Division of Fish and Wildlife

Discipline Guidelines

for

Invasive Species Operational Order 113

May 31, 2008

The Invasive Species Operations Order 113 Discipline Guidelines for the Division of Fish and Wildlife have been accepted and approved.

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I. Purpose and Overview

Because invasive species have the potential to adversely affect the natural resources that the Department manages, it is the Department's policy to:

- Limit the introduction of invasive species onto DNR managed lands and waters,
- Limit their rate of geographic spread, and
- Reduce their impacts on high value resources.

Because the DNR needs to be the lead on changing how we do business to ensure that we minimize our role in spreading invasive species and pathogens, the Operation Order and these guidelines requires equipment and activity hygiene above what is required of the commercial and recreational users of state resources. There were three main premises that made for the development of these guidelines:

- Movements of water, fish, aquatic plants, and equipment are the most likely pathways for transfer of non-target species, invasives, and pathogens by staff;
- Fish, water, and equipment may need to be moved from waters known to have non-target species, invasives, or pathogens to those that do not have them; and
- Most offices will not have separate equipment for those waters with invasives and those with none.

The purpose of the guidelines is to provide additional or alternative protocols that should be used in conjunction with what is in the Operations Order when engaged in work activities and unique situations to meet the following.

- Prevent or limit the introduction, establishment and spread of invasive species and pathogens.
- Implement site-level management to limit the spread and impact of invasive species. and pathogens
- Identifying invasive species and implement management strategies to reduce the impact at the site level
- Monitoring and reporting new invasive species infestations.

The information in the guidelines does not constitute the full array of management or cleaning techniques that can be used to address invasive species issues. If staff has techniques unique to their management needs they should be brought to the attention of the Operations Order 113 Guidelines team for review.

Supervisors and Project Managers must ensure that all personnel under their direction implement management activities consistent with the operation order and discipline guidelines:

- Annual work planning
- Annual training
- Follow state and federal statutes, rules and regulations
- Inform contractors and vendors of discipline guidelines and monitor compliance
- Minimize ecological impacts
- Consider Department management goals

The guidelines will be continually updated as new information becomes available.

II. Standard Protocols

Operational Order #113 (http://files-intranet.dnr.state.mn.us/user_files/1920/oporder_113.pdf) provides policy and procedures for prevention and management of invasive species. Division staff members are expected to carry out the operation and division guidelines to the best of their ability as part of their day-to-day operations in much the same way we incorporate safety practices in all we do. These guidelines apply to but are not limited to management planning, survey, site visits, restoration, invasive species treatments, activities permitted or reviewed by staff, contracts, and all activities using grant money.

Staff should reference the operational order and the specific activity protocols to plan the best management practices to implement during their workday unless:

- Alternative precautions have been outlined and approved that assist in responding to calls for service or visiting numerous sites each day
- Immediate response is needed to save a life
- Immediate response is needed to prevent serious environmental damage

Division employees are to use their best judgment in full recognition of the consequences of invasive species for long-term natural resources health and productivity. Area supervisors and regional staff are responsible for monitoring variations in guideline implementation to ensure consistent understanding and compliance among staff.

Intentional movement of materials (including organic and inorganic materials as well as water, fish, plants, mulch, soil, gravel, rock, etc):

1. Where possible, treat any infestations identified prior to utilizing any stored materials. Otherwise, restrict access to the storage site until such time as all infestations can be controlled.
2. At least once annually, inspect all sites where materials are stored for signs of invasive plants, animals, insects, or disease organisms.
3. Preserve all sampling material in the field unless the study requires live samples.
4. Transport live samples in sealed containers.
5. When possible minimize the use of materials from outside the site.
6. Before leaving an aquatic work site (or water source), drain water from any equipment, tanks or water-retaining components. Before disposing of water treat with ethyl alcohol or drain on land where water will not enter surface water.
7. Conduct post management treatment monitoring and treat any identified infestations.

Intentional movement of equipment (including trucks, trailers, heavy equipment, off highway vehicles, equipment, tools, personal clothing and gear, etc):

1. When possible, maintain separate equipment to use on non-infested sites and store them in a location away from equipment used on infested sites.
2. Work in non-infested sites before infested sites and work from the upper to the lower waters within a watershed.
3. Minimize soil disturbance with equipment.
4. Minimize number of access points to site.
5. Inspect all gear and remove any materials prior to leaving the site and before moving it from one work area to the next on the same site. Pressure washing or using compressed air is most ideal; using a broom or brush will be sufficient when moving within a work site.
6. Clean all equipment via drying, hot water wash or soak or treat with ethyl alcohol or other prescribed disinfectant if necessary, prior to moving to non-infested waters or at the end of each work day if encountering invasives or pathogens.

7. Carry boot brush in all vehicles and clean boots and clothing (in a controlled area) when leaving any site. Disinfect brush between sites.
8. Avoid parking in or moving through existing patches of invasive species when getting to and from the work site. When unavoidable, clean vehicle of all visible evidence of soil and vegetation when leaving the parking site.

Site Planning and Management:

1. Report suspected new infestations of invasives and pathogens to the DNR Invasive Species Program using the Invasive Species Reporting Form (Appendix XX) or electronically using standardized inventory protocols.
2. Identify invasive species and pathogens in your work sites and determine the extent to which you can mitigate their spread and impact at the site level.
3. Project proposals will include a statement that staff have checked for invasives, non-target species, and pathogens to determine if infestations exist.
4. Change frequency and timing of activity to avoid high-risk times for movement of non-target species, invasives, or pathogens.
5. Incorporate procedures in contracts and grants that help safeguard against spread and inspect contractor's work for compliance.

Monitoring and Evaluation:

Infestations of zebra mussels and spiny waterflea in the state suggest that casual spot monitoring is inadequate to find invasive populations in their initial invasion of a new habitat. They will likely have been present at the site for more than one season by the time they are discovered. Thus, routine standard precautions must be taken on EVERY site and more stringent precautions should be taken whenever any amount of water is to be moved from one waterbody to another. There exists a definite risk that routine activities could occur in waters that are infested; yet not reported. Thus, no water should ever be considered "safe" and not requiring extra effort to reduce as much as possible the risk of transport of invasives.

Workloads are already very full. Consequently, monitoring is to not to be a separate activity, but one that should be worked into your current schedule in the following priorities. First priority: Source waters and rearing ponds associated with hatcheries. Second priority: Rearing ponds not on hatchery grounds. Third priority: Lakes and surface waters used consistently in spawn take operations Forth Priority: Habitat improvement, site development, and shoreland restoration Fifth priority: All other activities. Ecological Resources staff may provide assistance with field collection as time permits. Ecological Resources will complete confirmation of suspected species/plants.

In addition to the above, staff should also

1. Review statutory or regulatory changes related to invasives and recommend changes to the Op Order and discipline guidelines.
2. Review discipline guidelines to ensure conformity with department policy.
3. Report findings to Ecological Resources
4. Keep a listing or database of those waters and sites with non-target species, invasives, and pathogens in your work area.

Results from field monitoring efforts will be used each year by Ecological Resources to update databases with the locations of invasives and pathogens that staff can access through the DNR WebPages.

III. Detailed Aquatic Activities

Category of Activity: Coldwater Hatchery Production and Stocking

Description: Includes spawning, rearing, and stocking of trout and salmon species.

Risk Assessment:

Overall Risk of Spread: **Low to Moderate**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
Low – moderate	Low	Moderate - High	Low	Low to Moderate

The coldwater facilities have in place strict biosecurity programs to prevent the introduction of fish pathogens and invasives. There is disease information on the state coldwater fish hatcheries since the mid 1970's. The coldwater hatchery operations seem to be at minimal risk, with biosecurity procedures and spring water for distribution being followed. Free-floating plant fragments or plant propagules, such as Eurasian watermilfoil or curly-leaf pondweed can be easily transferred if not careful. Concern will increase if New Zealand mud snails ever became established in any of their water sources. While zebra mussel risk seems low, on a site-specific basis (for example, French River) it may be significantly higher and should have a site-specific plan to address these differences.

Procedures to meet Op Order and discipline standards:

1. If the use of surface water is necessary, all water should be filtered through a l mm mesh filter or screen and the equipment disinfected.
2. Facilities that use waters known to have invasives as their water source must pass all intake water through a l mm filter or fine enough to block the smallest life stages of infesting plant and fish species.
3. Send out standard guidelines to contractors and stipulate adherence to guidelines in contract
4. Water harden eggs in pathogen free water and disinfect with an iodophor.
5. If eggs can be infested by the pathogen, use of the spawn take site must be discontinued, or eggs may only be used to produce fish to be stocked in waters infested with the same pathogen.
6. Use certified pathogen free fish stocks; otherwise, fish produced can only be stocked into waters already with that pathogen.
7. Areas receiving fish from coldwater hatcheries and expecting to off-load fish from the coldwater fish transports onto their distribution truck/trucks must arrive with their trucks, distribution tanks, dip nets and all personal gear thoroughly disinfected. The water in their distribution tanks **must** be ground water or well water, **not** surface water.
8. Continue strict biosecurity efforts and testing.
9. Educate contractors on op order and standard guidelines and stipulate adherence to guidelines in contract
10. Educate seasonal and temporary hires on op order and standard guidelines and stipulate adherence to guidelines in everyday work behaviors.

Monitoring:

1. Any spring not controlled on DNR lands should be examined summer and fall for freshwater snails. Focus is on detecting New Zealand mud snail infestation.
2. All source waters for rearing ponds should be monitored on a yearly basis for the presence of Non-target or invasive species
3. Fish pathogens need to be monitored in all reared fish. Sixty production fish and twenty brood fish samples from each lot need to be examined on a yearly basis. One hundred and fifty ovarian fluid

samples from spawning fish need to be screened for coldwater fish viruses and Renibacterium, warm water fish should also be sampled if available.

4. Monitor rearing ponds in late April and late June for curly-leaf pondweed and Eurasian watermilfoil. Determine if any plants growing in the rearing ponds are non-target or invasive species.

Category of Activity: Cool and Warmwater Fish Production and Stocking

Description: Includes spawning, rearing, and stocking of walleye, bass, muskie, catfish, northern pike, and white suckers.

Risk Assessment:

Overall Risk of Spread: Moderate - **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
Moderate	Moderate	Moderate - High	Low – Moderate	Moderate - High

The cool/warmwater hatcheries and rearing facilities have a higher risk due to using surface water sources for egg hatching and pond rearing, as well as the summer/fall time frame for some activities. Development of strict biosecurity efforts and testing for these facilities need to be developed and implemented using the coldwater hatchery documents a model.

Spawning: The egg take for muskie and northern pike seem to have lower risk because they are done in fewer sites and early in the season when there are few zooplankton populations, and no zebra mussel vilagers. Little water is moved and eggs are formalin treated. Any nets could have snails on them, as they are in the water for an extended period.

Walleye egg take has a higher risk, due to increased number of sites visited in one day. Treatment of eggs with formalin and little movement of water reduce risk. Again, nets used for egg take that are also used for lake surveys could be a potential pathway.

White sucker egg take operations are high risk. Fisheries procedures seem to have disinfection steps and precautions built in, while the private hatcheries pose an unknown risk. Particularly with respect to the Pine River, the level of risk is high because of its connection to Pelican Brook from Lake Ossawinnamakee as a tributary that has been identified with zebra mussels.

Rearing Ponds have higher risks than earlier stages of fish rearing that mostly occur within a facility. The natural surface water conditions, later season use, and multiple pond use in a day all factor to increase the risk of movement of free floating parts and seeds of invasives and pathogens. These habitats are probably not favorable for zebra mussels, but other invertebrate invasives could be in any of these waters.

Fish Distribution and Stocking risk varies depending on whether the fish are moved from facilities, which are a lower risk or the rearing ponds that are a much higher risk. Multiple lake harvests and stockings and use of surface waters also adds to increased risk.

Procedures to meet Op Order and discipline standards:

1. Eggs transported in “infested water” should be rinsed with water going into the infested water prior to bringing them into the facility. Infested water should be chlorinated and neutralized before discharge.
2. Any water transported as part of egg transfer should be formalin, Argentyne or hydrogen peroxide treated or discharged on ground, not directly to other waters.

3. Facilities that use waters known to have invasives as their water source must pass all intake water through a l mm filter or filter fine enough to block the smallest life stages of infesting plant and fish species.
4. Water harden eggs in pathogen free water and disinfect with an iodophor.
5. If eggs can be infested by the pathogen, use of the spawn take site must be discontinued, or eggs may only be used to produce fish to be stocked in waters infested with the same pathogen.
6. Use certified pathogen free fish stocks; otherwise, fish produced can only be stocked into waters already with that pathogen.
7. All forage fish should be tested for fish pathogens prior to import into facility or ponds.
8. Disinfect equipment and personal gear between lots.
9. Educate seasonal and temporary staff on op order and standard guidelines and stipulate adherence to guidelines in everyday work behaviors.

