

Exelon Nuclear 20106
Braidwood-391

**Final Report:
Unionid Relocation near the Braidwood
Nuclear Station Kankakee River Discharge
Location**

Prepared for:

Exelon Nuclear
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1.0 Introduction

Exelon's Braidwood Nuclear Station (Braidwood) is planning construction of a diffuser pipe in the Kankakee River to replace their existing discharge canal. A 2008 unionid (freshwater mussel) brail survey in the Kankakee River near the proposed diffuser pipe location indicated unionids were present (HDR, 2008). Ecological Specialists, Inc. conducted a more comprehensive dive study later in 2008 to better characterize the unionid community and map distribution within this reach of the Kankakee River. Results showed Illinois listed species were present and that higher densities of unionids were located along the right descending bank (RDB) riverward to approximately 30m (ESI, 2009). Braidwood decided to avoid that area of the river by keeping construction approximately 40m away from the RDB (creating a 10m buffer from the observed higher unionid densities; Figure 1-1).

The Kankakee River harbors a diverse unionid community that includes Illinois listed species. The unionid studies in 2008 (see HDR, 2008; see ESI, 2009) resulted in 17 live unionid species (Table 1-1), including three Illinois listed species (*Elliptio dilatata*, *Cyclonaias tuberculata*, and *Vemustaconcha ellipsiformis*). In addition, shells of two other Illinois listed species were encountered (*Elliptio dilatata* and *Plethobasus cyphus* [also a candidate for federal listing]).

In-stream construction activity may disrupt the substrate and, consequently, the animals living in the substrate. Unionids within the area directly affected by construction could be crushed by equipment or permanently buried under excavation spoil. Disruption of the substrate could result in displacement of unionids to unsuitable habitat, which could lead to reduced fitness or death. Construction activities could also lead to altered flow patterns that may increase sedimentation, which is a putative source of unionid declines throughout North America (Fuller, 1974; Aldridge *et al.*, 1987; Williams *et al.*, 1993; Box and Mossa, 1999). Construction impacts to unionids have successfully been mitigated by minimizing the area used for constructing and relocating unionids from areas of unavoidable impact (Dunn *et al.*, 2000).

Ecological Specialists, Inc. was contracted to collect and relocate unionids within the potential impact area where construction of the diffuser is proposed. The objective of this unionid relocation was to minimize impact to the unionid community (specifically Illinois listed species) within the Kankakee River. This report summarizes the results of the unionid relocation efforts within the project area. Fieldwork was conducted July 28-30, 2010.

2.0 Methods

Two and a half days of collection and relocation effort was spent within the study area. The first half-day focused on locating and evaluating the relocation area and collecting the area at, and upstream of, the current outfall where the pipe will enter the Kankakee River (Figure 2-1). Day 2's focus was collecting unionids from the general area downstream of the proposed pipe and cofferdam construction area, where siltation and flow alteration during construction may occur (see Figure 2-1). Day 3 collecting was within and around the direct impact area (the proposed cofferdam and pipe centerline).

The relocation area used in a 2009 survey at the screen house upstream of the study site near Horse Creek (ESI, 2009) was checked for suitable unionid habitat and unionid presence. A qualitative search was conducted within this area and conditions appeared appropriate for a relocation site (Figure 2-2). Substrate was a stable mix of cobble, gravel and sand, and the area contained an existing unionid community.

All sampling was timed qualitative searches conducted by two divers simultaneously. These qualitative searches involved the divers probing the substrate visually and tactually for unionids. All live and dead unionids were collected, placed in mesh bags, and sent to the surface for processing by a malacologist.

The Day 1 collection area was shallow and unionids were collected while wading rather than diving. A time of 4 person-hrs was spent collecting unionids within this area. Unionids were collected from the general area downstream of the cofferdam and pipe on Day 2. Depths were greater in this area and required diving. Effort within this area was 11.3 person-hrs. The focus of Day 3's collecting was the area within and around the proposed cofferdam and along the pipe centerline (the direct impact area). Diving effort was 11.5 person-hrs within the direct impact area and 1.3 person-hrs along the pipe centerline on Day 3.

Live unionids were identified, counted and recorded as adult or juvenile (Lampsilines and Anodontines ≤ 3 yrs, Amblemines ≤ 5 yrs; external annuli count). Species designated in Illinois as endangered, threatened, or of special concern were photographed. Depth (m) and substrate (Wentworth scale) were also noted. To minimize stress on the unionids, live individuals were retained in live-wells with fresh river water to the relocation area. Live unionids were scattered throughout the relocation area. Listed species were placed into the substrate with the posterior end pointing away from the substrate surface (see Dunn *et al.*, 2000).

