Ulster County 2021 Climate Smart Communities Recertification Documentation

PE7 Action: Riparian Buffers

4 POINTS DOCUMENTED

Background: The Ulster County Soil & Water Conservation District (UCSWCD) has been working for over fifty years and is responsible for the direct design and implementation of engineering and agronomic practices intended for the improvement of water quality and the preservation of the County's natural resources. A major focus area for the District is to assist municipalities, citizen's groups, agricultural operations and individuals in the planning, development and implementation of vegetative buffer systems which promote water quality, improve aesthetics, and facilitate wildlife habitat. Beginning in 2005, and in partnership with the USDA Natural Resource Conservation Service and the Village of New Paltz, a 35-foot wide riparian buffer system along 1,200 feet of the Wallkill River was initiated.

In the Ashokan Reservoir watershed, UCSWCD staff implement a similar program called the Catskill Streams and Buffer Initiative (CSBI), as part of the Ashokan Watershed Stream Management Program (AWSMP). Here, interested streamside landowners receive onsite technical assistance, educational materials, riparian corridor management plans, and best management practices design and installation. Since its inception, UCSWCD's CSBI program have worked with over 65 landowners to vegetate more than 13 acres of riparian area (~18,500 feet of streambank), with over 10,000 trees and shrubs planted.

The AWSMP partnership is fully documented in the County's 2021 CSC recertification materials under the CSC action "PE1: Partnerships with Other Entities", and is a joint effort between Cornell Cooperative Extension of Ulster County, the Ulster County Soil and Water Conservation District, and the New York City Department of Environmental Protection. The three agencies work collaboratively to maintain the health of streams in the Ashokan Reservoir Watershed. The program aims to improve stream stability and reduce erosion threats to water quality and infrastructure, mitigate potential damage from flooding, and enhance aquatic and riparian habitat. AWSMP works to educate and inform the community about stream stewardship best management practices and coordinates stream management activities in the watershed. Stream management plans — comprehensive evaluations of stream characteristics with recommendations and strategies for improvement — provide the basis for the program's activities.

- UCSWCD's CSBI for Riparian Landowners: https://ashokanstreams.org/our-areas-of-focus/streamside-landowners/
- CSBI general webpage: https://catskillstreams.org/catskill-streams-buffer-initiative/
- AWSMP webpage: https://ashokanstreams.org/about-the-program/

Documentation:

- Riparian Assessment (2 points) – Included is an assessment that was conducted for a 40-mile stretch (which included 106 sample plots across 13 community types) of the upper Esopus Creek watershed riparian area. The primary objective of this assessment was to classify, map, and describe a set of reference riparian habitat types that can then be used by the Soil & Water Conservation District and through the CSBI, to guide stream corridor restoration projects.

- Project Summary: Woodland Creek Vegetation Mapping Assessment. The project used remote sensed data to map riparian vegetation communities.
- Stream management Planning Phase 1 LandUse-LandCover Assessment & Riparian Buffer Width Assessment Tables
  - *Included as separate document
- *Inventory, Classification, And Description of Riparian Natural Community Reference Types for Ashokan Watershed, New York - Final Technical Report December 2012 (*includes Woodland Creek)
  - *Included as separate document
- *Woodland Creek Stream Management Plan (2018):* Each management unit has a discrete section on riparian buffer condition and recommendations.
  - Webpage (available for download): https://ashokanstreams.org/woodland-valley-creekstream-management-plan-now-available-for-free-download/

- Riparian revegetation (2 points) – Attached information for two revegetation sites: Costa (right bank) and Sammet (left bank) parcels which are on opposite sides of the Warner Creek. This project was part of a larger stream restoration effort, Warner Creek Site 5, which was initiated after Tropical Storm Irene in 2011. The riparian revegetation project covered 850 linear feet, revegetated 1.03 acres (44,867 square feet), and contained nearly 1,400 plantings.
  - Project Summary: Warner Site 5 landowners and riparian restoration project
  - Warner Creek Site 5 Construction Plans: Included – *Proposed Conditions Plan View & Construction Specification 6—Seeding, Sprigging, and Mulching*
  - Project location maps & delineated planting area maps
    - *Included as separate document
  - Warner Creek site 5 riparian corridor management plans and planting plans with “Riparian Buffer Maintenance” section (pp. 16, 17). As there are two separate landowners own opposite sides of the creek, the plans are broken out by landowner.
    - *Included as separate document

Introduction and Purpose

Woodland Valley Stream Situated in located in the Catskill Mountains in Ulster County, New York. It is one of the nine perennial tributaries of the Esopus Creek and is characterized as a mountain freshwater creek that supports a wide variety of plants and animals (Figure 1). The total study/focus area of the Woodland Valley river corridor is 1,128.5 acres (1.76 sq. miles). Located in the vicinity of the Woodland Valley Stream is the Woodland Valley Campground, the areas surrounding the campground were clear cut in the late 1800's, and the bark from hemlock trees was used in the large tanning industries nearby. The land was subsequently abandoned and taken over by the state in 1902. Over the next 25 years it became a popular camping and hiking area. The large cabin and other original buildings were built by the Civilian Conservation Corps in the early 1930's, making this one of the earliest campgrounds. Two main trails come through the campground making it popular with hikers. The campsite is located at the base of Slide Mountain, the tallest peak in the Catskills, and surrounded by Panther, Cornell, and Wittenberg Mountains. Panter Mountain is the impact site of a meteorite that hit 350 million years ago. It is outlined by the Esopus Creek and Woodland Valley Stream, which form an almost perfect circle around Panther Mountain. Woodland Valley Stream contains the following fish species: cutlips minnow, blacknose dace, longnose dace, sculpin, brook trout, brown trout, rainbow trout, and white sucker (NYDEC, 2008).

