Lower Passaic River Restoration Project

HABITAT IDENTIFICATION SURVEY DATA REPORT FOR THE LOWER PASSAIC RIVER STUDY AREA FALL 2010 FIELD EFFORT

FINAL

Prepared for:

Cooperating Parties Group
Newark, NJ

January 6, 2014

Prepared by:

Windward environmental LLC

200 West Mercer Street, Suite 401
Seattle, WA 98119

Table of Contents

Tables ii

Figures ii

Acronyms iii

1 Introduction 1
- 1.1 PURPOSE AND SCOPE 1
- 1.2 DOCUMENT OVERVIEW 2

2 Survey Design and Methodology 3
- 2.1 SURVEY LOCATIONS 3
- 2.2 SURVEY METHODS 15
  - 2.2.1 Survey methods for the mainstem LPRSA 15
  - 2.2.2 Survey methods for the tributaries 17
- 2.3 DEVIATIONS 17

3 Survey Results 17
- 3.1 SURVEY OF THE MAINSTEM LPRSA 17
  - 3.1.1 Summary of LPRSA shoreline characterization 17
  - 3.1.2 Summary of LPRSA habitat and plant community observations 25
  - 3.1.3 Summary of wildlife observations along the LPRSA 32
  - 3.1.4 Summary of observations related to human access and shoreline features along the mainstem of the LPRSA 34
- 3.2 SURVEY OF THE LPRSA TRIBUTARIES 45
  - 3.2.1 Summary of tributary shoreline characterization 45
  - 3.2.2 Summary of tributary habitat and plant community observations 46
  - 3.2.3 Summary of tributary wildlife observations 48
- 3.3 COMPARISON OF 2010 SURVEY AND HISTORICAL SURVEYS 49

4 Summary 50

5 References 51

Appendix A Field Forms

Appendix B Field Notebook Entries

Appendix C Shoreline Video Survey

Appendix D LPRSA Land Use and Shoreline Features for Human Access and Exposure Figure

Appendix E Photo Log

Tables

Table 2-1.	Survey locations along the LPRSA	3
Table 2-2.	Survey locations along the LPRSA tributaries	11
Table 3-1.	LPRSA shoreline categories by river mile	18
Table 3-2.	Percentage of shoreline categories along the LPRSA	23
Table 3-3.	Mudflats along the length of the LPRSA	24
Table 3-4.	Plant communities and habitat features identified along the LPRSA	26
Table 3-5.	Common plant species identified in the LPRSA	31
Table 3-6.	Wildlife observations along the LPRSA	32
Table 3-7.	Summary of observations of LPRSA shoreline features and uses	35
Table 3-8.	Shoreline types along the LPRSA tributaries surveyed	45
Table 3-9.	Plant community and habitat features along the tributary survey locations	46
Table 3-10.	Common plant species identified at the LPRSA tributary survey locations	47
Table 3-11.	Wildlife observations along the tributary survey locations	49

Figures

Figure 2-1.	Habitat identification survey waypoints for the 2010 field effort in the LPRSA mainstem	9
Figure 2-2.	Habitat identification survey waypoints for the 2010 field effort in select LPRSA tributaries	13
Figure 3-1.	LPRSA shoreline habitat classifications	21
Figure 3-2.	LPRSA shoreline plant communities	29
Figure 3-3.	Comparison of shoreline by habitat classification along the mainstem LPRSA during the 1999/2000 and 2010 surveys	50

Acronyms

CPG	Cooperating Parties Group
ERA	ecological risk assessment
FS	feasibility study
GIS	geographic information system
HHRA	human health risk assessment
ID	identification
LPR	Lower Passaic River
LPRSA	Lower Passaic River Study Area
NJDEP	New Jersey Department of Environmental Protection
QAPP	quality assurance project plan
RI	remedial investigation
RM	river mile
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency

1 Introduction

This data report presents the results of a habitat identification survey that was conducted in the Lower Passaic River Study Area (LPRSA) from September 20 to September 23, 2010. The survey was conducted under the authority of the May 2007 Settlement Agreement (Section IX.37.d.) (USEPA 2007) between the US Environmental Protection Agency (USEPA) and the Cooperating Parties Group (CPG), a consortium of approximately 70 companies that agreed to complete the remedial investigation and feasibility study (RI/FS) of the 17.4-mile stretch of the Passaic River from the mouth of the river at Newark Bay to Dundee Dam. The 2010 survey included qualitative observations along the right and left banks of the LPRSA from the mouth at Newark Bay up to Dundee Dam.[1] In addition, specific locations along three of the tributaries to the LPRSA (Second River, Third River, and Saddle River) were surveyed at the request of the US Army Corp of Engineers (USACE) and USEPA.

1.1 Purpose and Scope

This report is part of the ongoing investigation of the LPRSA RI/FS. The data reported here are intended to support the planned ecological risk assessment (ERA) and human health risk assessment (HHRA). Specifically, this information will be used to qualitatively support the ERA[2] and HHRA in terms of identifying shoreline habitat availability and identifying areas for potential human access and activities in the LPRSA. The information may also be used in restoration planning under the Water Resources Development Act.

The purpose of the habitat identification survey was to qualitatively evaluate the shoreline of the LPRSA by documenting shoreline features, including bulkheads, riprap, and/or vegetation, as well as the types of vegetation present, including aquatic, scrub-shrub, or forested vegetation. This survey encompassed the tidal stretch of the LPRSA from the mouth of the river at Newark Bay to Dundee Dam, and 18 specific locations above the head of tide on three tributaries as requested by USACE. The three tributaries surveyed include: the Second River (confluence at approximately River Mile (RM) 8.0 in the main stem of the Lower Passaic River [LPR]), the Third River (confluence at approximately RM 11.3 in the LPR), and the Saddle River (confluence at approximately RM 15.6 of the LPR).

---

[1] The right bank and left bank are the terms used in this report to indicate the direction of the bank on the river when facing upstream. The right and left banks of the river generally correspond with the east/north and west/south banks, respectively.

[2] While this habitat survey will provide qualitative identification of shoreline features, it is not intended to support the delineation of ecological sediment exposure areas for evaluation in the ERA. Rather, the results of physical and chemical characterization of the LPRSA, along with the benthic invertebrate community, fish community, and avian surveys and the results of the ecological life history profiles based on a literature review will be used in ultimately defining ecological sediment exposure areas.

Shoreline characteristics (i.e., presence and extent of shoreline features and vegetation) were documented by scientists during the field survey; a video recorder was also used to document the surveyed shoreline. The boundaries of each shoreline feature and/or habitat type observed along each bank of the LPRSA during the survey were established using global positioning system coordinates and documented as waypoints to estimate the linear extent of shoreline categories and habitat types. Observations of human access points (e.g., parks, boat launches) and human uses of the LPRSA were also documented by AECOM staff, who accompanied the field crew from Windward Environmental LLC on the survey vessel.

1.2 DOCUMENT OVERVIEW

This report summarizes the methods and results of the 2010 habitat identification survey. The survey design and methodology are presented in Section 2. Survey results are summarized in Section 3 with results from the survey of the mainstem of the LPR provided in Section 3.1, and results from the survey of locations in the tributaries provided in Section 3.2. Section 4 summarizes the results of the habitat identification survey. References are provided in Section 5. The text is supported by the following appendices:

- Appendix A – Field Forms
- Appendix B – Field Notebook Entries
- Appendix C – Shoreline Video Survey (on CD)
- Appendix D – LPRSA Land Use and Shoreline Features for Human Access and Exposure Figure
- Appendix E – Photo Log

2 Survey Design and Methodology

The sampling design and methodology were presented in the *Lower Passaic River Restoration Project, Lower Passaic River Study Area RI/FS Habitat identification survey: Addendum to the Quality Assurance Project Plan. Surface sediment chemical analyses and benthic invertebrate toxicity and bioaccumulation testing. Addendum No. 3* (Windward 2010c), hereafter referred to as the Benthic Quality Assurance Project Plan (QAPP) Addendum No. 3. The scope of the effort for this survey was to evaluate the habitat along the shorelines and floodplains of the LPRSA. Primary data that were collected were estimated linear measurements of shoreline features (e.g., riprap, mixed vegetation, aquatic vegetation, bulkhead), including observations of habitat types and human access points (e.g., parks, boat launches), and human uses of the LPRSA. The survey included the 17.4-mile tidal stretch of the LPRSA from the mouth of the river at Newark Bay to Dundee Dam, as well as specific locations above the head of tide on the three tributaries (i.e., the Second River, Third River, and Saddle River).

2.1 Survey Locations

Both banks of the LPRSA were surveyed by boat on September 20 and 21, 2010, up to approximately RM 16. On September 21, 2010, three locations above RM 16.2 were accessed by land because the river was too shallow for a boat to safely navigate. The 146 waypoints within the LPRSA that were identified during the survey are listed in Table 2-1 and shown in Figure 2-1. The remaining portions of the river above RM 16 that were not surveyed by boat or land were documented by reviewing aerial photographs supplemented by Google® satellite images (images were dated 2010) to characterize the habitat and plant community. In addition, 18 tributary locations that were surveyed at locations above the head of tide as specifically requested by USACE and USEPA were accessed by and surveyed from land on September 22 and 23, 2010 (Table 2-2 and Figure 2-2). The coordinates and names of these locations were provided by USACE.

Table 2-1. Survey locations along the LPRSA

Waypoint ID	Approximate RM	Bank[a]	Easting (X)[b]	Northing (Y)[b]
9/20/2010				
1	RM 13.4	left	596993	734133
2	RM 13.4	left	596938	734001
3	RM 13.4	left	596863	733798
4	RM 13.3	left	596828	733557
5	RM 13.1	left	596594	732179
6	RM 13.0	left	596460	731764
7	RM 12.9	left	596280	731493
8	RM 12.7	left	595982	730628

Table 2-1. Survey locations along the LPRSA

Waypoint ID	Approximate RM	Bank[a]	Easting (X)[b]	Northing (Y)[b]
9	RM 12.2	left	596924	728043
10	RM 12.1	left	596815	727225
11	RM 11.9	left	596674	726430
12	RM 11.6	left	596071	724917
13	RM 11.5	left	595919	724699
14	RM 11.4	left	595678	724415
15	RM 11.4	left	595461	724232
16	RM 11.4	left	595281	724148
17	RM 11.3	left	595033	724051
18	RM 11.2	left	594493	723955
19	RM 11.1	left	594204	723824
20	RM 11.0	left	593758	723695
21	RM 10.4	left	592069	720904
22	RM 10.3	left	592052	720508
23	RM 10.2	left	592056	719712
24	RM 10.0	left	591814	718841
25	RM 8.8	left	590315	712986
26	RM 8.5	left	589793	711939
27	RM 8.4	left	589548	711443
28	RM 8.5	left	589604	711548
29	RM 8.0	left	589464	709291
30	RM 8.0	left	589429	709193
31	RM 7.9	left	589462	708642
32	RM 7.8	left	588935	708053
33	RM 7.6	left	588435	707532
34	RM 7.2	left	587157	705730
35	RM 7.2	left	587155	705424
36	RM 7.0	left	586884	704452
37	RM 6.6	left	586000	703094
38	RM 6.3	left	585067	701176
39	RM 6.1	left	585020	700454
40	RM 6.0	left	585011	700044
41	RM 5.8	left	584797	698771
42	RM 5.6	left	584672	697939
43	RM 5.6	left	584637	697700
44	RM 5.5	left	584622	697299
45	RM 5.4	left	584649	696631

Table 2-1. Survey locations along the LPRSA

Waypoint ID	Approximate RM	Bank[a]	Easting (X)[b]	Northing (Y)[b]
46	RM 5.1	left	585119	694901
47	RM 5.0	left	585212	694524
48	RM 4.9	left	585249	694330
49	RM 4.7	left	586003	693035
50	RM 4.3	left	587576	692227
51	RM 3.9	left	590032	692452
52	RM 3.7	left	590660	692981
53	RM 3.6	left	590960	693549
54	RM 3.5	left	591340	694209
55	RM 3.4	left	591438	694369
56	RM 3.3	left	591729	694599
57	RM 3.3	left	591990	694782
58	RM 3.1	left	592794	695069
59	RM 3.0	left	593601	695111
60	RM 2.9	left	593874	695151
61	RM 2.8	left	594526	695188
62	RM 2.5	left	595884	695315
63	RM 2.4	left	596387	695286
64	RM 2.2	left	597148	695060
65	RM 2.1	left	597675	694699
66	RM 2.0	left	597990	694330
67	RM 1.7	left	598104	693022
68	RM 1.5	left	597910	691860
69	RM 1.4	left	597777	691256
70	RM 1.3	left	597729	691017
71	RM 1.2	left	597513	690236
72	RM 0.1	left	596863	684373
73	RM 0.3	right	598606	685910
74	RM 0.4	right	598224	686324
75	RM 0.9	right	597357	688518
76	RM 1.9	right	598416	693801
77	RM 2.6	right	595238	695605
78	RM 3.1	right	592765	695301
79	RM 3.2	right	592463	695166
80	RM 3.2	right	592068	695022
81	RM 3.4	right	591457	694726
82	RM 3.5	right	591107	694437

Table 2-1. Survey locations along the LPRSA

Waypoint ID	Approximate RM	Bank[a]	Easting (X)[b]	Northing (Y)[b]
83	RM 3.9	right	589812	692708
84	RM 4.1	right	588863	692548
85	RM 4.3	right	587779	692528
86	RM 4.4	right	587235	692385
87	RM 4.6	right	586358	692840
88	RM 5.4	right	584853	696432
89	RM 6.2	right	585273	700806
90	RM 6.4	right	585465	701594
91	RM 6.5	right	585836	702482
92	RM 6.7	right	586339	703123
93	RM 7.1	right	587204	704811
94	RM 7.4	right	587970	706506
95	RM 8.3	right	589631	710912
96	RM 8.4	right	589687	711302
9/21/2010				
97	RM 13.4	left	596988	734137
98	RM 13.6	left	597276	734881
99	RM 13.8	left	597332	736099
100	RM 13.9	left	597252	736414
101	RM 13.9	left	597223	736507
102	RM 14.0	left	597135	736789
103	RM 14.2	left	597428	738071
104	RM 14.4	left	598286	738439
105	RM 14.4	left	598565	738463
106	RM 14.7	left	599392	737347
107	RM 14.7	left	599384	737117
108	RM 14.8	left	599511	736865
109	RM 14.9	left	599723	736732
110	RM 15.0	left	600207	736751
111	RM 15.7	left	600016	740133
112	RM 16.0	left	599307	741596
113	RM 16.1	left	599098	741814
114	RM 16.2	left	598853	742067
115	RM 15.5	right	600764	739606
116	RM 14.3	right	597794	738232
117	RM 14.1	right	597400	737278
118	RM 13.9	right	597305	736685

