

**CONNECTING PEOPLE TO URBAN WETLANDS:
PRESERVING BIODIVERSITY IN THE RARITAN RIVER
WATERSHED, NEW JERSEY**

2012 report to Together Green

By

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BACKGROUND

The Raritan River is New Jersey's largest river and is located entirely within our state's borders. Including the watershed, the Raritan River Basin encompasses more than 1,100 square miles (262,941 acres). Its waters are used for drinking, recreation, transportation and industry. Despite the environmental pressure to which they have been subjected, the Raritan River and Raritan Bay Estuary provide important wildlife habitats. From wetland and estuarine habitats that support Osprey, Night-Herons and Black Skimmers, riparian corridors that support nesting Bald Eagles, to upland grasslands sustaining Grasshopper Sparrows and Bobolinks, thousands of acres within the watershed provide habitat critical to the continued survival of a diverse array of threatened and endangered birds that is unrivaled in New Jersey. Numerous populations of rare and endangered plants are also known to occur within the watershed. Threats to this system include extreme pressure from commercial and residential developments. In addition, industrial development has resulted in contamination of parts of the river and associated wetlands for decades. However, large sprawling industrial complexes also include some of the last remaining undeveloped habitats in this heavily populated watershed.

New Jersey Audubon has been involved in surveys of urban habitats for birds for the past 30 years. Richard Kane, former Vice-president of Conservation, began conducting surveys and reporting on the Meadowland's avifauna in 1975. In 1991, Rich Kane headed up a team of NJAS staff that conducted the first year-long inventory of the Arthur Kill and Raritan. Much of what we currently know about the seasonal occurrences of avian species in the urban New Jersey wetlands is based on this work. More recently, the NJAS's Research and Monitoring Department undertook and completed a two-year, systematic study of avian abundance and distribution in the Meadowlands (2004-2006), an avian study in the Gateway National Recreation Area (2006-2007), and a survey of the Lower Raritan (2009).

Through this citizen science project we continued and expanded the 2009 surveys along the lower Raritan River to provide baseline information on bird use throughout the watershed. We also performed targeted searches for both new and historically documented rare plant populations in the lower and upper Raritan River watersheds, in hopes of updating scarce information and bringing attention to the unique habitats that remain amid significant urban sprawl. Results of this project will help set site acquisition priorities, and direct management and restoration activities related to reducing fragmentation and improving habitats for wildlife. The project will also help to connect residents (citizen scientists and community college students) to the remaining natural areas in this largely urbanized watershed and the varied and interesting wildlife that they support.

ACKNOWLEDGEMENTS

We thank all of our volunteers and partners for their contributions to this project (Table 1). An asterisk (*) indicates Raritan Valley Community College (RVCC) students participating as part of the NJACT program.

Table 1. Volunteers participating in the citizen science bird survey.

Bill Ball	Tom Gillen	George Roussey
Zach Batren*	Anita Gould	Pam Salkeld
Belinda Beetham	Linda Hunter	Debbie Schmidt
John Beetham	Carson King	Stanley Smith
Dan Brill	Bob Loveland	Tom Smith
Frank Budney	Linda Loveland	Rick Snyder
Karen Carlough	Patrick Lyman	
Sally Chandler	Nano Mardones	Harvey Swaine
Theodore Chase	Dan Morely	Karen Swaine
Tim Coffey	Tom Ostrand	Liz Vreeland
Rich Dawson	George Pitcher	Kirk Weber
Colin Dougherty	Leslie Roche	Lenore Weseley
Brian Fischer	Jean Romsted	Allan Williams
Jeff Fischer	Bob Rothberg	Joanne Williams
Cathy Folio	Josh Rothberg	Emily Willoughby*

LOWER RARITAN WATERSHED BIRD AND RARE PLANT SURVEYS

Introduction

NJ Audubon’s Citizen Science program has conducted several volunteer-based regional bird surveys during the past decade, including surveys of New Jersey’s Piedmont (2007-2008) and Pinelands (2006) regions. These projects involved recruiting skilled bird watchers from the community and surrounding areas and training them in scientifically sound survey techniques. In 2012, with funding from the National Audubon Society and Toyota’s Together Green program, we initiated a similar survey in the remaining green spaces of the heavily urbanized lower Raritan River watershed, a roughly 350 square-mile area.

Specific objectives of this survey were to: 1) collect baseline bird distribution and abundance information in remnant natural areas of the lower Raritan River watershed; 2) document existing rare plant populations and find new populations within and adjacent to the watershed; 3) cultivate awareness and appreciation of urban wild spaces through involvement of local residents and college students; and 4) foster cooperation between New Jersey Audubon and partner organizations to fulfill these goals.

Methods

Bird Survey Volunteer Recruitment and Training

Volunteers were recruited by contacting previous participants in the NJA Citizen Science Program, posting on local birding forums, reaching out to partner organizations, and through word of mouth. As a general bird survey taking place in a variety of habitats, a relatively high level of bird identification skill was required, both by sight and sound. Volunteers were initially screened by NJA staff during a series of volunteer training presentations which thoroughly explained the survey’s requirements. At these sessions, NJA staff interacted personally with volunteers and discussed whether the survey was right for them. They were also pointed to online tools to self-test whether their birding skills were at the appropriate level (e.g., <http://www.birdercertification.org/>). Variations in the volunteers’ identification skills were not measured quantitatively.

Three training workshops and two voluntary field seminars were held for instruction on data collection and recording, distance estimation, web-based data entry, and a refresher on visual and auditory bird identification. Workshops focusing on providing volunteers with the necessary information and materials to complete the surveys, including overview maps of all survey sites, close-up aerial photographs of each point (showing 100-meter circle for reference), detailed protocol, data sheets, bird song CD, species identification PowerPoint, and access permission letters. A few volunteers were not able to attend a workshop, and picked up their materials at Scherman-Hoffman Wildlife Sanctuary or were mailed packets instead; this group included only experienced volunteers who had previously participated in similar surveys with NJA. We coordinated with these volunteers via email to ensure that they were comfortable with the survey protocol and with accessing their sites.

Bird Survey Sites

We chose 42 sites within or immediately outside of the lower Raritan River watershed (NJDEP Watershed Management Area 09; Figure 1). Sites were chosen to represent a broad range of undeveloped or restored habitats distributed throughout the region, including parks, natural areas, capped landfills, and borders of industrial areas. Fourteen sites were used in previous surveys and 28 were new. To create survey points in new sites, we overlaid a grid of points in a GIS – 300m x 300m for smaller sites, 600m x 600m for larger sites – and retained those points that fell within undeveloped, apparently accessible habitat within the site. Volunteers ground-truthed all points before the start of the season. When they deemed a point to be inaccessible, either due to extremely dense vegetation or to obstructions, we allowed them to either 1) move it, for points not previously surveyed, or 2) create a new point, for points that had been surveyed in previous years. New and moved points were placed in similar habitat as near to the original point as possible. Points were located a minimum of 300 meters apart to minimize double-counting and spatial autocorrelation. Inaccessible points where no suitable replacement site could be found were deleted.

In total, we mapped 419 points within these sites, of which 90 were from previous surveys and 329 were new. We assigned a total of 300 points to volunteers for breeding surveys, 11 of which were double assigned (i.e., to two volunteers independently). Two NJ Audubon staff were assigned an additional 23 points and were available to fill in unexpected gaps in volunteer involvement as needed.

Bird Survey Design and Protocol

At each point, volunteers were asked to perform at least two point count bird surveys during the summer breeding season. The first survey was conducted between May 26th and June 15th 2012; the second survey was conducted between June 16th and June 30th 2012. The two surveys at each point were conducted at least seven days apart. Surveys were not conducted during rain or periods of high winds (greater than 12mph {Beaufort 3}). Surveys took place from one half hour before to four hours after sunrise (approximately between 5:30 AM and 9:30 AM).

