Division of Fish and Wildlife

Discipline Guidelines

for

Invasive Species Operational Order 113

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The Invasive Species Operational Order 113 Discipline Guidelines for the Division of Fish and Wildlife Approval

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Welcome to the Fish and Wildlife Division Guidelines on Invasive Species. The most efficient way to approach this document is to:

- 1. Read the Purpose and Overview section
- 2. Read the Standard Protocols for Aquatic Activities and the Standard Protocols for Terrestrial Activities
- 3. Examine the table of contents for specific activities you do as part of your work. Read the sections that pertain to the work you do.

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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 take the lead in minimizing our role in the spread of invasive species and pathogens, the Operational Order and these guidelines require equipment hygiene and activity hygiene above what is required of commercial and recreational users of state resources. There are three main premises that necessitated 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 to be used solely in infested or non-infested waters.

The purpose of these guidelines is to provide additional or alternative protocols that should be used in conjunction with Operational Order 113 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.
- Identify invasive species and implement management strategies to reduce the impact at the site level
- Monitor and report new invasive species infestations.

The information in these 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 Operational 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://intranet.dnr.state.mn.us/operational_orders/index.html) provides policy and procedures for prevention and management of invasive species. Division staff members are expected to carry out the operational order and division guidelines to the best of their ability as part of their day-to-day operations, in much the same way as we incorporate safety practices in all we do. These guidelines apply to but are not limited to management planning, surveys, site visits, restorations, 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:

- Alternate precautions that assist in responding to calls for service or visiting numerous sites each day have been outlined and approved
- 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 (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. Minimize the use of outside materials.
- 6. Before leaving an aquatic work site (or water source), drain water from any equipment, tanks or waterretaining components. Water used for transport should be treated with ethyl alcohol before disposal, or drained on land in an area where it cannot enter surface water. When possibly eliminate the use of surface water.
- 7. When working in known infested waters, use gear tagged for use in waters with that specific infestation only. At a minimum, thoroughly disinfect equipment and gear prior to use in other waters.
- 8. Do not use felt-soled waders unless absolutely necessary.
- 9. Conduct post-management treatment monitoring and treat any identified infestations.
- 10. Ensure that seasonal and temporary employees are trained about standard guidelines from operational order 113 and stipulate adherence to these guidelines in everyday work behaviors.
- 11. Incorporate Operational Order 113 procedures into contracts and grants to help safeguard against spread of invasive species. Inspect the contractor's work for compliance with these procedures.

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

- 1. When possible, maintain separate equipment to use on infested and non-infested sites and store them in separate locations.
- 2. When working at multiple sites, work in non-infested sites before infested sites and clean equipment after use. High-pressure hot water sprayers are available at more than 60 co-located offices across the state (see Operational Order 113 intranet page for up-to-date list and map: http://intranet.dnr.state.mn.us/eco/invasive_species/op_order_113.html).

- 3. Work from the upper to the lower waters within a watershed.
- 4. Minimize soil disturbance with equipment.
- 5. Minimize number of access points to site.
- 6. 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.
- 7. 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.
- 8. Carry boot brush in all vehicles and clean boots and clothing (in a controlled area) before leaving any site. Disinfect boot brush between sites.
- 9. 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.
- 10. Ensure that seasonal and temporary employees are trained about standard guidelines from operational order 113 and stipulate adherence to these guidelines in everyday work behaviors.
- 11. Incorporate Operational Order 113 procedures into contracts and grants to help safeguard against spread of invasive species. Inspect the contractor's work for compliance with these procedures.

Site Planning and Management:

- 1. Report suspected new infestations of invasive species and pathogens to the DNR Invasive Species Program using the Invasive Species Reporting Form (IX) 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 has 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. Ensure that seasonal and temporary employees are trained about standard guidelines from operational order 113 and stipulate adherence to these guidelines in everyday work behaviors.
- 6. Incorporate Operational Order 113 procedures into contracts and grants to help safeguard against spread of invasive species. Inspect the contractor's work for compliance with these procedures.

Monitoring and Evaluation:

Infestations of zebra mussel and spiny waterflea suggest that casual spot monitoring is inadequate to identify invasive populations during their initial invasion of a new habitat. They will likely have been present at the site for more than one season before they are discovered. Thus, routine standard precautions must be taken on <u>every</u> 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 spread infestations from waters that are infested; yet not reported. Thus, extra effort to reduce the risk of spreading invasive species should always be taken. No water should ever be considered "safe".

Workloads are already very full. Consequently, monitoring is to not a separate activity, but one that should be worked into your current schedule to incorporate the following priorities:

First priority: Source waters and rearing ponds associated with hatcheries.

Second priority: Rearing ponds not on hatchery grounds.

<u>Third priority</u>: Lakes and surface waters used consistently in spawn take operations<u>Forth Priority</u>: Habitat improvement, site development, and shoreland restoration <u>Fifth priority</u>: All other activities. Ecological and Water Resources staff may provide assistance with field collection as time permits. Ecological and Water 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 Operational Order 113 and discipline guidelines.
- 2. Review discipline guidelines to ensure conformity with department policy.
- 3. Report findings to The Division of Ecological and Water Resources
- 4. Keep a listing or database of those waters and sites with non-target species, invasives, and pathogens in your work area.
- 5. Results from field monitoring efforts will be used each year by The Division of Ecological and Water 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: 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 - Moderate

The coldwater hatcheries have strict biosecurity protocols in place to prevent the introduction of fish pathogens and invasive species. Adherence to these protocols, and the use of ground water, puts the hatcheries at minimal risk for spreading invasive species. Disease histories are available for each of the state coldwater fish hatcheries dating back to the mid 1980's. Free-floating plant fragments, such as Eurasian watermilfoil or curly-leaf pondweed can be easily transferred, so care needs to be taken to remove these fragments. The risk of spreading zebra mussels is low for all coldwater hatcheries except French River. French River Hatchery should have a site-specific plan to address this risk. The overall risk level will increase if New Zealand mud snails ever became established in the coldwater hatchery water sources.

- 1. If the use of surface water is necessary, all water should be filtered through a $<40 \mu$ mesh filter or screen and equipment used in surface water must be disinfected after each use. Use ground water if possible.
- 2. Facilities that use waters known to have invasive species in their water source must pass all intake water through a filter ($<40 \mu$).
- 3. Ensure that all staff follow biosecurity protocols.
- 4. Water harden eggs in pathogen-free water using an iodophor when bringing into a facility from another facility with a history of disease, or from a wild source.
- 5. Disinfect egg surfaces with an iodophor when bringing into a facility from another facility with a history of disease, or from a wild source.
- 6. Ensure that all lots of fish and ovarian fluids at the hatchery have a minimum of one yearly fish health inspection.

