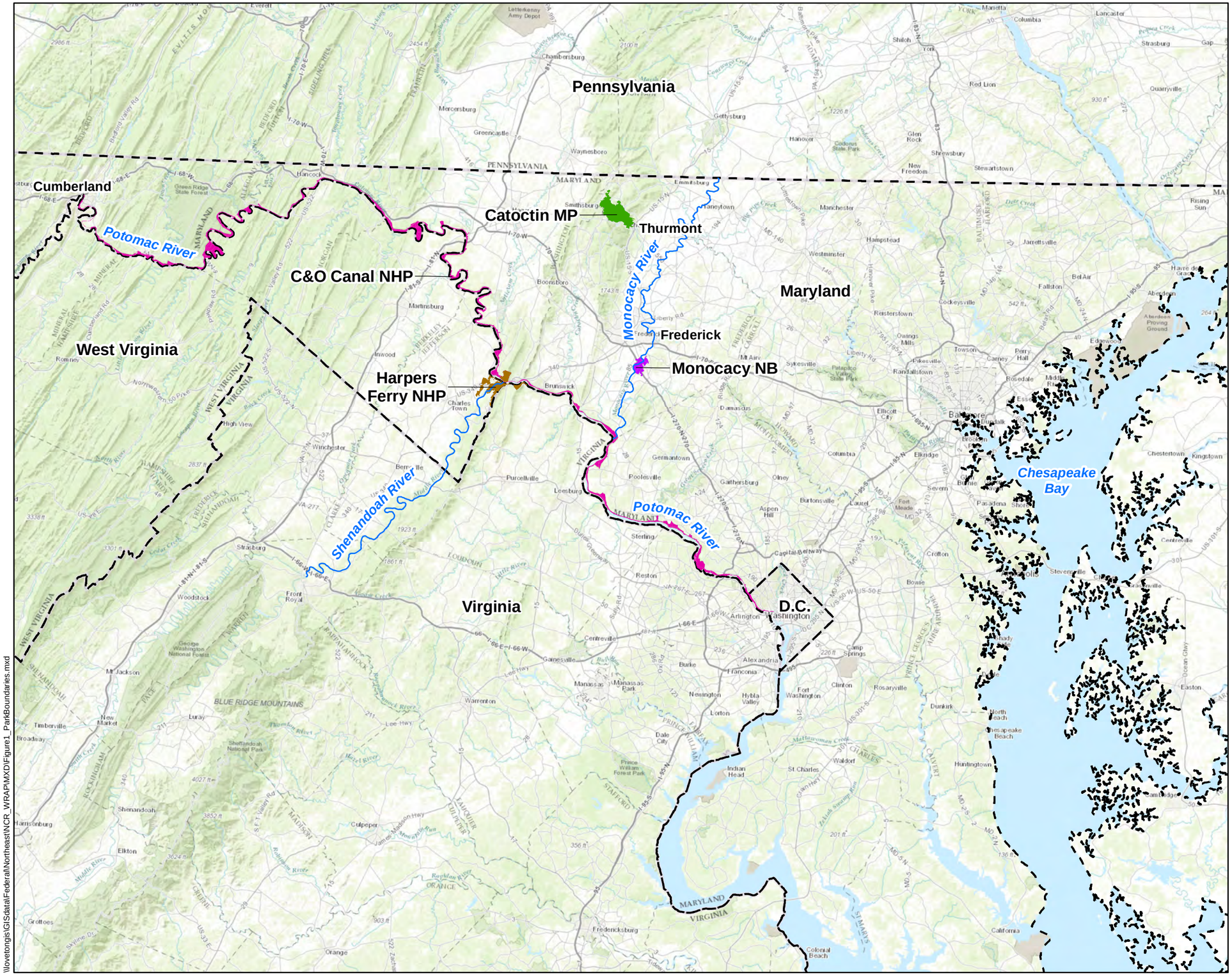
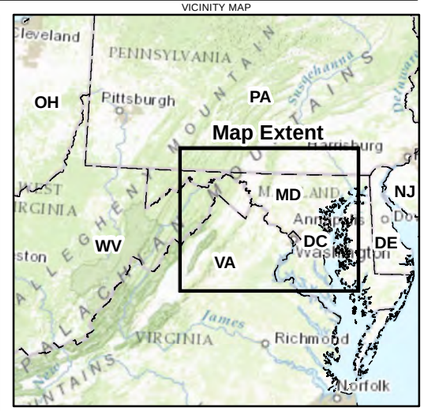


VICINITY MAP



Legend

- River
- State Boundary
- C&O Canal NHP
- Monocacy NB
- Harpers Ferry NHP
- Catoctin MP

Aerial: ESRI, 2015

Map Date: 6/24/2016

N

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Miles

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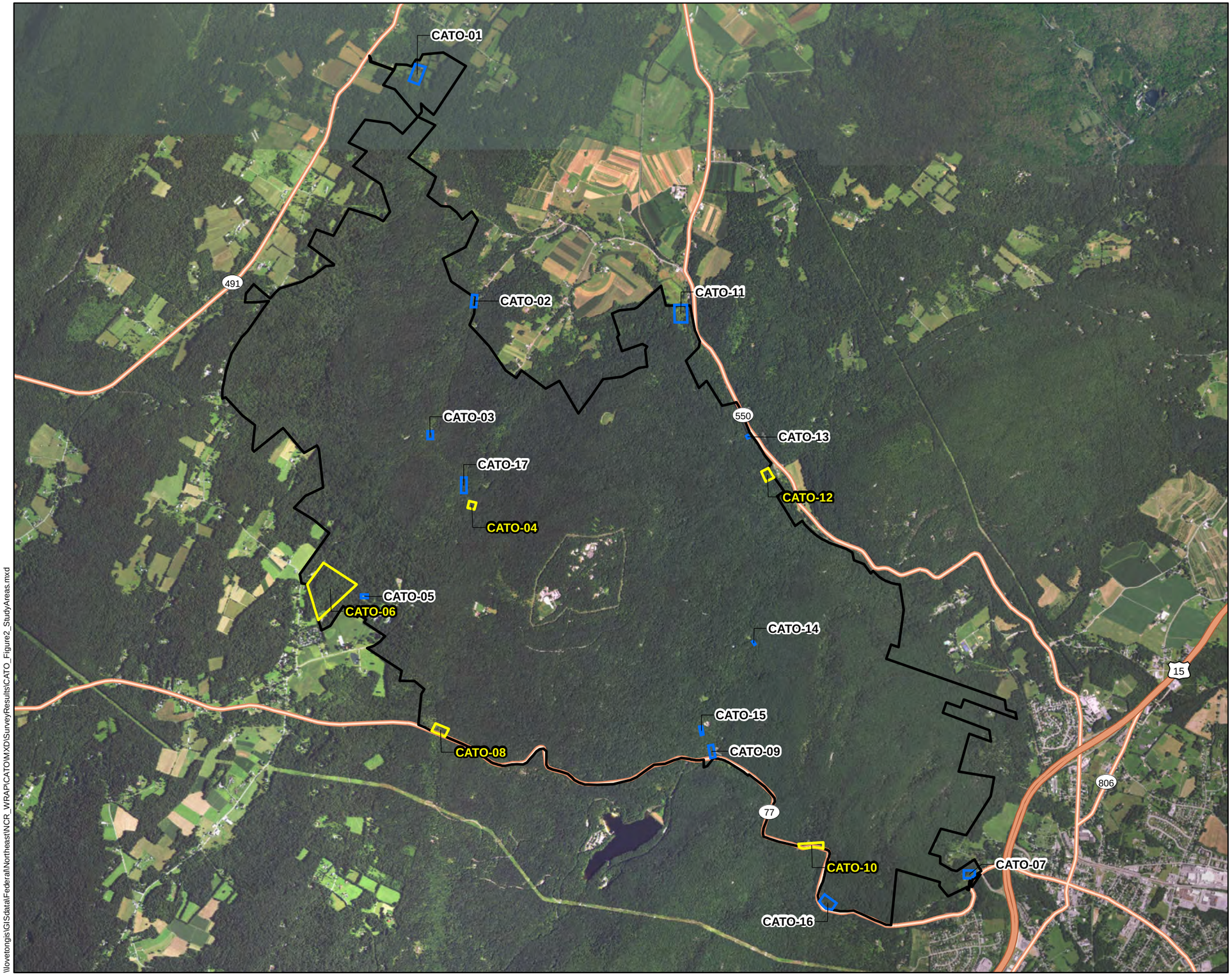
Figure 1
Park Boundaries
C&O Canal, Harpers Ferry, Monocacy, Catoctin
NPS/NCR Wetland Restoration Action Plan
D.C., Maryland, Virginia, West Virginia



