INVASIVE SPECIES PREVENTION AND MANAGEMENT PLAN

MORRIS RIDGE SOLAR ENERGY CENTER

Case No. 18-F-0440
Town of Mount Morris
Livingston County, New York

Prepared For:

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1. INTRODUCTION

Morris Ridge Solar Energy Center, LLC (the Applicant), is proposing to construct a 177-megawatt (MW) solar photovoltaic (PV) energy generating project located in the Town of Mount Morris, Livingston County, New York (the Facility). The Facility will be sited on approximately 1,060 acres of land within 3,331 acres of participating properties (the Facility Site). Both the Facility Site and the surrounding area are characterized by active agricultural land dominated by cultivated row crops, interspersed with isolated woodlots and scattered rural residences.

1.1. Purpose and Goal

The New York State Department of Environmental Conservation (NYSDEC) defines an invasive species as a species that is not native to the ecosystem under consideration, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (NYSDEC, 2014). Invasive plant species spread in several different ways. Dispersal methods include wind, water, wildlife, vegetative reproduction, and human activity. Invasive plant species typically establish most readily in places where the soil has been exposed, whether from anthropogenic disturbance (e.g., excavation) or natural processes (e.g., windthrow).

Construction of solar energy projects does not typically require significant soil disturbance; however, grading may be necessary in some areas. Although much of the site is relatively flat with gently rolling hills, limited grading is anticipated for installation of the PV arrays. It is anticipated that grading will also occur for proposed access roads, the collection substation, the point of interconnection (POI) switchyard, and for the energy storage building construction, if applicable. In those areas, construction of the Facility will result in the disturbance of soils and vegetation, and the spread of invasive plant species into disturbed areas is a risk. The purpose of this Invasive Species Prevention and Management Plan (ISPMP) is to facilitate the identification, control, and monitoring of invasive plant species within all areas that will be disturbed during construction of the Facility. The goal of the ISPMP is to prevent both the introduction of new invasive plant species and the expansion of targeted invasive plant populations. This Plan will be considered successful if the construction of the Facility results in no significant net increase in the coverage of invasive species when compared to the existing coverage of invasive species, to be documented in a Baseline Pre-Construction Survey that will be conducted during the growing season prior to the commencement of construction activities. For the purposes of this ISPMP, the management area shall consist of those areas where soil will be disturbed during Facility construction.

1.2. Laws and Regulations

There are many federal laws that contain invasive species provisions (e.g., the Endangered Species Act, the Federal Plant Pest Act, and the Federal Noxious Weed Act). However, the Federal law anticipated to be most applicable to the management of invasive species for this Facility is Section 404 of the Clean Water Act. The Environmental Conservation Law and the Agriculture and Markets Law authorize the NYSDEC and the New York State Department of Agriculture and Markets (NYSDAM) to regulate invasive species.[1] However, the State law anticipated to be most applicable to the management of invasive species for this Facility is Article 10 of the Public Service Law, to which both the NYSDEC and NYSDAM are Parties.

The official State listing of *Prohibited and Regulated Invasive Species* was last updated on September 10, 2014 (Appendix A). Title 6 NYCRR Part 575 includes: 1) a list of prohibited species which are unlawful to knowingly possess with the intent to sell, import, purchase, transport, or introduce; 2) a list of regulated species which are legal to possess, sell, purchase, propagate, and transport but may not be knowingly introduced into a free-living state; and 3) requirements for a permit for research, education, and other approved activities involving prohibited species and release of regulated species into a free-living state. These regulations are intended to help control invasive species by preventing the introduction of new invasive species and the spread of existing populations.

2. INVASIVE SPECIES MONITORING

Invasive species monitoring will have four phases, as described below:

2.1. Baseline Pre-Construction Survey

During a preliminary invasive species survey conducted in the fall of 2019 (Appendix B), 15 prohibited or regulated plant species were identified within the Survey Area. These species are listed below, with common names and botanical nomenclature following the New York Flora Atlas (Weldy et al., 2020):

- garlic mustard (*Alliaria petiolata*)
- mugwort (*Artemisia vulgaris*)
- Japanese barberry (*Berberis thunbergii*)

[1] Under the Environmental Conservation Law, the NYSDEC has regulatory authority regarding lands and forests (Article 9) and fish and wildlife (Article 11). Under the Agriculture and Markets Law, NYSDAM has the regulatory authority over the inspection and sale of seeds (Article 9); integrated pest management (Article 11); and the prevention and control of disease in trees and plants (Article 14).

- oriental bittersweet (*Celastrus orbiculatus*)
- creeping thistle (*Cirsium arvense*)
- autumn olive (*Elaeagnus umbellata*)
- border privet (*Ligustrum obtusifolium*)
- Amur honeysuckle (*Lonicera maackii*)
- Morrow's honeysuckle (*Lonicera morrowii*)
- purple loosestrife (*Lythrum salicaria*)
- common reed grass (*Phragmites australis*)
- Japanese knotweed (*Reynoutria japonica*)
- common buckthorn (*Rhamnus cathartica*)
- black locust (*Robinia pseudoacacia*)
- multiflora rose (*Rosa multiflora*)

A more detailed baseline pre-construction invasive species survey will be conducted during the growing season before the initiation of Facility construction (typically within six months). Data collected during this survey will be used to update and provide additional detail to this ISPMP. It will also serve as a baseline against which post-construction conditions will be compared. This detailed pre-construction survey will be conducted in all areas likely to be disturbed by Facility construction (the "Invasive Species Survey Area" or "Management Area"). Upon completion of this survey, a separate report will be prepared to fully document baseline invasive species occurrence on the Facility Site.

Survey methods for the baseline pre-construction invasive species survey will include:

1. Visually estimating the extent of all invasive plant species within the Management Area.
2. Using a GPS-enabled device to record the boundaries of and percent cover of all invasive species populations.
3. Taking representative photographs of each invasive plant species present within the Management Area.

2.2. Pre-Construction Management

Using the results of the pre-construction baseline survey, the Applicant will update this plan and implement pre-construction management of invasive species, where warranted, to help prevent the spread of existing invasive species within and beyond the Facility Site. The pre-construction control measures will be directed by the Applicant, following approval by the NYSDPS and the NYSDEC, and implemented by properly trained site preparation crews using appropriate techniques, equipment, and disposal methods as described below. Implementation of pre-construction management measures will occur prior to commencing soil disturbing activities.

The Action Plan for pre-construction management of invasive species includes the following steps:

1. Review of Baseline Pre-Construction Survey Results: The Applicant will review the Baseline Pre-Construction Survey Report and mapping and determine thresholds for action to control specific invasive species on site, these locations will be referred to as "target/targeted areas". These thresholds will be determined based on the biology of the individual species, population densities (primarily focused on species known to create monocultures), location on site, and the type and extent of disturbance the affected populations are likely to receive. This information will be used to determine where, or if, pre-construction control measures should be indicated on the construction drawings and implemented during site preparation (e.g., identify areas where specific pre-construction control measures are required, location of sanitation stations, location of equipment exclusion zones, etc.). Any thresholds and pre-construction control measures will be approved by NYSDPS and NYSDEC as part of the final ISPMP.
2. Pre-construction Site Walkover/Flagging: Where the Baseline Pre-construction Survey Report indicates that invasive species presence exceeds the thresholds for action established in the final ISPMP, the Biologist or Environmental Monitor will use brightly-colored flagging, signage, or other highly visible means to demarcate the extent of the invasive species infestation in the field.
3. Field Training of Site Preparation Crews: The Applicant will meet on-site with the site preparation crews to review the appropriate control measures for each species, which could include mechanical removal, removal by hand, and/or application of chemical treatments (i.e., herbicides). The training will cover the locations where pre-construction management of invasive species is to occur, the type of flagging or field demarcation used, basic identification of the invasive species to be controlled, and the actual mechanisms for safe control, removal, and disposal.
4. Implementation of Control Measures: The selected control measures, as determined by the Applicant, and in accordance with all permit conditions and label restrictions, will be implemented by properly trained site preparation crews at the designated locations. Examples of species-specific control methods for common invasive plant species, as recommended by the NYSDEC, are included as Appendix C.

2.3. Construction Monitoring

During construction, workers will be educated on the Best Management Practices (BMPs) for controlling the spread of invasive species on the Facility Site, as outlined in Section 3.0 below. The on-site Environmental Monitor will document all invasive species control measures that are implemented during Facility construction.

2.4. Post-Construction Monitoring

Invasive species will be surveyed during the growing season in the first, third, and fifth years following the completion of initial restoration activities. Post-construction surveys will follow the same methods used in pre-construction surveys and will be carried out by experienced biologists. Changes in invasive species location, extent of coverage, and density will be determined by comparing post-construction survey data to the baseline pre-construction survey data.

At the end of each monitoring period, a report shall be prepared that assesses whether the goal of no significant net increase of invasive species is being achieved. Copies of this report will be submitted to the New York State Department of Public Service (DPS), NYSDEC, Town, and NYSDAM, and filed with the Secretary of the Siting Board. In the event that the post-construction monitoring reports conclude that this goal is not being met and there is an increase of invasive species on-site due to Facility construction, appropriate remedial actions will be recommended in a corrective action plan. The Certificate Holder, DPS, NYSDEC, and NYSDAM will consider why initial control measures were ineffective and determine if additional treatment/management measures should be implemented. Invasive species populations that repeatedly encroach from adjacent areas outside the Management Area may be determined to be outside of the Applicant's responsibility for management. Potential post-construction invasive species treatment and removal measures are anticipated to be the same as those implemented before or during construction (see Section 3 below).

3. CONTROL MEASURES

A central theme of this ISPMP will be educating Morris Ridge-affiliated construction workers about invasive species and how to prevent their spread. This education will be accomplished through various training sessions provided by the Applicant and the on-site Environmental Monitor.

During Facility construction[2], the following control measures are proposed: 1) construction materials inspection; 2) targeted species treatment and removal; 3) construction equipment sanitation; 4) site restoration; and 5) minimizing ground disturbance to the extent practicable. Construction drawings will show the locations of targeted invasive species and include notes that will refer the contractor to the relevant site-specific protection measures for controlling the spread and transport of such species. Each of these control measures is described in detail below:

[2] The same control measures described in this section will be applied throughout all phases of construction, including site preparation (discussed above in Section 2.2), as well as during implementation of the Facility's grading and erosion and sediment control plan and Stormwater Pollution Prevention Plan.

1. Construction Materials Inspection: All imported construction material, such as seed mixes, mulch, sand, gravel, and packing materials, will be inspected to assure that they are free of invasive plant materials before entering the Facility Site. In addition, soil and/or spoils excavated from areas free of invasive species will be stockpiled in designated staging areas that do not contain invasive species. Similarly, soils from areas with documented invasive species will not be relocated to areas that are free of such species. Proper methods for segregating stockpiled soil and spoil material will be implemented, and excavated soil will be reused on the site from which it was excavated to limit opportunities for proliferation of non-native flora and other invasive species. In addition, all temporarily disturbed or stockpiled soils should be spread, graded, and stabilized with a native seed mix and clean mulch (straw or cellulose fiber) as soon as possible to limit the opportunity for the spread of invasive plants. Excess excavated material that is not used on-site will be disposed of at a Regulated Waste Facility or treated by a process that destroys seeds or propagules to prevent the spread of invasive species.

2. Target Species Treatment and Removal: If areas of the Facility Site subject to disturbance during construction contain targeted invasive species in excess of the threshold for action, appropriate treatment and removal methods will be conducted, as described above in Section 2.2. Specific invasive species treatment and disposal methods will be determined on a site/species specific basis in consultation with the Environmental Monitor and Applicant, based on the density and quantity of the invasive species encountered and pre-construction guidance provided by the final ISPMP. Treatment methods may include mechanical removal, manual removal, and/or herbicide treatment. Disposal techniques include deep burial, placement in an interim designated secure container, transport off-site in a sealed container to a solid waste disposal facility or leaving invasive vegetative materials in an area that is already infested. Any herbicide treatments would be applied by a Certified Commercial Pesticide Applicator, Commercial Pesticide Technician, or a Private Pesticide Applicator (i.e., individuals that meet the requirements set forth in 6 NYCRR Part 325, Application of Pesticides).

   Appendix C contains species-specific control method recommendations from the NYSDEC for common invasive plant species. Per these recommendations, if any of the identified Japanese knotweed populations are subject to disturbance during construction, the entire root system of the plants should be excavated and placed directly into a container or truck bed. The excavated material should not be stockpiled on site, instead it should be disposed of at a regulated solid waste disposal facility or treated by a process that destroys all Japanese knotweed propagules (roots, rhizomes, etc.).

   To prevent the spread of the hemlock woolly adelgid (*Adelges tsugae*), an invasive insect that has been documented in Livingston County and in the Town of Mount Morris (NYSDEC, 2020), the general treatment and removal methods identified above should also be implemented in any areas where eastern hemlock (*Tsuga*

canadensis) tree clearing occurs. In addition, incidences of infected trees should be reported to the NYSDEC to aid in documenting the spread of this species in New York State.

The emerald ash borer (*Agrilus planipennis*) is an invasive insect that has caused widespread die-offs of ash (*Fraxinus* spp.) trees in Livingston County and much of New York State (NYSDEC, 2019a). In order to prevent further infestations, any ash trees (*Fraxinus* spp.) removed during Facility construction should be treated according to NYSDEC and NYSDAM regulations and guidelines. Title 6 NYCRR Part 192.5 prohibits the movement of firewood of any tree species more than 50 miles from its source or origin. For ash wood that is not firewood, the NYSDEC guidelines on moving ash wood responsibly should be followed. These guidelines establish best management practices that are adequate and reasonable precautions in order to comply with 6 NYCRR Part 575. It is recommended that all materials from ash trees be chipped to smaller than 1-inch by 2-inch dimensions (NYSDEC, 2019b).

3. Construction Equipment and Personnel Sanitation: All construction equipment and personnel must be clean (free of mud, debris, vegetation, roots, debris, etc.) upon arrival, and all equipment utilized in areas where invasive species are present will be cleaned prior to moving out of the targeted area. The intent is that equipment should arrive at the site clean and leave the site clean. Equipment/clothing cleaning stations will be established to ensure that invasive species seeds and other viable plant parts cannot spread through vehicular movements, construction worker activities, stormwater runoff, or other means. Where practicable, cleaning stations will be located only within areas currently infested with targeted invasive species. Power-washing with clean water (no soaps or chemicals) will be used, where feasible. If conditions do not allow the use of power washing, the equipment shall be cleaned of all visible signs of plant material with shovels, brooms, or other means prior to exiting targeted areas. Water used for cleaning equipment shall not come from surface waters that could contain invasive species. All personnel clothing, footwear, and gear should be cleaned of visible signs of plant material prior to exiting targeted areas. Any wash water (including spray) shall not be discharged within 100 feet of any stream, wetland, regulated adjacent area, or storm-water conveyance (ditch, catch basin, etc.). The Environmental Energy Alliance of New York's *Best Management Practices for Preventing the Transportation of Invasive Plant Species* is attached to this report, as an additional guidance document to minimize the spread of invasive species (Appendix D).

4. Restoration: Areas where soil is temporarily disturbed during construction will be graded, stabilized, and restored in a timely manner, in accordance with the requirements of the Stormwater Pollution Prevention Plan (SWPPP). Although not anticipated, if any soil or fill material is brought onto the Facility Site from external sources for restoration purposes, it must be free of non-native invasive plant species. To assure this, inspection of the source material of such soil would likely be required. To minimize the chance of invasive species spreading or increasing

in abundance on site, all disturbed soils on the Facility Site, especially those within and adjacent to areas with invasive species, should be stabilized with an appropriate seed mix[3] and weed-free mulch as soon as possible following initial disturbance.

[3] Seed mixes will vary throughout the Facility Site. In agricultural areas under PV arrays, seed mixes will be selected that contain relatively low-growing grasses and legumes, such as Ernst Hay Mix, Ernst Sheep Pasture Mix, or equivalent. Such mixes will be favored to reduce mowing frequency, thereby minimizing risk to ground-nesting birds, with legumes desirable for nitrogen fixation to enhance long-term soil health. Along the edges of the Facility Site, where shading of solar PV arrays is less of a concern, seed mixes will be selected that contain a mix of native grasses and forbs, such as Ernst Mesic to Dry Pollinator Mix, Southern Tier Northeast Upland Native/Naturalized Wildflower Mix, or equivalent. Selection criteria for areas not under PV arrays will favor native, pollinator-friendly species to enhance wildlife habitat.

