Connecting with Our Waterways:
Public Access and its Stewardship in the
New York - New Jersey Harbor Estuary

Appendix A: Detailed Methods

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Overview

The following are the detailed methods, including references to specific GIS data used and created (available upon request from the NY-NJ Harbor & Estuary Program) to produce *Connecting with Our Waterways: Public Access and its Stewardship in the New York – New Jersey Harbor Estuary*. These methods were developed by the New York-New Jersey Harbor & Estuary Program (HEP) in collaboration with the USDA Forest Service at the NYC Urban Field Station. Sections of this appendix address the following.

Table of Contents

Tables and Figures

Overview

The basis for analysis of relative need for public access and stewardship throughout the estuary was a desktop analysis using ArcGIS. The individual data sets used and step-by-step methods of analysis are described in this section and, where appropriate, specific layer names within the geodatabase are referred to in parentheses.

Table 1: Geospatial data sets used

Data description	Source
Linear waterfront	National hydrography data set, adapted by NY-NJ HEP
Publicly accessible waterfront spaces	NYC Department of City Planning
NYC park lands	NYC Department of Parks & Recreation
NJ protected areas	NJ Protected Areas Database
NY protected areas	NY Protected Areas Database
Neighborhood tabulation area geographies	NYC Department of City Planning
Geographical boundary files (TIGER/Lines)	US Census
Median household income	US Census
Communities of color	US Census
Youth (under age 14)	US Census
Population growth	US Census, City University of NY Center for Urban Research

Figure 1: the study area was based on a .5 mile buffer around the waterfront and waterfront parks.

Public Access Typology

Public access sites were mapped using ESRI ArcGIS 10.2, and multiple data sets from the New York City Department of City Planning (Publicly Accessible Waterfront Spaces), New York City Department of Parks and Recreation, New Jersey PAD (Protected areas database), New York PAD (Protected areas database), and sites digitized by the New York-New Jersey Harbor & Estuary Program. All sites were reviewed individually and defined according to the following categories, of which only "parks" and "other public access" were considered openly accessible. Sites are only included if they are directly on the waterfront of the waters within the NY-NJ Harbor Estuary core area (Figure 1).

Typology definitions

The following are the typologies and definitions used in the assessment and developed in collaboration with the Public Access Work Group:

Parks: owned by federal, state, county, municipal, or private conservation entities and dedicated for park purposes.
Other public access: owned by public agencies or private sector with public easement, and generally open to public such as:

- Public boat ramps and marinas (not in parks)
- Public esplanades/piers (not in parks)
- Privately-owned esplanades/piers with public easements
- Improved street-ends and civic plazas

Limited: temporary or permanent restrictions on public access such as:

- Designated wildlife areas owned by federal, state, county, municipal, or private conservation entities with restricted access.
- Park lands owned by federal, state, county, municipal, or private conservation entities, where access is currently restricted but anticipated given future improvements (e.g. Fresh Kills, Penn and Fountain landfills).
- Public lands with highly controlled public access (e.g. Brooklyn Navy Yard)

Privately owned and open to public use but not dedicated as public space:[8]

- Marinas and boat launches that are privately owned and open to public
- Other commercial establishments (e.g. restaurants) that allow regular access to the water.

Gaps: sites with no current access to the waterfront including:

- Privately or publicly owned with no current access to the waterfront. This may include sites where access is occasionally allowed for special events or other purposes.

Prohibited access: areas with permanent restrictions on public access such as:

- Airports, marine terminals, ports, and other protected facilities/infrastructure (e.g. Port Newark).
- Military and corrections facilities (e.g. Naval Weapons Station Earle, Rikers Island).

Gaps in Access

To map the status of access along the linear waterfront, a harbor-wide waterfront layer was used ("NHDwater_052115") to calculate linear miles using field calculator. Then, the typology values "Parks" and "Other" were selected from all of the mapped sites, to create a new feature class of only publicly accessible sites ("waterfrontparks_8_12_15"). This layer was then buffered by 50 meters, and the subtract tool was used to erase all other waterfront in the NHDwater_052115 layer. These steps were repeated for the "limited access," "limited access: sensitive wildlife area," and "prohibited access" typologies. All linear waterfront not within the "parks," "other," and "limited access: sensitive wildlife" areas was considered a gap in access. Using satellite imagery, each linear layer was then manually corrected so that each gap in access correctly lined up with the extent of inaccessible area (to correct for some of the inaccuracy generated by buffering each open access by 50m). Using satellite imagery, if piers were submerged or no longer present, the waterfront layer was corrected to line up with the apparent land edge.

To calculate linear access for individual high need areas, the clustered high need areas (see Need Index: cluster analysis) were first overlain onto the typology map. Then, the linear waterfront composition perpendicular to each high need waterfront area (cluster) was calculated for each area. In this way, regardless of whether or not the cluster is touching the waterfront, a measure is possible based on the waterfront to which it is perpendicular.

Need Index

The components of the Need Index were developed to establish the socioeconomic and demand context (for publicly-accessible waterfront space) in the area of study (for the Need Index, the area of study is defined as within a 0.5 mile buffer from the edge of the waterfront and waterfront parks). The index was created by mapping the indicators described below within the area of study by census block group. Five main components contributed to the index:

- **Income:** median household income
- **Communities of color:** percentage of people of color
- **Youth (under age 14):** percentage of people under the age of 14
- **Population growth:** the percent change in population size between 2000-2010
- **Population without waterfront park access:** number of people without access within ½ mile

Obtaining data

All of the data for the **Need Index** were obtained from the US Census, with the exception of "population without waterfront park access," which included a combination of both US Census data (population) and the "waterfront parks" and "other" access typology layers.