- 7. Use only certified pathogen-free fish for stocking waterbodies, except in the following cases:
 - a. Fish infected with Viral Hemorrhagic Septicemia or *Renibacterium salmoninarum* can be stocked into waters where the pathogen has been confirmed to be present.
 - b. Eggs from fish infected with *Yersinia ruckeri*, *Myxobolus cerebralis*, or *Aeromonas salmonicia* can be stocked out following treatment approved by the Pathology Laboratory Leader, Aquaculture and Fish Health Consultant, and the Coldwater Hatchery Supervisor.
 - c. Fish or eggs from fish infected with other pathogens cannot be stocked out.
- 8. Areas receiving fish from coldwater hatcheries must arrive with their trucks, distribution tanks, dip nets and all personal gear thoroughly <u>disinfected</u>. The water in their distribution tanks <u>must</u> be ground water or well water, <u>not</u> surface water.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. Any spring not on DNR controlled lands should be examined summer and fall for freshwater snails (Specifically New Zealand mud snails).
- 2. All source waters for rearing ponds should be monitored on a yearly basis for the presence of Nontarget or invasive species.
- 3. 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.
- 4. Fish pathogens need to be monitored yearly in all reared fish. Ovarian fluids must be sampled at the 95% confidence level of detecting 2% incidence of disease, fish must be sampled at the 95% confidence level of detecting 5% incidence of disease. The following pathogens will be screened for:
 - a) Viral Hemorrhagic Septicemia Virus (ovarian fluids and fish)
 - b) Infectious Pancreatic Necrosis Virus (ovarian fluids and fish)
 - c) Infectious Hematopoietic Necrosis Virus (ovarian fluids and fish)
 - d) Myxobolus cerebralis (fish)
 - e) Renibacterium salmoninarum (fish)
 - f) Aeromonas salmonicida (fish)
 - g) Yersinia ruckeri (fish)

Category of Activity: Cool and Warmwater Fish Production and Stocking

Description: Spawning, rearing, and stocking of walleye, bass, muskellunge, catfish, northern pike, and white suckers.

Risk Assessment

Overall Risk of Spread: Moderate to High

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

The cool/warmwater hatcheries and rearing facilities that use surface water for egg hatching have a higher risk of spreading invasive species or pathogens. Pond rearing and the summer/fall time frame for some activities also put them at increased risk. Strict biosecurity and monitoring protocols need to be developed and implemented for these facilities (the coldwater hatchery documents should be used as a model).

<u>Spawning</u>: The egg takes for walleye, muskie, and northern pike seem to be a lower risk because they are doneearly in the season when there are few zooplankton populations, and no zebra mussel veligers. Very little water is moved and eggs are formalin and/or Iodophor treated. However, nets could have snails and plants on them, as they are in the water for an extended period.

White sucker egg take operations are moderate to 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 moderate because of its connection to Pelican Brook from Lake Ossawinnamakee as a tributary that has been identified with zebra mussels, but the egg take occurs in the spring when veliger presence is low.

<u>Rearing Ponds</u>: 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.

<u>Fish Distribution and Stocking</u>: 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 increase risk. Pathogen testing requirements make this a low risk for pathogen transmission.

Procedures to meet Operational Order 113 and discipline standards

Egg take operations

- Eggs coming from infested water should be transported in un-infested surface water or ground water. If water has to be moved from a designated infested water a permit from Eco-Waters will be required. (information for applying for this permit can be found here: <u>Permit to work in infested waters</u>)
- 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. Use ground water if possible.
- 3. Facilities that use waters known to have invasives as their water source must pass all intake water through a $<40 \mu$ filter.
- 4. Water harden eggs in pathogen free water and surface disinfect with iodophor.
- 5. If egg source is found to be infected with a pathogen that is vertically transmitted (spread from parent to offspring), use of the spawn take site must be discontinued, except in the following cases where eggs can be used to produce fish for stocking:
 - a. Fish infected with Viral Hemorrhagic Septicemia or *Renibacterium salmoninarum* can be stocked into waters where the pathogen has been confirmed to be present.
 - b. Eggs from fish infected with *Yersinia ruckeri*, *Myxobolus cerebralis*, or *Aeromonas salmonicia* can be stocked out following treatment approved by the Pathology Laboratory Leader, Aquaculture and Fish Health Consultant, and the Coldwater Hatchery Supervisor.
 - c. Fish or eggs from fish infected with other pathogens cannot be stocked out.
- 6. Use certified pathogen free fish stocks; except in the following cases:
 - a. Fish infected with Viral Hemorrhagic Septicemia or *Renibacterium salmoninarum* can be stocked into waters where the pathogen has been confirmed to be present.

- b. Eggs from fish infected with *Yersinia ruckeri*, *Myxobolus cerebralis*, or *Aeromonas salmonicia* can be stocked out following treatment approved by the Pathology Laboratory Leader, Aquaculture and Fish Health Consultant, and the Coldwater Hatchery Supervisor.
- c. Fish or eggs from fish infected with other pathogens cannot be stocked out.
- 7. Ovarian fluids collected during spawning for pathogen testing should be submitted to the DNR pathology laboratory. Up to 2 ml of ovarian fluid from each female should be collected in a sterile 15ml centrifuge tubes. Five fish can be pooled into each tube. Tubes should be kept cool on ice and delivered within 24 hours. The Pathology Laboratory needs to be notified of pending shipment.
- 8. <u>Disinfect</u> equipment and personal gear between:
 - a. waterbodies
 - b. waterbody and hatchery
 - c. lots

Rearing Pond Harvest and Stocking specifics

1. Use ground water as distribution water. If the use of surface water is necessary, all water should be filtered through a $<40 \mu$ mesh filter or screen and the equipment.

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 or invasive, fish and water can only be released into waters also infested with the same invasive.

5. Fish cannot be transferred from waters known to be infected with a regulated pathogen, except

a. Fish infected with Viral Hemorrhagic Septicemia or *Renibacterium salmoninarum* can be transferred into waters where the pathogen has been confirmed to be present.

6. 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 <u>must</u> be ground water or well water, <u>not</u> surface water.

7. Use minimal screening to capture fish, avoid capturing any small plant parts or seeds with the fish.

8. Attempt to eradicate non-target or invasive species from a pond by winter draw down, chemical treatment or dredging.

9.Hot pressure wash and/or <u>disinfect</u> vehicles, holding tanks, personal protective gear, nets, and equipment at the end of the day in a location away from ponds and water supplies to prevent disinfectant or untreated water from entering those areas

- 10. The following pathogens will be screened for:
 - h) Viral Hemorrhagic Septicemia Virus (ovarian fluids and fish)
 - i) Infectious Pancreatic Necrosis Virus (ovarian fluids and fish)
 - j) Infectious Hematopoietic Necrosis Virus (ovarian fluids and fish)
 - k) Myxobolus cerebralis (fish)

- 1) Renibacterium salmoninarum (fish)
- m) Aeromonas salmonicida (fish)
- n) Yersinia ruckeri (fish)

11. Fish must be tested for pathogens during spawning and prior to stocking. . Different species require different testing.

- d. all species susceptible to VHS:
 - i. Viral Hemorrhagic Septicemia Virus (ovarian fluids and fish)
- e. Catfish:
 - i. Viral Hemorrhagic Septicemia Virus (fish)
 - ii. Channel Catfish Virus (fish)
 - iii. Edwardsiella ictaluri (fish)

12. Infested water should be the only stop or last stop on the stocking route. Infested water can NOT be used as make-up to get tank back to operational height.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

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 Division of Ecological and Water 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 Division of Ecological and Water Resources Invasive Species Program.
- 4. Surface source waters should be sampled early and late summer. Plankton tows (lakes: vertical in deep water area of lake, large lakes: horizontal/oblique near intake) should be performed to look for exotic zooplankton and zebra mussel veligers. Survey in late summer for freshwater snails. Settling plate samplers (bricks, plates, etc) should be used for zebra mussel settling.
- 5. All source waters for rearing ponds should be monitored on a yearly basis for the presence of Nontarget or invasive species
- 6. Fish must be tested for pathogens during spawning and prior to stocking.
 - a. <u>VHS susceptible species</u>:
 - i. Viral Hemorrhagic Septicemia Virus (ovarian fluids and fish)
 - b. Catfish:
 - i. Viral Hemorrhagic Septicemia Virus (fish)
 - ii. Channel Catfish Virus (fish)

iii. Edwardsiella ictaluri (fish)

7. 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 Specifics

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

Rearing Pond Specifics

- 11. 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.
- 12. 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.
- 13. 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.
- 14. All source waters used for rearing ponds should be monitored on a yearly basis for the presence of nontarget or invasive species

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 importance 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. They are likely to have snails, unless treatments to kill snails are performed. 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. The risk of pathogen transmission is moderate since testing requirements are in place, but compliance is not ensured.