Rearing Pond Harvest and Stocking specifics

10. Use spring/well water as distribution water. If the use of surface water is necessary, all water should be filtered through a l mm mesh filter or screen and the equipment disinfected
11. Areas receiving fish from hatcheries must arrive with their trucks, distribution tanks, dip nets and all personal gear thoroughly disinfected. The water in their distribution tanks **must** be ground water or well water, **not** surface water.
12. Use minimal screening to capture fish, avoid capturing any small plant parts or seeds with the fish.
13. Attempt to eradicate non-target or invasive species from a pond by winter draw down, chemical treatment or dredging.
14. Hot pressure wash and disinfect vehicles, holding tanks, personal protective gear, nets, and equipment at the end of the day (see Appendix 7) in a location away from ponds and water supplies to prevent disinfectant or untreated water from entering those areas
15. Fish should be sampled for pathogens either during spawning activities or prior to stocking. Sixty fish per lot will be screened. All wild spawning muskellunge will have ovarian fluid collected on an annual basis for pathogen testing. Up to 2 ml of ovarian fluid from each female and 2 ml of sperm from each male should be collected in sterile 15ml centrifuge tubes (to be provided by the path lab). Tubes should be kept cool on ice and delivered within 24 hours. Laboratory needs to be notified of pending shipment.
16. Infested water should be the only stop or last stop on the stocking route. Never be in a situation where part of a tank of fish is off loaded and infested water used as make-up to get tank back to operational height.
17. Educate contractors on op order and standard guidelines and stipulate adherence to guidelines in contract

Monitoring:

1. Surface source waters should be sampled early and late summer. Plankton tows (vertical in deepwaterarea of lake, if source, or horizontal/oblique near intake, if large lake) to examine for exotic zooplankton and zebra mussel veligers. Survey in late summer for freshwater snails. Settling plate samplers (bricks, plates, etc) for zebra mussel settling.
2. All source waters for rearing ponds should be monitored on a yearly basis for the presence of Non-target or invasive species
3. Fish pathogens need to be monitored in all reared fish. Sixty production fish and twenty brood fish samples from each lot need to be examined on a yearly basis. One hundred and fifty ovarian fluid samples from spawning fish need to be screened for viruses.
4. Monitor late April and late June for curly-leaf pondweed and Eurasian watermilfoil. Determine if any plants growing in the rearing ponds are Non-target or invasive species.

Spawning Waters

1. Survey areas r for presence and composition of snail populations, curly-leaf pondweed, and Eurasian watermilfoil. In particular, check the area where nets are placed.
2. Late summer plankton tows for analysis for zebra mussel veligers and exotic zooplankton. Larger lakes may require more than a single vertical tow.
3. Late summer annual shoreline search on hard substrate in shallow waters for settled zebra mussels.

Rearing ponds not on hatchery grounds can have some cursory examinations during normal visits, but the first three items below require outside help for many stations.

1. Survey/monitor in late summer for freshwater snails. Shoreline search of solid substrate (rock, wood, etc) for settled zebra mussels in waters that do not undergo winterkill.
2. Late summer plankton sampling (vertical tow in deeper water) to look for exotic zooplankton. Monitor continually, as long as a pond is being used for rearing.
3. Monitor late April and late June for curly-leaf pondweed and Eurasian watermilfoil. Determine if any plants growing in the rearing ponds are Non-target or invasive species.
3. Randomly check fish during fish collection, transports and stocking for the presence of non-target or invasive species.
4. All source waters for rearing ponds should be monitored on a yearly basis for the presence of non-target or invasive species

Category of Activity: Winterkill Lakes and Kid's Fishing Ponds

Description: Movement of fish from one water body to another as a way of stocking them to provide fishing opportunities or salvage fish. Purchase of fish for stocking is also done.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
Moderate	Moderate	Moderate - High	Moderate - High	Moderate - High

Kids Fishing Pond: Moderate-high for snails and zooplankton; moderate for zebra mussels and New Zealand mud snails. Activity done during summer increases risk, with potential veligers, zooplankton and possibly resting egg stages present, as well as increased snail numbers. As multiple lakes are visited in a single day, risk also increases for movement between lakes as well as to the receiving water.

Winterkill Lakes: Due to the use of natural surface waters and sometimes visiting multiple areas in a single day the potential risk was rated high.

Procedures to meet Op Order and discipline standards:

1. Use spring/well water as distribution water. If the use of surface water is necessary, all water should be filtered through a l mm mesh filter or screen and the equipment disinfected.
2. The more surface waters visited in a day, the higher the risk of movement of invasives and pathogens – minimize visits to multiple lakes in a day.
3. Shake and clean nets and ropes thoroughly. Nets and ropes pose higher risks than 'hard' equipment, because they are harder to clean and more likely to entangle or snag non-target or invasive species. All equipment can be scrubbed with a brush and disinfectant, or soaked or sprayed with hot water (over 140 F).
4. If transported from a source with a known pathogen or invasive, fish and water can only be released into waters with a similar health history
5. Infested water should be the only stop or last stop on the stocking route. Never be in a situation where part of a tank of fish is off loaded and infested water used as make-up to get tank back to operational height. Drain all fish hauling water at site prior to leaving.
6. Educate contractors on op order and standard guidelines and stipulate adherence to guidelines in contract

Monitoring:

1. Surface waters to be worked on (surveys, habitat work, fish movement for winterkill re-stocking) should be checked against listed infested waters.

2. Randomly check fish during surveys and fish transports for the presence of non-target or invasive species.
3. In the course of day-to-day work look for non-target or invasive species. If any are observed, make note of the observations location and send it to the Ecological Resources Invasives Program as soon as possible. If the water was not known to be infested with Eurasian watermilfoil or flowering rush, a sample should be collected and sent to the Ecological Resources Invasive Species Program.
4. Fish pathogens need to be monitored in all fish to be transferred. Sixty fish from each site need to be examined by the pathology lab on a yearly basis.

Category of Activity: Purchase of fish

Description: Buying fish through the state purchasing processes to supplement our production or provide fish for unique projects.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Moderate	High

Lack of control of source of fish, water and unknowns relating to what is in the private facility create a higher risk for invasives and pathogen movement. Little is known about the daily activities of the private sector and how much attention they place on biosecurity Private rearing ponds are likely too small and transitory for risk of established zebra mussel populations, although any infestation in water supply could move veliger life stages. Likely to have snails, unless treatments done by aquaculturist to kill snails. Zooplankton can create populations and produce resting eggs. Free-floating plant fragments or plant parts and seeds, such as Eurasian watermilfoil or curly-leaf pondweed are a high risk.

Procedures to meet Op Order and discipline standards:

1. Educate contractors on op order and standard guidelines and stipulate adherence to guidelines in contract
2. No water of unknown sources from the private hatchery should be used for transport or release in stocked waters.
3. Use combined potassium chloride/dilute formalin treatment for transport and stocking truck (see Appendix 6).
4. Hatcheries and holding facilities that use “infested waters” as their source water, or facilities that become infested must develop and operate under an organism-specific prevention/control plan.
5. Fish should be sampled for pathogens prior to stocking or receiving. Sixty fish per lot will be screened for the presence of cold, cool and warm water fish pathogens.
6. Fish should not be moved from an “infested water” to a ”noninfested water”, or water, which is infested with a different non-target species, invasive, or pathogen. Private hatcheries with ponds considered “infested” should only be able to bid on similar waters.
7. Continue to require inspection of fish and facilities prior to loading trucks and at the delivery location

Monitoring:

1. Surface waters licensed by the vendors should be checked against listed infested waters to determine if they are on the list or in the watershed or connected to those that are listed.
2. Randomly check fish during loading and unloading for the presence of non-target or invasive species. If any are found try work with the vendor to document location and send information to Ecological Resources Invasive Species Program.
3. Check to ensure fish pathogen certification documentation is in order for the fish being delivered.

Category of Activity: Habitat Improvement and Shoreland Restoration.

Description: Includes all activities and work done by the statewide construction and habitat improvement crews and the shoreland restoration program. Includes the grant program for shoreland restoration also.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
Moderate - High	Moderate	High	Low	High

Shoreland Program – Restoring Native Vegetation: The risk seems relatively low because most of the equipment can be easily cleaned and disinfected before moving to the next site. Snails can be moved in water pumped off-site, in any mud, on waders and other gear, so any equipment, particularly larger equipment, has potential to move them The highest risk is the transplant of aquatic vegetation (bulrush and water lily) from one water body to another. Invertebrates could be attached to or caught in the vegetation, and would be moved to a separate water body without drying. It is possible that resting eggs of exotic zooplankton could also be caught on this transplanted vegetation and moved.

Habitat Improvement – Trout Streams: Movement of earth and water has the potential to spread various invasives and pathogens. The risk is highest for snails, particularly if sediments are moved on equipment that is used in other water bodies. Particular concern could be the New Zealand mud snail. Plants, which can be spread by plant parts and seeds in lake and stream sediments, such as purple loosestrife and curly- leaf pondweed, have the highest risk of being moved on equipment if not cleaned.

Habitat Improvement – Lakes:
Similar to above, with some increased risk for resistant life stages for zooplankton.

Procedures to meet Op Order and discipline standards:

1. No sediment or water should be moved between water bodies.
2. Any water pumped out of a water body should be filtered and released into the same water body or drained on land..
3. No transplant of aquatic vegetation from any water listed as infested with aquatic invertebrates unless going into a water body with that invasive.
4. Thoroughly inspect and rinse plants for transplant in source water; briefly soak in soapy water, followed by rinse in clean well water prior to movement to destination waters.
5. Make sure all of the material planted are native plants.
6. Construction equipment should be cleaned and disinfected prior to leaving site
7. Educate contractors and grantees on op order and standard guidelines and stipulate adherence to guidelines in contract and grant.
8. Educate volunteers, seasonal, and temporary hires on op order and standard guidelines and stipulate adherence to guidelines in everyday work behaviors.

Monitoring

1. Surface waters to be worked on (surveys, habitat work, fish movement for winterkill re-stocking) should be checked against listed infested waters.
2. In the course of day-to-day work look for non-target or invasive species. If any are observed, make note of the observations location and send it to the Ecological Resources Invasives Program as soon as possible.

If the water was not known to be infested with Eurasian watermilfoil or flowering rush, a sample should be collected and sent to the Ecological Resources Invasive Species Program.

Category of Activity: Survey Program - Lakes and Streams

Description: Includes partial, full and special assessments and creel surveys.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Low	High

Stream Surveys: This is difficult to assess, due to the great variability in sizes of waters surveyed. For example, a creel clerk walking a stream would present little risk. A boom shocker working a larger river might have higher risk. While small streams pose little risk of zebra mussels, medium and larger size rivers have much higher risk. Larger rivers also may pose zooplankton risk in impounded areas. Much of the potential risk in the smaller streams, particularly in coldwater systems, may be that from moving snails, particularly New Zealand mud snails.

Lake Surveys: With the high number of natural surface waters visited, the large amount of equipment, and the time frame that these are conducted in, this activity has higher potential risk for invasives and pathogen transport. Drying/freezing nets aids in prevention, except that many invertebrate infestations will be unknown for a year or more prior to detection, which permits potential movement while water is still considered "uninfected".

Creel surveys Minimal to low risk on access based ones, while surveys on medium to larger size rivers and lakes carry a much higher risk.

General Equipment/gear left submerged in lakes, stream or rivers for extended periods, during summer may carry exotic aquatic invertebrates. In larger rivers, zooplankton populations can develop and produce resting eggs. Zebra mussel veligers typically are present in infested waters during summer, zooplankton populations are reproducing at increased rate, and snail populations are high. Nets left in a lake during zebra mussel reproduction can easily have attached juvenile zebra mussels settle, and these are unlikely to be visible. This can also occur in rivers with zebra mussel populations. The number of waters worked in and visited increase risk. Invasive aquatic invertebrate populations can easily be in a particular water for more than a season prior to any discovery, creating even higher risk. Aquatic plants which free-floating plant fragments can spread and plant parts and seeds are most likely to be spread due to nets, anchors, and leads. Movement of fish from a particular stream or river to another or to a hatchery can move microscopic life stages of invasives and pathogens.

Little is known about the pathogen loads of the lakes, rivers and streams being studied and crews are just now placing more attention to biosecurity.

Procedures to meet Op Order and discipline standards:

1. Any equipment left in waters (such as nets, floats, anchors should not be used in any other waters until they have been thoroughly cleaned, dried and disinfected.
2. Boats and other gear should not be used in infested and non-infested waters in the same day.
3. Particular attention should be given to bottom of boots and any gear, which may gather mud, plant fragments or seeds or small aquatic invertebrates.

4. Use spring/well water as distribution water. If the use of surface water is necessary, all water should be filtered through a l mm mesh filter or screen and the equipment disinfected
5. Infested water should be the only stop or last stop on the stocking route. Never be in a situation where part of a tank of fish is off loaded and infested water used as make-up to get tank back to operational height. Drain all fish hauling water at site prior to leaving.
6. Educate cooperators and contractors on op order and standard guidelines and stipulate adherence to guidelines in contract or grants.
7. Educate seasonal and temporary hires on op order and standard guidelines and stipulate adherence to guidelines in everyday work behaviors.