Census data were downloaded from the US Census factfinder website: http://factfinder.census.gov/faces/nav/jsf/pages/download_center.xhtml. For Median household income data, the 2013 American Community Survey (2013 ACS – 5 year estimates) data set was used. For the rest of the data (Communities of color, youth, population without waterfront park access, and population growth), the 2010 decennial census (2010 SF1) data set was used. In addition, for population growth, the 2000 decennial census (2000 SF1) was also used. For population growth, data were analyzed on the municipality (census calls them county subdivisions, New Jersey and New York State not NYC) or neighborhood scale (NTA, New York City). For the remaining criteria, census block groups were used.

Choosing fields

For the Income data, in the 2013 ACS, the field B19013 (MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2013 INFLATION-ADJUSTED DOLLARS) were used. For population growth in New Jersey and New York state outside of NYC, the 2000 and 2010 decennial survey, the field P1 (Total population) was used. For New York City, neighborhood tabulation areas (NTAs) were used. The compiled population growth census data from the Center for Urban Research were used, located at: www.urbanresearchmaps.org/plurality/#nabes. For Communities of Color, field P9 (HISPANIC OR LATINO, AND NOT HISPANIC OR LATINO BY RACE) was used. For Youth, field P12 (SEX BY AGE) was used. For Density, the fields P1 (Total population) was used at the block group level.

Preparation of data

Income

Median household income data were left unmodified except that all block groups with median household incomes greater than $250,000 were relabeled to be 250,000+.

Communities of color

In the manner described by the Center for Urban Research's www.oasisnyc.net map, communities of color were mapped. In order to obtain the percentage of people of color in a block group, sub-field D005 (Not Hispanic or Latino: - Population of one race: - White alone) was used to represent of the inverse of a person of color, or more simply stated: person who is "white alone." Therefore percent Community of Color (CC) was calculated at the block group level as follows:

$$\%\ CC = \frac{(Total\ population - "white\ alone")}{(Total\ population)} \times 100$$

Youth (under age 14)

In order to obtain the percentage of people under the age of 14 in a block groups, the following sub-fields were added together: D003 (Male: Under 5 years), D004 (Male: 5 to 9 years), D005 (Male: 10 to 14 years), D027 (Female: Under 5 years), D028 (Female: 5 to 9 years), D029 (Female: 10 to 14 years) to yield the number of people under the age of 14 for a specific block group. This number was then divided by the total population and multiplied by 100% to obtain the percentage of Youth in a block group.

Population growth

Population growth was calculated as follows:

$$Population\ growth = \frac{(population\ 2010 - population\ 2000)}{(population\ 2010)} \times 100$$

Population without waterfront park access

Population data from the 2010 census were used to calculate the population without waterfront park access. The methods for calculating this are described below; GIS methods are described further in "Creating a buffer within the study area," "Calculating the percent of a block group that lies within one half mile of accessible waterfront," and "Calculating the population by block group that has access within one half mile." Exact populations within the study area were approximated by first calculating the percent of the block group that fell within the buffer, and then multiplying that percent by the total population within the block group to get the approximated population within the buffer (this assumes equal distribution within the block group).

Population within the study area =

$$\sum_{i=1}^{n} \%\ of\ block\ group_i\ within\ buffer \times total\ block\ group_i\ population$$

The same was then completed only for the portion of that population within ½ mile of a waterfront park.

Population within .5 miles of a waterfront park =

$$\sum_{i=1}^{n} \%\ of\ block\ group_i\ within\ .5\ miles\ of\ park \times total\ block\ group_i\ population$$

Then, "population within .5 miles of a waterfront park" was subtracted from "population within the study area" to arrive at the population without waterfront park access (Figure 2). Then, these data were sorted into quintiles (see "Aggregation of data into quintiles," below), with the lowest need being block groups in which all individuals within the buffered study area that have access to waterfront parks.

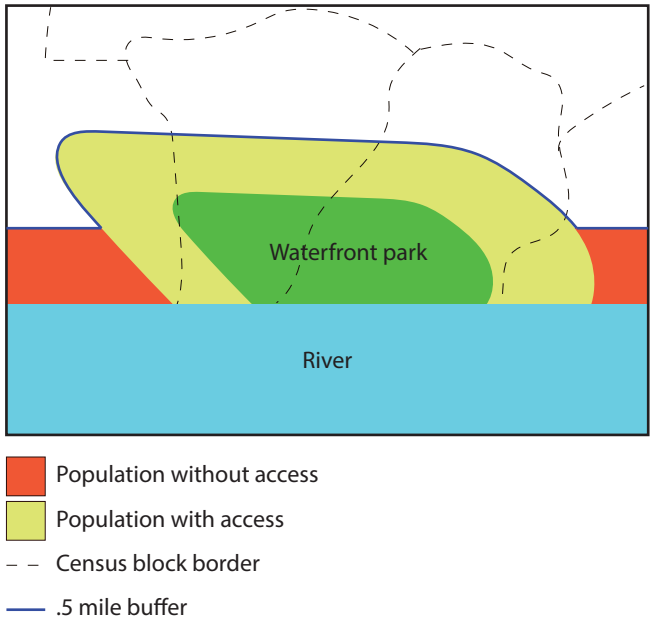

Figure 2: Calculating the population without waterfront park access. Buffers around the waterfront parks were subtracted from the overall .5 mile buffer.

