Table 1. Frequency of occurrence (%) of native mussels from surveys at ten Population Establishment Sites for Higgins eye (*Lampsilis higginsii*) on the Upper Mississippi River and tributaries.

		Site 1	Site 2	Site 3		Site 4		Site 5	Site 6	Site 7		Site 8	Site 9	Site 10
Species	Scientific Name	Upper Pool 2	Lower pool 2	Pool 3 - Main channel border	Pool 3 - Sturgeon Lake	Pool 4 - Goose Lk.	Pool 4 - 4th Cut	Rock River	Pool 16	Wisconsin River - Orion	Wisconsin River - Prairie du Sac	Iowa River	Cedar River	Wapsi River
spectaclecase	*Cumberlandia monodonta*													
washboard	*Megalonaias nervosa*								12.3					
pistolgrip	*Tritogonia verrucosa*									7.2	2.6	7.7		0.6
winged mapleleaf	*Quadrula fragosa*													
mapleleaf	*Quadrula quadrula*	5.6	33.3	4.9	15.3			17.7	12.7			0.5		
monkeyface	*Quadrula metanevra*					1.0			3.6	11.7	0.6	0.9		
wartyback	*Quadrula nodulata*	0.3	2.7					0.1	1.8			0.7		
pimpleback	*Quadrula pustulosa*	1.5	2.0	2.8	3.4	2.4	1.4	2.6	18.2	10.6	12.8	28.9	11.6	21.8
threeridge	*Amblema plicata*	18.5	6.1	12.2	26.3	68.8	89.4	27.4	17.7	15.9	9.8	10.7		
ebonyshell	*Fusconaia ebena*							0.1		0.0				
wabash pigtoe	*Fusconaia flava*	1.5	11.6	6.3	3.4	13.5	2.4	0.6	4.5	9.5	5.9	2.0		
purple wartyback	*Cyclonaias tuberculata*						0.5							
sheepnose	*Plethobasus cyphyus*									1.3	0.2			
round pigtoe	*Pleurobema sintoxia*		0.7			0.5	0.5			1.0	0.2			
elephant ear	*Elliptio crassidens*													
spike	*Elliptio dilatata*									5.6	0.2			
paper pondshell	*Utterbackia imbecillis*		1.4			0.5					0.2	0.1		
flat floater	*Anodonta suborbiculata*													
giant floater	*Pyganodon grandis*		6.8	3.5	4.2	1.0	0.5			0.4	2.9	2.3		1.4
cylindrical papershell	*Anodontoides ferussacianus*										0.1			
creeper	*Strophitus undulatus*	2.3						0.0	0.5	1.0	3.9			0.1
elktoe	*Alasmidonta marginata*	0.2								2.0				2.1
slippershell	*Alasmidonta viridus*													
rock pocketbook	*Arcidens confragosus*		2.0	0.7			0.5			0.2	0.2			
salamander mussel	*Simpsonaias ambigua*								5.2					
white heelsplitter	*Lasmigona complanata*		0.7					0.9		0.1	0.3	3.8	2.3	9.6
fluted shell	*Lasmigona costata*										0.1			
creek heelsplitter	*Lasmigona compressa*									0.0				
threehorn wartyback	*Obliquaria reflexa*	13.2	26.5	56.3	45.8	9.6	6.7	3.3	16.8	1.4	3.5	10.4	2.3	
mucket	*Actinonaias ligamentina*											0.1		
butterfly	*Ellipsaria lineolata*							0.3	1.8	0.0	0.1	0.1		
hickorynut	*Obovaria olivaria*							12.3	7.3	6.4	7.9	3.4	9.3	0.2
deertoe	*Truncilla truncata*	47.8	1.4	6.3	1.7	0.5		0.1	0.5	1.7	2.5	0.9		0.1
fawnsfoot	*Truncilla donaciformis*	1.7						0.1		0.5	2.9	1.0	7.0	
scaleshell	*Leptodea leptodon*													
fragile papershell	*Leptodea fragilis*	2.0	2.0			0.5		28.0		3.1	13.6	4.8	37.2	2.1
pink papershell	*Potamilus ohiensis*		1.4	2.8	0.8			2.1		0.2	0.2	1.1	11.6	0.1
pink heelsplitter	*Potamilus alatus*	0.3	1.4	2.8	0.8		0.5	0.3		1.5	5.7	6.2	2.3	
bluefer	*Potamilus purpuratus*													
fat pocketbook	*Potamilus capax*													
lilliput	*Toxolasma parvus*									0.1		0.1		2.8
black sandshell	*Ligumia recta*	1.8					0.5	1.3	0.9	4.0	4.5	2.2		1.9
pondmussel	*Ligumia subrostrata*													
ellipse	*Venustachoncha ellipsiformis*										0.1			0.3
yellow sandshell	*Lampsilis teres anodontoides*							0.1		0.4	0.1	2.8		
slough sandshell	*Lampsilis teres teres*									0.1				
fat mucket	*Lampsilis siliquoidea*	0.3				0.5		0.0	1.4	0.4	0.2			0.3
higgins eye	*Lampsilis higginsii*									0.2	0.4			0.8
plain pocketbook	*Lampsilis cardium*	2.8		1.4		1.4		2.5	0.5	8.3	18.5	10.0	16.3	56.0
snuffbox	*Epioblasma triquetra*													
Number of live mussels		604	147	286	118	208	214	2139	220	***3620	***1214	3426	43	1243
Number of live species		15	15	11	9	12	10	20	16	30.0	30.0	22	9	16
Time Searched (minutes)		213	230	46	25	80	65	180	75			6502	1620	8265
CPUE (Number live/minute)		2.84	**1.64	6.22	4.72	2.60	3.29	11.88	*1.85			0.53	0.03	0.15
Mussels per square meter			7.10						20.40					
Collection year		2001	2003	2001	2002	2003	2003	2003	2006	pre 2000	pre 2000	2005/06	2005	2005/06