Monitoring:

1. Surface waters to be worked on (surveys, habitat work, fish movement for winterkill re-stocking) should be checked against listed infested waters.
2. Randomly check fish during surveys and fish transports for the presence of non-target or invasive species.
3. In the course of day-to-day work look for non-target or invasive species. If any are observed, make note of the observations location and send it to the Ecological Resources Invasives Program as soon as possible. If the water was not known to be infested with Eurasian watermilfoil or flowering rush, a sample should be collected and sent to the Ecological Resources Invasive Species Program.
4. Fish pathogens need to be monitored in all fish to be transferred. Sixty fish from each site need to be examined by the pathology lab on a yearly basis.

Category of Activity: Wetland Habitat Program.

Description: Wetland development and maintenance work involving fish barriers, water level management, water control structures, ditches, dikes, and aquatic vegetation manipulation.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Low	High

Soil, plant parts and seeds may adhere to vehicles, trailers, ATVs and watercraft used to access and inspect sites, and exposure may be unavoidable. Soil, plant parts and seeds may adhere to mechanized equipment used to clear debris from outlets and control structures (tractors, backhoes, or other heavy equipment), to equipment used to maintain dikes and spillways (tractors, mowers, ATVs), and to heavy equipment used to expose and move large quantities of earth during impoundment development, wetland restoration, water control and wetland enhancement activities (large excavators, drag-lines, dump trucks, and bulldozers). Exposure of this equipment to soil and plants is usually unavoidable. Soil, plant parts and seeds may adhere to clothing, gloves, boots, waders and hand tools. Exposure of these items to soil and plants is usually unavoidable. Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment. Access through parking lots and roads or trails pose major risk of exposure of vehicles, equipment and footwear to seeds of invasive species, even when only conducting routine monitoring visits. Non-profit organizations and contractors administering major wetland development, restoration and enhancement projects may have less familiarity with and knowledge of invasive species issues, policies and mitigation strategies, thereby increasing the risk of spread and establishment of invasive species when engaged in these activities. Sites may be frequently accessed on foot or by motorized vehicle by the general public that also serve as a major vector for introduction and transport of soil and plant materials, particularly during hunting seasons.

Organisms or materials being intentionally moved to or off a project site:

- Removal of woody debris (logs, branches, beaver cuttings), vegetation, rocks or sediment from outlets, control structures and spillways.
- Woody and herbaceous vegetation removed from borrow-sites.
- Woody debris, vegetation, rocks or sediment moved to upland sites immediately adjacent to removal site or moved to another off-site upland location for routine structure & outlet maintenance activities.
- Seeding of grasses and forbs and any associated mulch on disturbed areas associated with control structure, dike & spillway repairs, replacements and developments.
- Fill from nearby or off-site borrow areas used for minor maintenance and major development projects associated with dikes, spillways and control structures.
- Rock of various sizes moved on site to riprap dikes, spillways and control structures.
- Aquatic seeding in existing or restored wetland basins as part of enhancement activities (e.g. seeding wild rice, moist-soil wetland plants, etc.).
- Aquatic vegetation removal from sites using heavy equipment (e.g. drag-lines, cookie cutters) to create open water as part of enhancement activities.
- Various artificial or processed materials brought on-site for major rehabilitation & development projects, including erosion control fabric, staking, rat-wire, culverts (concrete, metal, pvc-coated metal), concrete, bentonite, steel rebar, sheet-pile, metal catwalks, etc.

Procedures to meet Op Order and discipline standards:

1. To the extent possible, avoid accessing sites with vehicles and heavy equipment during wet periods that may increase soil exposure on site, especially on dikes, spillways and access roads.
2. Clean equipment, vehicles, clothing and footwear prior to visiting the site if possible. Particularly important if vehicles have been used previously during wet, muddy conditions and on unpaved road surfaces.
3. If impractical to thoroughly clean equipment or vehicles between sites, knock off the big chunks of soil and accumulated plant material and sweep off equipment to the extent possible before entering a new site.
4. Minimize site disturbance to the extent practical.
5. If site has multiple access points (for management purposes and the general public), use only one access or limit number of access points used over time to the extent possible.
6. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites
7. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site if practical.
8. If large quantities of silt, bog & debris need to be cleared of structures or outlets, and after obtaining necessary permits, dispose of material on-site on a nearby upland location if possible to minimize potential for spread of invasive species to other sites.
9. When practical, mow dikes prior to seed maturation and combine with herbicide treatment prior to seed maturation to minimize spread of seed on-site while mowing.
10. For projects involving exposure and movement of large amounts of earth, inspect site prior to development/restoration/enhancement for presence of invasive terrestrial or wetland vegetation. If invasive species of concern are present, conduct control/eradication prior to commencing construction to the extent possible and if increased hydrology may result in establishment or expansion of the species.
11. If control structures are being installed, consider designs that may allow for flexible management of water levels to aid in control of invasive species.
12. Seed impoundments and/or associated dikes and spillways with appropriate vegetation that may out compete invasive species and prevent establishment.

13. When practical, obtain certified invasive/weed-free seed & mulch sources.
14. To the extent possible, ensure that drills and broadcast seeders have been thoroughly cleaned prior to arriving on-site to minimize introduction of invasive species that do not occur on location.
15. Provide information to contractors, volunteers and non-profit organizations involved with these activities. Require adherence to operational order 113 for work done on state property.
16. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species (dikes, spillways, borrow-pits, staging areas), inspect at least through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
17. Frequently monitor sites used for vehicle or recreation access (e.g. dikes, roads, trails, parking lots).
18. If a site becomes infested subsequent to initial activity, other sites visited within a similar period of time with the same equipment or vehicles should be checked for the spread of invasive species.

Category of Activity: Waterfowl Nest Structure

Description: New nest structure construction and installation. Cleaning and repair of existing nest structures.

Risk Assessment:

Overall Risk of Spread: **High**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Low	High

Seeds of invasive aquatic plants (e.g. purple loosestrife, hybrid and narrow-leaved cattail, reed canary grass, etc.) may be present in the substrate and not readily apparent.
Soil, plant parts and seeds may adhere to highway vehicles, trailers, ATVs and watercraft used to access and inspect sites, or other equipment used to carry out the task. Mud and plant material often enter watercraft inadvertently when removing over water or floating structures and by use of paddles, oars and push-poles. Soil, plant parts and seeds may adhere to clothing and footwear. If wading is necessary, mud and plant material in deeper areas as well as along shorelines and on mudflats will cling or adhere to waders. Non-profit organizations and volunteers administering installing and maintaining waterfowl nesting structures may have less familiarity with and knowledge of invasive species issues, policies and mitigation strategies, thereby increasing the risk of spread and establishment of invasive species when engaged in these activities. Members of the general public participating in this activity are generally unaware of threats posed by terrestrial invasive plants, may transport soil, seed and plant parts from a wide geographic area, and are unlikely to make a serious effort to mitigate spread of invasive species.

<u>Organisms or materials</u> being moved to a project site and off a project site:

- Removals of birds or mammals potentially carrying weed seed, subsequent transport, and possible introduction of seed into release or disposal sites.
- Bedding or other material used for animal capture & release activities (e.g. turkey trap & transplant program) may have an invasive plant seed component.
- Feces of captured animals may have an invasive plant seed component and be transported to release or disposal sites.

Procedures to meet Op Order and discipline standards:

1. If practical, conduct activities when surface waters and ground are frozen.
2. Knock off big chunks of soil and plants and spray or sweep off equipment before entering a new site.
3. Clean equipment, vehicles, clothing and footwear prior to visiting the site.

4. To the extent possible, avoid accessing sites with vehicles during wet periods that may increase soil exposure on site, especially on dikes, spillways and access roads.
5. Minimize the number of wetland access points/landings.
6. If practical, avoid using watercraft launch sites that are infested with invasive species, or access such sites when risk of exposure & transfer is eliminated or minimized.
7. Loafing platforms and floating nesting structures potentially exposed to aquatic invasive plants should be dried or frozen prior to using at another site (see fisheries guidelines).
8. To the extent possible, remove obvious soil, seed, plant parts, and invertebrates adhering to loafing platforms and floating nesting structures prior to leaving a site.
9. If the site or access point is known to have invasive species, if possible, clean equipment, vehicles, and footwear prior to leaving the site.
10. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
11. Use nest material known to be free of invasive species if possible.
12. Consider abandoning nest structures in areas with significant infestation of invasive aquatic species and where structures have been determined ineffective in bolstering local waterfowl production/populations as determined by evaluation/monitoring.
13. Provide information to contractors, volunteers & non-profit organizations involved with nest structure activities. Require adherence to operational order 113 for work done on state property.
14. Monitor heavy use areas, major access points (especially watercraft landing sites), trails or roads where activity occurred.
15. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
16. If a visited site subsequently becomes infested with terrestrial invasive plants, other sites visited within a similar period of time should be checked for the spread of invasive species.

Category of Activity: Wildlife Lake Assessments

Description: Monitor and evaluate environmental conditions relating to wetland wildlife lakes.

Risk Assessment:

Overall Risk of Spread: **Moderate**

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Moderate	High

Equipment

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs and personnel clothing used for all activities.

Organisms, materials

- Personnel may inadvertently carry hitch-hikers on self, boats, nets, equipment, etc.
- Wildlife staff may not be able to accurately identify aquatic weeds and thus limit spread.

Procedures to meet Op Order and discipline standards:

- Try to move from un-infested waters to infested waters.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Become familiar with aquatic invasive species – just because a water body is 'infested', does not mean that it is infested with all species. Care should be taken not to move any organism from one body of water to another.

- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Site avoidance. If practical, avoid:
    - infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of purple loosestrife).

Monitoring

- Inspect water access areas twice per growing season.

IV. Other Discipline Aquatic Guidelines

Ecological Services Guidelines (www. ?????) for the following activities should also be reviewed and incorporated into Fish and Wildlife related activities

V. Detailed Terrestrial Activities

Category of Activity: Headquarters Operations

Description: Maintenance such as shoveling, cleaning, repairs, and storage of equipment.

Risk Assessment:

Overall Risk of Spread: **Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
Low	Moderate	High	Moderate	High

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, and personnel clothing used for all activities.
- Public and DNR parking areas around office receive vehicles from many places.
- Development (landscaping, construction) and maintenance (mowing, grading) activities—both contract and DNR.
- Earthen and vegetative materials are often cleaned from field equipment and vehicles at DNR offices.

Organisms, materials being moved to a project site and off a project site:

- Animal carcasses are often inspected at DNR offices and may have invasive pathogens.
- A variety of supplies (wood posts, gravel, rock, mulch, seed, etc.) are stored at many DNR offices.
- Plant and earthen materials may be brought onsite for DNR office development or maintenance projects (i.e., landscaping, new construction, repairs).

Procedures to meet Op Order and discipline standards:

- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- Make sure material cleaned from field equipment at headquarters is easily contained and disposed of properly and does not contaminate surface waters or areas not easily monitored.
- Purchase supplies from vendors that have weed-free supplies.
- Restrict access by public and other agencies to areas around headquarters that are easily monitored.
- Require all contractor and DNR equipment working at headquarters (i.e., lawn care service) to be cleaned offsite prior to starting work.

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
- Complete annual inspections of outside storage areas for invasive plant growth. Make this a part of Annual Site Inspection process.

Category of Activity: Land Acquisition

Description: Reviewing potential land purchase parcels in the field.

Risk Assessment:

Overall Risk of Spread: **Low**

Site Disturbance	Diseases	Plants	Materials	Equipment
NA	Low	Low	Low	Low

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, and personnel clothing used to conduct site inspections.

Organisms, materials being moved to a project site and off a project site:

- Not applicable

Procedures to meet Op Order and discipline standards:

- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.

Monitoring:

- Monitoring generally would not be required unless organisms or materials are brought to a site as part of these activities, or unless a visited site subsequently becomes infested. If the latter occurs, other sites visited within a similar period of time should be checked for the spread of invasive species.

Category of Activity: Heritage Grant Administration

Description: Habitat project work reviews in the field.

Risk Assessment:

Overall Risk of Spread: **Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
NA	Low	High	Low	Low

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, ATVs, and clothing used to conduct site inspections.
- Grant applicants and contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.

Organisms, materials being moved to a project site and off a project site:

- Material (gravel, fill, rock, seed, wood posts, mulch, etc.) may be brought onsite complete HE Grant projects.

Procedures to meet Op Order and discipline standards:

- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Make sure HE Grantee purchase products from vendors that have certified weed-free supplies when feasible.
- Inspect source of materials when feasible (especially gravel and fill material).

- Insert language into contracts that requires vendors to clean equipment prior to entering state lands; and recommend that Project Supervisor or designee inspect equipment prior to beginning work.
- Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- Provide educational material to HE Grantee's involved with activities that may introduce or cause the spread of invasive terrestrial species on state lands.
- Dispose of waste earthen and vegetative materials from HE Grant projects properly (i.e. in a manner that eliminates or reduces the threat of spreading invasive terrestrial species and/or makes treating those species more feasible).