Standard language has been developed that can be used in contracts, grants, and permits. The most current example language may be found at the OpOrder 113 Intranet Site:

Standard contract language

- 1. No water from the private hatchery should be used for transport or release in stocked waters, bring ground water.
- 2. <u>Disinfect</u> the transport and stocking truck using a pathogen disinfectant.
- 3. 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.
- 4. Fish should be sampled for pathogens prior to stocking or receiving. Ovarian fluids must be sampled at the 95% confidence level of detecting 2% incidence of disease, fish must be sampled at the 95% confidence level of detecting 5% incidence of disease. Different species require different testing:
 - a. Walleye and Muskellunge (susceptible to VHS):
 - i. Viral Hemorrhagic Septicemia Virus (ovarian fluids and fish)
 - b. Catfish:
 - i. Viral Hemorrhagic Septicemia Virus (fish)
 - ii. Channel Catfish Virus (fish)
 - iii. Edwardsiella ictaluri (fish)
- 5. Fish should not be moved from "infested water" to "non-infested 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 waters with the same infestations.
- 6. Require inspection of fish and facilities prior to loading trucks and at the delivery location.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. Surface waters licensed by the vendors should be checked against listed infested waters to determine if they are on the list, 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, work with the vendor to document the infested location and report the infestation to the Division of Ecological and Water Resources Invasive Species Program.
- 3. Ensure that fish health certification is in order for the fish being delivered as a part of the Live Fish Transportation, Importation, and Stocking Permit.

Category of Activity: Habitat Improvement and Shoreland Restoration.

Description: All activities and work done by the statewide construction and habitat improvement crews and the shoreland restoration program. This category also includes the grant program for shoreland restoration.

Risk Assessment

Overall Risk of Spread: High

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

<u>Shoreland Restoration Program – Restoring Native Vegetation</u>: The risk seems relatively low because most of the equipment can be easily cleaned and disinfected before moving to the next site. Any equipment (particularly larger equipment) has potential to move snails, since they can be moved in water pumped off-site, mud, and on waders and other gear. The highest risk is the transplant of aquatic vegetation from one waterbody to another. Invertebrates could be attached to or caught in the vegetation, and would be moved to a separate

waterbody without drying. It is possible that resting eggs of exotic zooplankton could also be caught on this transplanted vegetation and moved.

<u>Habitat Improvement – Trout Streams</u>: 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 Operational Order 113 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 released into the same water body or drained on land where it cannot enter surface water.
- 3. Aquatic vegetation cannot be transported from any water listed as infested.
- 4. Thoroughly inspect and rinse plants for aquatic invasive species in source water; briefly soak in soapy water, and rinse in clean well water prior to movement.
- 5. Only plant native plants.
- 6. Construction equipment should be cleaned and disinfected according to specifications in table 5 prior to leaving site.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. Determine if a waterbody is designated as infested prior to visiting the work site.
- 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 Division of Ecological and Water Resources Invasive Species 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 Division of Ecological and Water Resources Invasive Species Program.

Category of Activity: Survey Program - Lakes and Streams

Description: 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

<u>Stream Surveys</u>: 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. The risk of transmitting pathogens is moderate.

<u>Lake Surveys</u>: 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 "uninfested".

<u>Creel surveys</u>: Minimal to low risk on access based creels, while surveys on medium to larger size rivers and lakes carry a much higher risk.

<u>General</u>: Equipment/gear left submerged in lakes, stream or rivers for extended periods, during summer may carry aquatic invasive species. In larger rivers, zooplankton populations can develop and produce resting eggs. Zebra mussel veligers are typically 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 particular water for more than a season prior to any discovery, creating even higher risk. Free-floating aquatic plant fragments can spread infestations, 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 since not all waterbodies are monitored for pathogens, and only specific pathogens are monitored.

Procedures to meet Operational Order 113 and discipline standards

- 1. Any equipment left in waters (such as nets, floats, or anchors) should not be used in any other waters until they have been thoroughly cleaned, dried, and disinfected with a disinfectant from table 5.
- 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 ground water as distribution water. If the use of surface water is necessary, all water should be filtered through a $<40 \mu$ mesh filter or screen and the equipment disinfected.
- 6. Infested water cannot be transported.
- 7. Drain all fish hauling water at site prior to leaving.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

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 Division of Ecological and Water Resources Invasive Species 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 Division of Ecological and Water Resources Invasive Species Program.
- 4. All fish to be transferred need to be tested for pathogens prior to movement. Fish must be sampled at the 95% confidence level of detecting 5% incidence of disease. Different species require different testing:
 - a. Salmonids:

- i. Viral Hemorrhagic Septicemia Virus
- ii. Infectious Pancreatic Necrosis Virus
- iii. Infectious Hematopoietic Necrosis Virus
- iv. Myxobolus cerebralis
- v. Renibacterium salmoninarum
- vi. Aeromonas salmonicida
- vii. Yersinia ruckeri
- b. Catfish:
 - i. Viral Hemorrhagic Septicemia Virus
 - ii. Channel Catfish Virus
 - iii. Edwardsiella ictaluri
- c. <u>VHS susceptible species</u>:
 - i. Viral Hemorrhagic Septicemia Virus

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

<u> </u>				
Aquatic Inverts	Pathogens	Plants	Fish	Equipment
High	Moderate	High	Low	High

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). Likewise, soil, plant parts, and seeds may adhere to clothing, gloves, boots, waders and hand tools. Exposure 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. Accesses through parking lots and roads or trails pose a 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 frequently accessed on foot or by motorized vehicle by the general public 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 from a project site:

- Remove of woody debris (logs, branches, and beaver cuttings), vegetation, and rocks or sediment from outlets, control structures, and spillways.
- Woody and herbaceous vegetation should be 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.

- 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. Cleaning is required if vehicles have been used previously during wet, muddy conditions or on unpaved road surfaces.
- 3. If it is 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.
- 5. If a 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 a site is known to have invasive species, pre-treat the site prior to work activity to reduce or eliminate the chance of spreading the infestation within the project site, or 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 outcompete 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. 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.
- 16. Frequently monitor sites (dikes, roads, trails, parking lots, etc.) used for vehicle or recreation access.
- 17. If a site becomes infested after initial activity, other sites visited around the same time with the same equipment or vehicles should be checked for the spread of invasive species.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 Division of Ecological and Water Resources Invasive Species 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 Division of Ecological and Water Resources Invasive Species Program.

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 watercrafts 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.

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

- Removals of birds or mammals potentially carrying weed seeds, subsequent transport, and possible introduction of seeds 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.

