Northfield Mountain Pumped Storage Project
(FERC Project Number 2485)

Invasive Plant Species Management Plan

MARCH 2024

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BMP	best management practices
FERC	Federal Energy Regulatory Commission
FirstLight or Licensee	Northfield Mountain LLC
MA	Massachusetts
MDFW	Massachusetts Department of Fish and Wildlife
MIPAG	Massachusetts Invasive Plant Advisory Group
Northfield Project	Northfield Mountain Pumped Storage Project (FERC No. 2485)
Plan	Invasive Plant Species Management Plan
TFI	Turners Falls Impoundment
USDA	United States Department of Agriculture

1 BACKGROUND

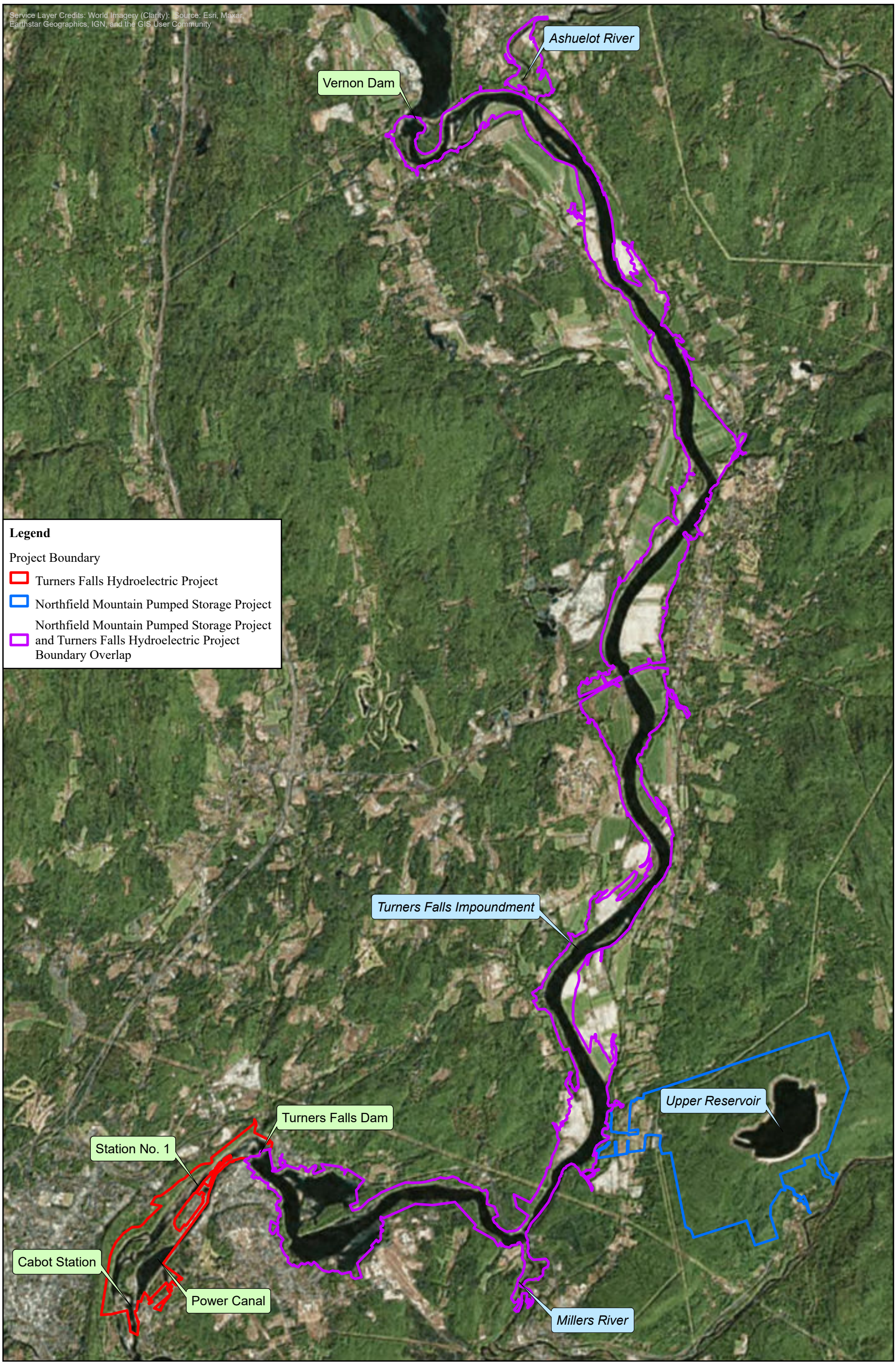
1.1 Project Ownership and Layout

Northfield Mountain LLC (FirstLight or the Licensee) is the owner and operator of the Northfield Mountain Pumped Storage Project (Northfield Project, FERC No. 2485). The Northfield Project is a pumped-storage facility located on the Connecticut River in Massachusetts (MA) that uses the Turners Falls Impoundment (TFI) as its lower reservoir. The Northfield Project Boundary (Figure 1.1-1) overlaps with Turners Falls Hydroelectric Project (FERC No. 1889) Boundary along nearly the entire perimeter of the TFI, but it does not include the Turners Falls Dam. The TFI is a shared project feature with the Turners Falls Hydroelectric Project. The Northfield Project tailrace is located approximately 5.2 miles upstream of Turners Falls Dam, on the east side of the TFI. The Northfield Project's Upper Reservoir is a man-made structure situated atop Northfield Mountain, to the east of the Connecticut River. During pumping operations, water is pumped from the TFI to the Upper Reservoir. When the Northfield Project is generating, water is passed from the Upper Reservoir through an underground pressure shaft to a powerhouse cavern and then a tailrace tunnel delivers the water back to the TFI.

Key features of the Northfield Project are shown on Figure 1.1-2 and include a main dam, intake channel, pressure shaft and tailrace tunnel.

1.2 Purpose of Plan

The purpose of this Invasive Plant Species Management Plan (Plan) is to help prevent the introduction and/or spread of terrestrial plants by implementing best management practices (BMP) and through supporting the education of individuals performing construction, maintenance, and/or operational activities within the Project boundary. While the Northfield Project and the Turners Falls Hydroelectric Project share a common Project Boundary, the TFI, for purposes of this Plan, the geographic area is limited to the Northfield Project Boundary absent the TFI (as shown in blue in Figure 1.1-1). Issues pertaining to invasive aquatic plants in the TFI are addressed in the Turners Falls Hydroelectric Project Invasive Species Management Plan.



FIRSTLIGHT MA HYDRO LLC
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0 0.5 1 2 Miles

