

DELAWARE AND RARITAN CANAL COMMISSION
APPLICATION
for
INDIVIDUAL APPROVAL and WAIVER

SAFETY IMPROVEMENTS
to
BULL'S ISLAND RECREATION AREA
Delaware & Raritan Canal State Park
Delaware and Kingwood Townships, Hunterdon County
New Jersey

Prepared for:
Delaware and Raritan Canal Commission
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2. BACKGROUND

Bull's Island Recreation Area is a very popular piece of the D&R Canal State Park administered by the New Jersey Department of Environmental Protection – Division of Parks & Forestry. It is located in Kingwood and Delaware Townships in Hunterdon County, and is bounded by the Delaware River and the Delaware and Raritan (D & R) Canal. The island marks the beginning of the feeder section of the canal which provides water into the primary canal, and is divided into northern and southern areas by a road connecting Route 29 to a pedestrian bridge that crosses the Delaware to Pennsylvania. The island is highly utilized for a wide variety of passive and active recreational activities from picnicking to boating. The southern portion of the island is a natural area with a boat launch. This project is located in the wooded northern portion of the island which has been used as a campground.

In June 2011, an American sycamore (*Platanus occidentalis*) tree approximately 42 inches at diameter at breast height (dbh) failed causing a human fatality. In response to this tragedy, DEP contracted with F.A. Bartlett Tree Expert Company to perform a tree risk assessment (July 2011) in the 6 acre up-river campground area (map 1) in order to determine why a tree, which to the untrained eye appeared to be healthy, ultimately failed in the early morning of a calm, sunny day. A tree risk assessment bases its determinations not only on the condition of the tree, but the potential targets and use of the space surrounding the tree. The species composition of this area is a mix of American sycamore, maple species (*Acer spp.* – silver, *saccharinum*; red, *rubrum*; boxelder, *negundo*), black walnut (*Juglans nigra*), and black locust (*Robinia pseudoacacia*). Evidence revealed that the root systems of the sycamore as well as the majority of the trees in the upper campground area were compromised as a result of siltation from past flooding events, structural defects and susceptibility to decay pathogens in the soil. Of the 180 trees assessed greater than 50 percent were determined to pose high to critical risk of failure.

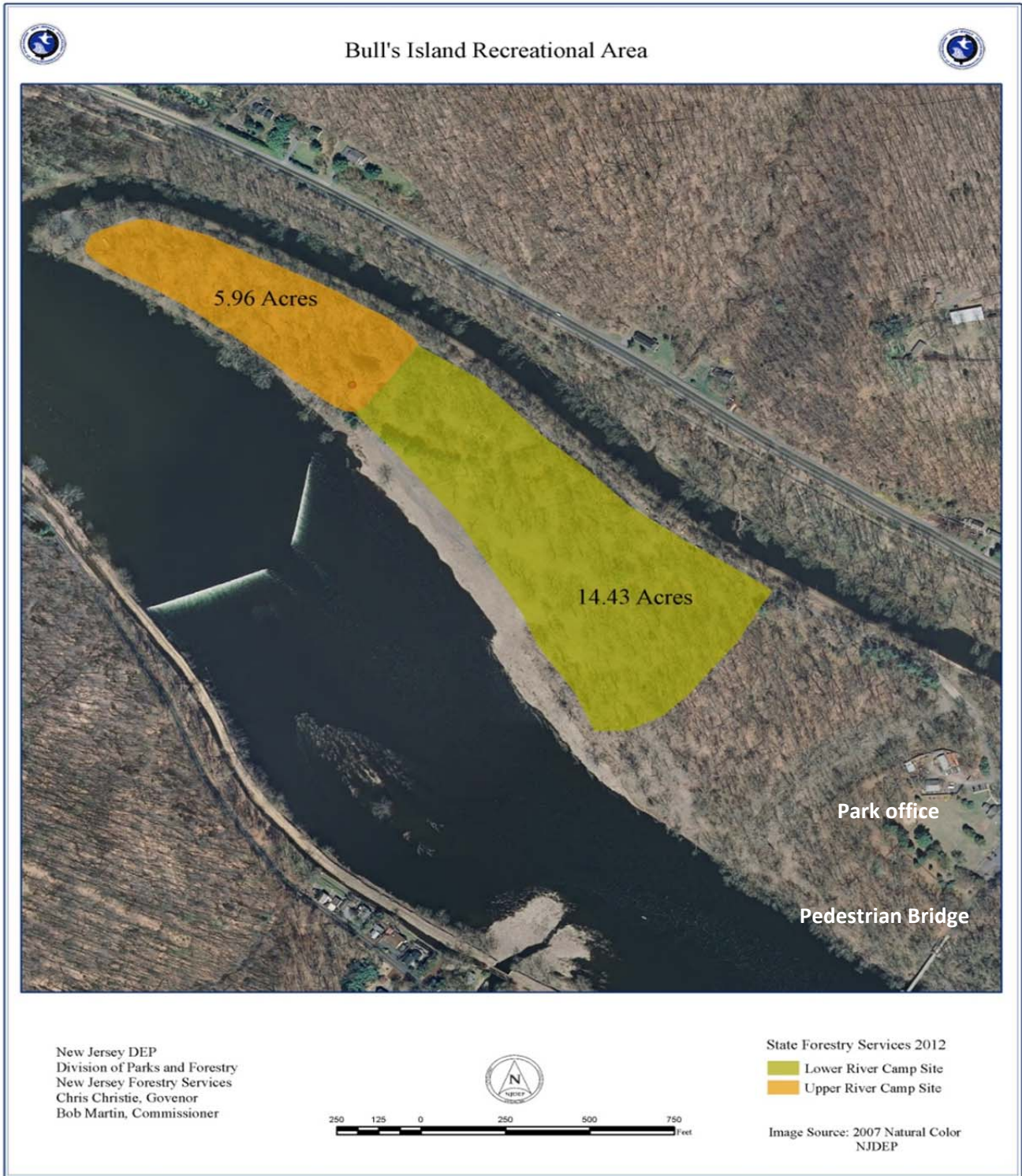
NJ DEP determined that no matter what action would be taken, if the site was going to be open to the public an additional tree risk assessment would be required in the down river section of the campground. The evaluation (August 2012) of this 14 acre area revealed 12 different species including 28% maple (boxelder, silver, sugar, *saccharum*), 19% American sycamore, and 15% hackberry (*Celtus occidentalis*). Results of the second tree risk assessment indicated the same compromised root systems were present in the down river campsite area as the up river area. Seventy-five percent (75%) of the sampled trees were determined to pose high to critical risk of failure. Consistent with the first tree risk assessment, roots were found to be buried under built up siltation from repeated flooding at a minimum of 6- 18 inches and up to 2 feet or more (picture 1). Buttress roots, the structural support for a tree were rarely detectable and adventitious roots which serve to feed and not stabilize the trees had appeared (Picture 2). Nine of the twenty six highest flooding events have occurred in the last ten years and four of those events occurred in 2011. Three years of consecutive flooding occurred in 2004, 2005, and 2006. Root system health and integrity is a primary concern.