* = 139 mussels collected from 15 timed searches of 5 minutes each

** = based on quantitative sample of site 047 (collected 55 mussels and 9 species)

*** = collected using a variety of methods

Site 1, Kelner and Davis 2002 (Site 58); Site 2, Davis 2003a; Site 3, Kelner and Davis 2002 (Site 131); Site 4, Davis 2003b; Site 6, Nicole McVay, COE, unpublished; Site 6, Dunn 2003; Site 7, Dave Heath, WIDNR, unpublished; Sites 8-10, Scott Gritters, IDNR, unpublished, Table 7.

Table 2. Target and number of adult, sub-adult and juvenile Higgins eye (*Lampsilis higginsii*) stocked at ten population establishment sites on the upper Mississippi River and tributaries.

		Site 1		Site 2	Site 3		Site 4		Site 5	Site 6	Site 7			Site 8	Site 9	Site 10	
		Upper Pool 2		Lower pool 2	Pool 3 - Main channel border	Pool 3 - Sturgeon Lake	Pool 4 - Goose Lk.	Pool 4 - 4th Cut	Rock River	Pool 16	Wisconsin River - Orion	Wisconsin River - Orion	Wisconsin River - Prairie du Sac	Iowa River - Iowa City	Cedar River	Wapsi River Central City	Wapsi River Anamosa
Year Placed	Cohort	adults	sub-adults	sub-adults	adults	sub-adults	sub-adults	sub-adults	sub-adults	sub-adults	sub-adults	Juv - cage	Juv - free	Juv - free	Juv - free	Juv - free	Juv - free
2000	Many	100			101												
	2000											*1100					
2001	Many	271															
	2001											34,042	13,485		69,200		
2002	2002												16,500	131,551	35,615	71,000	69,700
2003	2000						3										
	2001					195	346										
	2003											59,952	51,748	13,359	38,657	21,084	21,117
2004	2001			5			5	5									
	2002		5	334			264	300									
	2003			506			308	300									
	2004											29,471	26,101	93,721	87,888	45,198	45,198
2005	2003			800		1,400	500	500			1,334						
	2005											226,262	41,205	83,602	106,752	229,141	53,320
2006	2002		50	-50													
	2003		801	-251													
	2004		850	0		744			500								
	2006												221,455	120,141	Defer	549,312	227,772
2007	2004		100	200		100	100			500	100						
	2005		2,500	1,000		2,500	1,000		5,000	5,000	2,000						
	2007											100,000	100,000	100,000		10,000	150,000
2008	2006		300	300		300	200		2,000	2,000	2,000						
2009	2007		1,000	1,000		1,000	1,000		2,000	2,000	2,000						
2010	2008		1,000	1,000		1,000	1,000		2,000	2,000	2,000						
	Run Total	371	1,706	1,344	101	2,339	1,426	1,105	500								
	Final Total	371	5,606	4,844	101	7,239	4,726	1,105	11,500	11,500	9,434	450,827	470,494	542,374	338,112	925,735	567,107
	Target	300	420	420	100	420	210	210	420	420	420	0	0	0	0	0	0

Red Font = St. Croix strain. Blue Font = Cassville/Cordova/Prairie du Chien/Wisconsin River strain. * = Hatchery juveniles placed on river bottom.

Table 3. Number of female Higgins eye (*Lampsilis higginsii*) relocated as adults or responsible for production of cohorts by host fish infestation at ten relocation sites. Targets are the estimated number of different females needed to produce viable populations.

	Site 1		Site 2	Site 3		Site 4		Site 5	Site 6	Site 7			Site 8	Site 9	Site 10	
	Upper Pool 2		Low er pool 2	Pool 3 - Main channel border	Pool 3 - Sturgeon Lake	Pool 4 - Goose Lk.	Pool 4 - 4th Cut	Rock River	Pool 16	Wisconsin River - Orion	Wisconsin River - Orion	Wisconsin River - Prairie du Sac	low a River - low a City	Cedar River	Wapsi River Central City	Wapsi River Anamosa
Cohort	adults	sub-adults	sub-adults	adults	sub-adults	sub-adults	sub-adults	sub-adults	sub-adults	sub-adults	Juv - cage	Juv - free	Juv - free	Juv - free	Juv - free	Juv - free
2000	41			41		5					5					
2001	118				20	20					20	20		20		
2002		19	19			19	19					23	8	19	15	15
2003		18	18		18	18	18			18	23	23	35	35	35	35
2004		5	5		5	5	5	19	19	5	19	19	43	43	43	43
2005		9	9		9	9	9	40	43	14	14	14	29	29	29	29
2006		19			19			59	59	59		43	15		43	43
2007		17			17			30	30	10	10	10			30	30
2008		15			15			30	30	10	10	10				
Total	159	102	51	41	103	76	51	178	181	116	101	162	130	146	195	195
Target	100		100	100		100		100	100	100	100	100	100	100	100	

Table 4. Number of donor female Higgins eye (*Lampsilis higginsii*) used to inoculate host fish at Genoa National Fish Hatchery, Wisconsin. Juvenile estimates are based on transformation rates observed at the hatchery for each host species.