- 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. If 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. Loading platforms and floating nesting structures potentially exposed to aquatic invasive plants should be dried or frozen prior to use at other sites (see fisheries guidelines).
- 8. Remove obvious soil, seed, plant parts, and invertebrates adhering to loading platforms and floating nesting structures prior to leaving a site.
- 9. If a site or access point is known to have invasive species, if possible, clean equipment, vehicles, and footwear prior to leaving the site.
- 10. If a site is known to have invasive species, pre-treat the site prior to work activity to reduce or eliminate the chance of spreading the infestation within the project site, or spreading the invasive species to other sites.
- 11. Use nest material known to be free of invasive species.
- 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. Monitor heavy use areas, major access points (especially watercraft landing sites), trails or roads where activity occurred.
- 14. On sites with disturbed soil, or potential for introduction or spread of invasive species, inspect twice per season, through two growing seasons.
 - a. early in the growing period
 - b. in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
- 15. If a site becomes infested after initial activity, other sites visited around the same time should be checked for the spread of invasive species.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. 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 Division of Ecological and Water Resources Invasive Species 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 Division of Ecological and Water Resources Invasive Species Program.
- 2. On sites with disturbed soil, or potential for introduction or spread of invasive species, inspect twice per season, through two growing seasons.
 - a. early in the growing period
 - b. in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
- 3. Complete annual inspections of outside storage areas for invasive plant growth as a part of the Annual Site Inspection process.

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.

Procedures to meet Operational Order 113 and discipline standards

- 1. Work in un-infested waters first, and move to infested waters last.
- 2. Inspect the project site for invasive terrestrial species prior to initiating fieldwork.
- 3. 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 <u>any</u> organism from one body of water to another.
- 4. Remove vegetation and earthen material from equipment prior to leaving the work site by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- 5. If practical, <u>avoid</u> infested sites during periods when invasive species are more prone to relocate offsite (i.e. seed stage of purple loosestrife).

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. Inspect water access areas twice per growing season.
 - early in the growing period
 - in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.

Category of Activity: Fish Health Inspection and Laboratory Testing (for public and private facilities) **Description:** Traveling to a waterbody or facility for the purposes of conducting a fish health inspection, or obtaining samples for fish health testing. This category also covers fish health testing that occurs in the lab.

Risk Assessment

Overall Risk of Spread: Low

Aquatic Inverts	Pathogens	Plants	Fish	Equipment
Low	Low	Low	Low	High

Risk of movement of aquatic invasive species is very low since only fish are removed from waterbodies, and fish go directly to the Pathology Laboratory where they are processed, frozen, and subsequently autoclaved and or discarded into the sewer system. The risk of moving pathogens is low for the same reason. The risk of moving plants via shoes or vehicle is the highest risk.

- 1. Any equipment used to sample fish (such as nets, traps, or waders) should not be used in any other waters until they have been thoroughly cleaned, dried, and <u>disinfected</u>.
- 2. Remove vegetation and earthen material from shoes and vehicle prior to leaving each waterbody by brushing, scraping, sweeping, using forced air, hand tools, or pressure washing.
- 3. Continue to freeze and or autoclave fish before discarding them into the sewer system.

Standard Protocols Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. Any fish that test positive for a regulated disease should be autoclaved prior to disposal in the sewer system.

Category of Activity: Tagging Minnow Dealer's Equipment

Description: Tagging Minnow Dealer's Equipment for Use in Designated Infested Waters. Tagging could occur at a minnow dealer's facility or a DNR Fisheries Field Office.

Risk Assessment

Overall Risk of Spread: Low

Site Disturbance	Diseases	Plants	Materials	Equipment
Low	Low	Low	Low	Low

Spiny waterflea, zebra mussels, or faucet snail may adhere to equipment used to harvest minnows in designated infested waters. Since flowering rush and Eurasian watermilfoil plant fragments are visible, spreading these is a lower risk. Minnow dealers may bring their equipment to a DNR fisheries area office for tagging, and this poses a higher risk of spread than when DNR personnel travel to their facility to tag the equipment.

Procedures to meet Operational Order 113 and discipline standards:

- 1. If equipment is brought to an area office for tagging, do not allow private equipment to come into contact with, or near state equipment.
- 2. If necessary, <u>disinfect</u> areas where equipment was placed and allow to dry before placing state equipment in the same area.
- 3. Keep accurate records of equipment tagging.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

IV. Other Discipline Aquatic Guidelines

Ecological Services Guidelines

The following activities should also be reviewed and incorporated into Fish and Wildlife related activities (Eco-Waters Discipline Guidelines)

Activity	Guidelines Page #
Nearshore Fish Community Sampling (Lake)	
Nongame Fish Sampling (Streams/River)	
Zooplankton Sampling (Mississippi River)	
Plant Surveys (Lakes)	
Purple Loosestrife (PL) Biocontrol Transect Surveys	
Purple Loosestrife (PL) Biocontrol Collection and Movement	
Herbicide Treatment (Lakes)	14
Purple Loosestrife (PL) Herbicide Treatment (Rodeo)	
Collection and Possession of Invasive Plant Species for Research and	
Other Approved Activities	16

Water Quality Monitoring (Mississippi River and Tributaries)	17
Continuous In-situ Water Quality Monitoring	17
Aquatic Macro Invertebrate Sampling (Benthic Macro Invertebrates)	18
Aquatic Micro Invertebrate Sampling (Zooplankton Sampling)	18
Aeration Program Permitting and Safety Program	19
Spills/Kills Program	20
Natural Resources Damage Assessments	20
Processing of Contaminant Fish in MPCA Laboratory	21
Dam Removal	22
Stream Restoration	23
Stream and Lake Gauging	24
SCUBA Diving	25
Animal surveys (see section in terrestrial activities)	48

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 and from a project site a project site:

- Earthen and vegetative materials may adhere to highway vehicles, equipment, and personnel clothing used for all activities.
- Earthen and vegetative materials are often removed from field equipment and vehicles after returning to DNR offices.
- Parking areas around DNR offices are visited by vehicles from many places, not always clean.
- Development (landscaping, construction) and maintenance (mowing, grading) activities both contract and DNR.

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

- Fish and wildlife 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 Operational Order 113 and discipline standards

- 1. Purchase from vendors that have weed-free supplies.
- 2. Restrict public access in areas around headquarters that are not easily monitored.
- 3. DNR equipment used at headquarters (i.e., lawn care) must be cleaned offsite prior to starting work.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. On sites with disturbed soil, or potential for introduction or spread of invasive species, inspect twice per season, through two growing seasons.
 - early in the growing period
 - in the middle of the growing season prior to the end of flowering and the beginning of seed dispersal.
- 2. Complete annual inspections of outside storage areas for invasive plant growth as a part of the 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 and from 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 and from a project site:

• Not applicable

Procedures to meet Operational Order 113 and discipline standards

1. 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 around the same time should be checked for the spread of invasive species.

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 Operational Order 113 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 unless a site becomes infested after initial activity. If this happens, other sites visited around the same time should be checked for the spread of invasive species.

<u>Standard Protocols</u>

Follow the standard protocols on pages 7-9 of this document.

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 and from 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 and from a project site:

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

Procedures to meet Operational Order 113 and discipline standards

- 1. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 2. Make sure HE Grantees purchase certified weed-free supplies when feasible.
- 3. Inspect source of materials when feasible (especially gravel and fill material).
- 4. 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.
- 5. Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.
- 6. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 7. Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- 8. Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- 9. Provide educational material to HE Grantees involved with activities that may introduce or cause the spread of invasive terrestrial species on state lands.
- 10. 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).

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

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

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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 Operational Order 113 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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: 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.

- 1. Plan daily activities to include consideration for invasive species when possible <u>start</u> at units with no, or very little, invasive species infestation.
- 2. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 3. Move from un-infested areas to infested areas within a unit.
- 4. 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.
- 5. Site avoidance. If practical, avoid:
 - a. infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).

b. Wet soil to reduce movement of seeds and soil borne organisms.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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.