It should be noted that in the period between their first tree risk assessment in July 2011 and the third tree risk assessment in November 2012, at least 30 trees failed or had significant failures throughout the entire former campground area

NJ DEP developed two alternatives as a result of the second tree risk assessment:

- 1) Completely close the campground area to all public access precluding access to and from the Delaware River and wing dam (weir), or
- 2) Establish a safe corridor for limited public access to and from the Delaware River and wing dam that would allow most of the existing trees to remain while simultaneously addressing public safety and access concerns.

In order to continue the recreational use of the northern portion of the island, the decision was made to move forward with the establishment of a safe, passive recreation corridor along the southern end of this area extending west to the Delaware River. This application is for the execution of that project.



Map 1 . Up river campground and down river campground tree risk assessment areas.



Picture 1. Soil removed 24 inches down a tree stem and no buttress roots were found.



Picture 2. Adventitious roots present at the soil surface.

3. PROJECT DESCRIPTION & METHODOLOGY

The new plan for Safety Improvements to Bull's Island Recreational Area will close the campground and establish a safe, passive corridor along the existing roadway adjacent to the Delaware River (map 2). The project will include: removing hazards, increasing pervious surface, and planting native trees, shrubs and herbaceous plants. The total area of disturbance for this project is 3.8 acres.

A total of 134 trees were evaluated during a third tree risk assessment (November 2012) for the corridor (map 3) (table 1). Seventy-nine (79) were identified as possible to critical risk and listed for removal (table 2). This evaluation looked at all trees ≥ 6 inches diameter at breast height (dbh) within 55 feet on either side of the preserved roadway. Some trees identified have already failed since the assessment and additional trees may need to be considered for removal as conditions have changed in the last year. It may also be necessary to remove some risk trees from the remaining parking area at the southeast end of the corridor that were not part of the managed area tree risk assessment for the safety of the public and their vehicles. Any fluctuation in number is not anticipated to exceed a 12% difference from the current schedule.

Risk trees within fifty (50) feet of either side of the preserved path and within the fifty-five (55) foot assessment area that have been rated at possible to critical risk of failure shall be removed. This establishes a target zone under (1 x Height of the tree) for the largest trees on the periphery of the path, and was decided as acceptable in order to minimize the number of trees removed and create an area of safer passage to the river. There will be no fixed targets such as picnic tables, benches or port-a-potties permitted within this corridor. The tree removal operation will be selective (no clear-cutting will take place and only the risk trees designated for removal will be harvested), leave tree stumps intact at ground level and ensure that tree removal operations minimize any land disturbance, soil compaction or erosion from the project area. To prevent stumps from re-sprouting, an application of herbicide directly to the stump by certified applicators may be required as part of the tree removal operations. No soil grading will be performed.

Nineteen (19) of the trees identified for removal along the pedestrian corridor are located within the 150 foot riparian buffer for the Delaware River. Compensation for the deforestation of the riparian zone will be effectuated according to Flood Hazard Area (FHA) Control Act Rules N.J.A.C. 7:13. DEP is seeking a FHA hardship exemption for an individual permit. Mitigation for the trees removed in the 150 foot Delaware River riparian zone is required. The replanting project is low maintenance and consists of only native species. Existing native vegetation will be preserved to the fullest extent possible. No lawns will be created and fertilizer use in conjunction with planting will be done in accordance with the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-30 et seq., and implementing rules. The replanting will serve to:

1. Establish smaller maturing trees adjacent to the walkway.
2. Control the reseeding of larger growing tree species back into the area adjacent to the walkway.
3. Monitor and prevent invasive species from establishing (a two-year maintenance period will be part of the tree planting contract).
4. Ensure the reintroduction of native shrubs and herbaceous plants.
5. Allow for a diversity of plants and habitat for wildlife.

The majority of the existing structures including bathhouses, a playground and paved roadways will be removed totaling 0.9 acres of impervious surface. The roadway for the new corridor as well as the path for NJ Water Supply Authority access will remain. "No Public Access" signs will be posted along the area of concern, and a gate will be installed at the entrance to the NJ Water Supply Authority access road. Existing structures and roadway pavement will be removed with no additional disturbance. The limit of disturbance for the demolition will be consistent with the footprint of the impervious structures and pavement. All grading will remain consistent with existing conditions.



Bull's Island Recreation Area

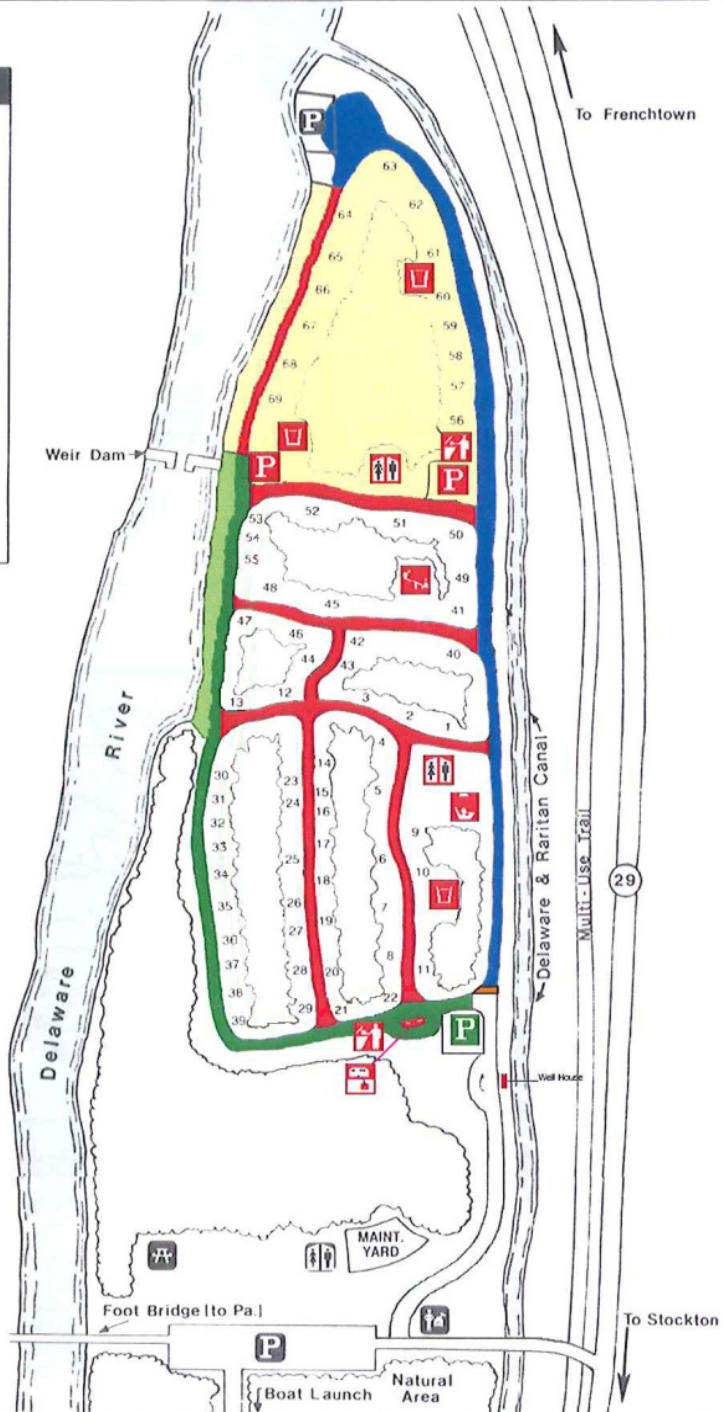


Legend

- Park Office
- Restroom
- Parking
- Showers
- Water
- Playground
- Picnic Area
- Trash Dumpster
- Dumping Station