4. REFERENCES

New York State Department of Environmental Conservation (NYSDEC). 2014. *6 NYCRR Part 575, Prohibited and Regulated Invasive Plants*. September 10, 2014. Available at: https://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf (Accessed January 2020).

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Weldy, T., D. Werier, and A. Nelson. 2020. *New York Flora Atlas*. [S. M. Landry and K. N. Campbell (original application development), USF Water Institute. University of South Florida]. New York Flora Association, Albany, New York. Available at: http://newyork.plantatlas.usf.edu/ (Updated April 24, 2020; Accessed April 2020).

Appendix A

NYSDEC Prohibited and Regulated Invasive Species

6 NYCRR Part 575
Prohibited and Regulated Invasive Species
September 10, 2014

ALGAE AND CYANOBACTERIA

Prohibited:
Caulerpa taxifolia, Killer Green Algae
Didymosphenia geminata, Didymo
Prymnesium parvum, Golden Algae

Regulated:
Cylindrospermopsis raciborskii, Cylindro
Grateloupia turuturu, Red Algae

PLANTS

Prohibited:
Acer pseudoplatanus, Sycamore Maple
Achyranthes japonica, Japanese Chaff Flower
Alliaria petiolata, Garlic Mustard
Ampelopsis brevipedunculata, Porcelain Berry
Anthriscus sylvestris, Wild Chervil
Aralia elata, Japanese Angelica Tree
Artemisia vulgaris, Mugwort
Arthraxon hispidus, Small Carpet Grass
Berberis thunbergii, Japanese Barberry
Brachypodium sylvaticum, Slender False Brome
Cabomba caroliniana, Fanwort
Cardamine impatiens, Narrowleaf Bittercress
Celastrus orbiculatus, Oriental Bittersweet
Centaurea stoebe (C. biebersteinii, C. diffusa, C. maculosa misapplied, C. xpsammogena), Spotted Knapweed
Cirsium arvense (C. setosum, C. incanum, Serratula arvensis), Canada Thistle
Cynanchum louiseae (C. nigrum, Vincetoxicum nigrum), Black Swallow-wort
Cynanchum rossicum (C. medium, Vincetoxicum medium, V. rossicum), Pale Swallow-wort
Dioscorea polystachya (D. batatas), Chinese Yam
Dipsacus laciniatus, Cut-leaf Teasel
Egeria densa, Brazilian Waterweed
Elaeagnus umbellata, Autumn Olive
Euphorbia cyparissias, Cypress Spurge
Euphorbia esula, Leafy Spurge
Ficaria verna (Ranunculus ficaria), Lesser Celandine
Frangula alnus (Rhamnus frangula), Smooth Buckthorn
Glyceria maxima, Reed Manna Grass
Heracleum mantegazzianum, Giant Hogweed
Humulus japonicus, Japanese Hops
Hydrilla verticillata, Hydrilla/ Water Thyme
Hydrocharis morsus-ranae, European Frogbit
Imperata cylindrica (I. arundinacea, Lagurus cylindricus), Cogon Grass
Iris pseudacorus, Yellow Iris
Lepidium latifolium, Broad-leaved Pepper-grass
Lespedeza cuneata, Chinese Lespedeza
Ligustrum obtusifolium, Border Privet
Lonicera japonica, Japanese Honeysuckle
Lonicera maackii, Amur Honeysuckle
Lonicera morrowii, Morrow's Honeysuckle
Lonicera tatarica, Tartarian Honeysuckle
Lonicera x bella, Fly Honeysuckle
Ludwigia hexapetala (L. grandiflora), Uruguayan Primrose Willow
Ludwigia peploides, Floating Primrose Willow
Lysimachia vulgaris, Garden Loosestrife
Lythrum salicaria, Purple Loosestrife
Microstegium vimineum, Japanese Stilt Grass
Murdannia keisak, Marsh Dewflower
Myriophyllum aquaticum, Parrot-feather
Myriophyllum heterophyllum, Broadleaf Water-milfoil
Myriophyllum heterophyllum x M. laxum, Broadleaf Water-milfoil Hybrid
Myriophyllum spicatum, Eurasian Water-milfoil
Nymphoides peltata, Yellow Floating Heart
Oplismenus hirtellus, Wavyleaf Basketgrass
Persicaria perfoliata (Polygonum perfoliatum), Mile-a-minute Weed
Phellodendron amurense, Amur Cork Tree
Phragmites australis, Common Reed Grass
Phyllostachys aurea, Golden Bamboo
Phyllostachys aureosulcata, Yellow Groove Bamboo
Potamogeton crispus, Curly Pondweed
Pueraria montana, Kudzu
Reynoutria japonica (Fallopia japonica, Polygonum cuspidatum), Japanese Knotweed
Reynoutria sachalinensis (Fallopia sachalinensis, Polygonum sachalinensis), Giant Knotweed
Reynoutria x bohemica (Fallopia x bohemica, Polygonum x bohemica), Bohemian Knotweed
Rhamnus cathartica, Common Buckthorn
Rosa multiflora, Multiflora Rose
Rubus phoenicolasius, Wineberry
Salix atrocinerea, Gray Florist's Willow
Silphium perfoliatum, Cup-plant
Trapa natans, Water Chestnut
Vitex rotundifolia, Beach Vitex

Regulated:
Acer platanoides, Norway Maple
Clematis terniflora, Japanese Virgin's Bower
Euonymus alatus, Burning Bush
Euonymus fortunei, Winter Creeper
Miscanthus sinensis, Chinese Silver Grass
Robinia pseudoacacia, Black Locust

FISH

Prohibited:
Channa argus, Northern Snakehead

Channa marulius, Bullseye Snakehead
Channa micropeltes, Giant Snakehead
Clarias batrachus, Walking Catfish
Gambusia affinis, Western Mosquitofish
Gambusia holbrooki, Eastern Mosquitofish
Hypophthalmichthys harmandi, Largescale Silver Carp
Hypophthalmichthys molitrix, Silver Carp
Hypophthalmichthys nobilis, Bighead Carp
Misgurnus anguillicaudatus, Oriental Weatherfish
Mylopharyngodon piceus, Black Carp
Neogobius melanostomus, Round Goby
Petromyzon marinus, Sea Lamprey
Proterorhinus semilunaris (P. marmoratus), Tubenose Goby
Tinca tinca, Tench

Regulated:
Carassius auratus, Goldfish
Cyprinella lutrensis, Red Shiner
Cyprinus carpio, Common Carp/ Koi
Gymnocephalus cernuus, Ruffe
Monopterus albus, Asian Swamp Eel
Oreochromis aureus, Blue Tilapia
Oreochromis niloticus, Nile Tilapia
Pterois miles, Common Lionfish
Pterois volitans, Red Lionfish
Sander lucioperca (Stizostedion lucioperca), Zander
Scardinius erythrophthalmus, Rudd

AQUATIC INVERTEBRATES

Prohibited:
Bellamya chinensis (Cipangopaludina chinensis),Chinese Mystery Snail
Bellamya japonica, Japanese Mystery Snail
Bithynia tentaculata, Faucet Snail
Bythotrephese longimanus (B. cederstroemi), Spiny Water Flea
Cercopagis pengoi, Fishhook Water Flea
Corbicula fluminea, Asian Clam
Crassostrea ariakensis, Suminoe Oyster
Didemnum spp., Carpet Tunicate
Dreissena polymorpha, Zebra Mussel
Dreissena rostriformis bugensis, Quagga Mussel
Eriocheir sinensi, Chinese Mitten Crab
Hemigrapsus sanguineus, Asian Shore Crab
Hemimysis anomala, Bloody Red Shrimp
Orconectes rusticus, Rusty Crayfish
Potamopyrgus antipodarum, New Zealand Mud Snail
Rapana venosa, Veined Rapa Whelk
Styela plicata, Asian Sea Squirt

Regulated:
Carcinus maenas, European Green Crab
Daphnia lumholtzi, Water Flea
Hemigrapsus takanoi (H. penicillatus), Brush-clawed Shore Crab/ Grapsid Crab

TERRESTRIAL INVERTEBRATES

Prohibited:
Achatina achatina, Giant Ghana Snail
Achatina fulica (Lissachatina fulica), Giant African Land Snail
Adelges tsugae, Hemlock Woolly Adelgid
Agrilus planipennis, Emerald Ash Borer
Amynthas spp., Asian Earthworms
Anoplophora glabripennis, Asian Longhorn Beetle
Apis mellifera scutellata x A. mellifera ligustica/ A. mellifera iberiensis, Africanized Honey Bee
Archachatina marginata, Giant West African Snail
Cryptococcus fagisuga, Beech Scale
Lymantria dispar, Asian and European Gypsy Moth
Monochamus alternatus, Japanese Pine Sawyer
Pityophthorus juglandis, Walnut Twig Beetle
Sirex noctilio, Sirex Woodwasp

TERRESTRIAL AND AQUATIC VERTEBRATES

Prohibited:
Cygnus olor, Mute Swan
Lepus europaeus, European Hare
Myocastor coypus, Nutria
Nyctereutes procyonoides, Asian Raccoon Dog
Sus scrofa (excluding Sus scrofa domestica), Eurasian Boar

Regulated:
Alopochen aegyptiacus, Egyptian Goose
Cairina moschata, Muscovy Duck
Myiopsitta monachus, Monk Parakeet
Oryctolagus cuniculus, European Rabbit
Trachemys scripta elegans, Red-eared Slider
Xenopus laevis, African Clawed Frog

FUNGI

Prohibited:
Amylostereum areolatum, Sirex Wasp Fungus
Geomyces destructans, White-nose Syndrome
Geosmithia morbida, Thousand Canker Disease
Phytophthora ramorum, Sudden Oak Death

For the official regulations and species lists please see: http://www.dec.ny.gov/regulations/265.html.

New York State Department of Environmental Conservation
Part 575 Invasive Species Regulations
Questions and Answers

What are invasive species?
Invasive species means a species that is non-native to the ecosystem under consideration; and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Why are invasive species a problem?
Invasive species have a detrimental effect upon the State's natural communities and systems by out-competing native species, diminishing biological diversity, altering community structure and, in some cases, changing ecosystem processes. They can even harm human health.

How will these regulations help?
The regulations were developed by the Department of Environmental Conservation, in cooperation with the Department of Agriculture and Markets. These regulations, once implemented, are expected to help control invasive species by reducing the introduction and spread of invasive species populations by limiting commerce in such species, thereby having a positive impact on the environment.

How were the lists of species in the regulations developed?
The lists of prohibited and regulated species were developed using the standardized species assessment and listing process outlined in the 2010 report "A Regulatory System for Non-native Species". Lists of candidate non-native invasive species were compiled by reviewing other state regulations, reports, lists and consulting with agency experts. A rapid assessment was conducted to determine if the species warranted listing and was already federally regulated. Ecological invasiveness assessments were conducted on each potential invasive species followed by a socio-economic assessment for those ranking High or Very High. The assessment team then placed the species in the appropriate regulatory classification of Prohibited or Regulated. The initial recommendations were submitted to the Invasive Species Advisory Committee (25 Non-Government Organizations) and Council (9 State Agencies) for review and comment. The lists were then incorporated into the regulations.

Why isn't a particular species included on the prohibited or regulated lists?
Due to staffing limitations and time constraints, the initial list of prohibited and regulated species is not all-encompassing. We anticipate that the regulations will be updated on a regular basis. The regulations include language for petitioning for addition or removal of species from the prohibited and regulated lists. Some species were assessed, but do not meet the criteria for prohibition or regulation.

Aren't some of the species listed as either prohibited or regulated already established?
Yes, however, there are areas of the State in which they have not yet established populations and these regulations are intended to slow the spread by reducing the number of individuals of a species released into a region, to which they are not native, associated with the sale and introduction of such species.

When did the regulation become final?
The part 575 invasive species regulations were proposed, and a 60 day to public comment held between October and December 2013. During this time, four public hearings were scheduled across the State. All comments received were reviewed and a summary of public comments and agency responses was compiled. Required changes were made to the final regulations. A summary of the final regulations was published in the State Register September 10, 2014 and the full express terms were published on the Department's website.

Once finalized, when will the regulations become implemented?
A summary of the final regulations was published in the State Register September 10, 2014. The part 575 regulations take effect 6 months later (March 10, 2015).

What is the difference between prohibited and regulated invasive species?
Prohibited invasive species cannot be knowingly possessed with the intent to sell, import, purchase, transport or introduce. In addition, no person shall sell, import, purchase, transport, introduce or propagate prohibited invasive species. Regulated invasive species, on the other hand, are species which cannot be knowingly introduced into a free-living state, or introduced by a means that one should have known would lead to such an introduction, although such species shall be legal to possess, sell, buy, propagate and transport.

What is considered a free-living state?
A species is considered in a free-living state if it is introduced to public lands or lands connected to public lands, natural areas, and public waters or waters connected to public waters.

Are there any exceptions to the definition of a free-living state?
Yes, such exceptions include artificial ponds and water gardens with no outlet to public waters, waters entirely within private land not connected to public waters, and water-use facilities with outflows not providing access to public waters.

Do the regulations require existing populations of species on the prohibited and regulated lists be managed or destroyed by the land-owner?
No, existing populations of non-native invasive species listed as prohibited or regulated and established prior to the implementation of the final part 575 regulations do not require management by the owner. However, once implemented, the final regulations do prohibit commerce involving those species listed as prohibited species and the release of regulated species into a free-living state.

What species have grace periods established in the regulations?
A one year grace period is included in the regulations for Japanese Barberry (*Berberis thunbergii*), during which existing stock of this species may be sold. In addition, a person may possess, sell, offer for sale, distribute, transport, or otherwise market or trade live Eurasian boars (*Sus scrofa*) until September 1, 2015. No person shall knowingly import, propagate or introduce Eurasian boars into a free-living state.

Will there be a fee for permits? No fee is anticipated for permits issued for research, education or other approved activity.

Who will enforce the final regulations?
The regulations will be enforced by the Department of Environmental Conservation, with assistance from the Department of Agriculture and Markets.

Appendix B

Preliminary Invasive Species Report

PRELIMINARY INVASIVE SPECIES SURVEY

MORRIS RIDGE SOLAR ENERGY CENTER

Case No. 18-F-0440
Town of Mount Morris
Livingston County, New York

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May 2020

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1.0 INTRODUCTION

In accordance with the Invasive Species Prevention and Management Plan (ISPMP) for the Morris Ridge Solar Energy Center (the Facility), Morris Ridge Solar Energy Center, LLC (the Applicant) retained Environmental Design and Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) to conduct a preliminary invasive plant species survey at the Facility site in the Town of Mount Morris, Livingston County, New York (Figure 1).

The purpose of this survey is to document, prior to Facility construction, the occurrence and extent of non-native invasive plant species, as defined by the New York State Department of Environmental Conservation (NYSDEC). The target area for the survey (the "Survey Area") is the buildable area, as provided to EDR in shapefile format by the Applicant in 2019 (Figure 2). The Survey Area and methodology used in this preliminary survey are intended to inform the ISPMP and subsequent, more comprehensive, baseline pre-construction surveys.

2.0 METHODS

The preliminary invasive plant survey was conducted by qualified biologists between October 29 and November 21, 2019 under the direction and guidance of EDR Botanist Sara Stebbins. Survey methodology consisted of walking the Survey Area and identifying prohibited and regulated invasive plant species as listed under 6 NYCRR Part 575 (NYSDEC, 2014; attached to the ISPMP as Appendix A). The initial encounter of any prohibited or regulated invasive plant species was recorded and mapped. For subsequent encounters of the same species, percent cover was evaluated within strata-based plots (defined below in Table 1).

Table 1. Strata Based Plot Sizes

Strata	Description	Plot Size
Tree	woody plants 3 inches or more in diameter at breast height (DBH) regardless of height	30-foot radius
Vine	woody vines greater than 1 meter (3.28 feet) tall	30-foot radius
Shrub/Sapling	woody plants less than 3 inches DBH and greater than or equal to 1 meter (3.28 feet) tall	15-foot radius
Herb	all herbaceous plants, including herbaceous vines, and woody plants less than 1 meter (3.28 feet) tall	5-foot radius

Invasive plant occurrences with an absolute cover value greater than 25% were documented with field notes and mapped using a global positioning system (GPS) device. Data were recorded using a four letter code corresponding to the first two letters of the scientific name of the genus and the first two letters of the scientific name of the species (e.g., since the scientific name of multiflora rose is *Rosa multiflora*, multiflora rose populations were mapped as labeled ROMU).