3.0 Results

As observed in the 2008 study, habitat varied little throughout the collection area with exception of shallower depths near the banks. Habitat throughout the area was a run. Depths near the bank were less than 1m, while depths throughout the other areas ranged from 1.4-2.4m (Table 3-1). Substrate was generally a mix of boulder, cobble, gravel and sand (see Table 3-1). In general, more boulder and less gravel was observed near the center of the river. Habitat in the relocation area was similar.

A total of 911 live unionids of 16 species were collected from potential impact areas and relocated upstream to an area of similar habitat. The following unionids were collected during the relocation effort: *Actinonaias ligamentina* (n=798), *Amblema plicata* (n=37), *C. tuberculata* (n=8), *Fusconaia flava* (n=6), *Lampsilis cardium* (n=14), *Lampsilis siliquoidea* (n=4), *Lasmigona c. complanata* (n=2), *Lasmigona costata* (n=11), *Leptodea fragilis* (n=5), *Ligumia recta* (n=8), *Pleurobema sintoxia* (n=4), *Potamilus alatus* (n=2), *Pyganodon grandis* (n=1), *Quadrula metanevra* (n=7), *Strophitus undulatus* (n=2), *V. ellipsiformis* (n=2) (see Table 1-1). Two species (*C. tuberculata*, and *L. recta*) are listed as Endangered and one as a species of Special Concern (*V. ellipsiformis*) by the IDNR. Only two juveniles were observed (*A. ligamentina* and *L. cardium*).