ALL NUMBERS ARE RESERVABLE CAMPSITES

- Remove
- Paved driveway to remain
- Retain for Water Authority access
- Public Use Area
- Access Gate
- Upper Campsite Area



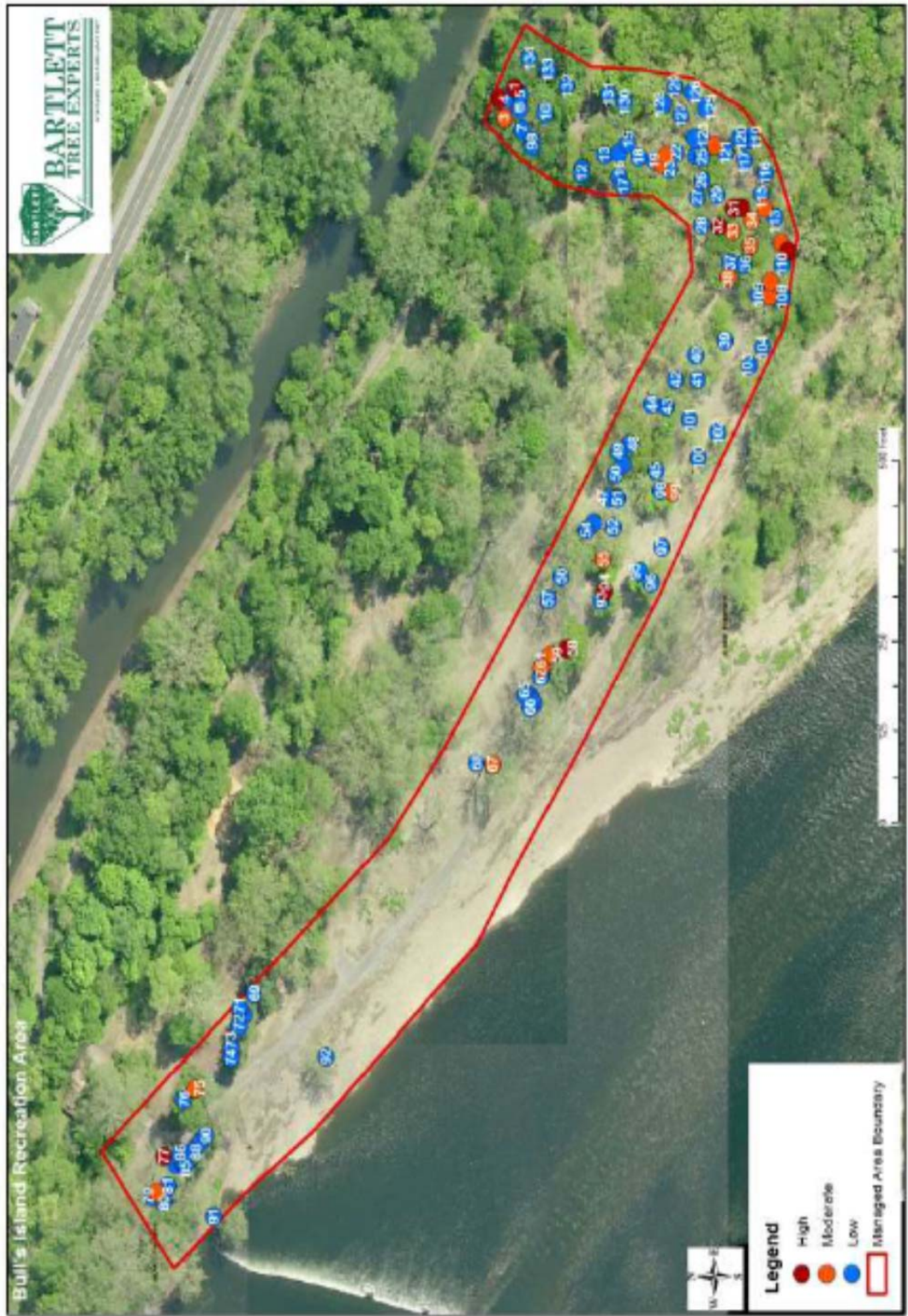
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Map 2. . Proposed Site Plan for Safety Improvements.

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Appendix I: Map 2: Proposed Frequent Use Risk Map



Map 3. Location of trees in the proposed pedestrian corridor.

Table 1. Inventory and analysis of 134 trees evaluated in the proposed managed corridor.

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Appendix H: Likelihood of Failure, Likelihood of Impacting a Target, Consequences of Failure, and Overall Risk Ratings for all trees inventoried in the "managed area boundary."

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of impacting a Target for current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
3	American sycamore	44	roots	probable	very low/low/moderate	severe	Low	Low	Moderate
20	eastern black oak	39	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
21	American sycamore	24	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
33	black walnut	14	stem	probable	very low/low/moderate	severe	Low	Low	Moderate
34	black walnut	13	roots	probable	very low/low/moderate	severe	Low	Low	Moderate
35	green ash	21	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
38	black walnut	14	roots	probable	very low/low/moderate	severe	Low	Low	Moderate
55	boxelder	24	stem	probable	very low/low/moderate	severe	Low	Low	Moderate
59	black walnut	22	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
61	American sycamore	39	stem	probable	very low/low/moderate	severe	Low	Low	Moderate
67	green ash	31	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
75	American sycamore	34	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
78	American sycamore	35	stem	probable	very low/low/moderate	severe	Low	Low	Moderate
99	black walnut	21	stem	probable	very low/low/moderate	severe	Low	Low	Moderate
106	black walnut	23	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
109	American sycamore	28	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
112	black walnut	12	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
114	green ash	16	branches	probable	very low/low/moderate	severe	Low	Low	Moderate