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Enforcement

Description: Managing enforcement issues.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
NA	Low	High	Low	Low

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, and personnel clothing used to conduct enforcement activities.
- Personnel may not have time to clean equipment properly during enforcement activity.

Organisms, materials being moved to a project site and off a project site:

- Confiscated materials (i.e., hunting equipment) may contain invasive terrestrial species.

Procedures to meet Op Order and discipline standards:

- If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- In situations where personnel are responding to an emergency or an ongoing violation, all reasonable efforts shall be made to prevent the transportation or introduction of an invasive species. The need to respond immediately shall be weighed against the potential threat of not conducting preventative measures of thoroughly inspecting and removing organisms from equipment.

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Environmental Review Program

Description: Review and provide input for voluntary and required assessments of project impacts to historical, cultural, heritage, environmental resources.

Risk Assessment:

Overall Risk of Spread: **Low**

Site Disturbance	Diseases	Plants	Materials	Equipment
NA	Low	Moderate	Low	Low

Soil and plant parts may adhere to highway vehicles or ATVs used to inspect sites.
Soil may adhere to clothing and boots.

Procedures to meet Op Order and discipline standards:

1. Clean equipment, vehicles, clothing and boots prior to visiting the site.
2. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
3. Monitoring generally would not be required other than if the site subsequently becomes infested then other sites visited within a similar period of time should be checked for the spread of invasive species.

Category of Activity: Resource Assessment

Description: Monitor, evaluate and assess natural and cultural resources relating to wildlife habitat or populations.

Risk Assessment:

Overall Risk of Spread: **Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
Low	Low	Moderate	Low	Low

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs and personnel clothing.

Organisms, materials being moved to a project site and off a project site:

- Personnel may inspect several sites in one day and transport materials from site to site.
- May involve traversing the entirety of the unit, both infested and non-infested areas.
- Informal surveys may include collecting specimens (i.e. Minnesota Odonata Survey Project), which would be taken off the site alive.

Procedures to meet Op Order and discipline standards:

- Plan daily activities to include consideration for invasive species – when possible start at units with none to little invasive species infestation.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Move from un-infested areas to infested areas within a unit.

- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Site avoidance. If practical, avoid:
    - infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
    - Wet soil to reduce movement of seeds and soil borne organisms.
    -

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal. This may include many site visits yearly depending on what species are present on a site.

Category of Activity: Noxious Weed Control

Description: Control of noxious weeds using herbicides, equipment, or mechanical practices.

Risk Assessment:

Overall Risk of Spread**: Very High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- DNR employees or contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.
- Equipment used to manage noxious weeds readily transport plant material (i.e. tractor, sprayer, mower, brush hog, etc) to other destinations and along the travel routes.
- Travel to and from infestation(s) on a unit can result in advancing the infestation.

Organisms, materials being moved to a project site and off a project site:

- Equipment used to mow or spray noxious weeds transport seeds and plant material (i.e tractor, sprayer, mower, brush hog, etc) to other WMAs and along travel routes.
- Many sites are treated at the height of the infestation.
- Management due to spraying may weaken native plants and cause greater spread of invasive plants.

Procedures to meet Op Order and discipline standards:

- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Try to move from un-infested areas to infested areas within a unit.
- Do not use equipment for other activities while being used for noxious weed control unless equipment is thoroughly cleaned before use on non-infested sites.
- Management due to spraying may weaken native plants and cause greater spread of invasive plants.
    - Spot spray when possible.
- Site avoidance. If practical, avoid:
    - infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
    - wet soil to reduce movement of seeds and soil borne organisms.

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal. This may include many site visits yearly depending on what species are present on a site.
- Inspect 'non-infested' units annually.

Category of Activity: Prairie/Grassland Management

Description: All efforts to improve, restore, establish native prairie grasslands including planting, mowing, brushing, and herbicide applications.

Risk Assessment:

Overall Risk of Spread**: Very High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- DNR employees or contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.
- Contract vendors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.
- Contractor and DNR equipment brought onsite may contain pre-existing plant and soil material.

Organisms, materials being moved to a project site and off a project site:

- Seed may contain weed seeds.
- Clipping and mowing may encourage the spread of weed seeds.
- Management due to spraying may weaken native plants and cause greater spread of invasive plants.

Procedures to meet Op Order and discipline standards:

- Move from un-infested areas to infested areas within a unit.
- Plan daily activities to include consideration for invasive species – when possible start at units with none to little invasive species infestation.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Purchase native plant seed from sources that are certified noxious weed free.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Seedbed preparation and planting can involve soil disturbance, making invasive species spread problematic.
    - Spray site with herbicide prior to planting to reduce incidence of future weed problems.
- Spot spray when possible.
- Mow before weed seeds are viable.
- Educate contractors of invasive species known to be on the site
    - Time contracts to reduce weed movement off-site.
    - Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
    - Provide information on species identification, distribution and ways to minimize spread.
- Site avoidance. If practical, avoid:

- infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
- wet soil to reduce movement of seeds and soil borne organisms.

Monitoring

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal. This may include many site visits yearly depending on what species are present on a site

Category of Activity: Food Development

Description: Annual planting of food plots or contract or placement of feeder cribs for winter habitat improvement.

Risk Assessment:

Overall Risk of Spread**: Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- DNR employees or contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.

Organisms, materials being moved to a project site and off a project site:

- Seedbed preparation and planting cause soil disturbance, making invasive species spread problematic
- Seed may contain weed seeds.

Procedures to meet Op Order and discipline standards:

- Limit management activities while soil is moist to reduce chance of invasive species movement.
- Maintain good weed control through spraying or cultivating.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Plan to establish other desirable vegetation in food plot location following its use as a food plot.

Monitoring

- Note weeds in food plot during growing season and check annually for two years following its use a food plot.

Category of Activity: Cooperative Farming Agreements

Description: Management of cooperative farming agreements including haying, food plots, grazing, nesting and cover planting for wildlife habitat improvement.

Risk Assessment:

Overall Risk of Spread**: Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment

High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- Private vendors may be unaware of problems associated with the spread of invasive species via equipment, clothing, livestock and vehicles.
- Contractor and DNR equipment brought onsite may contain pre-existing plant and soil material.

Organisms, materials being moved to a project site and off a project site:

- Seedbed preparation and planting cause soil disturbance, making invasive species spread problematic likely
- Seed may contain weed seeds.
- Grazing *may* lead to spread of invasive species due to:
    - plant material adhered to animals coat
    - seeds contained within the digestive system
    - increased soil disturbance

Procedures to meet Op Order and discipline standards:

- Limit management activities while soil is moist to reduce chance of invasive species movement.
- Maintain good weed control through spraying or cultivating.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Establish vegetation in food plot location following its use as a food plot.
- Grazing agreements
    - Include a quarantine period prior to animals entering the unit.
    - Cooperator should be educated on the risk of invasive species introduction and spread to and from the WMA.
    - Strict grazing timelines should be established to:
        - reduce stress on native vegetation
        - maintain minimum stubble height to eliminate possibility for soil erosion and weed establishment
    - Spot spraying should be incorporated to treat weeds not actively grazed by animals.

Monitoring

- Grazed/Pastured areas - inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal
- Row crop areas - note weeds in food plot during growing season and check annually for two years following its use a food plot.

Category of Activity: Prairie/Grassland Burns

Description: Prescribed burning using firebreaks, equipment, and personnel to enhance wildlife habitat improvement.

Risk Assessment:

Overall Risk of Spread**: Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Low	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- DNR employees or contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.

Organisms, materials being moved to a project site and off a project site:

- Warm, fertile soils can be cause some invasive species to flourish (i.e. Canada thistle).
- Much prescribed burning is conducted in the spring when soils are moist. Equipment can cause ruts and allow for weeds to establish.
- Water used for fire may be obtained from infested waters and then released into another body of water.

Procedures to meet Op Order and discipline standards:

- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Mow fire breaks when weed seed movement is least likely.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Educate contractors of invasive species known to be on the site
    - Time contracts to reduce weed proliferation.
    - Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
    - Provide information on species identification.
- Move from un-infested areas to infested areas within a unit.
- Plan daily activities to include consideration for invasive species – when possible start at units with none to little invasive species infestation.
- Site avoidance. If practical, avoid:
    - infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
    - wet soil to reduce movement of seeds and soil borne organisms.

Monitoring

- If species known to surge following a fire have been recorded prior to a prescribed burn, plan to conduct further monitoring during the growing season following the fire.

Category of Activity: Woody Cover Development

Description: Planting and weed control of woody stock.

Risk Assessment:

Overall Risk of Spread**: High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Low	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetation and earthen materials may adhere to vehicles, equipment, ATVs, and clothing.
- DNR employees or contractors may be unaware of problems associated with the spread of invasive species via equipment, clothing, and vehicles.
- Often wet locations are susceptible to soil disturbance.

Organisms, materials being moved to a project site and off a project site:

- Equipment can cause ruts and allow for weeds to establish.
- ***Seedlings are not typically local origin.***
- Known invasive species are still used on some sites (i.e. honeysuckle, autumn olive).
- Live plants may carry insects, diseases, fungi, other plants.

Procedures to meet Op Order and discipline standards:

- Planting can involve soil disturbance, making invasive species spread problematic
    - Use appropriate herbicides to control noxious weeds in planting areas.
- Remove as much vegetation and earthen material as practical from equipment prior to leaving work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Mow or spray before weed seeds are viable.
- Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- Educate contractors of known invasive species known on the site.
    - Time contracts to reduce weed proliferation.
    - Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
    - Provide information on species identification.
- Site avoidance. If practical, avoid:
    - infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
    - wet soil to reduce movement of seeds and soil borne organisms.

Monitoring

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal. This may include many site visits yearly depending on what species are present on a site.

Category of Activity: Forest Opening Management

Description: Developing, improving and maintaining forest openings for wildlife that are created during normal timber harvest management.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Soil and plant parts may adhere to highway vehicles or ATVs used to inspect sites. Soil may adhere to clothing and boots. Soil and plant parts may adhere to mechanized equipment used for seedbed preparation: crawler dozers, agricultural tractors, atvs, etc. Soil and plant parts may adhere to equipment used to maintain (spraying herbicides, mowing) forest openings: agricultural tractors, rotary mowers, and atvs. Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment. Woody debris (trees, brush, slash, stumps) rock, soil, grasses and legumes sources may have a weed seed component.

Procedures to meet Op Order and discipline standards:

1. Knock off the big chunks of soil and plants and sweep off equipment before entering a new site.
2. Clean equipment, vehicles, clothing and boots prior to visiting the site.

3. Minimize site disturbance, follow site level guidelines for minimizing soil disturbance.
4. Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
5. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
6. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
7. Use seed sources known to be free of invasive species.
8. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Forest Stand Improvement

Description: Timber harvest, regeneration, mast enhancement, thermal cover establishment, browse regeneration, and oak wilt control.

Risk Assessment

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Soil and plant parts may adhere to highway vehicles or ATVs used to inspect sites. Soil may adhere to clothing and boots. Soil and plant parts may adhere to mechanized equipment used for timber harvest, stand regeneration, mast enhancement, thermal cover establishment, browse regeneration, oak wilt control, buckthorn removal: logging equipment, skid-steers, agricultural tractors, atvs. Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment. Wood products and woody debris (trees, brush, slash) and planting tree and shrub seedlings or saplings with soil from other sites and use of seed that may have a weed seed component.

Procedures to meet Op Order and discipline standards:

1. Clean equipment, vehicles, clothing, and boots prior to visiting the site.
2. Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
3. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
4. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
5. Sites with disturbed soil that may be slow to regenerate should be seeded to limit the time of exposed soil and reduce the opportunity for the introduction of invasive species.
6. Use seedling, sapling and seed from sources known to be free of invasive species.
7. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Forest Stand Burns and Openland & Brushland Burns

Description: Use of prescribed burning to enhance and restore forest, brushland, and openland communities for related wildlife habitat.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Soil and plant parts may adhere to highway vehicles or ATVs used to inspect sites.
Soil may adhere to clothing and boots. Soil and plant parts may adhere to mechanized equipment used to develop firebreaks: crawler dozers, agricultural tractors, and atvs.
Soil and plant parts may adhere to equipment used for prescribed fire: crawler dozers, J-5 & J-7 track vehicles, swamp master or other amphibious track vehicles, atvs, pickups with fire suppression equipment. Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment. Removal of woody debris (trees, brush, slash), soil. Removal of water from ponds, streams and lakes by drafting into water tanks and the distribution of that water to prescribed burn sites.

Procedures to meet Op Order and discipline standards:

1. Clean equipment, vehicles, clothing and boots prior to visiting the site.
2. Empty water tanks onto level soil.
3. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
4. If drafted water was from a source with known invasive species, the tank must be treated before being put into service.
5. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
6. Sites with disturbed soil that may be slow to regenerate should be seeded to limit the time of exposed soil and reduce the opportunity for the introduction of invasive species.
7. Use seed sources known to be free of invasive species.
8. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Openland & Brushland Management

Description: Non-prescribed burn efforts such as shearing and herbicides relating to the restoration of brushland habitiats.