New York City Department of Environmental Protection (NYCDEP) and its local government partners have created riparian land cover maps as part of their stream management planning process and have incorporated these maps within the stream management plans. Stream management plans involves local citizens and leaders in prioritizing actions and recommendations for long-term stewardship of the stream corridor. Riparian land cover maps are a valuable tool for identifying the condition of riparian buffers, documenting the intensity of land use along a stream corridor, and delineating areas for future protection and enhancement of the riparian buffer vegetation. The mapping to date consists of the production of an ARCGIS polygon shapefile and attribute tables based upon the photointerpretation and delineation of land cover from the digital orthophotography within a defined riparian corridor. The NYCDEP and Cornell Cooperative Extension of Ulster County (CCEU) contracted with Barry A. Vittor &

Associates, Inc. (Vittor & Associates) to create a similar GIS layer for the Woodland Valley Stream through this project.

Methods

The color infra-red NYS digital orthophotographic series flown in 2001 (UTM Zone projection 18 N based on the NAD 1983 datum) and provided by the NYCDEP were used as the base map for the photointerpretation and delineation of land cover class polygon boundaries. The contractor along with assistance from the NYCDEP delineated the river corridor boundary. The Woodland Valley river corridor was mapped by first selecting an existing river centerline from a hydrology coverage downloaded from the New York State GIS Clearing House (NYSGIS, 2008). Once an appropriate center line was identified, a 300-foot buffer of this line was created. The resulting coverage was reviewed and additional locations were added and subtracted by on-screen digitization dependent on elevation and interest by the consultant and the NYCDEP. Once the coverage was complete it was approved by the NYCDEP this coverage was used for the photointerpretation.

ArcView 3.3 GIS from ESRI was used to display the 2001 color infra-red digital ortho-photographs and to perform the on-screen digitization of the Level I and Level II vegetation mapping units (Appendix A) within the reaches of the Esopus Creek river corridor. Once zoomed into a specific area within the river corridor, the river corridor boundary was selected for editing. The shapefile was in editing mode, the splitting polygon tool was selected from the editing drop down menu. The Polygon Split tool  was used to draw a line across a polygon to split it into separate polygons. To draw this line, the user clicked where the line was to start (must be outside of the existing polygon to be cut or clipped), click each vertex along the line to create the new shape of the desired polygon, then double-click the final vertex. Once the user has finished drawing the line, ArcView automatically splits the polygon along the line drawn, and removes any overshoots from the line; a new record of that feature is added to the theme's feature attribute table. Once the polygon is split the attribute table was updated with the label of

the polygon for the Level I and Level II categories. If the identification of a particular polygon was not 100% it was flagged for checking during the field verification.

Once the polygon shapefile of the Level I and Level II vegetation mapping units was created, an ESRI Avenue script was run to check for topology (Appendix B). This script checks for overlaps and gaps within the polygon coverages, and identifies them as a separate polygons in the shapefile. If any gaps and/or overlaps were identified in the shapefile they were cleaned and corrected.

Once the delineation of the vegetation mapping units was completed, any questionable polygons were field verified. One of the issues faced when digitizing from aerial photography was the inability to determine the difference between tree canopy types, tree canopy densities, and driveway type, gravel or paved. For example, the aerial photography did not have a high enough resolution to determine the difference between white pine evergreen trees and hemlock evergreen trees, so the polygon was flagged for field verification. An advantage to this process is that once the polygons are identified slight color signatures and patterns on the aerial photography can be used to identify other polygons within the river corridor. Once back from the field, any corrections were made and some additional delineations were also completed. The final file was added to ARCGIS to assign the projection file (UTM Zone projection 18 N based on the NAD 1983 datum), and to create a basic metadata file.

Results and Discussion

A total of 1,129 acres was mapped using the Level I and Level II vegetation mapping units. The largest Level I mapping unit across the river corridor was Mixed Closed Tree Canopy (465.58 acres, 41% of the river corridor) (Table 1 & Figure 2). The largest Level II vegetation mapping unit with the most area was Closed Hemlock-Northern Harwood Forest (428.53 acres, 38% of the river corridor), followed by Closed Northern Hardwood (156.48 acres, 14% of the river corridor) (Table 2 & Figure 3). The spatial distributions of the different Level II vegetation mapping units are plotted on Map Sheets 1 through 20. Figures 4-6 document some of the

different habitats identified within the Woodland Valley Stream Corridor. The Woodland Valley Stream riparian zone is characterized by dense mixed closed tree canopy, made up of mainly northern hardwoods and hemlocks. Followed by pine forested areas and many natural ponds. There are also open and closed floodplain forests, and a few shallow emergent marshes and wet meadows (Figures 4-6).

References

Cornell Cooperative Extension of Ulster County and NYCDEP Stream Management Program. 2005. Phase 1 Geomorphic Assessment of Esopus Creek Above Ashokan Reservoir: Draft Report.

Cornell Cooperative Extension of Ulster County. Retrieved December, 2006 from Esopus Creek Stream Management Plan http://esopuscreek.org/.