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of Impacting a Target for current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
122	northern red oak	24	branches	probable	very low/low/moderate	severe	Low	Low	Moderate
6	northern hackberry	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
7	tree of heaven	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
8	American basswood	28	roots	possible	very low/low/moderate	severe	Low	Low	Low
9	northern hackberry	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
10	American basswood	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
13	northern red oak	35	roots	possible	very low/low/moderate	severe	Low	Low	Low
14	American basswood	17	roots	possible	very low/low/moderate	severe	Low	Low	Low
15	American sycamore	30	roots	possible	very low/low/moderate	severe	Low	Low	Low
16	American basswood	25	roots	possible	very low/low/moderate	severe	Low	Low	Low
17	black walnut	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
18	black walnut	11	roots	possible	very low/low/moderate	severe	Low	Low	Low
19	northern red oak	26	roots	possible	very low/low/moderate	severe	Low	Low	Low
22	bitternut hickory	15	roots	possible	very low/low/moderate	severe	Low	Low	Low
23	green ash	19	roots	possible	very low/low/moderate	severe	Low	Low	Low
24	American sycamore	34	roots	possible	very low/low/moderate	severe	Low	Low	Low
25	black walnut	19	stem	possible	very low/low/moderate	severe	Low	Low	Low
26	green ash	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
27	bitternut hickory	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
28	black walnut	15	stem	possible	very low/low/moderate	severe	Low	Low	Low

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of Impacting a Target for current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
29	American sycamore	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
36	bitternut hickory	21	roots	possible	very low/low/moderate	severe	Low	Low	Low
37	black walnut	12	roots	possible	very low/low/moderate	severe	Low	Low	Low
39	American basswood	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
40	American sycamore	35	roots	possible	very low/low/moderate	severe	Low	Low	Low
41	black walnut	13	stem	possible	very low/low/moderate	severe	Low	Low	Low
42	black walnut	25	roots	possible	very low/low/moderate	severe	Low	Low	Low
43	northern hackberry	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
44	black walnut	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
45	black walnut	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
46	American sycamore	25	roots	possible	very low/low/moderate	severe	Low	Low	Low
47	black walnut	20	stem	possible	very low/low/moderate	severe	Low	Low	Low
48	bitternut hickory	15	roots	possible	very low/low/moderate	severe	Low	Low	Low
49	green ash	29	roots	possible	very low/low/moderate	severe	Low	Low	Low
50	American sycamore	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
51	American sycamore	30	stem	possible	very low/low/moderate	severe	Low	Low	Low
52	American sycamore	33	roots	possible	very low/low/moderate	severe	Low	Low	Low
53	American sycamore	29	roots	possible	very low/low/moderate	severe	Low	Low	Low
54	black walnut	27	roots	possible	very low/low/moderate	severe	Low	Low	Low

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of Impacting a Target for current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
56	black walnut	28	roots	possible	very low/low/moderate	severe	Low	Low	Low
57	black walnut	29	roots	possible	very low/low/moderate	severe	Low	Low	Low
60	American sycamore	13	stem	possible	very low/low/moderate	severe	Low	Low	Low
62	American sycamore	26	roots	possible	very low/low/moderate	severe	Low	Low	Low
63	American sycamore	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
64	American sycamore	28	roots	possible	very low/low/moderate	severe	Low	Low	Low
65	American sycamore	25	roots	possible	very low/low/moderate	severe	Low	Low	Low
66	American sycamore	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
68	black walnut	29	roots	possible	very low/low/moderate	severe	Low	Low	Low
69	eastern white pine	22	stem	possible	very low/low/moderate	severe	Low	Low	Low
70	eastern white pine	18	roots	possible	very low/low/moderate	severe	Low	Low	Low
71	eastern white pine	21	roots	possible	very low/low/moderate	severe	Low	Low	Low
72	eastern white pine	17	roots	possible	very low/low/moderate	severe	Low	Low	Low
73	eastern white pine	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
74	eastern white pine	18	roots	possible	very low/low/moderate	severe	Low	Low	Low
76	silver maple	48	roots	possible	very low/low/moderate	severe	Low	Low	Low
79	eastern white pine	11	roots	possible	very low/low/moderate	severe	Low	Low	Low
80	eastern white pine	10	roots	possible	very low/low/moderate	severe	Low	Low	Low
81	eastern white pine	13	roots	possible	very low/low/moderate	severe	Low	Low	Low
82	eastern white pine	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
83	eastern white pine	17	roots	possible	very low/low/moderate	severe	Low	Low	Low

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of impacting a current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
84	eastern white pine	11	roots	possible	very low/low/moderate	severe	Low	Low	Low
85	eastern white pine	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
86	eastern white pine	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
87	eastern white pine	16	roots	possible	very low/low/moderate	severe	Low	Low	Low
88	eastern white pine	15	roots	possible	very low/low/moderate	severe	Low	Low	Low
89	eastern white pine	13	roots	possible	very low/low/moderate	severe	Low	Low	Low
90	eastern white pine	19	roots	possible	very low/low/moderate	severe	Low	Low	Low
91	American sycamore	30	roots	possible	very low/low/moderate	severe	Low	Low	Low
92	American sycamore	32	roots	possible	very low/low/moderate	severe	Low	Low	Low
93	boxelder	19	branches	possible	very low/low/moderate	severe	Low	Low	Low
95	sugar maple	26	roots	possible	very low/low/moderate	severe	Low	Low	Low
96	boxelder	22	roots	possible	very low/low/moderate	severe	Low	Low	Low
97	green ash	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
98	sugar maple	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
100	black walnut	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
101	bitternut hickory	26	roots	possible	very low/low/moderate	severe	Low	Low	Low
102	black locust	21	roots	possible	very low/low/moderate	severe	Low	Low	Low
103	black walnut	23	roots	possible	very low/low/moderate	severe	Low	Low	Low
104	black walnut	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
105	bitternut hickory	10	roots	possible	very low/low/moderate	severe	Low	Low	Low
107	American basswood	16	roots	possible	very low/low/moderate	severe	Low	Low	Low
108	green ash	16	roots	possible	very low/low/moderate	severe	Low	Low	Low
110	black walnut	27	roots	possible	very low/low/moderate	severe	Low	Low	Low

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of impacting a current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
113	green ash	28	roots	possible	very low/low/moderate	severe	Low	Low	Low
115	black walnut	16	roots	possible	very low/low/moderate	severe	Low	Low	Low
116	black walnut	17	roots	possible	very low/low/moderate	severe	Low	Low	Low
117	black walnut	17	roots	possible	very low/low/moderate	severe	Low	Low	Low
118	green ash	16	roots	possible	very low/low/moderate	severe	Low	Low	Low
119	green ash	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
120	green ash	17	roots	possible	very low/low/moderate	severe	Low	Low	Low
121	black walnut	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
123	green ash	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
124	bitternut hickory	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
125	American sycamore	21	roots	possible	very low/low/moderate	severe	Low	Low	Low
126	American sycamore	32	branches	possible	very low/low/moderate	severe	Low	Low	Low
127	green ash	19	roots	possible	very low/low/moderate	severe	Low	Low	Low
128	eastern white oak	18	stem	possible	very low/low/moderate	severe	Low	Low	Low
129	honeylocust	14	roots	possible	very low/low/moderate	severe	Low	Low	Low
130	American basswood	20	roots	possible	very low/low/moderate	severe	Low	Low	Low
131	boxelder	24	roots	possible	very low/low/moderate	severe	Low	Low	Low
132	boxelder	19	roots	possible	very low/low/moderate	severe	Low	Low	Low
133	boxelder	21	roots	possible	very low/low/moderate	severe	Low	Low	Low
134	silver maple	33	branches	possible	very low/low/moderate	severe	Low	Low	Low
4	northern hackberry	10	roots	improbable	very low/low/moderate	severe	Low	Low	Low
5	boxelder	10	roots	improbable	very low/low/moderate	severe	Low	Low	Low
11	white mulberry	7	roots	improbable	very low/low/moderate	severe	Low	Low	Low

