Invasive Species Mapping Protocols

Objective

The objective for creating these mapping protocols is to develop a unified database of invasive species occurrences within the Midwest region of the United States. These protocols were created in partnership with the Michigan Invasive Species Coalition (MISC). These guidelines will assist all partners within the region in documenting the occurrence and spread of invasive species. The data collected will allow for the development and implementation of effective control strategies in the region.

Documentation

Documentation: All information about invasive species occurrences must be documented using the categories on the official data form. All locations must be recorded using GPS. New occurrences should be marked with flagging ONLY if necessary to help relocate the invasive species for treatment. Volunteers must obtain permission before using flagging. The use of flagging or other references should be noted on the data form under the comments section.

All equipment, materials and instructions will be provided by project partners as needed.

GPS Protocols

GPS Protocols: For all observations, record a point location in the center of each population. If the area is heavily infested and distinct populations can be easily seen one to the next, mark no more than ONE point per 100ft. An average of 25 points should be taken per waypoint. All GPS points must be labeled with a unique ID number using the numbering convention explained below.

Unique ID

Unique ID: For each GPS position collected, record a unique twelve or thirteen digit number (depending on the invasive species code) in the GPS unit for each point as follows: "BBJJGM00141U" where BB is the two letter code for the natural area, JJ is the mapper's initials, GM is the invasive species code, 001 is the three digit sequence number, 4 is the area, 1 is the sparse density, and U is for untreated. Within each location, the three digit sequence number of the ID for each person should not be repeated. If the GPS unit you are using does not allow for a twelve digit number, only record the first nine digits. These nine digits are considered the waypoint number and can be matched to the data sheet later.

Data Collection – Standard Operating Procedure

1. Identify which volunteers have received invasive species identification training and/or mapping training. (http://www.misin.msu.edu/training/)
2. Ensure each mapping team contains at least one member with experience in both mapping and identification methods.
3. Provide basic refresher training to all volunteers regarding the invasive species which the group expects to encounter and the mapping protocol for recording GPS waypoints.
4. Before sending teams out to map independently, direct volunteers to locate targeted invasive species in the immediate area, to ensure teams are equipped to identify target species and have the opportunity to ask questions.
5. Provide each team with a GPS unit, a data collection form, and have them fill out the following details on the form:
   a. Date
   b. GPS Unit #
   c. Observer(s)
   d. Site/Location
6. Divide overall site into reasonable chunks for each team. Whenever team members encounter one of the targeted invasive species in their assigned area, log a waypoint as per the directions below, making sure the calculated precision of the GPS unit is within 10 meters.

Logging a GPS Waypoint

GPS waypoints may be logged in one of two ways; either log the location on the GPS unit as a point and label using the format described below and on the lower left hand corner of the data collection sheet, or record the latitude and longitude on the data collection sheet manually.

- The GPS Waypoint Code includes:
  - <u>Location Code:</u> "BB"- volunteers should create a two digit code representing the natural area the observation was recorded. E.g. "IW" for inland wetland.
  - <u>Observer Initials:</u> First initial of first name and first initial of last name. E.g. "JJ"
  - <u>Species:</u> Enter the two or three digit code for the invasive plant species found at the location. Each person will be given a code sheet with all of the invasive plant common names, scientific names, and the abbreviation codes. E.g. phragmites = PH
  - <u>Waypoint ID Number:</u> This is a three digit sequence number. The first entry should be "001", the second "002", the third "003", etc. A sequence number of the ID for each person should never repeat in the site being surveyed.

- **Record Area**—Select one of the following:
  - **0** = None / NA
  - **1** = Individual/few/several
  - **2** = < 1,000 square feet (half tennis court)
  - **3** = 1,000 square feet to 0.5 acre
  - **4** = 0.5 acre to 1 acre (football field w/o end zones)
  - **5** = > 1 acre

- **Record Density**—Select one of the following options:
  - **0** = None / NA
  - **1** = Sparse (scattered individual stems or very small stands)
  - **2** = Patchy (a mix of sparse and dense areas)
  - **3** = Dense (greater than 40% of the area)
  - **4** = Monoculture (nearly 100% of area)

- **Record Treatment Status**—Enter "U" for untreated; or "N" for nonconsecutive years treated; or enter the number of years of consecutive treatment; or "D" for don't know.