VICINITY MAP

Legend

- Park Boundary
- Study Area
- Study Area Dropped Before Field Review
- Study Area Dropped After Field Review

Aerial: ESRI, 2015

Map Date: 9/21/2016

N

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Feet

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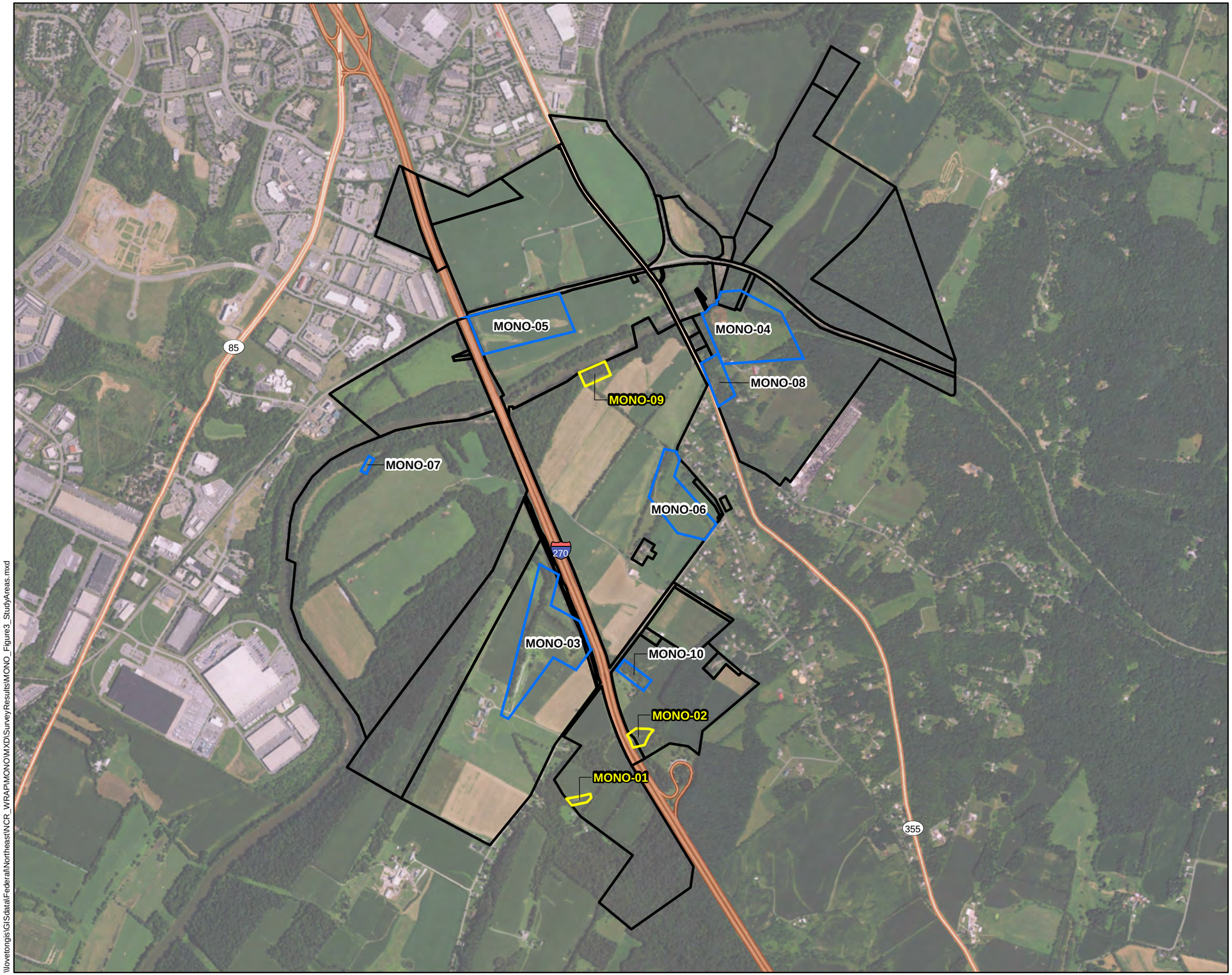
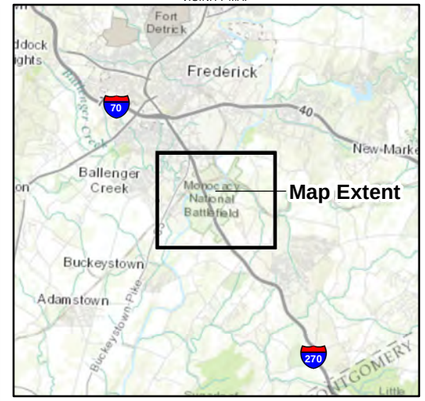
Figure 2
Study Areas
Catoctin
NPS/NCR Wetland Restoration Action Plan
Maryland





Legend

- Park Boundary
- Study Area
- Study Area Dropped Before Field Review
- Study Area Dropped After Field Review