New York State Department of Environmental Conservation. Retrieved August, 2008 from New York State Department of Environmental Conservation, http://www.dec.ny.gov/outdoor/24501.html

New York State Geographical Information Systems Clearinghouse Retrieved August, 2008 from New York State Geographical Information Systems, http://www.nysgis.state.ny.us/gisdata/inventories/

APPENDIX A

NYCDEP Riparian Vegetation Mapping Units

Level 1	Level 2
Bare soil	Cobble
	Construction Spoils
	Exposed Bank
	Gravel Mine
	Junkyard
	Landfill/dump
	Roadcut cliff/slope
	Bedrock
Herbaceous Vegetation	Mowed Lawn
	Mowed Lawn w/ Trees
	Mowed Roadside
	Pastureland
	Wet Meadow
	Shallow Emergent Marsh
	Sparse Vegetation
	Successional Old Field
	Cropland
Shrubland	Brushy Cleared Land
	Evergreen Shrubland
	Deciduous Shrubland
	Scrub/Shrub Wetland
	Successional Shrubland
Deciduous Closed Tree Canopy	Closed Northern Hardwood
	Closed Floodplain Forest
	Closed Deciduous Forested Wetlands
	Closed Successional Northern Hardwood
Deciduous Open Tree Canopy	Open Northern Hardwood
	Open Floodplain Forest
	Open Deciduous Forested Wetlands
	Open Successional Northern Hardwood
Evergreen Closed Tree Canopy	Closed Hemlock Forest
	Closed White Pine Forest
	Closed Evergreen Forested Wetlands
Evergreen Open Tree Canopy	Open Hemlock Forest
	Open White Pine Forest
	Open Evergreen Forested Wetlands
Mixed Closed Tree Canopy	Closed Hemlock-Northern Hardwood
	Closed Pine-Northern Hardwood
	Closed Spruce-Northern Hardwood
	Closed Mixed Forested Wetlands
Mixed Open Tree Canopy	Open Hemlock-Northern Hardwood
	Open Pine-Northern Hardwood
	Open Spruce-Northern Hardwood
	Open Mixed Forested Wetlands

Unpaved Road	Unpaved road
	Railroad
	Path
Impervious Surface	Paved
	Other
	Rooftop
Revetment	Riprap*
	Concrete
	Other
Water	Backwater Slough
	Farm Pond/agricultural pond
	Farm Pond/artifical pond
	Industrial Cooling Pond
	Natural Pond
	Reservoir/Artificial Impoundment
	Sewage Treatment Pond
	Tributary
	Beaver Impoundment
	Ephemeral Pond/Pool

Standards for classifying vegetation (modified from the National Vegetation Classification Standard):

Non-Vegetated
Impervious Surfaces (0% Vegetative Cover) Roads, buildings, driveways
Unpaved Road (0% Vegetative Cover) Semi-impervious surfaces, roads, driveways, railroads, paths (dirt, gravel)

Open Tree Canopy
Evergreen Open Tree Canopy (25% - 60% cover, Evergreens contribute to > 75%, Crowns not touching)
Deciduous Open Tree Canopy (25% - 60% cover, Deciduous contributes to > 75%)
Mixed evergreen-deciduous Open Tree Canopy (25% - 75% of each type)

Closed Tree Canopy
Closed Evergreen Tree Canopy (Evergreen contributes to > 75% cover)
Closed Deciduous Tree Canopy (Deciduous Contributes to 75% Cover)
Closed Mixed Tree Canopy (25% - 75% each type)

Herbaceous and Shrub Vegetation
Herbaceous Vegetation (Herbaceous species dominant, > 25% of cover)
Deciduous Shrubland (Shrubs > 0.5 m tall, individual or clumps not overlapping, > 25% canopy cover with tree cover < 25%)