Figure 1.1-1:
Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project Project Boundary

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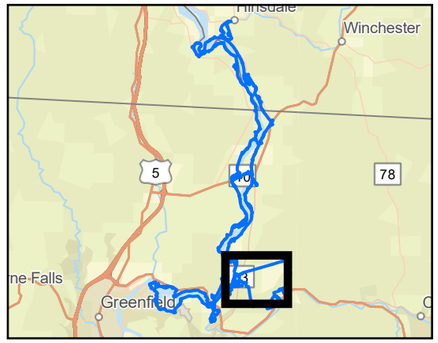

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Figure 1.1-2:
Northfield Mountain Pumped Storage Project Features

Legend

Project Boundary

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Service Layer Credits: World Street Map: Esri, HERE, Garmin, NGA, USGS, NPS
World Street Map: Esri, TomTom, Garmin, SafeGraph, FAO, METI/ NASA, USGS, EPA, NPS, USFWS
World Imagery: Maxar

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2 EXISTING INFORMATION

As part of the Federal Energy Regulatory Commission (FERC) licensing of the Project, studies were conducted to document the locations of rare, threatened and endangered plants as well as invasive plant species. The two key studies were:

- Study No. 3.4.1. Baseline Study of Terrestrial Wildlife and Botanical Resources at the Turners Falls Impoundment, in the Bypass Reach and below Cabot Station within the Project Boundary.
- Study No. 3.5.1. Baseline Inventory of Wetland, Riparian, and Littoral Habitat in Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species.

The study findings regarding terrestrial invasive plants are summarized below.

2.1 Invasive Terrestrial Plant Species

Methods

In 2014 and 2015[1], biologists conducted plant surveys in the study area defined as including a) uplands adjacent to the TFI, bypass reach, and Connecticut River from Cabot Station to the Route 116 Bridge in Sunderland, MA and b) upland areas in the Turners Falls and Northfield Mountain Project Boundaries.

To document an infested area, biologists used a GPS survey data collector with sub-foot accuracy to delineate the boundary of the infestation as defined by the dominant cover of the invasive plant. Biologists also used field notes, photographs, and field mark-ups of aerial maps to document observations. Areas containing only occasional invasive species were recorded with a GPS center point and radius necessary to enclose the population. For areas where invasive species were ubiquitous or impractical to map, biologists characterized invasive species populations using estimates of areal coverage and percent cover of species present. Along the shoreline, biologists estimated areal coverage using cover classes of 50%.

Findings

The Massachusetts Invasive Plant Advisory Group (MIPAG) maintains a list of invasive plant species occurring in Massachusetts.[2] Invasive plants as defined by the MIPAG are, "*non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems*." Prior to conducting the study, biologists reviewed the MIPAG for a list of invasive plant species occurring in Massachusetts. The findings described below reflect observations in the study area.