Aerial: ESRI, 2015

Map Date: 9/21/2016

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Feet

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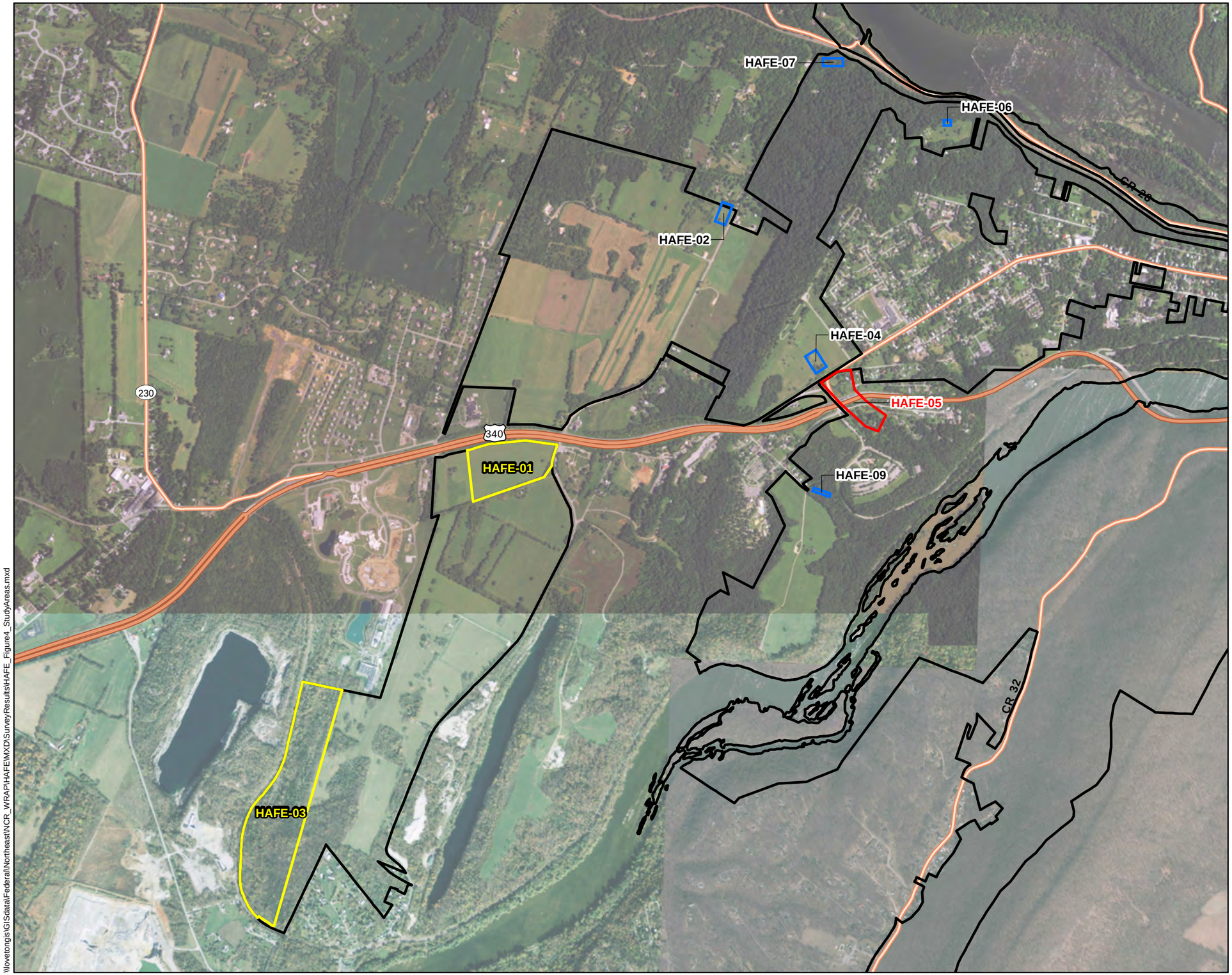
Figure 3
Study Areas
Monocacy
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland



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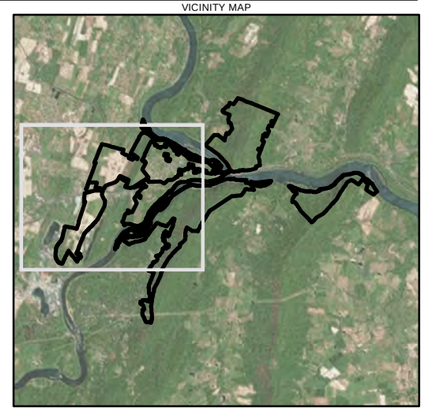

Legend

- Park Boundary
- Study Area
- Study Area Dropped Before Field Revisions
- Study Area Dropped After Field Revisions

Aerial: ESRI, 2015

Map Date: 12/9/2016

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Feet

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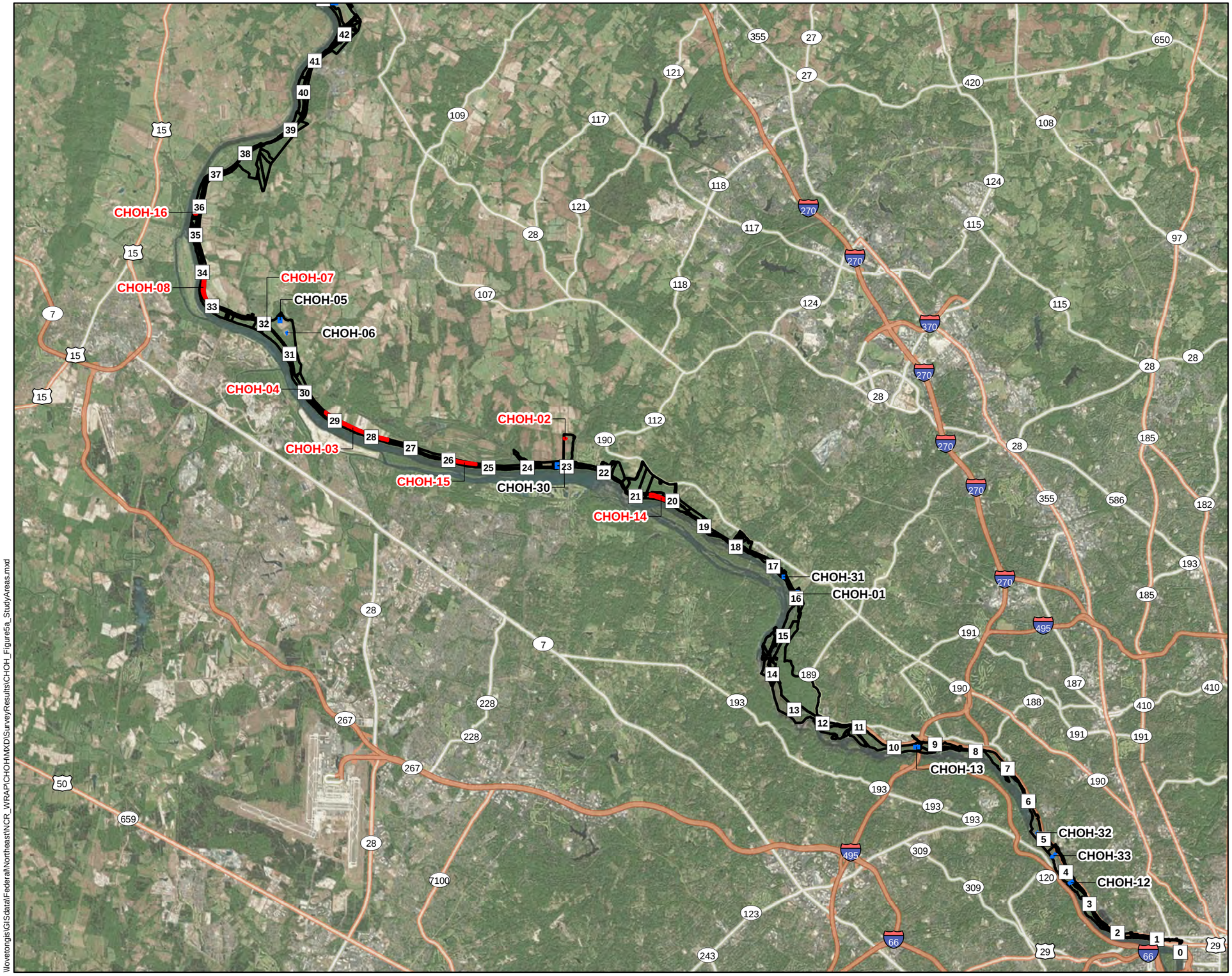
Figure 4
Study Areas
Harpers Ferry
NPS/NCR Wetland Restoration Action Plan
Jefferson, West Virginia