- 1. 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.
- 2. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 3. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 4. Try to move from un-infested areas to infested areas within a unit.
- 5. 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.
- 6. Management due to spraying may weaken native plants and cause greater spread of invasive plants.
- 7. Spot spray when possible.
- 8. Site avoidance. If practical, avoid:
 - a. infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
 - b. wet soil to reduce movement of seeds and soil borne organisms.

Standard Protocols Follow the standard protocols on pages 7-9 of this document.

Monitoring:

- 1. 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.
- 2. 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.

- 1. Move from un-infested areas to infested areas within a unit.
- 2. Plan daily activities to include consideration for invasive species when possible <u>start</u> at units with no, or very little, invasive species infestation.
- 3. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 4. Purchase native plant seed from sources that are certified noxious weed free.
- 5. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 6. 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.
- 7. Seedbed preparation and planting can involve soil disturbance, making invasive species spread problematic.
 - a. Spray site with herbicide prior to planting to reduce incidence of future weed problems.
- 8. Spot spray when possible.
- 9. Mow before weed seeds are viable.
- 10. Educate contractors of invasive species known to be on the site
 - a. Time contracts to reduce weed movement off-site.

- b. Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
- c. Provide information on species identification, distribution and ways to minimize spread.
- 11. Site avoidance. If practical, <u>avoid</u>:
 - a. infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
 - b. wet soil to reduce movement of seeds and soil borne organisms.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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
- Weed seeds may be mixed in with desired seeds

Procedures to meet Operational Order 113 and discipline standards

- 1. Limit management activities while soil is moist to reduce chance of invasive species movement.
- 2. Maintain good weed control through spraying or cultivating.
- 3. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 4. 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.
- 5. Plan to establish other desirable vegetation in food plot location following its use as a food plot.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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

Sit	e 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 likely
- Weed seeds may be mixed in with desired seeds
- Grazing *may* lead to spread of invasive species due to:
 - o plant material adhered to animals coat
 - o seeds contained within the digestive system
 - o increased soil disturbance

Procedures to meet Operational Order 113 and discipline standards

- 1. Limit management activities while soil is moist to reduce chance of invasive species movement.
- 2. Maintain good weed control through spraying or cultivating.
- 3. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 4. 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.
- 5. Establish vegetation in food plot location following its use as a food plot.
- 6. Grazing agreements
 - a. Include a quarantine period prior to animals entering the unit.
 - b. Cooperator should be educated on the risk of invasive species introduction and spread to and from the WMA.
 - c. Strict grazing timelines should be established to:
 - i. reduce stress on native vegetation
 - ii. maintain minimum stubble height to eliminate possibility for soil erosion and weed establishment
 - d. Spot spraying should be incorporated to treat weeds not actively grazed by animals.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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

2. 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 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 Operational Order 113 and discipline standards

- 1. 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.
- 2. Mow fire breaks when weed seed movement is least likely.
- 3. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 4. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 5. Educate contractors of invasive species known to be on the site
 - a. Time contracts to reduce weed proliferation.
 - b. Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
 - c. Provide information on species identification.
- 6. Move from un-infested areas to infested areas within a unit.
- 7. Plan daily activities to include consideration for invasive species when possible <u>start</u> at units with none to little invasive species infestation.
- 8. Site avoidance. If practical, <u>avoid</u>:
 - a. infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
 - b. wet soil to reduce movement of seeds and soil borne organisms.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 Operational Order 113 and discipline standards

- 1. Planting can involve soil disturbance, making invasive species spread problematic
 - a. Use appropriate herbicides to control noxious weeds in planting areas.
- 2. 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.
- 3. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 4. Mow or spray before weed seeds are viable.
- 5. Inspect project site for invasive terrestrial species prior to initiating fieldwork.
- 6. Educate contractors of known invasive species known on the site.
 - a. Time contracts to reduce weed proliferation.
 - b. Require contractors to clean vehicle(s), ATVs, personnel, and equipment of vegetative material and soil before entering and after leaving a site.
 - c. Provide information on species identification.
- 7. Site avoidance. If practical, avoid:
 - a. infested sites during periods when invasive species are more prone to relocated off-site (i.e. seed stage of Canada thistle).
 - b. wet soil to reduce movement of seeds and soil borne organisms.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 Operational Order 113 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 Operational Order 113 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

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: Forest Stand, 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.

- 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 habitats.

Risk Assessment

Overall Risk of Spread: High

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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 Operational Order 113 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

1. 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 Operational Order 113 and discipline standards:

- 1. If the site is known to have invasive species, clean equipment, vehicles, and boots prior to leaving the site.
- 2. 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.
- 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. Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- 5. Minimize site disturbance, follow site level guidelines for minimizing soil disturbance.
- 6. Require contract crews to thoroughly clean dirt and vegetation from equipment prior to entering and leaving sites with known invasive species.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring:

1. 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, Maintenance, Development, Access Improvement for Public Lands, Maintenance, and 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 publicly used 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 unconcerned 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 Operational Order 113 and discipline standards:

- 1. Purchase products from vendors that have certified weed-free supplies when feasible.
- 2. Use only native plantings and native plant seed sources that are certified noxious weed free.
- 3. Inspect source of materials when feasible (especially gravel and fill material).
- 4. 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.
- 5. 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.
- 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. Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.
- 8. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 9. Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- 10. Conduct as much work as possible under frozen conditions to minimize exposing and moving soil.
- 11. 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.
- 12. Install signs at parking lots, campgrounds, & water access sites that educate users about the spread of aquatic and terrestrial invasive species.
- 13. 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).

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring:

- 1. 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.
- 2. 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 unconcerned 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.

- 1. Purchase products from vendors that have certified weed-free supplies when feasible.
- 2. Use only native plantings and native plant seed sources that are certified noxious weed free.
- 3. Inspect source of materials when feasible (especially gravel and fill material).
- 4. 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.
- 5. 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.
- 6. Equipment must be thoroughly cleaned before leaving sites with known terrestrial invasive species.
- 7. Require contractors to inform project supervisor if coming from a site with known terrestrial invasive species.
- 8. Limit soil disturbance when feasible to decrease introduction of invasive plant species.
- 9. 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.
- 10. 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).

Standard Protocols Follow the standard protocols on pages 7-9 of this document.

Monitoring:

1. 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 Operational Order 113 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

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

ĺ	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 Operational Order 113 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 a 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.

Standard Protocols

Follow the standard protocols on pages 7-9 of this document.

Monitoring

- 1. Monitor heavy use areas, access points, trails or roads where activity occurred.
- 2. 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.
- 3. 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 for the following activities should also be reviewed and incorporated into Fish and Wildlife related activities (Eco - Waters Discipline Guidelines)

Activity Guideli	nes Page #
Prescribed Burning	
Access Road Construction/Trail Construction	
Construction and Maintenance of Fences, Gates, Signs, Parking Lots,	
and Culverts	
Site Clean-up (Building Demolition, Garbage Pick-up, Farm Dump Removal)	
Mechanical Brush Removal	
Brush Removal with Chainsaw and/or Brush Saw	
Chemical Treatment or Hand Pulling of Invasive Species or Chemical Treatm	ent
with ATV, Tractor and Spot Sprayer	
Mowing Fire Breaks	
Seeding	
Seed Harvest	
Prescribed Grazing	
Watering Facilities	
Site Visits (Land Acquisition, Plant Surveys, Joint Site Visits,	
Monitoring)	
Private Lands Technical Assistance	
Public Information/Outreach Workshops	
Well Sealing	
Well Monitoring	
Brush Pile Stacking and Burning	40
Research Permits (Endangered Species, Invasive Species, etc)	41
Equipment and Facility Maintenance	
Woodland Reconstruction (Restoration)	43
Lakescaping	43
Riprap	45
Revetment	45
Animal Surveys	47
Bat Surveys and Cave or Mine Visits	49
Biomass Removal and Collection	