- **Record GPS Coordinates**—If not entering the waypoint code directly into the GPS unit, write the GPS coordinates for each plant species found at each location. All coordinates must be recorded in decimal degrees. For example: 44.75723, -85.65276 (N44.75723 W85.65276).

- **Record Comments**—Use this space to record anything of interest about the observation, i.e. note the use of flagging, general quality of natural community, last year treated (if known) or other pertinent information about the location, species infestation or mapping.

Data Collection Sheet

Date:_____   GPS Unit #:_____   Observer:_____   Site:_____

Waypoint Code			Area	Density	Treatment Status	GPS Coordinates (decimal degrees)		Comments		
Location Code	Observer Initials	Species *				Lat. i.e. N44.75723	Long. i.e. W85.65276			

Waypoint Code: XXYYZZ001
XX = Location Code
YY = Observer's Initials
ZZ = Species*
001 = Waypoint ID Number
(consecutive, ascending, and non-repeating, i.e. 001, 002, 003, etc.
*see attached sheet

Area
0 = None
1 = Individual/few/several
2 = < 1,000 sq. ft. (half tennis court)
3 = 1,000 sq. ft. to 0.5 acre
4 = 0.5 acre to 1 acre (football field w/o end zones)
5 = > 1 acre

Density
1 = Sparse (scattered individual stems or very smalls stands)
2 = Patchy (a mix of sparse and dense areas)
3 = Dense (greater than 40% of the area)
4 = Monoculture (nearly 100% of area)

Treatment Status
U = Untreated
# = Consecutive years treated
N = Nonconsecutive years treated
D = Don't know

MISIN Midwest Invasive Species Information Network

Last Updated: October 2021

MISIN -- Target Species

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
Amur honeysuckle	AH	*Lonicera maackii*	Hickory bark beetle	SQ	*Scolytus quadrispinosus*
Asian longhorned beetle	ALB	*Anoplophora glabripennis*	Hickory wilt	CS	*Ceratocystis smalleyii*
Autumn olive	AO	*Elaeagnus umbellata*	Japanese barberry	JB	*Berberis thunbergii*
Baby's breath	BB	*Gypsophila paniculata*	Japanese honeysuckle	LJ	*Lonicera japonica*
Bell's honeysuckle	BH	*Lonicera xbella*	Japanese knotweed	JK	*Fallopia cuspidatum*
Bighead carp	HN	*Hypophthalmichthys nobilis*	Leafy spurge	LS	*Euphorbia esula*
Bishops goutweed	BG	*Aegopodium podagraria*	Lymegrass	LG	*Leymus arenarius*
Brown marmorated stink bug	HH	*Halyomorpha halys*	Morrow's honeysuckle	MH	*Lonicera morrowii*
Bull thistle	BT	*Cirsium vulgare*	Multiflora rose	MR	*Rosa multiflora*
Butterbur	BU	*Petasites hybridus*	Mute swan	CO	*Cygnus olor*
Canada thistle	CT	*Cirsium arvense*	Narrowleaf cattail	NC	*Typha angustifolia*
Common buckthorn	CB	*Rhamnus cathartica*	Northern snakehead	NS	*Channa argus*
Common carp	CC	*Cyprinus carpio*	Oak wilt	OW	*Ceratocystis fagacearum*
Dame's rocket	DR	*Hesperis matronalis*	Oriental bittersweet	OB	*Celastrus orbiculatus*
Emerald ash borer	EAB	*Agrilus planipennis*	Phragmites (non-native)	PH	*Phragmites australis*
Eurasian watermilfoil	EW	*Myriophyllum spicatum*	Purple loosestrife	PL	*Lythrum salicaria*
European fly honeysuckle	LX	*lonicera xylosteum*	Quagga mussel	QM	*Dreissena bugensis*
European frog-bit	FB	*Hydrocharis morsus-ranae*	Reed canarygrass	RC	*Phalaris arundinacea*
European swamp thistle	ST	*Cirsium palustre*	Ruffe	GC	*Gymnocephalus cernuus*
Feral swine	FS	*Sus scrofa*	Russian olive	RO	*Elaeagnus angustifolia*
Fishhook waterflea	FWF	*Cercopagis pengoi*	Rusty crayfish	OR	*Orconectes rusticus*
Garlic mustard	GM	*Alliaria petiolata*	Sea lamprey	PM	*Petromyzon marinus*
Giant knotweed	GK	*Polygonum sachalinense*	Silver carp	HM	*Hypophthalmichthys molitrix*
Glossy buckthorn	GB	*Rhamnus frangula*	Spiny waterflea	SWF	*Bythotrephes longimanus*
Grass carp	CI	*Ctenopharyngodon idella*	Tatarian honeysuckle	LT	*Lonicera tatarica*
Gypsy moth	LD	*Lymantria dispar*	Wild parsnip	WP	*Pastinaca sativa*
Hemlock woolly adelgid	HWA	*Adelges tsugae*	Zebra mussel	ZM	*Dreissena polymorpha*