Biologists identified 21 upland invasive plants in the study area as shown in Table 2.1-1. Because invasive species were widely distributed along the shoreline, the relative abundance and distribution of invasive plants in the study area were mapped using estimated cover classes of 50%. The following five invasive plant species were found to be common within the study area during the 2014 and 2015 field reconnaissance surveys:

- Oriental Bittersweet - found throughout the study area, particularly ubiquitous along the edge of the river where there is abundant sunlight. Highest concentrations were noted in the TFI north of Pauchaug Brook where the TFI transitions to a more dynamic riverine environment. In the upper

[1] The Study No. 3.4.1 Report was filed with FERC on 3/2/2016.

[2] The MIPAG is a voluntary collaborative representing organizations and professionals concerned with the conservation of the Massachusetts landscape. MIPAG was charged by the Massachusetts Executive Office of Environmental Affairs to provide recommendations to the Commonwealth regarding which plants are invasive and what steps should be taken to manage these species. MIPAG - Massachusetts Invasive Plant Advisory Group (massnrc.org)

reaches of the TFI, Oriental bittersweet can be found covering at least 50% of the trees and shrubs along the shoreline.

- Japanese Knotweed - typically confined to discrete patches along the immediate shoreline and, in some instances, in small stands along the edge habitat of previously disturbed areas.
- Multiflora Rose - scattered throughout the study area, particularly along edges of field habitat and along shoreline/transition areas abutting agricultural lands.
- Japanese Barberry - throughout the study area, a common forest understory shrub that forms monoculture thickets. Particularly found in low lying lands and on upland islands within the river.
- Black Swallowwort – found throughout study area, particularly on the banks of the river and the TFI.

Invasive species occurring within the study area are present in areas that have been cleared in the past and are subsequently labeled as disturbed habitat. The forested habitat in the study area along the river has varying amounts of invasive species abundance and distribution.

Table 2.1-1: Upland Invasive Plant List in Study Area

Scientific Name	Common Name	Lifeform Type	Notes	MIPAG Status
Acer platanoides	Norway maple	Tree	Common in woodlands with colluvial soils, grows full sun to full shade dispersed by water, wind and vehicles	MIPAG listed non-native invasive
Alliaria petiolata	Garlic mustard	Biennial Herb	Widespread, grows full sun to full shade, spreads by seed, especially in wooded areas	MIPAG listed non-native invasive
Berberis thunbergii	Japanese barberry	Shrub	Wooded uplands and wetlands, grows in full sun to full shade, spread by birds, forms dense stands	MIPAG listed non-native invasive
Celastrus orbiculatus	Oriental bittersweet	Perennial vine	Grows in full sun to partial shade, berries spread by birds and humans	MIPAG listed non-native invasive
Centaurea maculosa	Spotted knapweed	Perennial herb	Occurs in full sun, spreads rapidly in artificial corridors, agricultural fields, and margins.	Early Detection Species - recorded as potentially invasive in MA by USDA Forest Service
Cynanchum louiseae	Black swallow-wort	Perennial vine	Grows in full sun to partial shade, forms dense stands, deadly to Monarch butterfly larvae	MIPAG listed non-native invasive
Elaeagnus umbellata	Autumn olive	Shrub	Grows in full sun, berries spread by birds, aggressive in open areas	MIPAG listed non-native invasive
Euonymus alatus	Burning bush	Shrub	Capable of germinating in full sun to full shade. Escapes from cultivation and can form dense thickets and dominate the understory	MIPAG listed non-native invasive
Euphorbia esula	Leafy spurge	Perennial herb	Occurs in grasslands	MIPAG listed non-native invasive
Fallopia japonica	Japanese knotweed	Perennial Herb-subshrub	Widespread, grows in full sun to full shade, spreads vegetatively and by seed, forms dense thickets	MIPAG listed non-native invasive
Lonicera japonica	Japanese honeysuckle	Perennial vine	Widespread, grows full sun to full shade, climbs vegetation, seeds dispersed by birds	MIPAG listed non-native invasive
Lonicera morrowii	Morrow's honeysuckle	Shrub	Widespread, grows full sun to full shade, dispersed by birds, can hybridize with other honeysuckle species	MIPAG listed non-native invasive
Lysimachia nummularia	Creeping jenny	Perennial herb	Occurs in uplands and wetlands, grows in full sun to full shade, forms dense mats	MIPAG listed non-native invasive