Aggregation of data into quintiles

Each block group (bg) was given a score of 1-5 for each component of the Need Index dependent on its quintile rank (located in field "Rank_Sum" of the attribute table of "BG_POC_Youth_Income_Parks_Growth_05mile_waterfront") among that particular component, as summarized by the following equation:

Quintile score =

$$\begin{cases} 1, \text{if bg value} < 20\text{th percentile} \\ 2, \text{if bg value} \geq 20\text{th percentile and} < 40\text{th percentile} \\ 3, \text{if bg value} \geq 40\text{th percentile and} < 60\text{th percentile} \\ 4, \text{if bg value} \geq 60\text{th percentile and} < 80\text{th percentile} \\ 5, \text{if bg value} \geq 80\text{th percentile} \end{cases}$$

For example, if a block group's median household income was in the 28th percentile of all block group median household income, it was given a quintile score of 2.

For each component of the Need Index, the lower quintile values were assigned the block groups that correspond with the most "need", which is summarized as follows:

- Income: lower income signifies greater need.
- Communities of color: higher percentage of communities of color signifies greater need.
- Youth (under age 14): higher percentage of youth signifies greater need.
- Population growth: higher population growth signifies greater need.
- Population without waterfront park access: higher population of those not served by waterfront parks signifies greater need.

Joining data to geographies

Geographical boundary files (TIGER/Lines) were downloaded at www.census.gov/geo/maps-data/data/tiger-line.html. Where the respective year and geographic level was downloaded for each data set used: 2013 block group, 2010 block group, 2010 county subdivision, and 2000 block group. NTA geographies were downloaded from NYC department of City Planning at: http://www.nyc.gov/html/dcp/html/bytes/dwn_nynta.shtml. The GEIOD field was then used to join the census data with the TIGER/Line data within GIS.

Creating a buffer in the study area

The study area was defined as the area within either one half mile from the waterfront or a waterfront park. To gather census data within the study area, any block group within a body of water was clipped from the census block group feature class.

The attribute table of the feature class: "NYNJ_BG_nowater" (block groups with census data attached) was used to calculate the total acres of each census block group within study area. Then a new field was added and geometry in acres was calculated (field labeled as TOT_Acres_BG).

To create a buffer around accessible waterfront for analyzing the population without waterfront access, all openly accessible waterfront spaces were extracted from the all sites feature class (named all_sites_8_12_15) by selecting the field "Major_Typology" and the values "Parks" and "Other." The selected features were then exported to a new feature class labeled: "waterfrontparks_8_12_15".

Following this, a new field was created in the attribute table of the "waterfrontparks_8_12_15" feature class that calculated the total acreage of waterfront parks. The new field was populated by calculating the geometry of the area in acres and named Total_Acres_Waterfrontpark.

A geometric join was then created of the two separate feature classes of the water bodies within the study area ("NHDwater_052115") and waterfront parks ("waterfrontparks_8_12_15") by using the Union Tool in the geoprocessing tool bar. The new feature class was named "union_NHDwater_waterfrontparks."

A 0.5 mile buffer was then created around the waterfront public spaces and water bodies feature class using the feature class "union_NHDwater_waterfrontparks" and was named buffer_05mile_waterfront (represents a one half mile buffer around waterfront public spaces and the waterfront).

In order to separate the buffered areas from going across water bodies so that calculations did not spread across narrow rivers and streams, the erase tool was used to extract out any areas using the water body feature class ("NHDwater_52115"). The output feature class was named "erase_buffer_05mile_waterfront."
The dissolve tool was then used to merge features of

the ½ mile buffered areas of all the waterfront parks and coastal areas.

The dissolved feature class of the ½ mile buffered areas of waterfront parks and water bodies ("dissolve_buffer_05mile_waterfront") was then used to extract census blocks groups with relevant census data ("NYNJ_BG_no_water") that fall within the ½ mile buffered accessible waterfront area.

The resulting feature class ("intersect_bg_with_05mile_buffer_waterfront") represents all the block groups with census data attached that lie within the on half mile buffer around waterfront public spaces and the waterfront.

Calculating the percent of a block group that lies within one half mile of accessible waterfront

To enable calculating the population without waterfront access, the percent of block groups falling within one half mile of a waterfront park or other public space was first calculated.

A new field (type: double) was created in the attribute table of buffered block feature class ("intersect_bg_with_05mile_buffer_waterfront," described above) to calculate the acreage of each block group that lies only with the buffered one half mile of the waterfront.

The new field ("Acres_BG_within_05mile_accessible_waterfront") was populated by calculating the geometry of the area in acres. Another new field was created in the attribute table of the "intersect_bg_with_05mile_buffer_waterfrontpark" feature class that contained the percentage of the block group area that lies within the one half mile of accessible waterfront in acres by using field calculator and the equation below.

$$\frac{(Acres\_BG\_within\_05mile\_accessible\_waterfront)}{(TOT\_Acres\_BG)} \times 100$$

The resulting field (PercentAcres_BG_within_05mile_accessible_waterfront) represents the percentage of the block group area (acres) that lies within the one half mile buffer of accessible waterfront.