Field notes and GPS data were then digitized in ArcGIS® to produce a map of the extent of invasive plants throughout the Survey Area (Figure 3). Photos were taken to document current existing conditions throughout the Survey Area, and representative photos were taken of each species detected (Appendix A). For Japanese knotweed and common reed, population boundaries were mapped for each occurrence, regardless of extent or percent cover. This is because

these species tend to occur in discrete, well-defined patches rather than spread across the landscape, and the occurrence and spread of these species are of particular concern to the State.

3.0 RESULTS

The Survey Area is largely characterized by active agricultural lands, wooded areas, and rural residences. Much of the Survey Area has a long history of disturbance attributed to agriculture and logging, creating ideal conditions for the establishment and spread of invasive plant species. As summarized in Table 1, a total of 15 different invasive plant species were observed within the Survey Area.

Table 2. Invasive Species Within Survey Area and Codes

Common Name	Scientific Name	Mapping Code
garlic mustard	*Alliaria petiolata*	ALPE
mugwort	*Artemisia vulgaris*	ARVU
Japanese barberry	*Berberis thunbergii*	BETH
oriental bittersweet	*Celastrus orbiculatus*	CEOR
creeping thistle	*Cirsium arvense*	CIAR
autumn olive	*Elaeagnus umbellata*	ELUM
border privet	*Ligustrum obtusifolium*	LIOB
Amur honeysuckle	*Lonicera maackii*	LOMA
Morrow's honeysuckle	*Lonicera morrowii*	LOMO
purple loosestrife	*Lythrum salicaria*	LYSA
common reed	*Phragmites australis*	PHAU
Japanese knotweed	*Reynoutria japonica* var. *japonica*	REJA
common buckthorn	*Rhamnus cathartica*	RHCA
black locust	*Robinia pseudoacacia*	ROPS
multiflora rose	*Rosa multiflora*	ROMU

Some large, undisturbed, wooded areas and agricultural fields did not have significant occurrences of invasive species; however, a variety of prohibited and regulated species were observed throughout the Survey Area at varying densities. Invasive species were especially prevalent along hedgerows and public road corridors.

The most common invasive species observed included common buckthorn, Morrow's honeysuckle, and garlic mustard. Common buckthorn was ubiquitous in hedgerows and forest interiors. Other commonly observed species included multiflora rose, autumn olive, and common reed. Common reed was found most often in wetland pockets within agricultural fields and in wet hedgerows.

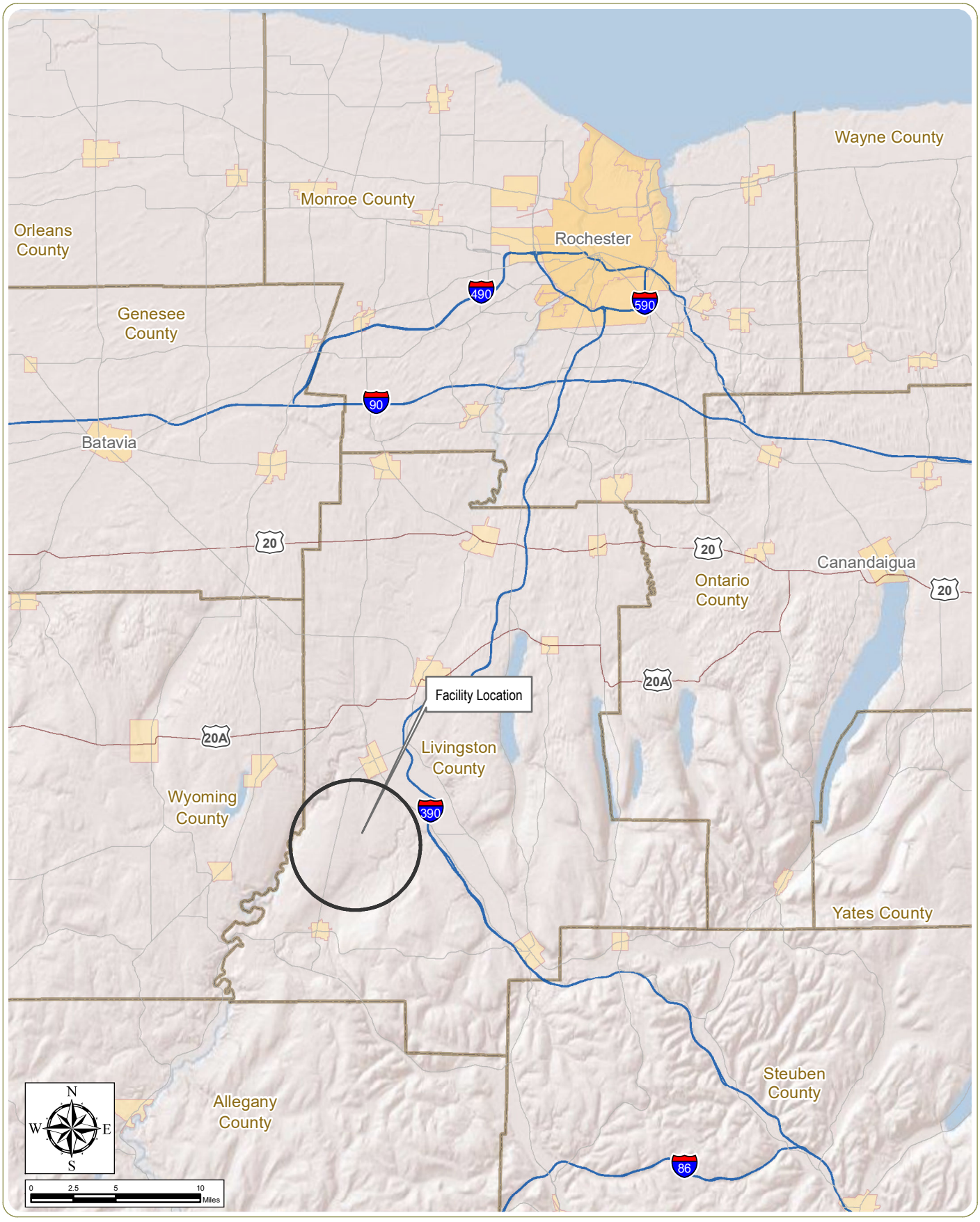
4.0 CONCLUSION AND RECOMMENDATIONS

Fifteen invasive plant species listed as prohibited or regulated by the NYSDEC were found at variable densities across the Survey Area, primarily within hedgerows along field margins and forest boundaries, and along public road corridors. During the full pre-construction survey, which will be conducted during the growing season prior to the commencement of construction-related earthmoving activities, qualified biologists will survey the limits of disturbance to more thoroughly document the area and percent cover of invasive species. The pre-construction survey will map all occurrences of invasive plant species, regardless of areal extent or percent cover, and will serve as the baseline against which future post-construction surveys will be compared.

5.0 LITERATURE CITED

New York State Department of Environmental Conservation (NYSDEC). 2014. *6 NYCRR Part 575, Prohibited and Regulated Invasive Plants*. September 10, 2014. Available at: https://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf (Accessed October 2019).

Figures

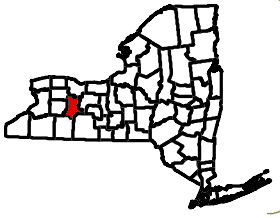


Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 1: Regional Facility Location

Notes: 1. Basemap: ESRI ArcGIS Online "World Shaded Relief" map service. **2.** This map was generated in ArcMap on May 15, 2020. **3.** This is a color graphic. Reproduction in grayscale may misrepresent the data.



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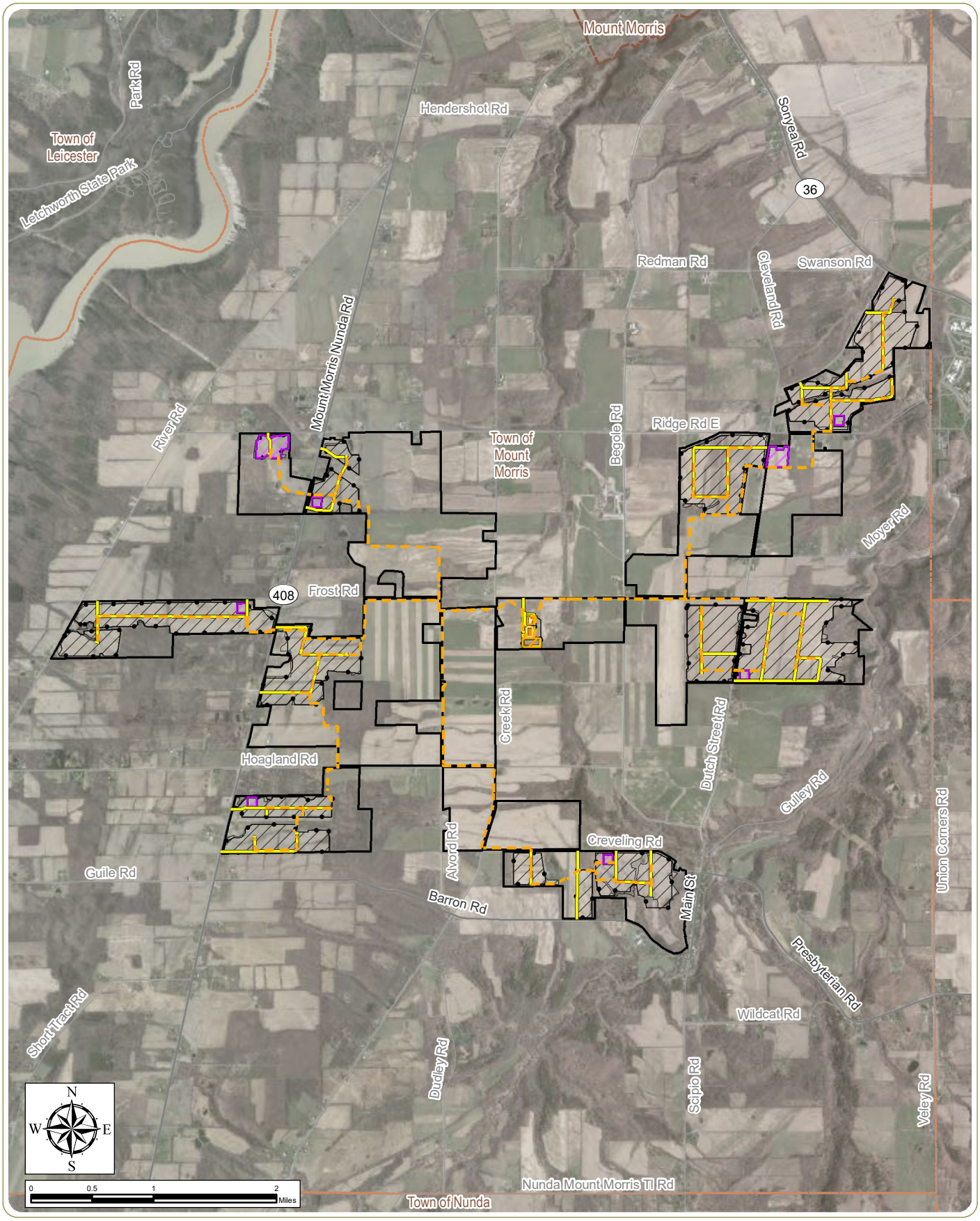

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 2: Facility Area

Notes: 1. Basemap: NYSDOP "2015" orthoimagery map service. **2.** This map was generated in ArcMap on May 15, 2020. **3.** This is a color graphic. Reproduction in grayscale may misrepresent the data.

- Access Road
- Collection Line
- POI Switchyard
- Collection Substation
- Energy Storage Facility
- Laydown Area
- Buildable Area
- Fenceline
- Facility Site
- City/Village Boundary
- Town Boundary

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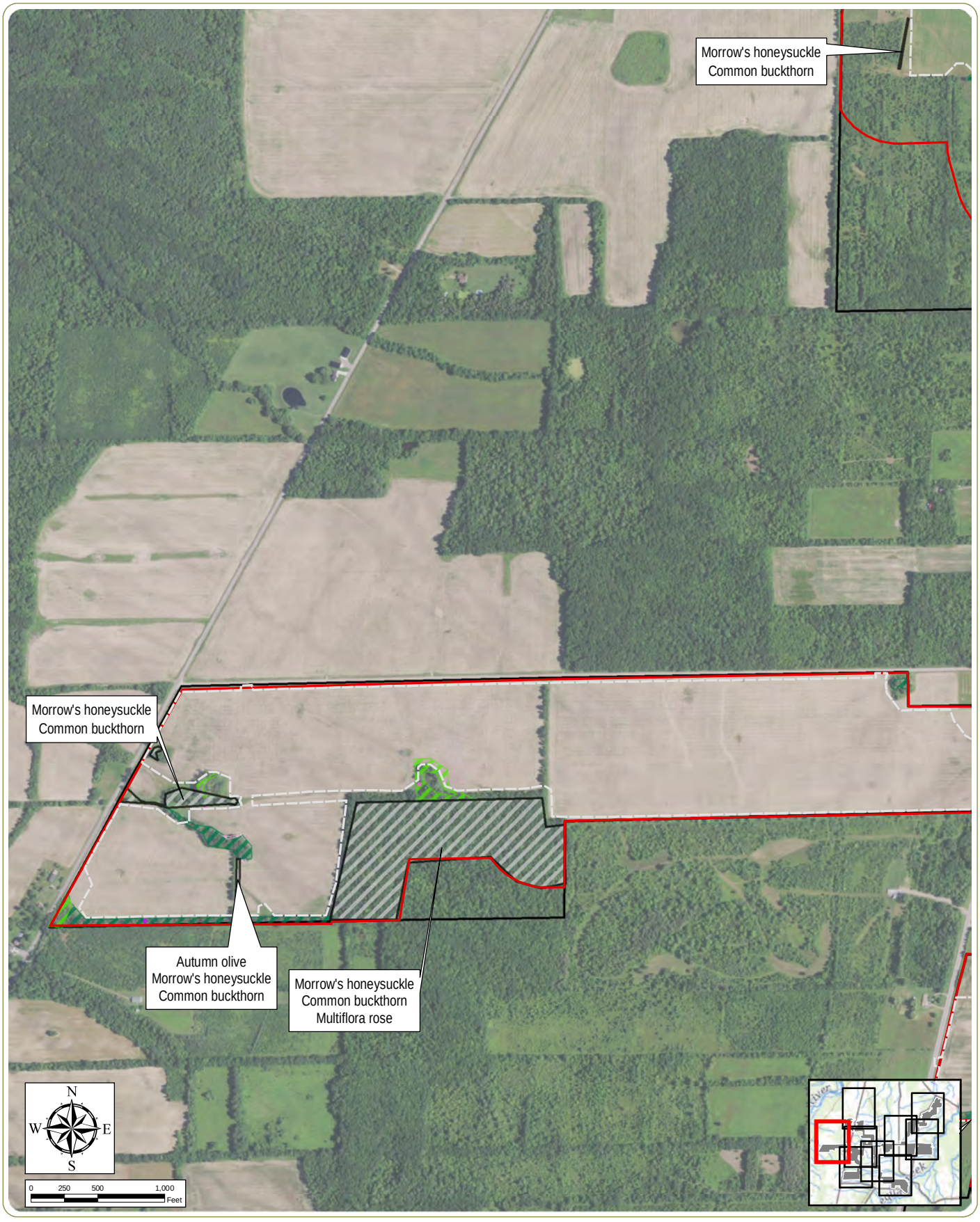

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 1 of 9

Invasive Species
- Oriental bittersweet
- Creeping thistle
- Morrow's honeysuckle
- Multi-Species
- Common buckthorn
- Multiflora rose
- Black locust