Bull's Island Recreation Area: Tree Risk Assessment and Results November 2012

Tree Id	Common Name	DBH	Plant Part of Concern	Likelihood of Failure	Likelihood of Impacting a Target for current/occasional/frequent occupancy rates	Consequences of Failure	Current Use Risk Rating	Proposed Occasional Use Risk Rating	Proposed Frequent Use Risk Rating
12	American basswood	14	roots	improbable	very low/low/moderate	severe	Low	Low	Low
1	black walnut	18	branches	imminent	very low/low/moderate	severe	Low	Moderate	High
2	silver maple	48	crown	imminent	very low/low/moderate	severe	Low	Moderate	High
30	northern red oak	19	branches	imminent	very low/low/moderate	severe	Low	Moderate	High
31	northern red oak	24	roots	imminent	very low/low/moderate	severe	Low	Moderate	High
32	green ash	21	roots	imminent	very low/low/moderate	severe	Low	Moderate	High
58	northern red oak	39	branches	imminent	very low/low/moderate	severe	Low	Moderate	High
77	American sycamore	41	branches	imminent	very low/low/moderate	severe	Low	Moderate	High
94	boxelder	18	branches	imminent	very low/low/moderate	severe	Low	Moderate	High
111	honeylocust	23	roots	imminent	very low/low/moderate	severe	Low	Moderate	High

Table 2. Bull's Island safe corridor tree removal summary.

Tree ID Tag #	Tree Species (common name)	Diameter at Breast Height (DBH)
1	Juglans nigra (black walnut)	18"
2	Acer saccharinum (silver maple)	48"
7	Ailanthus altissima (tree of heaven)	23"
10	Tilia americana (American basswood)	23"
13	Quercus rubra (northern red oak)	35"
14	Tilia americana (American basswood)	17"
15	Platanus occidentalis (American sycamore)	30"
20	Quercus velutina (black oak)	39"
21	Platanus occidentalis (American sycamore)	24"
23	Fraxinus pennsylvanica (green ash)	19"
24	Platanus occidentalis (American sycamore)	24"
25	Juglans nigra (black walnut)	19"
29	Platanus occidentalis (American sycamore)	22"
30	Quercus rubra (northern red oak)	19"
31	Quercus rubra (northern red oak)	24"
32	Fraxinus pennsylvanica (green ash)	21"
33	Juglans nigra (black walnut)	14"
34	Juglans nigra (black walnut)	13"
37	Juglans nigra (black walnut)	12"
38	Juglans nigra (black walnut)	14"
39	Tilia americana (American basswood)	20"
41	Juglans nigra (black walnut)	13"
42	Juglans nigra (black walnut)	25"
44	Juglans nigra (black walnut)	24"
45	Juglans nigra (black walnut)	24'
46	Platanus occidentalis (American sycamore)	25"
47	Juglans nigra (black walnut)	20"
49	Fraxinus pennsylvanica (green ash)	29"
50	Platanus occidentalis (American sycamore)	24"
51	Platanus occidentalis (American sycamore)	30"
53	Platanus occidentalis (American sycamore)	29"
54	Juglans nigra (black walnut)	27"
55	Acer negundo (boxelder maple)	24"
56	Juglans nigra (black walnut)	28"
57	Juglans nigra (black walnut)	29"
58	Quercus rubra (northern red oak)	39"
59	Juglans nigra (black walnut)	22"
60	Platanus occidentalis (American sycamore)	13"
61	Platanus occidentalis (American sycamore)	39"

Tree ID Tag #	Tree Species (common name)	Diameter at Breast Height (DBH)
62	Platanus occidentalis (American sycamore)	26"
63	Platanus occidentalis (American sycamore)	22"
64	Platanus occidentalis (American sycamore)	28"
65	Platanus occidentalis (American sycamore)	25"
66	Platanus occidentalis (American sycamore)	23"
67	Fraxinus pennsylvanica (green ash)	31"
68	Juglans nigra (black walnut)	29"
75	Platanus occidentalis (American sycamore)	34"
76	Acer saccharinum (silver maple)	48"
77	Platanus occidentalis (American sycamore)	41"
78	Platanus occidentalis (American sycamore)	35"
91	Platanus occidentalis (American sycamore)	30"
92	Platanus occidentalis (American sycamore)	32"
93	Acer negundo (boxelder maple)	19"
94	Acer negundo (boxelder maple)	18"
95	Acer saccharum (sugar maple)	26"
98	Acer saccharum (sugar maple)	19"
99	Juglans nigra (black walnut)	21"
100	Juglans nigra (black walnut)	23"
101	Carya cordiformis (bitternut hickory)	26"
103	Juglans nigra (black walnut)	23"
104	Juglans nigra (black walnut)	24"
106	Juglans nigra (black walnut)	23"
109	Platanus occidentalis (American sycamore)	28"
110	Juglans nigra (black walnut)	27"
111	Gleditsia triacanthos (honey locust)	23"
112	Juglans nigra (black walnut)	12"
114	Fraxinus pennsylvanica (green ash)	16"
115	Juglans nigra (black walnut)	16"
117	Juglans nigra (black walnut)	17"
121	Juglans nigra (black walnut)	14"
122	Quercus rubra (northern red oak)	24"
127	Fraxinus pennsylvanica (green ash)	19"
130	Tilia americana (American basswood)	20"
131	Acer negundo (boxelder maple)	24"
132	Acer negundo (boxelder maple)	19"
133	Acer negundo (boxelder maple)	21"
134	Acer saccharinum (silver maple)	33"
3	Platanus occidentalis (American sycamore)	44"
35	Fraxinus Americana (green ash)	21"

Four-hundred twenty-five (425) trees will be planted. Native tree species that do not exceed 40 feet in height have been selected to avoid creation of a future risk situation. The planting list was developed in cooperation among the NJDEP's Office of Natural Lands Management, naturalists from the State Park Service, biologists from the endangered and non-game species program, and foresters from the State Forestry Service. Planting will be done according to the Cluster Planting Layout (figure 1) to give the planting a random, naturalized appearance. The replanting has been prioritized in the following way (map 4):

1. Riparian Corridor – reforestation in the area along the east site of the existing path within the 150' riparian zone where harvesting will occur.
2. Woodland Corridor – reforestation in the area along the path outside the 150' riparian buffer where harvesting will occur.
3. Riparian Woodland – enrichment planting in the area within the 150' riparian buffer where no harvesting will occur, but where an impervious roadway will be removed.
4. Campground Enrichment – enrichment planting in the area outside the 150' riparian buffer where no harvesting will occur, but where existing structures and impervious roadways will be removed.