During each survey, volunteers tallied the number of birds of each species detected during 5 minutes, along with the following information about each individual: 1) how it was detected – heard, seen, both heard and seen, or fly-over, 2) distance from observer – less than or greater than 100 meters, and 3) time of first detection – during the first three minutes of the count or the

last two. Staff surveys were identical except that we incorporated more rigorous methodologies for estimating detection probabilities (e.g., distance sampling [Buckland et al. 2001, Diefenbach et al. 2005], removal methods [Farnsworth et al 2002]), including estimating exact distances (using laser range finders) and recording time of first detection in one-minute intervals. During each of the two site visits, a general habitat assessment was conducted, including wetland status (upland or wetland) and habitat category (see attached protocol, Appendix 1). If changes occurred to the landscape since the aerial photos on their count circle maps (forest cut down, houses built, etc.), volunteers were instructed to alert us of these changes.

Bird Survey Data Entry and Proofing

Volunteers were asked to enter their own data on a dedicated data entry web page which imports the data directly into a Microsoft Access database. NJA staff entered data for volunteers that were not able to, and systematically checked all data entered for accuracy by comparing to the original field datasheets. Questionable sightings or entries were clarified through direct discussions with volunteers via phone or email.

Rare Plant Surveys

Surveys were done during approximately 13 days from August 2011 to August 2012 by Dr. Jay Kelly and students from Raritan Valley Community College. Habitats surveyed included tidal mudflats, salt marshes, cedar and hardwood swamps, river bluffs and banks, riparian forests, mixed hardwood forests and rocky outcrops. The survey methods consisted of visiting local herbaria and viewing the NJ Natural Heritage Program data for the area to see what plants were known from these areas and then search the most significant areas of suitable habitat remaining for these species within the study area. There were no specific formal search criteria, just visiting the sites and looking carefully for the species of interest, while keeping an eye open for any other species that might also be present.

Results

Bird Survey Volunteer Recruitment and Participation

Three training workshops were held during Spring 2012. Two workshops were held on March 29th and April 12th at the Highland Park Environmental Education Center, and were attended by 22 volunteers in total. A third workshop was held on April 14th at NJA's Plainsboro Preserve, and was attended by 13 volunteers. All 35 workshop attendees committed to participate in the survey either as a primary volunteer (assigned specific sites) or as an assistant to the primary volunteer. An additional 5 volunteers contacted us during the training period expressing an interest in participating but were not able to attend a workshop. All volunteers who did not attend a workshop were either experienced with previous surveys or partnered with an experienced volunteer. Four additional volunteers joined the project mid-season as assistants, and were trained in data recording by their primary volunteer partner. Two optional field trips to Duke Farms were held on June 2nd and 12th, and 10 participants attended.

Of the 44 volunteers committed to participate in the survey, 34 were primary volunteers that were assigned specific sites, and 10 were secondary volunteers interested in assisting the primary surveyors (e.g., helping with site scouting, data recording). Two of the primary volunteers were Raritan Valley Community College students recommended by their Ornithology professor, and participated as part of the NJECT program. We partnered with the Raritan Riverkeeper Bill Schultz (part of NY/NJ Baykeeper) for surveys performed by NJ Audubon staff that required boat access (two trips, 20 total surveys).

Of the 34 primary volunteers that were assigned sites, 30 (88%) completed surveys and returned data. Of the original 419 mapped points, 300 were assigned to a volunteer, and 241 received at least one survey by a volunteer. Of the 59 points assigned to but not surveyed by volunteers, 36 were vacated due to lack of participation and the remaining were either deemed inaccessible or unsuitable habitat (e.g., crops) and were not able to be moved. Volunteers performed a total of 482 surveys. NJ Audubon staff covered 13 of the points vacated by volunteer cancellation, surveyed an additional 23 points not assigned to volunteers, and ‘doubled-up’ (i.e., surveyed independently) with volunteers at an additional 9 points. Staff performed a total of 81 surveys.

Twenty-five volunteers entered their own data into the online database, and NJ Audubon staff entered data for four. One volunteer who completed surveys still has not entered data or sent datasheets. Staff proofed all data entered by comparing with original datasheets. The 23 primary volunteers and 9 assistants who have returned timesheets spent a total of 430 hours and traveled approximately 1434 miles for this project in 2012. We estimated total volunteer hours using survey times for those that didn’t report hours (plus 3 hours for scouting, travel, and data entry), and this produced an estimate of approximately 550 total hours for the surveys. Volunteers spent an additional approximately 190 hours at workshops and field training sessions.

Bird Data

A total of 7126 observations of 107 species were recorded in the 2012 breeding survey. The fifty most abundant species recorded are listed in Figure 2. Species richness ranged from 0 to 23 species per point (Figure 3). We mapped the abundance and distribution of 12 species, including a selection of the more common neo-tropical migrant songbirds (Common Yellowthroat [Figure 4], Eastern Wood-Pewee [Figure 5], Great Crested Flycatcher [Figure 6], Gray Catbird [Figure 7], Willow Flycatcher [Figure 8], Wood Thrush [Figure 9], and Yellow Warbler [Figure 10]), two marsh habitat specialists (Clapper Rail [Figure 11] and Marsh Wren [Figure 12]), and a few common year-round residents or short-distance migrants (American Robin [Figure 13], Downy Woodpecker [Figure 14], and Northern Cardinal [Figure 15]).

Volunteers and staff reported sightings of nine state-listed threatened (T) or endangered (E) species during the survey, including Bald Eagle (E), Barred Owl (T), Black-crowned Night Heron (T), Black Skimmer (E), Least Tern (E), Peregrine Falcon (E), Savannah Sparrow (T), and Yellow-crowned Night-Heron (T; see map, Figure 16). An unconfirmed but probable detection (vocal only) of Pied-billed Grebe (E) was also made by NJA staff along the Raritan River near the Raritan Arsenal property (Raritan Center), a known breeding location for this species.

Rare Plant Data

We documented 39 populations of rare plants during the survey representing 18 confirmed species and 3 species in need of additional visits to confirm identification. A full list of species

can be found in Appendix 2. Twenty-three populations were in locations undocumented by the NJ Natural Heritage Program (NHP). Figure 17 shows the NHP rare plant grid along with the places rare plants were found in this project.

Discussion

In the 2012 field season, we developed close ties with a diverse array of residents, students, and partner organizations while simultaneously gathering valuable data highlighting the biodiversity of the lower Raritan River. Both the citizen science bird survey and the targeted rare plant searches confirmed that the lower Raritan is indeed a tremendously biologically diverse area despite its dense population and industrial history. Volunteers documented over 100 bird species including many sensitive neo-tropical migrant songbirds and 9 threatened or endangered species. Plant searches revealed locations of 21 rare species, including 23 previously undocumented populations. Increased knowledge of rare plant and animal distributions in the watershed will help guide management and land use decisions moving forward. Baseline data on currently common species will also prove valuable for monitoring population changes over time.

Community participation was essential to success in this project. The training session organized with the town of Highland Park Environmental Commission brought in at least eight local residents (and birders), most of whom had not participated in NJ Audubon citizen science projects before. The use of birding forums on the web connected us with local birding groups (e.g., Christmas Bird Count groups) who brought in several of our most loyal volunteers. The involvement with Raritan Valley Community College and the NJACT program brought in two enthusiastic and knowledgeable Ornithology students who performed a total of 118 surveys and spent approximately 80 hours each on the survey, far more than any of the other citizen scientists. Partnership with RVCC also allowed expanded reach in the form of travel assistance during plant surveys. Collaboration with the Raritan Riverkeeper (a division of NY/NJ Baykeeper) allowed us invaluable boat access to difficult to reach yet extremely important survey locations on the lower portion of the river.

Overall, the project has helped to raise the profile of biological diversity in a watershed that is more often associated with urbanization, industrial development, and pollution. We hope that our data will highlight the importance of the unique habitats of the lower Raritan when future development and re-development plans are considered. We also hope that efforts to connect the residents to these habitats will encourage greater participation in efforts to preserve them.

LITERATURE CITED

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling. Oxford: Oxford University Press.