Scientific Name	Common Name	Lifeform Type	Notes	MIPAG Status
Lythrum salicaria	Purple loosestrife	Perennial herb	Occurs in uplands and wetlands, grows in full sun to partial shade, high seed production, overtakes wetlands	MIPAG listed non-native invasive
Phalaris arundinacea	Reed canary grass	Perennial grass	Occurs in uplands and wetlands, grows full sun to partial shade, can form large colonies, common in agricultural settings	MIPAG listed non-native invasive
Phragmites australis	Common reed	Perennial grass	Grows in uplands and wetlands, full sun to full shade, forms dense stands, flourishes in disturbed areas	MIPAG listed non-native invasive
Polygonum perfoliatum	Mile-a-minute	Perennial vine	Occurs in streamside, fields, and road edges in full sun to partial shade; highly aggressive.	MIPAG listed non-native invasive
Ranunculus ficaria	Lesser celandine	Perennial herb	Occurs in lowland and upland woods, grows in full sun to full shade, spreads vegetatively and by seed, forms dense stands	MIPAG listed non-native invasive
Rhamnus cathartica	Common buckthorn	Shrub-tree	Occurs in uplands and wetlands, grows in full sun to full shade.	MIPAG listed non-native invasive
Robinia pseudoacacia	Black locust	Tree	Occurs in uplands, grows full sun to full shade, aggressive in areas with sandy soils	MIPAG listed non-native invasive
Rosa multiflora	Multiflora rose	Shrub	Widespread, grows in full sun to full shade, forms thorny thickets, dispersed by birds.	MIPAG listed non-native invasive

3 MEASURES TO PREVENT THE SPREAD OF INVASIVE PLANTS

3.1 Activities Associated with Daily Operations and Routine Maintenance

The Licensee will implement the following measures to assist in preventing the establishment, and/or spreading, of terrestrial and aquatic invasive plant species.

1. The Licensee will continue to maintain Project grounds to help prevent the introduction and spread of invasive plant species within the Project boundary, as described below.
2. The Licensee will not actively plant any terrestrial plants listed under the noxious weeds in the United States Department of Agriculture (USDA) Natural Resources Conservation Service Plants Database, which incorporates plants listed by the MIPAG.
3. The Licensee will monitor areas of disturbance caused by routine operation or maintenance activities within the Project Boundary to ensure that invasive plant species do not out-compete desirable vegetation during the reestablishment phase.
4. The Licensee will instruct its work personnel to visually inspect all of Licensee's exposed boating equipment for attached invasive plant species.
5. The Licensee will clean and dry its boats and trailers that come in contact with the water following removal from the water. The Licensee will remove any visible plants or animals before entering the water or leaving the site. Plants and animals are to be discarded in an upland area.
6. At Project recreation areas and state boat launches, the Licensee will post signage explaining the threats of nonnative aquatic species and steps to prevent the spread will be posted.

3.2 Activities Associated with Construction or Major Maintenance

Prior to major construction or major maintenance activities, the Licensee will consult with the Massachusetts Department of Fish and Wildlife (MDFW) regarding the best management practices (BMP) to be employed to help prevent the introduction and/or spread of invasive plant species within the area associated with the activity to be performed. In addition to activity specific BMPs that may be developed through consultation, the Licensee will employ the following BMPs during construction and major maintenance activities.

3.2.1 During Construction

1. Workers will be trained to identify invasive plants and informed of the importance of infestation prevention.
2. Obvious vegetative material will be removed from construction equipment before allowing the equipment to enter an invasive-free area.
3. Invasive plants that could potentially be spread by construction equipment or workers will be removed. Along access roads, invasive plants will be identified and controlled to avoid introducing them into invasive-free areas.
4. Where practical, gravel and fill will come from invasive-free sources to avoid introducing invasive vegetation to the construction site.
5. Where practical, certified invasive-free straw, mulch, fiber rolls, and sediment logs will be used for erosion and sediment control.

3.2.2 During Seeding and Planting

1. Where practical, soil amendments (if any) and mulches will be obtained from invasive-free sources.
2. The Licensee will make a reasonable effort to use only native seed mixes for reseeding disturbed areas.
3. Seeding and planting operations and maintenance will be conducted in a manner to promote vigorous growth of desirable vegetation and discourage invasive species.
4. Bare ground will be seeded following disturbance.
5. Seeded sites will be monitored for infestation by invasive plant species.
6. Identified invasive plant species at monitored sites will be treated in the first full growing season.
7. Where practical, mulch will be used to limit the number of unwanted seed sources reaching bare soil.
8. The Licensee will ensure that all construction contractors are aware of, and comply with, the terms listed above.

3.2.3 Post Construction

1. The Licensee will monitor any areas of disturbance caused by construction activities on lands owned by the Licensee within the Project boundary as needed to ensure that invasive species have not out-competed desirable vegetation during the re-establishment.