Calculating population by block group with access within one half mile

To calculate only those with access within one half mile, a one half mile buffer was created around waterfront "park" or "other" typology categories in the feature class "waterfrontparks_8_12_15."

To again separate the buffered areas from going over the bodies of waters so that calculations of the waterfront park acreage did not occur across narrow rivers and streams, the erase tool was used to remove these areas using the water body feature class ("NHDwater_52115"). The output feature class was named "erase_buffer_05mile_waterfrontparks."

The dissolve tool was then used to merge features of the one half mile buffered area around the waterfront parks.

The dissolved feature class of the one half mile buffered areas of waterfront public spaces ("dissolve_buffer_05mile_waterfrontparks") was then used to extract census block groups with census data that fall within the buffer.

The resulting feature class ("intersect_bg_buffer _05mile_waterfrontparks") represents all the block groups with census data attached that lie within the ½ mile buffer of a waterfront park.

A new field (type: double) was then created in the attribute table of the: "intersect_bg_buffer _05mile_waterfrontparks" feature class to calculate the geometry acres of each block group lying only within the buffered one half mile of the waterfront ("Acres_BG_within_05mile_ waterfrontpark."
Another new field in the attribute table of the "intersect_bg_buffer _05mile_waterfrontparks" feature class was created containing the percentage of the block group area that lies within the ½ mile of a waterfront park in acres using field calculator and the equation below:
That field was named "PercentAcres_BG_

$$\frac{(Acres\_BG\_within\_05mile\_waterfrontpark)}{(TOT\_Acres\_BG)} \times 100$$

within_05mile_waterfrontpark," representing the percentage of the block group area (acres) that lies within the one half mile buffer of a waterfront park.
To obtain only the population in each block group within

the one half mile buffer of a waterfront park, a new field (BG_TOT_POP_within_05mile_waterfrontpark) was created within the attribute table of the "intersect_bg_ buffer _05mile_waterfrontparks." This was completed by taking the percentage acres of the block group field, dividing by 100, then multiplying by the total population field in field calculator:*

$$\frac{(PercentAcres\_BG\_within\_05mile\_waterfrontpark)}{(100)} \times \text{Total pop.}$$

A new field, (BG_PERCENT_POP_within_05mile_ waterfrontpark) was created, using the type "Double." To calculate the percentage of the total population in a block group within the one half mile buffer of a waterfront park, records were selected where values for the fields of "Total", equal more than 0. The selected records exclude from calculations any fields that have zero values because field calculator is unable to divide by zeros and an overflow error will occur. Field calculator was then used to calculate the equation below:

$$\frac{(BG\_TOT\_POP\_within\_05mile\_waterfrontpark)}{(Total\ pop)} \times 100$$

The two features classes were then joined to create a new feature class that included all the attributes of the ½ mile buffer of the waterfront ("intersect_bg_ with_05mile_buffer_waterfront") and ½ mile buffer of the waterfront parks with census data attached ("intersect_bg_buffer _05mile_waterfrontparks"). Then, new fields were created manually and the percentages of the population using the above steps were calculated.

Aggregating the components of the Need Index using ArcGIS

After each of the Need Index components was individually calculated, the Need Index itself was then calculated by adding the quintile score of each of the above five components of the Need Index. This summed scored was then grouped into quintiles following the equation described in "Aggregation of Data into Quintiles" and mapped with higher scores indicating higher need and lower scores indicating lower need (Figure 3).

Because population growth was analyzed at a different geographical scale than the other components of the Need Index, it was converted into block groups. Block groups falling within the municipalities in NJ or NTAs in NYC were considered to have the population growth value of the parent geography. In ArcGIS, this was accomplished by using the Spatial Join (Analysis) Tool, where the block group file is the target feature and the municipality/NTA file is the join feature and the match option set to "HAVE THEIR CENTERS IN".

Higher Need Waterfront Areas Analysis

A spatial cluster analysis (Getis-Ord Gi tool) was conducted to identify where, in the entire Harbor Estuary region, high need areas are most concentrated. The cluster analysis identifies "hot spots" and "cold spots" of these area based on statistical significance.

Areas associated with the highest level of confidence of being a cluster of higher-need census block groups (99% CI) receive the highest scores (depicted in red, below). While higher need areas may exist (see Figure 3), only those that are near other neighboring block groups with similar scores will be highlighted using the Getis-Ord Gi tool. To do this, the Need Index values were placed into the Getis-Ord Gi tool to identify clusters of high need areas. The resulting output feature class "RANK_SUM" was joined to the "BG_POC_Youth_Income_Parks_ Growth_05mile_waterfront" feature class. The new final feature class "GETIS_HOT_SPOT_RANK_SUM," was then exported as a new feature class named "Final_BG_ Need_Index_Ranks_ALL_DATA," used for the mapping of all the five need components.

