butterfly is very small.

Host species for glochidia of the butterfly include the freshwater drum, green sunfish and sauger. Other species in the genus *Lepomis* and the walleye have been found to serve as hosts in laboratory studies, and may possibly serve as hosts in the field environment. Considering only those species that are known to serve as hosts in the field, the drum, green sunfish and sauger are common species to this stretch of the Mississippi River. We do not anticipate that their populations will be negatively affected by the dredging activity. Therefore, we do not anticipate that the proposed dredging will affect their potential to serve as larval hosts for the butterfly.

An effort will be made to collect live butterfly mussels from Plot 18 of the 2013 survey area, where the lone dead specimen was collected. A slight chance exists for the incidental take of live individuals of this species. All live individuals of this species will be carefully handled, and relocated to a site out of harm's way. In the event that mature individuals of both sexes are collected and relocated, this relocation may possibly benefit their recruitment due to placement in closer proximity to one another.

5. IMPLEMENTING AGREEMENT

A. Names and Signatures of Participants in the Execution of the Plan

I certify that the conservation plan will be followed as described within the document and provide the required projects updates and monitoring information.

Tim Petitgout, President, Frentress Lake Marine Center, Inc.

_____ _____

Signature Date

Dr. Daniel Call, Co-Principal, Environmental Research & Information Analysts, LLC

_____ _____

Signature Date

Mike Malon, Resource Conservationist, Jo Daviess County Soil & Water Conservation District

_____ _____

Signature Date

Bob Schanzle, Professional Mussel Diver and Malacologist

_____ _____

Signature Date

B. Obligations and Responsibilities of Identified Participants

Responsibilities

Frentress Lake Marine Center shall be responsible for implementing the proposed conservation plan. Dan Call and Mike Malon shall be responsible for carrying out the proposed pre-dredging collection and potential relocation of affected species, with Bob Schanzle and Dan Sallee performing diving and collection. A summary report will be written and submitted to the Illinois

Department of Natural Resources and U.S. Fish and Wildlife Service (USFWS) when the dredging has been completed.

Estimation of Schedules

All dates listed are subject to change due to weather conditions, river conditions, permitting approvals or other factors. The dates submitted are appropriate for not affecting the next successive stage in the conservation plan and compromising overall conservation plan success.

May 1, 2014. Submit conservation plan to Illinois Department of Natural Resources (IDNR) for approval.

June 1, 2014. Receive comments from IDNR requesting any changes to the proposed conservation plan.

July 1, 2014. Receive approval of the Conservation Plan from IDNR. Once approval has been granted, the dive team will be notified and field work will be scheduled in coordination with dredging. Possible relocation sites will be identified. Dredging infrastructure will be installed (floating pipeline).

August 1, 2014. When weather and river conditions allow, diving and collection will begin. Once diving has been completed dredging will begin. Any taking (pursuant to subsection (d), 17 IL Administrative Code, 2001) shall be reported in writing within 10 working days.

September 15, 2014. Dredging shall be completed and all construction activities in the project area will cease.

November 1, 2014. Final report will be submitted to IDNR and USFWS.

C. Assurance of Compliance with Regulating Authorities

Illinois Department of Natural Resources, Office of Water Resources – "The Department has the power to take all measures necessary for the conservation , preservation, distribution, introduction, propagation, and restoration of fish, mussels, frogs, turtles, game, wild animals, wild fowls, and birds" (Civil Administrative Code of Illinois, 2000). All necessary permits and authorizations have been completed (Appendices 1-4).

D. Copies of Existing Authorizations

See Appendices, 1-4.

6.0 REFERENCES

Civil Administrative Code of Illinois, 91-239. (2000).

Elzinga, W. and H. Dunn. 2002. Evaluation of unionid mussel colonization within thalweg and island creation areas potentially affected by dredged material placement within Pools 12, 13 and 14 of the Upper Mississippi River, Draft Report to the U.S. Army Corps of Engineers, Rock Island, IL. 57 pp. Available: www.watertoolbox.us/mvp/mussels_dev.intro.main. Accessed April 9, 2014.

Great Plains Nature Center. Date unavailable. Butterfly, *Ellipsaria lineolata*. Available online: www.gpnc.org/butterfly.htm. Wichita, KS. Accessed March 31, 2014.

