

TABLE 1. Location abbreviations of exotic species in the Great Lakes.

<i>Location</i>	<i>Code</i>
Lake Ontario	O
Lake Erie	E
Lake St. Clair	StC
Lake Huron	H
Lake Michigan	M
Lake Superior	S
tributaries	T

TABLE 2. Codes for transport mechanisms of exotic species entering the Great Lakes.

<i>Mechanism</i>	<i>Code</i>
Release (Deliberate)	R(D)
Release (Unintentional)	R(U)
Release (Aquarium)	R(AQ)
Release (Cultivation)	R(C)
Release (Fish)	R(F)
Release (Accidental)	R(A)
Shipping activities	S
Ships (Ballast Water)	S(BW)
Ships (Solid Ballast)	S(SB)
Ships (Fouling)	S(F)
Canals	C
Railroads and Highways	RH

TABLE 3. Origin, date and location of first sighting, and entry mechanism(s) for non-indigenous aquatic fauna of the Great Lakes. For location and introduction mechanism codes see Tables 1 and 2.

Taxon	Species	Common Name	Origin	Date	Location	Mechanism
Fish						
Petromyzontidae	<i>Petromyzon marinus</i>	sea lamprey	Atlantic	1830s	Lake Ontario	C, S(F)
Clupeidae	<i>Alosa pseudoharengus</i>	alewife	Atlantic	1873	Lake Ontario	C, R(F)
Cyprinidae	<i>Carassius auratus</i>	goldfish	Asia	<1878	widespread	R(D), R(AQ) R(F), R(A)
	<i>Cyprinus carpio</i>	common carp	Asia	1879	widespread	R(D)
	<i>Notropis buchanani</i>	ghost shiner	Mississippi	1979	Thames River (StC)	R(F)
	<i>Phenacobius mirabilis</i>	suckermouth minnow	Mississippi	1950	Ohio(E)	C, R(F)
	<i>Scardinius erythrophthalmus</i>	rudd	Eurasia	1989	Lake Ontario	R(F)
Cobitidae	<i>Misgurnus anguillicaudatus</i>	oriental weatherfish	Asia	1939	Shiawassee River (H)	R(A)
Ictaluridae	<i>Noturus insignis</i>	margined madtom	Atlantic	1928	Oswego River (O)	C, R(F)
Osmeridae	<i>Osmerus mordax</i>	rainbow smelt	Atlantic	1912	Crystal Lake (M)	R(D)
Salmonidae	<i>Oncorhynchus gorbuscha</i>	pink salmon	Pacific	1956	Current River (S)	R(A)
	<i>Oncorhynchus kisutch</i>	coho salmon	Pacific	1933	Lake Erie	R(D)
	<i>Oncorhynchus nerka</i>	kokanee	Pacific	1950	Lake Ontario (T)	R(D)
	<i>Oncorhynchus tshawytscha</i>	chinook salmon	Pacific	1873	All Lakes but S	R(D)
	<i>Oncorhynchus mykiss</i>	rainbow trout	Pacific	1876	Lake Huron (T)	R(D)
	<i>Salmo trutta</i>	brown trout	Eurasia	1883	Lakes Ontario (T) and Michigan (T)	R(A) R(D)
Poeciliidae	<i>Gambusia affinis</i>	western mosquitofish	Mississippi	1923	Cook Co., Illinois	R(D)
Gasterosteidae	<i>Apeltes quadracus</i>	fourspine stickleback	Atlantic	1986	Thunder Bay (S)	S(BW)
Percichthyidae	<i>Morone americana</i>	white perch	Atlantic	1950	Cross Lake (O)	C
Centrarchidae	<i>Enneacanthus gloriosus</i>	bluespotted sunfish	Atlantic	1971	Jamesville Res. (O)	R(AQ), R(F)
	<i>Lepomis humilis</i>	orangespotted sunfish	Mississippi	1929	Lake St. Mary's (E)	C
	<i>Lepomis microlophus</i>	redear sunfish	Southern U.S.	1928	Inland Indiana (M)	R(D)
Percidae	<i>Gymnocephalus cernuus</i>	ruffe	Eurasia	1986	St. Louis River (S)	S(BW)
Gobiidae	<i>Neogobius melanostomus</i>	round goby	Eurasia	1990	St. Clair River (StC)	S(BW)
	<i>Proterorhinus marmoratus</i>	tubenose goby	Eurasia	1990	St. Clair River (StC)	S(BW)
Mollusks						
Valvatidae	<i>Valvata piscinalis</i>	European valve snail	Eurasia	1897	Lake Ontario	S(SB)
Viviparidae	<i>Cipangopaludina chinensis malleata</i>	Oriental mystery snail	Asia	1931	Niagara River	R(AQ)
	<i>Cipangopaludina japonica</i>		Asia	1940s	Lake Erie	R(D)
	<i>Viviparus georgianus</i>	banded mystery snail	Mississippi	<1906	Lake Michigan (T)	R(AQ)