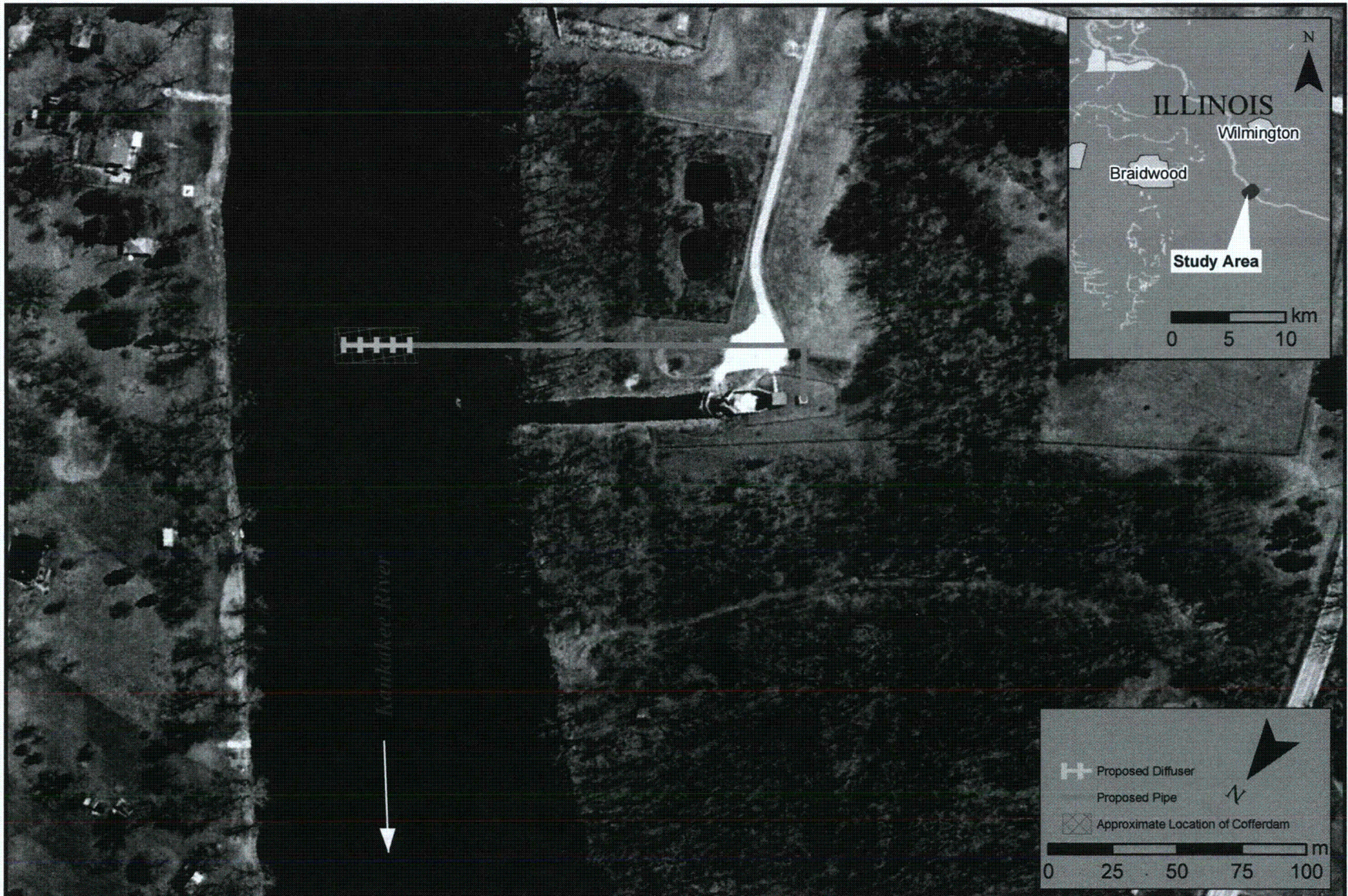
4.0 Summary

Braidwood is planning construction of a diffuser pipe in the Kankakee River upstream of their current outfall canal. Unionid surveys in 2008 identified a concentration of unionids on the left descending bank (LDB) upstream of the diffuser location (see HDR, 2008) and within 30m from the shore along the right descending bank (see ESI, 2009). To minimize impacts from diffuser construction, these areas will be avoided. To mitigate impacts in construction zones, unionids were collected and relocated from potential impact areas July 28-30, 2010. Search effort was concentrated within the direct impact area. A total of 911 live unionids were relocated to an area with suitable unionid habitat upstream, and outside of the potential construction impact area. Eight (8) individuals each of two Illinois threatened species (*C. tuberculata* and *L. recta*) were collected and relocated.