Great Plains Nature Center. Date unavailable. Reproduction in unionid mussels. Available online: www.gpnc.org/mrepro.htm. Wichita, KS. Accessed April 2, 2014.

Illinois Endangered species Protection Board. 2011. Checklist of endangered and threatened animals and plants of Illinois. Illinois Endangered Species Protection Board, Springfield, IL. 18 pp. Available online: www.dnr.illinois.gov/ESPB/Documents/ETchecklist2011.pdf. Accessed March 31, 2014.

Illinois Administrative Code 17, Chapter 1, § 1070. (2001).

INHS, 2014, April. Illinois Natural History Survey Mollusk Collection, 2014. Illinois Natural History Survey, Champaign IL. Available online: www.inhs.illinois.edu/collections/mollusk. Accessed March 31, 2014.

INHS, 2014. INHS 136 *Ligumia recta* (Lamarck 1819), Butterfly. Illinois Natural History Survey, Champaign, IL. [species description]. Available online: www.inhs.illinois.edu/collections/mollusk/publications/guide/index/106/. Accessed March 31, 2014.

INHS, 2014. INHS 106 *Ellipsaria lineolata* (Rafinesque 1820), Black Sandshell. Illinois Natural History Survey, Champaign, IL. [species description]. Available online: www.inhs.illinois.edu/collections/mollusk/publications/guide/index/136/. Accessed March 31, 2014.

Marangelo, P. J. and H. L. Dunn. 2000. Evaluation of Unionid Mussels: Bellevue, Iowa, Highway 52 Section 14 Streambank Stabilization, Pool 13, Mississippi River. Final report to US Army Corps of Engineers, Rock Island, IL. Ecological Specialists, Inc. St. Peters, MO. September, 2000. Available online: www.watertoolbox.us/mvp/mussels_dev.intro.main. Accessed April 9, 2014.

MN DNR. 2014. *Ligumia recta* (Lamarck 1819), Black Sandshell. Minnesota Department of Natural Resources, St. Paul, MN. [species description]. Available online: www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElementIMBIV26020. Accessed March 31, 2014.

MN DNR. 2014. *Ellipsaria lineolata* (Rafinesque 1820), Butterfly. Minnesota Department of Natural Resources, St. Paul, MN. [species description]. Available online: www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElementIMBIV13010. Accessed March 31, 2014.

Mulcrone, R. 2006. "*Ligumia recta*" (On-Line), Animal Diversity web. Available online: http://animaldiversity.ummz.umich.edu/accounts/Ligumia_recta/. Accessed April 3, 2014.

U.S. Fish & Wildlife Service. 2012. J. Duyvejonck (Ed.). Draft guidelines, Upper Mississippi River mussel sampling guidelines for activities requiring federal permits. U.S. Fish & Wildlife Service, Rock Island Field Office, Rock Island, IL. 12 pp. Feb 22, 2012.

Whitney, S.D., K.D. Blodgett and R.E. Sparks. 1997. A comprehensive evaluation of three mussel beds in Reach 15 of the Upper Mississippi River. Illinois Natural History Survey Aquatic Ecology Technical Report 1996(7), Havana. Reprinted buy USGS, Environmental Management Technical Center, Onalaska, WI. 155 pp. Available online: www.watertoolbox.us/mvp/mussels_dev.intro.main. Accessed April 9, 2014.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Authorization is hereby granted, under Section 5/3.22, Chapter 520 and Section 5/20-100, Chapter 515 of the Illinois compliled Statues to:

Last Name: **Call** First Name: **Daniel J.** Permit Number: **A14.5719**

Issued: **10/1/2013** **Expires: 12/31/2014**

Business Name: Env Research & Information Analysts, LLC

Street Address: 11367 Robin Hood Drive

City: Dubuque State: IA Zip Code: 52001

for strictly scientific, educational or zoological purposes, to take the Illinois fauna identified below subject to the following provisions:

Applicant and all research associates may conduct live trapping (unharmed release or limited euthanization) and/or salvage surveys for all non-listed fish and macroinvertebrates throughout the entire State of Illinois (all Illinois counties). These surveys shall be conducted via scientifically accepted survey methods and all collected specimens may be tagged/marked, photographed if desired, and sacrificed/euthanized for storage in permanent collections. All non-sacrificed specimens shall be released unharmed at or near the original capture location once data is collected [As listed on the accompanying Illinois Department of Natural Resources (IDNR) scientific permit application/project proposal (on file in Springfield, IL.)] strictly for scientific, educational, and/or zoological purposes]. A federal permit is required for all projects involving federally regulated species, including migratory birds. If Endangered and Threatened Species are to be captured, handled, and/or collected, the IDNR Division of Natural Heritage, Endangered Species Coordinator must first be notified and must approve in writing all project related activities of the permit applicant and a separate Endangered Species Permit must be issued covering such activities.

I agree to the following provisions and terms of this Scientific Permit.

Permittee's Signature: Daniel J. Call Approved By: Date: 10/3

(Permit not valid unless signed) Office of Resource Conservation

TERMS FOR SCIENTIFIC PERMIT

1. Under no circumstances shall a scientific permit be used in lieu of sport or commercial licenses.
2. All taking shall be performed by or under the direct supervision of the permittee. Permitte must be present with persons involved in actual taking.
3. All gear left unattended must be tagged bearing name and scientific permit number of permittee.
4. Permittee must be at least eighteen (18) years of age.
5. Permits are not transferable and PERMITTE SHALL CARRY PERMIT AT ALL TIMES WHEN TAKING FAUNA.
6. Agency, company or institution listed on the application is responsible for the taking activities and reports of the individual issued this permit
7. Scientific permits will not be valid for taking any species appearing on official State List of Endangered and Threatened Vertebrate Species of Illinois (see attached Administrative Rule, Part 1010) without specific written approval from the Department of Natural Resources.
8. A federal Permit is required for the taking of species protected by the Federal Government in addition to the State Scientific Permit.
9. The Division of Wildlife Resources may require special conditions or provsions on any Scientific Permit.
10. Use of rotenone or any other toxic materials for taking must have special written approval from the Department of Natural Resources and may need a variance from the Illinois Environmental Protection Agency.
11. By january 31 of next year, an annual report of the permittee's activies must be submitted to the Division of Wildlife Resources. In addition, the permittee shall submit a copy of all written reports, etc. that result from the permitted activity. Permits will be renewed after these annual reports and appropriate publications have been received.
12. Any permit may be revoked or suspended at any time by the Department of Natural Resources.
13. Permits expire December 31 each calendar year unless otherwise specified.

The Department of Natural Resources is an equal opportunity employer.

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

DANIEL J CALL DR
dba ERIA, LLC
11367 ROBIN HOOD DRIVE
DUBUQUE, IA 52001
U.S.A.

2. AUTHORITY-STATUTES
16 USC 1539(a)

REGULATIONS
50 CFR 17.22

50 CFR 13

3. NUMBER
TE07293B-0

4. RENEWABLE
☒ YES
☐ NO

5. MAY COPY
☒ YES
☐ NO

6. EFFECTIVE
08/07/2013

7. EXPIRES
12/31/2013

8. NAME AND TITLE OF PRINCIPAL OFFICER *(If #1 Is a business)*

9. TYPE OF PERMIT
NATIVE ENDANGERED SP. RECOVERY - E WILDLIFE

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
UPPER MISSISSIPPI RIVER, POOL 12

11. CONDITIONS AND AUTHORIZATIONS:

A. GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL, TRIBAL, OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

C.1. VALID FOR USE BY DANIEL J. CALL, MICHAEL MALON, AND ROBERT SCHANZLE. ALL ACTIVITIES SHALL BE CONDUCTED UNDER THE DIRECT AND ON-SITE SUPERVISION OF ROBERT SCHANZLE.

D. ACCEPTANCE OF THIS PERMIT SERVES AS EVIDENCE THAT THE PERMITTEE AND ITS AUTHORIZED AGENTS UNDERSTAND AND AGREE TO ABIDE BY THE TERMS OF THIS PERMIT AND ALL SECTIONS OF TITLE 50 CODE OF FEDERAL REGULATIONS, PARTS 13 AND 17, PERTINENT TO ISSUED PERMITS. SECTION 11 OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED, PROVIDES FOR CIVIL AND CRIMINAL PENALTIES FOR FAILURE TO COMPLY WITH PERMIT CONDITIONS.