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MISIN -- Species of Concern

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
African oxygen weed	LM	*Lagarosiphon major*	Black carp	BCP	*Mylopharyngodon piceus*
Alewife	AW	*Alosa pseudoharengus*	Black henbane	BHN	*Hyoscyamus niger*
Amur corktree	AC	*Phellodendron amurense*	Black jetbead	BJ	*Rhodotypos scandens*
Amur Maple	AG	*Acer ginnala*	Black knapweed	BK	*Centaurea nigra*
Anchored water hyacinth	AWH	*Eichhornia azurea*	Black locust	BL	*Robinia pseudoacacia*
Apple of Peru	NP	*Nicandra physalodes*	Black swallow-wort	VN	*Vincetoxicum nigrum*
Asian chestnut gall wasp	DK	*Dryocosmus kuriphilus*	Bladder campion	BC	*Silene vulgaris*
Asian clam	CF	*Corbicula fluminea*	Bloody red shrimp	HA	*Hemimysis anomala*
Asian giant hornet	AGH	*Vespa mandarinia*	Blue spruce	SPR	*Picea pungens*
Asian loeseneri bittersweet	CL	*Celastrus loeseneri*	Blueback herring	AA	*Alosa aestivalis*
Asian marshweed	AM	*Limnophila sessiliflora*	Bohemian knotweed	PXB	*Polygonum x bohemicum*
Asiatic sand sedge	CK	*Carex kobomugi*	Bouncingbet	SO	*Saponaria officinalis*
Austrian pine	AP	*Pinus nigra*	Brazilian elodea	BW	*Egeria densa*
Balfour's touch-me-not	IB	*Impatiens balfourii*	Bristly locust	RH	*Robinia hispida*
Balsam woolly adelgid	BWA	*Adelges piceae*	British yellowhead	BY	*Inula britannica*
Banded mystery snail	BMS	*Viviparus georgianus*	Brittle water-nymph	WN	*Najas minor*
Barnyardgrass	ECG	*Echinochloa crus-galli*	Brittlestem hempnettle	GT	*Galeopsis tetrahit*
Beech bark disease	BBD	*Neonectria spp.*	Broadleaf helleborine	HEL	*Epipactis helleborine*
Beech scale	BS	*Cryptococcus fagisuga*	Broadleaved pepperweed	PEP	*Lepidium latifolium*
Bigleaf lupine	BLL	*Lupinus polyphyllus*	Brown garden snail	BGS	*Cantareus aspersa*
Bigleaf periwinkle	BP	*Vinca major*	Brownray knapweed	CJ	*Centaurea jacea*
Birdfoot trefoil	LC	*Lotus corniculata*	Butter and eggs	BE	*Linaria vulgaris*
Bitter dock	BD	*Rumex obtusifolius*	Butterfly bush	BBU	*Buddleja davidii*
Bitter sneezeweed	SZ	*Helenium amarum*	Cabbage rose	CAB	*Rosa centifolia*
Bitterling	BIT	*Rhodeus sericeus*	Callery pear	CP	*Pyrus calleryana*
Bittersweet nightshade	BN	*Solanum dulcamara*	Canada bluegrass	CBG	*Poa compressa*
Black alder	BA	*Alnus glutinosa*	Carolina fanwort	FW	*Cabomba caroliniana*