The planting will primarily consist of 2 – 2.5 inch balled and burlap (B&B) material. Two native species pussy willow (*Salix discolor*) and smooth alder (*Alnus serrulata*) are not available in caliper inch sizes and will be procured in containers. These two species represent 45 of the 425 trees that will be planted and will be planted where existing roadways are being removed. In addition to the trees, 540 native shrubs and 900 herbaceous perennials will be planted (table 3).

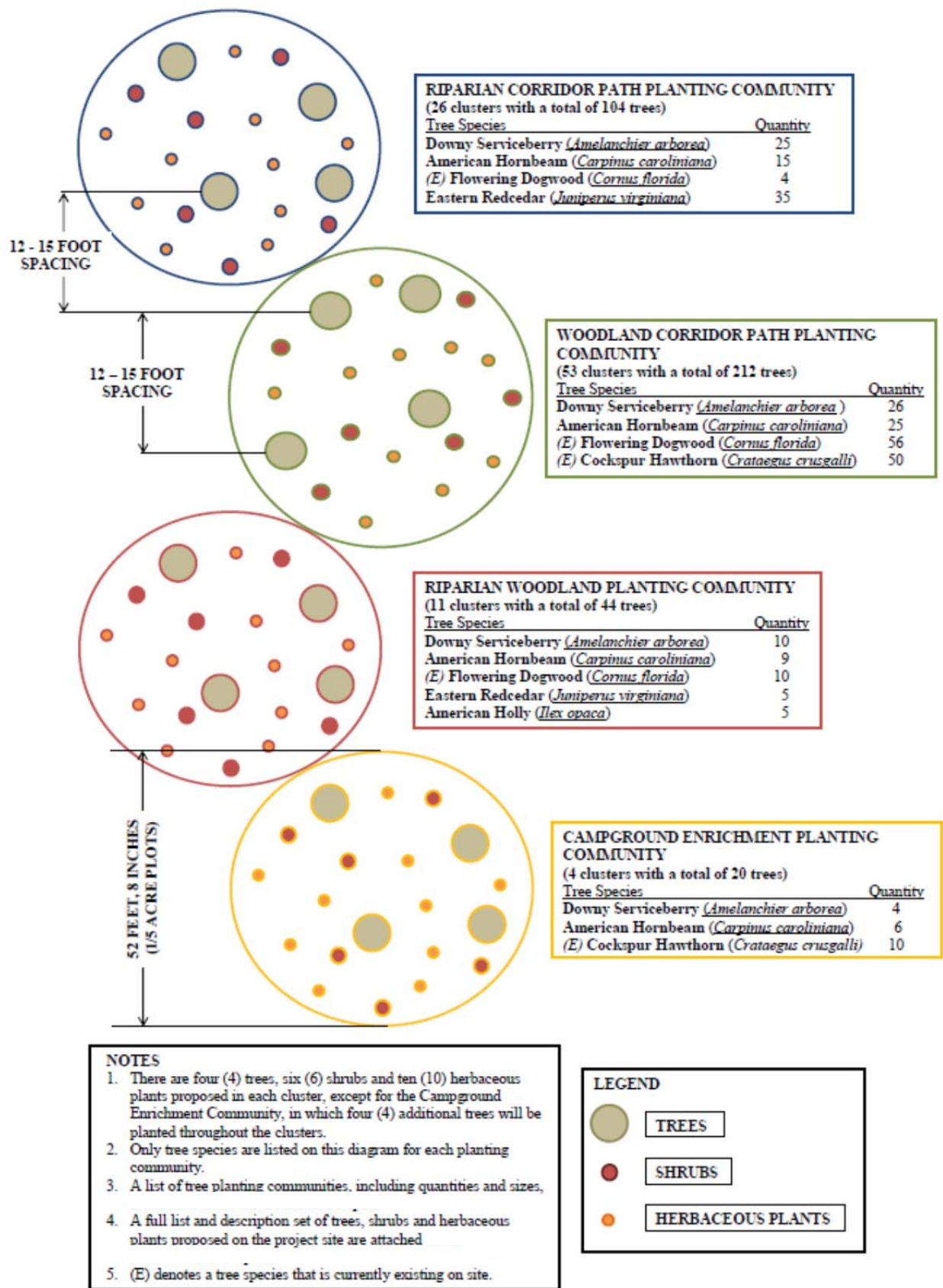


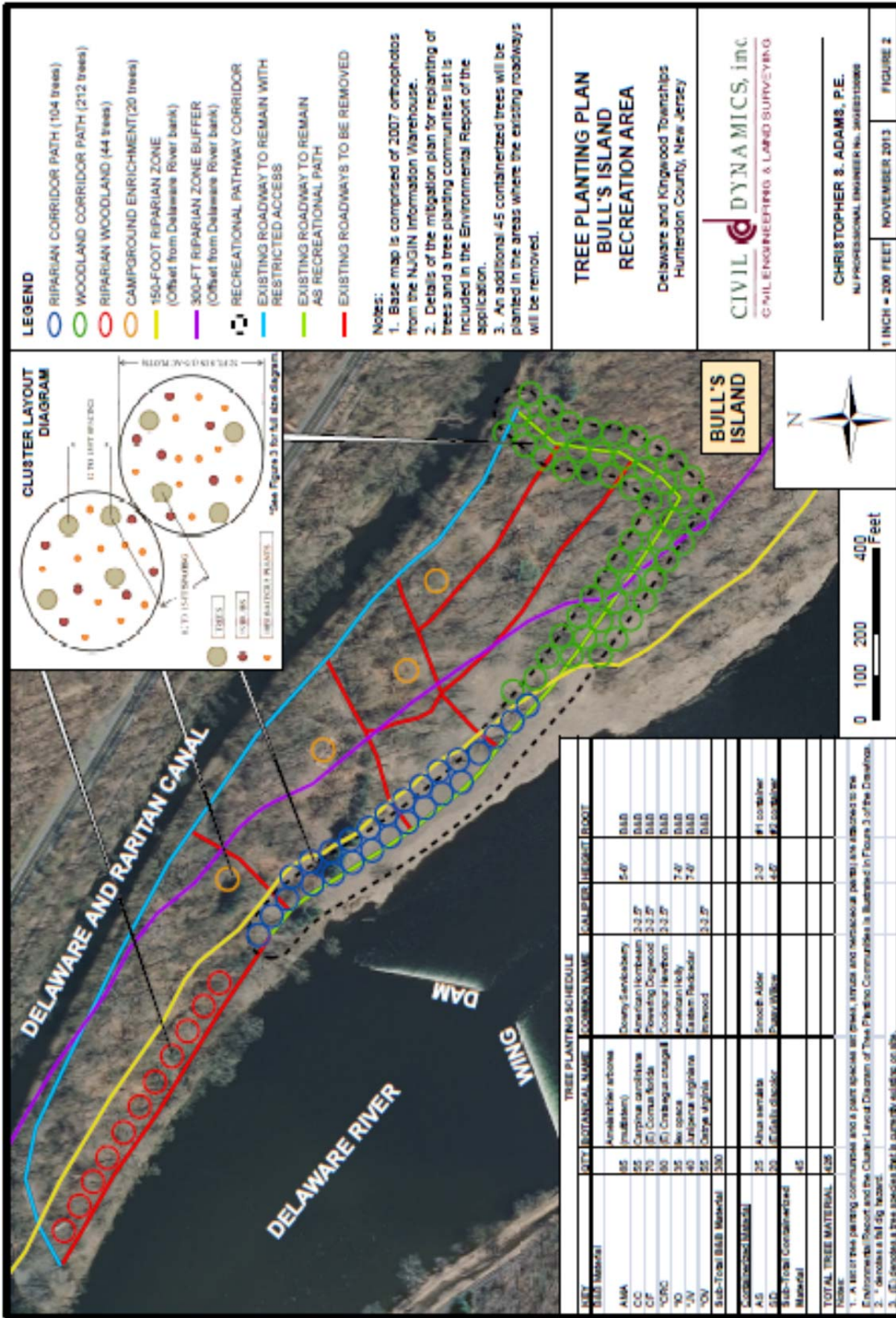
Figure 1. Cluster Layout Planting Method diagram and planting community description.