	Female Strain						Estimated	
Year	St. Croix	Cassville	Prairie	Cordova	WI. River	# host fish	Juveniles	Species
2000	5					1,300	91,528	LMB
2001	20					3,343	177,029	SMB/WAE
2002	19	8		15		5,230	370,340	LMB/WAE/SMB
2003	18	21		35	2	7,197	522,482	LMB/SMB
2004	5	19		43	3	8,258	545,678	LMB/SMB
2005	9	15		29		6,884	1,971,665	SMB/LMB
2006	19	9	34	15		7,175	2,239,554	LMB/WAE
Totals	95	72	34	137	5	39,387	5,918,276	

LMB = largemouth bass; SMB = smallmouth bass; WAE = walleye

Table 5. Juvenile Higgins eye (*Lampsilis higginsii*) produced at Genoa National Fish Hatchery, Wisconsin, and relocated to tributaries of the upper Mississippi River (Gordon 2002). WIR = Wisconsin River, Wisconsin. BLR = Black River, Wisconsin. WAE = walleye, LMB = largemouth bass, SMB = smallmouth bass.

Date	Location	No. Juveniles	Host Species	Strain
7-10-00	WIR-RM6.5	3,800	WAE, LMB	ST.CROIX
8-1-00	WIR-ORION	1,100	WAE, LMB	ST.CROIX
7-20-01	BLR-RM60.62	1,900	SMB, LMB	ST.CROIX
6-20-02	BLR-RM60.62	1,200	WAE, LMB	ST.CROIX

Table 6. Number of glochidia infested host fish placed in open bottom cages or free released at population establishment sites.

		Open Cages		Estimated	Free	Estimated
Year	Species	Cages	Fish	Juveniles	Release	Juveniles
2001	SMB/WAE	9	595	34,042	1,698	82,685
2002	LMB/WAE/SMB	0	0	0	3,780	244,940
2003	LMB/SMB	26	640	60,096	3,529	159,687
2004	LMB/SMB	20	992	65,550	3,868	** 244,032
2005	SMB/LMB	23	575	226,262	2,872	338,200
2006	LMB/WAE	0	0	0	3,935	1,118,670
Totals		78	2,802	385,950	21,429	2,188,214

** not include fall fish release

LMB = largemouth bass; SMB = smallmouth bass; WAE = walleye

Table 7. Mussel species richness and abundance from timed searches at select sites on the Iowa Wapsipinicon and Cedar Rivers, Iowa, 2005 and 2006.

	Iowa River											
					Iowa City							
	Highlines (2006)		Hills North (2005)		2005	2006	Total		Spillway (2006)		Total	
Species	No.	%	No.	%	No.	No.	No.	%	No.	%	No.	%
Actinonaias ligamentina			2	0.3	1		1	0.1			3	0.1
Amblema plicata	11	2.5	7	0.9	77	13	90	6.0	259	34.9	367	10.7
Fusconaia flava	22	5.0	22	2.9	17	7	24	1.6			68	2.0
Lampsilis cardium	30	6.9	91	12.0	121	9	130	8.7	92	12.4	343	10.0
Lampsilis siliquoidea	1	0.2			5		5	0.3			6	0.2
Lampsilis teres anodontoides	24	5.5	53	7.0	18	2	20	1.3			97	2.8
Lasmigona complanata	21	4.8	5	0.7	25	4	29	1.9	74	10.0	129	3.8
Leptodea fragilis	24	5.5	83	11.0	45	12	57	3.8			164	4.8
Ligumia recta	18	4.1	25	3.3	27	6	33	2.2			76	2.2
Obliquaria reflexa	30	6.9	47	6.2	204	76	280	18.8			357	10.4
Obovaria olivaria	33	7.6	60	7.9	16	8	24	1.6			117	3.4
Pleurobema coccineum			Dead								Dead	
Potamilus alatus	45	10.3	108	14.3	57	4	61	4.1			214	6.2
Potamilus ohiensis	6	1.4	15	2.0	18		18	1.2			39	1.1
Pyganodon grandis	2	0.5	3	0.4	19	8	27	1.8	46	6.2	78	2.3
Quadrula metanevra	9	2.1	8	1.1	14		14	0.9			31	0.9
Quadrula pustulosa	62	14.2	122	16.1	491	61	552	37.0	253	34.1	989	28.9
Quadrula quadrula	3	0.7			8	6	14	0.9			17	0.5
Toxolasma parvus					1		1	0.1	1	0.1	2	0.1
Tritogonia verrucosa	92	21.1	82	10.8	49	25	74	5.0	17	2.3	265	7.7
Truncilla donaciformis	1	0.2	19	2.5	12	1	13	0.9			33	1.0
Truncilla truncata	2	0.5	5	0.7	23		23	1.5			30	0.9
Utterbackia imbecillis					1		1	0.1			1	<0.1
No. individuals	436		757		1,249	242	1,491		742		3,426	
No. live species	19		18		22	15	22		7		22	
Total species	19		19		22	15	22		8		23	
Minutes sampling	915		4,155		2,325	420	2,745		450		8,265	
CPE (No. live/hour)	28.6		10.9				32.6		98.9		24.9	