- Facility Site
- Survey Area
- Limit of Construction Activity

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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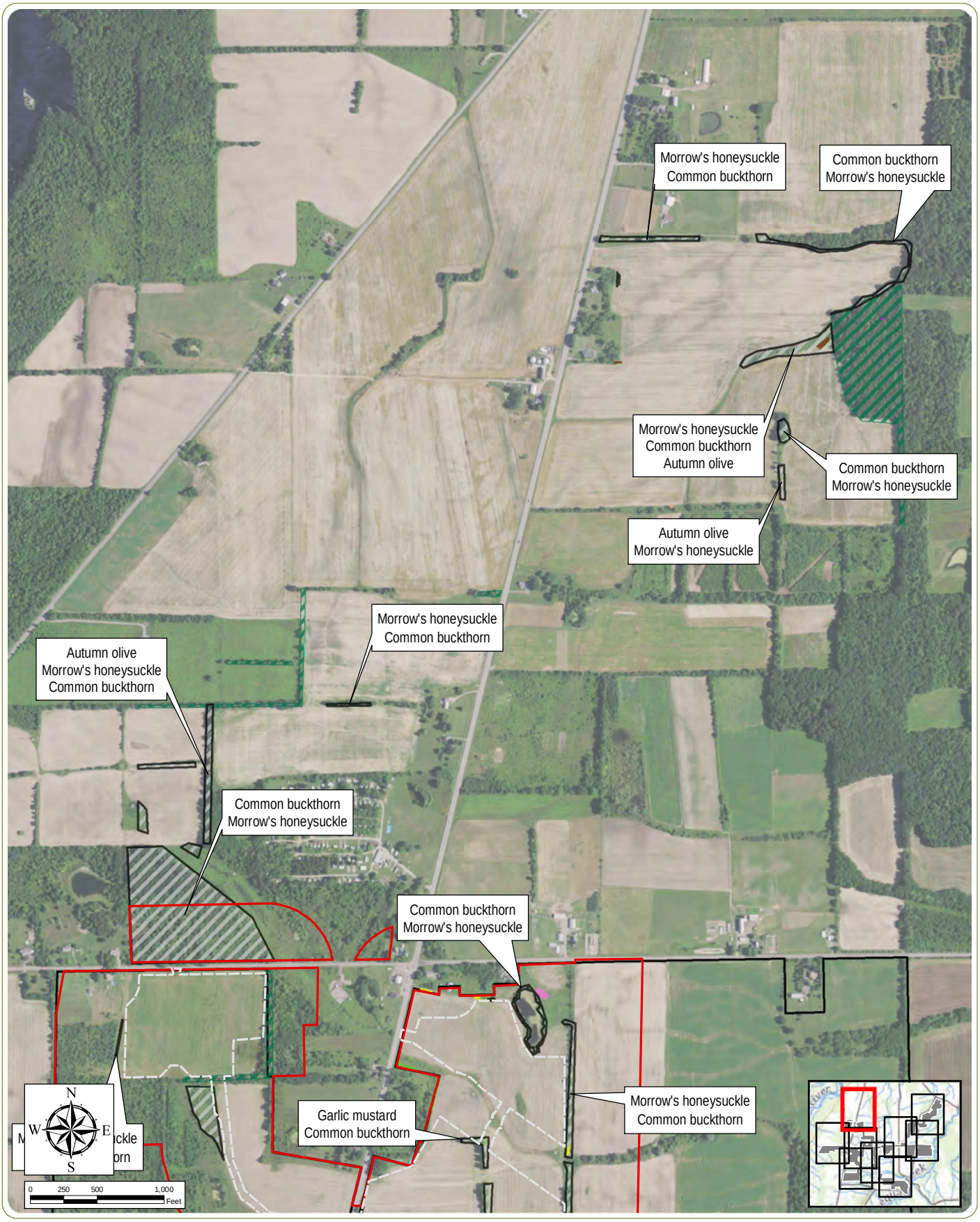

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 2 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Oriental bittersweet
- Creeping thistle
- Autumn olive
- Morrow's honeysuckle
- Multi-Species
- Purple loosestrife
- Common reed
- Common buckthorn
- Multiflora rose
- Black locust

- Facility Site
- Survey Area
- Limit of Construction Activity

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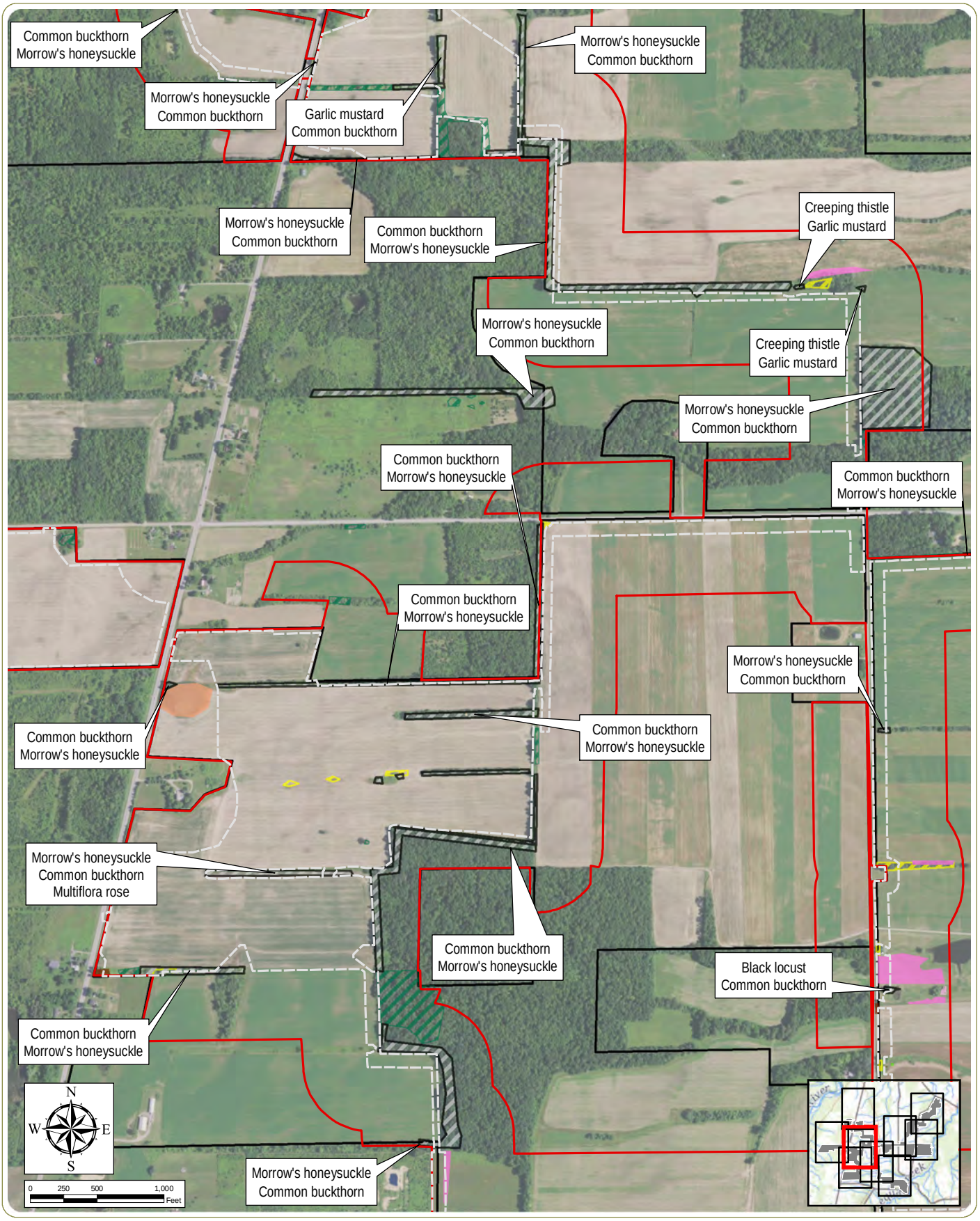

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 3 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Creeping thistle
- Autumn olive
- Amur honeysuckle
- Morrow's honeysuckle
- Multi-Species
- Common reed
- Common buckthorn
- Multiflora rose
- Black locust
- Facility Site
- Survey Area
- Limit of Construction Activity

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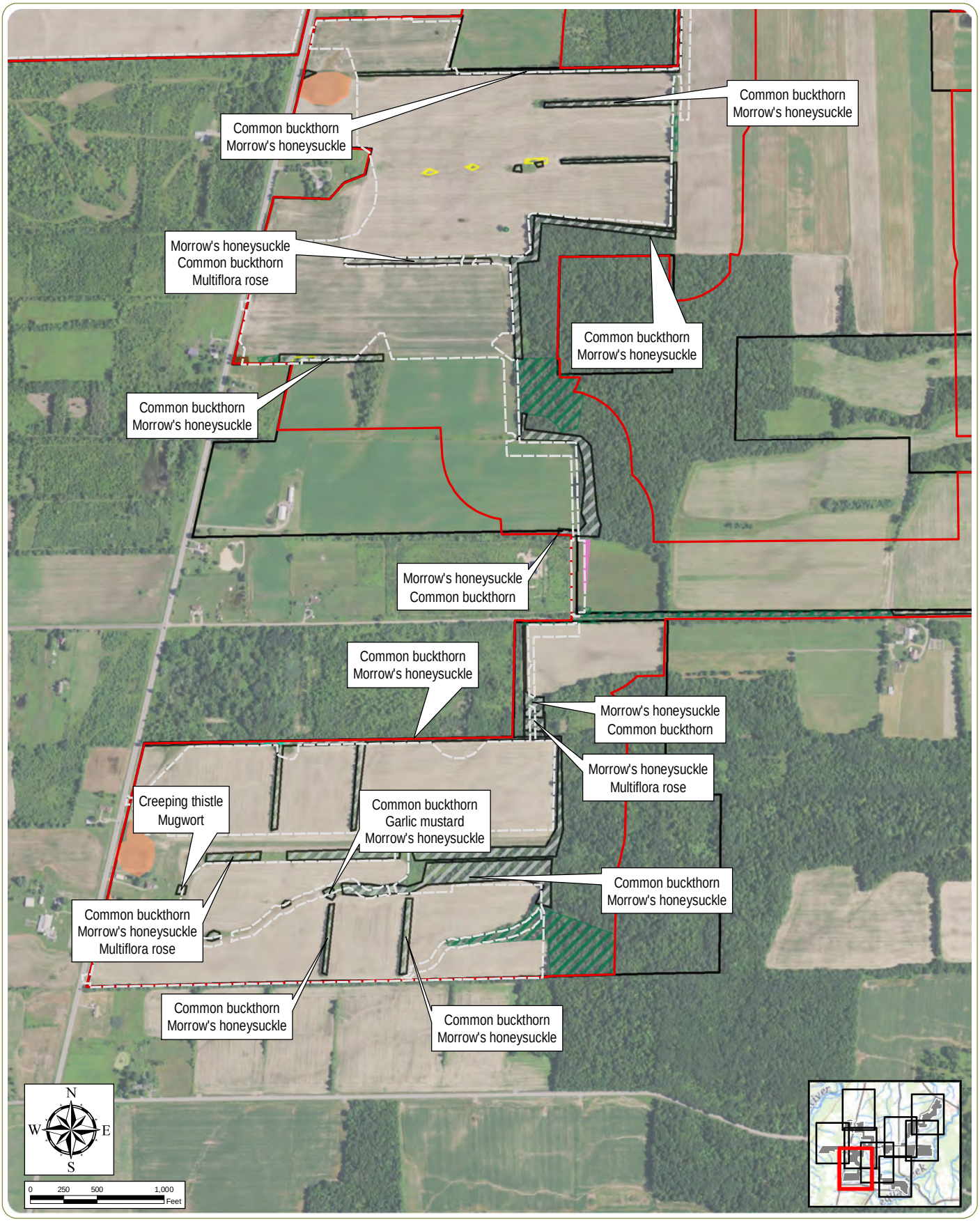

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 4 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Creeping thistle
- Autumn olive
- Amur honeysuckle
- Multi-Species
- Common reed
- Japanese knotweed
- Common buckthorn
- Multiflora rose
- Black locust

- Facility Site
- Survey Area
- Limit of Construction Activity

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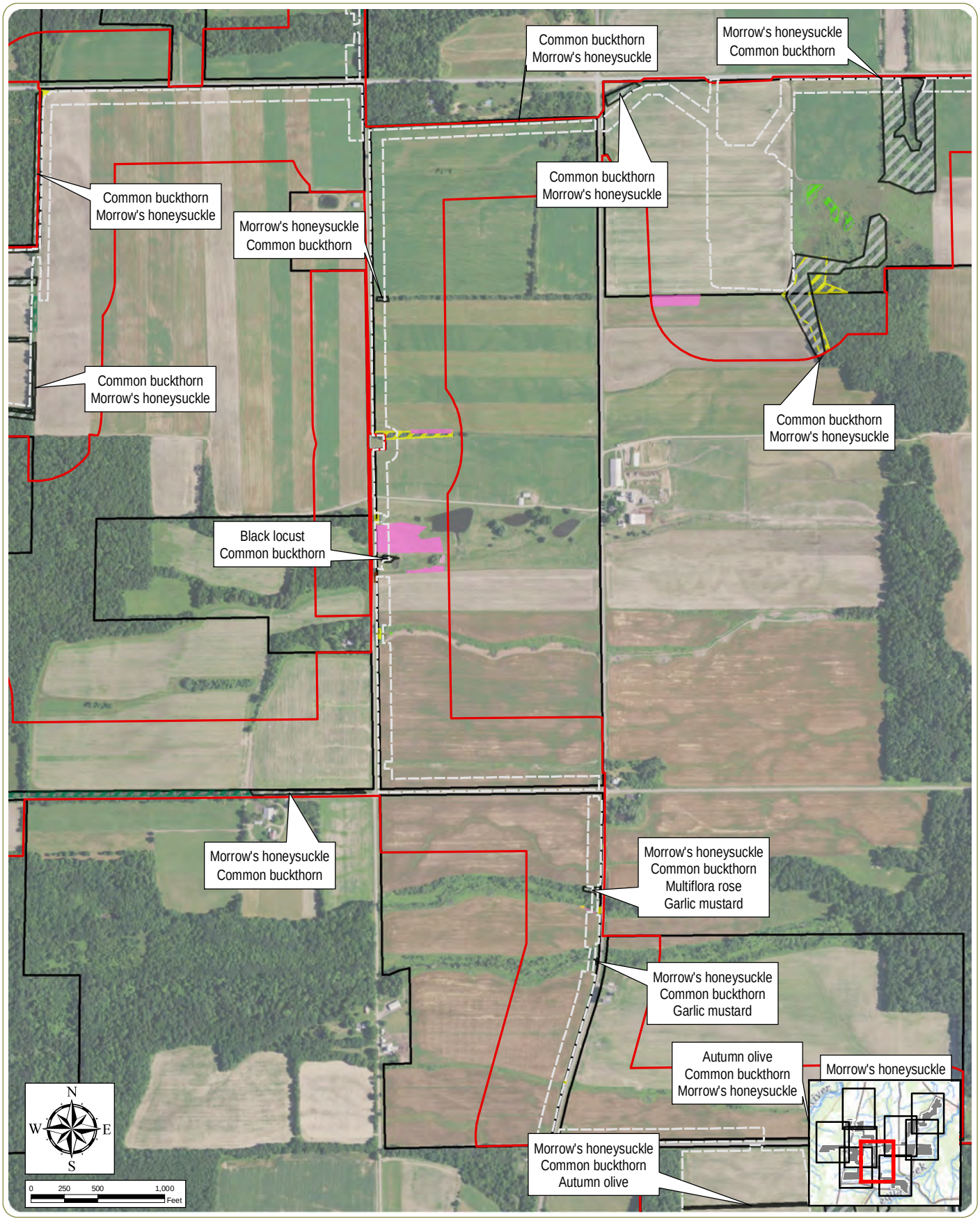

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 5 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Mugwort
- Creeping thistle
- Autumn olive
- Morrow's honeysuckle
- Multi-Species
- Common buckthorn
- Multiflora rose
- Black locust

