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**I-294
CORRIDOR**

FRESHWATER MOLLUSK SAMPLING ALONG THE SOUTHERN I-294 CORRIDOR



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ILLINOIS STATE TOLL HIGHWAY AUTHORITY

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Biological monitoring associated with Illinois tollway construction activities (2015–2019)

EXECUTIVE SUMMARY

- Sampled 8 sites at 6 stream crossings
- Spent 13.5 person-hours surveying (average of 2.3 mussels collected/hr)
- Encountered 31 live individuals of 3 mussel species
- Only 2 of the 8 sites had mussels
- Recorded the following species:
 - ▷ Giant Floater, *Pyganodon grandis* (n=29, 94%), most common
 - ▷ Paper Pondshell, *Utterbackia imbecillus* (n=1, 3%)
 - ▷ Lilliput, *Toxolasma parvum* (n=1, 3%)
 - ▷ One native snail, Liver Elimia, *Elimia livescens*, was abundant in Salt Creek
- Invasive Asian Clams, *Corbicula fluminea*, were common at sites
 - ▷ Upstream reach of I-294 to Bemis Woods littered with relict shells of native unionids

INTRODUCTION

The Illinois State Toll Highway Authority (ISTHA) is currently in the planning phases for conducting maintenance and rehabilitation work along the central Tri-State (I-294) from Balmoral Road south to 95th Street. The work is part of their Move Illinois Program, which includes various improvements and maintenance work to the tollway road network. Although the current planning is for rehabilitation, the ISTHA is currently assessing whether construction should include additional capacity (e.g., additional lanes) to ease current traffic congestion. Within the ISTHA network, I-294 is one of their most heavily trafficked roads. Because of the potential to impact biota and habitats, the ISTHA contracted the Illinois Natural History Survey to perform surveys and habitat assessments of streams and ecologically important areas within a one-mile buffer of the

existing roadway. The results of this report summarize survey efforts for freshwater mollusks during August and September 2015.

Many freshwater mussel populations across North America have drastically reduced ranges, species richness, and population size; it is estimated that ~70% of the approximately 300 mussel taxa are extinct, federally listed as endangered or threatened, or in need of conservation status (Williams et al., 1993; Strayer et al., 2004). Freshwater mussels provide the following ecosystem services: they can have a biomass that exceeds all other benthos by an order of magnitude, are natural biological filters, cycle nutrients, are a food source or provide shelter for other aquatic life and wildlife, and can significantly affect benthic density and community structure (Vaughn et al., 2008 and references therein; Haag, 2012). Recognizing their important role in a stream system is

essential for understanding their positive effects upon human health, since mussels are bio indicators of water quality and sensitive to water quality changes. Illinois, particularly in the Chicago region, is no exception to the species loss still happening today (Price et al., 2012). While we have seen some rebound in certain mussel fauna across the state since the Clean Water Act, pollution and habitat alteration from urbanization remains problematic for mussel populations in these areas.

MATERIALS & METHODS

Sampling methods.—Eight sites on six stream crossings (Des Plaines River basin) within the corridor were sampled for freshwater mussels (Table 1). Live mussels and shells were collected at each site to assess the past and current freshwater mussel occurrences. Survey techniques for live mussels included tactile and visual detection (e.g., trails, siphons, exposed shells). Efforts were made to cover all available habitat types at a site including riffles, pools, slack water, and areas of differing substrates. A two-hour timed search method was implemented at most sites since these were small, degraded headwater streams and previous surveys recorded diminished species richness within the basin (Tiemann et al., 2009; Huang et al., 2011; Price et al., 2012). We held live mussels in mesh bags in the stream until processing.

Following the timed search, all live mussels and shells were identified to species and recorded. For each live individual, shell length (mm), gender, and an estimate of the number of growth rings were documented. Shell material was classified as recent dead (periostracum present, nacre pearly, and soft tissue may be present) or relict (periostracum eroded, nacre faded, shell chalky) based on the condition of the best shell found. A species was considered extant at a site if it was represented by live or recently dead shell material (Szafoni, 2001). The nomenclature employed in this report follows Graf and Cummings (2007) except for recent taxonomic changes to the gender ending of Lilliput (*Toxolasma parvum*), which follows Williams et al. (2008)(Appendix I). We retained voucher specimens and deposited them in the Illinois Natural History Survey Mollusk Collection, Champaign, Illinois. All nonvouchered live mussels were returned to the stream reach where collected.

Water quality.—Water quality measurements of pH, conductivity (μS), total dissolved solids (ppm), and salinity (ppm) were taken with a Multiparameter PCSTestr 35 (Oakton Instruments) on all sampling occasions and summarized in Table 2.

Data analysis.—We compiled a species list, determined species richness, and calculated relative abundance (RA), the Shannon Diversity Index (H), and evenness

Table 1. Site locations within the I-294 corridor.