Diefenbach, D. R., D. W. Brauning, and J. A. Mattice. 2003. Variability in grassland bird counts related to observer differences and species detection rates. *Auk* 120:1168-1179.

Farnsworth, G. L., K. H. Pollock, J. D. Nichols, T. R. Simons, J. E. Hines, and J. R. Sauer. 2002. A removal model for estimating detection probabilities from point-count surveys. *Auk* 119: 414-425.

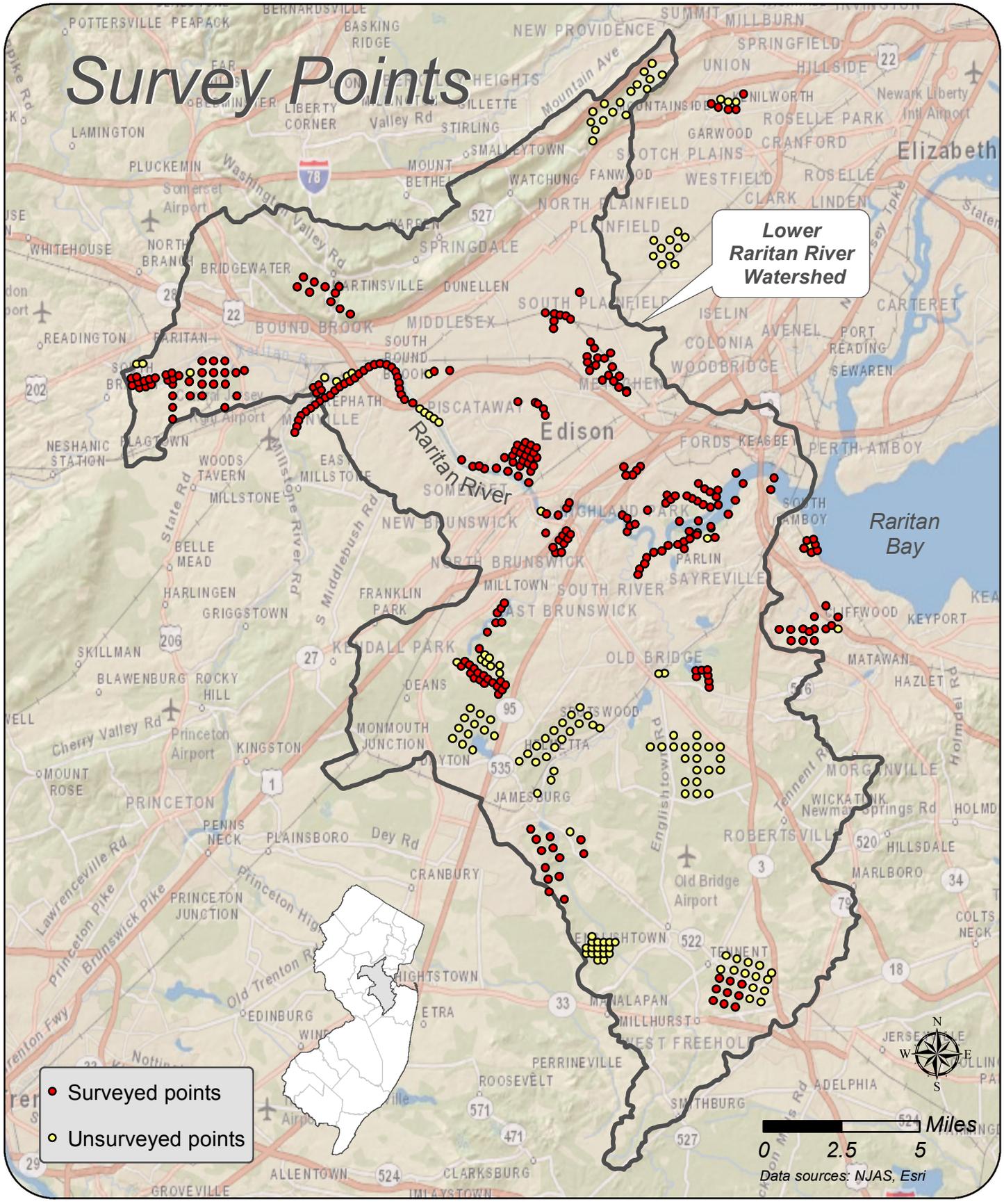


Figure 1. Point count survey locations for the 2012 Lower Raritan River bird survey. Points in red were surveyed at least once between 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

American Robin
 Canada Goose
 Red-winged Blackbird
 Common Grackle
 Gray Catbird
 Blue Jay
 Northern Cardinal
 European Starling
 American Crow
 Tufted Titmouse
 Herring Gull
 Mourning Dove
 Red-bellied Woodpecker
 Wood Thrush
 Common Yellowthroat
 Song Sparrow
 Downy Woodpecker
 Yellow Warbler
 Barn Swallow
 Tree Swallow
 Northern Flicker
 Mallard
 American Goldfinch
 Carolina Wren
 White-breasted Nuthatch
 Eastern Wood-Pewee
 Black-capped Chickadee
 Great Black-backed Gull
 Turkey Vulture
 Baltimore Oriole
 Chimney Swift
 Cedar Waxwing
 Marsh Wren
 Eastern Towhee
 Field Sparrow
 House Wren
 Great Crested Flycatcher
 House Finch
 Northern Rough-winged Swallow
 Warbling Vireo
 Northern Mockingbird
 Osprey
 Red-eyed Vireo
 Indigo Bunting
 Brown-headed Cowbird
 Willow Flycatcher
 Common Tern
 Double-crested Cormorant
 Chipping Sparrow
 Great Blue Heron

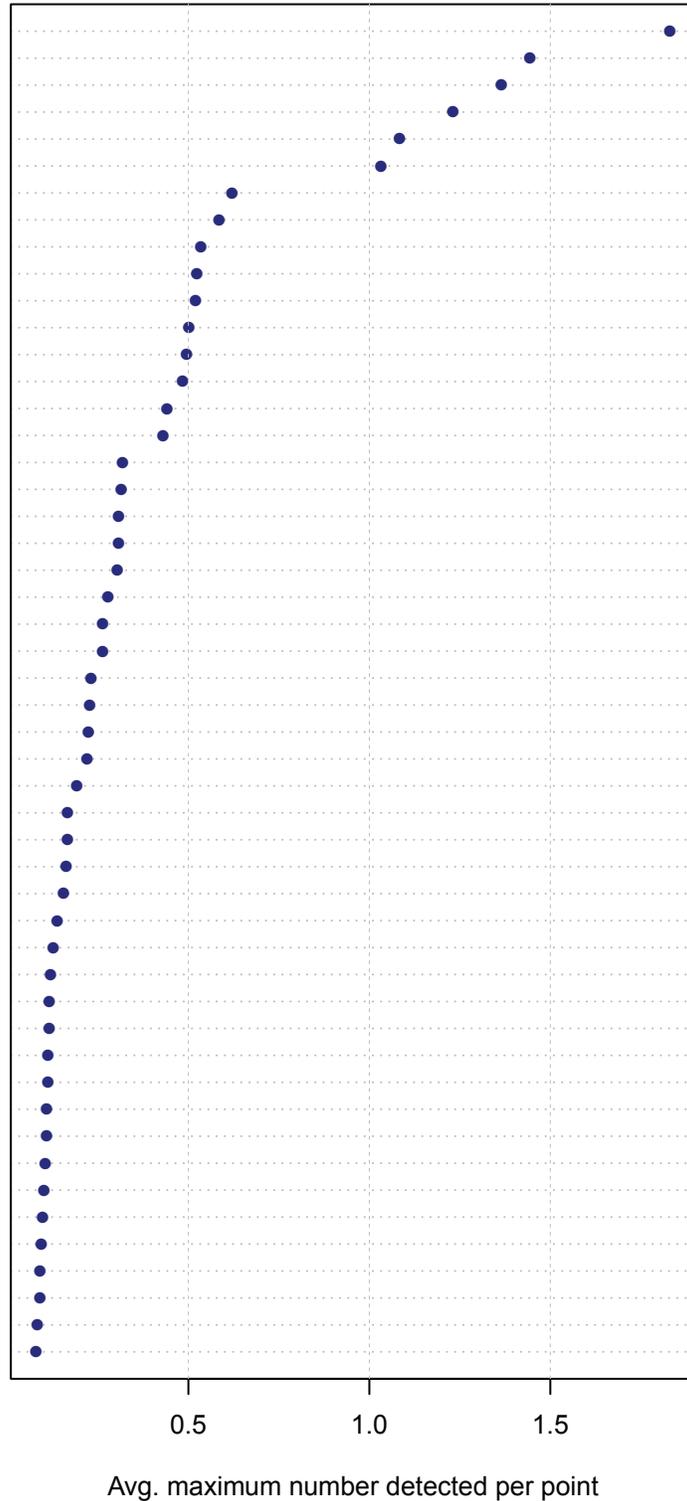


Figure 2. The fifty most abundant bird species detected during counts conducted at 277 points throughout the lower Raritan River watershed.