- Facility Site
- Survey Area
- Limit of Construction Activity

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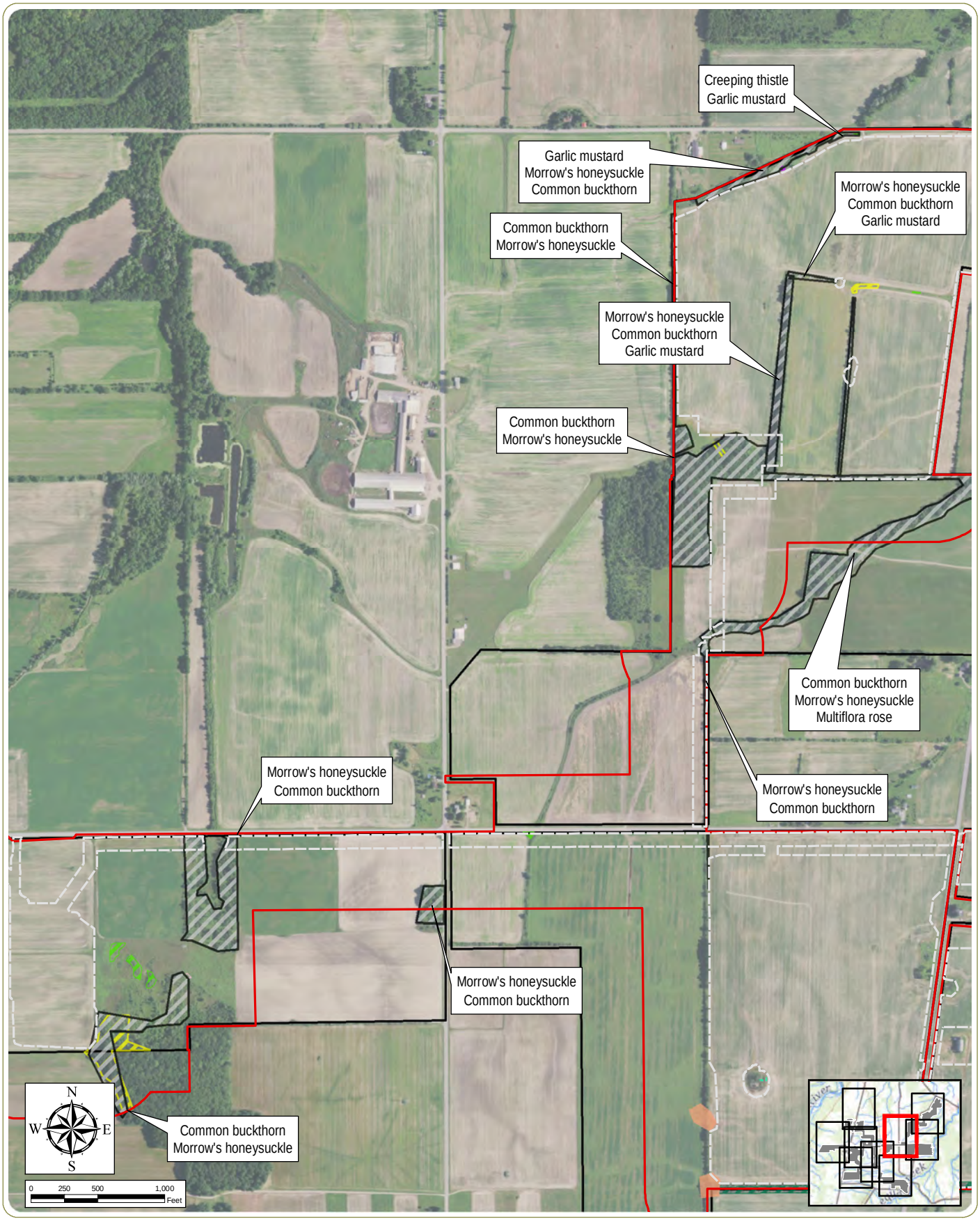

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Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 6 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Oriental bittersweet
- Autumn olive
- Morrow's honeysuckle

- Multi-Species
- Common reed
- Common buckthorn
- Multiflora rose

- Facility Site
- Survey Area
- Limit of Construction Activity

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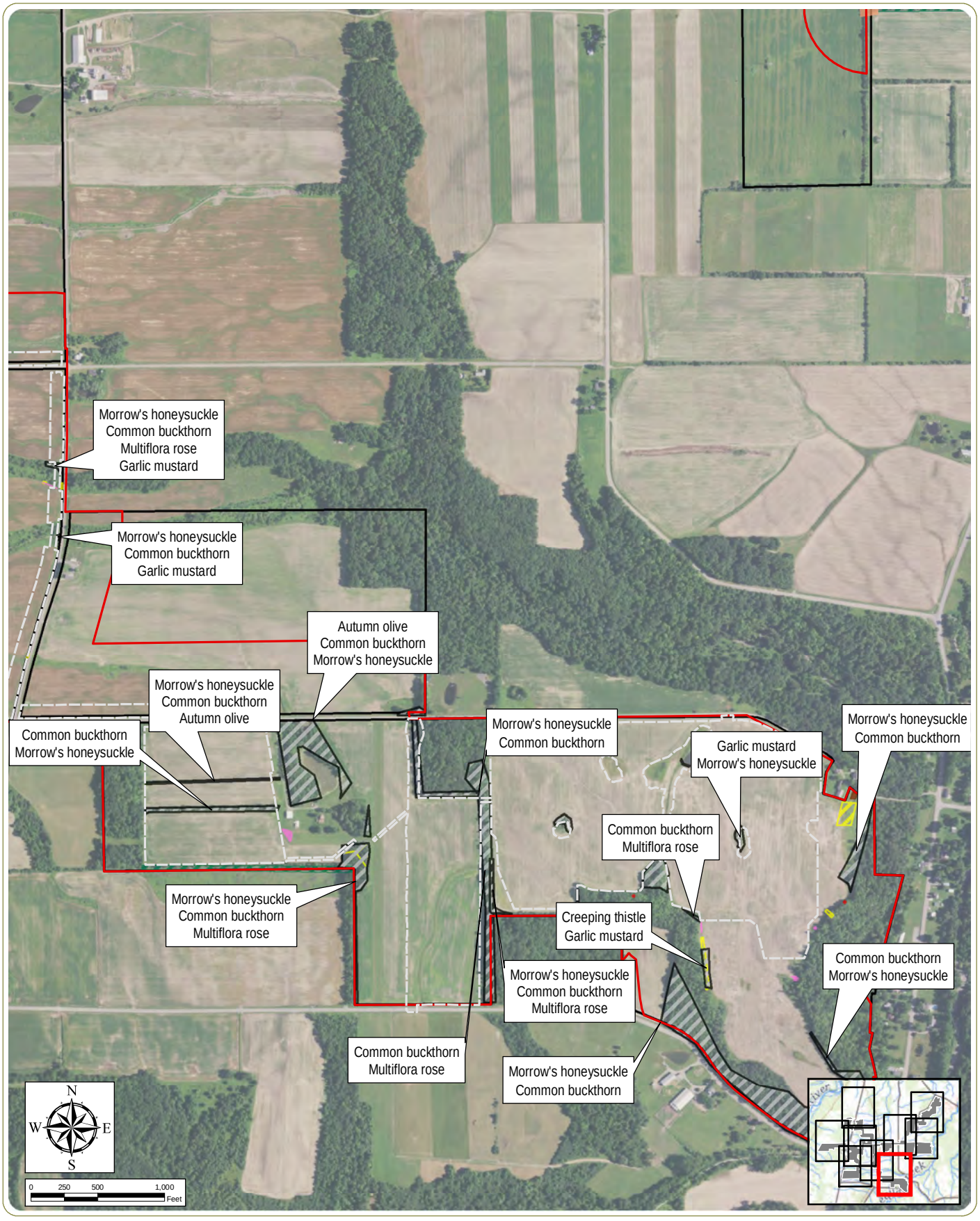

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 7 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Mugwort
- Japanese barberry
- Creeping thistle
- Morrow's honeysuckle
- Multi-Species
- Common reed
- Common buckthorn
- Black locust

- Facility Site
- Survey Area
- Limit of Construction Activity

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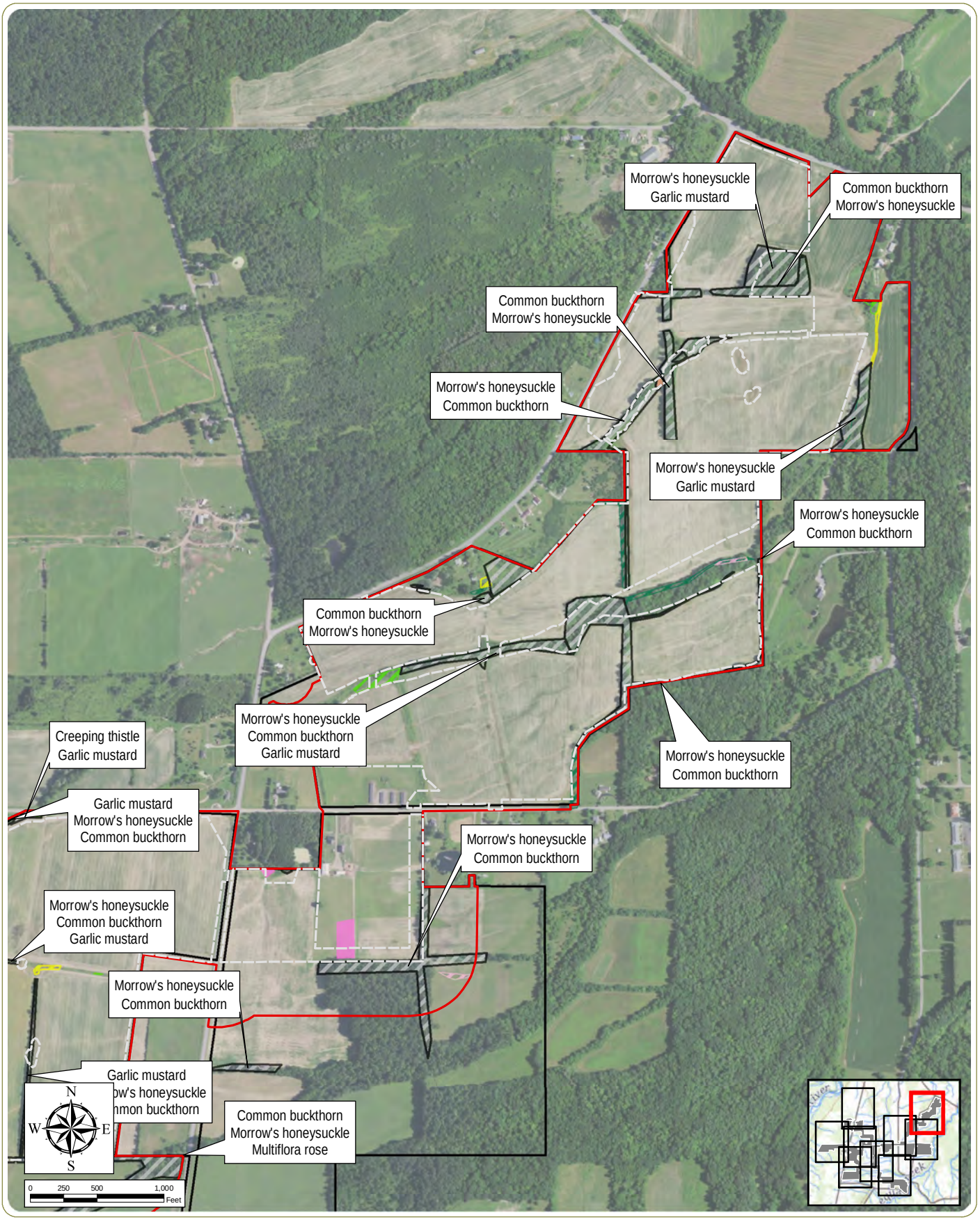

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 8 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Creeping thistle
- Amur honeysuckle
- Morrow's honeysuckle
- Multi-Species
- Common reed
- Common buckthorn
- Multiflora rose

- Facility Site
- Survey Area
- Limit of Construction Activity

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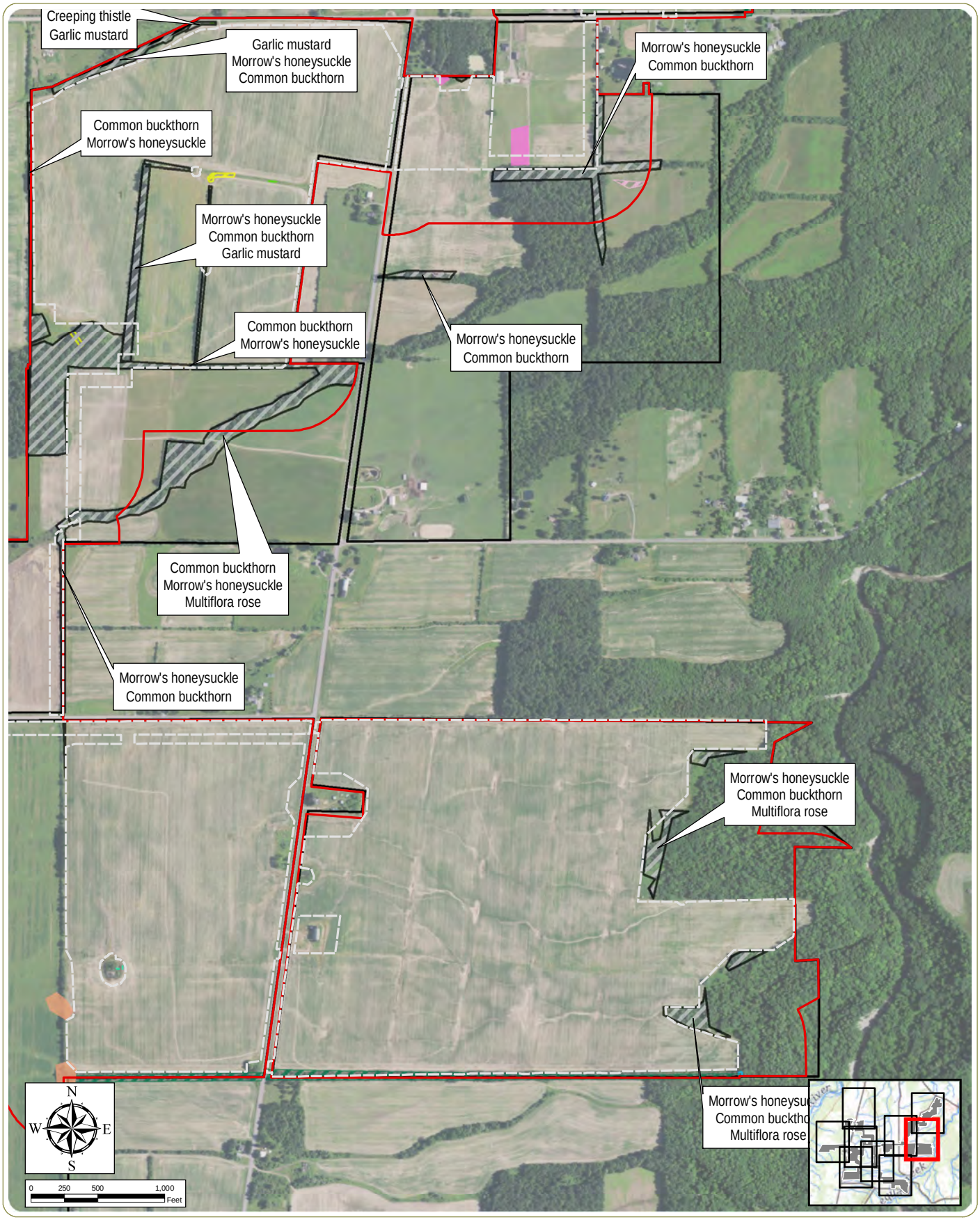

Morris Ridge Solar Energy Center

Town of Mount Morris, Livingston County, New York

Figure 3: Invasive Species Cover - Sheet 9 of 9

Notes: 1. Basemap: USDA NAIP "2019, New York 60 cm" orthoimagery map service, 2. This map was generated in ArcMap on May 26, 2020. 3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Invasive Species
- Garlic mustard
- Oriental bittersweet
- Creeping thistle
- Autumn olive
- Border privet
- Morrow's honeysuckle
- Multi-Species
- Common reed
- Common buckthorn
- Multiflora rose

- Facility Site
- Survey Area
- Limit of Construction Activity

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Appendix A

Photo Documentation

Photo 1

Garlic Mustard (*Alliaria petiolata*) basal leaves in a forest setting

Photo 2

Garlic Mustard (*Alliaria petiolata*) seed heads in fall condition

Photo 3

Representative Photo:
Mugwort (*Artemisia vulgaris*)
silver underside of leaf

Photo 4

Representative Photo:
Mugwort (*Artemisia vulgaris*)
in field setting

Photo 5

Japanese barberry (*Berberis thunbergii*) seedling in forest setting

Photo 6

Representative Photo: Japanese barberry (*Berberis thunbergii*) growth pattern

Photo 7

Representative Photo: Oriental bittersweet (*Celastrus orbiculatus*) winter fruit display