APPENDIX B

```
'Avenue code to check planar topology in a polygon shapefile
theView = av.GetActiveDoc
theActiveTheme = theView.GetActiveThemes.Get(0)

if ( theActiveTheme.Is ( FTHEME ).NOT ) then
  return NIL
end

theFTab = theActiveTheme.GetFTab
theShapeFld = theFTab.FindField ( "Shape" )
if ( theShapeFld = NIL ) then
  MsgBox.Warning ( "Error in getting shape field for theFtab","")
end

'********************
' CLEAN the POLYGONS
'********************
' get the filename for the new polygon shapefile
def = "z" + theActiveTheme.GetName
theFN = FileDialog.Put(def.asFilename, "*.shp", "Cleaned Shapefile")
if ( theFN = NIL ) then
  return FALSE
end

' clean the shapes and put into a new theme
Shape.SetCleanPreference ( #SHAPE_CLEAN_HIGHEST_QUALITY )
theNewFTab = theFTab.ExportClean ( theFN, FALSE)
if (( theNewFTab.HasError)) then
  msgBox.Warning ( "Error making ftab!","")
  return NIL
end

theNewFTab.SetEditable ( TRUE )
theNewFTab.BeginTransaction
theNShapeFld = theNewFTab.FindField ( "Shape" )

' (re-)calculate the AREA and PERIMETER
theAFld = theNewFTab.FindField ( "Area" )
if ( theAFld = NIL ) then
  theNewFTab.AddFields ( { Field.Make ( "Area", #FIELD_FLOAT, 16, 5 ) } )
  theAFld = theNewFTab.FindField ( "Area" )
end
thePFld = theNewFTab.FindField ( "Perimeter" )
if ( thePFld = NIL ) then
  theNewFTab.AddFields ( { Field.Make ( "Perimeter", #FIELD_FLOAT, 16, 5 ) } )
  thePFld = theNewFTab.FindField ( "Perimeter" )
end

for each rec in theNewFTab
  theNewFTab.SetValue ( theAFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnArea ) )
```

```
  theNewFTab.SetValue ( thePFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnLength )
)
end

'********************
' CHECK TOPOLOGY
'********************
theFld = Field.Make ("Type", #FIELD_CHAR, 8, 0)
theNewFTab.AddFields ( { theFld } )

' get a list of the polygons
thePolygons = List.Make
theOrigBM = theNewFTab.GetSelection
if ( theOrigBM.Count = 0 ) then
  theOrigBM.Not
end
for each rec in theNewFTab
  thePolygons.Add ( theFTab.ReturnValue ( theShapeFld, rec ) )
  theNewFTab.SetValue ( theFld, rec, "Original" )
end

'********************
' FIND GAPS
'********************
theMER = theActiveTheme.ReturnExtent.Scale ( 2 )
theMERArea = theActiveTheme.ReturnExtent.ReturnArea

theShape2 = thePolygons.Get(0)
for each theP in thePolygons
    theShape2 = theP.ReturnUnion ( theShape2 )
end

theGaps1 = theMER.ReturnDifference ( theShape2 )
' remove the largest polygon
theGaps = theGaps1.Explode

for each i in 0..(theGaps.Count - 1)
  if ( theGaps.Get(i).ReturnArea > theMERArea ) then
    theGaps.Remove ( i )
    break
  end
end

'********************
' FIND OVERLAPS
'********************
theOverlapShapes = List.Make

for each i in 0..(thePolygons.Count - 2)
  for each j in (i+1)..(thePolygons.Count - 1)
    theOL = thePolygons.Get(i).ReturnIntersection ( thePolygons.Get(j) )
```

```
    if ( theOL.ReturnArea > 0.0 ) then
      theOverlapShapes.Add ( theOL )
    end
  end
end

theOverlaps = List.Make
for each theOL in theOverlapShapes
  theOL2 = theOL.Explode
  for each theOL3 in theOL2
    theOverlaps.Add ( theOL3 )
  end
end

' ************
' now add the gaps and overlaps to the new shapefile
' ****************
theNumOverlaps = theOverlaps.Count
theNumGaps = theGaps.Count
if ( ( theNumOverlaps > 0 ) OR ( theNumGaps > 0 ) )then
  for each theP in theOverlaps
    rec = theNewFTab.AddRecord
    theNewFTab.SetValue ( theNShapeFld, rec, theP )
    theNewFTab.SetValue ( theFld, rec, "Overlap" )
    theNewFTab.SetValue ( theAFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnArea )
)
    theNewFTab.SetValue ( thePFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnLength
) )
  end
  for each theG in theGaps
    rec = theNewFTab.AddRecord
    theNewFTab.SetValue ( theNShapeFld, rec, theG )
    theNewFTab.SetValue ( theFld, rec, "Gap" )
    theNewFTab.SetValue ( theAFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnArea )
)
    theNewFTab.SetValue ( thePFld, rec, ( theNewFTab.ReturnValue ( theNShapeFld, rec ).ReturnLength
) )
  end
end

msgBox.info ("Found "+theNumOverlaps.asString + " overlaps and "+theNumGaps.asString + "
gaps!","")

' finish up the new theme
theNewFTab.EndTransaction
theNewFTab.SetEditable ( FALSE )
theFTheme = FTheme.Make ( theNewFTab )
theView.AddTheme ( theFTheme )
```

Master Class Code	Master Class	Whole Watershed Acres	Whole Watershed Square miles	River Corridor Acres	River Corridor Square miles
1	Coniferous not overhanging	1572.102	2.45640873	50.64639	0.07913499
4	Deciduous not overhanging	11278.91	17.6233001	154.5368	0.24146367
2	Coniferous over roads	1.708093	0.0026689	0.58139	0.00090842
3	Coniferous over other impervious	1.154807	0.00180439	0.127276	0.00019887
5	Deciduous over roads	15.89578	0.02483716	4.832178	0.00755028
6	Deciduous over other impervious	12.59787	0.01968418	0.900525	0.00140707
14	Roads	24.45129	0.03820514	7.314633	0.01142911
15	Other Impervious	20.52046	0.03206321	3.505844	0.00547788
13	Buildings	14.14895	0.02210773	1.957367	0.00305839
8	Managed grass	10.49268	0.01639481	0.526244	0.00082226
9	Other Herbaceous	70.5473	0.11023016	13.53981	0.02115596
10	Shrubs	13.33981	0.02084346	1.613542	0.00252116
11	Turf	62.93536	0.0983365	12.89672	0.02015112
16	Bare Soil	1.058398	0.00165375	0	0
17	Water NHD	23.64577	0.03694652	20.36179	0.03181529
12	Water LC	7.535059	0.01177353	5.057751	0.00790274
	Total	**13131.05**	**20.5172583**	**278.3982**	**0.4349972**

***Note: WVC's MU-1 extends outside of the watershed boundary, therefore the corresponding river corridor file also extends outside of the watershed. The LULC data has been clipped to the WVC watershed boundary so the very downstream extent of the river corridor is not represented in this analysis.

LULC Category	LULC Category	Watershed Area (acres)	% of Watershed	River Corridor Area (acres)	% of River Corridor
Forest Land	Trees	12851.01365	97.87	205.183145	73.70
Urban or Built-up Land	Roads, Building, & Impervious Surfaces	90.477245	0.69	19.219213	6.90
Rangeland	Shrubs, Turf, & Other Herbaceous	157.315153	1.20	28.576316	10.26
Barren Land	Bare Ground	1.058398	0.01	0	0.00
Water	Water	31.180833	0.24	25.419537	9.13
	Total Area	13131.04528		278.398211	

* **

* This reflects the naming convention from Anderson Level 1 classification

**This reflects the naming convention that CA began with BNV and TR copied with BSK

Anderson's 4 digit classification table:

Series	Category
1000	Urban or Built-up Land
2000	Agriculture Land
3000	Rangeland
4000	Forest Land
5000	Water
6000	Wetland
7000	Barren Land
8000	Tundra
9000	Perennial Snow or Ice

Note: Some of the above categories are not observed and thus omitted from the Phase 1 appendix