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Figures

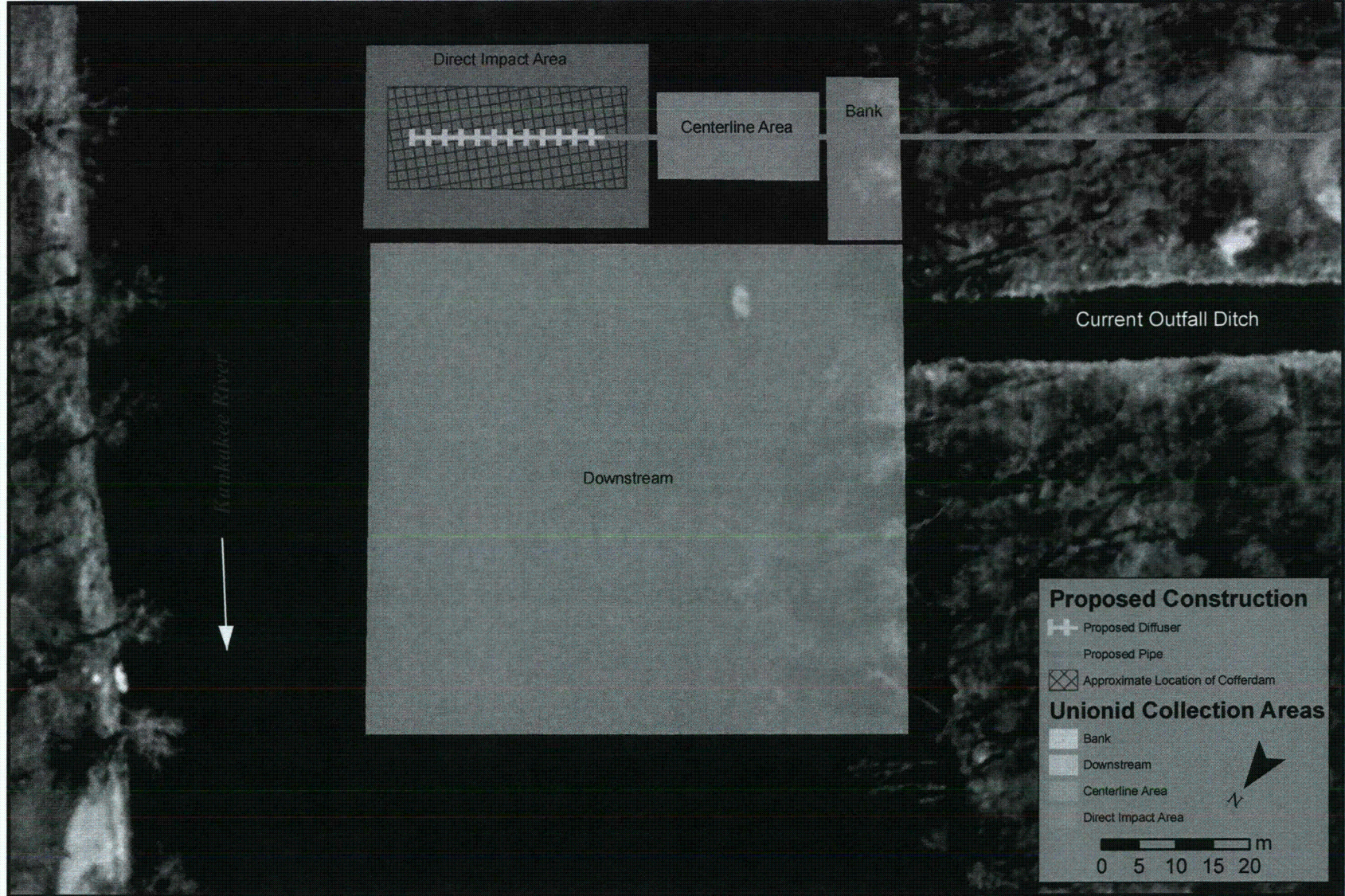


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Figure 1-1. Location of proposed construction in the Kankakee River near Braidwood, Illinois.

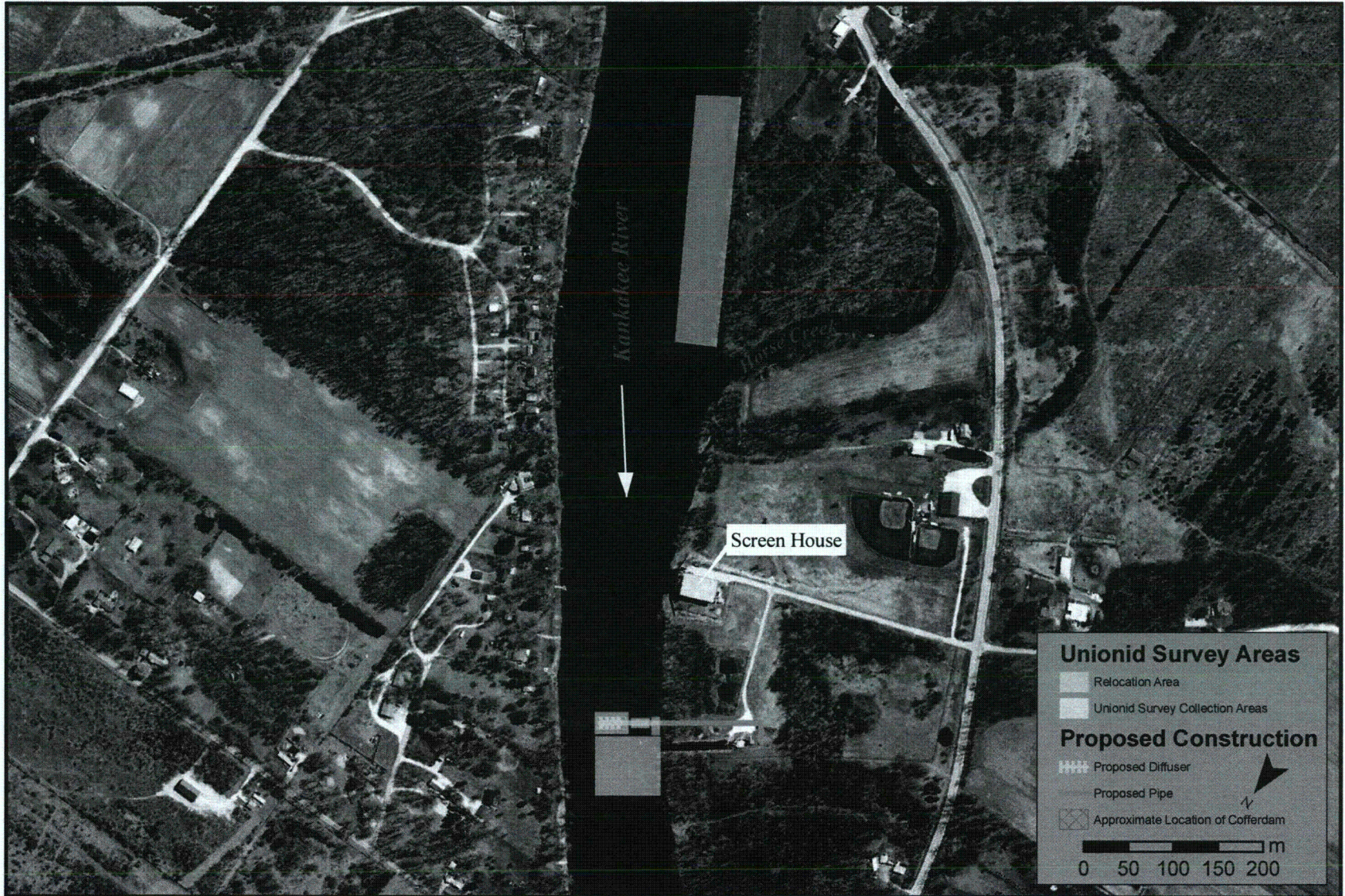
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Figure 2-1. Unionid collection areas in the Kankakee River near the Braidwood Nuclear Station discharge location, July 2010.