Table 2-1. Survey locations along the LPRSA

Waypoint ID	Approximate RM	Bank[a]	Easting (X)[b]	Northing (Y)[b]
119	RM 13.4	right	597124	734034
120	RM 13.3	right	596995	733611
121	RM 13.3	right	596944	733457
122	RM 13.2	right	596815	732779
123	RM 12.5	right	596609	729575
124	RM 12.4	right	596874	728938
125	RM 12.3	right	597079	728436
126	RM 12.1	right	597063	727655
127	RM 12.1	right	596998	727428
128	RM 11.6	right	596228	724702
129	RM 11.0	right	593410	723347
130	RM 10.8	right	592722	722899
131	RM 10.5	right	592340	721565
132	RM 10.3	right	592245	720438
133	RM 10.2	right	592217	719850
134	RM 10.1	right	592224	719171
135	RM 9.8	right	592056	717572
136	RM 9.7	right	592218	717058
137	RM 9.6	right	592320	716697
138	RM 9.5	right	592414	716397
139	RM 9.5	right	592427	716194
140	RM 8.9	right	591015	713687
141	RM 8.8	right	590716	713242
142	RM 8.6	right	590038	712053
143	RM 8.4	right	589710	711341
144	RM 16.6	right	598009	744284
145	RM 17.0	right	597017	746098
146	RM 17.2	right	596139	746593

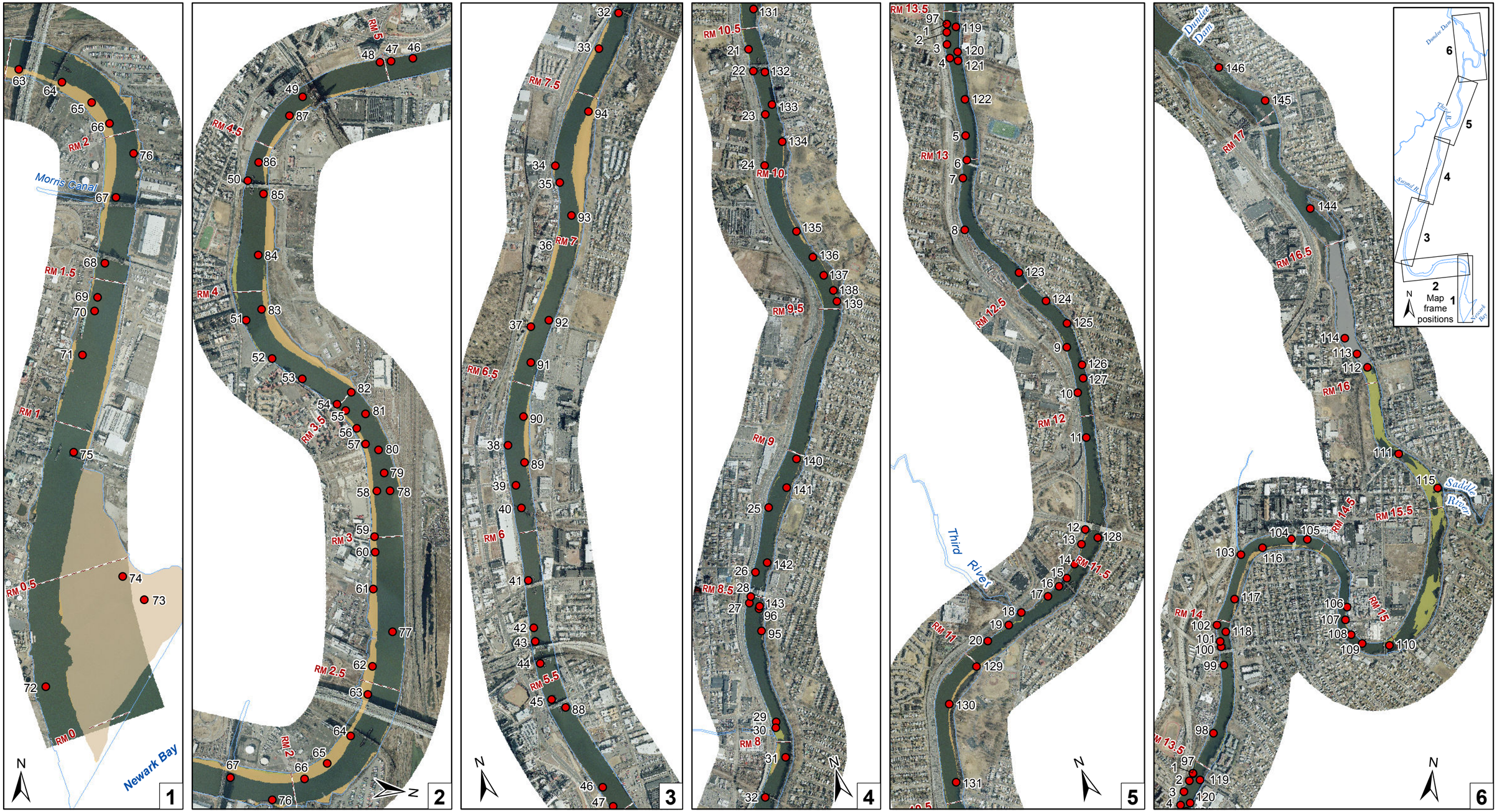
[a] Left bank is the bank on the left of the river when facing upstream; right bank is the bank on the right of the river when facing upstream.

[b] New Jersey State Plane (US survey ft).

ID – identification

LPR – Lower Passaic River

RM – river mile



Wind Ward LLC environmental

0 0.5 1 Kilometers

0 0.25 0.5 Miles

Waypoints
River mile
LPRSA
Mudflat
Kearney Point mudflat
Gravel flat
No grainsize data

Mudflat and gravel flat locations are determined as those areas where the river bottom slope is ≤6° and the depth is ≥-4.5 ft NGVD29 (i.e. -2 ft MLLW). Mudflats are areas of fine (i.e., silt or sand) sediment substrate. LPRSA sediment grain size is based on map layers from the Draft Technical Report, Geophysical Survey (Aqua Survey, Inc., 2005a). LPRSA bathymetry is taken from the 2007 bathymetric survey conducted by Gahagan & Bryant Associates, Inc. (GBA), except for the area outside Kearny Point; bathymetry in the southeast part of this area is estimated based on NOAA data. In the GBA survey area, multibeam data are used where available and single-beam data are used where they are not. Aerial photo: GEOD Corporation, 3/12/2007

Figure 2-1. Habitat identification survey waypoints for the 2010 field effort in the LPRSA mainstem

Prepared by MTY 10/20/10, modified by LSM 10/27/10, map #4380; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps_and_Analysis\HabitatSurvey

Table 2-2. Survey locations along the LPRSA tributaries

Tributary	Location Name[a]	Waypoint ID	Date Sampled	Easting (X)[b]	Northing (Y)[b]
Saddle River	Arcola Pool Site	163	09/22/10	604610	767075
	County Park	162	09/22/10	602480	771615
	Felician College South	160	09/22/10	603500	741031
	Lodi Cemeteries	161	09/22/10	604478	741348
	Ox Bow	159	09/22/10	601953	738955
Second River	Belleville	148	09/22/10	584669	711688
	Bloomfield	149	09/22/10	578532	712931
	Mills	151	09/22/10	573140	717467
	Passaic	147	09/22/10	587506	709880
	Watsessing Park	150	09/22/10	575420	712466
	Wigwam Brook	152	09/22/10	569943	709263
Third River	Bonsal Wildlife Preserve	157	09/22/10	578451	734445
	Clarks Pond	156	09/22/10	580481	725632
	Clifton Pond	158	09/22/10	592291	727905
	Forest Hills Field Club	155	09/22/10	579687	718053
	Glen Ridge Country Club	153	09/22/10	577286	722753
	JFK Parkway	154	09/22/10	577320	719921
	River Mouth	164	09/23/10	593848	725000

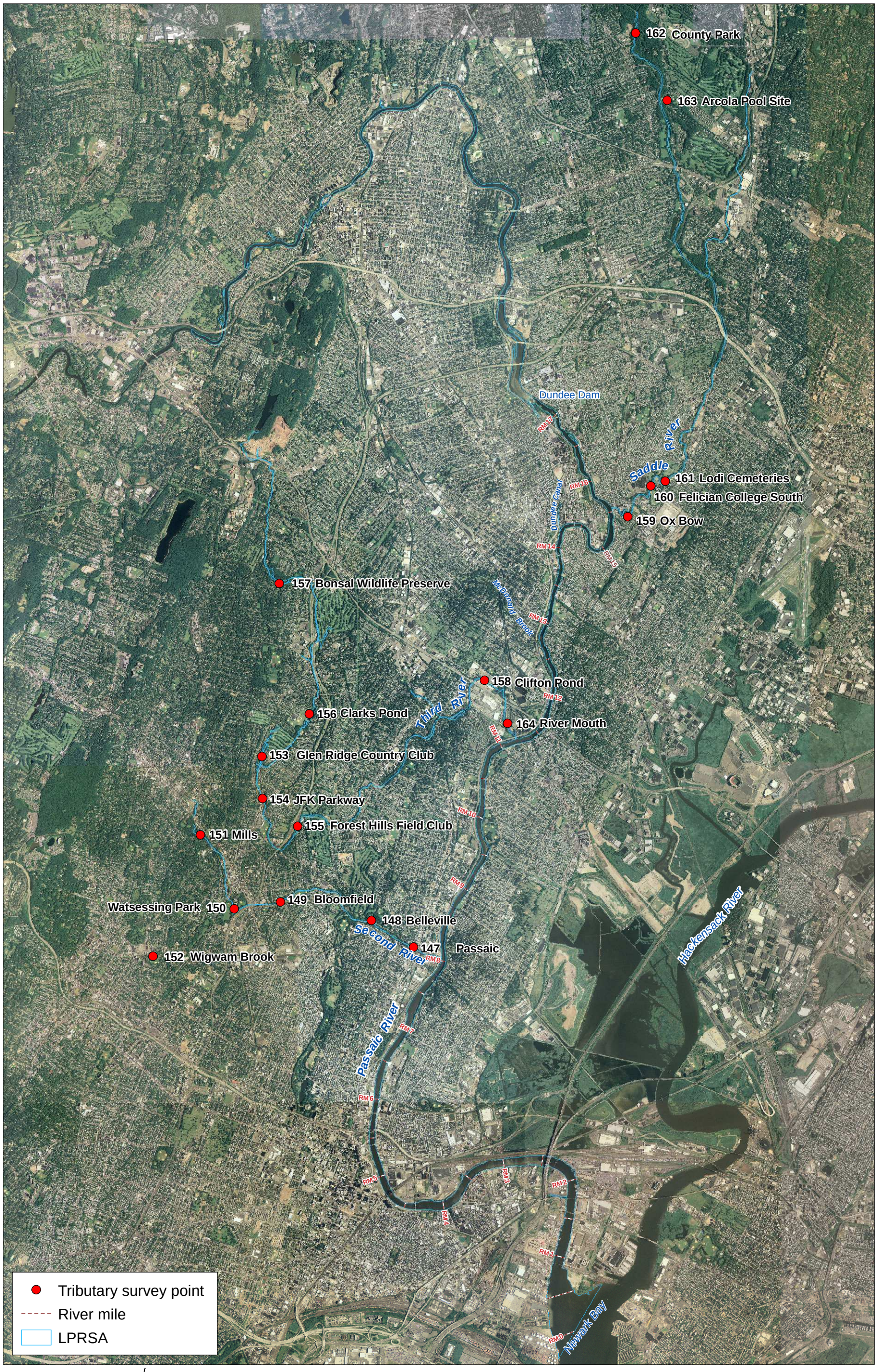
[a] These are specific locations requested by USACE and considered to be potential LPRSA tributary restoration site locations.

[b] New Jersey State Plane (US survey ft).

ID – identification

LPRSA – Lower Passaic River Study Area

USACE – US Army Corps of Engineers



Wind Ward LLC environmental

0 1 2 Kilometers

0 0.5 1 1.5 Miles

N

Orthophoto: USGS National Agriculture Imagery Program, August 2006

Figure 2-2. Habitat identification survey waypoints for the 2010 field effort in select LPRSA tributaries

Prepared by LSM 10/27/10, map #4382; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps and Analysis\HabitatSurvey

2.2 SURVEY METHODS

This section discusses the survey methods for both the mainstem LPRSA and the tributary locations identified by USACE.

2.2.1 Survey methods for the mainstem LPRSA

In accordance with QAPP Addendum No. 3 (Windward 2010c), the habitat identification survey was conducted primarily by boat (to the extent possible) using a camera to record continuous video of the shoreline. The shoreline was accessed on foot when boat access wasn't possible. For the purpose of this survey, the shoreline was defined as the area immediately adjacent to the river that is visible by boat or readily accessible by foot (where boat access to the shoreline is not possible). Due to the fact that in most places on the LPRSA, the properties, parks, and roads along the river generally extend to the water's edge, the shoreline is generally a narrow area. Binoculars were used to examine vegetation features (e.g., leaves, bark, flowers) in order to identify plant species.

The shoreline was classified into the same four ecological risk assessment habitat classification categories relied upon by Tierra Solutions during their lower portion of the LPRSA in 1999 and 2000 (Tierra Solutions 2002):

- **Aquatic vegetation —** extent of shoreline with greater than 50% emergent vegetation (e.g., smooth cordgrass [*Spartina alterniflora],* common reed [*Phragmites australis*])
- **Bulkhead —** extent of shoreline where greater than 50% of the vertical face is composed of wood timbers, metal sheet pile, or large stone blocks
- **Mixed vegetation —** extent of shoreline where riprap or bulkhead and emergent vegetation or overhanging vegetation are present in roughly equal proportions.
- **Riprap —** extent of shoreline dominated by sloped banks that are covered by cobble to boulder-sized stones and/or concrete rubble

In addition to the four shoreline categories outlined above, the length of each mudflat along the shoreline that was exposed at the time of observation was recorded by collecting waypoint coordinates in the field that represented the boundary of the mudflat length.[3] Mudflat areas were calculated using these waypoint coordinates to determine the mudflat length along the shoreline and aerial photographs of the LPR (GEOD 2007) to determine the shape of the mudflat and the distance that the mudflat extended from the shoreline. Geographic information system (GIS) spatial tools were then used to estimate the area of the mudflat.