LULC Coverage in Watershed and River Corridor

Anderson Level 1 Category	Watershed Area (acres)	% of Watershed	River Corridor Area (acres)	% of River Corridor
Forest Land	12,851.0	97.87	205.2	73.70
Urban or Built-up Land	90.5	0.69	19.2	6.90
Rangeland	157.3	1.20	28.6	10.26
Barren Land	1.1	< 0.01	0.0	0.00
Water	31.2	0.24	25.4	9.13
Total Area	13,131.0		278.4	

Anderson Level 1 Categories
Urban or Built-up Land
Agriculture Land
Rangeland
Forest Land
Water
Wetland
Barren Land
Tundra
Perennial Snow or Ice

Re-Grouping LULC Categories into Anderson 1 Classification

Forest Land	Urban or Built-up Land	Rangeland	Barren Land	Water
Coniferous not overhanging	Coniferous over roads	Managed grass	Bare Soil	Water NHD
Deciduous not overhanging	Coniferous over other impervious	Other Herbaceous		Water LC
	Deciduous over roads	Shrubs		
	Deciduous over other impervious	Turf		
	Roads			
	Other Impervious			
	Buildings			

	Total percent (%)			
	0-25 ft	25-50 ft	50-100 ft	> 100 ft
WVC-1	31.0	6.0	19.0	44.0
WVC-2	0.0	0.0	31.9	68.1
WVC-3	9.1	2.0	2.5	86.5
WVC-4	25.2	5.8	9.5	59.4
WVC-5	10.7	3.1	15.2	71.0
WVC-6	7.9	9.1	17.8	65.2
WVC-7	1.0	0.0	3.5	95.5

Data based on 2013 aerial imagery with buffer rings of 25, 50, and 100 ft around the bankfull width.

	Total length (ft)					
	0-25 ft	25-50 ft	50-100 ft	> 100 ft	Totals	
WVC-1	1743.150621	337.6121979	1068.633606	2477.215561	5626.611986	
WVC-2	0	0	688.9390106	1469.690048	2158.629059	
WVC-3	1008.518997	221.1015053	275.8989944	9623.41095	11128.93045	
WVC-4	4353.598415	1011.522695	1651.503387	10278.61419	17295.23869	
WVC-5	1033.525509	294.1287041	1457.602177	6831.770035	9617.026424	
WVC-6	840.1830941	962.7449056	1889.482006	6930.823269	10623.23327	
WVC-7	98.6405029	0	345.2593003	9333.952652	9777.852455	4812.010904
	9077.61714	**2827.110007**	**7377.318481**	**46945.4767**	**66227.52233**	
	13.7067141	4.268784197	11.13935449	70.88514722		

Reach	Left Bank Buffer					Right Bank Buffer				
	0-25 ft (%)	> 25-50 ft (%)	> 50-100 ft (%)	> 100 ft (%)	**Dominant Width**	0-25 ft (%)	> 25-50 ft (%)	> 50-100 ft (%)	> 100 ft (%)	**Dominant Width**
1	9.4	3.3	18.9	68.4	**> 100 ft**	53.8	8.9	19.1	18.2	**0-25 ft**
2	0.0	0.0	66.6	33.4	**> 50-100 ft**	0.0	0.0	0.0	100.0	**> 100 ft**
3	18.2	4.0	5.0	72.8	**> 100 ft**	0.0	0.0	0.0	100.0	**> 100 ft**
4	43.5	10.4	16.4	29.8	**0-25 ft**	6.9	1.3	2.8	89.0	**> 100 ft**
5	21.6	5.1	25.7	47.5	**> 100 ft**	0.0	1.0	4.8	94.2	**> 100 ft**
6	11.7	13.2	28.5	46.5	**> 100 ft**	4.1	4.9	7.0	84.0	**> 100 ft**
7	2.0	0.0	4.7	93.2	**> 100 ft**	0.0	0.0	2.4	97.6	**> 100 ft**

Reach	Dominant Width Category		**Impact Rating**
	Left Bank	Right Bank	
1	> 100 ft	0-25 ft	**L**
2	> 50-100 ft	> 100 ft	**NS**
3	> 100 ft	> 100 ft	**NS**
4	0-25 ft	> 100 ft	**L**
5	> 100 ft	> 100 ft	**NS**
6	> 100 ft	> 100 ft	**NS**
7	> 100 ft	> 100 ft	**NS**

High (H) - Over 75% of reach has 0-25' of riparian buffer on one or both banks

Low (L) - 25 to 75% of reach has 0-25' of riparian buffer on one or both banks

Not Significant (NS) - Less than 25% of reach has 0-25' of riparian buffer on one or both banks

Warner Creek Site 5 – Stream Restoration Project and Riparian Buffer Enhancement

Warner Creek received post flood intervention restoration work following Tropical Storm Irene under the NRCS Emergency Watershed Protection Program administered through Ulster County Soil & Water Conservation District. The restoration work aimed to remove the creek from contact with unstable glacial lake clays and to promote stream system stability by utilizing natural stream design principals to regain appropriate stream channel dimensioning. EWP program was unable to provide funding to restore the riparian zones through this restoration project.

The Ulster County Soil & Water Conservation district worked with the private landowners along the project to design and install a riparian buffer restoration project through the Ashokan Watershed Stream Management Program's Catskill Streams Buffer Initiative.

The CSBI program works with individual landowners to protect or restore riparian areas in the Ashokan Watershed. On the Warner Creek Site 5 project, two distinct landowners were involved in riparian restoration. The right bank (looking downstream) was owned by John Costa (see attached COSTA documents) and the left bank (looking downstream) was owned by John Sammett (see attached Samett documents). To clarify, while the CSBI program breaks down riparian restoration and implements best management practices on individual properties, this project was designed as a whole system (both right and left banks) but for organizational purposes each project is listed under applicable landowner name. Both right and left banks were planted during the same month, November 2013.