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Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
Carthusian snail	CAR	*Monacha cartusiana*	Common sheep sorrel	RA	*Rumex acetosella*
Caucasian bluestem	CBS	*Bothriochloa bladhii*	Common St. Johnswort	SJ	*Hypericum perforatum*
Cheatgrass	CG	*Bromus tectorum*	Common tansy	TV	*Tanacetum vulgare*
Chee reedgrass	CE	*Calamagrostis epigeios*	Common viper's bugloss	EV	*Echium vulgare*
Chinese buckthorn	CHB	*Rhamnus utilis*	Common wormwood	AV	*Artemisia vulgaris*
Chinese lespedeza	LES	*Lespedeza cuneata*	Cow vetch	VV	*Vicia cracca*
Chinese mitten crab	CMC	*Eriocheir sinensis*	Crack willow	SF	*Salix fragilis*
Chinese mystery snail	CMS	*Cipangopaludina chinensis*	Creeping buttercup	RR	*Ranunculus repens*
Chinese silvergrass	MS	*Miscanthus sinensis*	Creeping charlie	PN	*Pilea nummulariifolia*
Chinese wisteria	CW	*Wisteria sinensis*	Cressleaf groundsel	PG	*Packera glabella*
Chinese yam	CY	*Dioscorea oppositifolia*	Crown vetch	CV	*Coronilla varia*
Chocolate vine	AQ	*Akebia quinata*	Curly dock	CDK	*Rumex crispus*
Cogongrass	IC	*Imperata cylindrica*	Curly plumeless thistle	PT	*Carduus crispus*
Coltsfoot	TF	*Tussilago farfara*	Curly pondweed	PW	*Potamogeton crispus*
Columbus grass	COL	*Sorghum almum*	Cutleaf teasel	DL	*Dipsacus laciniatus*
Common barberry	BV	*Berberis vulgaris*	Cylindro	CYL	*Cylindrospermopsis raciborskii*
Common bugle	AR	*Ajuga reptans*	Cypress spurge	EC	*Euphorbia cyparissias*
Common chickweed	SM	*Stellaria media*	Dahurian buckthorn	RD	*Rhamnus davurica*
Common gypsyweed	GW	*Veronica officinalis*	Dalmatian toadflax	DT	*Linaria dalmatica*
Common kochia	KS	*Kochia scoparia*	Deptford pink	DA	*Dianthus armeria*
Common lilac	SV	*Syringa vulgaris*	Didymo	DG	*Didymosphenia geminata*
Common motherwort	MO	*Leonurus cardiaca*	Diffuse knapweed	DIF	*Centaurea diffusa*
Common mullein	MN	*Verbascum thapsus*	Dotted duckweed	DD	*Landoltia punctata*
Common nipplewort	CN	*Lapsana communis*	Ducklettuce	OA	*Ottelia alismoides*
Common periwinkle	VM	*Vinca minor*	English ivy	EI	*Hedera helix*
Common poison ivy	PI	*Toxicodendron radicans*	Enteromorpha	ENT	*Enteromorpha spp.*
Common ragweed	RW	*Ambrosia artemisiifolia*	Eurasian collared dove	ECD	*Streptopelia decaocto*