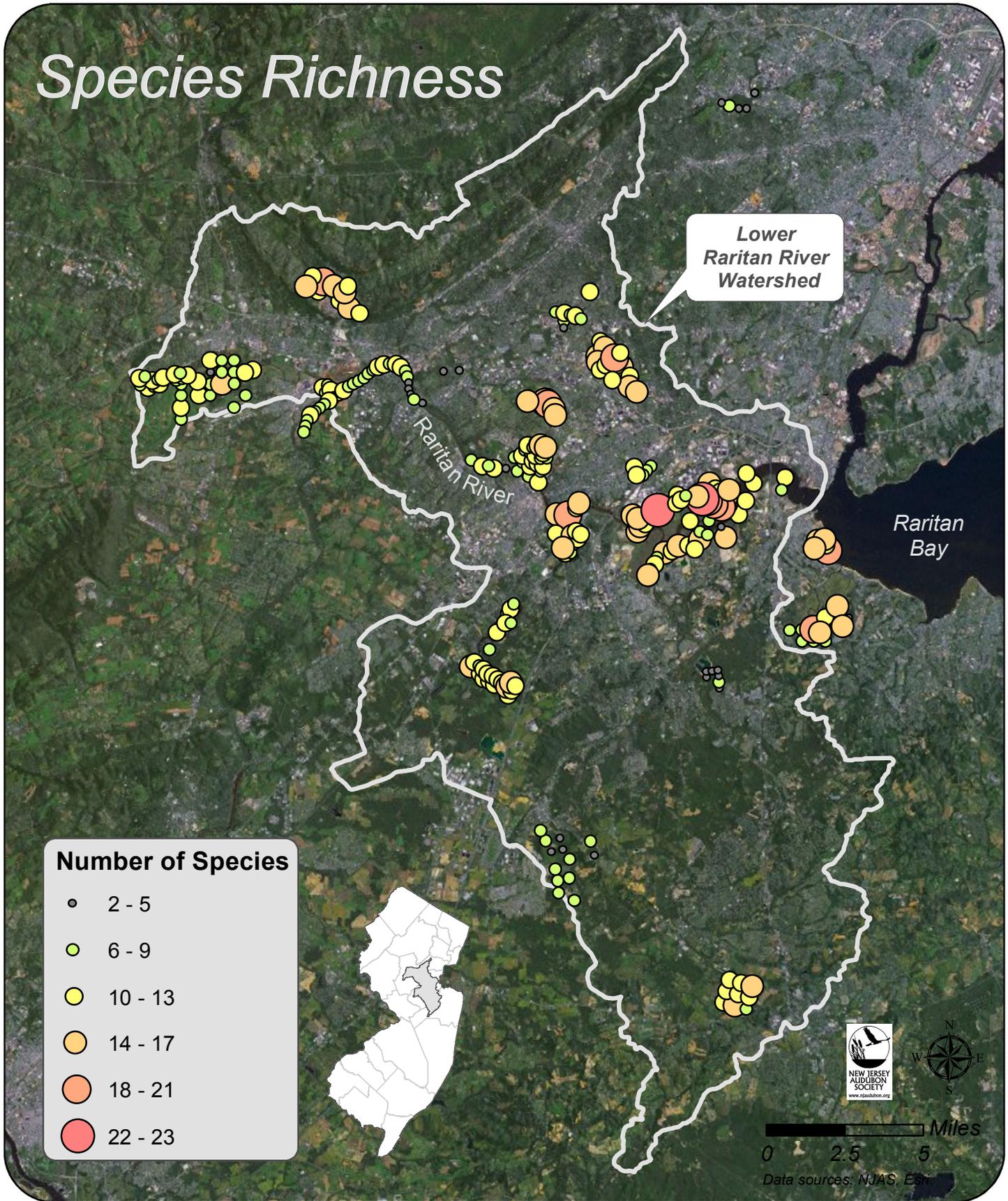


Figure 3. Total number of species detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

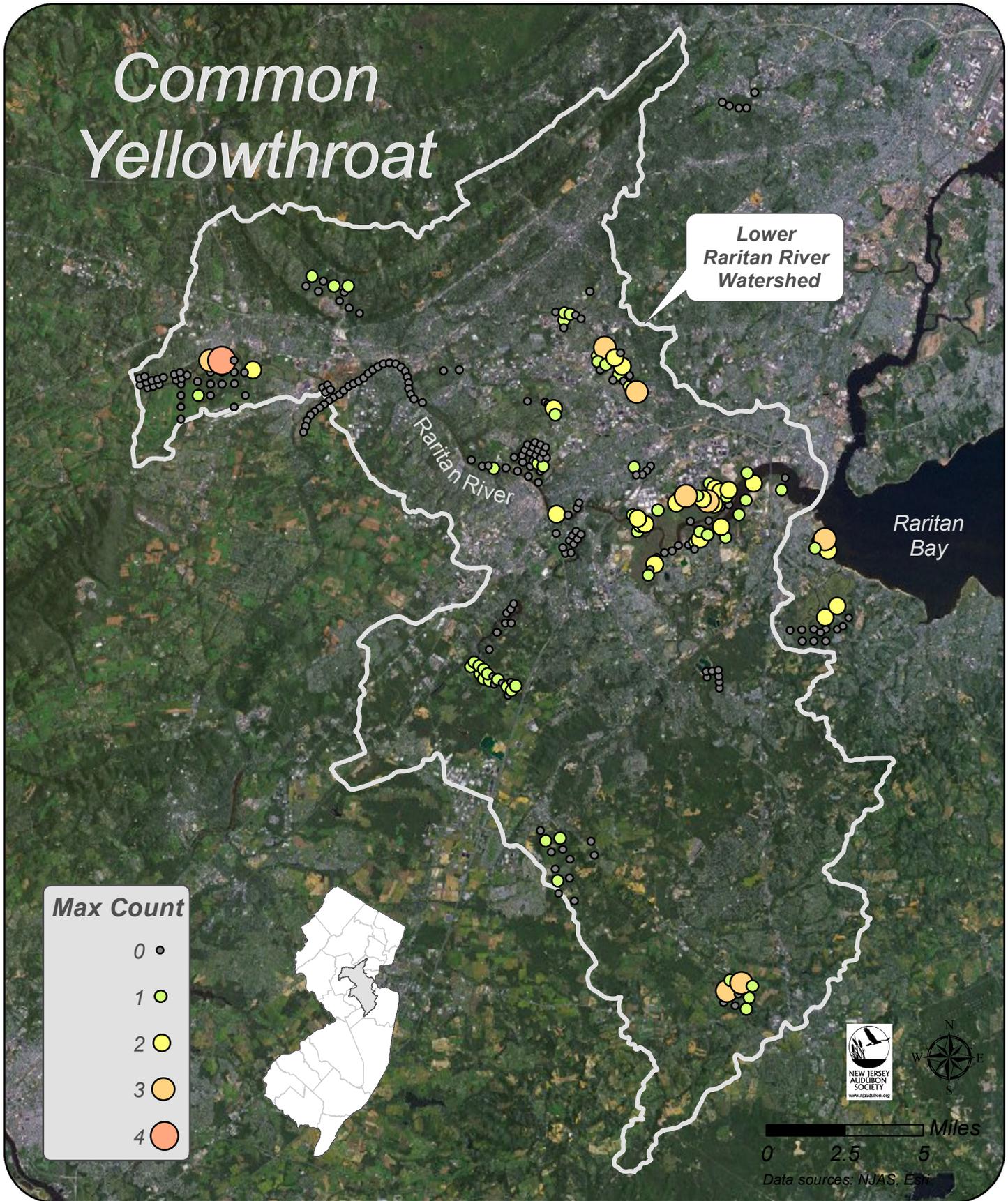


Figure 4. Abundance of Common Yellowthroat detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