Forestry Guidelines for the following activities should also be reviewed and incorporated into Fish and Wildlife related activities (http://files-intranet.dnr.state.mn.us/user_files/1920/invasiveguidelines.pdf)

the related activities (http://files-intranet.dnr.state.mn.us/user_files/1920/	/invasiveguidennes.p
Activity	Guidelines Page #
Road Construction & Maintenance	11
Harvest Operations & Deer Exclosures	
Site Preparation	
Nursery Operations	
Pest Management Invasive Terrestrial Plants	
Gravel Operations	
Planting Operations	
Aerial Wildfire Suppression	
Ground Operations for Wildfire Suppression & Prescribed Burning	

Special Products and Fuel Wood Permits	32
Pest Management Insects & Disease	34
Seed Orchard Management & Seed Cone Collection	37
Recreational and Special Events	40
Stand Improvement & Protection	43
Seeding Operation	45
General Maintenance	48
Land Transactions	50
General Site Visits	52

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:

Minnesota Statute Chapter 18

Minnesota Statute Chapter 18G

Minnesota Statute Chapter 84D

Minnesota Rule 1505

Minnesota Rule Chapter 6216

More information on species of concern can be found at the Invasive species web page at: <u>MN DNR Invasive</u> <u>Species Web Page</u>

Selected Applicable Regulations:

It is illegal to transport water from infested waters except under permit or for emergency use such as firefighting (M.R. 6216.0500).

- It is illegal to introduce prohibited or regulated invasive species into public waters (see M.S. 84D.05, M.S. 84D.07, and M.R. 6216)
- It is illegal to transport materials or equipment containing the propagating parts of noxious weeds, except by permit (M.S. 18.82, 18.86)
- It is illegal to transport aquatic plants on public roads except as allowed in the statute (M.S 84D.09).
- It is illegal to launch or attempt to launch a boat or trailer with aquatic plants or prohibited species attached (M.S. 84D.10).
- A person leaving waters of the state must drain boating-related equipment holding water and live wells and bilges by removing the drain plug before transporting the watercraft and associated equipment on public roads. Drain plugs, bailers, valves, or other devices used to control the draining of water from ballast tanks, bilges, and live wells must be removed or opened while transporting watercraft on a public road. Marine sanitary systems and portable bait containers are excluded from this requirement. A person must not dispose of bait in waters of the state. (M.S. 84D.10)

VIII. OTHER RESOURCES

- 1. Invasive species
 - <u>MN DNR Invasive Species Web Page</u>
 - List of Designated Infested Waters
 - MDA's Terrestrial Invasive Plant Early Detection Program
- 2. Aquatic Pathogens
 - MN DNR Fish Disease Webpage
 - USDA-APHIS list of VHS susceptible species
 - Focus on Fish Health website
 - link to statute 17.4991 disease transmission internet page
 - link to statute 17.4985 transporting aquatic life web page
 - link to Minnesota statute 17.4986 importation of aquatic life web page
 - link to Minnesota statute 17.4987 stocking private aquatic life web page

IX. CONTRACTS AND GRANTS

Writing Contracts

Op Order 113 order applies to all DNR resource management activities by employees and non-DNR individuals or organizations on DNR-administered lands and public waters; and activities DNR regulates, permits, or funds (grants). It is designed to ensure that DNR resource management activities protect our environment from invasive species impacts, comply with existing statutes and rules governing invasive species, and meet requirements for dual forest certification by Forest Stewardship Council and Sustainable Forestry Initiative.

Standard language has been developed that can be used in contracts, grants, and permits. The most current example language may be found at the Op Order 113 Intranet Site: <u>Sample contract language</u>. Contract language at this site includes:

General Contract Language relating to invasive species prevention Clearing and Grubbing Dredging Excavation and Embankment Exterior Plants

General Contract Language:

1.531A INVASIVE SPECIES PREVENTION: (No Invasive Species Present)

The Minnesota DNR Operation Order 113 requires preventing or limiting the introduction, establishment and spread of invasive species during activities on public waters and DNR-administered lands. The Contractor shall prevent invasive species from entering into or spreading within a project site by cleaning equipment and clothing prior to arriving at the project site. The Project Manager shall inspect all equipment and clothing at the staging area determined at the preconstruction meeting.

If the equipment or clothing arrives at the project site with soil, aggregate material, mulch, vegetation (including seeds) or animals, it shall be cleaned by Contractor furnished tool or equipment (brush/broom, compressed air or pressure washer)

at the staging area. The Contractor shall dispose of material cleaned from equipment and clothing at a location determined by the Owner. If the material cannot be disposed of onsite, secure material prior to transport (sealed container, covered truck, or wrap with tarp) and legally dispose of offsite.

If the project site includes a water body, the Contractor shall clean equipment and clothing as noted above, prior to entering and leaving the water body. Prior to leaving the water body, drain water from all equipment, tanks or water retaining components of boats (motors, live well and bilge). Immediately after leaving the water body, drain water from transom wells onto dry land.

1.531B INVASIVE SPECIES PREVENTION: (Invasive Species Present)

The Minnesota DNR Operation Order 113 requires preventing or limiting the introduction, establishment and spread of invasive species during activities on public waters and DNR-administered lands. The Contractor shall prevent invasive species from entering into or spreading within a project site by cleaning equipment and clothing prior to arriving at the project site. The Project Manager shall inspect all equipment and clothing at the staging area determined at the pre-construction meeting.

If the equipment or clothing arrives at the project site with soil, aggregate material, mulch, vegetation (including seeds) or animals, it shall be cleaned by Contractor furnished tool or equipment (brush/broom, compressed air or pressure washer) at the staging area. The Contractor shall dispose of material cleaned from equipment and clothing at a location determined by the Owner. If the material cannot be disposed of onsite, secure material prior to transport (sealed container, covered truck, or wrap with tarp) and legally dispose of offsite.

If the project site includes a water body, the Contractor shall clean equipment and clothing as noted above, prior to entering and leaving the water body. Prior to leaving the water body, drain water from all equipment, tanks or water retaining components of boats (motors, live well and bilge). Immediately after leaving the water body, drain water from transom wells onto dry land.

The Owner has determined that invasive species are within the project limits. The Contractor shall meet the following requirements.

At the pre-construction meeting, the Project Manager shall identify on the plan the known infested sites to be avoided. The parking and staging areas and travel routes shall not be within the invasive species area. The Contractor shall clean equipment and clothing and dispose of material as noted above, prior to leaving the project limits. Additionally, aquatic equipment used in invertebrate infested waters shall be dried before reuse, rinsed with hot water or power washed to remove invertebrates. Aquatic equipment used in pathogen infested water(s) shall be disinfected, as outlined in the *Invasive Species Operational Handbook* (Invasive Species Operational Handbook) immediately after exiting water.

Where there are multiple sites and at least one contains invasive species, the intent is to start work at the site with the fewest number of invasive plants, leaving the most heavily infested sites to last. The Contractor shall make every effort to schedule operations and site visits to avoid the spread of weed seed. When planning to travel between multiple sites in one day, the Contractor shall submit the last site visited and the schedule to the Owner for review and either acceptance or rejection. The Contractor shall not start work until the schedule has been accepted.

If the project is inactive for longer than one month of the growing season, the Contractor shall close, obstruct or gate all access routes, when directed by Project Manager, until the project resumes.