E. PERMITTEE IS AUTHORIZED TO TAKE (CAPTURE AND RELEASE) THE FOLLOWING SPECIES FOR QUALITATIVE AND QUANTITATIVE SURVEYS TO SUPPORT RECOVERY AND ENHANCEMENT OF SURVIVAL OF THE SPECIES IN THE WILD:

Fat pocketbook (*Potamilus capax*)
Higgins eye pearlymussel (*Lampsilis higginsii*)
Scaleshell (*Leptodea leptodon*)
Sheepnose (*Plethobasus cyphyus*)
Spectaclecase (*Cumberlandia monodonta*)
Winged mapleleaf (*Quadrula fragosa*)

☒ ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

12. REPORTING REQUIREMENTS
ANNUAL REPORT DUE: 01/31

ISSUED BY	TITLE	DATE
Lisa Mandell	ACTING CHIEF - ENDANGERED SPECIES	08/07/2013

OMB Control Number 1018-0102
Expiration Date: 06/30/2014

For Official Use Only (This section to be filled out by refuge personnel only.)

Special Use Permit

Permit #: 2013-039

1) Date: 8/21/13 2) ◉ Permit Approved ○ Permit Denied 3) Station #: 32576

4) Additional special conditions required: (Special conditions may include activity reports, before and after photographs, and other conditions.)
◉ Yes ○ No ○ N/A

Additional sheets attached:
◉ Yes ○ No

5) Other licenses/permits required:
○ Yes ○ No ◉ N/A

Verification of other licenses/permits, type:

6) Insurance/certifications required:
○ Yes ○ No ◉ N/A

Verification of insurance/certification, type:

7) Record of Payments: ◉ Exempt ○ Partial ○ Full

Amount of payment: N/A Record of partial payment:

8) Bond posted: ○ Yes ◉ No

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the applicant signed below, subject to the terms, covenants, obligations, and reservations, expressed or implied herein, and to the notice, conditions, and requirements included or attached. A copy of this permit should be kept on hand so that it may be shown at any time to any refuge staff.

Permit approved and issued by (Signature and title):

Ed Britton Date: 8-21-2013
* Ed Britton Refuge Station Manager

Permit accepted by (Signature of applicant):

Daniel J. Coll Date: 08/22/2013

FWS Form 3-1383-G
03/11

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 2742-09

PERMIT NO.: 2009-EA-2742

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS PREPARED BY: WHKS & Co.

DATE ISSUED: November 6, 2009

SUBJECT: Frentress Lake Marina, Inc.- Confined Disposal Facility

PERMITEE TO CONSTRUCT, OWN AND OPERATE

Frentress Lake Marina, Inc.
830 W. Gill Road
East Dubuque, IL 61205

Permit is hereby granted to the above designated permittee(s) to construct and/or operate water pollution control facilities described as follows:

The facility is an existing confined disposal facility for hydraulically dredged material, proposed modifications include expansion to approximately 4 acres with a capacity of 70,000 cubic yards and the removal of the existing discharge structure. Material will be dredged from Frentress Lake access channels and from the marina. There will be no wastewater discharge from the facility.

This operating permit expires on October 31, 2014.

This permit renews and replaces Permit Number 2003-EA-3796 which was previously issued for the herein permitted facilities.

This permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: The permittee shall operate the dredge and the disposal facilities such that there is no wastewater discharge from the facility.

SPECIAL CONDITION 2: The permittee shall have the facility inspected by a registered engineer to assess for damage and necessary repairs if dredged material is removed to allow for further disposal operations. The report of the engineer shall be filed with the Agency, and any repairs shall be permitted under supplemental permit, as required. The permittee shall send the inspection reports and requests for modification to the following address:

Illinois Environmental Protection Agency
Watershed Management Section, BOW #15
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

SAK: DRG:2742-2009_State Construction Permit_07Aug09.docx

BUREAU OF WATER

Alan Keller, P.E.
Manager, Permit Section
Division of Water Pollution Control

cc: IEPA, DWPC, FOS, Rockford
Jo Daviess County Dept. of Planning & Dev.
Records
Binds
Attn: Dan Hingtgen, P.E., 1701 Route 35 North, East Dubuque, IL 61025