Drainage	Stream	Common Location	Latitude	Longitude	County	State	Date	Watershed Area (km ²)	
Des Plaines	Willow Creek	I-294/I-90; Ruby Street Bridge	41.9877	-87.8692	Cook	IL	4-Aug-15	57.27	
	Crystal Creek	I-294; Werhman Avenue, on bend	41.9568	-87.8784	Cook	IL	4-Aug-15	6.93	
	Addison Creek	I-294; Northwest Avenue	41.9265	-87.9191	Cook	IL	4-Aug-15	17.75	
	Flag Creek	Spring Rock Park, downstream from I-294		41.8052	-87.9109	Cook	IL	5-Aug-15	30.40
				41.7673	-87.9031	Cook	IL	5-Aug-15	40.17
	Salt Creek	Bemis Woods Forest Preserve		41.8279	-87.9077	Cook	IL	2-Sep-15	304.78
			41.8286	-87.9186	Dupage/ Cook	IL	3-Sep-15	304.78	
Illinois River	Des Plaines	I-294; Canal Bank Road	41.7504	-87.8640	Cook	IL	3-Sep-15	1651.97	

Table 2. Summarized water quality measurements for all sites, except for the Des Plaines.

	Willow Creek	Crystal Creek	Addison Creek	Flag Creek	Salt Creek
pH	8.3	8.6	8.08	8	8.29
Conductivity (μS)	1056	1586	1153	1315.5	1075.5
TDIS (ppm)	756	1160	817	938	773.5
Salinity (ppm)	566	856	610	704	570

Table 3. Summarized mussel survey results for Flag Creek at Cochise Drive and Salt Creek at Dean Nature Preserve within the I-294 project corridor. RA = relative abundance. CPUE = catch per unit effort.

Species	Common Name	Total	RA
<i>Pyganodon grandis</i>	Giant Floater	29	0.784
<i>Toxolasma parvum</i>	Lilliput	1	0.027
<i>Utterbackia imbecillus</i>	Paper Pondshell	1	0.027
Total		31	
Total live species		3	
Extant species		3	
CPUE		2.30	
Richness		3	
Shannon Diversity Index		0.39	
Evenness		0.35	

(H'_E) indices for all sites with live mussels (Brower et al., 1990). Since we found live mussels at only two sites, these metrics were summarized in Table 3.

RESULTS

We sampled 8 sites across 6 stream crossings and encountered 31 live individuals of 3 mussel species in 2 sites (Table 3). We spent 13.5 person-hours surveying with an average of 2.3 mussels collected per hour. The number of live individuals collected at a site ranged from 1 to 30. We recorded Giant Floater, *Pyganodon grandis* (n=29, 94%), as the most commonly collected species. One *P. grandis* individual was found in Salt Creek at Dean Nature Preserve and the remaining individuals plus two additional species, Paper Pondshell, *Utterbackia imbecillus*, and Lilliput, *Toxolasma parvum* (n=1, 3% each), were found in Flag Creek at Cochise Drive. One native snail, Liver Elimia, *Elimia livescens*, was present and abundant in Salt Creek. Further site-specific photographs for mussel surveys within the I-294 project corridor are included in Appendix II as Plates 1–8.

CONCLUSIONS

The decline of freshwater mussel species diversity and community change occurring in the Des Plaines River basin are well documented (Price et al., 2012; Appendix I). Reasons for the dramatic species loss in this region can include decades of pollution problems and municipal structural changes (i.e., low head dams, channel modification) from increased urbanization (IDNR,

2001). Many stream reaches in the Des Plaines basin are considered “not supporting of aquatic life,” primary contact, or secondary contact based on IEPA standards largely due to elevated levels of fecal coliform, suspended solids, contaminants, and sedimentation (IEPA, 2014). Additionally, watershed size for a few streams surveyed could be a natural limiting factor in species richness (Haag, 2012). Therefore, it is not surprising so few live unionids were captured in this survey and in a previous corridor survey (Kuhns et al., 2007).

Flag Creek at Cochise Drive contained the majority of individuals and species found, although it still had poor diversity and evenness indices. The three species (*P. grandis*, *T. parvum*, and *U. imbecillus*) found are typically considered tolerant to poor water quality and can utilize a suite of host fish for successful metamorphosis, which allows these species to persist in degraded stream systems statewide (Douglass and Stodola, 2014). Flag Creek seems to have retained a variety of instream habitat diversity but is dominated largely by soft substrates; however, all three species are well adapted to and can thrive in silt, soft mud, or sand substrates (Cummings and Mayer, 1992).