VICINITY MAP

Legend

- 1 Mile Marker
- Park Boundary
- Study Area
- Study Area Dropped Before Field Review
- Study Area Dropped After Field Review

Aerial: ESRI, 2015

Map Date: 9/21/2016

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Miles

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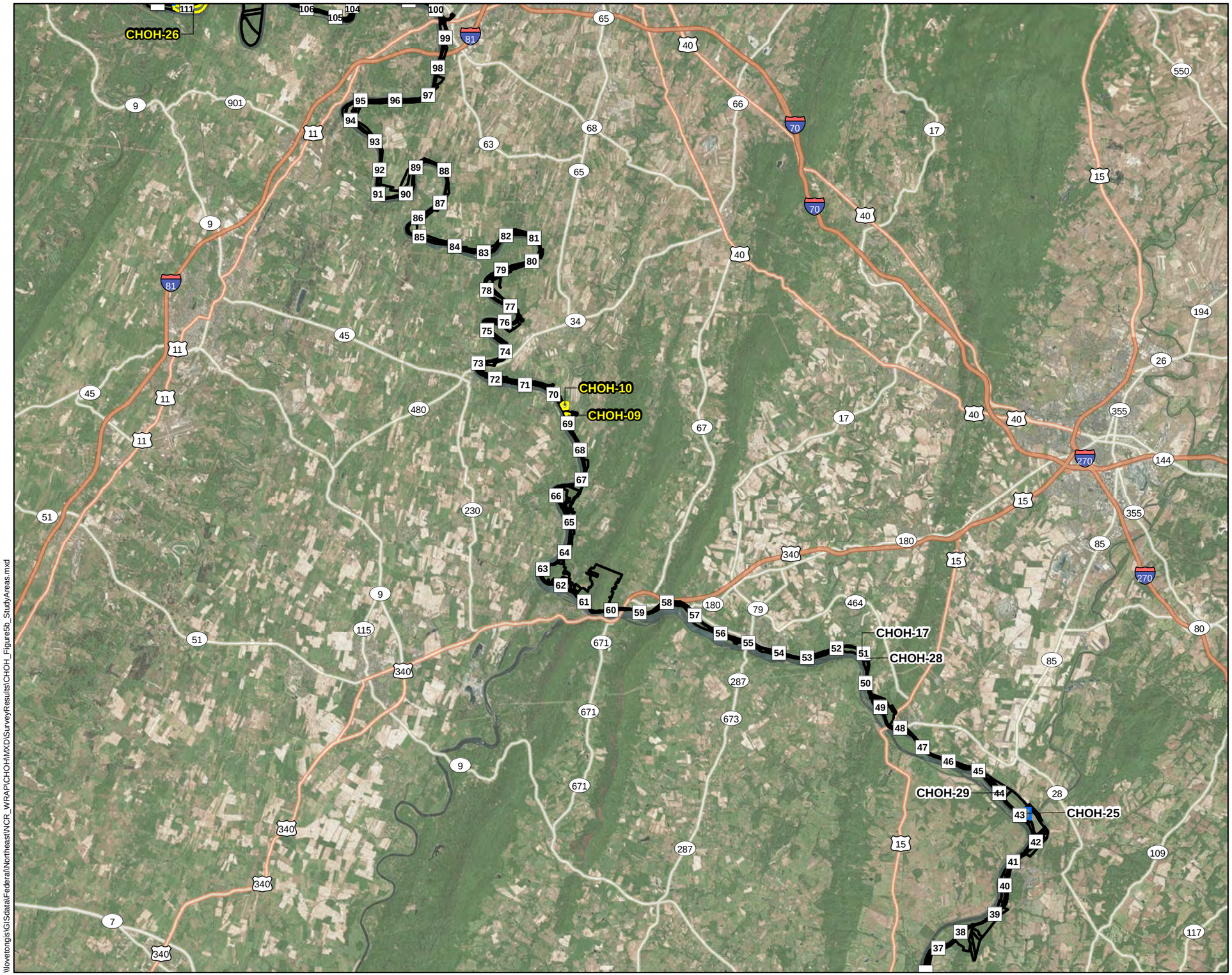
Figure 5a
Study Areas
C&O Canal
NPS/NCR Wetland Restoration Action Plan
Maryland and Washington, D.C.