Photo 8

Oriental bittersweet (*Celastrus orbiculatus*) in a hedgerow along an agricultural field

Photo 9

Creeping Thistle (*Cirsium arvense*) fall condition in field setting

Photo 10

Representative Photo: Creeping Thistle (*Cirsium arvense*) flower transition to seed head

Photo 11

Representative Photo: Autumn Olive (*Elaeagnus umbellata*) twig with ripe fruit

Photo 12

Representative Photo: Autumn Olive (*Elaeagnus umbellata*) leaves and twig with developing fruit

Photo 13

Border privet (*Ligustrum obtusifolium*) spring growth pattern

Photo 14

Representative Photo: Border privet (*Ligustrum obtusifolium*) beginning of fall color change and fruit development

Photo 15

Representative Photo: Amur honeysuckle (*Lonicera maackii*) leaves

Photo 16

Amur honeysuckle (*Lonicera maackii*) flower identification in a wooded setting

Photo 17

Morrow's honeysuckle (*Lonicera morrowii*) fall condition in a wooded setting

Photo 18

Representative Photo: Morrow's honeysuckle (*Lonicera morrowii*) flowers and leaves

Photo 19

Purple loosestrife (*Lythrum salicaria*) new growth in a PEM setting

Photo 20

Representative Photo: Purple loosestrife (*Lythrum salicaria*) flowers

Photo 21

Common reed (*Phragmites australis*) in an agricultural field setting

Photo 22

Common reed (*Phragmites australis*) in an agricultural field setting

Photo 23

Japanese knotweed (*Reynoutria japonica var. japonica*) in an agricultural setting

Photo 24

Representative Photo: Japanese knotweed (*Reynoutria japonica var. japonica*) in bloom

Photo 25

Common buckthorn (*Rhamnus cathartica*) in a hedgerow along an agricultural field

Photo 26

Representative Photo: Common buckthorn (*Rhamnus cathartica*) leaves and fruit

Photo 27

Representative Photo: Black locust (*Robinia pseudoacacia*) leaves

Photo 28

Representative Photo: Black locust (*Robinia pseudoacacia*) bark and armoring

Photo 29

Multiflora rose (*Rosa multiflora*) in full bloom along a hedgerow

Photo 30

Representative Photo: Multiflora rose (*Rosa multiflora*) growth pattern

Appendix C

Control Methods for Select Invasive Plant Species

CONTROL METHODS FOR PURPLE LOOSESTRIFE
(*Lythrum salicaria*)

PLANT DESCRIPTION

Purple loosestrife is a wetland perennial native to Eurasia that forms large, monotypic stands throughout the temperate regions of the U.S. and Canada. It has a vigorous rootstock that serves as a storage organ, providing resources for growth in spring and regrowth if the plant has been damaged from cuttings. New stems emerge from the perennial roots enabling the plant to establish dense stands within a few years. Seedling densities can approach 10,000-20,000 plants/m^2 with growth rates exceeding 1 cm/day. A single, mature plant can produce more than 2.5 million seeds annually which can remain viable after 20 months of submergence in water. In addition, plant fragments produced by animals and mechanical clipping can contribute to the spread of purple loosestrife through rivers and lakes.

MANAGEMENT OPTIONS

1. Digging/pulling

Effectiveness: Can be effective in small stands i.e., <100 plants, low-med density (1-75% area), and <3 acres, especially on younger plants in unconsolidated soils.

Methods: Hand-pull plants <2 years old. Use mini-tiller for plants >2 years - gets most of roots w/minimum soil disturbance, has 3 heavy duty prongs on 1 side that are pushed under base of plant, then pry back on handle to leverage plant out of ground. Use weed wrench for plants >2 years old - good w/minimal soil disturbance. In mucky conditions, put base of wrench on small piece of wood (e.g., piece of 2x4) to keep wrench from sinking into mud. Use shovel for plants >2 years old - dig up plant, tamp down disturbed area and/or then replace soil and any existing cover.

Cautions: May increase habitat disturbance and increase spread of loosestrife. This method requires follow-up treatments of sites for 3 years to eliminate re-sprouting from fragments left behind. Must pull/dig ENTIRE rootstock or resprouting will likely occur. Must pull/dig before the plants begin setting seed or must remove flower/seed heads first (cut into bags) to prevent spread of seeds. Also remove previous year's dry seed heads. Erosion control may be necessary.

Disposal: Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

2. Cutting

Effectiveness: Can be effective in small stands i.e., <100 plants, low-med density (1-75% area), and <3 acres, especially on younger plants.

Methods: Remove flower heads before they go to seed, so seed is not spread when plant is cut or mowed. Repeated cutting and mulching is necessary to permit growth of grasses.

Cautions: Need to repeat for several years to reduce spread of plants. Doesn't affect rootstalk; thus, cut pieces can be spread that will resprout. Once severed, stems are buoyant and may disperse to other areas and re-sprout. Removal of seed heads should be done as late in the growing season as possible yet before seed set. Early cutting without additional seed head harvest could allow resprouting with greater subsequent seed production.

Disposal: Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

3. Herbicide

Effectiveness: Use when >100 plants and <3-4 acres in size.

Methods: Use glyphosate formulations only. If possible treat seedlings before they reach 12" in height. Cut and bag flower heads before applying herbicide. Apply prior to or when in flower (late July/Aug) so plants are actively growing. For spot application use a sponge tip applicator w/wick or stem injection.

Cautions: This herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants. Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulation for applications in standing water or along a shoreline.

4. Biocontrol

Two species of leaf-feeding beetle, *Galerucella calmariensis* and *G. pusilla*, have been shown to be effective in controlling purple loosestrife. Over 5 million of these beetles have been released in 30 states including New York, the northeastern and midwestern states as well as all of the Canadian Provinces. The beetles have shown dramatic decreases in purple loosestrife populations with subsequent increases in populations of native species. The scientific literature indicates that the beetles are very specific to

purple loosestrife with only minor “spillover” effects that do not compromise non-target plant populations.

Effectiveness: Use if site has at least a half acre of purple loosestrife of medium to thick density. Best type of control for large patches of loosestrife >3-4 acres.

Methods: The number of beetles released per site should be based on the size of the site, the density of loosestrife and the economics of purchase. More beetles are generally better than fewer.

Cautions: Use only if mowing, pesticide and herbicide use are not active practices on the site. The site must not be permanently flooded and should be sunny. Use only if winged loosestrife, *(Lythrum alatum)* and waterwillow *(Decodon verticillatus)* are not major components of the plant community on the release site. **Please note that identification of winged loosestrife and waterwillow should be done by a professional botanist prior to treatment to determine if this biocontrol method is appropriate.**

CONTROL METHODS FOR COMMON REED
(*Phragmites australis*)

PLANT DESCRIPTION

Phragmites is a perennial grass that can grow to 14 feet in height. Flowering and seed set occur between July and September, resulting in a large feathery inflorescence, purple-hued turning to tan. Phragmites is capable of vigorous vegetative reproduction and often forms dense, virtually monospecific stands. It is unclear what proportion of the many seeds that phragmites produces are viable. **Please note that identification of phragmites should be done by a professional botanist prior to treatment to distinguish the invasive non-native race from the non-invasive native.**

MANAGEMENT OPTIONS

1. Cutting and Pulling

Effectiveness: Need to repeat annually for several years to reduce spread of plants. Hand-pulling, though labor intensive, is an effective technique for controlling phragmites in small areas with unconsolidated soils or sediments.

Methods: The best time to cut phragmites is when most of food reserves are in aerial portion of plant (when close to tassel stage, at end of July/early August) to decrease plant's vigor. Some patches may be too large to cut by hand, but repeated cutting of the perimeter of a stand can prevent vegetative expansion. Phragmites stems should be cut below the lowest leaf, leaving a 6" or shorter stump. Hand-held cutters and gas-powered hedge trimmers work well. Weed whackers with a circular blade were found to be particularly efficient, though dangerous.

Cautions: If cut before in tassel stage or at wrong time, stand density may increase because phragmites is a grass. Remove cut shoots to prevent re-sprouting and forming stolons.

Disposal: Cut or pulled material should be removed from the site and composted, land-filled or incinerated. The harvested biomass can be disposed of onsite if the seed heads are removed and the cut stems are dispersed in an upland area.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

2. Herbicide

Effectiveness: Herbicide use is a 2 year, 2 step process because the plants may need "touch-up" application, especially in dense stands since subdominant plants are protected by thick canopy and may not receive adequate herbicide in the first application.

Methods: Use glyphosate formulations only. Cut phragmites at waist-height just before onset of tassel stage. Immediately squeeze/inject 5 mil of 50% solution of glyphosate into each individual, freshly-cut stem. Secure all cut plant material; remove from site and dispose of at approved landfill or incinerator. A 50% solution of glyphosate equates to a one to one mix with distilled water. After 2 to 3 weeks following application of glyphosate, cut or mow down the stalks to stimulate the emergence and growth of other plants previously suppressed. Use spray bottle for individual foliar spot treatments or use swab or syringe with large gauge needle or Nalgene® Unitary® wash bottle (or equivalent) to apply 1-2 drops directly to cut stems if cutting done first, or cloth glove applicator.

Cautions: This herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants. Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Choose appropriate glyphosate formulation for applications in standing water or along a shoreline.

3. Plastic

Effectiveness: Tarping can be effective in small stands i.e., <100 plants, low-med density (1-75%area). Plants die off within 3-10 days, depending on sun exposure.

Methods: Cut plants first to 6-8" (hand clippers or loppers, hand-pushed bush hog or weed whacker w/blade). After cutting a stand of phragmites, anchor a sheet of plastic over the cut area using sand bags or rocks. High temperatures under the plastic will eventually kill off the plants. This technique works best when the treated area is in direct sunlight. Black plastic is desirable, but clear plastic also works. Plastic should be at least 6 millimeters thick. Hold plastic in place with sandbags, rocks, etc. Treat runners along edge with spot application of glyphosate. Cut holes in plastic in Oct. - Nov. to promote germination of cattail shoots. The plastic can be removed the following year when the covered plants have been killed. A few phragmites shoots may return. These can be cut or hand-pulled.

Cautions: Must monitor to determine if shoots are extending out from under the plastic.

Disposal: Can leave cut material under plastic or bag all plant parts and remove from site. Dispose of in approved landfill or incinerate with appropriate permits. Note: All plastic sheeting must be removed from State lands!

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 “Sanitation” in the General Practices section.

4. Cutting
Effectiveness: Can be effective in small stands i.e., <100 plants, low-med density (1-75%area) and <3 acres.

Methods: Cut just before the end of July, most of the food reserves produced that season are removed with the aerial portion of the plant reducing the plant's vigor. This regime may eliminate a colony if carried out annually for several years. This can be done after herbicides.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

5. Pulling
Effectiveness: Can be effective in small stands i.e., <100 plants. This method is very labor intensive and best with sandy soils.

Methods: Hand-pull plants <2 years old. Use shovel for plants >2 years old-dig up plant, then replace soil and any existing cover.

Disposal: Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

6. Excavation
Effectiveness: Can be effective for patches up to ½ acre. Cost is the limiting factor.

Methods: When working in wetlands only tracked equipment shall be used. Rubber-tired excavators can operate from adjacent pavement or upland areas. All use of motorized equipment on State lands under the jurisdiction of DEC shall be in compliance with pertinent DEC policy regarding the use of motorized equipment on State lands.

Cautions: The patch should be excavated to below the depth of rhizome development. Follow-ups later in the season or the following year must be conducted to verify that all the plants have been removed.

Disposal: Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

CONTROL METHODS FOR GARLIC MUSTARD
(*Alliaria petiolata)*

PLANT DESCRIPTION

Garlic mustard is a naturalized European biennial herb that typically invades partially shaded forested and roadside areas. It is capable of dominating the ground layer and excluding other herbaceous species. Its seeds germinate in early spring and develop a basal rosette of leaves during the first year. Garlic mustard produces white flowers between late April and June of the following spring. Plants die after producing seeds, which typically mature and disperse in August. Normally its seeds are dormant for 20 months and germinate the second spring after being formed. Seeds remain viable for up to 5 years.

MANAGEMENT OPTIONS

1. Pulling

Effectiveness: Hand pulling is an effective method for removing small populations of garlic mustard, since plants pull up easily in most forested habitats. Plants can be pulled during most of the year. However, pulling also disturbs the soil and can increase rates of germination of buried seeds. In most cases cutting is the preferred hand control option.

Methods: Soil should be tamped down firmly after removing the plant. Soil disturbance can bring garlic mustard seeds to the surface, thus creating a favorable environment for their germination.

Cautions: Care should be taken to minimize soil disturbance but to remove all root tissues. Re-sprouting is uncommon, but may occur from mature plants not entirely removed. Cutting is preferred to pulling due to potential for soil disturbance.

Disposal: If plants have capsules present, they should be bagged and disposed of to prevent seed dispersal. Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 “Sanitation” in the General Practices section.

2. Cutting

Effectiveness: Cutting is effective for medium to large sized populations depending on available time and labor resources. Dormant seeds in the soil seed bank are unaffected by this technique due to minimal disturbance of the soil.

Methods: Cut stems when in flower (late spring/early summer) at ground level either manually (with clippers or a scythe) or with a motorized string trimmer. This technique will result in almost total mortality of existing plants and will minimize re-sprouting.

Cautions: Cuttings should be conducted annually until the seedbank is depleted.

Disposal: Cut stems should be removed from the site when possible since they may produce viable seed even when cut. Bag and remove all plant parts from site. Dispose of in approved landfill or incinerate with appropriate permits.

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 "Sanitation" in the General Practices section.

3. Herbicide

Effectiveness: Glyphosate will not affect subsequent seedling emergence of garlic mustard or other plants.

Methods: Use glyphosate formulations only. Product should be applied after seedlings have emerged, but prior to flowering of second year plants. Application should be by wick applicator or spray bottle for individual spot treatments.

Cautions: This herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants. Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose appropriate glyphosate formulation for applications in standing water or along a shoreline.

CONTROL METHODS FOR JAPANESE, GIANT AND BOHEMIAN KNOTWEED
(*Fallopia japonica ssp. japonica, F. sachalinensis, and F. x. bohemica*)

PLANT DESCRIPTION

The knotweeds are herbaceous perennials which forms dense clumps 1-3 meters (3-10 feet) high. Its broad leaves are somewhat triangular and pointed at the tip. Clusters of tiny greenish-white flowers are borne in upper leaf axils during August and September. The fruit is a small, brown triangular achene. Knotweed reproduces via seed and by vegetative growth through stout, aggressive rhizomes. It spreads rapidly to form dense thickets that can alter natural ecosystems. Japanese knotweed can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. It is found near water sources, in low-lying areas, waste places, and utility rights of way. It poses a significant threat to riparian areas, where it can survive severe floods.

MANAGEMENT OPTIONS

1. Digging

Effectiveness: This method is appropriate for very small populations.

Methods: Remove the entire plant including all roots and runners using a digging tool. Juvenile plants can be hand-pulled depending on soil conditions and root development.

Cautions: Care must be taken not to spread rhizome or stem fragments. Any portions of the root system or the plant stem not removed will potentially re-sprout.

Disposal: All plant parts, including mature fruit, should be bagged and disposed of in the trash to prevent re-establishment (dispose of in an approved landfill or incinerate with appropriate permits).

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 “Sanitation” in the General Practices section.

2. Cutting

Effectiveness: Repeated cutting may be effective in eliminating Japanese knotweed. Manual control is labor intensive, but is a good option where populations are small and isolated or in environmentally sensitive areas.

Methods: Cut the knotweed close to the ground at least 3 times a year. Plant native plant species as an alternative to continued treatment.

[*] Stockpiling implies temporary storage prior to transfer to a permanent treatment facility.

Cautions: This strategy must be carried out for several years to obtain success. Both mechanical and herbicidal control methods require continued treatment to prevent reestablishment of knotweed.

Disposal: Bag and remove all plant parts from site (dispose of in an approved landfill or incinerate with appropriate permits).

Sanitation: Clean all clothing, boots, and equipment to prevent spread of seed. See item #7 “Sanitation” in the General Practices section.

3. Herbicide

Effectiveness: Glyphosate treatments in late summer or early fall are much more effective in preventing re-growth of Japanese knotweed the following year.

Methods: Use glyphosate formulations only. In late June/early July cleanly cut or mow down existing stalks/canes. Allow the knotweed to re-grow. After August 1, spray knotweed all re-growth with ROUNDUP®, RODEO®.