Using the cluster analysis and expert judgement, geographically contiguous high need areas (Figure 4) were analyzed more closely to provide a snapshot of how components of the Need Index vary geographically. Each cluster of block groups that were identified as being high need within the 99% confidence interval was selected and its data exported for analysis. All census block groups with a population of "0," as well as the Census Block representing Rikers Island correctional facility, were removed from the analysis. For each "high need area," population, communities of color, median household income, youth, population growth, and

***Note:** values were calculated based on the assumption that population is evenly distributed within the block group.*

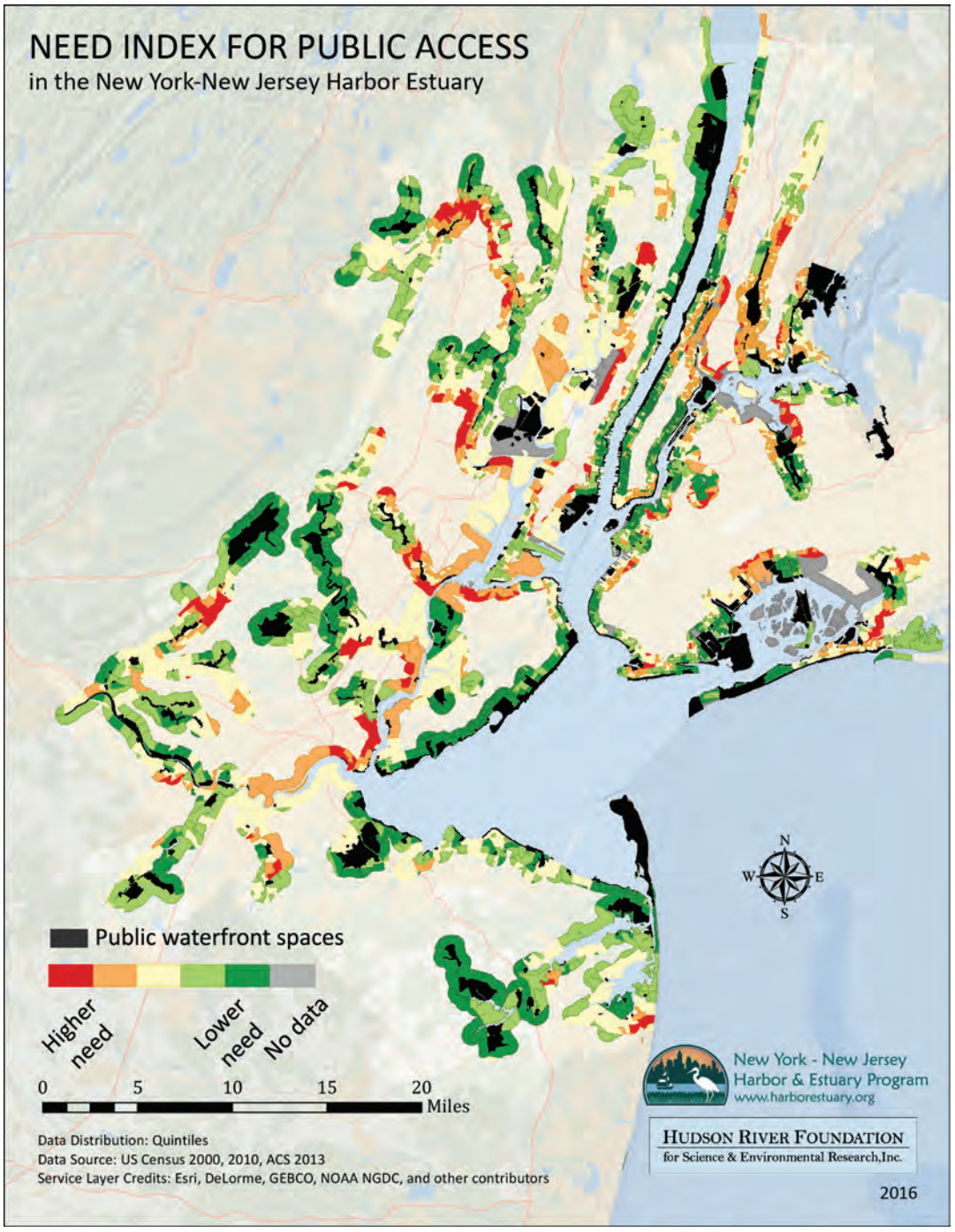

Figure 3: Five components were aggregated into a Need Index and sorted into quintiles.

population without waterfront access were calculated using the following steps. These data were presented in tabular form in the full report.

- **Population:** all population data within the selected area were summed.
- **Income:** the average was taken of all median household incomes within the selected area.
- **Communities of color:** the total "persons of color" population within the selected area was summed, divided by the total population, and multiplied by one hundred to calculate the percentage value.
- **Youth (under age 14):** the total youth population (persons 0-14) within the selected area was summed, divided by the total population, and

multiplied by one hundred to calculate the percentage value.

- **Population growth:** the total change in population within the selected area was summed, divided by the total population, and multiplied by one hundred to calculate the percentage value.
- **Population without waterfront access:** the total population within the selected area without waterfront park access was summed, divided by the total population, and multiplied by one hundred to calculate the percentage value.