We recorded one live *P. grandis* in Salt Creek at Dean Nature Sanctuary, but historically 10 species were present in Salt Creek (INHS Mollusk Collection). The reach upstream of I-294 to Bemis Woods is dominated by a sand, gravel, and cobble riffle and littered with relict shells of native unionids and the invasive Asian Clam, *Corbicula fluminea* (Appendix I; Plate 8). One native snail species, *E. livescens*, is present and abundant within the riffle. *E. livescens* occurs statewide and in diverse habitats with flowing water (Baker, 1902; INHS Mollusk Collection). Multiple reaches of Salt Creek remain impounded by several low head dams throughout the river system. Low head dams are known to impede fish passage, dispersal, and significantly alter habitat; hence, these changes can negatively affect survival in a mussel population and are likely contributing factors to the severe species loss evident in Salt Creek (Strayer, 2008).

We encountered live invasive Asian Clams at most sites surveyed, which included a few streams with substrate dominated by spent shells. The success of Asian clams colonizing and persisting within the Des Plaines basin is due to their tolerance to pollution, no intermediate host needed for successful recruitment, and possibly lack of competition from native unionids, especially in streams with high *C. fluminea* densities and little or no live unionid presence (Counts, 1986).

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APPENDIX I

Scientific and common names of mussel species in the Des Plaines River basin. Status refers to conservation status in Illinois (January 2016); FE = federally endangered, SE = state endangered, ST = state threatened, T= species in greatest conservation need.

Subfamily	Presumed extant		Presumed extirpated		
	Common Name	Scientific Name	Common Name	Scientific Name	
Cumberlandinae	---	---	Spectaclecase	<i>Margaritifera monodonta</i> ^{FE,SE}	
Anodontinae	Slippershell Mussel	<i>Alasmidonta viridis</i> ST	Elktoe	<i>Alasmidonta marginata</i>	
	Cylindrical Papershell	<i>Anodontoides ferussacianus</i>	Creek Heelsplitter	<i>Lasmigona compressa</i> ^T	
	White Heelsplitter	<i>Lasmigona complanata</i>	Flutedshell	<i>Lasmigona costata</i> ^T	
	Giant Floater	<i>Pyganodon grandis</i>	Salamander Mussel	<i>Simpsonaias ambigua</i> ^{SE}	
	Creeper	<i>Strophitus undulatus</i>			
	Paper Pondshell	<i>Utterbackia imbecillis</i>			
Ambleminae	Threeridge	<i>Amblema plicata</i>	Pimpleback	<i>Amphinaias pustulosa</i>	
			Purple Wartyback	<i>Cyclonaias tuberculata</i> ST	
			Elephantear	<i>Elliptio crassidens</i> ^{SE}	
			Spike	<i>Elliptio dilatata</i> ST	
			Wabash Pigtoe	<i>Fusconaia flava</i>	
			Sheepnose	<i>Plethobasus cyphus</i> ^{FE,SE}	
			Round Pigtoe	<i>Pleurobema sintoxia</i>	
			Mapleleaf	<i>Quadrula quadrula</i>	
			Monkeyface	<i>Theliderma metanevra</i> ^T	
			Pistolgrip	<i>Tritogonia verrucosa</i>	
			Pondhorn	<i>Unio merus tetralasmus</i>	
	Lampsilinae	Plain Pocketbook	<i>Lampsilis cardium</i>	Mucket	<i>Actinonaias ligamentina</i>
		Fatmucket	<i>Lampsilis siliquoidea</i>	Wavy-rayed Lampmussel	<i>Lampsilis fasciola</i> ^{SE}
Lilliput		<i>Toxolasma parvum</i>	Yellow Sandshell	<i>Lampsilis teres</i>	
Ellipse		<i>Venustaconcha ellipsiformis</i> ^T	Fragile Papershell	<i>Leptodea fragilis</i>	
			Black Sandshell	<i>Ligumia recta</i> ST	
			Pondmussel	<i>Ligumia subrostrata</i>	
			Threehorn Wartyback	<i>Obliquaria reflexa</i>	
			Pink Heelsplitter	<i>Potamilus alatus</i>	
		Rainbow	<i>Villosa iris</i> ^{SE}		
	Total extant = 11		Total extirpated = 25		

APPENDIX II

Site-specific photographs for mussel surveys within the I-294 project corridor.



PLATE 1. Photograph of Willow Creek, Cook County, Illinois.



PLATE 3. Photograph of Addison Creek, Cook County, Illinois.



PLATE 2. Photograph of Crystal Creek, Cook County, Illinois.



PLATE 4. Photograph of Flag Creek at Cochise Drive, Cook County, Illinois.

APPENDIX II [CONTD.]

Site-specific photographs for mussel surveys within the I-294 project corridor.



PLATE 5. Photograph of Flag Creek at Spring Rock Park, Cook County, Illinois.



PLATE 7. Photograph of Salt Creek at Bemis Woods, Cook County, Illinois.



PLATE 6. Photograph of Salt Creek at Dean Nature Preserve, upstream from I-294, Cook County, Illinois.



PLATE 8. Relict shells of the invasive Asian Clam, *Corbicula fluminea*, composing part of the substrate in Salt Creek at Bemis Woods, Cook County, Illinois.