[3] The recorded length of each mudflat represents the length of the mudflat when encountered during the survey and not specifically at low tide. Therefore, the length of each mudflat provided in this report is not intended to represent the entire length of the mudflat.

Shoreline vegetation was identified to the species level when possible, and the plant community was classified into one of four groups:

- **Emergent vegetation —**Includes marsh vegetation such as smooth cordgrass [*Spartina alterniflora*] and common reed [*Phragmites australis]*.
- **Mixed forest —** Includes all trees that provide canopy cover such as silver maple (*Acer saccharinum*).
- **Shrub/scrub —** Includes shrub/scrub species, such as groundsel tree (*Baccharis halimifolia*).
- **None —** Includes few or no plants.

At those locations above RM 16 that could not be accessed by boat, the field survey was conducted using the same methods described above, except that the survey was conducted by field personnel on foot. The shorelines of these areas were accessed at public access points (i.e., areas accessible by walking from the road or parking lots to the river). Given that these locations could not be surveyed and videotaped from a boat, continuous video recording was conducted to the extent possible. After the field survey was completed, the 2007 LPRSA aerial photograph survey (GEOD 2007) was used to identify shoreline features and characterize the habitat types and plant community for areas of the shoreline that were not visible in the areas surveyed by foot. Field forms and field notes are presented in Appendices A and B, respectively. Appendix C presents the shoreline video.

Shoreline features and uses pertinent to human activities and potential exposures along the mainstem of the LPRSA were documented separately by AECOM staff during the habitat identification survey following methods detailed in the Benthic QAPP Addendum No. 3, specifically, the LPRSA Human Access/Exposure Identification Survey Form in Attachment T (Windward 2010c). Shoreline types were identified based on field observations, videotape, and photo documentation, and categorized according to features relevant to the potential for human access and exposure. Three predominant shoreline types were noted:

- Natural/vegetated
- Riprap/stone
- Sheet pile/bulkhead

Areas with mixed vegetation overhanging bulkhead were classified as bulkhead and areas of mixed vegetation overhanging riprap were classified as riprap, when the bulkhead or riprap was the more dominant shoreline feature. This approach differed from the approach taken to classify ecological habitat, which focused on abundance and type of vegetation (Tierra Solutions 2002). Additional observations relevant to human use of the LPRSA, included noting potential public access points (e.g., boat launches/docks, foot paths), and evidence of human use of the LPRSA predominant adjoining land uses, and activities ongoing at the time of the survey.

2.2.2 Survey methods for the tributaries

The 18 tributary survey locations along the Saddle River, Second River, and Third River identified by USACE were not accessible by boat because each of these rivers was too shallow. The shorelines of these areas were accessed at public-access points. Field personnel drove to the locations and then accessed them on foot. Shoreline vegetation was surveyed to the extent possible and categorized as described in Section 2.2.1, with the exception that human access points were not evaluated at the tributary survey locations. To the extent possible, the shoreline was video recorded. Binoculars were used to examine vegetation features (e.g., leaves, bark, flowers) in order to identify plant species.

2.3 DEVIATIONS

No deviations from protocols presented in the Benthic QAPP Addendum No. 3 (Windward 2010c) were necessary during the 2010 habitat identification survey.

3 Survey Results

This section summarizes the observations recorded during the habitat identification survey, including those related to shoreline characterization; extent of mudflats; plant community types; habitat features, where available; incidental wildlife observations; and human access areas.

3.1 SURVEY OF THE MAINSTEM LPRSA

This section presents the observations recorded on September 20 and 21, 2010, during the survey of the mainstem LPRSA. Supporting documentation (field forms and field logbook entries), video footage, a figure that shows land use and shoreline features for human access and exposure, and photographs are provided in Appendices A through E.

3.1.1 Summary of LPRSA shoreline characterization

The LPRSA shoreline is generally divided into two main areas: a lower portion, which is largely characterized by a developed shoreline with structures that abut industrial properties and an upper portion characterized by more mixed vegetation that abuts roads, parks, and residential properties. Bulkhead was predominant (measured as length along the shoreline) in the more industrially developed lower portions of the LPRSA (RM 0 to RM 8 of the LPRSA), whereas, the shoreline along the upper portion (i.e., above RM 8) was dominated by mixed vegetation (Table 3-1). A map that shows the shoreline characterization along both banks is presented as Figure 3-1.

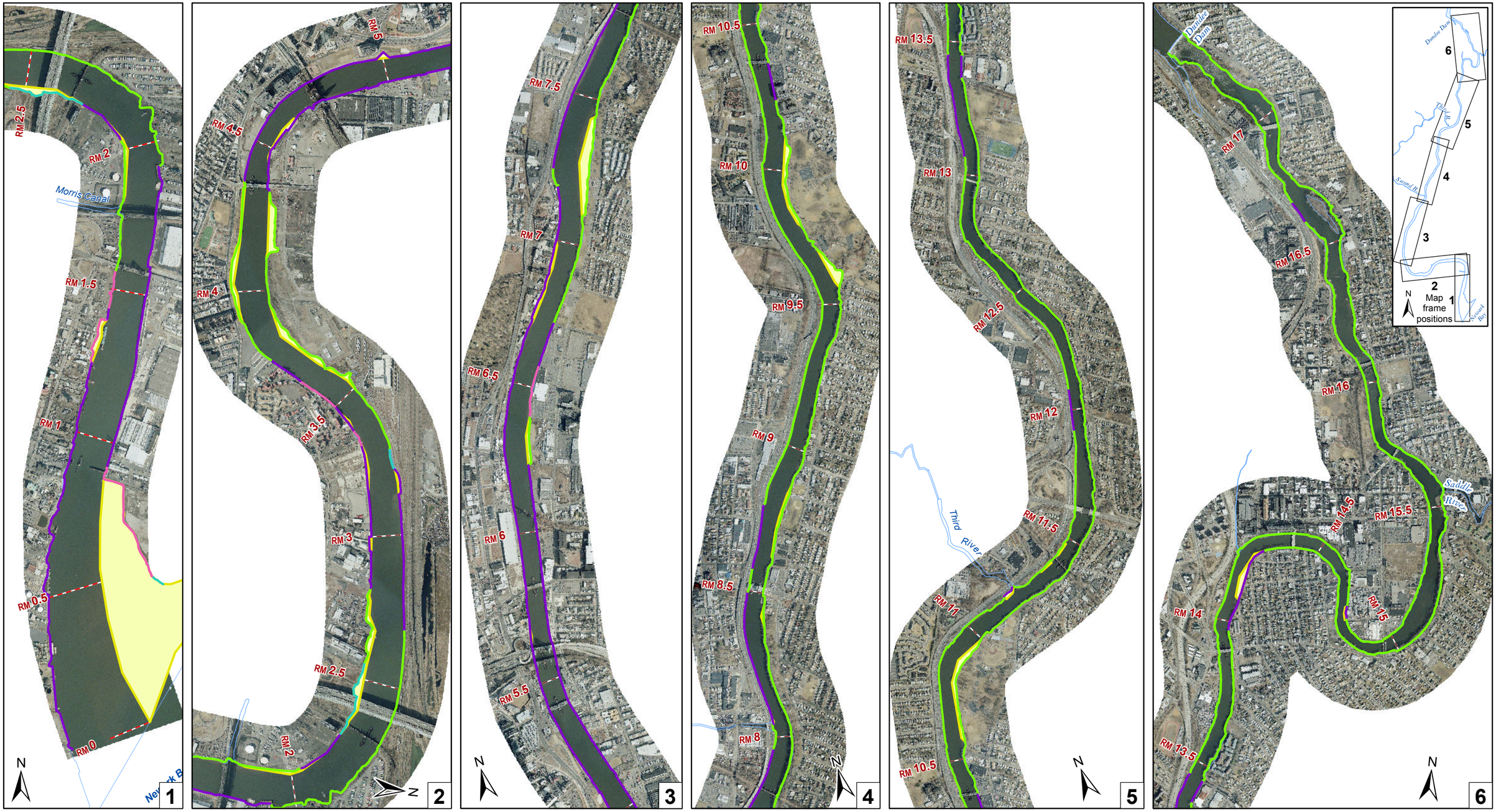
Table 3-1. LPRSA shoreline categories by river mile

RM Segment	Waypoint ID	Shoreline Category	Length (ft)	Percentage of Total Shoreline[a]
Left Bank[b]				
RM 0.0 – RM 1.2	71 – 72	bulkhead	7,397	7.9
RM 1.2 – RM 1.3	70 – 71	riprap	980	1.0
RM 1.3 – RM 1.4	69 – 70	bulkhead	198	0.2
RM 1.4 – RM 1.6	68 – 69	riprap	744	0.8
RM 1.6 – RM 2.0	66 – 68	mixed vegetation	2,430	2.6
RM 2.0 – RM 2.3	64 – 66	bulkhead	943	1.0
RM 2.3 – RM 2.6	62 – 64	aquatic vegetation	1,455	1.5
RM 2.6 – RM 2.8	61 – 62	mixed vegetation	1,459	1.6
RM 2.8 – RM 3.3	57 – 61	bulkhead	2,636	2.8
RM 3.3 – RM 3.4	56 – 57	riprap	309	0.3
RM 3.4 – RM 3.5	54 – 56	bulkhead	532	0.6
RM 3.5 – RM 3.6	53 – 54	riprap	761	0.8
RM 3.6 – RM 3.7	52 – 53	bulkhead	639	0.7
RM 3.7 – RM 4.4	50 – 52	mixed vegetation	3,468	3.7
RM 4.4 – RM 7.2	35 – 50	bulkhead	15,439	16.4
RM 7.2 – RM 7.3	33 – 35	mixed vegetation	361	0.4
RM 7.3 – RM 7.9	31 – 33	bulkhead	3,750	4.0
RM 7.9 – RM 8.0	30 – 31	mixed vegetation	473	0.5
RM 8.0 – RM 8.5	28 – 30	bulkhead	2,434	2.6
RM 8.5 – RM 8.6	26 – 28	mixed vegetation	443	0.5
RM 8.6 – RM 8.8	25 – 26	bulkhead	1,150	1.2
RM 8.8 – RM 11.2	19 – 25	mixed vegetation	12,880	13.7
RM 11.2 – RM 11.3	18 – 19	bulkhead	293	0.3
RM 11.3 – RM 11.9	11 – 18	mixed vegetation	3,661	3.9
RM 11.9 – RM 12.1	10 – 11	bulkhead	806	0.9
RM 12.1 – RM 13.1	5 – 10	mixed vegetation	5,309	5.6
RM 13.1 – RM 13.5	1 – 5	bulkhead	2,024	2.2
RM 13.5 – RM 14.7	97 – 106	mixed vegetation	7,173	7.6
RM 14.7 – RM 14.8	106 – 107	bulkhead	229	0.2
RM 14.8 – RM 16.2	107 – 114	mixed vegetation	7,052	7.5
RM 16.2 – RM 16.6	not assigned[c]	mixed vegetation[d]	2,351	2.5
RM 16.6 – RM 16.7	not assigned[c]	bulkhead[d]	406	0.4
RM 16.7 – RM 17.4	not assigned[c]	mixed vegetation[d]	3,864	4.1
Right Bank[e]				
RM 0.0 – RM 0.4	73 – 74	aquatic vegetation	214	0.2
RM 0.4 – RM 0.9	74 – 75	riprap	2,383	2.6

Table 3-1. LPRSA shoreline categories by river mile

RM Segment	Waypoint ID	Shoreline Category	Length (ft)	Percentage of Total Shoreline[a]
RM 0.9 – RM 1.9	75 – 76	bulkhead	5,582	6.0
RM 1.9 – RM 2.7	76 – 77	mixed vegetation	4,840	5.2
RM 2.7 – RM 3.2	77 – 79	bulkhead	2,922	3.1
RM 3.2 – RM 3.3	79 – 80	aquatic vegetation	367	0.4
RM 3.3 – RM 4.4	80 – 85	mixed vegetation	5,875	6.3
RM 4.4 – RM 6.2	85 – 89	bulkhead	9,894	10.7
RM 6.2 – RM 6.4	89 – 90	mixed vegetation	873	0.9
RM 6.4 – RM 6.6	90 – 91	riprap	928	1.0
RM 6.6 – RM 6.7	91 – 92	bulkhead	810	0.9
RM 6.7 – RM 8.5	92 – 96	mixed vegetation	9,215	9.9
RM 8.5 – RM 10.2	133 – 143	mixed vegetation	9,843	10.6
RM 10.2 – RM 10.4	132 – 133	bulkhead	669	0.7
RM 10.4 – RM 13.3	120 – 132	mixed vegetation	16,186	17.4
RM 13.3 – RM 13.4	119 – 120	bulkhead	432	0.5
RM 13.4 – RM 14.0	118 – 119	mixed vegetation	2,870	3.1
RM 14.0 – RM 14.3	116 – 118	bulkhead	1,598	1.7
RM 14.3 – RM 15.6	115 – 116	mixed vegetation	7,104	7.6
RM 15.6 – RM 16.6	not assigned[c]	mixed vegetation[d]	6,155	6.6
RM 16.6	144	mixed vegetation	na	0.0
RM 16.6 – RM 17.1	not assigned[c]	mixed vegetation[d]	2,173	2.3
RM 17.2 – RM 17.4	not assigned[c]	mixed vegetation[d]	899	1.0
RM 17.1 – RM 17.2	145 – 146	mixed vegetation	1,047	1.1

[a] Percentage of total shoreline along the identified bank (i.e., left or right).
[b] Left bank is the bank on the left of the river when facing upstream.
[c] Waypoint ID was not assigned because area of shoreline could not be access by boat or on foot.
[d] Shoreline category was determined by reviewing aerial photographs supplemented by satellite images.
[e] Right bank is the bank on the right of the river when facing upstream.
LPRSA – Lower Passaic River Study Area
na – not applicable
RM – river mile



Wind Ward environmental LLC

0 0.5 1 Kilometer

0 0.25 0.5 Miles

Shoreline classification
- Aquatic vegetation
- Mixed vegetation
- Bulkhead
- Riprap
- Exposed mudflat observed
- River mile
- LPRSA

Figure 3-1. LPRSA shoreline habitat classifications

Prepared by LSM 10/27/10, map #4383; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps and Analysis\HabitatSurvey

Roughly two-thirds of the shoreline along the LPRSA were classified as mixed vegetation, and one-third was classified as bulkhead and/or riprap; approximately 1% of the LPRSA shoreline was classified as aquatic vegetation (Table 3-2). The left bank had more bulkhead than did the right bank because Highway 21 directly abuts and runs parallel to the river along the left bank. The area of the shoreline where Highway 21 runs parallel to the river is characterized largely by steep concrete walls. The right bank had more mixed vegetation than did the left bank; aquatic vegetation was comparable along both banks and was primarily limited to fringe areas along intertidal mudflats. Many of the shoreline areas categorized as mixed vegetation had riprap and/or bulkhead with overhanging vegetation.