	Wapsipinicon River											
					Central City							
	Independence (2006)		Newport (2006)		2005	2006	Total		Olin (2006)		Total	
Species	No.	%	No.	%	No.	No.	No.	%	No.	%	No.	%
Alasmidonta marginata	3	3.0			7	16	23	2.2			26	2.1
Amblema plicata			Dead								Dead	
Lampsilis cardium	17	16.8	22	45.8	213	396	609	59.4	48	69.6	696	56.0
Lampsilis higginsii					1	9	10	1.0			10	0.8
Lampsilis siliquoidea	4	4.0									4	0.3
Lasmigona complanata	15	14.9	3	6.3	21	79	100	9.8	1	1.4	119	9.6
Lasmigona costata			Dead								Dead	
Leptodea fragilis			7	14.6	2	9	11	1.1	8	11.6	26	2.1
Ligumia recta	1	1.0	3	6.3	2	14	16	1.6	3	4.3	23	1.9
Obovaria olivaria									2	2.9	2	0.2
Potamilus ohiensis									1	1.4	1	0.1
Pyganodon grandis	7	6.9			1	9	10	1.0			17	1.4
Quadrula pustulosa	54	53.5	6	12.5	56	154	210	20.5	1	1.4	271	21.8
Stophitus undulatus					1		1	0.1			1	0.1
Toxolasma parvus					32	3	35	3.4			35	2.8
Tritogonia verrucosa			6	12.5					1	1.4	7	0.6
Truncilla truncata			1	2.1							1	0.1
Venustaconcha ellipsiformis									4	5.8	4	0.3
No. individuals	101		48		336	689	1,025		69		1,243	
No. live species	7		7		10	9	10		9		16	
Total species	7		9		10	9	10		9		18	
Minutes sampling	360		1,110		1,965	2,337	4,302		730		6,502	
CPE (No. live/hour)	16.8		2.6				14.3		5.7		11.5	

	Cedar River					
	Palisades (2005)		Roller Dam (2005)		Total	
Species	No.	%	No.	%	No.	%
Actinonaias ligamentina	Dead				Dead	
Amblema plicata	Dead		Dead		Dead	
Fusconaia flava	Dead		Dead		Dead	
Lampsilis cardium	6	20.7	1	7.1	7	16.3
Lampsilis siliquoidea			Dead		Dead	
Lasmigona complanata			1	7.1	1	2.3
Leptodea fragilis	10	34.5	6	42.9	16	37.2
Ligumia recta	Dead		Dead		Dead	
Obliquaria reflexa			1	7.1	1	2.3
Obovaria olivaria	4	13.8			4	9.3
Potamilus alatus	1	3.4	Dead		1	2.3
Potamilus ohiensis	2	6.9	3	21.4	5	11.6
Quadrula metanevra	Dead		Dead		Dead	
Quadrula pustulosa	4	13.8	1	7.1	5	11.6
Tritogonia verrucosa	Dead		Dead		Dead	
Truncilla donaciformis	2	6.9	1	7.1	3	7.0
No. individuals	29		14		43	
No. live species	7		7		9	
Total species	13		14		16	
Minutes sampling	1,020		600		1,620	
CPE (No. live/hour)	1.7		1.4		1.6	

Table 8. Number of closed cages and host fish place at propagation sites on the upper Mississippi River. Juvenile estimates are from transformation rates for each host species observed at Genoa National Fish Hatchery, Wisconsin.

Year	# Cages	# Fish	Estimated Juveniles	Species
2000	2	150	NA	LMB
2001	20	1,050	60,300	SMB/WAE
2002	47	1,450	125,400	LMB/WAE/SMB
2003	63	3,028	305,334	LMB/SMB
2004	125	3,398	236,096	LMB/SMB
2005	118	3,437	1,407,203	SMB/LMB
2006	106	3,240	1,120,884	LMB/WAE
Totals	481	15,753	3,255,217	

LMB = largemouth bass; SMB = smallmouth bass
WAE = walleye

Table 9. Number of subadult Higgins eye (*Lampsilis higginsii*) currently held in closed propagation cages in the upper Mississippi River, Pool 4 (Frontenac). Numbers for 2006 are estimates based on sampling two cages per strain.

		Strain	
Cohort	St. Croix	Cassville	Cordova
2004	450	608	
2005	9,428	1,865	12,132
2006	760	*9625	955
Totals	10,638	12,098	13,087

* includes Prairie du Chien strain

Table 10. Juvenile mussels collected from mussel propagation cages in the upper Mississippi and St. Croix Rivers, 2000 - 2002 (Mussel Coordination Team 2003).