Project Statistics-

Costa Right Bank – Completed Fall 2013

Length – 348 LINEAR FT

Area – 25,980 sq. Ft. revegetated

Total Plants – 366 Shrubs , 140 Trees, 100 Willow live stakes

Sammett – Right Bank

Length – 502

Area – 18,887 sq. ft. re-vegetated

Total Plants – 490 Shrubs, 240 Shrubs, 50 willow live stakes

Total Combined for Warner Creek Site 5 Project

Length = 850 Linear Feet

Area = 1.03 Acres or 44,867 sq. ft. revegetated

1,195 trees and shrubs – 150 live stakes – 10 Clump Willow Plantings

LEGEND

STREAM OVERFLOW CHANNEL

EXISTING WATER'S EDGE

POND OVERFLOW CHANNELS

PROPOSED CHANNEL LIMITS

TREES TO BE REMOVED

ROCK LINED WATERWAY

End Channel Realignment

AREA OF DISTURBANCE/LIMITS OF CONSTRUCTION = 1.80 ACRES

STREAM OVERFLOW CHANNEL

POND OVERFLOW CHANNEL

STATION 1
ELEV: 1,159.20'

XS-S7
ELEV: 1,138.53'

TREES IN NEED OF REMOVAL

Slide Stabilization #2

PAVED STONE FOR TOE OF BANK STABILIZATION
TOP OF WALL ELEV. @ 3+90 = 1131.2'

STATION 6
ELEV: 1,126.46'

Live clumps

STATION 3
ELEV: 1,160.04'

ditch diversion

STONE CHANNEL BLOCK

AREA OF TREE REMOVAL

Riffle Ramp

LP (1) 8+00

ROOT WADS
SPACING ~15'

OVERFLOW CHANNELS

GRAVEL BAR

STONE CHANNEL BLOCK

Live Clumps

Hook Vane

STREAM BANK STABILIZATION
DONE BY OTHERS

Riffle Ramp

STATION 4
ELEV: 1,132.69'

PAVED STONE FOR TOE OF BANK STABILIZATION
TOP OF WALL ELEV. @ 1+60 = 1133.5'

Cross Vane

Slide Stabilization #1

Hook Vane

Begin Channel Realignment

Step pool

ROOT WADS
SPACING ~15'

Access Road

STATION 5
ELEV: 1,133.47'

0 10 25 50 100
1 inch = 50 feet

MATERIALS LIST

ACCESS ROAD: 420 L.F.
CONSTRUCTION ENTERANCE:1
TURNING VANES: 174 CY
CROSS VANES:216 CY
IN-STREAM CUT VOLUME: 600 CY
IN-STREAM FILL VOLUME: 1,906 CY
NON-WOVEN GEOTEXTILE: 2,051 SQ. YDS
CLEARING AND GRUBBING: ~1.0 AC
2½ INCH STONE FOR DITCH DIVERSION: 25 CY
ROCK FOR WATERWAY 75 CY
SOIL REMOVAL FOR SLOPE STABILIZATION #2: 4,050 CY
GRADED SAND MATERIAL FOR SLOPE STABILIZATION #2: 345 CY
GRADED RIVER ROCK BLANKET FOR SLOPE STABILIZATION #2: 810 CY
RIVER ROCK FOR SLOPE STABILIZATION #2: 615 CY
TOP SOIL FOR SLOPE STABILIZATION #2: 844 CY
CONSTRUCTED RIFFLES (2): 532 CY
PAVED STONE FOR SLOPE STABILIZATION #2: 187 CY
STONE CHANNEL BLOCKS (2): 29 CY

Date 8-1-2012
Designed D. Davis/J. Wedemeyer
Drawn
Checked
Approved
Title

Proposed Conditions Plan View
Warner Creek Site 5
Town of Shandaken
Ulster County, New York

NRCS
U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
NEW YORK

NRCS Drawing Name
Warner Creek site 5 2012.dwg

NRCS Project ID
NRCS-NY-6661

Sheet 3 of 14

REVISIONS			
Date Revised	Item(s) Revised	Revised By	Approved By

Construction Specification 6—Seeding, Sprigging, and Mulching

1. Scope
The work consists of preparing the area for treatment; furnishing and placing seed, sprigs, mulch, fertilizer, inoculant, lime, and other soil amendments; and anchoring mulch in designated areas as specified.

2. Material
Seed—All seed shall conform to the current rules and regulations of the state where it is being used and shall be from the latest crop available. It shall meet or exceed the standard for purity and germination listed in Section 7.

Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures are evidence of purity and germination. No seed will be accepted with a test date of more than 9 months before the delivery date to the site.

Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable shall be as defined in the current State laws relating to agricultural seeds. Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the contracting officer.

Fertilizer—Unless otherwise specified, the fertilizer shall be a commercial grade fertilizer. It shall meet the standard for grade and quality specified by State law. Where fertilizer is furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample of the fertilizer shall be furnished to the contracting officer for chemical analysis.

Inoculants—The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used except four times the amount shall be used when seed is applied using a hydraulic seeder. Seed shall be sown within 24 hours of treatment and shall not remain in the hydraulic seeder longer than 4 hours.

Lime and other soil amendments—Lime shall consist of standard ground agriculture limestone, or approved equivalent. Standard ground agriculture limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Other soil amendments shall meet quality criteria and application requirements specified in Section 7.

Mulch tackifiers—Asphalt emulsion tackifiers shall conform to the requirements of ASTM D 977, Specification for Emulsified Asphalt. The emulsified asphalt may be rapid setting, medium setting, or slow setting. Nonasphaltic tackifiers required because of environmental considerations shall be as specified in Section 7.