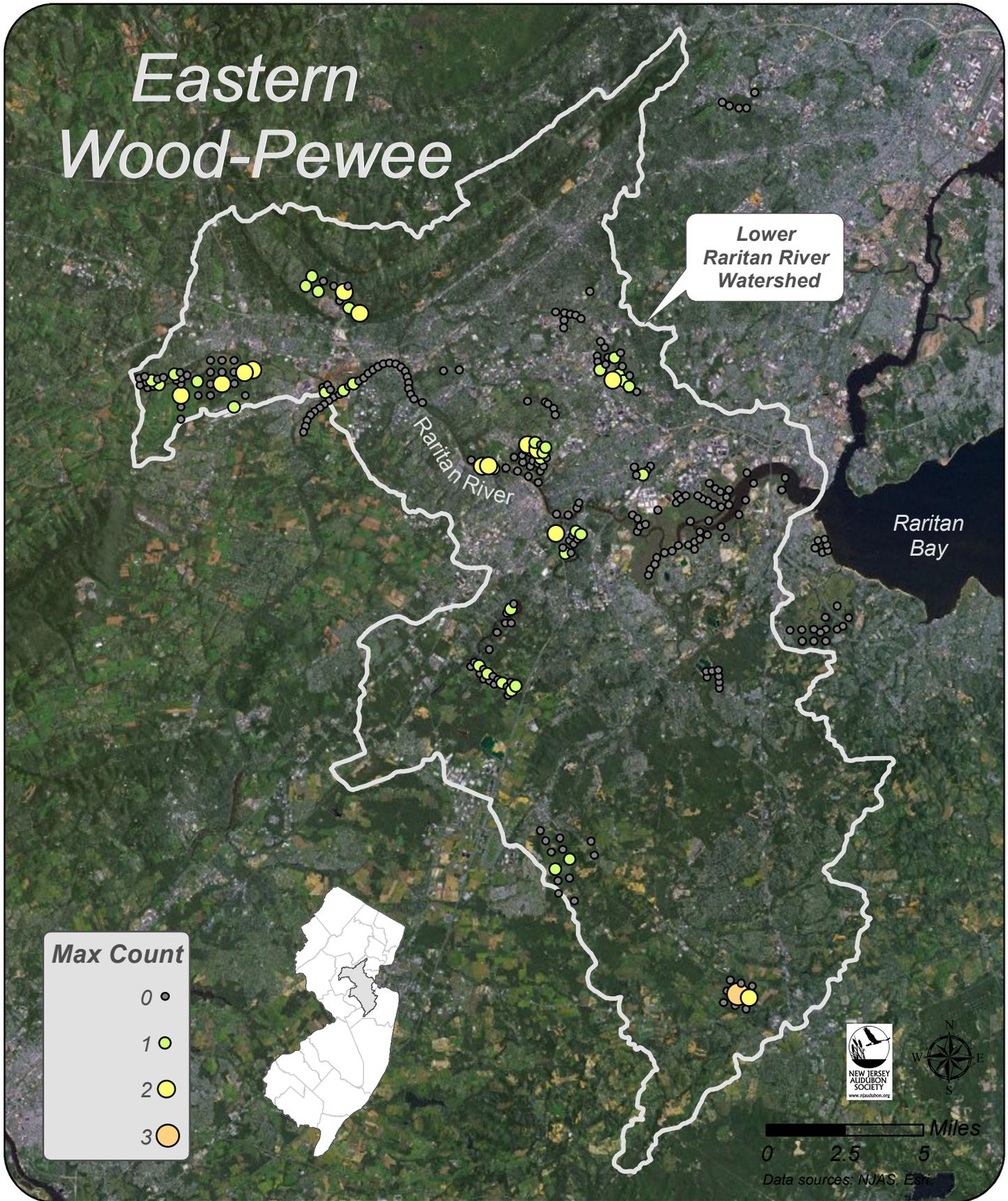


Figure 5. Abundance of Eastern Wood-Pewee detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

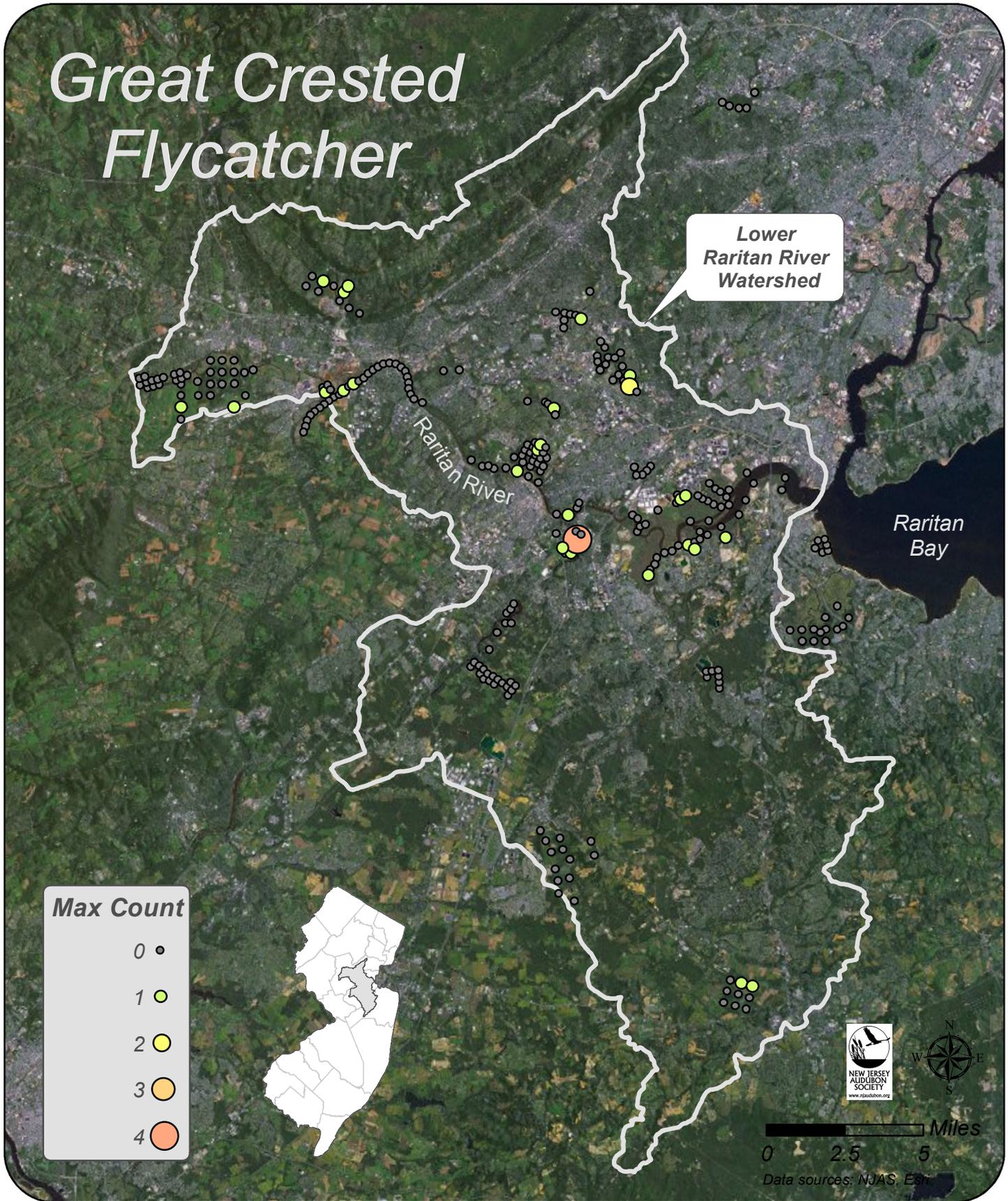


Figure 6. Abundance of Great Crested Flycatcher detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