Table 3-2. Percentage of shoreline categories along the LPRSA

	Left Bank[a]		Right Bank[b]		Total Shoreline	
Shoreline Category	**Length (ft)**	**Percentage of Total Shoreline[c]**	**Length (ft)**	**Percentage of Total Shoreline[c]**	**Length (ft)**	**Percentage**
Aquatic vegetation	1,455	1.6	581	0.6	2,036	1.1
Bulkhead	38,876	41.3	21,907	23.6	60,783	32.5
Mixed vegetation	50,924	54.1	67,080	72.2	118,004	63.1
Riprap	2,794	3.0	3,311	3.6	6,105	3.3
Total	**94,049**		**92,879[d]**		**186,928**	

[a] Left bank is the bank on the left of the river when facing upstream.
[b] Right bank is the bank on the right of the river when facing upstream.
[c] Percentage of total shoreline along the identified bank (i.e., left or right).
[d] Length of total shoreline along the right bank does not include the eastern portion of the Kearny Point mudflat (i.e., the portion of shoreline along the Hackensack River).

LPRSA – Lower Passaic River Study Area

Mudflats were present along 35% of the total LPRSA shoreline (Table 3-3) and were more prevalent in the lower portions of the LPRSA (i.e., below RM 8). Ninety percent of the left bank mudflats were below RM 8, and 62% of the right bank mudflats were below RM 8. Mudflats were documented in similar proportions along each bank of the entire length of the mainstem LPRSA (i.e., 14% of the left bank and 21% of the right bank). In contrast, the areal extent of the mudflats along the right bank was much greater than that of the left bank (i.e., 91% versus 9%, respectively, of the total mudflat area in the LPRSA) because of the inclusion of the Kearny Point mudflat.[4]

[4] The Kearny Point mudflat was not exposed at the time of the survey and, therefore, was not documented in the field notes as a mudflat. At the request of USEPA, the Kearny Point mudflat has been included in this report (Table 3-3), and the length and area of the mudflat were estimated from aerial photographs of the LPR (GEOD 2007).

Table 3-3. Mudflats along the length of the LPRSA

RM Segment	Waypoint ID	Length (ft)[a]	Percentage of Total Mudflat per Bank[b]	Percentage of Bank that is Mudflat[c]	Mudflat Area (sq ft)[d]	Percentage of Area per Bank
Left Bank[e]						
RM 1.3 – RM 1.4	70 – 71	980	7.5	1.0	52,339	10.4
RM 1.8 – RM 2.2	65 – 67	1,553	11.9	1.7	42,483	8.4
RM 2.3 – RM 2.8	61 – 64	2,914	22.4	3.1	153,148	30.3
RM 2.9 – RM 3.0	59 – 60	336	2.6	0.4	9,489	1.9
RM 3.2 – RM 3.3	57 – 58	840	6.5	0.9	20,390	4.0
RM 3.4 – RM 3.5	55 – 56	360	2.8	0.4	6,197	1.2
RM 3.9 – RM 4.4	50 – 51	2,636	20.3	2.8	108,744	21.5
RM 4.9 – RM 5.0	47 – 48	332	2.6	0.3	12,380	2.5
RM 5.6 – RM 5.7	42 – 43	252	1.9	0.3	2,719	0.5
RM 6.7 – RM 7.0	36 – 37	1,627	12.5	1.7	56,783	11.2
RM 8.0 – RM 8.1	29 – 30	100	0.8	0.1	966	0.2
RM 11.1 – RM 11.2	18 – 19	293	2.3	0.3	15,651	3.1
RM 11.3 – RM 11.4	16 – 17	273	2.1	0.3	7,750	1.5
RM 11.4 – RM 11.5	14 – 15	284	2.2	0.3	9,352	1.9
RM 14.7 – RM 14.8	106 – 107	229	1.8	0.2	7,234	1.4
Total		**13,009**		**13.8**	**505,625**	
Right Bank[f]						
RM 0 – RM 0.9	nd[g]	4,333	22.0	4.6	4,101,623	81.5
RM 3.2 – RM 3.3	78 – 79	489	2.5	0.5	16,767	0.3
RM 3.5 – RM 3.9	82 – 83	2,383	12.1	2.5	118,524	2.4
RM 4.2 – RM 4.4	84 – 85	1,373	7.0	1.4	109,653	2.2
RM 4.4 – RM 4.7	86 – 87	960	4.9	1.0	30,913	0.6
RM 6.2 – RM 6.4	89 – 90	873	4.4	0.9	36,233	0.7
RM 7.1 – RM 7.4	93 – 94	1,850	9.4	1.9	219,701	4.4
RM 8.4 – RM 8.5	95 – 96	358	1.8	0.4	7,257	0.1
RM 8.8 – RM 9.0	141 – 142	1,349	6.8	1.4	31,693	0.6
RM 9.6 – RM 9.7	136 – 138	927	4.7	1.0	74,573	1.5
RM 9.8 – RM 10.1	134 – 135	1,683	8.5	1.8	89,751	1.8
RM 10.6 – RM 11.0	129 – 131	2,159	10.9	2.3	134,305	2.7
RM 14.1 – RM 14.3	116 – 117	1,002	5.1	1.1	61,874	1.2
Total		**19,739**		**20.8**	**5,032,867**	
Combined Total		**32,748**		**34.6**	**5,538,492**	

[a] Length of mudflat as measured along the shoreline at the time that the survey was conducted.

[b] Percentage of total mudflat length along the identified bank (e.g., left or right).

[c] Left bank has 94,094 ft of shoreline; right bank has 95,059 ft of shoreline, which includes 2,180 ft of shoreline along the eastern portion of the Kearny Point mudflat (i.e., on the Hackensack River) not surveyed during the habitat identification survey.

[d] Mudflat areas were calculated using the field-collected waypoint coordinates to determine the mudflat length along the shoreline and aerial photographs of the LPR (GEOD 2007) to determine the shape of the mudflat and the distance that the mudflat extended from the shoreline. GIS spatial tools were then used to estimate the area of the mudflat.

[e] Left bank is the bank on the left of the river when facing upstream.

[f] Right bank is the bank on the right of the river when facing upstream.

[g] The Kearny Point mudflat was not exposed at the time of the survey and, therefore, was not documented in the field notes as a mudflat. At the request of USEPA, the Kearny Point mudflat has been included in this table, and the total length of the mudflat (includes the length of the mudflat along the LPR and the Hackensack River) and the total area of the mudflat were estimated from aerial photographs of the LPR (GEOD 2007).

GIS – geographic information system

LPR – Lower Passaic River

LPRSA – Lower Passaic River Study Area

nd – no data

RM – river mile

3.1.2 Summary of LPRSA habitat and plant community observations

In the lower portions of the LPRSA, where most of the shoreline has been industrially developed, the plant community was less diverse and comprised mostly of scrub-shrub vegetation, such as groundsel tree, frequently intermixed with individual or small stands trees. In general, tree species present were representative of disturbed conditions and consisted primarily of tree-of-heaven (*Ailanthus altissima)*, eastern cottonwood (*Populus deltoids)*, Norway maple (*Acer platanoides*), locust trees (*Gleditsia* spp. or *Robinia* spp.), and catalpa (*Catalpa speciosa*). Sites dominated with emergent vegetation were primarily below RM 3.5 and were associated with intertidal mudflats. In general, these areas were dominated by smooth cordgrass (*Spartina alterniflora)* or common reed *(Phragmites australis)*. Japanese knotweed (*Fallopia japonica,* syn. *Polygonum cuspidatum*) was also noted as a dominant emergent species in the lower portions of the river as well as throughout the remainder of the LPRSA.

Further upriver, where the shoreline was flanked by wider urban green spaces and parks, mixed forest became more dominant and diverse with the addition of elm (*Ulmus* spp.), sycamore (*Platanus* spp.), ash (*Fraxinus* spp.*)*, and willow (*Salix* spp.) trees; the emergent plant community also included, among others, *Amaranthus* spp., purple loosestrife (*Lythrum salicaria)*, and goldenrod (*Solidago* spp.). Although there were fewer sites with emergent vegetation upriver, a more mature canopy with overhanging vegetation and large woody debris was more prevalent along the shoreline. Above RM 16.5, to the Dundee Dam (at RM 17.4), is a large floodplain that consists mostly of silver maple.

Table 3-4 identifies the general plant communities encountered during the survey, as well as prominent habitat features at each river mile segment, where appropriate; these plant community designations are shown in Figure 3-2. Throughout the LPRSA, the plant community was generally mixed with both native and non-native plants and often dominated by a few species, in both the canopy and the understory. Table 3-5 identifies the more commonly observed plants and their native/non-native status.

Table 3-4. Plant communities and habitat features identified along the LPRSA

RM Segment	Waypoint ID	Plant Community	Habitat Feature Notes
Left Bank[a]			
RM 0.0 – RM 1.4	69 – 72	none	sparse vegetation; sparse large woody debris
RM 1.4 – RM 1.6	68 – 69	emergent vegetation	
RM 1.6 – RM 1.8	67 – 68	shrub/scrub	
RM 1.8 – RM 2.1	66 – 67	emergent vegetation	large woody debris; rocks
RM 2.1 – RM 2.2	65 – 66	shrub/scrub; emergent vegetation	sparse vegetation; large woody debris; rocks
RM 2.2 – RM 2.3	64 – 65	shrub/scrub	sparse vegetation
RM 2.3 – RM 2.6	62 – 64	emergent vegetation	mudflat area
RM 2.6 – RM 2.8	61 – 62	shrub/scrub	
RM 2.8 – RM 3.5	54 – 61	none	sparse vegetation on top of bulkhead
RM 3.5 – RM 4.4	50 – 54	mixed forest; shrub/scrub	steep slope; small snags
RM 4.4 – RM 5.7	42 – 50	none	sparse vegetation on top of bulkhead
RM 5.7 – RM 6.2	39 – 42	mixed forest; shrub/scrub	snag; sparse vegetation on top of bulkhead
RM 6.2 – RM 6.3	38 – 39	none	
RM 6.3 – RM 7.7	33 – 38	mixed forest; shrub/scrub	snags; large woody debris; pilings
RM 7.7 – RM 7.9	31 – 33	none	
RM 7.9 – RM 8.0	30 – 31	shrub/scrub	
RM 8.0 – RM 8.5	27 – 30	none	sparse vegetation growing out of bulkhead wall along Highway 21
RM 8.5 – RM 8.6	26 – 27	mixed forest; shrub/scrub	
RM 8.6 – RM 8.8	25 – 26	shrub/scrub	sparse vegetation growing out of bulkhead wall along Highway 21
RM 8.8 – RM 11.1	19 – 25	mixed forest; shrub/scrub	snags; overhanging vegetation; large woody debris in water
RM 11.1 – RM 11.2	18 – 19	shrub/scrub	snags
RM 11.2 – RM 11.4	16 – 18	mixed forest	large woody debris; overhanging vegetation
RM 11.4 – RM 11.9	11 – 16	mixed forest; shrub/scrub	snags; large woody debris
RM 11.9 – RM 12.1	10 – 11	none	purple loosestrife growing out of outfall pipe
RM 12.1 – RM 13.4	4 – 10	mixed forest; shrub/scrub	snags; overhanging vegetation; large woody debris in water
RM 13.4	3 – 4	none	
RM 13.4 – RM 13.5	1 – 3	scrub/shrub	
RM 13.5 – RM 13.6	97 – 98	mixed forest	
RM 13.6 – RM 13.8	98 – 99	mixed forest; shrub/scrub	snags; large woody debris
RM 13.8 – RM 13.9	99 – 100	mixed forest	