TABLE 3. Continued

Taxon	Species	Common Name	Origin	Date	Location	Mechanism
Bithyniidae	<i>Bithynia tentaculata</i>	faucet snail	Eurasia	1871	Lake Michigan	S(SB), R(D)
Hydrobiidae	<i>Gillia altilis</i>	snail	Atlantic	1918	Oneida Lake (O)	C
Pleuroceridae	<i>Elimia virginica</i>	snail	Atlantic	1860	Erie Canal	C
Lymnaeidae	<i>Radix auricularia</i>	European ear snail	Eurasia	1901	Chicago (M)	R(AQ), R(A)
Sphaeriidae	<i>Sphaerium corneum</i>	European fingernail clam	Eurasia	1952	Rice Lake (H/O)	Unknown
	<i>Pisidium amnicum</i>	greater European pea clam	Eurasia	1897	Genesee (O)	S(SB)
Corbiculidae	<i>Corbicula fluminea</i>	Asiatic clam	Asia	1980	Lake Erie	R(A), R(AQ), R(F)
Dreissenidae	<i>Dreissena polymorpha</i>	zebra mussel	Eurasia	1988	Lake St. Clair	S(BW)
	<i>Dreissena sp.</i>	zebra mussel	Eurasia	1991	Lake Ontario	S(BW)
Unionidae	<i>Lasmigona subviridis</i>	mussel	Atlantic	<1959	Erie Canal	C
Crustaceans						
Cladocera	<i>Bythotrephes cederstroemi</i>	spiny water flea	Eurasia	1984	Lake Huron	S(BW)
	<i>Eubosmina coregoni</i>	water flea	Eurasia	1966	Lake Michigan	S(BW)
Copepoda	<i>Eurytemora affinis</i>	calanoid copepod	widespread	1958	Lake Ontario	S(BW)
	<i>Skistodiaptomus pallidus</i>	calanoid copepod	Mississippi	1967	Lake Ontario	R(A), R(F)
	<i>Argulus japonicus</i>	parasitic copepod	Asia	<1988	Lake Michigan	R(F), R(AQ)
Amphipoda	<i>Gammarus fasciatus</i>	gammarid amphipod	Atlantic	<1940	Unknown	S(BW), S(SB)
Oligochaetes						
Naididae	<i>Ripistes parasita</i>	oligochaete	Eurasia	1980	North Channel (H)	S(BW)
Tubificidae	<i>Branchiura sowerbyi</i>	oligochaete	Asia	1951	Kalamazoo River (M)	R(A)
	<i>Phalodrilus aquaedulcis</i>	oligochaete	Eurasia	1983	Niagara River	S(BW)
Other invertebrates						
Platyhelminthes	<i>Dugesia polychroa</i>	flatworm	Eurasia	1968	Lake Ontario	S(BW)
Hydrozoa	<i>Cordylophora caspia</i>	hydroid	Unknown	1956	Lake Erie	R(A)
	<i>Craspedacusta sowerbyi</i>	freshwater jellyfish	Asia	1933	Lake Erie (T)	R(A)
Insecta	<i>Acentropus niveus</i>	aquatic moth	Eurasia	1950	Lake Ontario, Erie	R(A)
	<i>Tanyssphyrus lemnae</i>	aquatic weevil	Eurasia	<1943	Unknown	Unknown
Disease pathogens						
Bacteria	<i>Aeromonas salmonicida</i>	furunculosis	Unknown	<1902	Unknown	R(F)
Protozoa	<i>Glugea hertwigi</i>	microsporidian parasite	Eurasia	1960	Lake Erie	R(F)
	<i>Myxobolus cerebralis</i>	salmonid whirling disease	Unknown	1968	Ohio (E)	R(F)