If the Owner or Contractor discovers additional invasive species infestation areas during construction, the Contractor is to stop operations in the newly discovered infested area until a resolution can be accepted by the Owner.

Upon completion of the project, close, obstruct or gate all temporary construction access routes as directed by the Project Manager.

Writing Grants

Op Order 113 order applies to all DNR resource management activities by employees and non-DNR individuals or organizations on DNR-administered lands and public waters; and activities DNR regulates, permits, or funds (grants). It is designed to ensure that DNR resource management activities protect our environment from invasive species impacts, comply with existing statutes and rules governing invasive species and meet requirements for dual forest certification by Forest Stewardship Council and Sustainable Forestry Initiative.

Standard language has been developed that can be used in contracts, grants, and permits. The most current example language may be found at the Op Order 113 Intranet Site: <u>Sample contract language</u>.

DNR Ecological and Water Resources has the opportunity to influence the introduction and spread of invasive species in the administration of projects funded with DNR dollars through our grant programs, such as Flood Damage Reduction, Dam Safety, Coastal Zone Management, and Woody Biomass projects.

General Grant Language:

Standard Provision

Every approved grant will contain the following provision:

Grantees and subcontractors must follow Minnesota DNR's Operational Order 113, which requires preventing or limiting the introduction, establishment and spread of invasive species during activities on public waters and DNR-administered lands. This applies to all activities performed on all lands under this grant agreement and is not limited to lands under DNR control or public waters. Duties are listed under Sections II and III (p. 3-8) of Operational Order 113 which may be found at <u>Contractor Duties</u>.

Additional grant language has been developed and can be found at the Op Order 113 Intranet Site: <u>Additional</u> <u>Grant Language</u>. There is more detailed language for use when you know that invasive species could be encountered based on the work being done or the general location of the project or if you know that invasive species will be an issue on the project and you need to ensure that the grantee is taking strict measures to reduce the risk.

X. LIST OF INVASIVE SPECIES

There is a list of invasive species covered by the Invasive Species Op Order and the Invasive Species Operational Handbook. See the Op Order 113 Informational website for the most current list of species <u>List of Invasive Species</u>

XI. 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 (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 and Water Resources - 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: Standardized attribute data (for terrestrial) and Table 4 (for aquatic). When collected in this format, the data can be readily appended to the two centralized databases for terrestrial and aquatic invasive species.

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.



PDA/GPS used in collecting invasive species data.

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). To find invasives layers in ArcMap, open Quick Layers, open the "Environmental Quality" folder, and then you will see the "Aquatic Invasive Species Observations" layer and the "Terrestrial invasive Species Observations" layer.



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. Otherwise, if you observe an invasive species infestation (one or several), these observations can be reported using the reporting form online at: Invasive Species Reporting Form Standardized Data. 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."

XII. 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



XIII. Tables

Relative risk of spreading invasive aquatic invertebrates by Fisheries Management activity

<u>*Rusty crayfish:*</u> 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. 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; being 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 crayfish 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 crayfish, 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 a particular net, the net should be allowed to dry completely or soaked in hot water (over 140° F) to kill any crayfish. As a standard policy, any crayfish 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° F) water. No equipment can be used with any crayfish 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: Taking precautions while working in "infested" waters is important. However, it is important to consider that often exotic invertebrates establish reproducing populations in a waterbody one or more years prior to detection. This creates a situation where we assume that water is non-infested, and do not take precautions for working in infested waters. We need to be aware that our activities may be unintentionally spreading exotic invertebrates. 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 waterbodies for infestation. Monitoring cannot give a waterbody a "clean" bill of health with a quick cursory inspection. Thus identifying a waterbody as non-infested signifies that aquatic invasive species have not been found there, not that they are not present.

Zebra mussels	Cold 1	Cool/warm egg 1	Hatcheries Cool/warm rear 1	Spawn Northern pike 1	Muskie 1	WAE 2	White Sucker 3	Rearing Ponds 2	Fish Distrib Stocking 1, 2	Private Fish Purch 2
Snails (all fresh water)	1	1	4	2	2	2	3	5	1, 5	5
New Zeland 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 Kids	1 Lake &	1	2	1, 1	1
	Habitat Impro Trout Stream	vement Lake	Shore-veg	Winterkill Lakes	Fishing Pond	Stream Surveys	Stream Surveys			
Zebra mussels	1	1	1	3	3	4	3			
Snails (all fresh water)	4	4	3	4	3	4	4			
New Zeland 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			

Table 1: 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

Table 2: Relative Probability of Invasion by Aquatic Plants as a Result of Fisheries Activities

Draft by Wendy Crowell, revision date: August 25, 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. Number of Cool and warm water Fish known No. Pike Muskie Walleye White sucker Coldwater hatcheries Cool and warm water Fish distribution Kids fishing Winter kill Lake Habitat Rearing Stream Shore land Vector of plant spread infestations spawning spawning spawning hatchery (hatching) hatcheries (rearing) and stocking lakes survey improvement purchase Ponds spawning ponds surveys program 3 - if the 5 - if lake 4 - if the 4 - if the is infested species is species is species is 3 - if 3 - if present in the 3 - if the species is 4 - if the species is 4 - plant and is not present in present in Spread by free floating plant fragments/small 3 - if invasives invasives are 3 - if invasives production present in the water present in the fragments on known to 3 - pumped the hatchery the rearing 3 - in plant parts throughout the growing season are in lake are in lake in lake are in lake pond used to transport fry hatchery pond boat trailers 4 Δ be water pond pond 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 3 - if the 5 - if lake 4 - if the 4 - if the is infested species is species is species is Spread by plant patrs and seedss attached to 3 - if 3 - if present in the 3 - if the species is 4 - if the species is 4 - plant and is not present in present in plant fragments when plant patrs and seedss are 3 - if invasives invasives are 3 - if invasives production present in the water present in the fragments on known to 2 - pumped the hatchery the rearing 3 - in are in lake are in lake boat trailers present in lake are in lake pond used to transport frv hatchery pond 4 4 be water pond pond nets/water 704 Curlv-leaf (Potamoaeton crispus) 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	>2000	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
Spread by whole floating plants moving	72000	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1
Water chestnut (Trapa natans) Water soldiers (Stratiotes aloides) Frog-bit (Hydrocharis morsus-ranae)	none none 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 > 10 - rough																
Yellow flag iris (Iris pseudacorus)	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 (Trana natans) Frog-bit (Hydrocharis morsus-ranae) Hydrilla (Hydrilla verticillata) Flowering rush (Butomus umbellatus) Curly-leaf (Potamogeton crispus)	none none < 50 704																
- 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 (<i>Trapa natans</i>) Frog-bit (<i>Hydrocharis morsus-ranae</i>) Hydrilla (<i>Hydrilla verticillata</i>) Flowering rush (<i>Butomus umbellatus</i>) Curly-leaf (<i>Potamogeton crispus</i>) Non-native waterlilies (<i>Nymphaea oderata cultivars</i>) Eurasian watermilfoil (<i>Myriophyllum spicatum</i>) Loosestrife (<i>Lythrum salicaria</i>)	none none < 50 704 < 20 170 > 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

Table 3: Relative Probability of Transmission of 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
Yersinia ruckeri (causes Enteric Redmouth)	Infected fish, invertebrates, mammals, viable in the 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
Aeromonas salmonicida (causes Furnuculosis)	Infected fish, invertebrates, viable in the 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
Renibacterium salmoninarum (causes Bacterial Kidney Disease)	Infected fish, viable in the environment	Vertical 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
<i>Edwardsiella ictaluri</i> (causes enteric septicemia of catfish)	Infected fish, viable in the 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
Viral Hemorrhagic Septicemia Virus	Infested fish, viable in the environment	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
Channel Catfish Virus	Infected fish, viable in the environment	Unknown Vertical and Horizontal 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
Largemouth Bass Virus	Infected fish, viable in the 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
Spring Viremia of Carp Virus	Infected fish, Possible invertebrates, viable in the environment.	Primarily horizontally transmitted, may be vertically transmitted	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
White Sturgeon Iridovirus	Infected fish, viable in the environment	Unknown Vertical and Horizontal 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
Other Viral Diseases	Infected Fish, viable in the 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
Other diseases	Infected fish, viable in the 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

Table 4 - Prevention

Ensuring equipment is clean and any materials moved as part of DNR, Division of Ecological and Water 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 infested waters without a permit.
- You are required to remove drain plug after leaving all waterbodies.
- It is illegal to transport materials or equipment containing the propagating parts of noxious weeds, except by permit.