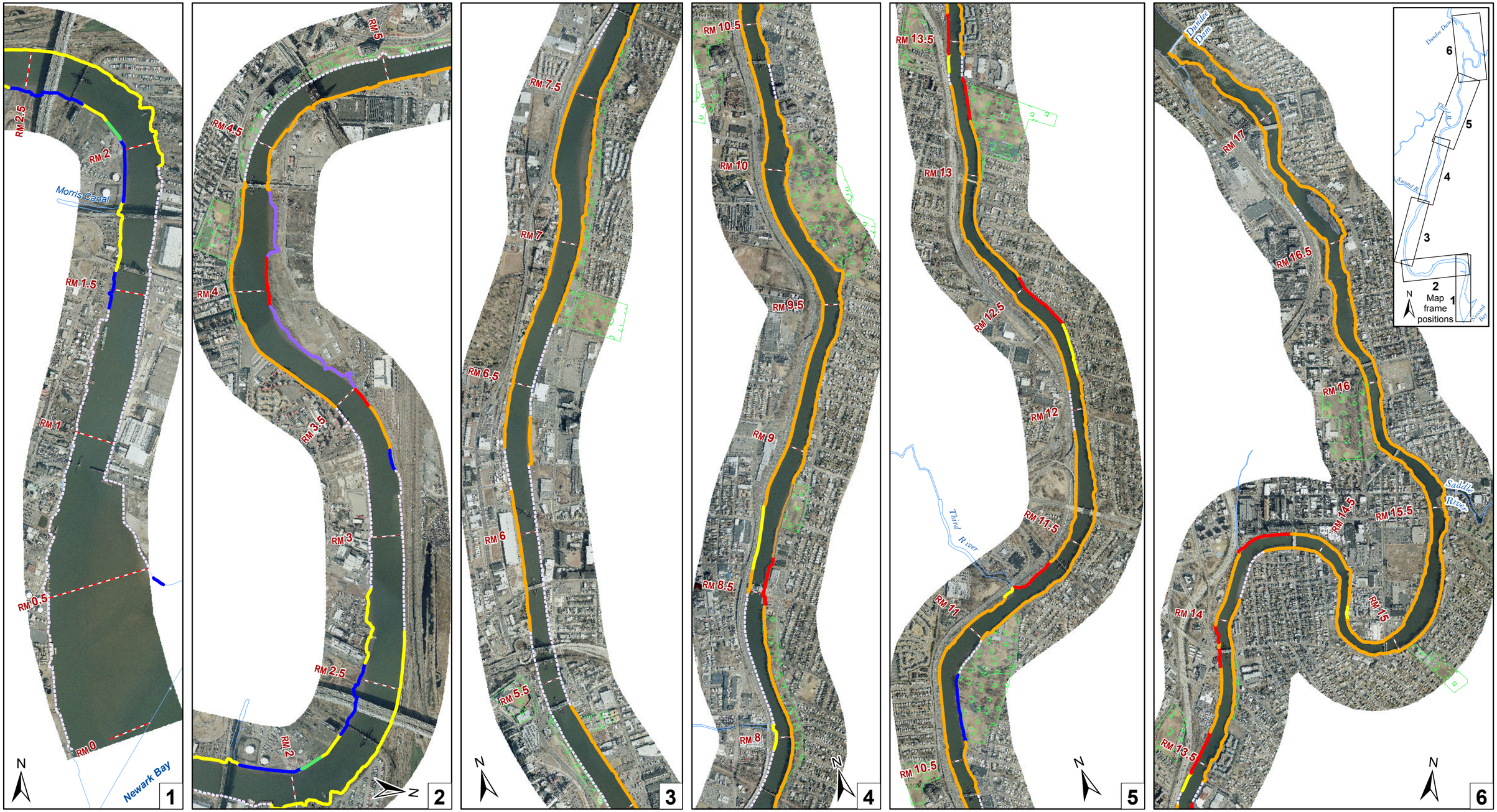
Table 3-4. Plant communities and habitat features identified along the LPRSA

RM Segment	Waypoint ID	Plant Community	Habitat Feature Notes
RM 13.9	100 – 101	mixed forest; shrub/scrub	
RM 13.9 – RM 14.0	101 – 102	mixed forest	snags
RM 14.0 – RM 14.2	102 – 103	mixed forest; shrub/scrub	nursery trees abundant
RM 14.2 – RM 14.4	103 – 104	mixed forest	
RM 14.4 – RM 14.7	104 – 106	mixed forest; shrub/scrub	sparse trees; snags; overhanging vegetation
RM 14.7 – RM 14.8	106 – 107	shrub/scrub	sparse trees
RM 14.8 – RM 16.2	107 – 114	mixed forest; shrub/scrub	large woody debris; overhanging vegetation; snags
RM 16.2 – RM 16.5	not assigned[b]	mixed forest; shrub/scrub[c]	
RM 16.5 – RM 16.7	not assigned[b]	none	
RM 16.7 – RM 17.4	not assigned[b]	mixed forest; shrub/scrub[c]	
Right Bank[d]			
RM 0.0 – RM 0.4	73 – 74	emergent vegetation	trees above shoreline; small areas (< 20 ft) of smooth cordgrass/common reed (*Spartina alterniflora/Phragmites australis)*
RM 0.4 – RM 1.9	74 – 76	none	
RM 1.9 – RM 2.7	76 – 77	shrub/scrub	small sections of bulkhead interspersed
RM 2.7 – RM 3.2	77 – 79	none	sparse vegetation
RM 3.2 – RM 3.3	79 – 80	emergent vegetation	
RM 3.3 – RM 3.4	80 – 81	mixed forest; shrub/scrub	few trees; mostly shrub/scrub
RM 3.4 – RM 3.5	81 – 82	mixed forest	
RM 3.5 – RM 3.9	82 – 83	mixed forest; emergent vegetation	
RM 3.9 – RM 4.1	83 – 84	mixed forest	rocky shoreline; snags; pilings
RM 4.1 – RM 4.4	84 – 85	mixed forest; emergent vegetation	large woody debris; pilings
RM 4.4 – RM 5.4	85 – 88	mixed forest; shrub/scrub	few trees
RM 5.4 – RM 6.2	88 – 89	none	sparse vegetation
RM 6.2 – RM 6.4	89 – 90	mixed forest; shrub/scrub	small sections of riprap
RM 6.4 – RM 6.7	90 – 92	none	sparse vegetation
RM 6.7 – RM 8.5	92 – 96	mixed forest; shrub/scrub	rocky shoreline; pilings; snags; large woody debris
RM 8.5 – RM 8.6	142 – 143	mixed forest	tree density increases
RM 8.6 – RM 8.9	141 – 142	emergent vegetation	

Table 3-4. Plant communities and habitat features identified along the LPRSA

RM Segment	Waypoint ID	Plant Community	Habitat Feature Notes
RM 8.6 – RM 10.2	133 – 142	mixed forest; shrub/scrub	large woody debris; snags; overhanging vegetation; wide patches of mudflat with some aquatic vegetation/common reed (*Phragmites australis)* under power lines
RM 9.6	137	emergent vegetation	
RM 10.2 – RM 10.4	132 – 133	none	
RM 10.4 – RM 10.6	131 – 132	mixed forest; shrub/scrub	steep bank
RM 10.6 – RM 10.8	130 – 131	emergent vegetation	overhanging vegetation; large woody debris; snags, large rocks; park area
RM 10.8 – RM 11.0	129 – 130	none	
RM 11.0 – RM 12.1	127 – 129	mixed forest; shrub/scrub	some riprap and bulkhead; overhanging vegetation; large woody debris; residential area
RM 12.1 – RM 12.3	125 – 127	shrub/scrub	
RM 12.3 – RM 12.5	123 – 125	mixed forest	
RM 12.5 – RM 13.2	122 – 123	mixed forest; shrub/scrub	large woody debris; snags
RM 13.2 – RM 13.3	120 – 122	mixed forest	
RM 13.3 – RM 13.4	119 – 120	none	
RM 13.4 – RM 14.1	117 – 119	mixed forest; shrub/scrub	abundant tree cover
RM 14.1 – RM 14.3	116 – 117	none	
RM 14.3 – RM 15.6	115 – 116	mixed forest; shrub/scrub	large woody debris; snags; abundant tree cover
RM 15.6 – RM 17.1	not assigned[b]	mixed forest; shrub/scrub[c]	
RM 16.6	144	mixed forest; shrub/scrub	cobble substrate; large woody debris
RM 17.1 – RM 17.2	145 – 146	mixed forest; shrub/scrub	floodplain habitat below dam; large woody debris
RM 17.2 – RM 17.4	not assigned[b]	mixed forest; shrub/scrub[c]	

[a] Left bank is the bank on the left of the river when facing upstream.
[b] Waypoint ID was not assigned because area of shoreline could not be access by boat or on foot.
[c] Plant community was determined by reviewing aerial photographs supplemented by satellite images.
[d] Right bank is the bank on the right of the river when facing upstream.
ID – identification
LPRSA – Lower Passaic River Study Area
RM – river mile



Wind Ward environmental LLC

0 0.5 1 Kilometers

0 0.25 0.5 Miles

Plant community	Mixed community	
Mixed forest	Mixed forest and shrub/scrub	Park
Shrub/scrub	Shrub/scrub and emergent vegetation:	River mile
Emergent vegetation	Mixed forest and emergent vegetation	LPRSA
None	Mixed forest, shrub/scrub, and emergent vegetation	

Aerial photo: GEOD Corporation, 3/12/2007

Figure 3-2. LPRSA shoreline plant communities

Prepared by LSM 10/27/10, map #4384; W:\Projects\06-58-01 Passaic RI\Data\GIS\Maps and Analysis\HabitatSurvey

Table 3-5. Common plant species identified in the LPRSA

Common Name	Scientific Name	Status[a]
American elm	*Ulmus americana*	native
Aster (unidentified)	*Aster* spp.	
Black locust	*Robinia pseudoacacia*	native (naturalized from southeast United States)
Boneset (unidentified)	*Eupatorium* spp.	
Box elder	*Acer negundo*	native
Catalpa	*Catalpa speciosa*	native
Cattail (unidentified)	*Typha* spp.	
Common reed	*Phragmites australis*	native
Eastern cottonwood	*Populus deltoides*	native
Elm (unidentified)	*Ulmus* spp.	
Goldenrod (unidentified)	*Solidago* spp.	
Groundsel tree[b]	*Baccharis halimifolia*	native
Hickory (unidentified)	*Carya* spp.	
Honeysuckle (unidentified)	*Lonicera* spp.	
Horseweed (unidentified	*Conyza* spp.	
Japanese knotweed	*Fallopia japonica, syn. Polygonum cuspidatum*	non-native
Jewelweed (unidentified)	*Impatiens* spp.	
Locust (unidentified)	*Gleditsia* spp. or *Robinia* spp.	
Maple (unidentified)	*Acer* spp.	
Mimosa (unidentified)	*Mimosa* spp.	
Mugwort (unidentified)	*Artemisia* spp.	
Mulberry[b]	*Morus* spp.	
Multiflora rose	*Rosa multiflora*	non-native
Northern red oak	*Quercus rubra*	native
Norway maple	*Acer platanoides*	non-native
Oak (unidentified)	*Quercus* spp.	
Pigweed/amaranth	*Amaranthus* spp.	
Poison ivy	*Toxicodendron radicans*	native
Pokeweed	*Phytolacca americana*	native
Princess tree	*Paulownia tomentosa*	non-native
Purple loosestrife	*Lythrum salicaria*	non-native
Ragweed (unidentified)	*Ambrosia* spp.	
Ragwort	*Jacobaea vulgaris,* syn. *Senecio jacobaea*	non-native
Red osier dogwood	*Cornus sericea*	native
Silk tree	*Albizia julibrissin*	non-native
Silver maple[b]	*Acer saccharinum*	native
Smooth cordgrass	*Spartina alterniflora*	native

Table 3-5. Common plant species identified in the LPRSA

Common Name	Scientific Name	Status[a]
Snakeroot (unidentified)	*Ageratina* spp.	
Sycamore	*Platanus occidentalis*	native
Tree-of-heaven	*Ailanthus altissima*	non-native
Virginia creeper	*Parthenocissus quinquefolia*	native
Weeping willow	*Salix babylonica*	non-native
White ash	*Fraxinus americana*	native
Willow (unidentified)	*Salix* spp.	

[a] Native/non-native status is provided only for plants identified to the species level, when available (NRCS 2010).
[b] Species identified by USEPA oversight personnel.

3.1.3 Summary of wildlife observations along the LPRSA

Most of the wildlife that was incidentally observed along the mainstem of the LPRSA during the survey was birds (including gulls [*Laurus* spp.], egrets and herons [*Ardea* spp.], mallard ducks [*Anas platyrhynchos*], Canada geese [*Branta canadensis]*, double-crested cormorants [*Phalacrocorax auritus*], and belted kingfishers [*Megaceryle alcyon*]); but one reptile (i.e., turtle [unidentified species]) and a few mammals (i.e., groundhogs [*Marmota monax*] and a Norway rat [*Rattus norvegicus]*) were also sighted. Table 3-6 presents the wildlife observed during the habitat identification survey. Although wildlife were incidentally observed during the habitat survey (as documented herein), these observations do not represent a comprehensive survey. Comprehensive seasonal avian surveys are being conducted in the LPRSA, and the results of these surveys will be presented in subsequent data reports.

Table 3-6. Wildlife observations along the LPRSA

RM Segment	Waypoint ID	Wildlife Observed	
		Common Name	Scientific Name
Left Bank[a]			
RM 1.2 – RM 1.4	70 – 71	unidentified gull species	*Laurus* spp.
RM 1.8 – RM 2.2	65 – 67	great egret	*Ardea alba*
RM 2.1 – RM 2.3	64 – 66	unidentified gull species	*Laurus* spp.
		mallard duck	*Anas platyrhynchos*
RM 2.6 – RM 2.8	61 – 62	unidentified gull species	*Laurus* spp.
RM 6.6 – RM 7.0	36 – 37	unidentified gull species	*Laurus* spp.
RM 7.3 – RM 7.6	33 – 34	unidentified gull species	*Laurus* spp.
		double-crested cormorant	*Phalacrocorax auritus*
		great blue heron	*Ardea herodias*
RM 8.8 – RM 10.0	24 – 25	unidentified gull species	*Laurus* spp.
		red-winged blackbird	*Agelaius phoeniceus*
		rock pigeon	*Columba livia*

Table 3-6. Wildlife observations along the LPRSA

RM Segment	Waypoint ID	Wildlife Observed	
		Common Name	Scientific Name
		barn swallow	*Hirundo rustica*
RM 10.4 – RM 11.1	20 – 21	unidentified turtle species	unknown
		great blue heron	*Ardea herodias*
		belted kingfisher	*Megaceryle alcyon*
RM 11.2 – RM 11.3	17 – 18	rock pigeon	*Columba livia*
		belted kingfisher	*Megaceryle alcyon*
RM 11.4 – RM 11.5	13 – 14	great blue heron	*Ardea herodias*
		belted kingfisher	*Megaceryle alcyon*
RM 14.4 – RM 14.7	105 – 106	great blue heron	*Ardea herodias*
RM 14.8 – RM 16.1	109 – 113	great blue heron	*Ardea herodias*
		rock pigeon	*Columba livia*
		barn swallow	*Hirundo rustica*
Right Bank[b]			
RM 0.3 – RM 0.4	73 – 74	unidentified gull species	*Laurus* spp.
		Canada goose	*Branta canadensis*
RM 1.9 – RM 2.7	76 – 77	double-crested cormorant	*Phalacrocorax auritus*
RM 3.4 – RM 3.5	81 – 82	belted kingfisher	*Megaceryle alcyon*
RM 3.5 – RM 3.9	82 – 83	great blue heron	*Ardea herodias*
		mallard duck	*Anas platyrhynchos*
RM 4.2 – RM 4.3	84 – 85	unidentified gull species	*Laurus* spp.
RM 4.4 – RM 4.6	86 – 87	unidentified gull species	*Laurus* spp.
RM 6.3 – RM 6.4	89 – 90	great blue heron	*Ardea herodias*
RM 6.7 – RM 7.1	92 – 93	groundhog	*Marmota monax*
RM 8.9 – RM 9.6	137 – 141	Norway rat	*Rattus norvegicus*
		mallard duck	*Anas platyrhynchos*
RM 9.8 – RM 10.1	134 – 135	belted kingfisher	*Megaceryle alcyon*
		great egret	*Ardea alba*
RM 10.8 – RM 11.0	129 – 130	Canada goose	*Branta canadensis*
RM 13.3	120 – 121	American robin	*Turdus migratorius*
RM 14.3 – RM 15.6	115 – 116	mallard duck	*Anas platyrhynchos*
		mourning dove	*Zenaida macroura*
		unidentified warbler species	*Dendroica* spp. or *Wilsonia* spp.
		belted kingfisher	*Megaceryle alcyon*
		groundhog	*Marmota monax*
RM 14.1 – RM 14.3	116 – 117	great blue heron	*Ardea herodias*
		unidentified gull species	*Laurus* spp.
		Canada goose	*Branta canadensis*
RM 16.6	144	Canada goose	*Branta canadensis*

Table 3-6. Wildlife observations along the LPRSA

RM Segment	Waypoint ID	Wildlife Observed	
		Common Name	Scientific Name
RM 17.2	146	Canada goose	*Branta canadensis*
		mallard duck	*Anas platyrhynchos*
		great egret	*Ardea alba*

[a] Left bank is the bank on the left of the river when facing upstream.