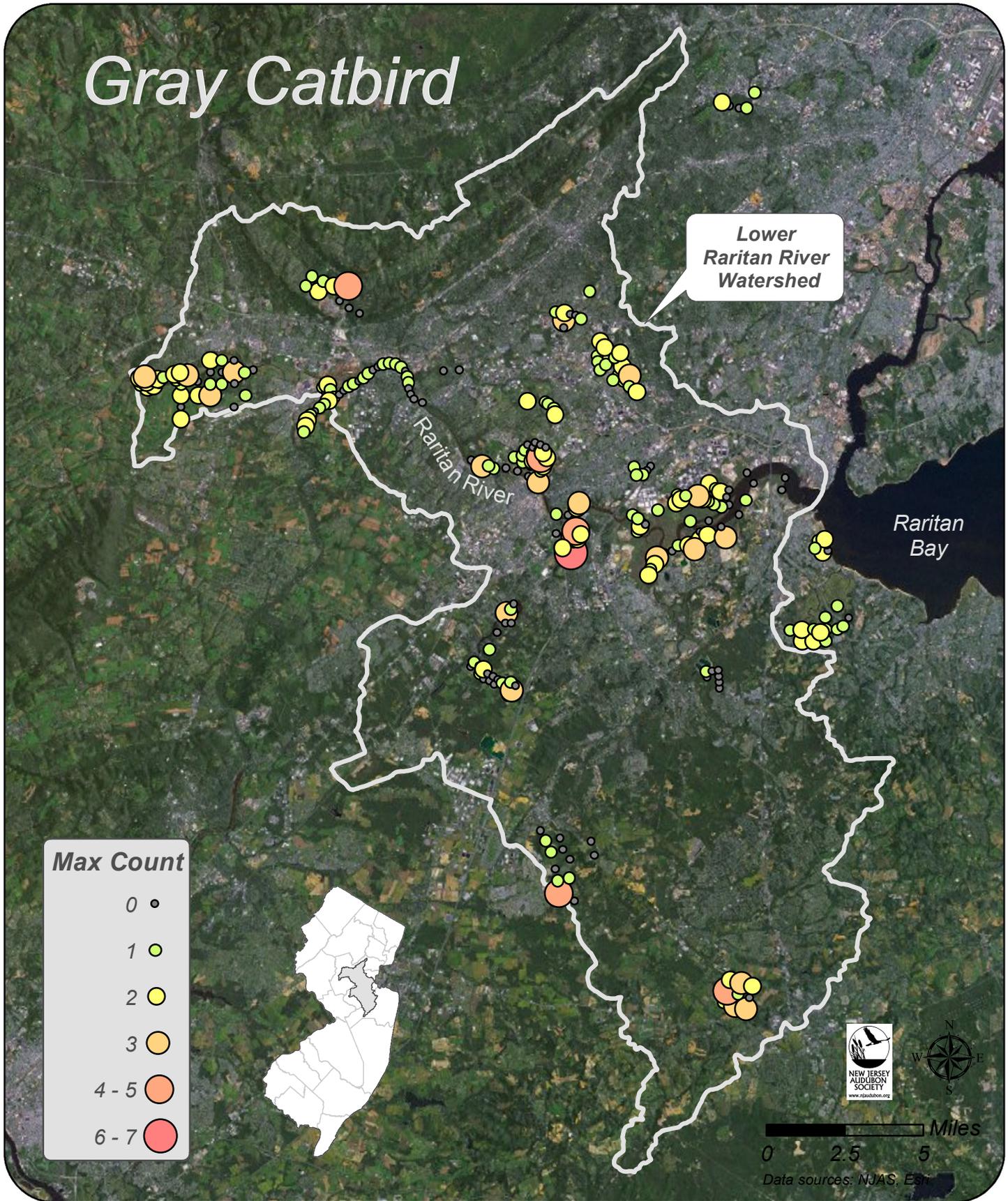


Figure 7. Abundance of Gray Catbird detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

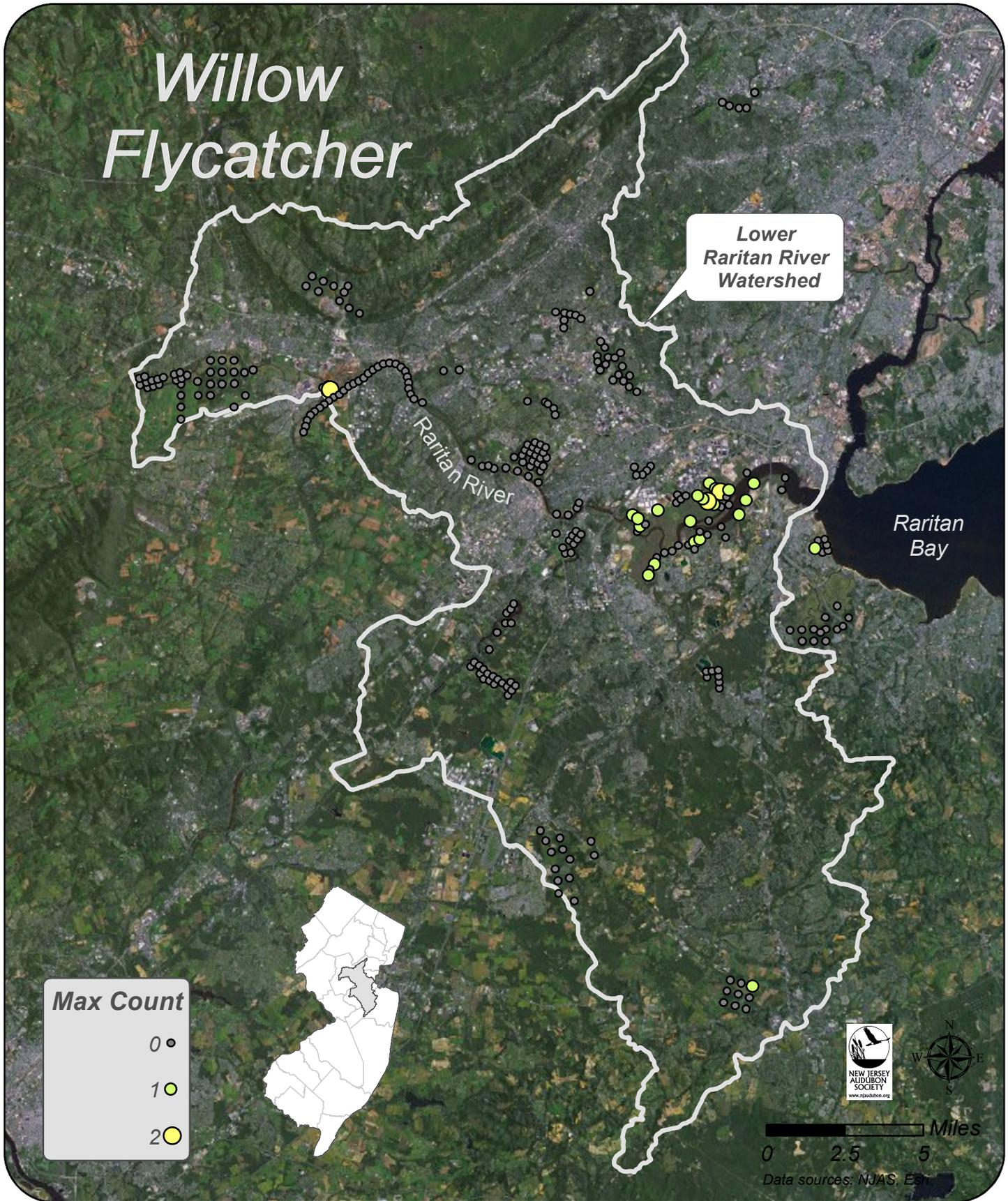


Figure 8. Abundance of Willow Flycatcher detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