Common Name	Scientific Name	Number (per cage)	Percent total
Higgins eye pearlymussel	*Lampsilis higginsii*	1,097 (1 - 200)	74.9
Asiatic clam	*Corbicula sp.*	162 (1 - 120)	11.0
Paper pondshell	*Utterbackia imbecillis*	129 (1 - 56)	8.8
Fragile papershell	*Leptodea fragilis*	33 (1 - 15)	2.2
Threeridge	*Amblema plicata*	15 (2 - 5)	1.0
Lilliput	*Toxolasma parvus*	10 (1 - 3)	0.7
Pink healsplitter	*Potamilus alatus*	6 (1 - 3)	0.4
Pink papershell	*Potamilus ohiensis*	6 (1 - 2)	0.4
Black sandshell	*Ligumia recta*	1	0.1
Rock pocketbook	*Arcidens confragosus*	1	0.1
Giant floater	*Pyganodon grandis*	1	0.1
Plain pocketbook	*Lampsilis cardium*	1	0.1
Threehorn wartyback	*Obliquaria reflexa*	1	0.1
Spike	*Elliptio dilatata*	1	0.1
Ohio River pigtoe	*Pleurobema sintoxia*	1	0.1
	Total	1,465	

Table 11. Survival of juvenile and subadult Higgins eye (*Lampsilis higginsii*) in propagation cages in the upper Mississippi River, Pool 4, Frontenac, Minnesota.

		Placement			Collection		
Cohort	Date	Age (yrs)	Number	Date	Number	months	Survival %
2000	5/25/2000	0	3	5/16/2001	3	12	100
2000	5/16/2001	1	3	9/19/2001	3	4	100
2000	9/19/2001	1	3	6/19/2002	3	9	100
2000	6/19/2002	2	3	9/29/2002	3	3	100
2000	9/29/2002	3	3	8/6/2003	3	12	100
2001	6/20/2002	1	215	7/29/2003	196	13	91
2001	6/20/2002	1	15	9/24/2002	15	3	100
2002	9/24/2002	0	273	9/30/2003	163	12	60
2002	9/24/2002	0	274	9/30/2003	188	12	69
2003	9/27/2003	0	4,818	7/25/2004	4,380	10	91

Table 12. Survival of subadult Higgins eye (*Lampsilis higginsii*) stocked at three population establishment sites on the upper Mississippi River.

Population Establishment Site	Cohort	No. Cells Monitored	Year Stocked	Number Stocked	Year Recovered	Number Recovered	Percent Recovered	*Percent in Cage
Site 2,UMR Lower Pool 2	2003	4	2004	120	2005	95	79	NA
Site 3, UMR Pool 3	2001	4	2003	40	2004	36	90	100
Site 3, UMR Pool 3	2003	5	2005	50	2006	22	44	NA
Site 4, UMR Pool 4, Goose Lake	2001	4	2003	40	2004	2	5	100

* = mussels recovered from closed bottom cage placed adjacent to stocked subadults

Table 13. Average length (millimeters) of subadult Higgins eye (*Lampsilis higginsii*) stocked at six population establishment sites in the upper Mississippi River and tributarie

		Cohort			
Population Establishment Site	2000	2001	2002	2003	2004
Site 1, UMR, Upper Pool 2			73	68	52
Site 2, UMR, Lower Pool 2			53	51	
Site 3, UMR, Pool 3		42		58	54
Site 4, UMR Pool 4, Goose Lake	50	33	54	53	
Site 4, UMR Pool 4, 4th Cut			54	51	
Site 5, Rock River					52
Site 7, Wisconsin River, Orion				56	

Table 14. Length and growth (millimeters) of subadult Higgins eye (*Lampsilis higginsii*) stocked at three population establishment sites on the Upper Mississippi River (St. Croix Strain). Lengths shown are averages with range in parentheses.

Population	Placement				Monitoring					
Establishment Site	Cohort	Date	Number	Length	Number	1-yr Grth.	Number	2-yr Grth.	Number	3-yr Grth
2, Lower Pool 2	2002	9/29/2004	27	53(41-62)	27	7(0-16)				
	2003	9/29/2004	6	42(36-47)	6	15(7-21)				
3, Pool 3, Sturgeon L.	2001	7/29/2003	36	42(36-59)	36	7(5-12)				
	2003	9/29/2005	16	58(50-70)	16	9(6-13)				
4, Pool 4, Goose L.	2001	8/6/2003	26	31(23-41)	10	9(2-11)	25	29(10-38)	1	52
	2002	9/28/2004	34	54(44-75)	33	8(-1-13)	1	20		
	2003	9/28/2004	15	43(34-55)	9	15(9-27)	6	28(21-30)		
	2003	9/28/2005	30	58(45-78)	30	11(7-16)				

Table 15. Growth (millimeters) of adult Higgins eye (*Lampsilis higginsii*) stocked at two population establishment sites in 2000 and 2001 on the upper Mississippi River. Gravidity observations are from last date collected.