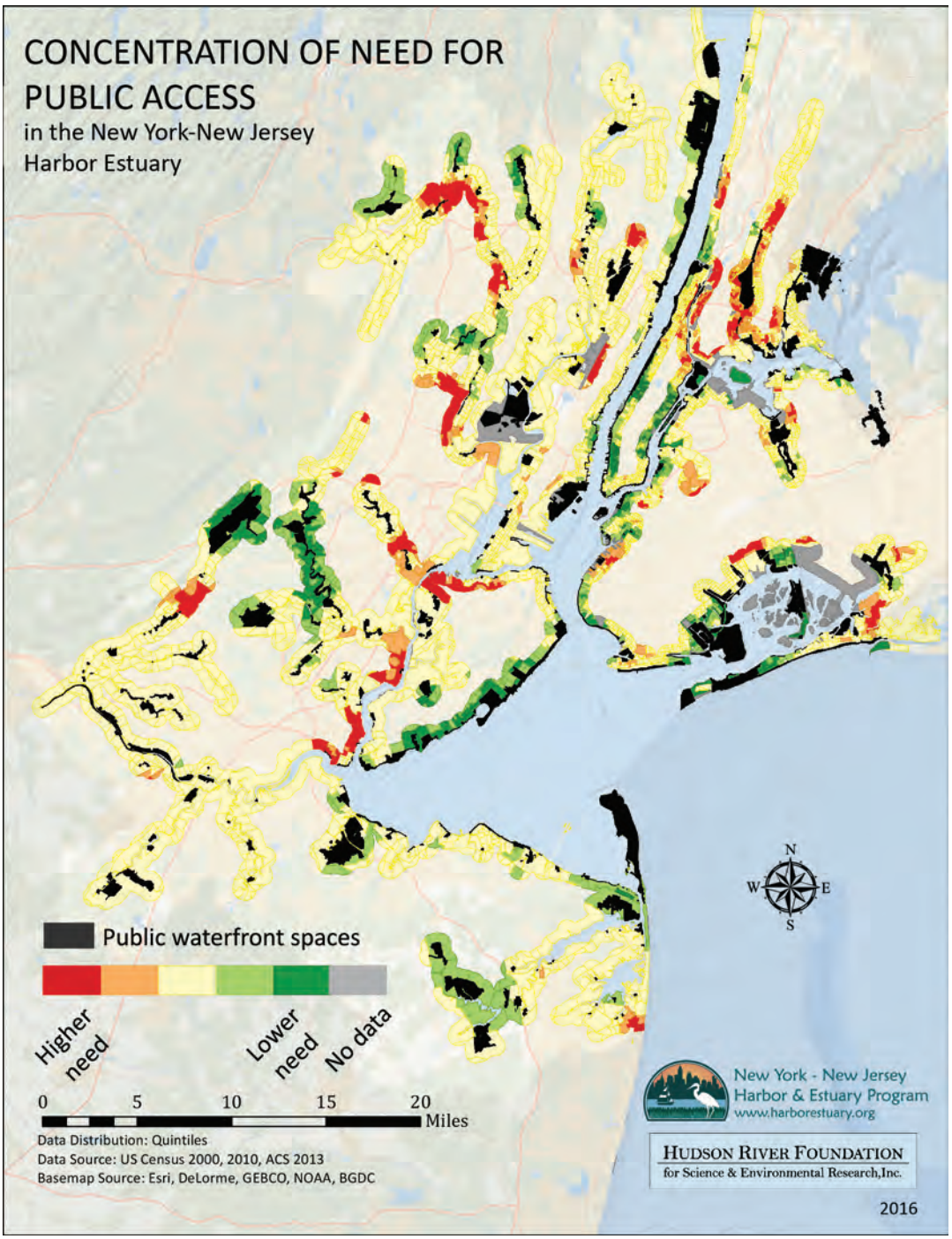

Figure 4: Higher need waterfront areas as identified by the cluster analysis of the Need Index and expert judgement were analyzed for further analysis.

Overview

Waterfront-focused stewardship organizations in the NY-NJ Harbor Estuary core area were assessed to understand their organizational capacity and stewardship practices, including organizational focus, geographic turf, and social networks. The term "organization" in this context is broadly defined; any group that considers itself a group that conducts stewardship on the waterfront, regardless of 501(c3) or other organizational status, was included. The data collection protocol used for this assessment was based upon the previous (2007) STEW-MAP assessment and modified to focus exclusively on stewardship groups of waterfront public spaces. In addition to questions retained from the 2007 STEW-MAP assessment, additional site-focused questions about waterfront areas that organizations directly steward were included.

Stewardship Assessment Implementation

The web-based stewardship assessment, administered using Survey Monkey, opened March 9, 2015, and closed May 15, 2015, for a total of 67 days. The assessment was both sent to a sampling frame (described below) and sent out to mailing lists. Two e-mail reminders were sent, and non-respondent groups were called once. If voice mail was available, a message was left. If there was no voice mail available, a second call was made. After the initial e-mail invitation to the web-based assessment, if individuals had not been reached by phone, links to the assessment and contact information were sent by mail to those groups that had not responded after approximately two weeks. For the full set of stewardship assessment questions, please refer to Appendix B: Stewardship Assessment Questions.

Sampling frame

An initial sampling frame of 523 groups was developed for directly distributing the assessment. Adjusting for duplicates, organizations that had dissolved, and unavailable contact information, the final sampling frame totaled 458 groups (430 civic organizations and 28 governmental organizations). The sampling frame was created by pooling together a list of civic organizations from HEP's mailing list and the 2007 STEW-MAP sampling frame (stewardship turfs or offices within 250 feet of the waterfront) and then adding governmental organizations of interest to HEP. Contact information for the 2007 STEW-MAP was updated. Then the following were removed: duplicates, groups than no longer existed, groups operating outside of the HEP core area, and those that did not include water or waterfront areas in their mission. Unique identifiers were assigned to each group, to track responses relative to the sampling frame. In addition to the sampling frame (458 groups), a link to the assessment questions was sent out via the New York-New Jersey Harbor & Estuary Program and Waterfront Alliance's e-newsletters (Tidal Exchange and Waterwire, respectively), and shared by other organizations.