A cut-stem treatment utilizing glyphosate formulations can be an effective control for smaller colonies of knotweed. In early to mid-July cut the existing stems just below the 2nd or 3rd node above the soil surface. Immediately after cutting apply by swab or small spray bottle a 50% solution of glyphosate to the freshly-cut cross section and into the internodal cavity of each stalk/cane. Monitor treatment area by early to mid-August and repeat cut-stem treatment to any residual stems.

Stem injection is another promising control method for smaller colonies of knotweeds. Currently, a supplemental label for AQUAMASTER® (glyphosate) herbicide exists for this stem injection method. In late June/early July inject 5 mLs of AQUAMASTER® below the 2nd node above the ground of each stem in the clump. Use suitable equipment that must penetrate into the internodal region. JKInternational manufactures a stem injection tool that is suitable and recommended for this control method.

Cautions: Established stands of Japanese knotweed are difficult to eradicate even with repeated herbicide treatments. However, herbicide treatments will greatly weaken the plant and prevent it from dominating a site. Adequate control is usually not possible unless the entire stand of knotweed is treated (otherwise, it will re-invade via creeping rootstocks from untreated areas).

These herbicides are not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants.

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* Stockpiling implies temporary storage prior to transfer to a permanent treatment facility.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose Rodeo® formulation for applications in standing water or along a shoreline.

CONTROL METHODS FOR JAPANESE, MORROW'S, TATARIAN,
AMUR AND BELL'S HONEYSUCKLES
(*Lonicera morrowii, L. tatarica, L. japonica, L. maackii, L. x. bella*)

PLANT DESCRIPTION – JAPANESE HONEYSUCKLE

Japanese honeysuckle (*Lonicera japonica*) is a perennial trailing or climbing woody vine of the honeysuckle family (Caprifoliaceae) that spreads by seeds, underground rhizomes, and aboveground runners. It has opposite leaves that are ovate, entire (young leaves often lobed), 4-8 cm long, with a short petiole, and variable pubescence. In the southern part of the range the leaves are evergreen, while in more northern locales the leaves are semi-evergreen and fall off in midwinter. Young stems are reddish brown to light brown, usually pubescent, and about 3 mm in diameter. Older stems are glabrous, hollow, with brownish bark that peels in long strips. The woody stems are usually 2-3 m long, (less often to 10 m). *Lonicera japonica* creates dense tangled thickets by a combination of stem branching, nodal rooting, and vegetative spread from rhizomes.

Lonicera japonica (including the varieties) is easily distinguished from native honeysuckle vines by its upper leaves and by its berries. The uppermost pairs of leaves of *Lonicera japonica* are distinctly separate, while those of native honeysuckle vines are connate, or fused to form a single leaf through which the stem grows. *Lonicera japonica* has black berries, in contrast to the red to orange berries of native honeysuckle vines. The fruits are produced September through November. Each contains 2-3 ovate to oblong seeds that are 2-3 mm long, dark-brown to black, ridged on one side and flat to concave on the other.

The fragrant white (fading to yellow) flowers of *Lonicera japonica* are borne in pairs on solitary, axillary peduncles 5-10 mm long, supported by leaflike bracts. The species has white flowers tinged with pink and purple. Individual flowers are tubular, with a fused two-lipped corolla 3-4(-5) cm long, pubescent on the outside. Flowers are produced late April through July, and sometimes through October.

MANAGEMENT OPTIONS

1. Mowing and Pulling

Effectiveness: Removing the above-ground portion of *Lonicera japonica* reduces current-year growth but does not kill the plant, and generally stimulates dense regrowth. Cut material can take root and should therefore be removed from the site (not practical with most infestations).

Methods: Hand pulling is highly effective. Pull out Japanese honeysuckle by the roots in winter wherever it climbs, aim the roots upward and tie them in place. The absence of light energy causes the trailing vines to decline precipitously next year. This method greatly reduces spraying requirements.

Disposal: All plant parts, including mature fruit, should be bagged and disposed of in the trash to prevent re-establishment (dispose of in an approved landfill or incinerate with appropriate permits).

Cautions: Mowing is an ineffective control method, stimulating growth and encouraging formation of dense, albeit shorter, mats. Bush-hogging is an ineffective control, as *Lonicera japonica* re-invades within one growing season.

2. Herbicide

Effectiveness: In northern states, *Lonicera japonica* retains some leaves through all or most of the winter (semi-evergreen or evergreen), when most native plants have dropped their leaves. This provides a window of opportunity from mid-autumn through early spring when it is easier to spot and treat with herbicides, fire or other methods without damaging native species.

Controls: A foliar application of 1.5% glyphosate shortly after the first frost appears to be the most effective treatment, applied after native vegetation is dormant and when temperatures are near and preferably above freezing. Applications within 2 days of the first killing frost are more effective than applications later in the winter. *Lonicera japonica* is less susceptible to herbicides after the first hard frost (-4^{o}C).

Cautions: Soil disturbance should be avoided in infested areas to minimize germination of seed in the seedbank. Treated plants should be re-examined at the end of the second growing season, as plants can recover from herbicide application.

These herbicides are not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act.

PLANT DESCRIPTIONS – BUSH HONEYSUCKLES

Exotic bush honeysuckles (Morrow's, Bell's, Amur and Tatarian) are upright, multi-stemmed, oppositely branched, deciduous shrubs that range in height from 2 m to 6 m. The opposite leaves are simple and entire, and paired; axillary flowers are showy with white, pink, or yellow corollas. The fruits of *Lonicera spp.* are red, or rarely yellow, fleshy berries.

[*] Stockpiling implies temporary storage prior to transfer to a permanent treatment facility.

In flower, exotic bush honeysuckles can be distinguished from all native bush honeysuckles except swamp fly-honeysuckle (*L. oblongifolia*) by their hirsute (hairy) styles. In fruit, the red or rarely yellow berries of the exotics separate them from the blue- or black-berried native waterberry (*L. caerulea*) and bearberry honeysuckle (*L. involucrata*). The exotic bush honeysuckles also generally leaf-out earlier and retain their leaves longer than the native shrub honeysuckles.

Within the exotic bush honeysuckles, *L. maackii* alone has acuminate, lightly pubescent leaves that range in size from 3.5 to 8.5 cm long and peduncles generally shorter than 6 mm. Its flowers are white to pink, fading to yellow, 15-20 mm long. Its berries are red or with an orange cast. Height ranges to 6 m.

In North America, there has been considerable confusion regarding the correct identification of *L. morrowii*, *L. tatarica*, and *L. x bella*, their hybrid. The literature contains a number of references to plants called by the name of one of the parents, but described as having characters more like those of the hybrid, *L. x bella*. The hybrid therefore, may be more common than the literature would indicate, and accurate field identification may be similarly problematic.

The two parent species of *L. x bella*, however, are dissimilar. *L. morrowii* has leaves that are elliptic to oblong gray-green, soft-pubescent beneath, and are 3-6 cm long. Its flowers are pubescent, white fading to yellow, 1.5-2 cm long, on densely hairy peduncles 5-15 mm long. The fruits are red. The height ranges to 2 m. *L. tatarica* has leaves that are ovate to oblong, glabrous, and are 3-6 cm long. Its flowers are glabrous, white to pink, 1.5-2 cm long, on peduncles 15-25 mm long. The fruits are red or rarely yellow. Height ranges to 3 m.

L. x bella has intermediate characteristics. The leaves are slightly hairy beneath. Flowers are pink fading to yellow, on sparsely hairy peduncles 5-15 mm. long. Fruits are red or rarely yellow. Height ranges to 6 m.

MANAGEMENT OPTIONS

1. Grubbing, Pulling, Cutting

Effectiveness: Mechanical controls include grubbing or pulling seedlings and mature shrubs, and repeated clipping of shrubs. Effective mechanical management requires a commitment to cut or pull plants at least once a year for a period of three to five years.

Methods: Grubbing or pulling by hand (using a Weed Wrench or a similar tool) is appropriate for small populations or where herbicides cannot be used. Mature *L. maackii* shrubs growing in shaded forest settings can be eradicated by clipping once a year, during the growing season, until control is achieved. Other bush honeysuckles growing in more open settings can be managed by clipping twice yearly, once in early spring and again in late summer or early autumn.

Disposal: All plant parts, including mature fruit, should be bagged and disposed of in the trash to prevent re-establishment (dispose of in an approved landfill or incinerate with appropriate permits).

Cautions: Any portions of the root system not removed can resprout. Because open soil can support rapid re-invasion, managers must monitor their efforts at least once per year and repeat control measures as needed. Winter clipping should be avoided as it encourages vigorous re-sprouting.

2. Herbicides

Effectiveness: Most managers report that treatment with herbicides is necessary for the control of *L. maackii* populations growing in full sun and may be necessary for all large bush honeysuckle populations.

Controls: Use formulations of glyphosate (brand names Roundup, and for use near water bodies, Rodeo) as foliar sprays or cut stump sprays and paints with varying degrees of success. Glyphosate is a non-selective herbicide which kills both grasses and broad-leaved plants. For cut stump treatments, 20-25% solutions of glyphosate can be applied to the outer ring (phloem) of the cut stem. A 2% solutions of glyphosate can be used for foliar treatments. Glyphosate should be applied to the foliage late in the growing season, and to the cut stumps from late summer through the dormant season.

Cautions: The subsequent flush of seedlings following all herbicide treatments must also be controlled.

These herbicides are not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act.

[*] Stockpiling implies temporary storage prior to transfer to a permanent treatment facility.

Dispose of in approved landfill or incinerate with appropriate permits.

Cautions: These methods, however, are very time and labor-intensive, since even small rhizome fragments can resprout. Additionally, digging disturbs the soil, may fragment rhizomes, and promote germination of *I. pseudacorus* and other undesirable species from the soil seed bank.

Care should be taken when pulling, cutting, or digging *I. pseudacorus*, since resinous substances in the leaves and rhizomes can cause skin irritation.

2. Herbicide

Effectiveness: *Iris pseudacorus* can be effectively controlled by herbicides. Since it usually grows in or adjacent to water, an aquatic-labeled herbicide and adjuvant must be used. Glyphosate (for example, trade names Rodeo®, Aquamaster® or Glypro®) applied in a 25% solution (13% a.i.) using a dripless wick/wiper applicator, or applied in a 5 to 8% solution if sprayed, when used with the appropriate non-ionic surfactant adjuvant, can effectively kill *I. pseudacorus*. *I. pseudacorus* can be effectively controlled by stem injection utilizing Aquamaster® applied at .5 to .7 ml. of product per flowering stem.

Controls: The timing and choice of application technique will determine control efficacy and should work to minimize off-target effects. *Iris pseudacorus* can be controlled by either directly applying the herbicide to foliage, or by immediately applying herbicide to freshly cut leaf and stem surfaces. Herbicides can be directly applied to *I. pseudacorus* foliage or cut stems by a dripless wick system or using a backpack sprayer.

Cautions: These herbicides are not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants. Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill of the herbicide.

Appendix D

Environmental Energy Alliance of New York

Best Management Practices for Preventing the Transportation

of Invasive Plant Species

Best Management Practice for Preventing the Transportation of Invasive Plant Species

Environmental Energy Alliance of New York

4/26/12/2012

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Appendices

1.0 Introduction

Invasive species are non-native plant, animal, or microbial species that cause, or are likely to cause, economic or ecological harm or harm to human health (Presidential Executive Order 13112). Invasive species means, "A species that is nonnative to the ecosystem under consideration; and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Harm must significantly outweigh benefit" [New York Environmental Conservation Law §9-1703(10)(a)] Invasive species have been introduced by human action into a region outside their natural geographic range. Introductions occur along a variety of pathways or vectors, either intentionally such as intentional transport of a species for trade, or by accidental means, as in the case of stowaway species found in the ballast-water of ocean-going vessels.

Most scientists regard invasive species as second only to habitat loss as a threat to biodiversity. The presence of invasive species in a given region is one of the leading causes of endangerment to species native to that region. On a nationwide basis, about half of plant and animal species listed as federally Endangered or Threatened are at risk because of invasive species.

Currently, annual economic losses due to invasive species in the U.S. are estimated at over $138 billion (Pimentel et al. 2000). These losses include damage to crops and pasture, forest losses, damage from insect and other invertebrate pests, human diseases, and associated control costs.

In an effort, where feasible, to limit the introduction and spread of *invasive plant species*, this Best Management Practice ("BMP") will be employed when performing activities that occur in *jurisdictional areas* as authorized by the DEC. The BMP identifies procedures that will be incorporated into routine work practices to prevent the introduction and spread of *invasive plant species*.

2.0 Definitions

The following definitions are applicable to this BMP.

***Environmental Energy Alliance of New York (EEANY)* –** is an association of electric and gas Transmission and Distribution (T&D) companies and electric generating companies that provide energy services in the State of New York. This BMP was prepared by the Land Use Subcommittee of the T&D Committee, which currently represents the following members: Central Hudson Gas & Electric Corporation, Consolidated Edison Company of New York, Long Island Power Authority, National Grid USA Service Company, Inc., New York Power Authority, New York State Electric & Gas Corporation, Orange and Rockland Utilities, and Rochester Gas & Electric Corporation.

Invasive plant species – species that are non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Management Plan National Invasive Species Council, 2001). For purposes of this document, *invasive plant species* are those contained on the "Revised Interim List of Invasive Plants Species in New York State" dated January 23, 2012 developed by NYS DEC (Appendix – 2).

Invasive species plant material – seeds, roots, or pieces of plant material that could germinate into live plants.

Jurisdictional Area – lands under the statutory jurisdiction of the NYSDEC such as certain freshwater wetlands and adjacent areas, tidal wetlands, certain water bodies, and any protected and species habitat areas specified by natural resource supervisors.

NYSDEC General Permit – a NYSDEC permit authorizing certain utility line activities under Articles 15, 24, and 25 of NYS Environmental Conservation Law. These activities include: inspection, maintenance, repair, restoration, reconstruction of pre-existing structures, vegetation cutting and trimming, and emergency actions affecting tidal wetlands, protected waters, regulated freshwater wetlands, adjacent areas, and protected habitat areas.

Regulated Activity – an activity taking place within a *jurisdictional area* that requires authorization from the NYSDEC.

Utility Rights-of-Way - is an easement-acquired or fee-owned corridor in which gas or electric transmission facilities are located.

3.0 Purpose or Goal

This BMP provides guidance for inspecting and cleaning vehicles and equipment to help prevent the spread of invasive plant species. The procedures identified within this manual outline cost-effective and realistic practices that *Environmental Energy Alliance of New York (EEANY)* utility members will implement when conducting a *regulated activity* within a *jurisdictional area*.

4.0 Applicability

This management practice applies to all *EEANY* utility members performing NYSDEC *regulated activities* within *jurisdictional areas* with populations of *invasive plant species*.

5.0 Procedures

There are two procedural options for EEANY companies to follow; one is to conduct the BMPs as detailed in the following sections of this plan or to conduct vegetation surveys for invasive species as outlined in Section 5.6.Field crews will be provided a flowchart to assist with determining when to implement these best management practices (Appendix 1).

The following detailed practices will apply where feasible when invasive species are present and when the work is covered by a GP or individual wetland permit.

5.1 Equipment

a. Equipment must arrive clean without visible soil clumps, plant or animal material.
b. Equipment includes, but is not limited to, vehicles, trailers, machinery, matting, boats, barges, and other watercraft, tools, and other materials.
c. Transporting equipment will be cleaned before accepting a new load.
d. Consider tracking pads as a means to remove soil from equipment. If tracking pads are used they must be cleaned after each use in a specific area.
e. Equipment will be cleaned using one of the methods listed below (use the most effective method that is practical):
    - Brush, broom, shovel or other similar hand tools (used without water)
    - High pressure air (when feasible)
f. Equipment must be cleaned within one of the below areas:
    - the infested work area

- an area immediately adjacent to the work area that is itself currently infested with *invasive plant species*

g. Do not clean equipment in or near waterways as it may promote the spread of *invasive plant species* downstream.
h. Where possible, staging areas will be established in locations that are free of *invasive plant species*. Otherwise, all equipment will be cleaned using the techniques described in 5.3 before leaving the area.
i. When wetland matting is required, it will arrive on site visibly clean, be installed prior to any activities, and will be appropriately cleaned before leaving the area.