Legend

- Mile Marker
- Park Boundary
- Study Area
- Study Area Dropped Before Field Review
- Study Area Dropped After Field Review

Aerial: ESRI, 2015

Map Date: 12/9/2016

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Miles

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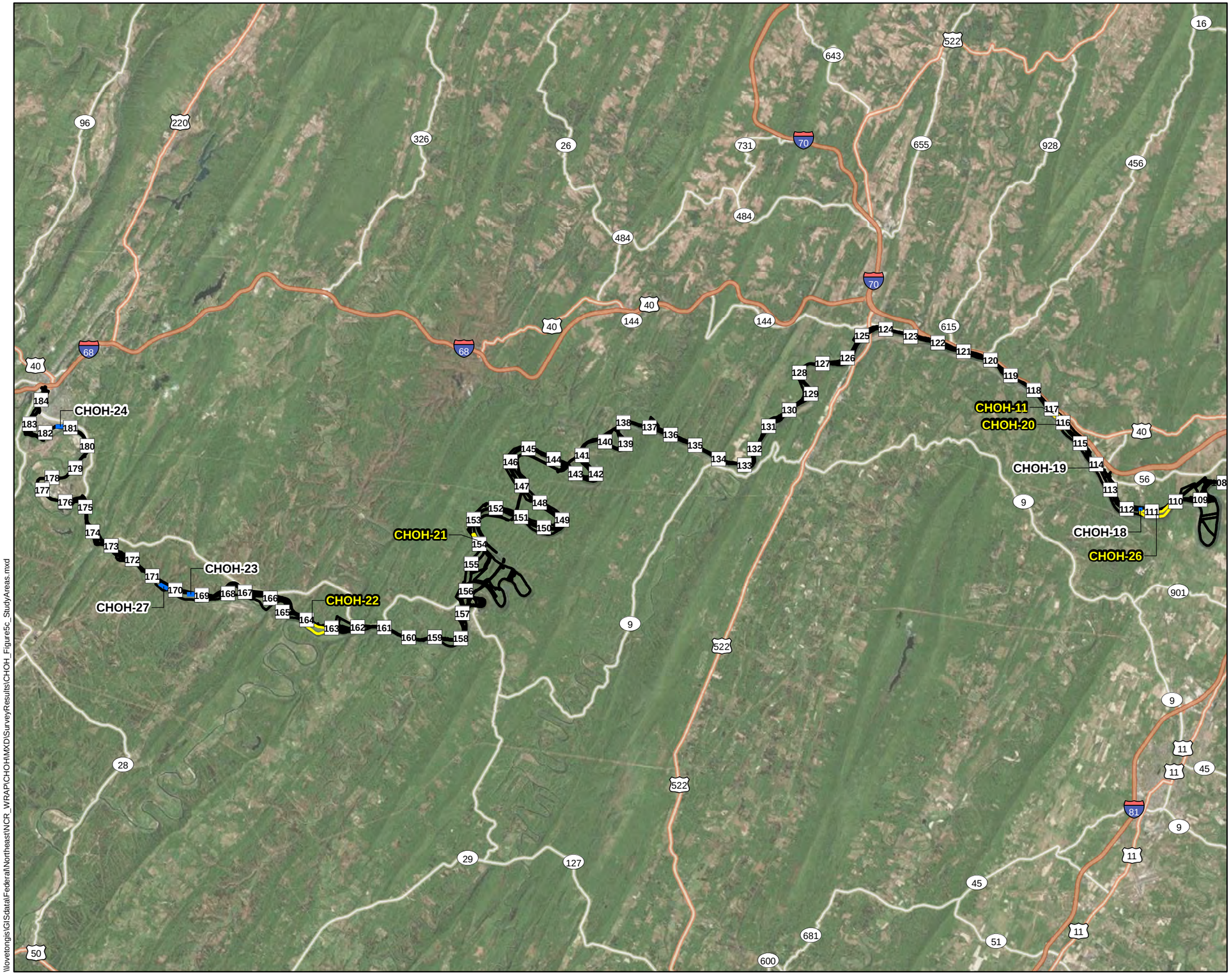
Figure 5b
Study Area
C&O Canal
NPS/NCR Wetland Restoration Action Plan
Maryland and Washington, D.C.



VICINITY MAP

Legend

- 1 Mile Marker
- Park Boundary
- Study Area
- Study Area Dropped Before Field Review
- Study Area Dropped After Field Review

Aerial: ESRI, 2015

Map Date: 12/9/2016

N

0 4 8
Miles

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Figure 5c
Study Areas
C&O Canal
NPS/NCR Wetland Restoration Action Plan
Maryland and Washington, D.C.

VICINITY MAP

Legend

- Park Boundary
- Study Area
- Culvert
- Waters of the US (WUS)
- Wetland, Open Water
- Pipe

Proposed Conditions

- Invasive Species Control and Native Plantings
- Riparian Plantings

Aerial: ESRI, 2015

Map Date: 7/6/2016

N

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Feet

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Figure 6a
CATO-01
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland

VICINITY MAP

Legend

- Park Boundary
- Study Area
- Waters of the US (WUS)
- Wetland, Open Water
- Wetland, Emergent
- Wetland, Forested

Proposed Conditions

- Invasive Species Control and Native Plantings
- Riparian Plantings

Aerial: ESRI, 2015

Map Date: 7/6/2016

N

0 20 40
Feet

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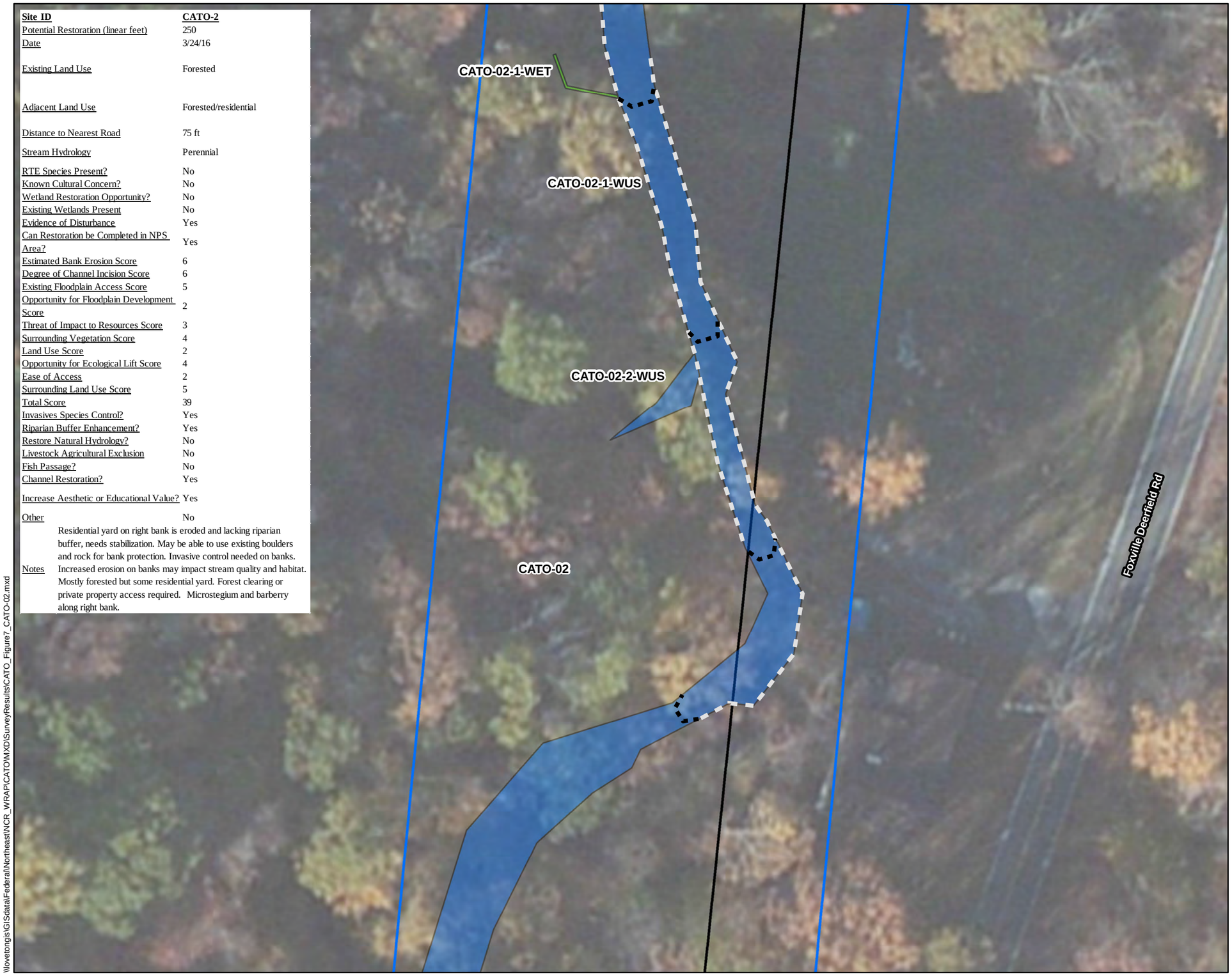
Figure 6b
CATO-01
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland

Site ID	**CATO-1**
Potential Restoration Area (Acres)	0.00
Date of Field Assessment	3/21/16
Existing Land Use	old field/home stead
Adjacent Land Use	old field/home stead/park
Distance to Nearest Road	adjacent
RTE Species Present?	No
Known Cultural Concern?	Yes
Stream Restoration Opportunity?	Yes
Site Currently Wetland?	Yes
Site Formerly Wetland?	Yes
Evidence of Disturbance	Yes
Soils Score	9
Hydrology Score	9
Existing Vegetation Score	8
Geomorphic Score	9
Surrounding Land Use Score	7
Function and Value Score	7
Presence of Invasive Species Score	7
Site Disturbance Score	6
Ease of Access Score	9
Stormwater Influence Score	9
Total Score	80
Invasive Species Control?	Yes
Native Plantings?	Yes
Restore Hydrology?	Yes
Increase Diversity?	Yes
Convert Open Water to Vegetated?	Yes
Convert Emergent to Shrub/Forested	No
Increase Asthetic or Educational Value	No
Other	No
Notes	Groundwater seep feeding pond, berm separates from stream hydric soils within seep groundwater seep on NE edge. Pond overflows to stream through verticle pipe open water, trees and shrubs along border. Water level could be lowered and planted to increase habitat and diversity, improve connection to stream. Barberry and multiflora rose along edge culvert and berm continue to alter stream flow, however no new alteration gravel road off main road crosses stream.

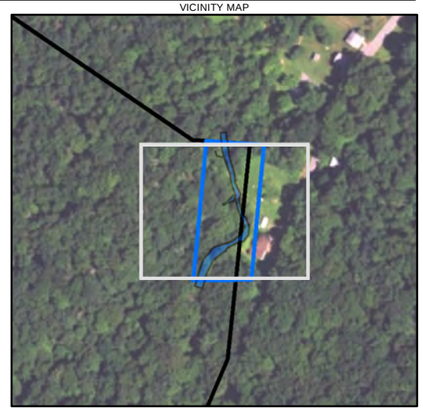
Site ID	**CATO-1**
Potential Restoration (linear feet)	100
Date	3/21/16
Existing Land Use	old field
Adjacent Land Use	open field/forested
Distance to Nearest Road	0ft
Stream Hydrology	Perennial
RTE Species Present?	No
Known Cultural Concern?	Yes
Wetland Restoration Opportunity?	Yes
Existing Wetlands Present	Yes
Evidence of Disturbance	Yes
Can Restoration be Completed in NPS Area?	Yes
Estimated Bank Erosion Score	3
Degree of Channel Incision Score	1
Existing Floodplain Access Score	3
Opportunity for Floodplain Development Score	8
Threat of Impact to Resources Score	3
Surrounding Vegetation Score	5
Land Use Score	1
Opportunity for Ecological Lift Score	5
Ease of Access	10
Surrounding Land Use Score	5
Total Score	44
Invasives Species Control?	Yes
Riparian Buffer Enhancement?	Yes
Restore Natural Hydrology?	Yes
Livestock Agricultural Exclusion	No
Fish Passage?	Yes
Channel Restoration?	Yes
Increase Aesthetic or Educational Value?	Yes
Other	No
Notes	Small channel appears to have been diverted from natural flow around the pond embankment and through a culvert beneath the driveway causing minor bank erosion and fish passage issues. Lack of riparian buffer below the existing driveway.

Site ID	CATO-2
Potential Restoration (linear feet)	250
Date	3/24/16
Existing Land Use	Forested
Adjacent Land Use	Forested/residential
Distance to Nearest Road	75 ft
Stream Hydrology	Perennial
RTE Species Present?	No
Known Cultural Concern?	No
Wetland Restoration Opportunity?	No
Existing Wetlands Present	No
Evidence of Disturbance	Yes
Can Restoration be Completed in NPS Area?	Yes
Estimated Bank Erosion Score	6
Degree of Channel Incision Score	6
Existing Floodplain Access Score	5
Opportunity for Floodplain Development Score	2
Threat of Impact to Resources Score	3
Surrounding Vegetation Score	4
Land Use Score	2
Opportunity for Ecological Lift Score	4
Ease of Access	2
Surrounding Land Use Score	5
Total Score	39
Invasives Species Control?	Yes
Riparian Buffer Enhancement?	Yes
Restore Natural Hydrology?	No
Livestock Agricultural Exclusion	No
Fish Passage?	No
Channel Restoration?	Yes
Increase Aesthetic or Educational Value?	Yes
Other	No

Notes: Residential yard on right bank is eroded and lacking riparian buffer, needs stabilization. May be able to use existing boulders and rock for bank protection. Invasive control needed on banks. Increased erosion on banks may impact stream quality and habitat. Mostly forested but some residential yard. Forest clearing or private property access required. Microstegium and barberry along right bank.