Response rate

In total, 167 groups submitted responses of which 146 groups were civic organizations. Of these responses, 105 were from the initial sampling frame, including 98 civic organizations (Figure 5). The response rate for civic organizations in the sampling frame was 23.0% (based on 98 responses and 3 refusals). Only civic organization respondents from the sampling frame were analyzed further for this report.

For some organizations, more than one response was received. In these cases, if multiple entries from the same name and e-mail were received and all but one was blank, the complete entry was taken. If the responses came from multiple individuals, those individuals were contacted with a summary of the differences in response. In consultation with the individuals, the double responses were resolved into a single entry for their groups.

Non-response bias

The distribution of responding and non-responding civic organizations was examined geographically (Figure 5). Overall response rates for organizations with offices in New Jersey (18.7%) and in New York (24.1%) were relatively similar (Figure 6). Lacking additional information on non-responding groups, we did not examine non-response bias by organizational attributes. Also, because of the small sampling frame for governmental organizations (n=28), we did not assess this sector for non-response bias.

Missing data

Of those responding, 167 organizations completed the assessment questions, and 18 organizations partially completed the assessment. Questions were voluntary, rather than mandatory. Even for those organizations that completed the assessment, individual questions were sometimes skipped (29.9% of total items).

Data processing

Responses were downloaded from Survey Monkey into a Microsoft Excel spreadsheet, where they were linked to the groups' unique identifiers for those groups in the sampling frame. Organizations not in the initial sampling frame were assigned unique identifiers. Data were cleaned and duplicate respondents from the same organization were removed.

Figure 5: The sampling frame and civic organization respondents were mapped by office location.

Mapping Stewardship Turfs

One assessment question asked groups to identify where their organization worked; this area where a group works is defined as their "stewardship turf." If organizations had a map or spatial data set of their "turf," it was requested of the group and subsequently incorporated into an ArcGIS geodatabase. If a text description was used, HEP digitized the turf boundaries in consultation with the stewardship organization. Turfs were mapped as polygons (or points, if the description was limited) using ancillary GIS data sets, including parks, roads, railroads, parcels, and rivers/shoreline (Figure 7). Turfs were assigned attributes for other organizational characteristics from assessment responses and the results stored in the geodatabase. To create a map for ease of comparison across the study area, stewardship turfs were first stacked so that darker shades indicate more stewards (Figure 7), and then clipped to the buffered study area of one half mile around the waterfront and waterfront parks (Figure 6).