Table 3. Bull's Island replanting list species, quantities and sizes.

<u>Trees</u>	<u>Quantity</u>	<u>Size</u>
Downy Serviceberry (<i>Amelanchier arborea</i>)	65	5'-6' B&B
Smooth Alder (<i>Alnus serrulata</i>)	25	2'-3' container
American Hornbeam (<i>Carpinus caroliniana</i>)	55	2"-2.5" B&B
(E) Flowering Dogwood (<i>Cornus florida</i>)	70	2"-2.5" B&B
(E) Cockspur Hawthorn (<i>Crataegus crusgalli</i>)	60	2"-2.5" B&B
American Holly (<i>Ilex opaca</i>)	35	7'-8' B&B
Eastern Redcedar (<i>Juniperus virginiana</i>)	40	7'-8' B&B
(E) Pussy Willow (<i>Salix discolor</i>)	20	3'-4' container
Ironwood (<i>Ostrya virginia</i>)	55	2"-2.5" B&B
TOTAL	425	

<u>Shrubs</u>	<u>Quantity</u>	<u>Size</u>
Buttonbush (<i>Cephalanthus occidentalis</i>)	55	#1 Container
Sweet Pepperbush (<i>Clethra alnifolia</i>)	75	5 gallon 24"-30"
Silky Dogwood (<i>Cornus amomum</i>)	40	2'-3' B&B
Red-stem Dogwood (<i>Cornus stolonifera</i>)	55	1 quart
Common Witch-hazel (<i>Hamaemelis virginiana</i>)	30	2'-3' B&B
Winterberry (<i>Ilex verticillata</i>)	30	2'-3' B&B
(E) Spicebush (<i>Lindera benzoin</i>)	30	#1 Container
Swamp Azalea (<i>Rhododendron viscosum</i>)	15	#1 Container
American Elderberry (<i>Sambucus canadensis</i>)	40	3 gallon 18"-24"
(E) Bladdernut (<i>Staphylea trifolia</i>)	40	1 gallon
(E) Arrowwood (<i>Viburnum dentatum</i>)	75	2'-3' B&B
Sweet Viburnum (<i>Viburnum lentago</i>)	55	2'-3' B&B
TOTAL	540	

<u>Herbaceous Plants and Grasses</u>	<u>Quantity</u>	<u>Size</u>
Hay-scented Fern (<i>Dennstaedtia punctilobula</i>)	50	1 quart
Ostrich Fern (<i>Matteuccia struthiopteris</i>)	50	1 quart
(E) Gray's Sedge (<i>Carex grayi</i>)	40	1 quart
Pennsylvania Sedge (<i>Carex pennsylvanica</i>)	40	1 quart
Purple Giant Hyssop (<i>Agastache scrophularifolia</i>)	40	1 quart
Round-lobed Hepatica (<i>Anemone Americana</i>)	40	1 quart
(E) Jack-in-the-Pulpit (<i>Arisaema triphyllum</i>)	50	1 quart
(E) Wild Ginger (<i>Asarum canadense</i>)	40	1 quart
(E) Dutchman's-Breeches (<i>Dicentra cucullaria</i>)	50	1 quart
Hollow Stem Joe Pye Weed (<i>Eupatorium fistulosum</i>)	40	1 quart
(E) Boneset (<i>Eupatorium perfoliatum</i>)	50	1 quart
Joe Pye Weed (<i>Eutrochium fistulosum</i>)	45	1 gallon
Autumn Helenium (<i>Helenium autumnale</i>)	40	1 quart
Wild Bergamot (<i>Monarda fistulosa</i>)	35	1 quart
Switchgrass (<i>Panicum virgatum</i>)	35	1 quart
Solomon's Seal (<i>Polygonatum biflorum</i>)	35	1 quart
Early Saxifrage (<i>Saxifraga virginensis</i>)	40	1 quart
Little Bluestem (<i>Schizachyrium scoparium</i>)	35	1 quart
Zig-Zag Goldenrod (<i>Solidago flexicaulis</i>)	35	1 quart
Showy Goldenrod (<i>Solidago speciosa</i>)	35	1 quart
Upland Ironweed (<i>Veronica glauca</i>)	35	1 quart
New York Ironweed (<i>Vernonia noveboracensis</i>)	40	1 quart
TOTAL	900	



Map 3. Replanting communities and priority areas.

4. MASTER PLAN OF THE DELAWARE & RARITAN CANAL STATE PARK COMPLIANCE

This project strives to conform as nearly as possible to the Master Plan of the Delaware & Raritan Canal State Park adopted by the Commission in that the development plan for Bull's Island, "calls for maintaining and upgrading the present facilities, with clearer distinctions made among areas directed toward river uses, camping and picnicking, and the natural area."

This project is consistent with the Master Plan objectives as follows:

1. The Delaware and Raritan Canal is a water supply system.

This project does not take place directly on or along the canal itself. The removal of impervious surfaces and structures will actually provide a net benefit to water quality by reducing overall peak flow for the 2, 10, and 100-year events by 13%, 8%, and 5% respectively. There will also be an overall decrease in the runoff volume for the 2, 10, and 100-year events by 8%, 5%, and 3% respectively.

2. The Park is a site for recreational activities.

The primary goal of this project is to ensure that the northern portion of Bull's Island is safe and open for recreational activity that is compatible with the flood plain environment and provides for the enjoyment of the Delaware River and wing dam. This project directly seeks to ensure that access is "allocated to all parts of the park in order to avoid concentrating use at a few locations" by keeping the northern portion of the island open to the public to access the Delaware River and wing dam and to enjoy the wooded space.