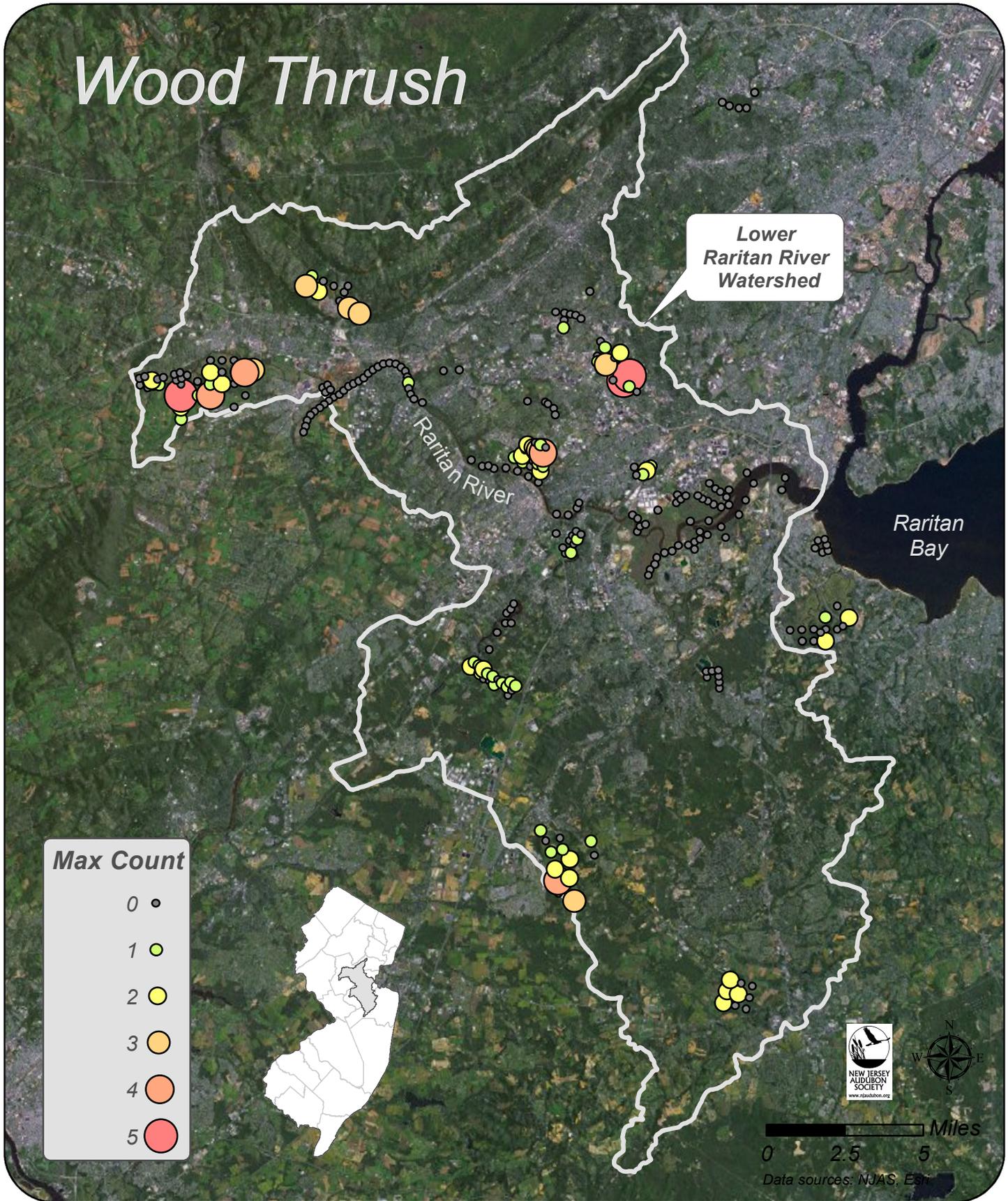


Figure 9. Abundance of Wood Thrush detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

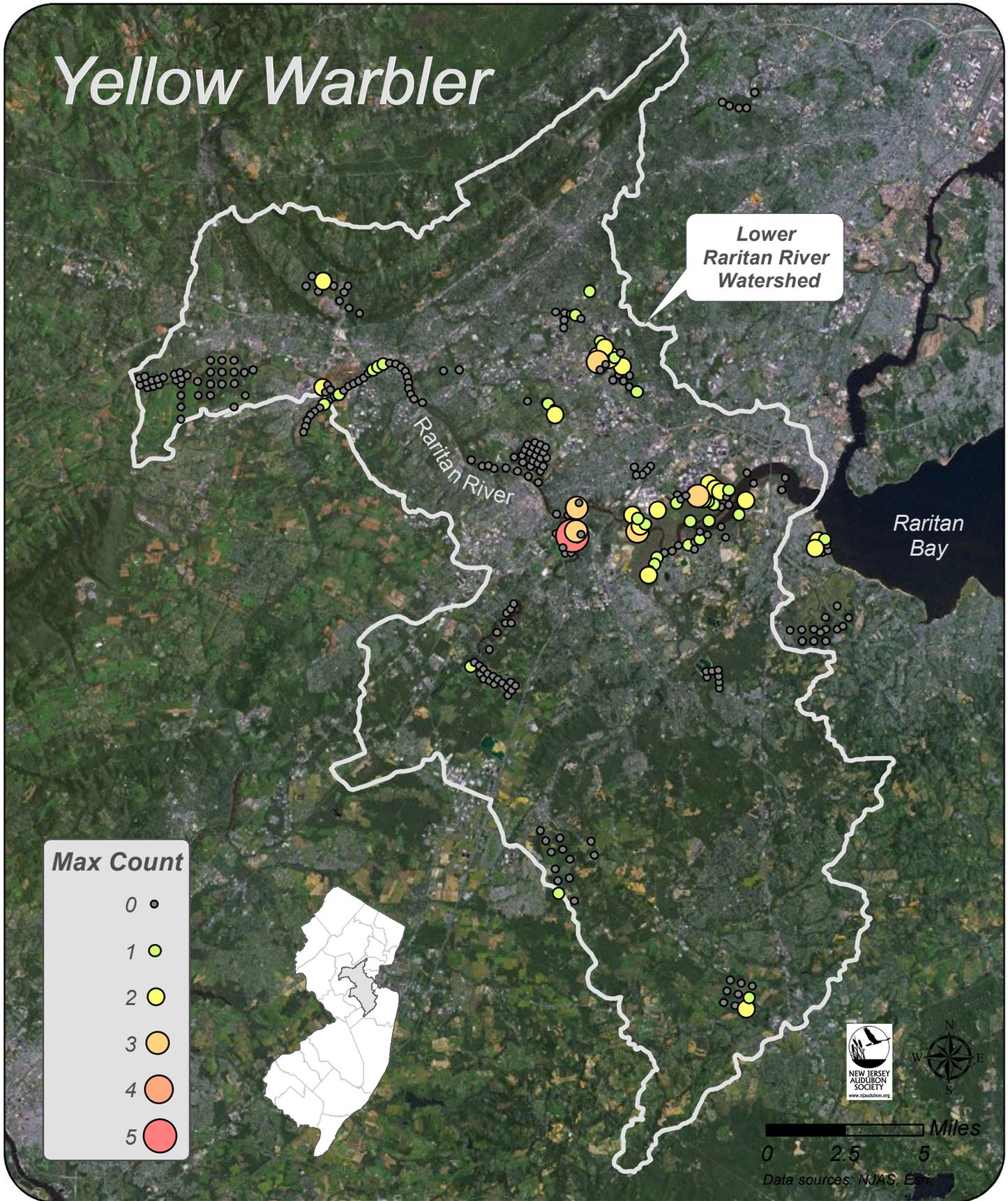


Figure 10. Abundance of Yellow Warbler detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