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
European cranberrybush	VO	*Viburnum opulus*	Giant African snail	AFS	*Lissachatina fulica*
European fireweed	EH	*Epilobium hirsutum*	Giant bellflower	BF	*Campanula latifolia*
European grapevine moth	EGM	*Lobesia botrana*	Giant hogweed	GH	*Heracleum mantegazzianum*
European lily of the valley	LV	*Convallaria majalis*	Giant ragweed	AT	*Ambrosia trifida*
European mountain ash	EMA	*Sorbus aucuparia*	Giant reed	GR	*Arundo donax*
European privet	PR	*Ligustrum vulgare*	Giant salvinia	GS	*Salvinia molesta*
European spindletree	EE	*Euonymus europaeus*	Giantchickweed	GCW	*Myosoton aquaticum*
European valve snail	VP	*Valvata piscinalis*	Gingermint	MG	*Mentha x gracilis*
European wand loosestrife	EWL	*Lythrum virgatum*	Girdled snail	GDL	*Hygromia cinctella*
European waterclover	WC	*Marsilea quadrifolia*	Goatsrue	GTR	*Galega officinalis*
Fall phlox	FP	*Phlox paniculata*	Golden bamboo	BBO	*Phyllostachys aurea*
False baby's breath	FBB	*Galium mollugo*	Golden mussel	LF	*Limnoperna fortunei*
False indigo bush	AF	*Amorpha fruticosa*	Goldfish	GF	*Carassius auratus*
Faucet snail	FAU	*Bithynia tentaculata*	Goldmoss stonecrop	GO	*Sedum acre*
Feathered mosquito fern	FMF	*Azolla pinnata*	Graceful cattail	GCT	*Typha laxmannii*
Field bindweed	BND	*Convolvulus arvensis*	Greater celandine	GCL	*Chelidonium majus*
Field hedge parsley	TA	*Torilis arvensis*	Grecian foxglove	DFX	*Digitalis lanata*
Field scabiosa	KA	*Knautia arvensis*	Hawaii arrowhead	HIA	*Sagittaria sagittifolia*
Five leaf aralia	ES	*Eleutherococcus siebodianus*	Heartshape false pickerelweed	HFP	*Monochoria vaginalis*
Flat pea	PE	*Lathyrus slyvestris*	Heath helicellid	XO	*Xerolenta obvia*
Floating marsh pennywort	HR	*Hydrocotyle ranunculoides*	Hill mustard	BO	*Bunias orientalis*
Flowering rush	FR	*Butomus umbellatus*	Himalayan balsam	HB	*Impatiens glandulifera*
Fuller's teasel	DF	*Dipsacus fullonum*	Himalayan blackberry	HBB	*Rubus armeniacus*
Garden valerian	GV	*Valeriana officinalis*	Himalayan knotweed	HK	*Polygonum polystachyum*
Garden yellow loosestrife	YL	*Lysimachia vulgaris*	Hoary alyssum	BI	*Berteroa incana*
Garden yellowrocket	YR	*Barbarea vulgaris*	Horse nettle	HNT	*Solanum carolinense*
Germander speedwell	VC	*Veronica chamaedrys*	Houndstongue	HT	*Cynoglossum officinale*

MISIN — Midwest Invasive Species Information Network

MISIN -- Species of Concern (Cont.)