[b] Right bank is the bank on the right of the river when facing upstream.

LPRSA – Lower Passaic River Study Area RM – river mile

3.1.4 Summary of observations related to human access and shoreline features along the mainstem of the LPRSA

During the habitat identification survey that was conducted from September 20 to 22, 2010, information related to shoreline features, public access points (e.g., boat launches/docks, worn foot paths), and observed human uses of the LPRSA was compiled by AECOM staff. Observations along the mainstem of the LPRSA were conducted via boat on September 20 and 21. Parks and public open space along the right shore were observed from land on September 22. This section summarizes the observations related to shoreline type, predominant adjoining land uses, human uses and activities recorded during the survey (e.g., fishing, rowing), and relevant shoreline features, including boat launches, boat docks, marinas, homeless/transient camps, fencing, and worn footpaths along the mainstem of the LPRSA. Table 3-7 presents a summary of AECOM's observations by river mile and survey waypoint. This section, as well as field forms completed during the survey (presented in Appendix A), a series of figures that identify the adjoining land use, shoreline type, and features related to human access and use (presented as Appendix D), and a photo log (presented as Appendix E), were provided by AECOM.

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
Left Bank[a]			
0 – 1.2	71 – 72	sheet pile/bulkhead	Photos 1, 2, and 3 Passaic Valley Sewerage Commission dock at RM 0.2 (Photo 1) boat dock at RM 0.6 (Photo 3) land use is industrial/commercial/urban
1.2 – 1.4	70 – 71	riprap/stone	land use is industrial/commercial/urban
1.4	69 – 70	sheet pile/bulkhead	land use is industrial/commercial/urban
1.5	66 – 68	natural/vegetated	Photo 4 land use is industrial/commercial/urban
1.5	68 – 69	riprap/stone	land use is industrial/commercial/urban
2.03 – 2.3	64 – 66	sheet pile/bulkhead	land use is industrial/commercial/urban
2.3 – 2.8	61 – 64	natural/vegetated	Photos 5, 6, and 7 land use is industrial/commercial/urban
2.8 – 3.3	57 – 61	sheet pile/bulkhead	Photos 8 and 9 land use is industrial/commercial/urban
3.3 – 3.4	56 – 57	riprap/stone	land use is industrial/commercial/urban
3.4 – 3.5	54 – 56	sheet pile/bulkhead	Photo 10 land use is industrial/commercial/urban
3.5 – 3.7	53 – 54	riprap/stone	land use is industrial/commercial/urban
3.7 – 3.8	52 – 53	sheet pile/bulkhead	land use is industrial/commercial/urban
3.8 – 4.4	50 – 52	natural/vegetated	Riverbank Park, Newark, New Jersey homeless camp at RM 4.2 (Photo 11) land use is recreational/open space
4.4 – 7.2	35 – 50	sheet pile/bulkhead	Photos 12 through 20 private boat dock and marina at RM 7.1 (Photo 20) Minish Park at RM 4.5 to RM 5.1 (Photos 12, 13, and 14) land use is industrial/commercial/urban and recreational/open space bounded by infrastructure (Route 21)
7.2	34 – 35	natural/vegetated	land use is fringe of vegetated open space bounded by infrastructure (Route 21)

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
7.2 – 8.0	31 – 34	sheet pile/bulkhead	Photo 21 land use is infrastructure (Route 21)
8.0	30 – 31	natural/vegetated	confluence with Second River
8.0 – 8.5	27 – 30	sheet pile/bulkhead	land use is infrastructure (Route 21)
8.5	26 – 27	natural/vegetated	land use is fringe of vegetation bounded by infrastructure (Route 21)
8.5 – 10	24 – 26	sheet pile/bulkhead	Photos 22 through 25 land use is fringe of vegetation bounded by infrastructure (Route 21)
10.0 – 10.2	23 – 24	natural/vegetated	land use is open space bounded by infrastructure (Route 21)
10.2 – 11.2	20 – 23	sheet pile/bulkhead	Photos 26 and 27 Nutley boat ramp at RM 10.5 (Photo 27) homeless camp at RM 10.4 (Photo 26)
11.1	19 – 20	natural/vegetated	land use is open space bounded by infrastructure (Route 21)
11.2	18 – 19	sheet pile/bulkhead	confluence with Third River
11.2 – 11.5	13 – 18	natural/vegetated	land use is open space bounded by infrastructure (Route 21)
11.5 – 12.2	9 – 13	sheet pile/bulkhead	Photos 28 and 29 land use is fringe of vegetation with some open space bounded by infrastructure (Route 21)
12.2 – 12.7	8 – 9	riprap/stone	private boat launch at RM 12.5 (Photo 30) land use is industrial/commercial/urban and open space bounded by infrastructure (Route 21)
12.7 – 12.9	7 – 8	sheet pile/bulkhead	Photos 31 and 32 fishing observed at RM 12.8 (Photo 32) land use is fringe of vegetation bounded by infrastructure (Route 21)
12.9 – 13.1	5 – 7	natural/vegetated	land use is open space bounded by infrastructure (Route 21) path through vegetation to shore observed just upstream of Union Avenue bridge sculler observed on river just below Union Avenue bridge
13.1 – 13.4	1 – 5	sheet pile/bulkhead	land use is fringe of vegetation bounded by infrastructure (Route 21)
13.4 – 13.6	97 – 98	natural/vegetated	land use is open space and industrial/commercial/urban bounded by infrastructure (Route 21)
13.6 – 13.8	98 – 99	sheet pile/bulkhead	land use is industrial/commercial/urban
13.8 – 13.9	99 – 100	natural/vegetated	land use is industrial/commercial/urban
13.9	100 – 101	sheet pile/bulkhead	land use is industrial/commercial/urban

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
13.9 – 14.0	101 – 102	natural/vegetated	Photo 33 land use is industrial/commercial/urban
14.0 – 14.4	102 – 105	sheet pile/bulkhead	Photos 34 through 36 homeless camp under Dundee Canal bridge at RM 14.2 (Photo 35) land use is industrial/commercial/urban bounded by infrastructure (Route 21)
14.4 – 14.8	105 – 106	natural/vegetated	Photo 37 land use is industrial/commercial/urban
14.8	106 – 107	sheet pile/bulkhead	Photo 38 land use is industrial/commercial/urban
14.8	107 – 108	natural/vegetated	land use is industrial/commercial/urban
14.9	108 – 109	sheet pile/bulkhead	Photo 39 land use is industrial/commercial/urban
14.9 – 16.1	109 – 113	natural/vegetated	Photos 40 through 43 Pulaski Park at RM 15.7 to RM 16 (Photo 43) Pulaski Park boat ramp at RM 15.9 (Photo 42) private boat launch at RM 15.5 (Photo 41) boat launch at RM 15.4 (Photo 40) land use is residential, recreational, and industrial/commercial/urban space
16.1 – 16.2	113 – 114	sheet pile/bulkhead	Photos 44 through 46 small area past bulkhead in park where shoreline is accessible (Photo 46) land use is residential and recreational
16.2 – 17.4	on foot	natural/vegetated	homeless camp at RM 17 land use is open space and industrial/commercial/urban bounded by infrastructure (Route 21)
Right Bank[b]			
0.4	73 – 74	natural/vegetated	access to river bank at Kearny Point (Photo 49) land use is open space and industrial/commercial/urban
0.4 – 0.9	74 – 75	riprap/stone	land use is industrial/commercial/urban
0.9 – 1.9	75 – 76	sheet pile/bulkhead	Photo 50 land use is industrial/commercial/urban with some infrastructure

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
1.9 – 2.7	76 – 77	riprap/stone	Photos 51 through 53 old boat dock at RM 2.2 (Photo 52) steps to water's edge beside bridge at RM 2.3 (Photo 53) land use is infrastructure (train tracks) with some open space
2.7 – 3.1	77 – 78	sheet pile/bulkhead	land use is infrastructure (train tracks)
3.1 – 3.5	78 – 82	natural/vegetated	land use is infrastructure (train tracks)
3.5 – 4.4	82 – 85	natural/vegetated	Photos 54 and 55 land use is industrial/commercial/urban with some open space
4.4 – 6.2	85 – 89	sheet pile/bulkhead	Photos 56 through 59 land use is industrial/commercial/urban
6.2 – 6.4	89 – 90	natural/vegetated	land use is industrial/commercial/urban
6.4 – 6.6	90 – 91	riprap/stone	Photos 60 and 61 land use is industrial/commercial/urban; no trespassing sign
6.6 – 6.7	91 – 92	sheet pile/bulkhead	Photo 62 land use is industrial/commercial/urban
6.7 – 8.5	92 – 96	natural/vegetated	Photos 63 through 68 Kearny Park at RM 6.7 to RM 6.8 Riverbank Park, Kearny at RM 6.8 to RM 8.5 Kearny boat launch at RM 6.8 (Photo 63) Rapp's Boat Yard at RM 7.7 (Photo 65) Kearny High School floating dock at RM 8.5 (Photo 67) access to river bank through park; no fence land use is recreational/open space with some industrial/commercial/urban space

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
8.5 – 10.2	133 – 143	natural/vegetated	Photos 69 through 79 Riverside County Park at RM 9.6 to RM 10.1 Passaic River Rowing Association floating dock at RM 9.9 (Photo 79) Passaic Valley Sewer Commission private boat launch at RM 9.5 (Photo 74) private boat docks at RM 9.0 (man observed working on dock) (Photo 70) and RM 9.2 fishing observed at RM 9.1 (Photos 71 and 72) next to firehouse boat launch baseball field at RM 8.7 to RM 8.9 (Photo 69) Riverbank Park, Kearny at RM 8.4 to RM 8.5 access to river bank through parkland at various locations land use is residential, recreational and industrial/commercial/urban
10.2 – 10.3	132 – 133	bulkhead	Photo 80 land use is residential
10.3 – 10.5	131 – 132	natural/vegetated	land use is residential, and industrial/commercial/urban
10.5 – 10.9	130 – 131	natural/vegetated	Photos 81 and 82 Riverside County Park at RM 10.5 to RM 10.9 access to river bank through parkland land use is recreational
10.9 – 12.1	127 – 130	natural/vegetated	Photos 83 through 87 Lyndt Park at RM 10.9 to RM 11.7 boat launch at RM 11.0 (Photo 83) Montclair College boathouse and dock at RM 11.6 ; rowers observed boarding boats (Photo 84) land use is recreational/open space with some residential and industrial/commercial/urban space
12.1	126 – 127	sheet pile/bulkhead	Photo 88 Nereid Boat Club at RM 12.1 (Photo 88) land use is recreational/open space
12.1 – 13.2	122 – 125	natural/vegetated	Photos 89 through 93 land use is recreational/open space (Rutherford Memorial Park) and residential

Table 3-7. Summary of observations of LPRSA shoreline features and uses

River Mile	Waypoint ID	Shoreline Type	Shoreline Features and Use Notes
13.2 – 13.4	121 – 122	sheet pile/bulkhead	Photo 94 Rutherford Memorial Park at RM 13.2 to RM 13.4 no access to water through Rutherford Memorial Park because of heavy tree line, steep embankment, and fencing land use is recreational/open space
13.4	120 – 121	natural/vegetated	land use is industrial/commercial/urban
13.4 – 13.5	119 – 120	sheet pile/bulkhead	CPG dock at RM 13.4 (Photo 95)
13.5 – 14	118 – 119	natural/vegetated	Memorial Park at RM 13.7 to RM 13.9 no access to water through Memorial Park because of dense shrubs and fencing (Photo 96) land use is residential and recreational/open space
14 – 14.3	116 – 118	sheet pile/bulkhead	Photos 97 through 99 boat ramp at RM 14.3 (Photo 98) land use is primarily residential with some commercial/industrial/urban space
14.3 – 16.2	114 – 116	natural/vegetated	Photos 100 through 104 path to river bank at RM 15.6 and RM 15.8 fishing observed at RM 15.1 boat ramp at RM 14.6 (Photo 101) foot path to river bank at RM 14.5 (Photo 100) and at RM 15.6 (Photo 104) land use is industrial/commercial/urban, residential, with some infrastructure and open space
16.2 – 17.4	on foot	natural/vegetated	Photos 47 and 48 fishing observed at RM 17 land use is industrial/commercial/urban, residential and open space

[a] Left bank is the bank on the left of the river when facing upstream

[b] Right bank is the bank on the right of the river when facing upstream

CPG – Cooperating Parties Group

LPRSA – Lower Passaic River Study Area

RM – river mile

Shoreline types and potential access points were identified by AECOM based on field observations, videotape, and photo documentation. Shoreline type was categorized according to features relevant to the potential for human access and exposure (Figure D-1 in Appendix D). As described in Section 2.2.1, three predominant shoreline types were noted: natural/vegetated, riprap/stone, and sheet pile/bulkhead. For human access and exposure, areas of mixed vegetation overhanging bulkhead were classified as bulkhead, and areas of mixed vegetation overhanging riprap were classified as riprap. These classifications differ slightly from those used in the ecological habitat characterization, which classified shoreline with bulkhead or riprap with at least 50% overhanging vegetation as mixed vegetation. Differences in classification resulting from the two methods occurred along the left bank between RM 13 and RM 10 adjacent to Route 21, where vegetation was overhanging bulkhead, and one stretch of riprap along the right bank between RM 2.7 and 1.9.