3. The Park is a historic resource.

The NJ State Historic Preservation Office (SHPO) has state that, "the project does not have the potential to affect the historic character of the Canal." Please refer to the letter included with this submission.

4. The Park is an area that should be maintained in its natural state.

The decision to pursue the establishment of a corridor to the Delaware River and wing dam was done with consideration of preserving the wildlife habitat and natural vegetative communities to the maximum extent possible while facilitating safe public access to the site. This course of action minimizes the amount of disturbance to the existing landscape, and seeks to mitigate and enrich the site through the planting and maintenance of 1,865 native trees, shrubs and herbaceous plants. All plants have been identified and vetted as appropriate for the floodplain. The island will continue to serve as a migratory route for plants and animals.

This project will not adversely impact any rare, threatened or endangered species. Included with this application are the natural heritage data for the site as well as a letter from the NJDEP Division of Fish and Wildlife.

NJ State Threatened and Endangered Plants:

Broad-leaf Waterleaf (*Hydrophyllum canadense*) – One sub-population is located on the island and it is not in the area of the proposed work.

Missouri Gooseberry (*Ribes missouriense*) – Two sub-populations have been identified on the island. Neither one is in the area of the proposed work.

NJ State Threatened and Endangered Wildlife:

Wood Turtle (*Glyptemys insculpta*) – There is no record of nesting turtles on the island. There will be no adverse impact on turtles as long as there is still forest cover.

Bald Eagle (*Haliaeetus leucocephalus*) – There are no significant impacts for the species as sufficient perch trees for resting or hunting will remain.

Tree removal and all other identifies timing restricted activities will take place outside of wildlife breeding and roosting seasons. Swift replanting will ensure habitat is reestablished quickly. Restoration will maintain native plant communities to provide habitat.

5. The park is a means of enhancing urban areas.

Bull's Island has been identified as a rural environmental type based upon the character of this section of the Park and its adjoining corridor and is defined as such in the Park's Master Plan.

5. TYPES OF IMPACT

As a major project (a disturbance of 1 acre or more of land) in Zone A this project is subject to impact reviews for stormwater runoff and water quality, stream corridor impact, traffic impact, and visual, historic and natural impact.

A. Stormwater Runoff and Water Quality Impact

The removal of impervious surfaces and structures will actually provide a net benefit to water quality by reducing overall peak flow for the 2, 10, and 100-year events by 13%, 8%, and 5% respectively. There will also be an overall decrease in the runoff volume for the 2, 10, and 100-year events by 8%, 5%, and 3% respectively. Refer to enclosed signed and sealed Stormwater Management Report for Safety Improvements to Bull's Island Recreation Area prepared by Civil Dynamics, Inc. and the checklist enclosed.

B. Stream Corridor Impact

Historically, stream corridor impact has not been attributed as applicable to the Bull's Island area of the park by the Delaware and Raritan Canal State Park Commission.

C. Visual, Historic and Natural Quality Impact

Map 3 of this application shows the location of the existing trees in the project area. Table 1 details the all the species inventoried in the project area at ≥ 6 inches diameter at breast height. Fifty-five of those trees will remain and seventy-nine probable to critical risk trees are to be removed and are detailed in Table 2. Although visual impact is inherent in the removal of any tree, this project has planned for extensive compensatory planting with 1,865 native trees, shrubs and herbaceous plants. The natural quality of the area will be enhanced with the removal of existing structures (photo 3) and impervious surfaces (photo 2). The natural terrain, soil, stones, and vegetation will be preserved wherever possible.

The project has been assessed to have no impact on any historic resource by the State Historic Preservation Office (letter enclosed).

D. Traffic Impact

This project will not generate any additional traffic and will serve to reduce traffic in the park through the elimination of the campground sites and the access roads to them.

6. WAIVER OF STRICT ADHERENCE TO REVIEW STANDARDS

A waiver of review standards is being sought due to compelling public need. The impetus for this project was the fatality of a camper due to the failure of an otherwise seemingly healthy tree in the early morning of a clear, still and sunny day. It was determined that the cause of the lethal failure was compromised root health and integrity caused by repeated siltation upon the root system from flood events. Nine of the twenty-six highest flooding events have occurred in the last ten years and four of those events occurred in 2011. Three years of consecutive flooding occurred in 2004, 2005, and 2006. After three tree risk assessments by an independent tree expert company this condition was revealed to be affecting the majority of the trees in the campground area. In the tree risk assessment for the up-river campground where the fatality occurred, greater than 50% of the 180 trees analyzed were stated to pose high to critical risk of failure at the roots. In the tree risk assessment for the down-river portion of the campground, 75% of the trees in the sample plots were stated to pose high to critical risk of failure at the roots.

With this knowledge and given that in the period from July 2011 to November 2012 at least 30 trees failed or had significant failures throughout the entire former campground area the NJDEP was left with two choices: 1) completely close the northern area of Bull's Island Recreation Area to the public, or 2) develop an alternative that would meet the safety needs of the public while continuing to satisfy the objectives of the Park's Master Plan by providing for passive recreational activities, and ensuring the natural condition of the rural environment type. The project detailed in this application to close the campground and establish a 100' wide safe pedestrian corridor through the removal of risk trees along an existing driveway providing access to and from the Delaware River and wing dam is a comprehensive solution to serve an essential public safety need while providing public access.

A waiver from the visual impact standard is also sought. It is understood that visual impact is inherent in the removal of any tree. The site currently has a rather open view both under the existing overstory of the proposed corridor and once the Delaware River is reached. There will be no change in land use, and this project has planned for extensive compensatory planting with 1,865 native trees, shrubs and herbaceous plants (figure 1, table 3, map 4). The visual aesthetic will be altered due to a reduction in the number of overstory trees; however, a forested view will still remain composed of a distribution of diverse understory trees.

7. NATURAL HERITAGE DATA

Provided by Jess Bergman, Civil Dynamics, Inc.



Photo No. 1: Typical view of large overstory trees throughout the campground area.



Photo No. 2: Typical view of interior roadway to be removed within the campground area.



Photo No 3: One of two bath houses to be removed within the campground area.



Photo 4: Typical view of campsite located along the Canal-side roadway, which will be gated to restrict access.



Photo 5: Eastern end of proposed recreational pathway corridor along the existing roadway along the south side of the campground.



Photo 6: Proposed recreational pathway corridor along the existing roadway looking north from the curve.



Photo 7: Proposed recreational pathway corridor along the existing roadway along the west side of the campground adjacent to the Delaware River.



Photo 8: Proposed recreational pathway corridor along the existing roadway along the Delaware River.



Photo 9: Proposed recreational pathway corridor along the existing roadway along the Delaware River.



Photo 10: Proposed recreational pathway corridor along the existing roadway along the Delaware River.



Photo 11: Northern end of proposed recreational pathway corridor along the existing roadway along the Delaware River.



Photo 12: View of proposed public use area along the recreational pathway corridor and the Delaware River.