Risk Assessment

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Soil and plant parts may adhere to highway vehicles or ATVs used to inspect sites.
Soil may adhere to clothing and boots. Soil and plant parts may adhere to equipment used to herbicide brush or mow brush: agricultural tractors, rotary mowers, skid-steers, crawler dozers, atvs, etc. Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment. Removal of woody debris (trees, brush, slash), soil.

Procedures to meet Op Order and discipline standards:

1. Clean equipment, vehicles, clothing and boots prior to visiting the site.
2. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
3. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
4. Sites with disturbed soil that may be slow to regenerate should be seeded to limit the time of exposed soil and reduce the opportunity for the introduction of invasive species.
5. Use seed sources known to be free of invasive species.
6. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Boundary Management for Public Lands

Description: Installation and maintenance of perimeter signs, fencing and gates on management units.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, and personnel clothing used during survey and sign maintenance.
- Survey crews often cross private land to gain access to state lands.
- Equipment used to clear site lines (rotary-mower, hand tools, tracked vehicles, ATVs)
- Contractor and DNR equipment brought onsite may contain pre-existing plant and soil material.
- Soil disturbance and exposure provides a medium for the natural introduction of invasive species to the site as well as distribution from soil and plant parts adhering to equipment.

Organisms, materials being moved to a project site and off a project site:

- Boundary maintenance usually does not involve intentional movement of earth or vegetative materials.

Procedures to meet Op Order and discipline standards:

- If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
- Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- Minimize site disturbance, follow site level guidelines for minimizing soil disturbance.
- Require contract crews to thoroughly clean dirt and vegetation from equipment prior to entering and leaving sites with known invasive species.

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Facility Improvement, Facility Maintenance, User Facility Development, Access Improvement for Public Lands, Access Maintenance, and Access Development

Description: Improvement and maintenance of parking lots, roads, walking trails, hunter blinds, camp sites, etc on management units.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Many Public user vehicles (trucks, ATVs, boat trailers, etc.) congregate at parking lots, campgrounds, and water access sites and travel along trails and roadways.
- Vegetative parts and earthen materials may adhere to highway vehicles, heavy equipment, ATVs, and personnel clothing used to conduct site inspections, annual maintenance, and improvement and development projects (both contract vendors and DNR).
- Vegetative parts and earthen materials may adhere to highway vehicles, equipment, ATVs, and clothing used by public users.
- Equipment (DNR and Contractor) often travels throughout the state and is used on different areas and may come from out of state.
- Public users and contractors may be unaware or not concerned with the spread of invasive species via equipment, clothing, and vehicles.

Organisms, materials being moved to a project site and off a project site:

- Material (gravel, fill, rock, seed, wood posts, mulch, etc.) is brought onsite to improve/develop/maintain public use facilities and accesses.
- Vegetative and earthen materials are often removed from water access sites.
- Public users bringing offsite materials (firewood, debris, hunting equipment, etc.) to parking lots, campgrounds, water access, trails.

Procedures to meet Op Order and discipline standards:

- Purchase products from vendors that have certified weed-free supplies when feasible.
- Use only native plantings and native plant seed sources that are certified noxious weed free.
- Inspect source of materials when feasible (especially gravel and fill material).
- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- Insert language into contracts that requires vendors to clean equipment prior to entering state lands; and that Project Supervisor or designee should ensure that equipment is inspected prior to beginning work.
- If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
- Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.

- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- Provide educational material to non-DNR personnel involved with facility and access maintenance/development/improvement activities that may introduce or cause the spread of invasive terrestrial species on state lands.
- Install signage at parking lots, campgrounds, water access sites that educates users on spread of terrestrial invasive species.
- Dispose of waste earthen and vegetative materials from maintenance/development/ improvement projects properly (i.e. in a manner that eliminates or reduces the threat of spreading invasive terrestrial species and/or makes treating those species more feasible).

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
- Conduct annual inspections for terrestrial invasive species at sites where public equipment is congregated (parking lots, water access sites, campgrounds).

Category of Activity: Site/Building Cleanup/Well Sealing

Description: Cleanup and sealing of old wells and cisterns on management units.

Risk Assessment:

Overall Risk of Spread: **High**

Site Disturbance	Diseases	Plants	Materials	Equipment
High	Moderate	High	High	High

Equipment being moved to a project site and off a project site:

- Vegetative parts and earthen materials may adhere to highway vehicles, heavy equipment, ATVs, and personnel clothing used to conduct site inspections, annual maintenance, and improvement and development projects (both contract vendors and DNR).
- Contractor equipment often travels throughout the state, is used on different areas, and may come from out of state.
- Contractors may be unaware or not concerned with the spread of invasive species via equipment, clothing, and vehicles.

Organisms, materials being moved to a project site and off a project site:

- Material (gravel, fill, rock, seed, etc.) is brought onsite to rehabilitate old building sites.
- Vegetative and earthen materials are often removed from old building sites.
- Well sealing material (water, clay, bentonite, pea gravel, limestone) is brought onsite.
- Soil disturbance is very common with site cleanup and is unavoidable.
- Potential is high for existing invasive terrestrial species at old building sites.

Procedures to meet Op Order and discipline standards:

- Purchase products from vendors that have certified weed-free supplies when feasible.
- Use only native plantings and native plant seed sources that are certified noxious weed free.
- Inspect source of materials when feasible (especially gravel and fill material).

- Remove as much vegetation and soil as reasonably possible from equipment prior to leaving work site by sweeping, using forced air, using hand tools, or pressurized water.
- Insert language into contracts that requires vendors to clean equipment prior to entering state lands; and that Project Supervisor or designee should ensure that equipment is inspected prior to beginning work.
- Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.
- Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- Provide educational material to non-DNR personnel involved with site/building and well sealing activities that may introduce or cause the spread of invasive terrestrial species on state lands.
- Dispose of waste earthen and vegetative materials from projects properly (i.e. in a manner that eliminates or reduces the threat of spreading invasive terrestrial species and/or makes treating those species more feasible).

Monitoring:

- On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Treaty Management, Reservation Issues, Wolf Management, Animal Survey and Season Management Activities

Description: Management and field work such as surveys and boundary work.

Risk Assessment:

Overall Risk of Spread: **Low - Moderate**

Site Disturbance	Diseases	Plants	Materials	Equipment
Low	Low	Moderate	Low	Low

In general, much of this work is planning-oriented and equipment is not moved to or from project sites, thereby representing low risk of spreading terrestrial invasive species. However, tasks involving a site visit (e.g. certain Formal & Informal Bird/Mammal Surveys, Refuge Boundary work as part of Season Management), then risk of spread and increase of invasive species becomes moderate to high because:

- Soil, plant parts and seeds may adhere to highway vehicles or ATVs used to access and inspect sites, or other equipment used to carry out the task.
- Soil, plant parts and seeds may adhere to clothing and boots.

Procedures to meet Op Order and discipline standards:

1. Clean equipment, vehicles, clothing and footwear prior to visiting the site. Particularly important if vehicles have been used previously during wet, muddy conditions and on unpaved road surfaces.
2. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site if practical.
3. Monitoring generally would not be required unless organisms or materials are brought to a site as part of these activities, or unless a visited site subsequently becomes infested. If the latter occurs, other sites visited within a similar period of time should be checked for the spread of invasive species.

Category of Activity: Special Hunt, Nuisance Animal, Animal Disease, and Animal Capture & Release Activities

Description: Actions related to special, permitted, or controlled hunts, including banding efforts and blind maintenance. Onsite work to solve nuisance problems or property damage associated with animals.

Risk Assessment:

Overall Risk of Spread: **Moderate- High**

Site Disturbance	Diseases	Plants	Materials	Equipment
Low	Low	Moderate	High	High

Soil, plant parts and seeds may adhere to highway vehicles or ATVs used to access and inspect sites, or other equipment used to carry out the task. Soil, plant parts and seeds may adhere to clothing and footwear. Soil, plant parts and seeds may adhere to or be contained within portable blinds or other materials used during special hunts. Non-profit organizations, volunteers and contractors administering animal capture & release projects or special hunts may have less familiarity with and knowledge of invasive species issues, policies and mitigation strategies, thereby increasing the risk of spread and establishment of invasive species when engaged in these activities. Members of the general public participating in special hunts are generally unaware of threats posed by terrestrial invasive plants, may transport soil, seed and plant parts from a wide geographic area, and are unlikely to make a serious effort to mitigate spread of invasive species.

Organisms or materials being moved to a project site and off a project site:

- Removals of birds or mammals potentially carrying weed seed, subsequent transport, and possible introduction of seed into release or disposal sites.
- Bedding or other material used for animal capture & release activities (e.g. turkey trap & transplant program) may have an invasive plant seed component.
- Feces of captured animals may have an invasive plant seed component and be transported to release or disposal sites.

Procedures to meet Op Order and discipline standards:

1. Knock off big chunks of soil and plants and spray or sweep off equipment before entering a new site.
2. Clean equipment, vehicles, clothing and footwear prior to visiting the site.
3. Minimize site disturbance to the extent possible.
4. Nets, panels, traps or other equipment used to capture animals on sites infested with invasive terrestrial plants should be cleaned before using at another site; capture equipment exposed to aquatic invasive plants should be dried or frozen prior to using at another site (see fisheries guidelines).
5. If feasible, remove obvious soil, seed or plant parts adhering to captured animals & carcasses prior to leaving a site.
6. If possible, dispose of carcasses at an approved landfill.
7. If practical, consider holding live animals for a sufficient time prior to translocation until stomach contents have passed.
8. If the site is known to have invasive species, if possible, clean equipment, vehicles, and footwear prior to leaving the site.
9. If the site is known to have invasive species prior to work activity, if possible, pre-treat the site to remove or reduce the chance of increasing the infestation on the project site and spreading the invasive species to other sites.
10. Use animal bedding sources known to be free of invasive species if possible.

11. Provide information to contractors, volunteers & non-profit organizations involved with capture, release and special hunt activities. Require adherence to operational order 113 for work done on state property.
12. Monitor heavy use areas, access points, trails or roads where activity occurred.
13. On sites with disturbed soil or where there is potential for the introduction or spread of invasive species, inspect through two growing seasons, twice per season: 1) early in the growing period and 2) in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
14. If a visited site subsequently becomes infested with terrestrial invasive plants, other sites visited within a similar period of time should be checked for the spread of invasive species.

VI. Other Discipline Terrestrial Guidelines Relevant to Fish and Wildlife Activities

Ecological Services Guidelines (www. ?????) for the following activities should also be reviewed and incorporated into Fish and Wildlife related activities

Forestry Guidelines (www. ?????) for the following activities should also be reviewed and incorporated into Fish and Wildlife related activities

VII. STATUTES AND RULES

The Minnesota Statutes and Rules listed below govern management and other activities as they pertain to selected invasive species. The full Statute or Rule language can be found at the websites listed below.

Please refer to the following websites for current information:

MN Statutes, Chapter 18.75-18.88:
http://ros.leg.mn/bin/getpub.php?pubtype=STAT_CHAP&year=2006&section=18

MN Statutes, Chapter 18G:
http://ros.leg.mn/bin/getpub.php?pubtype=STAT_CHAP&year=2006&section=18G

MN Statutes, Chapter 84D: http://www.revisor.leg.state.mn.us/stats/84D/

MN Rules, Chapter 1505.0730-1505.0750: http://www.revisor.leg.state.mn.us/arule/1505/

MN Rules, Chapter 6216: http://www.revisor.leg.state.mn.us/arule/6216/

More information on species of concern can be found at the Invasive species web page at:
http://www.dnr.state.mn.us/ecological_services/invasives.html

VIII. LIST OF INVASIVE SPECIES

The following list represents the invasive species covered by the ISOO and the ISOH. This list is current as of the development of the ISOO and ISOH and will be updated as needed.