Adjoining land use type shown in Figure D-1 was estimated based on the NJDEP GIS databank (2010). The following six land use categories were used based on NJDEP's land use categories: industrial/commercial/urban[5], residential, recreational/open space, infrastructure, wetlands, and water.

For the purpose of presenting the habitat identification survey findings, the LPRSA has been preliminarily divided into four segments: RM 0 to RM 6.7 (left and right banks), RM 6.7 to RM 16.2 (left bank), RM 6.7 to RM 16.2 (right bank), and RM 16.2 to RM 17.4 (left and right banks). These segments are based on predominant shoreline features and adjoining land uses and are subject to further refinement pending the collection of any new data.

RM 0 to RM 6.7 (left and right banks)

RM 0 to RM 6.7 is dominated by industrial/commercial/urban land use as well as infrastructure (e.g., train tracks adjacent to the right bank from RM 2.0 to RM 3.5). The shoreline is predominantly composed of sheet pile and bulkhead with short segments of riprap/stone and natural, vegetated shoreline. For the most part, direct human access to the river is limited in this portion of the LPRSA because of the nature of the shoreline (i.e., vertical bulkhead) and industrial land uses adjacent to the river. Photos 1 to 19 show RM 0 to RM 6.7 on the left bank; Photos 49 to 61 show RM 0 to RM 6.7 on the right bank.

Major observations along the lower 6.7 miles are summarized as follows:

- The lower left bank up to approximately RM 1.5 is dominated by commercial marine vessel berths and docking facilities (Photos 1 through 4). Adjacent land use is industrial/marine and includes transportation and storage for the

[5] NJDEP land use categories classified as industrial/commercial/urban include: commercial/services, industrial, industrial/commercial complexes, mixed urban or built-up land, other urban or built-up land.

petroleum industry. The shoreline in this area is predominantly sheet pile/bulkhead. The Passaic Valley Sewerage Commission dock is located in this stretch (Photo 1).

- The right bank near the confluence with Newark Bay is predominantly vacant land and open space (Kearny Point). The shoreline in this area is natural/vegetated and riprap/stone (Photo 49).
- A mix of infrastructure (e.g., bridges, rail), industrial and commercial facilities and vacant industrial/commercial land is present on both sides of the river up to approximately RM 3.9 on the left bank (Photos 6 through 10) and approximately RM 5 on the right bank (Photos 50 through 55).
- A small makeshift homeless camp was observed on the left bank at RM 4.2 (Photo 11).
- Riverbank Park, Newark (left bank), a narrow band of green space/open space, runs along the left bank from approximately RM 3.9 to RM 4.4. The shoreline bordering the park is vegetated and steeply sloped. Upstream of Riverbank Park, adjacent to City of Newark and Route 21, the shoreline is predominantly bulkhead (Photos 12 through 19).
- Along the right bank between RM 5 and RM 6.7, the adjacent land use is commercial (e.g., hotel, shopping, car wash) with a new development of multi-family condominiums (Photos 56 through 62). The shoreline is predominantly bulkhead and riprap. In many places, fencing separates the river from the adjoining onshore properties (e.g., Hampton Inn, condominiums).

RM 6.7 to RM 16.2 (left bank)

On the left bank between RM 6.7 to RM 16.2, land use is predominantly infrastructure (Route 21) and commercial/industrial, with pockets of recreational and residential land, particularly in the upper stretch of this segment. A narrow band of vegetated land between Route 21 and the river is present along parts of this stretch. The shoreline is predominantly sheet pile/bulkhead, with short segments of riprap/stone and vegetated shoreline (Photo 29). For the most part, direct human access to the river in this stretch is limited by the presence of Route 21 and the bulkhead along the shoreline. Photos 20 through 46 show RM 6.7 to RM 16.2 on the left bank.

Major observations along the left bank of RM 6.7 to RM 16.2 are summarized as follows:

- A private marina and boat launch is located at RM 7.1 (Photo 20).
- There is a small, makeshift homeless camp at RM 10.4 (Photo 26). At the time of the survey, a tent was present at this location.
- The Nutley Boat Ramp is located at RM 10.5 (Photo 27).

- A private boat launch along a riprap shoreline was observed at RM 12.5 (Photo 30).
- At the time of the survey, anglers with lines in the water were observed fishing from the top of a sheetpile bulkhead at RM 12.8 (Photo 32).
- A small, makeshift homeless camp is situated under the Dundee Canal Bridge at RM 14.2 (Photo 35).
- Several boat launches were observed between RM 15.4 and RM 15.9 (Photos 40 through 42). Some of these are private and abut residential properties.
- Pulaski Park runs along the left bank from RM 15.7 to RM 16.0 (Photos 42 and 43). Potential human access points were observed along the natural/vegetated shoreline of the park, including the Pulaski Park boat launch at RM 15.9 (Photo 42).
- Parks and multi-family residential areas continue along the left bank from approximately RM 16.1 to RM 16.2. Most of the shoreline is bulkheaded (Photos 44 through 46); a wooded area at the upper end of the park land slopes to the shoreline (Photo 46).

RM 6.7 to RM 16.2 (right bank)

On the right bank between RM 6.7 and RM 16.2, land use along the river is varied and includes recreational and green space, commercial, and residential areas. Several parks are located along the right bank between RM 6.7 to RM 13.4. The shoreline is dominated by vegetation, often growing over armored banks, with stretches of bulkhead and riprap. Photos 62 through 104 show RM 6.7 to RM 16.2 on the right bank.

Major observations along the right bank between RM 6.7 to RM 16.2 are summarized as follows:

- Kearny Park runs adjacent to the shore from RM 6.7 to RM 6.8. The Kearny Boat Launch is located at RM 6.8 (Photo 63).
- Riverbank Park (Kearny) runs adjacent to the shore almost continuously from approximately RM 6.8 to RM 8.5 (Photos 64, 66, and 68). Access to the river bank is possible through clearings and within areas where vegetation growth is limited. An expanse of exposed sediment/mudflat was observed offshore.
- Rapp's Boat Yard and Marina is located at RM 7.7 (Photo 65).
- The Kearny High School crew floating dock is located at RM 8.5 (Photo 67).
- A small park with a baseball field is located at approximately RM 8.7 to RM 8.8. Access to the river bank appears possible from this park, although the baseball field is fenced (Photo 69).

- Several boat docks and boat launches are located between RM 9 and RM 9.5 (Photos 70 and 71). The Passaic Valley Sewer Commission boat launch is located at RM 9.5 (Photo 74).
- The firehouse boat launch is at RM 9.1 next to a small park (Photos 72 and 73). At the time of the survey, one or more anglers were observed fishing at the park next to the boat launch (Photo 71).
- Riverside County Park is located adjacent to the river between RM 9.6 and RM 10.1 (Photos 75 through 79). Access to the river bank through clearings in the vegetation appears possible at several points in the park. An expanse of exposed sediment/mudflat was observed offshore.
- The Passaic River Rowing Association has a floating dock within Riverside County Park at RM 9.9 (Photo 79).
- Riverside County Park continues from RM 10.5 to RM 10.9 (Photos 81 and 82). Access to the river bank through clearings in the vegetation appears possible at several points in the park. An expanse of exposed sediment/mudflat was observed offshore.
- Lyndt Park is located between RM 10.9 and RM 11.7. A boat launch is located within the park at RM 11 (Photo 83). The shoreline is mostly vegetated.
- The Montclair College boathouse and dock is located at RM 11.6 (Photo 84). At the time of the survey, rowers were observed on the dock.
- A stretch of predominantly residential property is located between Lyndt Park and the southern end of Rutherford Memorial Park (approximately RM 11.7 to RM 12.8). Some of the properties have boat docks/ramps with access to the water; others are fenced and bulkheaded (Photos 85, 86, 87, 89, 90, 91, 92, and 93).
- The Nereid Boat Club and floating dock is located at RM 12.1 (Photo 88).
- Rutherford Memorial Park is located adjacent to the river between approximately RM 12.8 and RM 13.4. The park is fenced, and much of the shoreline is bulkheaded (Photo 94).
- The CPG dock is located at RM 13.4 (Photo 95).
- A small park (Memorial Park) is located next to the river at approximately RM 13.8. The park is fenced (Photo 96).
- Residential properties are located between RM 14 and RM 14.3 (Photos 97, 98, and 99). The properties are fenced along the shoreline, which is bulkheaded.
- A boat ramp is located at RM 14.3 (Photo 98).
- Between RM 14.5 and RM 14.6, there is a foot path to the water and a boat ramp (Photos 100 and 101).

- Park land/green space is located between RM 15 and RM 15.6 and foot paths to the water's edge were observed (Photos 103 and 104). At the time of the survey, an angler was observed with a line in the water at RM 15.1. Residential property with access to the water is located at approximately RM 15.2 (Photo 102).

RM 16.2 to RM 17.4 (left and right banks)

This section of the river was only accessible by foot during the survey. Observations of this portion of the river were only made from the right bank. The shoreline is vegetated and slopes down to the water on both sides of the river (Photos 47 and 48). Makeshift homeless camps are present on both banks of the river at approximately RM 17. At the time of the survey, people were present at both locations. Two anglers were observed fishing off the right bank at approximately RM 17. Access to the water is possible throughout much of this stretch of the river, and several foot paths were observed.

3.2 SURVEY OF THE LPRSA TRIBUTARIES

This section presents the observations recorded on September 22 and 23, 2010, during the survey of the tributary locations. Supporting documentation (i.e., field forms and field logbook entries) and video footage are provided in Appendices A though C.

3.2.1 Summary of tributary shoreline characterization

The shoreline at 15 of the 18 tributary locations surveyed was characterized as mixed vegetation; the remaining three locations were characterized as bulkhead (Table 3-8).

Table 3-8. Shoreline types along the LPRSA tributaries surveyed

Tributary	Location	Shoreline Category
Saddle river	Arcola Pool Site	mixed vegetation
	County Park	mixed vegetation
	Felician College South	mixed vegetation
	Lodi Cemeteries	mixed vegetation
	Ox Bow	mixed vegetation
Second River	Belleville	bulkhead/mixed vegetation
	Bloomfield	bulkhead/mixed vegetation
	Mills	bulkhead/mixed vegetation
	Passaic	bulkhead/mixed vegetation
	Watsessing Park	bulkhead/mixed vegetation
	Wigwam Brook	bulkhead

Table 3-8. Shoreline types along the LPRSA tributaries surveyed

Tributary	Location	Shoreline Category
Third river	Bonsal Wildlife Preserve	mixed vegetation
	Clarks Pond	mixed vegetation
	Clifton Pond	mixed vegetation
	Forest Hills Field Club	mixed vegetation
	Glen Ridge Country Club	mixed vegetation
	JFK Parkway	bulkhead/mixed vegetation
	River Mouth	mixed vegetation

3.2.2 Summary of tributary habitat and plant community observations

The plant communities at all but one of the tributary locations were composed of mixed forest with shrub/scrub (Table 3-9). The Arcola Pool site along the Saddle River was dominated by emergent vegetation. Plant species were similar to those found along the LPRSA. Plants commonly observed during the tributary survey, as well as their status as native/non-native species, are provided in Table 3-10.

Table 3-9. Plant community and habitat features along the tributary survey locations

Tributary	Location	Plant Community	Habitat Features
Saddle River	Arcola Pool Site	emergent vegetation	sand substrate; large patches of common reed (*Phragmites australis)*; in-water concrete structures; large tree canopy along site border
	County Park	mixed forest; shrub/scrub	silt and sand substrate; cobbles; large woody debris
	Felician College South	mixed forest; shrub/scrub	woody debris; sandbar with gravel and cobble
	Lodi Cemeteries	mixed forest; shrub/scrub	steep banks; sparse trees on edge of cemetery; silt and sand substrate
	Ox Bow	mixed forest; shrub/scrub	steep banks; sparse large woody debris; sparse large rocks on shoreline
Second River	Belleville	mixed forest; shrub/scrub	bulkhead along both banks; cobble substrate; walkway
	Bloomfield	mixed forest; shrub/scrub	bulkhead along both banks; sand and cobble substrate; overhanging vegetation; maintained lawn above left bank (at bridge); Morris Canal site; larger trees along canopy of left bank
	Mills	mixed forest; shrub/scrub	steep banks but no bulkhead; steep descent from residences at top of left bank (~150 ft above); large canopy trees; sparse understory along both banks; cobble, gravel, and sand substrate with garbage debris; concrete debris; overhanging vegetation (not dense); some large woody debris
	Passaic	mixed forest; shrub/scrub	bulkhead along left bank with building above, bulkhead with river walk above along right bank; large woody debris in stream; cobble; minimal overhanging vegetation

Table 3-9. Plant community and habitat features along the tributary survey locations

Tributary	Location	Plant Community	Habitat Features
	Watsessing Park	mixed forest; shrub/scrub	left bank – bulkhead and steep bank; right bank – bulkhead; cobble, gravel, sand, substrate; overhanging vegetation; concrete debris, large rocks; canopy predominantly closed canopy with concrete path parallel to railroad bridge
	Wigwam Brook	mixed forest; shrub/scrub	bulkhead on both banks; right bank is mostly lawn; left bank has sparse small trees
Third River	Bonsal Wildlife Preserve	mixed forest; shrub/scrub	steep left bank up to residences and sparse understory growth on slope; small creek coming along right bank; cobble, gravel, and sand substrate; side streambed with woody debris and overhanging vegetation; wide streambed with riffles and small pools; few large trees; exposed roots
	Clarks Pond	mixed forest; shrub/scrub	edge of ball field along left bank; appears to have been planted with riparian vegetation; path along shoreline; pond is dammed; closed tree canopy with overhanging vegetation and large woody debris along right bank
	Clifton Pond	mixed forest; shrub/scrub	steep left and right bank; sparse tree cover along left bank; dense but narrow strip of tree cover along right bank
	Forest Hills Field Club	mixed forest; shrub/scrub	edge of parking lot in apartment complex along right bank; snag
	Glen Ridge Country Club	mixed forest; shrub/scrub	shallow banks; sand substrate; large woody debris on banks; concrete debris in water
	JFK Parkway	mixed forest; shrub/scrub	bulkhead; cobble, silt and sand substrate; park surrounding brook upstream on right bank and downstream left bank; fenced shoreline and businesses.
	River Mouth	mixed forest; shrub/scrub	overhanging vegetation on left bank; paved fenced walkway with plantings above river walk along right bank