Straw mulch material—Straw mulch shall consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses, or other plants as specified in Section 7. The mulch material shall be air-dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds is not permitted. The contractor shall provide a method satisfactory to the contracting officer for determining weight of mulch furnished.

Other mulch materials—Mulching materials, such as wood cellulose fiber mulch, mulch tackifiers, synthetic fiber mulch, netting, and mesh, are other mulching materials that may be required for specialized locations and conditions. These materials, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

3. Seeding mixtures, sod, sprigs, and dates of planting

The application rate per acre for seed mixtures, sprigs, or sod and date of seeding or planting shall be as shown on the plans or as specified in Section 7.

4. Seedbed preparation and treatment

Areas to be treated shall be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking, or both, may be necessary to properly prepare a seedbed. Where equipment cannot operate safely, the seedbed shall be prepared by hand methods by scarifying to provide a roughened soil surface so that broadcast seed will remain in place.

If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on a compacted, polished, or freshly cut soil surface.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations shall be removed or disposed of as specified in Section 7.

Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the contracting officer's technical representative (COTR).

5. Seeding, sprigging, fertilizing, mulching, and stabilizing

All seeding or sprigging operations shall be performed in such a manner that the seed or sprigs are applied in the specified quantities uniformly in the designated areas. The method and rate of seed application shall be as specified in Section 7. Unless otherwise specified, seeding or sprigging shall be accomplished within 2 days after final grading is completed and approved.

Fertilizer, lime, and other soil amendments shall be applied as specified in Section 7. When specified, the fertilizer and soil amendments shall be thoroughly incorporated into the soil immediately following surface application.

The rate, amount, and kind of mulching or mesh shall be as specified in Section 7. Mulches shall be applied uniformly to the designated areas. They shall be applied to areas seeded not later than 2 working days after seeding has been performed. Straw mulch material shall be stabilized within 24 hours of application using a mulch crimper or equivalent anchoring tool or by a suitable tackifier. When the mulch crimper or equivalent anchoring tool is used, it shall have straight blades and be the type manufactured expressly for and capable of firmly punching the mulch into the soil. Where the equipment can be safely operated, it shall be operated on the contour. Hand methods shall be used where equipment cannot safely operate to perform the work required.

The tackifier shall be applied uniformly over the mulch material at the specified rate, or it shall be injected into the mulch material as it is being applied. Mesh or netting stabilizing materials shall be applied smoothly, but loosely on the designated areas. The edges of these materials shall be buried or securely anchored using spikes or staples as specified in Section 7.

The contractor shall maintain the mesh or netting areas until all work under the contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by water erosion, wind,

fire, or other causes. Such areas shall be repaired to reestablish the intended condition and to the design lines and grades required by the contract. The areas shall be refertilized, reseeded, and remulched before the new application of the mesh or netting.

6. Measurement and payment

Method 1—For items of work for which specific unit prices are established in the contract, each area treated is measured as specified in Section 7 and the area calculated to the nearest 0.1 acre. Payment for treatment is made at the contract unit price for the designated treatment, which will constitute full compensation for completion of the work.

When specified as an item of work, mesh or netting is measured to the nearest square yard of surface area covered and accepted. Payment is made at the contract unit price and will constitute full compensation for completion of the work.

Method 2—For items of work for which specific lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item is made at the contract lump sum price for the item and will constitute full compensation for the completion of the work.

Method 3—For items of work for which lump sum prices are established in the contract, payment is made as the work proceeds. Progress payments will be determined as specified in Section 7. Payment of the lump sum contract price will constitute full compensation for completion of the work.

All Methods—The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule is included in the payment for the item of work to which it is made subsidiary. Such items and the item(s) to which they are made subsidiary are identified in Section 7.

7. Items of work and construction details

Items of work to be performed in conformance with this specification and the construction details therefore are:

A. Bid Item 10, Seeding, Sprigging, and Mulching

1. This item shall consist of preparing the seed bed, seeding, and mulching all disturbed areas of the project site and removing and transplanting any live clumps of native species disturbed during channel reloacation.

2. In Section 6, Measurement and payment, Method 2 shall apply.

Seeding and Mulching

1. Permanent seeding shall consist of:

(a) scarifying areas to a depth of 2 inches with a disk or other suitable implement
(b) fertilizer shall be applied at a rate of 300 lbs/ac of 10-20-20
(c) lime shall be applied at a rate of 3 tons/ac
(d) the seeding rates for the disturbed areas shall be as listed below:

Certified Seed	Seed Mixture
Little Bluestem	35%
Big Bluestem	10%
Virginia Wild Rye	10%
Indian Grass	29%
Autumn Bentgrass	1%
Switch Grass	5%
Canada Wild Rye	10%

2. The seeding rate for this mixture shall be 20 lb/ac. Mulch shall be uniformly applied to permanently seeded areas at a rate of 2 tons/ac. Mulch shall be applied within 24 hours of seeding or cellulose fiber mulch applied as per manufacturer's recommendations.

3. After seeding and mulching a degradable erosion control blanket (burlap or jute) shall be installed over all disturbed areas on a slope of 2:1 or steeper. The erosion control blanket shall be a machine-produced 100% biodegradable woven blanket with a functional longevity of up to 24 months. The opening of the erosion control blanket shall be no larger than ¾".

4. Live clumps of native shrub species that will be disturbed during construction shall be removed with as much root mass as practical and relocated to other areas within the new floodplain as directed by the engineer's representative. The root mass of the relocated clumps shall be watered as practical during construction.

5. In Section 6, Measurement and payment, Method 3 shall apply.

NEW YORK STATE OF OPPORTUNITY. Climate Smart Communities

PE7 Action: Riparian Buffers

2 — 14 Points

A.Why is this action important?