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
Hybrid cattail	HC	*Typha x glauca*	Lesser celandine	FV	*Ficaria verna*
Hybrid crack willow	SR	*Salix x rubens*	Lombardy poplar	LP	*Populus nigra* var. *italica*
Hybrid watermilfoil	MXS	*Myriophyllum xspicatum*	Malaysian trumpet snail	MTS	*Melanoides tuberculata*
Hydrilla	HD	*Hydrilla verticillata*	Marestail	MAR	*Conyza canadensis*
Ide	LI	*Leuciscus idus*	Meadow hawkweed	MHW	*Hieracium caespitosum*
Indian swampweed	IS	*Hygrophila polysperma*	Meadow knapweed	CXM	*Centaurea x moncktonii*
Italian plumeless thistle	IPT	*Carduus pycnocephalus*	Medusahead	TC	*Taeniatherum caput-medusae*
Japanese buckthorn	RJ	*Rhamnus japonica*	Mile-a-Minute weed	MW	*Polygonum perfoliatum*
Japanese chaff flower	AJ	*Achyranthes japonica*	Money plant	MP	*Lunaria annua*
Japanese hedge parsley	TJ	*Torilis japonica*	Moneywort	LN	*Lysimachia nummularia*
Japanese hop	HJ	*Humulus japonicas*	Mountain lupine	ML	*Lupinus monticola*
Japanese mysterysnail	JMS	*Cipangopaludina japonica*	Mudmat	MM	*Glossostigma cleistanthum*
Japanese stilt grass	JS	*Microstegium vimineum*	Musk mallow	MU	*Malva moschata*
Japanese tree lilac	TL	*Syringa reticulata*	Narrowleaf bitercress	NB	*Cardamine impatiens*
Japanese wineberry	RP	*Rubus phoenicolasius*	New Zealand mudsnail	NZM	*Potamopyrgus antipodarum*
Japanese wisteria	JW	*Wisteria floribunda*	Nine-banded armadillo	DN	*Dasypus novemcinctus*
Java waterdropwort	OJ	*Oenanthe javanica*	Nodding thistle	NT	*Carduus nutans*
Jimsonweed	DS	*Datura stramonium*	Norway maple	NM	*Acer platanoides*
Johnsongrass	JG	*Sorghum halepense*	Nutria	MC	*Myocastor coypus*
Jumping worm	JM	*Amynthas agrestis*	Onerow yellowcress	OY	*Nasturtium microphyllum*
Kentucky bluegrass	KB	*Poa pratensis*	Orange day lily	OD	*Hemerocallis fulva*
Khapra beetle	TG	*Trogoderma granarium*	Orange hawkweed	OH	*Hieracium aurantiacum*
Killer algae	KLA	*Caulerpa taxifolia*	Orchardgrass	OG	*Dactylis glomerata*
Killer shrimp	DV	*Dikerogammarus villosus*	Oregon grape	MA	*Mahonia aquifolium*
Kudzu	KZ	*Pueraria montana*	Oxeye daisy	OX	*Leucanthemum vulgare*
Laurel willow	LW	*Salix pentandra*	Pale swallow-wort	VR	*Vincetoxicum rossicum*
Lesser burdock	LB	*Arctium minus*	Palmer amaranth	PAL	*Amaranthus palmeri*

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Last Updated: October 2021

MISIN -- Species of Concern (Cont.)