TABLE 4. Origin, date and location of first sighting, and entry mechanism(s) for non-indigenous aquatic plants and algae of the Great Lakes. For location and introduction mechanism codes see Tables 1 and 2.

Taxon	Species	Common Name	Origin	Date	Location	Mechanism	
Algae							
Chlorophyceae	<i>Enteromorpha intestinalis</i>	green alga	Atlantic	1926	Wolf Creek (O)	R(A)	
	<i>Enteromorpha prolifera</i>	green alga	Atlantic	1979	Lake St. Clair	Unknown	
	<i>Nitellopsis obtusa</i>	green alga	Eurasia	1983	Lake St. Clair	S(BW)	
Chrysophyceae	<i>Hymenomonas roseola</i>	coccolithophorid	Eurasia	1975	Lake Huron	S(BW)	
Bacillariophyceae	<i>Actinocyclus normanii</i>	diatom	Eurasia	1938	Lake Ontario	S(BW)	
	<i>fo. subsalsa</i>						
	<i>Biddulphia laevis</i>	diatom	widespread	1978	Lake Michigan	S(BW)	
	<i>Cyclotella atomus</i>	diatom	widespread	1964	Lake Michigan	S(BW)	
	<i>Chaetoceros hohnii</i>	diatom	unknown	1978	Lake Huron	S(BW)	
	<i>Skeletonema potamos</i>	diatom	widespread	1963	Toledo, Ohio (E)	S(BW)	
	<i>Skeletonema subsalsum</i>	diatom	Eurasia	1973	Sandusky Bay (E)	S(BW)	
	<i>Stephanodiscus binderanus</i>	diatom	Eurasia	1938	Lake Michigan	S(BW)	
	<i>Stephanodiscus subtilis</i>	diatom	Eurasia	1946	Lake Michigan	S(BW)	
	<i>Thalassiosira guillardii</i>	diatom	widespread	1973	Sandusky Bay (E)	S(BW)	
	<i>Thalassiosira lacustris</i>	diatom	widespread	<1978	Lake Erie	S(BW)	
	<i>Thalassiosira pseudonana</i>	diatom	widespread	1973	Ohio (E)	S(BW)	
	<i>Thalassiosira weissflogii</i>	diatom	widespread	1962	Detroit River	S(BW)	
	<i>Diatoma ehrenbergii</i>	diatom	widespread	1930s	Lake Michigan	S(BW)	
	<i>Cyclotella cryptica</i>	diatom	widespread	1964	Lake Michigan	S(BW)	
	<i>Cyclotella pseudostelligera</i>	diatom	widespread	1946	Lake Michigan	S(BW)	
	<i>Cyclotella woltereki</i>	diatom	widespread	1964	Lake Michigan	S(BW)	
	Phaeophyceae	<i>Sphacelaria fluviatilis</i>	brown alga	Asia	1975	Gull Lake (M)	R(AQ), R(A)
		<i>Sphacelaria lacustris</i>	brown alga	unknown	1975	Lake Michigan	S(BW)
	Rhodophyceae	<i>Bangia atropurpurea</i>	red alga	widespread	1964	Lake Erie	S(BW), S(F)
<i>Chroodactylon ramosum</i>		red alga	Atlantic	1964	Lake Erie	S(BW)	
Submerged Plants							
Marsileaceae	<i>Marsilea quadrifolia</i>	European water clover	Eurasia	<1925	Cayuga Lake (O)	R(D)	
Cabombaceae	<i>Cabomba caroliniana</i>	fanwort	Southern U.S.	1935	Kimble Lake (M)	R(AQ), R(A)	
Brassicaceae	<i>Rorippa nasturtium aquaticum</i>	water cress	Eurasia	1847	Niagara Falls (O)	R(C)	
Haloragaceae	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Eurasia	1952	Lake Erie	R(AQ), S(F)	
Trapaceae	<i>Trapa natans</i>	water chestnut	Eurasia	<1959	Lake Ontario (T)	R(A), R(AQ)	
Menyanthaceae	<i>Nymphoides peltata</i>	yellow floating heart	Eurasia	1930	Conneaut River (E)	R(A)	
Hydrocharitaceae	<i>Hydrocharis morsus-ranae</i>	European frog-bit	Eurasia	1972	Lake Ontario		
R(AQ),R(D),S(F)							
Potamogetonaceae	<i>Potamogeton crispus</i>	curly pondweed	Eurasia	1879	Keuka Lake (O)	R(D), R(F)	
Najadaceae	<i>Najas marina</i>	spiny naiad	Eurasia	1864	Onondaga Lake (O)	S(SB)	
	<i>Najas minor</i>	minor naiad	Eurasia	1932	Lake Cardinal (E)	R(D)	
Marsh Plants							
Chenopodiaceae	<i>Chenopodium glaucum</i>	oak leaved goose foot	Eurasia	1867	Onondaga Lake (O)	RH	
Caryophylliaceae	<i>Stellaria aquatica</i>	giant chickweed	Eurasia	1894	Lake St. Clair	unknown	
Polygonaceae	<i>Polygonum caespitosum</i>	bristly lady's thumb	Asia	1960	Ohio (E)	unknown	
	<i>var. longisetum</i>						
	<i>Polygonum persicaria</i>	lady's thumb	Eurasia	<1843	widespread	unknown	
	<i>Rumex longifolius</i>	yard dock	Eurasia	1901	Isle Royale (S)	R(C)	
	<i>Rumex obtusifolius</i>	bitter dock	Eurasia	<1840	widespread	unknown	