Riparian buffers are areas along rivers, streams, and other bodies of surface water that are designated by humans to help protect the water body. Expanding riparian buffer areas and restoring vegetation, especially native trees and shrubs, helps to store water during droughts and helps protect people and property from the impacts of flooding. Healthy vegetated riparian buffers intercept rainfall, filter runoff, capture sediment, absorb excess floodwaters, provide shade (which reduces water temperatures), and reduce erosion. Restoring vegetated buffers is important in flood-prone areas, but also in upstream areas to reduce the speed and potentially the volume of floodwaters. Healthy riparian buffers also offer habitat benefits and contribute to ecosystem resiliency.

In general, the wider the buffer, the more effective it can be in providing all of the benefits described above. To address flooding, the most effective buffers should include the entire width of the floodplain. FEMA Flood Insurance Rate Maps (FIRMs) may be used as a tool to delineate the floodplain. However, note that flooding can occur outside of the mapped Special Flood Hazard Area (SFHA). A minimum riparian buffer of at least 100 feet is recommended by the US EPA to provide a wide range of stream protection functions.

This Climate Smart Communities (CSC) action is related to several others in the certification program:

PE7 Action: Conserve Natural Areas - This action offers guidance and points for protecting floodplains and riparian buffers through land acquisition and conservation easements.

PE7 Action: Watershed-based Flood Mitigation Plan - This action offers guidance and points for assessing a watershed and developing flood-mitigation strategies.

6.19 Preserve Natural Areas Through Zoning or Other Regulations - This action offers guidance and points for incorporating the protection of riparian buffers into local land regulations.

PE6 Action: Local Forestry Program - This action offers guidance and points for community-scale tree projects (e.g., tree planting and tree preservation ordinances), regardless of whether the trees are along a riparian area.

B.How to implement this action

This action focuses on assessing and revegetating riparian areas. To implement this action, consider the following:

Riparian assessment. Use land cover and other map data (e.g., FEMA FIRMS), watershed assessments, natural resources inventories, aerial photos, and local knowledge to complete the New York State (NYS) Statewide Riparian Opportunity Assessment. Use assessment results and landowner/stakeholder engagement to identify priority riparian buffer areas to conserve and revegetate.

Revegetate a riparian buffer area. Protect and revegetate riparian buffers with native trees, shrubs, and grasses. Revegetation project designs must include consideration of the underlying soil and chemical, hydrological, and biological processes that support riparian function. Designs should indicate how and when the project will meet the stated goals of the project. All projects should include a maintenance plan. Plantings can incorporate native fruit and edible species that overlap with sustainable food production or community garden models with appropriate maintenance plans (see edible stream buffer example below). Coordinate with state and federal agencies, to the extent required, to ensure adherence

with state and national policies in restoring floodplain connectivity to the waterway.

C.Timeframe, project costs, and resource needs

This action contains both short-term and long-term strategies with varying degrees of implementation costs. In general, a community can expect to make progress on this measure in between six-to-twelve months.

D.Which local governments implement this action? Which departments within the local government are most likely to have responsibility for this action?

This action is applicable to all types of local governments. The departments with the responsibility for leading parks and recreation development could be responsible for this action. If these do not exist, the department or office that leads climate and sustainability efforts may be responsible for this action. Municipal committees, such as CSC task forces, conservation advisory councils, environmental conservation committees, and watershed groups may also be involved and can help with outreach to local landowners. County Soil and Water Conservation Districts may be able to provide technical assistance with riparian buffer revegetation, especially in agricultural areas.

In some cases, local governments may wish to work together to implement this action, or by participating in a county-led process. Local governments will need to demonstrate substantial involvement in any intermunicipal or regional process to be eligible for CSC points.

E.How to obtain points for this action

Points for this action are tiered based on completion of the components described below. All must have occurred within ten years prior to the application date.

	POSSIBLE POINTS
Complete a riparian assessment that identifies and prioritizes sites for conservation and revegetation of buffers.	2
Revegetate a riparian buffer area for at least 50 feet width with a minimum area of 10,000 square feet. Revegetation projects must have a maintenance plan.	2
Revegetate a riparian buffer area for at least the mapped floodplain width or 100 feet and a length sufficient to reconnect existing vegetated buffer areas or a minimum area of 20,000 sq ft. Revegetation projects must have a maintenance plan.	4

F. What to submit

Riparian assessment: Submit a new or revised riparian assessment document that summarizes the maps/data used and identifies priority locations for conservation and revegetation based on data and stakeholder input.

Riparian revegetation: Submit evidence of a revegetation project and corresponding maintenance plan, including designs, plans and photos, clearly demonstrating the project meets minimum size requirements stated above.

The project(s) must have been completed within ten years prior to the application date.

All CSC action documentation is available for public viewing after an action is approved. Action submittals should not include any information or documents that are not intended to be viewed by the public.

G.Links to additional resources or examples

- DEC, NYS Trees for Tribs program
- New York Water Resources Institute - Riparian Buffers

- U.S. EPA, National Pollution Discharge Elimination System, Forest Roads
- New York State (NYS) Statewide Riparian Opportunity Assessment (to support the identification and prioritization of riparian sites for restoration or protection)
- NYS DEC riparian buffer web page (including funding options)
    - NYS Association of Soil and Water Conservation Districts
- Model Local Laws to Increase Resilience: Chapter 2: Wetland and Watercourse Protection Measures
- PA Department of Environmental Protection Riparian Forest Buffer Policy Part 2
- Town of New Paltz, NY Wetlands and Watercourse Protection Law
- Kingston Land Trust's edible stream buffer
- USGS StreamStats
- Federal Emergency Management Agency (FEMA) Map Service Center (MSC)
- USDA Soil Data and Maps

H.Recertification Requirements

The recertification requirements are the same as the initial certification requirements.