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
Paradise plant	PP	*Daphne mezereum*	Round goby	RG	*Neogobius melanostomus*
Parrot feather watermilfoil	PF	*Myriophyllum aquaticum*	Rudd	SE	*Scardinius erythrophthalmus*
Peppermint	MXP	*Mentha x piperita*	Rugosa rose	RU	*Rosa rugosa*
Perennial cornflower	CM	*Centaurea montana*	Russian thistle	RUS	*Salsola kali*
Perennial pea	LL	*Lathyrus latifolius*	Sacred lotus	NN	*Nelumbo nucifera*
Perennial sowthistle	PST	*Sonchus arvensis*	Saltcedar	TR	*Tamarix ramosissima*
Perfumed cherry	PC	*Prunus mahaleb*	Saltlover	HG	*Halogeton glomeratus*
Pignut	PIG	*Hoffmannseggia densiflora*	Sawtooth oak	QA	*Quercus acutissima*
Pine shoot beetle	PSB	*Tomicus piniperda*	Scarlet pumpernel	SPP	*Pimpinella saxifraga*
Poison hemlock	PHL	*Conium maculatum*	Scotch broom	SBR	*Cytisus scoparius*
Pond water-starwort	PWS	*Callitriche stagnalis*	Scotch thistle	SH	*Onopordum acanthium*
Porcelainberry	PB	*Ampelopsis brevipedunculata*	Scots pine	SP	*Pinus sylvestris*
Princesstree	PRN	*Paulownia tomentosa*	Seaside goldenrod	SG	*Solidago sempervirens*
Puncturevine	TT	*Tribulus terrestris*	Sharp-tooth buckthorn	STB	*Rhamnus arguta*
Purple foxglove	DP	*Digitalis purpurea*	Shasta daisy	SD	*Leucanthemum x superbum*
Quackgrass	QG	*Elymus repens*	Shatter cane	SCN	*Sorghum bicolor*
Queen Anne's lace	DC	*Daucus carota*	Siberian elm	UP	*Ulmus pumila*
Queen of the meadow	FU	*Filipendula ulmaria*	Siberian peashrub	SI	*Caragana arborescens*
Rabbitfoot clover	RF	*Trifolium arvense*	Siberian squill	SS	*Scilla siberica*
Rainbow smelt	OM	*Osmerus mordax*	Sickleweed	SKL	*Falcaria vulgaris*
Rampion bellflower	RB	*Campanula rapunculoides*	Silverleaf nightshade	SN	*Solanum elaeagnifolium*
Red clover	TP	*Trifolium pratense*	Simplestem bur-reed	BUR	*Sparganium erectum*
Red swamp crayfish	RS	*Procambarus clarkii*	Slender false brome	SFB	*Brachypodium sylvaticum*
Redear sunfish	RED	*Lepomis microlophus*	Smallflower hairy willowherb	EP	*Epilobium parviflorum*
Redtop	RT	*Agrostis gigantea*	Smooth brome	SB	*Bromus inermis*
Reed mannagrass	RM	*Glyceria maxima*	Smooth dock	SDK	*Rumex altissimus*
Rough cocklebur	XS	*Xanthium strumarium*	Southern cattail	TD	*Typha domingensis*

MISIN -- Species of Concern (Cont.)