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TABLE 4. Continued

Taxon	Species	Common Name	Origin	Date	Location	Mechanism
Brassicaceae	<i>Rorippa sylvestris</i>	creeping yellow cress	Eurasia	1884	Rochester, NY (O)	S(SB)
Primulaceae	<i>Lysimachia nummularia</i>	moneywort	Eurasia	1882	central NY (O)	R(C)
	<i>Lysimachia vulgaris</i>	garden loosestrife	Eurasia	1913	central NY (O)	R(C)
Lythraceae	<i>Lythrum salicaria</i>	purple loosestrife	Eurasia	1869	Ithaca, NY (O)	C, S(SB)
Onagraceae	<i>Epilobium hirsutum</i>	great hairy willow herb	Eurasia	1874	Ithaca, NY (O)	R(A), S(SB)
	<i>Epilobium parviflorum</i>	small flowered hairy willow herb	Eurasia	1966	Benzie Co., MI (M)	unknown
Apiaceae	<i>Conium maculatum</i>	poison hemlock	Eurasia	<1843	widespread	R(C)
Solanaceae	<i>Solanum dulcamara</i>	bittersweet nightshade	Eurasia	<1843	widespread	R(C)
Boraginaceae	<i>Myosotis scorpioides</i>	true forget-me-not	Eurasia	1886	central NY (O)	R(C)
Lamiaceae	<i>Lycopus asper</i>	western water horehound	Mississippi	1892	Lake Erie	R(A)
	<i>Lycopus europaeus</i>	European water horehound	Eurasia	1903	Lake Ontario	S(SB)
	<i>Mentha gentilis</i>	creeping whorled mint	Eurasia	1915	central NY (O)	R(C)
	<i>Mentha piperita</i>	peppermint	Eurasia	<1843	widespread	R(C)
	<i>Mentha spicata</i>	spearmint	Eurasia	<1843	widespread	R(C)
Scrophulariaceae	<i>Veronica beccabunga</i>	European brooklime	Eurasia	1915	Monroe Co., NY (O)	S(SB)
Asteraceae	<i>Cirsium palustre</i>	marsh thistle	Eurasia	<1950	Lake Superior	unknown
	<i>Pluchea odorata</i>					
	var. <i>succulenta</i>	salt-marsh fleabane	Atlantic	<1950	central NY (O)	unknown
	var. <i>purpurescens</i>	salt-marsh fleabane	Atlantic	1916	Lake Erie (T)	R(A)
	<i>Solidago sempervirens</i>	seaside goldenrod	Atlantic	1969	Chicago (M)	R(A)
	<i>Sonchus arvensis</i>	field sow thistle	Eurasia	1865	central NY	R(A)