Fish

bighead carp	*Hypophthalmichthys nobilis*	Prohibited Invasive Species (M.R. 6216)
black carp	*Mylopharyngodon piceus*	Prohibited Invasive Species (M.R. 6216)
grass carp	*Ctenopharyngodon idella*	Prohibited Invasive Species (M.R. 6216)
round goby*	*Neogobius melanostomus*	Prohibited Invasive Species (M.R. 6216)
rudd	*Scardinius erythrophthalmus*	Prohibited Invasive Species (M.R. 6216)
ruffe*	*Gymnocephalus cernuus*	Prohibited Invasive Species (M.R. 6216)
sea lamprey*	*Petromyzon marinus*	Prohibited Invasive Species (M.R. 6216)
silver carp	*Hypophthalmichthys molitrix*	Prohibited Invasive Species (M.R. 6216)
white perch*	*Morone americana*	Prohibited Invasive Species (M.R. 6216)
zander	*Stizostedion lucioperca*	Prohibited Invasive Species (M.R. 6216)
alewife	*Alosa pseudoharengus*	Regulated Invasive Species (M.R. 6216)
common carp, koi*	*Cyprinus carpio*	Regulated Invasive Species (M.R. 6216)
goldfish*	*Carassius auratus*	Regulated Invasive Species (M.R. 6216)
rainbow smelt*	*Osmerus mordax*	Regulated Invasive Species (M.R. 6216)
tilapia	*Tilapia, Oneochromis, Sartheradon* spp.	Regulated Invasive Species (M.R. 6216)

Aquatic Invertebrates

zebra mussel*	*Dreissena polymorpha*	Prohibited Invasive Species (M.R. 6216)
New Zealand mudsnail*	*Potamopyrgus antipodarum*	Prohibited Invasive Species (proposed)
Chinese mystery snail*	*Cipangopaludina* spp.	Regulated Invasive Species (M.R. 6216)
rusty crayfish*	*Orconectes rusticus*	Regulated Invasive Species (M.R. 6216)
spiny water flea*	*Bythotrephes cederstroemi*	Regulated Invasive Species (M.R. 6216)
Banded mystery snail	*Viviparus georgianus*	?

Aquatic Plants

African oxygen weed	Lagarosiphon major	Prohibited Invasive Species (M.R. 6216)
Australian stonecrop	*Crassula helmsii*	Prohibited Invasive Species (M.R. 6216)
brittle naiad	*Najas minor*	
curly-leaf pondweed*	*Potamogeton crispus*	Prohibited Invasive Species (M.R. 6216)
Eurasian water milfoil*	*Myriophyllum spicatum*	Prohibited Invasive Species (M.R. 6216)
European frog-bit	*Hydrocharis morsus-ranae*	Prohibited Invasive Species (M.R. 6216)
flowering rush*	*Butomus umbellatus*	Prohibited Invasive Species (M.R. 6216)
giant salvinia	*Salvinia molesta*	Prohibited Invasive Species (M.R. 6216)
hydrilla	*Hydrilla verticillata*	Prohibited Invasive Species (M.R. 6216)
Indian swampweed	*Hygrophila polysperma*	Prohibited Invasive Species (M.R. 6216)
purple loosestrife*	*Lythrum salicaria, L. virgatum*	Prohibited Invasive Species (M.R. 6216)
water aloe or water soldier	*Stratiotes aloides*	Prohibited Invasive Species (M.R. 6216)
water chestnut	*Trapa natans*	Prohibited Invasive Species (M.R. 6216)
Federal noxious weed list. aquatic plants listed in Code of Federal Regulations, title 7, section 360.200		Prohibited Invasive Species (M.R. 6216)
Carolina fanwort or fanwort	*Cabomba caroliniana*	Regulated Invasive Species (M.R. 6216)
parrot's feather	*Myriophyllum aquaticum*	Regulated Invasive Species (M.R. 6216)
nonnative waterlilies	*Nymphaea* spp or any variety, hybrid, or cultivar thereof.	Regulated Invasive Species (M.R. 6216)
yellow iris or yellow flag*	*Iris pseudacoris*	Regulated Invasive Species (M.R. 6216)

* species established in the state

Terrestrial Plants

Bull Thistle*	*Cirsium vulgare*	Prohibited noxious weed (M.R. 1505)
Canada Thistle*	*Cirsium arvense*	Prohibited noxious weed (M.R. 1505)
Field bindweed*	C*onvolvulus arvensis*	Prohibited noxious weed (M.R. 1505)
Garlic Mustard*	*Allaria petiolaria*	Prohibited noxious weed (M.R. 1505)
Leafy Spurge*	*Euphorbia escula*	Prohibited noxious weed (M.R. 1505)
Musk Thistle*	*Carduus nutans*	Prohibited noxious weed (M.R. 1505)
Perennial Sowthistle*	*Sonchus arvensis*	Prohibited noxious weed (M.R. 1505)
Plumeless Thistle	*Carduus acanthoides*	Prohibited noxious weed (M.R. 1505)
Purple Loosestrife*	*Lythrum salicaria*	Prohibited noxious weed (M.R. 1505)
Spotted Knapweed*	*Centaurea maculosa*	Prohibited noxious weed-some counties
European Buckthorn	*Rhamnus cathartica*	Restricted Noxious Weed (M.R. 1505)
Glossy Buckthorn (all cultivars)	*Frangula alnus*	Restricted Noxious Weed (M.R. 1505)
Amur Maple*	*Acer ginnala*	MISAC Moderate Threat – established
Autumn Olive*	*Eleagnus umbellata*	MISAC Severe Threat – established
Bela Honeysuckle*	*Lonicera x bella*	MISAC Severe Threat – established
Bird's-foot trefoil*	*Lotus corniculatus*	MISAC Severe Threat – established
Black Locust*	*Robinia pseudocacia*	MISAC Severe Threat – established
Crown Vetch*	*Coronillavaria*	MISAC Severe Threat – established
Giant Knotweed*	*Polygonum sachalinense*	MISAC Severe Threat – established
Grecian Foxglove*	*Digitalis lanata*	MISAC Severe Threat – established
Japanese knotweed*	*Falopia japonica*	MISAC Severe Threat – established

Morrow's Honeysuckle*	*Lonicera morrowii*	MISAC Severe Threat – established
Norway Maple*	*Acer platanoides*	MISAC Severe Threat – established
Reed canary grass*	*Phalaria arundinacea*	MISAC Severe Threat – established
Siberian Elm*	*Ulmus pumila*	MISAC Not yet assessed
Siberian Pea Shrub*	*Caragana arborescens*	MISAC Not yet assessed
Tansy*	*Tanacetum vulgare*	MISAC Severe Threat – established
Tartarian Honeysuckle*	*Lonicera tatarica*	MISAC Severe Threat – established
Wild Parsnip*	*Pastinaca sativa*	MISAC Not yet assessed

Terrestrial Animals

Asian raccoon dog	*Nyctereutes procyonoides*	Prohibited Invasive Species (M.R. 6216)
Egyptian goose	*Alopochen aegyptiaus*	Regulated Invasive Species (M.R. 6216)
Eurasian swine, European wild boar	*Sus scrofa scrofa*	Prohibited Invasive Species (M.R. 6216)
European rabbit	*Oryctolagus cuniculus*	Prohibited Invasive Species (M.R. 6216)
nutria, any strain	*Mycocastor coypu*	Prohibited Invasive Species (M.R. 6216)
mute swan*	*Cygnus olor*	Regulated Invasive Species (M.R. 6216)
Sichuan pheasant	*Phasianus colchicus strachi*	Regulated Invasive Species (M.R. 6216)

Terrestrial Insects

Asian Longhorn Beetle	*Anoplophora glabripennis*	MISAC Severe Threat – not in state
Emerald ash borer	*Agrilus planipennis*	MISAC Severe Threat – not in state
Mountain Pine Beetle	*Dendroctonus ponderosae*	MISAC Severe Threat – not in state
Spruce Engraver Beetle	*Ips typographus*	MISAC Severe Threat – not in state
Wood wasp	*Sirex noctilio*	MISAC Severe Threat – not in state
European Gypsy Moth	*Lymantria dispar*	MISAC Severe Threat – invading

Pathogens of Concern

Coldwater

Viral Hemorrhagic Septicemia Virus
Infectious Pancreatic Necrosis Virus
Infectious Hematopoietic Necrosis Virus
Whirling disease (Myxobolus cerebralis)
Heterosporis
Bacterial Kidney Disease (*Renibacterium salmoninarum*)

Warm/cool water

Channel catfish virus
Spring Viremia of Carp virus*?
White Sturgeon Iridovirus
Asian Tapeworm
Heterosporis

* species established in the state
NonTarget Species
Bullheads

The criteria for adding a species to the list of invasive species includes species that the DNR has identified as prohibited invasive species or regulated invasive species through rulemaking, species that the Minnesota Department of Agriculture has identified as state prohibited and restricted noxious weeds, pathogens of concern, determined by the Commissioner, that could impact populations of aquatic life, and species that were deemed to be a severe threat by the Minnesota Invasive Species Advisory Council.

The Minnesota Invasive Species Advisory Council (MISAC) worked with a panel of experts (from within MN) to rank the level of threat of numerous nonnative species to Minnesota. The species, list in this appendix, were ranked as a severe threat to the environment and whether the species was established in the state. Five panels, one for each of group of species (aquatic plants, aquatic animals, terrestrial plants, terrestrial animals, and insects), included representation invited from the following areas: agriculture, conservation / environmental groups, industry, natural resources, local / tribal government, federal government, and at-large.

The rankings are according to the following threat categories:

- Severe (established), Severe (invading), Severe (not yet in the state)
- Moderate (established), Moderate (invading), Moderate (not yet in the state)
- Minimal (established), Minimal (invading), Minimal (not yet in the state)
- Watch / Unknown
- Considered but not listed
- Severe pests in other areas, but could not establish in Minnesota

For more about MISAC go to: http://www.mda.state.mn.us/misac/default.htm

IX. MAPPING AND REPORTING

The following outlines the need and benefits of mapping and reporting invasive species. This section also provides a guide to managers regarding the DNR standard techniques and equipment used in the process of mapping and reporting invasive species.

To effectively prevent the movement and reduce impacts of invasive species, it is important to know the distributions of important invasive species. This information can be used to develop plans to minimize the spread from infested sites, tailor land use practices or management activities to prevent spread within a site and develop plans for managing invasive species.

The most important species to survey and report on are those species listed in this handbook (section III. List of Invasive Species). For aquatic invasive species, it is important to report all findings of listed species. Due to the large number of terrestrial invasive plants, it is important to survey for species that are of most concern to the land manager. This will vary depending on the location and habitat that is being managed.

Mapping Invasive Species

Division and Bureau Operations Managers who are responsible for overseeing the collection of invasive species information in the field, are the primary contacts for field staff. This includes ensuring that staff meet recommended standards for data collection and knowledge of hardware and software needs. Operations managers can work with the Division of Ecological Services - Invasive Species Program, to implement invasive species data collection.

DNR staff planning to carry out surveys for invasive species should follow the standardized monitoring protocols developed for terrestrial and aquatic invasive species. The standardized attribute data to be collected can be found in the meta data available in the DNR intra net at: http://jmaps.dnr.state.mn.us/mdreporter/dp_full_record.jsp?mpid=39000482&ptid=2&fcid=3&dsid=null (for terrestrial) and "coming soon" (for aquatic) (Table XX). When collected in this format, the data can be readily appended to the two centralized databases for terrestrial and aquatic invasive species.

collecting invasive species data

The preferred method of data collection is electronic, using a GPS capable handheld computer or PDA using standardized forms in the field. For terrestrial invasive species, standardized forms have been developed, that can be utilized by both palm based PDA and handheld PC. Pendragon software is currently being used to develop electronic data forms and manage the terrestrial invasive species data. These forms are available to any staff wishing to survey for terrestrial invasive species. Specific information is recorded for each invasive population including location, date, observer, invasive species name, number of plants, plant distribution, acres of infestation, site type, and GPS coordinates.

Using the current standardized forms, the data collected in the field (Fig. 2) is automatically downloaded and stored in a centralized database. The data is reviewed and updated and made available to state land managers through quick themes in Arcview or Arc GIS (Fig. 3).

Figure 2. Mapping invasive species in the field.