5.2 Inspection and Cleaning

a. Inspections and cleaning should be conducted especially when moving from an infested area to an un-infested area.
b. Prior to exiting work area clothing, footwear, and gear should be cleaned of visible signs of plant material.
c. Carry appropriate cleaning equipment (e.g. wire brush, small screwdriver, boot brush) to help remove soils, seeds, and plant material.
d. Preferred locations for cleaning are those where:
    - Work activities are taking place;
    - *Invasive plant species* are already established; or
    - An area immediately adjacent to the work site that is itself currently infested with *invasive plant species*.
e. No cleaning of clothing, footwear, gear in or adjacent to waterways – it may promote the spread of *invasive plant species* downstream.
f. Cleaning will include brushing or self "pat down" of clothing, footwear, and other personal gear within the infested work area.

5.3 Disposal of Impacted Material

a. Preferred locations for equipment cleaning are those areas where work activities are taking place or immediately adjacent areas currently impacted with *invasive plant species*.
b. Do not clean equipment, vehicles or trailers in or near waterways.
c. Do not dispose of soil, seeds, or plant material in storm drains.
d. Any plant materials that are incidentally removed after completion of steps a-c from site will be properly disposed of in a manner that prevents viable plant parts and propagules from being spread

5.4 Other Prevention Measures

a. Reasonable steps to avoid transportation of *invasive plant species,* including small, isolated, populations, will be taken.
b. As an alternative to cleaning, ancillary equipment such as spare tires and winches when feasible will be covered when entering *jurisdictional areas* containing populations of *invasive plant species*.
c. Vehicular access into areas containing populations of *invasive plant species* will be reduced or minimized to the maximum extent practical. When practical vehicles will be parked outside of the impacted area and crews will enter on foot.

5.5 Site Restoration

a. Minimize soil disturbances by reducing work areas and reducing activities that may result in soil disturbances.
b. Re-vegetate bare soils as soon as feasible to minimize the possible establishment of *invasive plant species*. When seeding, non-invasive or local native species must be used (seed mixes will vary from region to region). Seed will be broadcasted over all bare soil areas and covered with a mulch layer such as straw. Choose appropriate seed mixes based on site conditions.
c. On steep sloping areas (i.e. slopes exceeding 20 percent), soil erosion control matting (i.e. jute mesh or straw blankets) must be installed over the seeded area. The matting should be secured with biodegradable tacks.
d. Stabilize disturbed soils using appropriate erosion and sediment control procedures as soon as possible. Use invasive free materials such as straw or wood chips; avoid using hay.

5.6 Vegetation Survey (Optional)

If the above BMPS are not followed, then vegetation surveys of site(s) to detect populations of invasive species should be made in advance prior to any activities. If the optional vegetation survey is performed and no invasive species are found, then the procedures outlined above in section 5.1 through 5.5 will not be followed. Survey inspections can be integrated with other activities such as ROW inspections and should be kept as simple as possible to meet invasive species management objectives. If significant populations of invasive species are detected on surveys, then Sections 5.1 to 5.5 apply.

a. Prior to implementing activities scout for, locate and document significant invasive species infestations.
b. Consider the need for actions based on: 1) the degree of invasiveness; 2) severity of the current infestation; 3) amount of additional habitat or host at risk for invasion; and 4) feasibility of managing the spread.
c. Plan activities to limit the potential for introduction and spread of invasive species, prior to construction.

d. Provide appropriate resources in identification of known invasive species for corridor workers.

6.0 Training

A flowchart (Appendix 1) to assist field crews on when to implement the above procedures will be distributed to all field crews.

All transmission vegetation management planners, foresters, and ROW maintenance personnel will be trained in the procedures outlined in Section 5.0 above. Additionally, training sessions focused on the identification of *invasive plant species* identified in Appendix 3 will be conducted by the individual utility companies. This may take the form of hard copy materials, tail gate briefings and/or presentations during regular staff meetings.

7.0 Emergency Work

During emergencies, *EEANY* utility members will strictly comply with the Emergency Action condition protocol outlined in the *NYSDEC General Permit*. Appropriate site-specific *invasive plant species* controls and restoration efforts will be determined on an individual basis in conjunction with the regional NYSDEC office.

8.0 References

- Electric Power Research Institute, 2008 "Invasive Species and Utility Rights of Way: A Review of the Science". EPRI Publication number 1014032, Palo Alto, CA

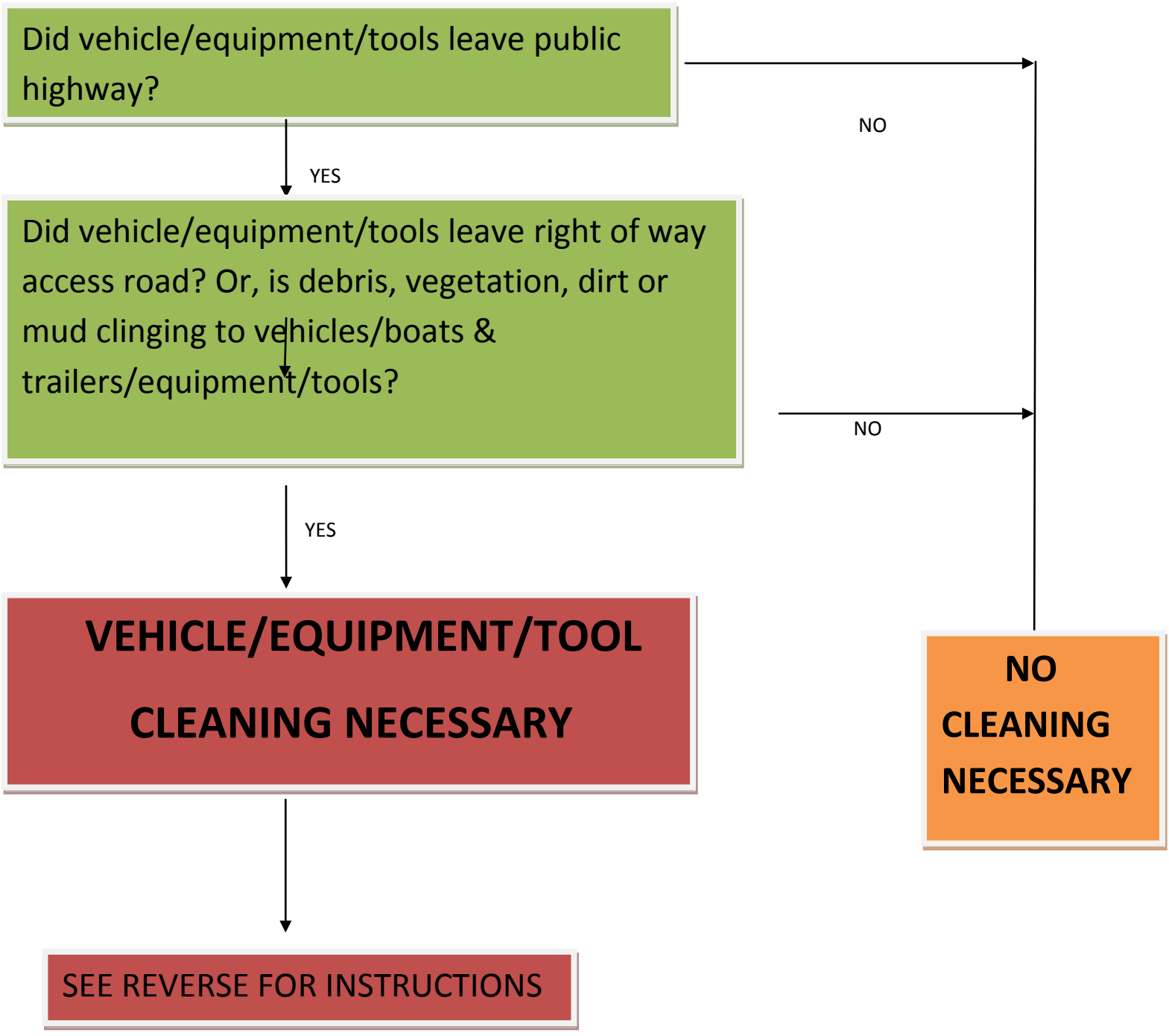
- Pimentel, D., Lach, L., Zuniga, R. & Morrison, D**.** 2000. Environmental and economic costs of nonindigenous species in the United States. Bioscience, 50(1): 53-65.

- Presidential Executive Order 13112. Volume 64, Federal Register 1999. Invasive Species.

- Wisconsin Council on Forestry. 2010. *Invasive Species Best Management Practice for Transportation and Utility Rights-of-Way*.

APPENDIX - 1

BEST MANAGEMENT PRACTICES (BMP'S) for INVASIVE SPECIES TRANSPORT PREVENTION



PRIOR TO LEAVING THE RIGHT-OF-WAY

- Prior to loading vehicle/equipment/tools remove as much debris, vegetation, dirt and mud clinging to the equipment as feasible using a brush, broom, shovel or other similar hand tool.

- High pressure air can be used on site for cleaning debris, vegetation, dirt and mud off vehicles/equipment/tools.

- Pick-ups and other small road vehicles shall remove on the right-of-way, as much debris, vegetation, dirt and mud clinging to vehicle as feasible prior to entering the highway.

- Small equipment/tools/boots shall be cleaned on site before removal or storage.

- Arrangements can be made for onsite cleaning or washing of vehicles/equipment/tools if deemed necessary.

APPENDIX - 2

REVISED INTERIM LIST OF INVASIVE PLANT SPECIES IN NEW YORK STATE

23 January 2012

Purpose

This list was not prepared pursuant to ECL 9-1705 (5) (h), the so-called "four-tier system".

The primary purpose of this list to inform New York State agencies so they can incorporate invasive species management into their funding, regulatory and other activities pursuant to ECL 9-1705 (b) and especially ECL 9-1709 (2):

> "...[DEC] in cooperation with [DAM] shall have the authority...to... coordinate state agency and public authority actions to do the following: (a) **phasing out uses of invasive species**; (b) **expanding use of native species**; (c) **promoting private and local government use of native species as alternatives to invasive species**; and (d) wherever practical and where consistent with watershed and/or regional invasive species management plans, **prohibiting and actively eliminating invasive species at project sites funded or regulated by the state**;...."

It is intended to inform regulatory actions pursuant to existing statutory authorities, e.g., protection of waters (ECL Article 15), wetlands (ECL Articles 24 and 25), State Environmental Quality Review (ECL Article 8), biocontrol (ECL Article 11), and pesticides (ECL Article 33). This list is also intended to inform non-regulatory management decisions and actions, such as for planning and priority-setting, prevention, early detection, monitoring, rapid response, control and eradication, restoration, research, and public education.

This list does not include *all* plant species that are invasive or potentially-invasive in New York State. Rather, it includes many of those plant species that are widely-recognized as invasive or potentially-invasive in New York State. ECL 9-1703 (10) defines "invasive species" as:

> "...a species that is: (a) nonnative to the ecosystem under consideration; and (b) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. For the purposes of this paragraph, the harm must significantly outweigh any benefits."

Thus, when complying with the provisions of 9-1709, agency staff use professional judgment in assessing the potential environmental harm (or harm to human health) when considering particular species in particular contexts.

Invasive Plants Field and Reference Guide: An Ecological Perspective of Plant Invaders of Forests and Woodlands http://www.fs.fed.us/ne/newtown_square/publications/information_bulletins/NA-TP-05-04.pdf

Mistaken Identity? Invasive Plants and their Native Look-alikes: an Identification Guide for the Mid-Atlantic

http://www.nybg.org/files/scientists/rnaczi/Mistaken_Identity_Final.pdf

REVISED INTERIM LIST OF INVASIVE PLANT SPECIES IN NEW YORK STATE

Floating & Submerged Aquatic		
Common Name	**Scientific Name**	**Rank**
Water thyme	*Hydrilla verticillata*	Very High
Frog Bit	*Hydrocharis morsus-ranae*	Very High
Floating Primrose Willow	*Ludwigia peploides*	Very High
Broadleaf Water-milfoil	*Myriophyllum heterophyllum*	Very High
Eurasian Water-milfoil	*Myriophyllum spicatum*	Very High
Water Chestnut	*Trapa natans*	Very High
Rock Snot (diatom)	*Didymosphenia geminata*	
Carolina Fanwort	*Cabomba caroliniana*	High
Brazilian Waterweed	*Egeria densa*	High
Parrot-feather	*Myriophyllum aquaticum*	High
Yellow Floating Heart	*Nymphoides peltata*	High
Curly Pondweed	*Potamogeton crispus*	High

Emergent Wetland & Littoral		
Common Name	**Scientific Name**	**Rank**
Japanese Knotweed	*Fallopia japonica*	Very High
Purple Loosestrife	*Lythrum salicaria*	Very High
European Common Reed Grass	*Phragmites australis*	Very High
Tall Glyceria	*Glyceria maxima*	High
Yellow Iris	*Iris pseudacorus*	High
Marsh Dewflower	*Murdannia keisak*	High
Reed Canary-grass	*Phalaris arundinacea*	High

Terrestrial - Herbaceous		
Common Name	**Scientific Name**	**Rank**
Garlic Mustard	*Alliaria petiolata*	Very High
Slender False Brome	*Brachypodium sylvaticum*	Very High
Oriental Bittersweet	*Celastrus orbiculatus*	Very High
Black swallow-wort	*Cynanchum louiseae*	Very High
Pale Swallow-wort	*Cynanchum rossicum*	Very High
Japanese Stilt Grass	*Microstegium vimineum*	Very High
Lesser Celandine	*Ranunculus ficaria*	Very High
Wild Chervil	*Anthriscus sylvestris*	High
Mugwort	*Artemisia vulgaris*	High
Small Carpgrass	*Arthraxon hispidus*	High
Narrowleaf Bittercress	*Cardamine impatiens*	High
Spotted Knapweed*	*Centaurea stoebe ssp. micranthos*	High
Canada Thistle	*Cirsium arvense*	High
Chinese Yam	*Dioscorea polystachya*	High
Cut-leaf Teasel	*Dipsacus laciniatus*	High
Winter Creeper	*Euonymus fortunei*	High
Cypress Spurge	*Euphorbia cyparissias*	High
Leafy Spurge	*Euphorbia esula*	High

Giant Hogweed	*Heracleum mantegazzianum*	High
Japanese Hops	*Humulus japonicus*	High
Cogon Grass	*Imperata cylindrica*	High
Broad-leaf Pepper-grass	*Lepidium latifolium*	High
Chinese Lespedeza	*Lespedeza cuneata*	High
Garden Loosestrife	*Lysimachia vulgaris*	High
Chinese Silver Grass	*Miscanthus sinensis*	High
Wavyleaf Basketgrass	*Oplismenus hirtellus*	High
Cup-plant	*Silphium perfoliatum*	High

Terrestrial - Vines		
Common Name	**Scientific Name**	**Rank**
Japanese Honeysuckle	*Lonicera japonica*	Very High
Mile-a-minute Weed	*Persicaria perfoliata*	Very High
Kudzu	*Pueraria montana*	Very High
Porcelain Berry	*Ampelopsis brevipedunculata*	High
Japanese Virgin's Bower	*Clematis terniflora*	High

Terrestrial - Shrubs & Trees		
Common Name	**Scientific Name**	**Rank**
Norway Maple	*Acer platanoides*	Very High
Japanese Angelica Tree	*Aralia elata*	Very High
Japanese Barberry	*Berberis thunbergii*	Very High
Autumn Olive	*Elaeagnus umbellata*	Very High
Winged Euonymus	*Euonymus alatus*	Very High
Amur Honeysuckle	*Lonicera maackii*	Very High
Morrow's Honeysuckle	*Lonicera morrowii*	Very High
Uruguayan primrose willow	*Ludwigia grandiflora*	Very High
Common Buckthorn	*Rhamnus cathartica*	Very High
Black Locust	*Robinia pseudoacacia*	Very High
Multiflora Rose	*Rosa multiflora*	Very High
Wineberry	*Rubus phoenicolasius*	Very High
Gray Florist's Willow	*Salix atrocinerea*	Very High
Sycamore Maple	*Acer pseudoplatanus*	High
Porcelain Berry	*Ampelopsis brevipedunculata*	High
Smooth Buckthorn	*Frangula alnus*	High
Border Privet	*Ligustrum obtusifolium*	High
Amur Cork Tree	*Phellodendron amurense*	High
Beach vitex	*Vitex rotundifolia*	High

* Brown and Black Knapweed have also been known to be problematic in grassland habitats

~ END ~