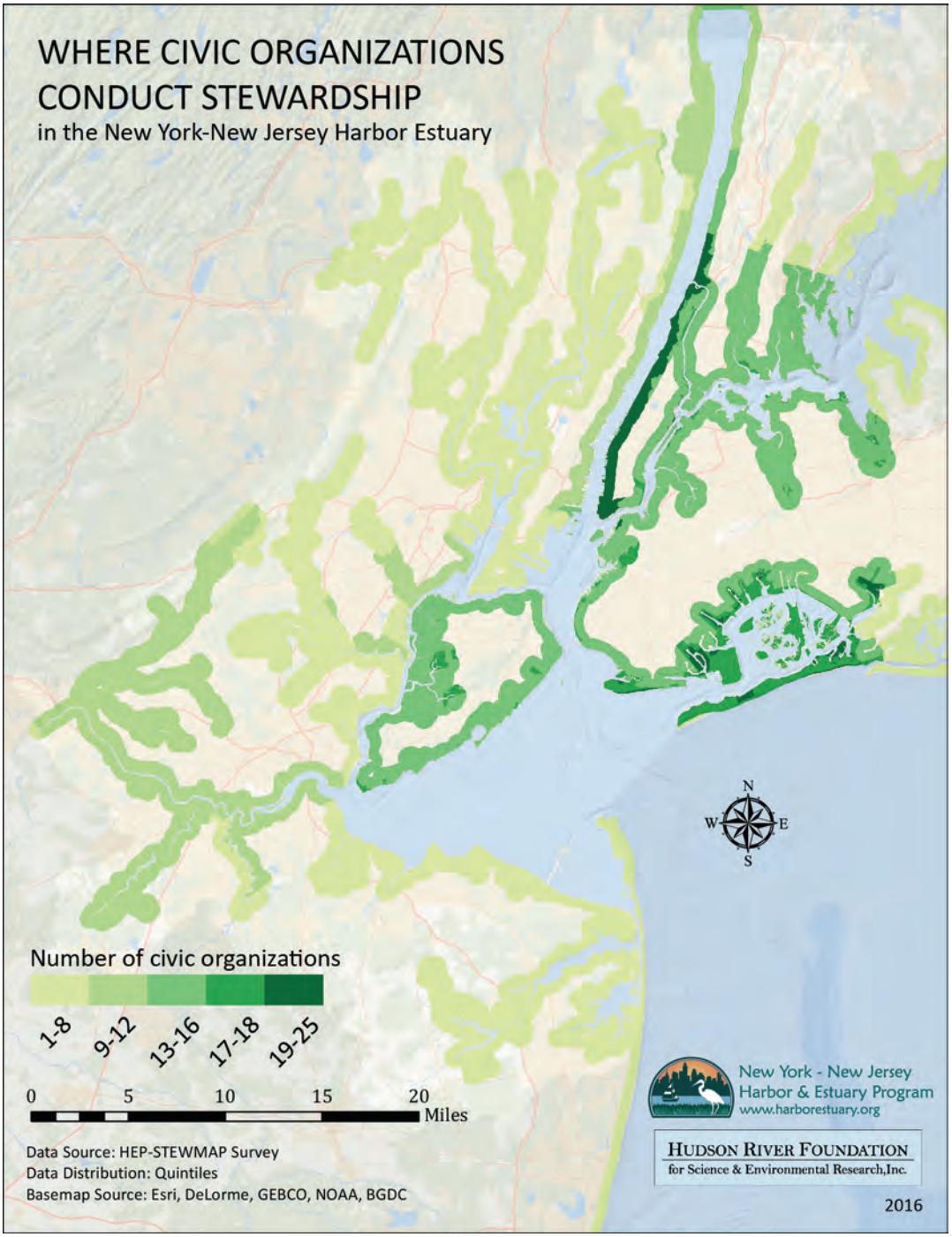

Figure 6: Stewardship "turfs" (geographic areas identified by the stewardship organizations as the geographic scope in which they work) were mapped and overlain across the study area.

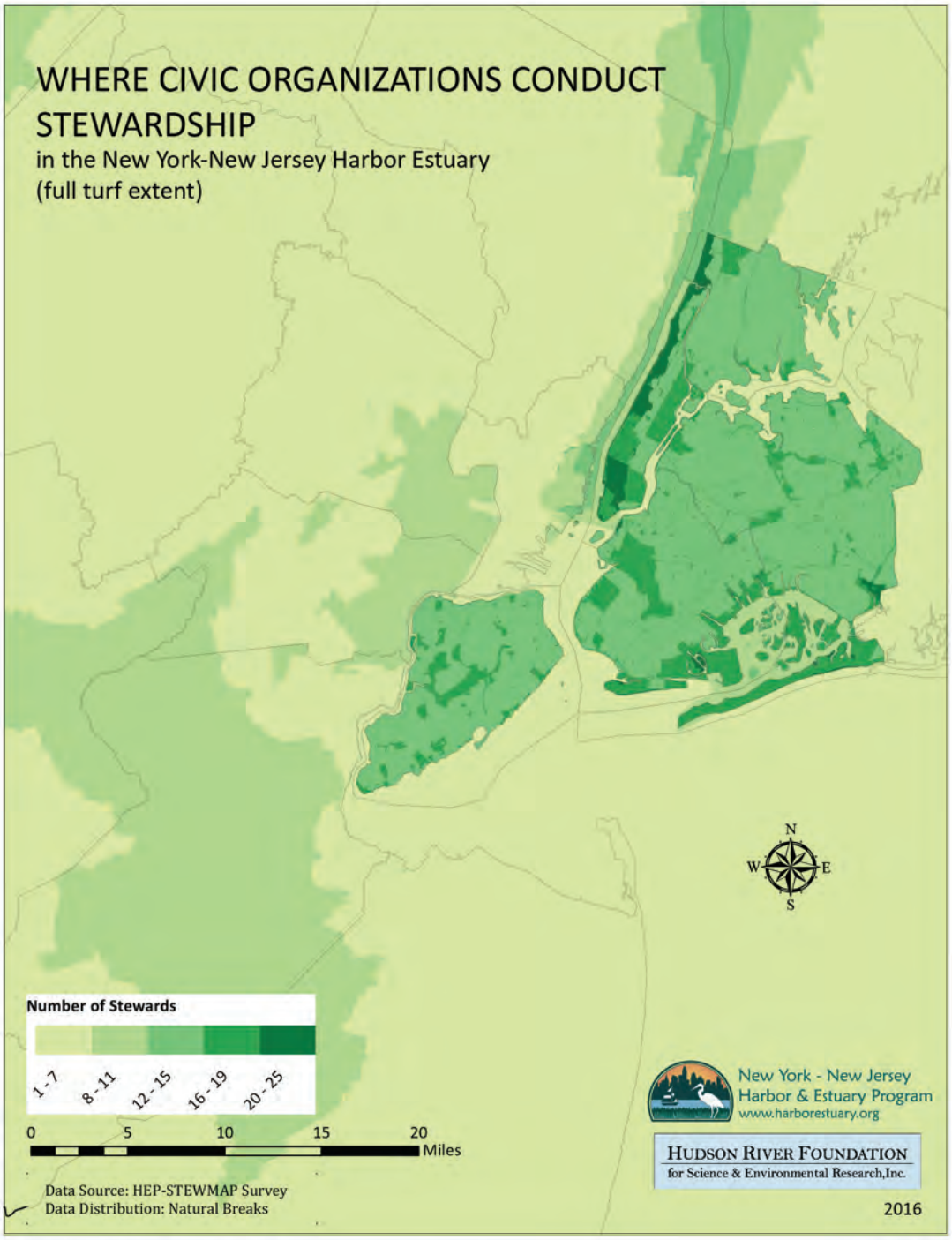

Figure 7: Turf boundaries for civic stewardship groups without the waterfront buffer.

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