Aquatic				
	All waters	Plant infested waters	Invertebrate infested waters	Pathogen infested waters
Boats, trailers, anchors, and	Procedures	Procedures	Procedures	Procedures
other boating equipment	2. Before arriving to a	Follow procedures listed under	Follow procedures listed under	Follow procedures listed under
	waterbody, ensure	"All waters".	"All waters" and:	"All waters" and:
	equipment is free of			7. After working on waters
	visible plants, seeds, mud,		Before re-use (choose one):	known to harbor
	soil, animals, etc.		4. Power spray equipment to	pathogens of concern,
	3. Before leaving a		remove attached water	disinfect equipment prior
	waterbody:		fleas, zebra mussels, or	to using it in locations not
	• Inspect for and		New Zealand mudsnails	known to contain
	remove all visible		5. Rinse with hot water to	pathogens present at the
	plants, seeds, mud,		kill the invasive species	last location visited.
	soil, animals, etc.		6. Dry before re-use to kill	
	from your		the invasive species	
	equipment		-	
	• Drain water from			
	any equipment,			
	tanks, or water			
	retaining			
	components of			
	boats such as			
	motors, live wells,			
	bilges, and			
	transom wells onto			
	dry land. Remove			
	the drain plug and			
	leave it out until			
	re-launching.			

Aquatic				
Equipment	All waters	Plant infested waters	Invertebrate infested waters	Pathogen infested waters
Seaplanes	Procedures	Procedures	Procedures	Procedures
	8. Before leaving a	Follow procedures listed under	Follow procedures listed under	Follow procedures listed under
	waterbody, ensure your	"All waters".	"All waters" and:	"All waters".
	equipment is free of		• If water is taken from	
	visible plants, seeds, mud,		zebra mussel and spiny	
	soil, animals, etc.		waterflea infested water to	
	9. Avoid trailing trough		be used for fire fighting,	
	aquatic plants before		aircraft should return to	
	taking off.		base and contaminated	
	10. Raise and lower water		buckets, tanks, and/or	
	rudders before and after		aircraft should be rinsed	
	takeoff.		with hot water.	
	11. Return to lake and remove		Avoid mooring in	
	vegetation that did not		invertebrate infested. If	
	free itself from water		necessary, scrub areas in	
	rudders/wires.		contact with infested	
	12. Send out guidelines to		water before leaving.	
	contractors and stipulate			
	adherence to guidelines in			
	contracts.			

Terrestrial				
Equipment	All Sites	Weed/Terrestrial Plant infested sites	Worm infested sites (based on visual observations)	Forest Pest/Invasive Insect infested sites
Vehicles (Trucks, Cars,	Procedures	Procedures	Procedures	Procedures
Trailers, etc.)	 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 from your equipment. Brush (hand remove) off plants, seeds, mud, soil and animals from vehicles including: wheel wells, tracks, hubs, blades, grills, etc. 	 Follow procedures listed under "All sites" and: Power spray vehicles and equipment after returning from site. 	 Follow procedures listed under "All sites" and: Power spray equipment and vehicles to remove organic material. Dry before use to kill species. 	Follow procedures listed under "All sites".

Terrestrial				
Equipment	All sites	Weed/Terrestrial Plant infested sites	Worm infested sites (based on visual observations)	Forest Pest/Invasive Insect infested sites
Heavy equipment (logging	Procedures	Procedures	Procedures	Procedures
machinery, mowers, etc.)	 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 from your equipment. Brush (hand remove) off plants, seeds, mud, soil and animals from vehicles including: wheel wells, tracks, hubs, blades, grills, tracks, etc. 	 Follow procedures listed under "All sites" and: Power spray vehicles and equipment after returning from site. Designate specific equipment for infested sites. 	 Follow procedures listed under "All sites" and: Power spray equipment and vehicles to remove organic material. Dry before use to kill species. 	Follow procedures listed under "All sites".

Table 5 - Treatments to Remove or Render Invasive Species Non-viable (last updated October, 2014)

This table lists known methods for removing or killing invasive species. You are not expected to perform all possible decontamination procedures. This information may be useful when developing permit conditions that specify decontamination required for specific species or infested waters. Table 1 lists the recommended prevention procedures, while Table 2 explains the logic behind the recommended prevention procedures and lists more specific information for various species. For example, if you followed the procedure in Table 1 and removed all visible plants from your boat, then you wouldn't need to worry about drying your boat for 10 days to kill Eurasian watermilfoil plants as noted in Table 2.

Species	Removal Methods	Drying Period	Wash Temp and Duration	Other
Aquatic Plante:				Treatments
Brazilian waterweed / elodea	 Hand pick plant fragments from equipment Power spray specific equipment after hand removal if needed 	Unknown	Unknown	 Filter to 500 μ (Rendall)
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 Water milfoil	 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) to 500 μ (Welling, Rendall)
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	
Faucet snail	Power spray to remove	•	• 122 F (50 C)/ 1 min+ (Mitchell and Cole)	24-h exposure to Hydrothol 191 at a concentration of at least 20 mg/L (Mitchell and Cole)
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 μ 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 μ 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 treatme		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	 Debark and/or process wood from infested areas prior to April 1st 	None	•	Check with MDA to ensure compliance with state and federal quarantines
EAB	Debark and remove sapwood	None	Heat to wood 160 degrees for 75 min	Check with MDA to ensure compliance with state and federal quarantines
Bark beetles (See Forestry Division Guidelines for additional information on forest insect pests)		• None	•	Check with MDA to ensure compliance with state and federal quarantines
Pathogens:	Removal Methods	Drying Period	Wash Temp and Duration	Other Treatments
Dutch elm disease (See Forestry Division Guidelines for additional information on forest pathogens)	 Harvest dead and dying trees prior to April 1st. Chip, debark, burn, process or tightly cover infested wood prior to April 1st. 	 Cover and season infested firewood for a year before uncovering and/or distributing. Trees standing dead more than a season are no longer infective. 	Sterilize tools before moving to nonsymptomatic trees.	 Avoiding pruning during the growing season. Where possible, disrupt root grafts to prevent root graft transmission.
LMBV Heterosporis VHS	• None	 VHS: 12 hours in the dark or 4 to 6 in the sun Heterosporis: 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

Table 6 - 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 or 10,000 ppm	On contact to 1 min	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.	
	1:200 or 5,000 ppm	10 minutes		
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.

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)
Χ, Υ	X,Y coordinates	the UTM Zone 15N grid coordinates of the center of the water body of interest