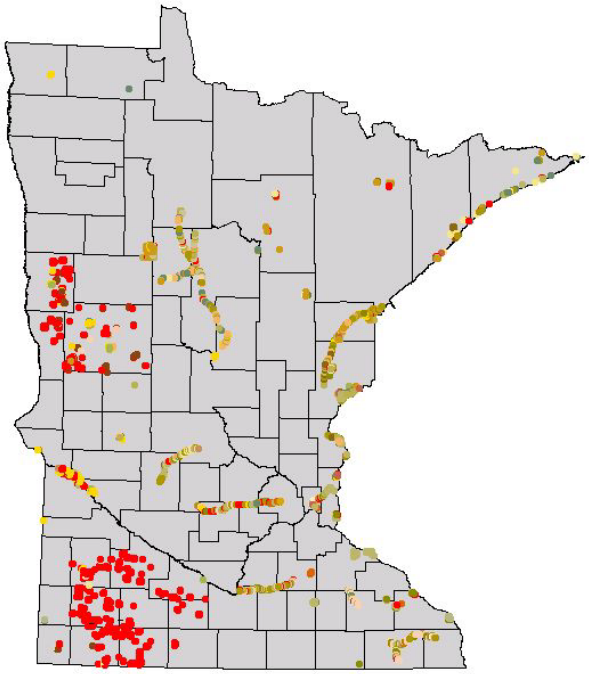


Figure 3. Example of invasive species data displayed

Reporting Invasive Species Observations

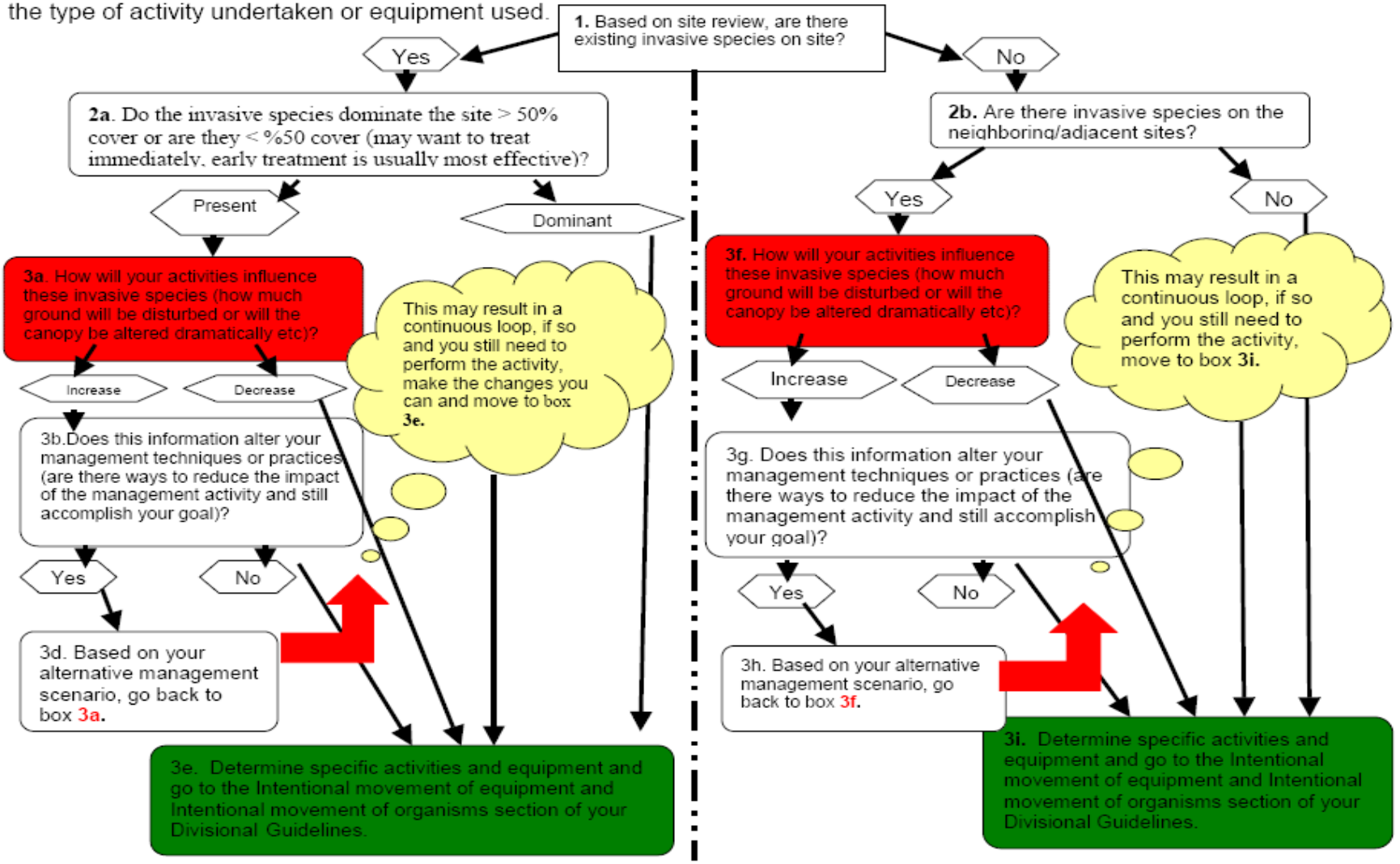
If you are mapping invasive species electronically with the standardized protocols, your data is automatically submitted to the database and no further action is required. If you observe an invasive species infestation (one or several), these observations can be reported using the reporting form on page 31. Depending on the abilities of the observer to accurately identify the invasive species, a sample of the invasive species may be needed to confirm the observation. Digital images can sometimes be substituted for actual specimens.

Accessing Data on Invasive Species Observations

Currently, there are two databases that can be access through quick themes in Arcview or Arc GIS under the theme class “Environmental Quality”. The themes are named “Terrestrial Invasive Species Observations” and “Aquatic Invasive Species Observations.”

X. Decision Tree Guide for Site Pre-planning Process

Example of decision tree to guide staff through site pre-planning process: (See management scenario as example)
This example starts with gathering information about the site where the activity will take place; other examples may include a focus on the type of activity undertaken or equipment used.



XI. Risk Assessment Detail Tables

Relative risk of spreading aquatic invasive invertebrates by Fisheries Management activity

Rusty crayfish: Risk for this species is ranked low for most activities. This is based on the assumption that Fisheries staffs are not knowingly moving large adult crayfish in their activities and can easily see and remove these from specific actions/equipment. Tiny young of the year crayfish are likely harder to see, but it is doubtful that these would be caught in any sampling equipment or gear. Additionally, crayfish don't have much desiccation resistance; left to dry for a day in the sun will kill them. Hot water (over 140 F) will also kill them, without any need for chemical treatment.

The occurrence of rusty crawfish in larger lakes in the state (such as Leech and Vermillion) as well as the interconnections between many of the lakes suggests that routine activities may occur in lakes containing the invasive.

Across all activities, Fisheries staff should avoid moving crawfish, regardless of which species they might be. Visual inspection of gear, either at the lake or back at the office on return is the best prevention method. Larger crayfish can be removed or if too many are entangled in the particular net, the net should be allowed to dry completely or soaked in hot water (over 140 F) to kill any crawfish. As a standard policy, any crawfish should be removed from equipment at the lake, removed and killed at the office, or equipment should be dried completely for 24 hours or soaked in hot (140 degree F) water. No equipment will be used with any crawfish still attached/entangled, even if treatments have been done to kill such animals.

Freshwater snails: This group tends to rank higher risk across more activities overall than most aquatic invertebrates. Minnesota contains a number of native snails throughout most of our waters. We also have recorded Chinese mystery snails (and banded mystery snails, which are a North American transplant) populations and are finding more of these in more waters of the state. Differentiating native and non-natives can be potentially difficult at times. Native snails can also create problems (swimmers itch, fisheries pathogens) similar to non-natives. While many snail die-offs occur with Chinese mystery snails, some are dominated by native species. Rather than determining if a particular snail is invasive or not, it would be better (and easier) to address this group as a whole. Actions to prevent movement of any of these taxa will aid in preventing the movement of Non-target or invasive species as well as natives. The recent report of New Zealand mud snails, from the St. Louis River estuary area suggest that increased effort and concern relating to this group is warranted.

Infested vs. non-infested waters: Many of the activities discuss precautions taken in "infested" waters. While this is important, a major drawback to this is the fact that some exotic invertebrates may establish reproducing populations in a waterbody for at least one or more years prior to any detection. This creates a situation where precautions for infested waters are not done, because the water worked on is assumed to be uninfested. However, activities may be spreading life stages unintentionally. Given the high numbers of waterbodies worked in on any given year, (for example, 700 annual surveys on 500-600 lakes) it is impossible to monitor all waters that may be impacted. Additionally, monitoring cannot really give a waterbody a "clean" bill of health with a quick cursory inspection – we can only say if we have found an exotic, not that it is not present.

Relative Probability of Invasion by Aquatic Invertebrates as a Result of Fisheries Activities

Gary Montz **Risk levels - 1 - 5: 1= low, 3= moderate, 5=high**

	Cold	Cool/warm egg	Hatcheries Cool/warm rear	Spawn N pike	Muskie	WAE	WhtSKR	Rearing Ponds	Fish Distrib Stocking	Private Fish Purch
Zebra mussels	1	1	1	1	1	2	3	2	1, 2	2
Snails (all freshwtr)	1	1	4	2	2	2	3	5	1, 5	5
New Z mud snail	2	1	2	2	2	2	3	5	2, 2	5
Zooplankton	1	3	2	1	1	2	2	3	2, 4	4
Rusty crayfish	1	1	1	1	1	1	1	2	1, 1	1

	Habitat Improvement Trout Stream	Lake	Shore-veg	Winterkill Lakes	Kids Fishing Pond	Lake & Stream Survey	Stream Surveys
Zebra mussels	1	1	1	3	3	4	3
Snails (all freshwtr)	4	4	3	4	3	4	4
New Z mud snail	4	4	2	3	1	4	4
Zooplankton	1	2	1	4	3	4	3
Rusty crayfish	1	1	1	1	1	1	1

Relative Probability of Invasion by Aquatic Plants as a Result of Fisheries Activities

Draft by Wendy Crowell, revision date: August25, 2005

Aquatic plant Non-target or invasive species: The risk of spreading invasive plant species posed by various fisheries activities, based on vectors of plant spread. Risk levels take into account precautions, which are routinely done. Risk levels - 1 - 5: 1= low, 3= moderate, 5=high.

Vector of plant spread	Number of known infestations	No. Pike spawning	Muskie spawning	Walleye spawning	White sucker spawning	Coldwater hatchery	Cool and warm water hatcheries (hatching)	Cool and warm water hatcheries (rearing)	Fish distribution and stocking	Kids fishing ponds	Winter kill lakes	Lake survey	Habitat improvement	Fish purchase	Rearing Ponds	Stream surveys	Shore land program
Spread by free floating plant fragments/small plant parts throughout the growing season		3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if the species is present in the production pond	3 - if the species is present in the water used to transport fry	4 - if the species is present in the hatchery pond	4 - plant fragments on boat trailers	4	4	5 - if lake is infested and is not known to be	3 - pumped water	4 - if the species is present in the hatchery pond	4 - if the species is present in the rearing pond	3 - in nets/water	1
Eurasian watermilfoil *(Myriophyllum spicatum)*	170																
Oxygen weed *(Lagarosiphon major)*	none																
Fanwort *(Cabomba Caroliniana)*	none																
Parrot's feather *(Myriophyllum aquaticum)*	none																
Hydrilla *(Hydrilla verticillata)*	none																
Australian Stonecrop *(Crassula helmsii)*	none																
Spread by plant patrs and seedss attached to plant fragments when plant patrs and seedss are present		3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if the species is present in the production pond	3 - if the species is present in the water used to transport fry	4 - if the species is present in the hatchery pond	4 - plant fragments on boat trailers	4	4	5 - if lake is infested and is not known to be	2 - pumped water	4 - if the species is present in the hatchery pond	4 - if the species is present in the rearing pond	3 - in nets/water	1
Curly-leaf *(Potamogeton crispus)*	704																
Brittle naiad *(Najas minor)*	1																
Hydrilla *(Hydrilla verticillata)*	none																
Water soldiers *(Stratiotes aloides)*	none																
Spread by free floating plant patrs and seedss which are tiny and could adhere to wet surfaces		2 - waders	2 - waders	2 - waders	2 - waders	3 - if the species is present in the production pond	3 - if the species is present in the water used to transport fry	4 - if the species is present in the hatchery pond	2 - waders	2	2	2	3	1	1	3- on wader	2
Loosestrife *(Lythrum salicaria)*	>2000																
Spread by whole floating plants moving		1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1
Water chestnut *(Trapa natans)*	none																
Water soldiers *(Stratiotes aloides)*	none																
Frog-bit *(Hydrocharis morsus-ranae)*	none																
Spread by deliberate planting		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**5**
Non-native waterlilies *(Nymphaea oderata cultivars)*	< 20																
Frog-bit *(Hydrocharis morsus-ranae)*	none																
Flowering rush *(Butomus umbellatus)*	< 50																
Yellow flag iris *(Iris pseudacorus)*	> 10 - rough estimate																

Spread by free floating plant patrs and seedss		3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if the species is present in the production pond	3 - if the species is present in the water used to transport fry	4 - if the species is present in the hatchery pond	4 - if the species is present in the hatchery pond	4	4	5 - if lake is infested and is not known to be	3 - when water is pumped	4 - if the species is present in the hatchery pond	4 - if the species is present in the rearing pond	3 - in nets/water	1
Water chestnut *(Trapa natans)*	none																
Frog-bit *(Hydrocharis morsus-ranae)*	none																
Hydrilla *(Hydrilla verticillata)*	none																
Flowering rush *(Butomus umbellatus)*	< 50																
Curly-leaf *(Potamogeton crispus)*	704																
Spread by plant patrs and seedss in lake /wetland / stream sediments		3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	3 - if invasives are in lake	1	1	1	1	1	1	2	**5**	1	2	3	3
Water chestnut *(Trapa natans)*	none																
Frog-bit *(Hydrocharis morsus-ranae)*	none																
Hydrilla *(Hydrilla verticillata)*	none																
Flowering rush *(Butomus umbellatus)*	< 50																
Curly-leaf *(Potamogeton crispus)*	704																
Non-native waterlilies *(Nymphaea oderata cultivars)*	< 20																
Eurasian watermilfoil *(Myriophyllum spicatum)*	170																
Loosestrife *(Lythrum salicaria)*	> 2000																
Spread by water		1	1	1	1	3 - if the species is present in the production pond	3 - if the species is present in the water used to transport fry	4 - if the species is present in the hatchery pond	4 - if the species is present in the hatchery pond	3	3	3	3 - water pumped	4 - if the species is present in the hatchery pond	4 - if the species is present in the rearing pond	4	1
Toxic algae	unknown, possibly many																
Will not survive Minnesota winter/ the formation of ice cover																	