Site 1, UMR Upper Pool 2, Minnesota

		Shell Length (mm) at Year Collected						
Adult #	Gender	2000	2001	2003	2004		Grwth mm	Gravid?
C132	F		69	73	78		9	YES
542	F	88		88	92		4	YES
629	M	87			92		9	
655	F	72		73	76		4	YES
DH14	F		86	84	87		1	YES
C165	F		79	81	84		5	YES
679	F	67			76		9	YES
690	M	97			98		1	
657	F	74			88		14	YES
C137	F		79		82		5	YES
C117	F		53		63		10	YES

Site 3, UMR Hastings, Minnesota

		Shell Length (mm) at Year Collected						
Adult #	Gender	2000		2003		2006	Grwth mm	Gravid?
523	M	98		99		101	3	
527	M	97				101	4	
533	M	97				99	2	
538	M	91		95		97	6	
551	M	84				89	5	
557	F	102		102		105	3	YES
574	F	69				88	19	YES
586	M	79		90		94	15	
587	M	95		95		94	-1	
600	F	82				88	6	YES
572	M	89				90	1	
520	M	98				103	5	
608	F	58				76	18	YES
652	F	81				84	3	YES
570	M	97				97	0	
619	F	90				93	3	YES
588	M	94				96	2	
577	M	87				94	7	
561	M	99				106	7	
528	M	81				91	10	
519	M	94				97	3	
536	M	77				96	19	
593	M	87				94	7	
518	M	94				97	3	

Table 16. Schedule for monitoring the ten population establishment sites for Higgins eye (*Lampsilis higginsii*) on the upper Mississippi River and tributaries.

						Year			
Site	Location	2002	2003	2004	2005	2006	2007	2008	2009
Site 1	UMR Pool 2, MN								
	adults		Qr	Qr	Q		M/Q		
	subadults						M/Qr		
Site 2	UMR Pool 2, MN				Qr	Qr		Qr	
Site 3	UMR Pool 3, MN								
	adults		Qr			Qr			Qr
	subadults			Qr	Qr	M/Qr		Qr	M/Qr
Site 4	UMR Pool 4, MN/WI			Qr	Qr	Qr	Qr		
Site 5	Rock River, IL						Qr	Qr	Qr
Site 6	UMR Pool 16, IA					Ql			Qr
Site 7	Wisconsin River, WI	Q					Q		
	juveniles/subadults			Qr	Qr		Qr		
	free release			Ql			Q	Ql	
Site 8	Iowa River, IA				Ql			Ql	
Site 9	Cedar River, IA				Q1			Ql	
Site 10	Wapsipinicon R., IA				Q1	Q1	Ql		M/Q

M = mapping mussel bed; Q = quantitative and qualitative sampling of mussel bed; Qr = monitoring of stocked individuals; Ql = qualitative sampling only

Table 17. Number of Higgins eye (*Lampsilis higginsii*) cleaned of zebra mussels and stockpiled on the upper Mississippi River and tributaries. Stockpiled females are also used as donors for infesting host fish with glochidia at Genoa National Fish Hatchery, Wisconsin.

			* Location		
Higgins eye	Cordova	Cassville	Harpers	Prairie	WI. River
Total stockpiled	896	407	34	14	12
2005 stockpile	271	156	26	14	12
Total females	137	56	9	6	7
Non-donor females	99	26	9	6	4

* Locations = Cordova, UMR Pool 14, IL; Cassville, UMR Pool 11, WI; Harpers Slough, UMR Pool 10, IA; Prairie du Chien, UMR Pool 10, WI; Wisconsin River, Prairie du Sac, WI

Table 18. Monitoring schedule for Essential Habitat Areas and other important mussel habitats on the upper Mississippi River.

	Year									
Site	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Orion, WI River			Q					Q		
Interstate, St. Croix R.	Q				Q					Q
Hudson, St. Croix R.	Q				Q					Q
Prescott, St. Croix R.	Q				M/Q					Q
Winters, UMR Pool 7	Q	Q				M/Q				
MN Slough, UMR Pool 9				Q						
Whiskey Rock, UMR Pool 9	Q	Q	Q		M/Q					Q
Harpers, UMR Pool 10	Q	Q				Q			M/Q	
Prairie, UMR Pool 10	Q	Q	Q	Q		Q	Q	M/Q	Q	
McMillian, UMR Pool 10	Q	Q				M/Q				
Cassville, UMR Pool 11		Q	Q	Q			M/Q			Q
Bellevue, UMR Pool 13	Q		Q		M/Q				Q	
Cordova, UMR Pool 14	Q	Q		Q		M/Q			Q	
Moline, UMR Pool 15	Q		Q			Ql	Q	M/Q		
UMR Pool 16					M/Q					
Muscatine, UMR Pool 17	Q		Q	Ql		Ql			M/Q	
Burlington, UMR Pool 19				Q						
UMR, Upper Pool 20				Ql						
UMR Pool 24				Ql						

M = mapping mussel bed; Q = quantitative and qualitative sampling; Ql = qualitative sampling only

Table 19. Summary of zebra mussel veliger collections on tributaries to the upper Mississippi River.