Common Name	Abbrev. Code	Scientific Name	Common Name	Abbrev. Code	Scientific Name
Spiny plumeless thistle	**CA**	*Carduus acanthoides*	True forget-me-not	**FM**	*Myosotis scorpioides*
Spotted knapweed	**SK**	*Centaurea stobe*	Tyrol knapweed	**TK**	*Centaurea nigrescens*
Spotted lanternfly	**SLF**	*Lycorma delicatula*	Vanhoutte spirea	**VS**	*Spiraea x vanhouttei*
Starry stonewort	**NO**	*Nitellopsis obtusa*	Velvet leaf	**VEL**	*Abutilon theophrasti*
Stinking willie	**JV**	*Senecio jacobaea*	Vervain mallow	**VE**	*Malva alcea*
Stone moroko	**SMO**	*Pseudorasbora parva*	Wall hawkweed	**HW**	*Hieracium murorum*
Sudden oak death	**SOD**	*Phytophthora ramorum*	Walnut twig beetle	**WTB**	*Pityophthorus juglandis*
Sulphur cinquefoil	**CQ**	*Potentilla recta*	Water chestnut	**TN**	*Trapa natans*
Swamp stonecrop	**CH**	*Crassula helmsii*	Water flea (D. lumholtzi)	**LUM**	*Daphnia lumholtzi*
Swede midge	**SWM**	*Contarinia nasturtii*	Water hemlock	**WHM**	*Cicuta douglasii*
Sweet autumn clematis	**SAC**	*Clematis terniflora*	Water hyacinth	**WH**	*Eichhornia crassipes*
Sweet breath of spring	**SBS**	*Lonicera fragrantissima*	Water lettuce	**PS**	*Pistea stratioides*
Sweet woodruff	**SW**	*Galium odoratum*	Water soldier	**SA**	*Stratiotes aloides*
Sweetbriar rose	**RE**	*Rosa eglanteria*	Water spinach	**IA**	*Ipomoea aquatica*
Sweetwilliam	**DB**	*Dianthus barbatus*	Watercress	**CR**	*Nasturtium officinale*
Swordleaf rush	**JE**	*Juncus ensifolius*	Wavyleaf basketgrass	**OU**	*Oplismenus undulatifolius*
Tall buttercup	**TB**	*Ranunculus acris*	Wayfaring-tree	**VL**	*Viburnum lantana*
Tall hawkweed	**HP**	*Hieracium piloselloides*	Weather loach	**WL**	*Misgurnus anguillicaudatus*
Tatarian maple	**TMP**	*Acer tataricum*	Weeping willow	**WEP**	*Salix babylonica*
Tench	**TEN**	*Tinca tinca*	Wels catfish	**WE**	*Sulurus glanis*
Thorny olive	**TO**	*Elaeagnus pungens*	Western tubenose goby	**WTG**	*Proterorhinus semilunaris*
Thousand canker disease	**TCD**	*Geosmithia morbida*	White campion	**SL**	*Silene latifolia*
Threespine stickleback	**GA**	*Gasterosteus aculeatus*	White clover	**WHC**	*Trifolium repens*
Timothy	**TM**	*Phleum pratense*	White henbane	**WHB**	*Hyoscyamus albus*
Toringo crab	**MT**	*Malus toringo*	White mulberry	**MB**	*Morus alba*
Tree of Heaven	**TH**	*Ailanthus altissima*	White perch	**PER**	*Morone americana*
Tropical soda apple	**TSA**	*Solanum viarum*	White poplar	**PA**	*Populus alba*

MISIN -- Species of Concern (Cont.)

Common Name	Abbrev. Code	Scientific Name
White stonecrop	SC	*Sedum album*
White sweet clover	WS	*Melilotus alba*
White willow	WW	*Salix alba*
Whitetop	WTP	*Cardaria draba*
Wild chervil	AS	*Anthriscus sylvestris*
Wild garlic	WG	*Allium vineale*
Wild mint	WM	*Mentha x gentilis*
Wild mustard	MUS	*Sinapis arvensis*
Wild sunflower	SUN	*Helianthus annuus*
Willowleaf meadowsweet	WI	*Spiraea salicifolia*
Winged burningbush	EA	*Euonymus alatus*
Winged sumac	SU	*Rhus copallinum*
Winter creeper	EF	*Euonymus fortunei*
Winter moth	WMT	*Operophtera brumata*
Witch's moneybags	WT	*Hylotelephium telephium*
Wood bluegrass	WD	*Poa nemoralis*
Woodland forget-me-not	WFM	*Myosotis sylvatica*
Woolly fruit bur ragweed	AE	*Ambrosia eriocentra*
Woollyleaf bur ragweed	WLB	*Ambrosia grayi*
Wormword	WRM	*Artemisia absinthium*
Wrinkled dune snail	WDS	*Candidula intersecta*
Yabby	CD	*Cherax destructor*
Yellow archangel	YA	*Lamiastrum galeobdolon*
Yellow bedstraw	YB	*Galium verum*
Yellow bluestem	YBS	*Bothriochloa ischaemum*
Yellow flag iris	IP	*Iris pseudacorus*
Yellow floating heart	FH	*Nymphoides peltata*

Common Name	Abbrev. Code	Scientific Name
Yellow foxglove	YF	*Digitalis grandiflora*
Yellow starthistle	YST	*Centaurea solstitialis*
Yellow sweet clover	YS	*Melilotus officinalis*
Yucca	YUC	*Yucca spp.*
Zander	ZA	*Sander lucioperca*

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