Relative Probability of Invasion by Pathogens because of Fisheries Activities

Pathogen	Vector	Egg Take MUE/WAE/NOP	Fish Purchase	Kids Fishing Ponds	Winter Kill Lakes	Coldwater Hatchery	Rearing Ponds Cool/Warm	Hatchery Cool/Warm	HI Work	Fish Distribution/ Stocking	Surveys Lake/Stream	Sampling
Spring Viremia of Carp	Infected fish Possible invertebrates, viable in environment.	Unknown, NOP fry may be infected	Moderate-Need prior health history	Low	Moderate to high if infected fish present	Low	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Largemouth Bass Virus	Infected fish Viable in environment	Unknown, possible vertical transmission	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Low	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
BKD	Infected fish Mud, environment, sediment,	Vertically and horizontal Transmission	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Moderate to high if infected fish present	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
ERM	Infected fish Invertebrates, mammals, environment	Horizontal	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Moderate to high if infected fish present	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Furnuculosis	Infected fish Invertebrates, environment	Horizontal	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Moderate to high if infected fish present	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
White Sturgeon Iridovirus	Infected fish, environment	Unknown Vert and Hor transmission possible	Low	Low	Low	Low	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Channel Catfish Virus	Infected fish, Environment	Unknown Vert and Hor transmission possible	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Low	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Edwardsiella ictaluri	Infected fish Environment	Unkown Horizontal	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Low	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Other diseases	Infected fish, Environment	Unknown	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Moderate to high if infected fish present	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling
Other Viral Diseases	Infected Fish Environment	Vertical and horizontal transmission possible	Moderate-Need prior health history	Moderate-Need prior health history	Moderate to high if infected fish present	Moderate to high if infected fish present	High if infected fish present	High if infected fish present	Low	High if infected fish present	Moderate to high if infected fish present	Low to high Depending on sampling

XII. Table 1. Prevention

Ensuring equipment is clean and any materials moved as part of DNR, Division of Ecological Resources Projects, activities, grants, and permits are free of invasive species is critical to limiting the spread of invasive species. The following guidelines should be followed to ensure equipment and materials are invasive species free.

Keep in mind:

- It is illegal to transport water from plant infested waters without a permit
- You are required to remove drain plug before reuse on waterbodies with Zebra Mussels and Spiny Water Fleas
- It is illegal to transport materials or equipment containing the propagating parts of noxious weeds, except by permit.

AQUATIC

Equipment	All Waters	Plant Infested Waters	Invertebrate Infested Waters	Pathogen Infested Waters
	Procedures	**Procedures**	**Procedures**	**Procedures**
Boats, Trailers, Anchors, and other boating equipment	• Before arriving to a waterbody or site, ensure equipment (vehicles, trailer, etc) is free of visible plants, seeds, mud soil and animals etc. • Before leaving a waterbody, inspect for and remove all visible plants, seeds, mud, soil and animals from your equipment. • Before leaving a waterbody, drain water from any equipment, tanks, or water retaining components of boats such as motors, live well, bilge, and transom wells onto dry land.		Same as All Waters plus: Before reuse- • Power spray equipment to remove attached water fleas, zebra mussels, or New Zealand mudsnails. -or- • Rinse with hot water to kill the species. -or- • Dry before reuse to kill the species.	Same as All Waters plus: • After working on waters known to harbor pathogens of concern, disinfect equipment prior to using in locations not known to contain pathogens present at the last location visited.

AQUATIC

Equipment	All Waters	Plant Infested Waters	Invertebrate Infested Waters	Pathogen Infested Waters
Seaplanes	**Procedures**	**Procedures**	**Procedures**	**Procedures**
	· **Before leaving a waterbody, inspect for and remove all visible plants, seeds, mud, soil and animals from your equipment.** ▪ Avoid trailing through aquatic plants before taking off. ▪ Raise and lower water rudders before and after take off. ▪ Return to lake and remove vegetation that did not free itself from water rudders/wires. ▪ Send out guidelines to contractors and stipulate adherence to guidelines in contracts.	Same as all waters plus: ▪ Return to lake and remove vegetation that did not free itself from water rudders/wires. ▪ Send out guidelines to contractors and stipulate adherence to guidelines in contracts.	Same as all waters plus: ▪ If water is taken from zebra mussel or spiny water flea infested water for fire fighting, aircraft should return to base (except…) and contaminated buckets, tanks and/or aircraft should be rinsed with hot water. ▪ Avoid mooring in invertebrate infested waters –or- scrub areas in contact with water before leaving waters after being moored for _____.	

TERRESTRIAL				
Equipment	**All Places**	**Weed/Terrestrial plant infested sites**	**Worm infested sites (based on visual observation)**	**Forest pest/Invasive Insect infested sites**
Vehicles (Trucks, cars, trailers)	**Procedures**	**Procedures**	**Procedures**	**Procedures**
	▪ Before arriving to a work site, ensure equipment and vehicles are free of viable plants, seeds, mud, soil and animals, etc. ▪ Before leaving a work site, inspect for and remove all visible plants, seeds, muck, soil and animals form your equipment. ▪ Brush (hand remove) off plants, seeds, mud, soil and animals from vehicles including: wheel wells, tracks, hubs, blades, grills, etc.	Same as all places plus: ▪ Power spray vehicles and equipment after returning from site.	Same as all places plus: ▪ Power spray equipment and vehicles to remove organic material. ▪ Dry before use to kill species.	
TERRESTRIAL				
Equipment	**All Places**	**Weed/Terrestrial plant infested sites**	**Worm infested sites**	**Forest pest/Invasive Insect infested sites**
Heavy equipment (logging machinery, mowers, etc)	**Procedures**	**Procedures**	**Procedures**	**Procedures**
	▪ Before arriving to a work site, ensure equipment and vehicles are free of visible plants, seeds, mud, soil and animals, etc. ▪ Before leaving a work site, inspect for and remove all visible plants, seeds, mud, soil and animals form your equipment. ▪ Brush (hand remove) off plants, seeds, mud, soil and animals from vehicles including: wheel wells, tracks, hubs, blades, grills, tracks, etc.	Same as all places plus: · **Power spray vehicles and equipment after returning from site.** ▪ Designate specific equipment for infested sites.	Same as all places plus: ▪ Power spray equipment and vehicles to remove organic material. ▪ Dry before use to kill species.	

VIII. Table 2. Treatments to Remove or Render Invasive Species Non-viable

April 11, 2007

Species	Removal Methods	Drying Period	Wash Temp and Duration	Other Treatments
Aquatic Plants:				
Curly-leaf pondweed	• Hand pick plant fragments from equipment • Power spray specific equipment after hand removal if needed	• Unknown for turions	• Unknown for turions	• Freeze in air for 1 week will kill turions
Eurasian watermilfoil	• Hand pick plant fragments from equipment • Power spray specific equipment after hand removal if needed	• Dry 10 days (regs)	≥60˚ C	• Freeze in air for 2 days (regs)
Flowering rush	• Hand pick plant parts from equipment • Power spray specific equipment after hand removal if needed, especially to remove mud and seeds	Unknown	Unknown	?
Purple loosestrife	• Hand pick plant parts from equipment • Power spray specific equipment after hand removal if needed, especially to remove mud and seeds	None	None	
Aquatic Animals:	**Removal Methods**	**Drying Period**	**Wash Temp and Duration**	**Other Treatments**
New Zealand mudsnail	• Power spray to remove	• Dry 4 days (other treatments are preferred)	• 120 F (49 C)/ 1 min (card/MT)	• Freeze in air for 2-4 hours
Spiny water flea	• Power spray to remove	• 12 hours minimum and 24 hours preferred	• soak for 10 minutes in hot (120-130 F degree) water	• Filter to 250 microns or less to remove resting eggs from water
Zebra mussels	• Power spray to remove • Scraping may be necessary if objects were in the water for extended periods	• Dry 3 days in temperatures over 65 F • Drying is NOT recommended in cool wet weather (<64 F)	• 104 F/ 4 min (hotter temps result in better and shorter kill times)	• Freeze for 2 days • Filter to 40 microns or less to remove veligers from water • Treat water with 750 mg/l KCL for 1 hour, followed by 25 mg/l formalin for 2 hours to kill zebra mussel veligers. Do not use NaCl when completing this treatment.

Terrestrial plants:	Removal Methods	Drying Period	Wash Temp and Duration	Other Treatments
All species	• Pull or brush plant material and soil off grills, tires, wheels, axles and other vehicle and equipment parts	• None		
Terrestrial insects/ animals:	**Removal Methods**	**Drying Period**	**Air Temp and Duration**	**Other Treatments**
Earthworms	• Power spray soil off of vehicles and equipment	• None		
Gypsy moth		• None	• Heat wood to __degrees for ___	
EAB	• Debark and remove sapwood	• None	• Heat to wood __degrees for ___	
Bark beetles		• None	• Heat to wood __degrees for ___	
Pathogens:	**Removal Methods**	**Drying Period**	**Wash Temp and Duration**	**Other Treatments**
Dutch elm disease	• Debark wood?	•	•	•
LMBV **Heterosporis** **VHS**	• None	• VHS - 12 hours without sun / 4 to 6 in the sun (Ling?) • Heterosporis – dry is effective (no time found) Gear must be completely dry for a minimum of 24 hours for desiccation to effectively kill the spores	• True steam cleaning (212 °F) will inactivate rhabdo viruses within seconds. This may be an option when chemical disinfection is difficult.	♦ see disinfection table below

XIV. Table 3. Fish Pathogen Disinfectants and their Properties

When mixing any of these chemicals, wear eye protection, gloves, and a dust mask if it is a powder. (Concentrations and effective times may change with additional discussion.)

Chemical	Concentration	Contact Time	Safety precautions
Chlorine	200 ppm 1000 ppm	10 min 30 sec – 1 min.	Wear eye protection, rain gear, gloves if spraying. Stay upwind of the spray. Will break down in sunlight and when in contact with organic material. Is corrosive to metal and rubber. Is toxic to fish at these concentrations so rinse well after disinfection or neutralize with sodium thiosulfate*.
Virkon Aquatic	1:100 10,000 ppm 1:200 5,000 ppm	On contact to 1 min 10 minutes	This is a new disinfectant in the peroxygen (hydrogen peroxide) family. It is a powder. It is 99.9% biodegradable and breaks down to water and oxygen. It is not corrosive at the working dilution. Wear eye protection, rain gear and gloves if spraying. Stay upwind of spray.
3.5% Free Iodine	1:20,000 or 50 ppm	30 sec. to 1 min.	Wear eye protection and rubber gloves when handling the concentrate. Wash with soap and water if concentrate gets onto skin. If concentrate gets into eyes, flush with plenty of water and call a physician. This stable, non-flammable liquid is 100% soluble in water and requires no special respiratory protection other than normal ventilation. Very safe product to use.
Quaternary Ammonia	1:833 or 1200 ppm	30 sec. to 1 min.	Wear eye protection and rubber gloves when handling the concentrate. Wash with soap and water if concentrate gets onto skin. If concentrate gets into eyes, flush with plenty of water and call a physician. This is a stable compound readily soluble in water. Vapors of ethanol can be flammable. Product residue can ignite explosively. Prior to use, eliminate ignition sources. Following use, rinse with water. Wear a respirator when normal ventilation is unsatisfactory.

* For neutralizing chlorine or iodine, spray sodium thiosulfate in an 800-ppm solution (3 grams per gallon of water) on all surfaces after the disinfection period is over. Rinse with water from the next lake to remove any remaining sodium thiosulfate.

** It is wise to have all four of these disinfectants available for use and to use them rotationally so as to minimize the chances of producing resistant bacteria, viruses and parasites.

XV. Table 4. Aquatic Invasive Species Standardized Data Fields.

Field Name	Attribute	Description
ACRES_INFESTED	Number of Acres infested	classification of the infestation size, i.e. <1, 1-5, 6-10,11-50, >50 acres
CONFIDENCE_CODE	confidence code	indicator of our confidence in this observation
DOWLKNUM	DOW number	the official identifying number maintained by DNR Division of Waters
NUM_INDV	Number of individuals	categories of species numbers i.e. 1-20, 21-99, 100-999
OBSERVATION_YEAR	year first observed	the year the infestation was discovered
SITE_TYPE	Site type	classification of the site type, i.e. lake, pond, river, wetland
SPP_COMMON_NM	common name	the preferred common name of the species
SPP_DIST	Species Distribution	classification of the distribution, i.e. occurs singly, scattered pockets, Continuous/Extensive
SPP_SCIENTIFIC_NM	scientific name	the scientific name of the species
WATER_NM	water body	the DNR preferred name of the water body (from Waters)
X, Y	x,y coordinates	the UTM Zone 15N grid coordinates of the center of the water body of interest