UMR Tributary Veliger Observations for 2001 through 2006

2006 Veliger Abundance (#/L)			
	July	August	Sept.
Tributaries		**Live Veligers**	
St. Croix R. - Prescott	9.17	3.28	-
St. Croix R. - Hudson	0.76	1.11	-
St. Croix River - Stillwater	0	0	-
St. Croix River -St. Croix Falls	0	0	-
Snake River	0	0	-
Sunrise River	0	0	-
Chippewa R. - Hwy 35	0	0	-
Black R. - Hwy 35	0	0	-
Wisconsin R.	0	0	-
Wapsi R. - mouth	0	0	-
Iowa R. - mouth	0	0	-
Cedar R. - mouth	0	0	-
Chicago Area	-	-	-
Peoria/LaGrange	-	-	-
Alton Area	-	-	-
		Dead Veligers	
St. Croix R. - Prescott	0.33	0.08	-
St. Croix R. - Hudson	0.11	0.22	-
St. Croix River - Stillwater	0	0	-
St. Croix River -St. Croix Falls	0	0	-
Snake River	0	0	-
Sunrise River	0	0	-
Chippewa R. - Hwy 35	0	0	-
Black R. - Hwy 35	0	0	-
Wisconsin R.	0	0	-
Wapsi R. - mouth	0	0	-
Iowa R. - mouth	0	0	-
Cedar R. - mouth	0	0	-
Chicago Area	-	-	-
Peoria/LaGrange	-	-	-
Alton Area	-	-	-

Wisconsin Lakes/Reservoirs in St. Croix Basin	
August 2006	Veliger Abundance (#/L)
Cedar Lake	0
Minong Flowage	0
Balsam Lake	0
Upper Lake St. Croix	0
Lake Owen	0
Lake Mallalieu	0
Grindstone Lake	0
Yellow River Flowage	0
Trade Lake	0
Clam Flowage	0
Nelson Lake	0

Tributary Notes from 2006

- No veligers detected outside of the St. Croix River

- Veligers detected on St. Croix at Hudson and Prescott

- No veligers detected at the St. Croix lift bridge at Stillwater

- Sampling of St. Croix Basin tributaries and lakes in Wisconsin didn't identify any veligers

Veliger Abundance (#/L)																		
	July						August						September					
Tributaries	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Live Veligers																		
Chippewa R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
St. Croix R. (Hudson)	0.07*	0	0	0.70	0	0.76	0.60*	0	0	0.50	0	1.11	0.22*	0	-	0.22	0.00	-
St. Croix R. (Prescott)	0.10	4.53	0	5.94	2.20	9.17	2.39	0	0.62	5.69	3.56	3.28	2.03	0.17	0.64	9.03	4.25	-
Black R.	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Wapsinicon River	0.93	0.02	0	0	0	0	3.71	0.02	0	0	0	0	0	0.14	-	0	0	-
Wis. R.	-	0.39	0	0	0	0	0.02	0	0	0	0	0	0	0.03	0	0	0	-
Iowa R. - mouth	0	0.11	0	0	0	0	0.35	0	0	0	0	0	0	0	-	0.42	0.00	-
Cedar R. - mouth	0	0	0	0	0	0	0	0	0	0.03	0	0	0.20	0	-	0	0	-
UMR I 694	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-
Dead Veligers																		-
Chippewa R.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
St. Croix R. (Hudson)	0.01*	0	0	0.13	0.00	0.11	0.06*	0	0	0.04	0.00	0.22	0.02*	0	-	0	0	-
St. Croix R. (Prescott)	0.01	0.47	0	0.78	0.61	0.33	0.02	0	0.12	0.83	0.25	0.08	0.08	0.07	0.06	0.64	0.08	-
Black R.	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0.06	-
Wapsinicon River	9.42	0.04	0	0	0	0	0.20	0.02	0	0	0	0	0.20	0.07	-	0	0	-
Wis. R.	-	0.12	0	0	0	0	0.36	0	0	0	0	0	0.02	0.06	0	0	0	-
Iowa R. - mouth	0.13	0.11	0	0	0	0	0.07	0	0	0	0	0	0.23	0	-	0	0	-
Cedar R. - mouth	0	0	0	0	0	0	0	0.17	0	0	0	0	0.60	0.25	-	0	0	-
UMR I 694	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	-

* represents sample from Kinnickinnic R. mouth

Table 20. Summary of zebra mussel veliger collections on the upper Mississippi River.