VICINITY MAP



Legend

- Park Boundary
- Study Area
- Waters of the US (WUS)
- Wetland, Forested

Proposed Conditions

- Bank Armoring
- Channel Cross Vane

Aerial: ESRI, 2015

Map Date: 9/22/2016

N

0 40 80
Feet

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Figure 7
CATO-02
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland

Site ID	CATO-3
Potential Restoration (linear feet)	100
Date	3/24/16
Existing Land Use	Forested /road
Adjacent Land Use	Forested
Distance to Nearest Road	0 at road
Stream Hydrology	Perennial
RTE Species Present?	No
Known Cultural Concern?	No
Wetland Restoration Opportunity?	No
Existing Wetlands Present	No
Evidence of Disturbance	Yes
Can Restoration be Completed in NPS Area?	Yes
Estimated Bank Erosion Score	5
Degree of Channel Incision Score	2
Existing Floodplain Access Score	8
Opportunity for Floodplain Development Score	5
Threat of Impact to Resources Score	9
Surrounding Vegetation Score	8
Land Use Score	8
Opportunity for Ecological Lift Score	5
Ease of Access	10
Surrounding Land Use Score	8
Total Score	68
Invasives Species Control?	Yes
Riparian Buffer Enhancement?	No
Restore Natural Hydrology?	Yes
Livestock Agricultural Exclusion	No
Fish Passage?	No
Channel Restoration?	Yes
Increase Aesthetic or Educational Value?	Yes
Other	Yes
Notes	Stream at road crossing near Owens campground. Issues with stream alignment to culvert wing wall and eroding bank downstream. Protection of existing left stream bank downstream of culvert with Boulder placement. Also opportunity for larger rock check damn along roadside drainage to reduce gravel wash entering stream. Also opportunity to protect existing wing wall on left bank.

VICINITY MAP

Legend

- Park Boundary
- Study Area
- Culvert
- Waters of the US (WUS)

Proposed Conditions

- Bank Armoring
- Check Dam
- Full Stream Restoration with Channel Relocation

Aerial: ESRI, 2015

Map Date: 9/22/2016

N

0 20 40
Feet

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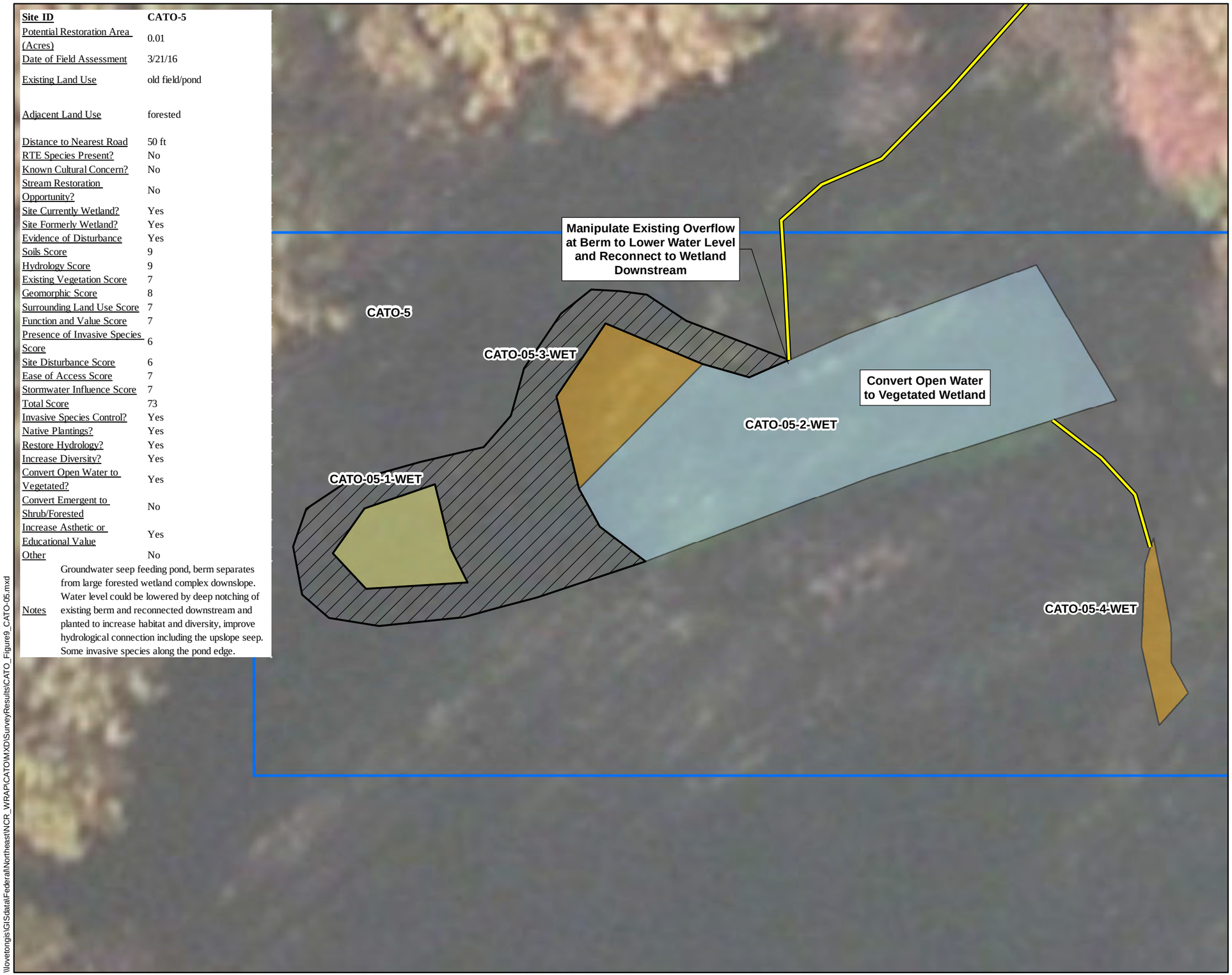
Figure 8
CATO-03
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland

Site ID	CATO-5
Potential Restoration Area (Acres)	0.01
Date of Field Assessment	3/21/16
Existing Land Use	old field/pond
Adjacent Land Use	forested
Distance to Nearest Road	50 ft
RTE Species Present?	No
Known Cultural Concern?	No
Stream Restoration Opportunity?	No
Site Currently Wetland?	Yes
Site Formerly Wetland?	Yes
Evidence of Disturbance	Yes
Soils Score	9
Hydrology Score	9
Existing Vegetation Score	7
Geomorphic Score	8
Surrounding Land Use Score	7
Function and Value Score	7
Presence of Invasive Species Score	6
Site Disturbance Score	6
Ease of Access Score	7
Stormwater Influence Score	7
Total Score	73
Invasive Species Control?	Yes
Native Plantings?	Yes
Restore Hydrology?	Yes
Increase Diversity?	Yes
Convert Open Water to Vegetated?	Yes
Convert Emergent to Shrub/Forested	No
Increase Asthetic or Educational Value	Yes
Other	No
Notes	Groundwater seep feeding pond, berm separates from large forested wetland complex downslope. Water level could be lowered by deep notching of existing berm and reconnected downstream and planted to increase habitat and diversity, improve hydrological connection including the upslope seep. Some invasive species along the pond edge.