Table 3-10. Common plant species identified at the LPRSA tributary survey locations

Common Name	Scientific Name	Status[a]
Arrow-wood viburnum	*Viburnum dentatum*	native
Ash (unidentified)	*Fraxinus spp.*	
Black locust	*Robinia pseudoacacia*	native (naturalized)
Boneset (unidentified)	*Eupatorium* spp.	
Catalpa	*Catalpa speciosa*	native
Cattail (unidentified)	*Typha* spp.	
Common ivy	*Hedera helix*	non-native
Common reed	*Phragmites australis*	native
Common smartweed	*Polygonum hydropiper*	
Dame's rocket	*Hesperis matronalis*	non-native
Duckweed (unidentified)	*Lemna* spp.	
Eastern cottonwood	*Populus deltoides*	native

Table 3-10. Common plant species identified at the LPRSA tributary survey locations

Common Name	Scientific Name	Status[a]
Elm (unidentified)	*Ulmus* spp.	
Goldenrod (unidentified)	*Solidago* spp.	
Hickory (unidentified)	*Carya* spp.	
Honeysuckle (unidentified)	*Lonicera* spp.	
Iris (unidentified)	*Iris* spp.	
Japanese knotweed	*Fallopia japonica, syn. Polygonum cuspidatum*	non-native
Jewelweed (unidentified)	*Impatiens* spp.	
Lady's thumb	*Persicaria maculosa*	non-native
Locust (unidentified)	*Gleditsia* spp. or *Robinia* spp.	
Maple (unidentified)	*Acer* spp.	
Multiflora rose	*Rosa multiflora*	non-native
Northern red oak	*Quercus rubra*	native
Norway maple	*Acer platanoides*	non-native
Ornamental cherry (unidentified)	*Prunus* spp.	
Pink smartweed (unidentified)	*Polygonum* spp.	
Poison ivy	*Toxicodendron radicans*	native
Pokeweed	*Phytolacca americana*	native
Privet (unidentified)	*Ligustrum* spp.	
Purple loosestrife	*Lythrum salicaria*	non-native
Red maple	*Acer rubrum*	native
Scarlet oak	*Quercus coccinea*	native
Silver maple	*Acer saccharinum*	native
Snakeroot (unidentified)	*Ageratina* spp.	
Spice bush	*Lindera benzoin*	native
Sycamore	*Platanus occidentalis*	native
Tree-of-heaven	*Ailanthus altissima*	non-native
Tuliptree[b]	*Liriodendron tulipifera*	native
Virginia creeper	*Parthenocissus quinquefolia*	native
Weeping willow	*Salix babylonica*	non-native
Willow oak[b]	*Quercus phellos*	native

[a] Native/non-native status was only provided for plants identified to the species level, where available (NRCS 2010).

[b] Species identified by USEPA oversight personnel.

3.2.3 Summary of tributary wildlife observations

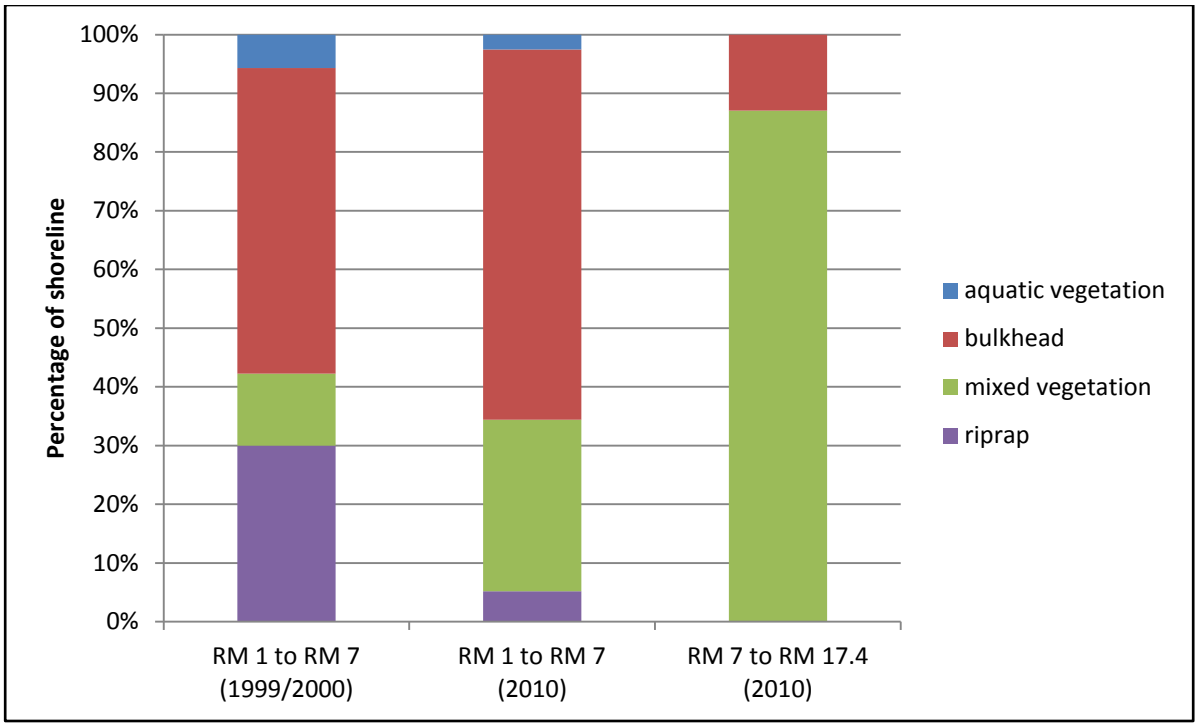
All the wildlife that was incidentally observed along the tributary locations during the survey was birds (Table 3-11). Two fish species (i.e., common carp [*Cyprinus carpio*] and an unidentified bass species) were also observed swimming.

Table 3-11. Wildlife observations along the tributary survey locations

Tributary	Location	Wildlife Observed	
		Common Name	Scientific Name
Saddle River	Felician College South	gray catbird	*Dumetella carolinensis*
		mallard duck	*Anas platyrhynchos*
	Lodi Cemeteries	American robin	*Turdus migratorius*
		gray catbird	*Dumetella carolinensis*
Second River	Mills	American robin	*Turdus migratorius*
	Wigwam Brook	gray catbird	*Dumetella carolinensis*
Third River	Glen Ridge Country Club	downy woodpecker	*Picoides pubescens*
	JFK Parkway	Canada goose	*Branta canadensis*
		mallard duck	*Anas platyrhynchos*
	Clarks Pond	Canada goose	*Branta canadensis*

3.3 COMPARISON OF 2010 SURVEY AND HISTORICAL SURVEYS

Tierra Solutions conducted a habitat characterization survey on the lower portion of the LPRSA (RM 1 to RM 7) in fall 1999 and spring 2000 (Tierra Solutions 2002). The 1999 and 2000 habitat surveys were conducted in a manner similar to that of the 2010 survey, in which observations of shoreline characteristics were made by boat, video recording was made in all areas surveyed, and shorelines were classified into four general categories (i.e., aquatic vegetation, bulkhead, riprap, mixed vegetation). Tierra Solutions reported that of the total shoreline (left and right banks) approximately 52% was bulkhead, 30% riprap, 12% mixed vegetation, and 6% aquatic vegetation; over 80% of the total shoreline was bulkhead and riprap, with little habitat value. In comparison, the 2010 survey of the same section of the LPRSA (i.e., RM 1 to RM 7) identified that the total shoreline is 63% bulkhead, 5% riprap, 29% mixed vegetation, and 3% aquatic vegetation (Figure 3-3). Although the differences in the percentages among shoreline categories between the 1999/2000 and 2010 surveys can be attributed, in part, to the subjective nature of the observations and the seasonal differences between the surveys; the increase in mixed vegetation can also be attributed to the amount of shoreline vegetation that has overgrown riprap and/or bulkhead over the course of 10 years (e.g., attributable to lack of maintenance).



Source of 1999/2000 data from RM 1 to RM 7: Tierra Solutions (2002)

Figure 3-3. Comparison of shoreline by habitat classification along the mainstem LPRSA during the 1999/2000 and 2010 surveys

The habitat and plant community observations made during the habitat identification survey are consistent with observations made during other surveys, specifically, the ecological benchmark survey conducted in 2005 (Shisler et al. 2008) and the vegetation sampling, wetland delineation, and bio-benchmark survey conducted in 2006 (USACE et al. 2008). Neither of these surveys was a continuous shoreline survey, but both examined specific locations for habitat attributes. Similar plant community observations were made during both surveys, and locations of specific habitat types (e.g., locations of mudflats or emergent marsh vegetation) appear to be consistent.

4 Summary

The results of the habitat identification survey revealed that the shoreline of the mainstem LPRSA is dominated by mixed vegetation (over 60% of the shoreline), which typically consisted of riprap, bulkhead, or natural bank with scrub/shrub or forest vegetation growing on top. Bulkhead and riprap alone, without vegetation, were also prevalent (approximately 35% of the shoreline), particularly along the lower portions of the LPRSA (RM 0 to RM 10). Aquatic vegetation constituted the smallest percentage of shoreline, approximately 1%.

The results of the habitat identification survey indicate that direct human access to the river in the lower 6.7 miles is limited because of the nature of the shoreline (i.e.,

vertical bulkhead) and industrial land uses adjacent to the river. Human access along the left bank between RM 6.7 and RM 16.2 is also limited by the presence of Route 21 and the primarily bulkheaded shoreline. There are several parks and residential areas where access to the water is possible along the right bank between RM 6.7 and RM 16.2. In this area, the shoreline is dominated by vegetation, often growing over armored banks, with stretches of bulkhead and riprap. RM 16.2 to RM 17.4 is vegetated and slopes down to the water on both sides of the river. Access to the water is possible throughout much of this upper stretch of river.

The 18 sites surveyed along the three tributaries were dominated by residential, commercial, or recreation land uses. The mixed-vegetation shorelines varied from steep banks with riprap or other decaying bank armor to shallow sloped banks with sand or gravel bars. The majority of the shorelines were shaded by canopy trees with scrub vegetation in the understory. Several shorelines were adjacent to trails or walkways with limited understory vegetation.

During the 2010 habitat identification survey, gulls, Canada geese, mallards, great blue herons, robins, catbirds, and woodpeckers were observed throughout the LPRSA mainstem and tributaries. Turtles, rats, groundhogs, carp, and bass were also observed throughout the LPRSA. Wildlife observations made during this 2010 field effort were consistent with observations made during previous sampling events, in particular the 2009 and 2010 fish and benthic community sampling events (Windward 2010a, b; 2011b, in prep.), and the summer and fall 2010 avian community surveys (Windward 2011a).

5 References

GEOD. 2007. GIS metadata for the Lower Passaic River Study Area. Prepared for the Cooperating Parties Group. GEOD Consulting, Burlington, MA.

NJDEP. 2010. NJDEP digital data downloads in ArcView shape file format: 2007 land use/land cover update (7/19/10) [online]. Bureau of Geographic Information Systems, New Jersey Department of Environmental Protection, Trenton, NJ. Updated 10/19/10. Available from: http://www.state.nj.us/dep/gis/lulc07cshp.html.

NRCS. 2010. The plants database, National Plant Data Center, Baton Rouge, LA [online]. Natural Resources Conservation Service, US Department of Agriculture. [Cited November 15, 2010.] Available from: http://plants.usda.gov/index.html.

Shisler JK, Iannuzzi TJ, Ludwig DF, Bluestein PJ. 2008. Ecological benchmarking in an urbanized estuarine river system. Ecol Restor 26(3):235-245.

Tierra Solutions. 2002. Passaic River Study Area habitat characterization. September 26, 2002. Tierra Solutions, Inc., Newark, NJ.

USACE, USEPA, NJDOT. 2008. Lower Passaic River Restoration Project vegetation sampling, wetland delineation and bio-benchmark report. US Army Corps of Engineers New York District; US Environmental Protection Agency Region 2, New York; New Jersey Department of Transportation.

USEPA. 2007. Administrative settlement agreement and order on consent for remedial investigation/feasibility study, Lower Passaic River Study Area portion of the Diamond Alkali Superfund site. US EPA Region 2 CERCLA docket no. 02-2007-2009. US Environmental Protection Agency, Region 2, New York, NY.

Windward. 2010a. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Benthic invertebrate community survey and benthic field data collection report for the Lower Passaic River Study Area fall 2009 field effort. Draft. Prepared for Cooperating Parties Group, Newark, NJ. August 23, 2010. Windward Environmental LLC, Seattle, WA.

Windward. 2010b. Lower Passaic River Restoration Project. Fish and decapod field report for the late summer/early fall 2009 field effort. Final. Prepared for the Cooperating Parties Group, Newark, NJ. September 14, 2010. Windward Environmental LLC, Seattle, WA.

Windward. 2010c. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Habitat identification survey: Addendum to the Quality Assurance Project Plan. Surface sediment chemical analyses and benthic invertebrate toxicity and bioaccumulation testing. Addendum No. 3. Final. Prepared for Cooperating Parties Group, Newark, New Jersey. September 13, 2010. Windward Environmental LLC, Seattle, WA.

Windward. 2011a. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Avian community survey data report for the Lower Passaic River Study Area summer and fall 2010 field efforts. Draft. Prepared for Cooperating Parties Group, Newark, NJ. April 5, 2011. Windward Environmental LLC, Seattle, WA.

Windward. 2011b. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. Fish community survey and tissue collection data report for the Lower Passaic River Study Area 2010 field efforts. Draft. Prepared for Cooperating Parties Group, Newark, NJ. March 9, 2011. Windward Environmental LLC, Seattle, WA.