Mississippi River Veliger Observations for 2001 through 2006

	Mississippi River Veliger Abundance (#/L) for 2001 through 200																	
	JULY						AUGUST						SEPTEMBER					
L&D	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006	2001	2002	2003	2004	2005	2006
I-694	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	-	0	0	-
1	-	0	0	0	0	-	-	0	0	0	0	-	0	0.1	-	0	0	-
2	1.7	0.2	0	0.2	0.2	0.3	2.0	0.2	0	0.9	0.5	0.2	0.1	0.3	0	0.1	0.7	-
3	2.5	0.7	0.2	3.2	2.7	3.7	2.0	0.9	0.4	7.8	6.1	8.1	3.2	1.3	0.9	4.9	2.7	-
4	49.5	19.3	0.3	27.3	58.3	31.2	118.0	0.9	1.8	1.3	39.3	7.7	49.4	1.2	1.3	0.4	7.3	-
5	147.1	98.1	0.0	97.7	105.7	28.8	248.6	17.2	5.4	4.9	133.3	86.7	64.8	3.4	3.4	12.7	97.3	-
5A	263.6	243.3	0.3	36.2	331.3	69.0	224.0	29.2	4.8	2.4	170.0	115.3	103.7	7.6	1.7	19.3	102.0	-
6	809.0	214.7	0.3	71.5	313.5	113.0	284.6	152.2	5.9	7.9	137.0	256.7	101.5	14.0	30.5	18.1	158.7	-
7	238.8	170.0	1.4	67.0	545.5	17.8	172.7	69.0	15.9	6.8	200.7	139.5	41.4	18.8	28.2	18.5	129.3	-
8	177.9	203.5	1.3	86.8	248.0	29.5	185.8	121.7	17.7	3.7	165.5	65.3	19.9	36.7	12.6	3.8	110.0	-
9	33.6	59.0	1.4	41.2	240.7	69.8	233.1	42.9	16.3	7.7	95.7	77.3	21.8	36.6	12.3	6.2	73.7	-
10	67.7	89.7	0.9	126.1	393.3	76.7	196.3	83.9	124.7	21.9	132.7	19.3	74.3	0.17*	-	24.9	62.7	-
11	138.4	203.6	1.3	135.8	314.7	-	240.9	157.5	42.7	28.6	130.0	-	68.8	58.3	-	23.8	26.3	-
12	95.2	174.4	1.3	125.3	334.7	155.0	210.5	215.3	69.1	244.3	42.3	8.6	69.0	53.3	-	63.3	15.4	-
13	197.7	149.4	2.5	49.7	442.2	202.8	143.8	163.6	35.3	407.3	5.7	3.1	72.6	37.8	-	100.2	8.3	-
14	100.2	70.6	-	25.4	456.0	220.0	331.7	341.1	80.3	279.3	2.2	0.6	-	37.8		99.3	9.5	-
15	64.5	97.2	1.6	176.3	314.5	-	83.9	358.1	106.8	385.0	2.3	-	41.0	23.3	-	72.0	7.0	-
16	141.6	143.1	2.0	149.3	374.7	101.7	48.9	274.2	238.7	465.7	0.4	1.6	12.8	19.7	-	49.4	4.7	-
17	57.7	59.8	2.8	53.8	138.9	160.0	63.1	-	126.5	386.5	0.3	4.2	13.4	25.2	-	70.7	1.8	-
18	90.9	80.6	1.5	76.6	189.3	96.4	17.3	268.5	80.0	451.8	0.2	0.3	8.2	23.8	-	60.5	0.6	-
19	80.1	51.3	1.4	217.3	44.3	-	10.5	109.6	13.5	293.0	0.5	-	2.5	3.6	-	34.0	-	-
22	-	66.3	5.9	357.0	364.0	-	-	26.7	4.9	462.0	0.7	-	-	3.6	-	64.4	1.6	-

2006 Veliger Abundance (#/L)			
L&D	July	August	September
I-694	0	0	-
1	-	-	-
2	0.33	0.22	-
3	3.67	8.06	-
4	31.17	7.67	-
5	28.75	86.67	-
5A	69.00	115.33	-
6	113.00	256.67	-
7	17.75	139.50	-
8	29.50	65.33	-
9	69.75	77.33	-
10	76.67	19.33	-
11	-	-	-
12	155.00	8.59	-
13	202.78	3.14	-
14	220.00	0.61	-
15	-	-	-
16	101.67	1.56	-
17	160.00	4.23	-
18	96.38	0.31	-
19	-	-	-
22	-	-	-

Annual Average Veliger Abundance (July & August; #/L						
L&D	2001	2002	2003	2004	2005	2006
I-694	0	0	0	0	0	0
1	-	0	0	0.01	0.01	-
2	1.86	0.19	0	0.56	0.34	0.28
3	2.25	0.81	0.31	5.50	4.42	5.87
4	83.79	10.13	1.08	14.29	48.83	19.42
5	197.86	57.65	2.74	51.28	119.50	57.71
5A	243.81	136.25	2.56	19.28	250.67	92.17
6	546.80	183.41	3.11	39.70	225.25	184.84
7	205.76	119.48	8.65	36.91	373.08	78.63
8	181.85	162.60	9.47	45.26	206.75	47.42
9	133.35	50.94	8.82	24.42	168.17	73.54
10	131.99	86.81	62.78	74.02	263.00	48.00
11	189.65	180.56	22.00	82.21	222.33	-
12	152.84	194.86	35.19	184.83	188.50	81.80
13	170.76	156.53	18.92	228.50	223.96	102.96
14	215.93	205.83	80.33	152.38	229.08	110.31
15	74.18	227.64	54.18	280.67	158.39	-
16	95.25	208.61	120.33	307.50	187.53	51.62
17	60.40	59.79	64.66	220.17	69.58	82.12
18	54.11	174.58	40.76	264.21	94.75	48.34
19	45.30	80.42	7.44	255.17	22.42	-
22	-	46.46	5.44	409.50	182.35	-

UMR Notes from 2006

- No veligers detected above the head of navigation (I-694)

- In general, veliger concentrations appear down from 2005.

- Patterns cyclic???

- Reduced sampling effort appears acceptable???