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Figure 2-2. Unionid collection and relocation areas in the Kankakee River near the Braidwood Nuclear Station discharge location, July 2010.

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Tables

Table 1-1. Unionids collected near the Braidwood Nuclear Station discharge location for this and two 2008 studies, Illinois, Kankakee River, 2010.

Species ²	August 2008 (HDR, 2008)		October 2008 (ESI, 2009)		July 2010 (this study)		All Recent Studies (ESI, 2009; HDR, 2008; ESI, 2010)
	No. Live ¹	% Abundance	No. Live	% Abundance	No. Live	% Abundance	Collected Live
<i>Alasmidonta marginata</i>	D	-	-	-	-	-	
<i>Actinonaias ligamentina</i>	115	54.8	97	77.0	798	87.6	X
<i>Amblema plicata</i>	28	13.3	13	10.3	37	4.1	X
<i>Cyclonaias tuberculata</i> (T) ³	3	1.4	1	0.8	8	0.9	X
<i>Elliptio dilatata</i> (T)	R	-	2	1.6	-	-	X
<i>Fusconaia flava</i>	WD	-	1	0.8	6	0.7	X
<i>Lampsilis cardium</i>	3	1.4	2	1.6	14	1.5	X
<i>Lampsilis siliquoidea</i>	5	2.4	-	-	4	0.4	X
<i>Lasmigona complanata</i>	10	4.8	-	-	2	0.2	X
<i>Lasmigona costata</i>	13	6.2	1	0.8	11	1.2	X
<i>Leptodea fragilis</i>	3	1.4	2	1.6	5	0.5	X
<i>Ligumia recta</i> (T)	D	-	-	-	8	0.9	X
<i>Megalonaias nervosa</i>	D	-	2	1.6	-	-	X
<i>Plethobasus cyphus</i> (E)	D	-	-	-	-	-	
<i>Pleurobema sintoxia</i>	5	2.4	-	-	4	0.4	X
<i>Potamilus alatus</i>	D	-	-	-	2	0.2	X
<i>Pyganodon grandis</i>	3	1.4	-	-	1	0.1	X
<i>Quadrula metanevra</i>	2	1.0	1	0.8	7	0.8	X
<i>Quadrula p. pustulosa</i>	12	5.7	1	0.8	WD	-	X
<i>Quadrula quadrula</i>	-	-	-	-	WD	-	
<i>Strophitus undulatus</i>	D	-	-	-	2	0.2	X
<i>Utterbackia imbecillis</i>	7	3.3	1	0.8	-	-	X
<i>Venustaconcha ellipsiformis</i> (SC)	1	0.5	2	1.6	2	0.2	X
Total Live	210		126		911		
Total Number of Live Species	14		13		16		
Total Number of Live Species from 2008 Studies			17				
Total Number of Live Species for All Recent Studies							20

¹D=collected only a fresh-dead shell; R=collected as a relic shell (HDR, 2008)²Turgeon *et al.* (1998)³T=Illinois state-threatened; E=Illinois state-endangered; SC=Illinois Special Concern species (IESPB, 2010)

Table 3-1. Habitat characteristics and number of live unionids by collection area, Kankakee River near the Braidwood Nuclear Station discharge location, July 2010.

Collection Area	No. Live	Effort (person-hrs)	Ave. Min Depth (m)	Ave. Max. Depth (m)	Average Substrate			
					% Boulder	% Cobble	% Gravel	% Sand
Bank	103	4.0	0.6	0.8	0.0	45.0	27.5	27.5
Downstream	374	11.3	1.4	1.8	21.7	33.3	22.5	22.5
Cofferdam	396	11.5	2.1	2.4	41.7	28.3	14.2	15.8
Centerline	38	1.3			0.0	25.0	25.0	50.0

¹Live unionids collected per person-hr