	<i>Sonchus arvensis</i>	smooth field sow thistle	Eurasia	1902	Ohio (E)	R(A)
	var. <i>glabrescens</i>					
Butomaceae	<i>Butomus umbellatus</i>	flowering rush	Eurasia	<1930	Detroit River (E)	S(SB)
Balsaminaceae	<i>Impatiens glandulifera</i>	Indian balsam	Asia	1912	Port Huron (H)	R(C)
Juncaceae	<i>Juncus compressus</i>	flattened rush	Eurasia	<1895	Cayuga Lake (O)	R(A)
	<i>Juncus gerardii</i>	black-grass rush	Atlantic	1862	Chicago	S(SB)
	<i>Juncus inflexus</i>	rush	Eurasia	1922	central, NY	unknown
Cyperaceae	<i>Carex acutiformis</i>	swamp sedge	Eurasia	1951	St. Joseph Lake (M)	unknown
	<i>Carex disticha</i>	sedge	Eurasia	1866	Belleville, Ontario (O)	S(SB)
	<i>Carex flacca</i>	sedge	Eurasia	1896	Detroit River	unknown
Poaceae	<i>Agrostis gigantea</i>	redtop	Eurasia	1884	Ontario (S)	R(C)
	<i>Alopecurus geniculatus</i>	water foxtail	Eurasia	1882	Lake Erie	R(C)
	<i>Echinochloa crusgalli</i>	barnyard grass	Eurasia	<1843	widespread	R(C), S(SB)
	<i>Glyceria maxima</i>	reed sweet-grass	Eurasia	1940	Lake Ontario	R(C), S(SB)
	<i>Poa trivialis</i>	rough-stalked meadow grass	Eurasia	<1843	widespread	R(C), S(SB)
	<i>Puccinellia distans</i>	weeping alkali grass	Eurasia	1893	Montezuma, NY (O)	S(SB), RH
Sparganiaceae	<i>Sparganium glomeratum</i>	bur reed	Eurasia	1936	Lake Superior	unknown
Typhaceae	<i>Typha angustifolia</i>	narrow leaved cattail	Eurasia	1880s	central NY (O)	C, R(A)
Iridaceae	<i>Iris pseudacorus</i>	yellow flag	Eurasia	1886	Ithaca, NY (O)	R(C)
Shoreline Trees and Shrubs						
Betulaceae	<i>Alnus glutinosa</i>	black alder	Eurasia	<1913	widespread	R(C)
Salicaceae	<i>Salix alba</i>	white willow	Eurasia	<1886	widespread	R(C)
	<i>Salix fragilis</i>	crack willow	Eurasia	<1886	widespread	R(C)
	<i>Salix purpurea</i>	purple willow	Eurasia	<1886	widespread	R(C)
Rhamnaceae	<i>Rhamnus frangula</i>	glossy buckthorn	Eurasia	<1913	Ontario	R(C)