VICINITY MAP

Legend

- Park Boundary
- Study Area
- Wetland, Open Water
- Wetland, Emergent
- Wetland, Scrub/Shrub

Proposed Conditions

- Hydrologic Connection
- Invasive Species Control and Native Plantings

Aerial: ESRI, 2015

Map Date: 7/6/2016

N

0 20 40

Feet

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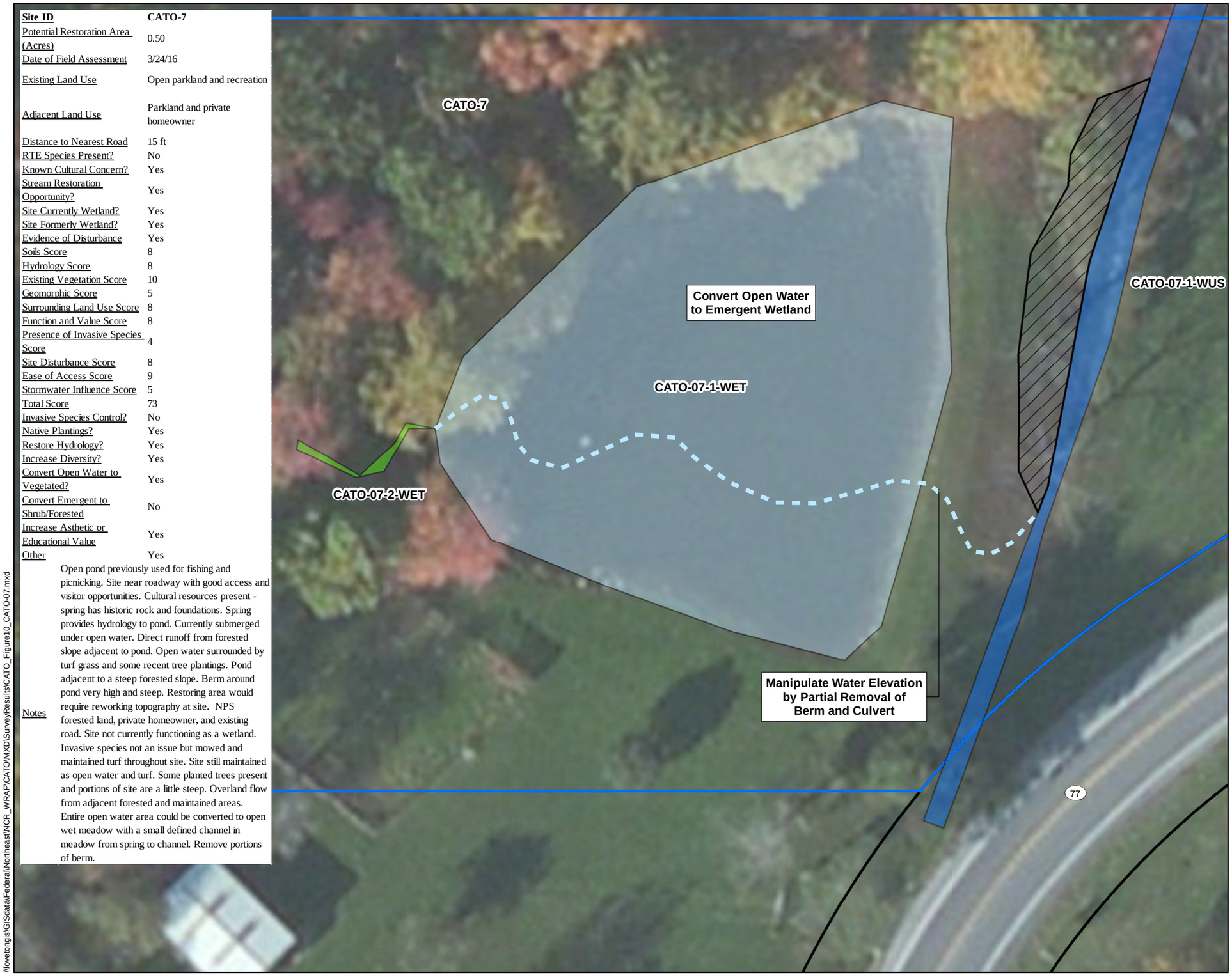
Figure 9
CATO-05
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland

Site ID	CATO-7
Potential Restoration Area (Acres)	0.50
Date of Field Assessment	3/24/16
Existing Land Use	Open parkland and recreation
Adjacent Land Use	Parkland and private homeowner
Distance to Nearest Road	15 ft
RTE Species Present?	No
Known Cultural Concern?	Yes
Stream Restoration Opportunity?	Yes
Site Currently Wetland?	Yes
Site Formerly Wetland?	Yes
Evidence of Disturbance	Yes
Soils Score	8
Hydrology Score	8
Existing Vegetation Score	10
Geomorphic Score	5
Surrounding Land Use Score	8
Function and Value Score	8
Presence of Invasive Species Score	4
Site Disturbance Score	8
Ease of Access Score	9
Stormwater Influence Score	5
Total Score	73
Invasive Species Control?	No
Native Plantings?	Yes
Restore Hydrology?	Yes
Increase Diversity?	Yes
Convert Open Water to Vegetated?	Yes
Convert Emergent to Shrub/Forested	No
Increase Asthetic or Educational Value	Yes
Other	Yes
Notes	Open pond previously used for fishing and picnicking. Site near roadway with good access and visitor opportunities. Cultural resources present - spring has historic rock and foundations. Spring provides hydrology to pond. Currently submerged under open water. Direct runoff from forested slope adjacent to pond. Open water surrounded by turf grass and some recent tree plantings. Pond adjacent to a steep forested slope. Berm around pond very high and steep. Restoring area would require reworking topography at site. NPS forested land, private homeowner, and existing road. Site not currently functioning as a wetland. Invasive species not an issue but mowed and maintained turf throughout site. Site still maintained as open water and turf. Some planted trees present and portions of site are a little steep. Overland flow from adjacent forested and maintained areas. Entire open water area could be converted to open wet meadow with a small defined channel in meadow from spring to channel. Remove portions of berm.



VICINITY MAP

Legend

- Park Boundary
- Study Area
- Waters of the US (WUS)
- Wetland, Open Water
- Wetland, Forested

Proposed Conditions

- Small Channel Creation
- Invasive Species Control and Native Plantings

Aerial: ESRI, 2015

Map Date: 9/22/2016

N

0 20 40
Feet

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Figure 10
CATO-07
Catoctin
NPS/NCR Wetland Restoration Action Plan
Frederick, Maryland