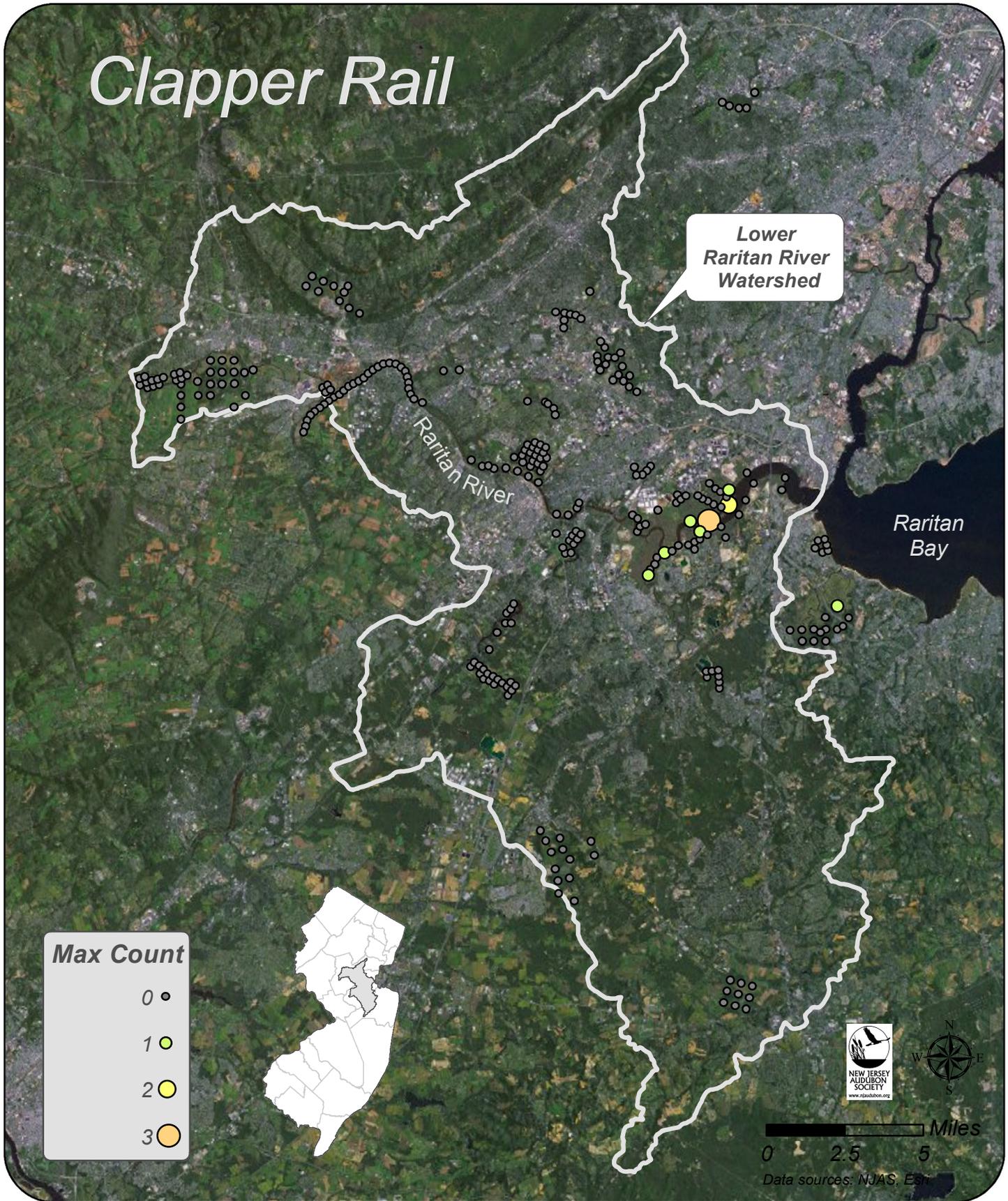


Figure 11. Abundance of Clapper Rail detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

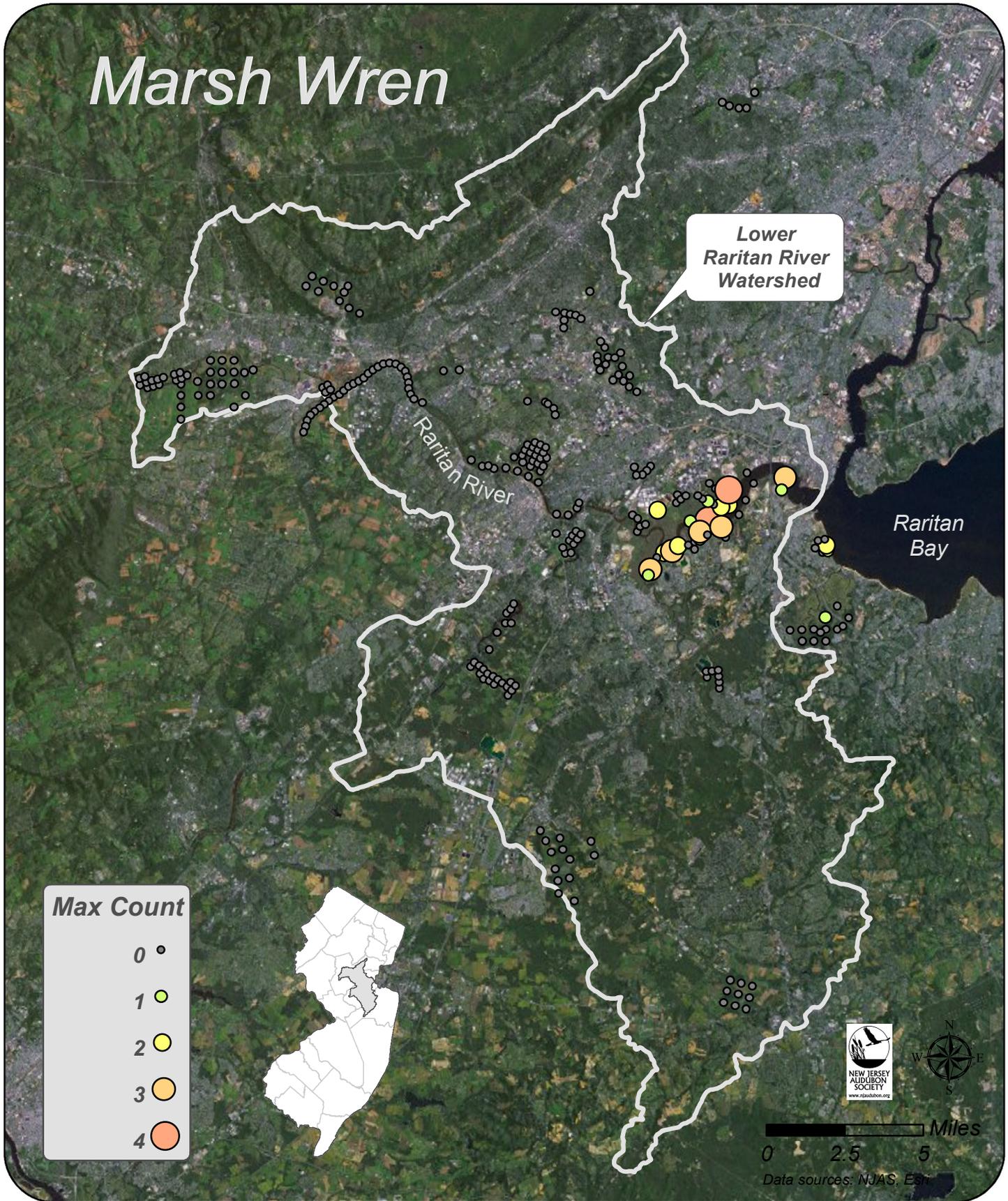


Figure 12. Abundance of Marsh Wren detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

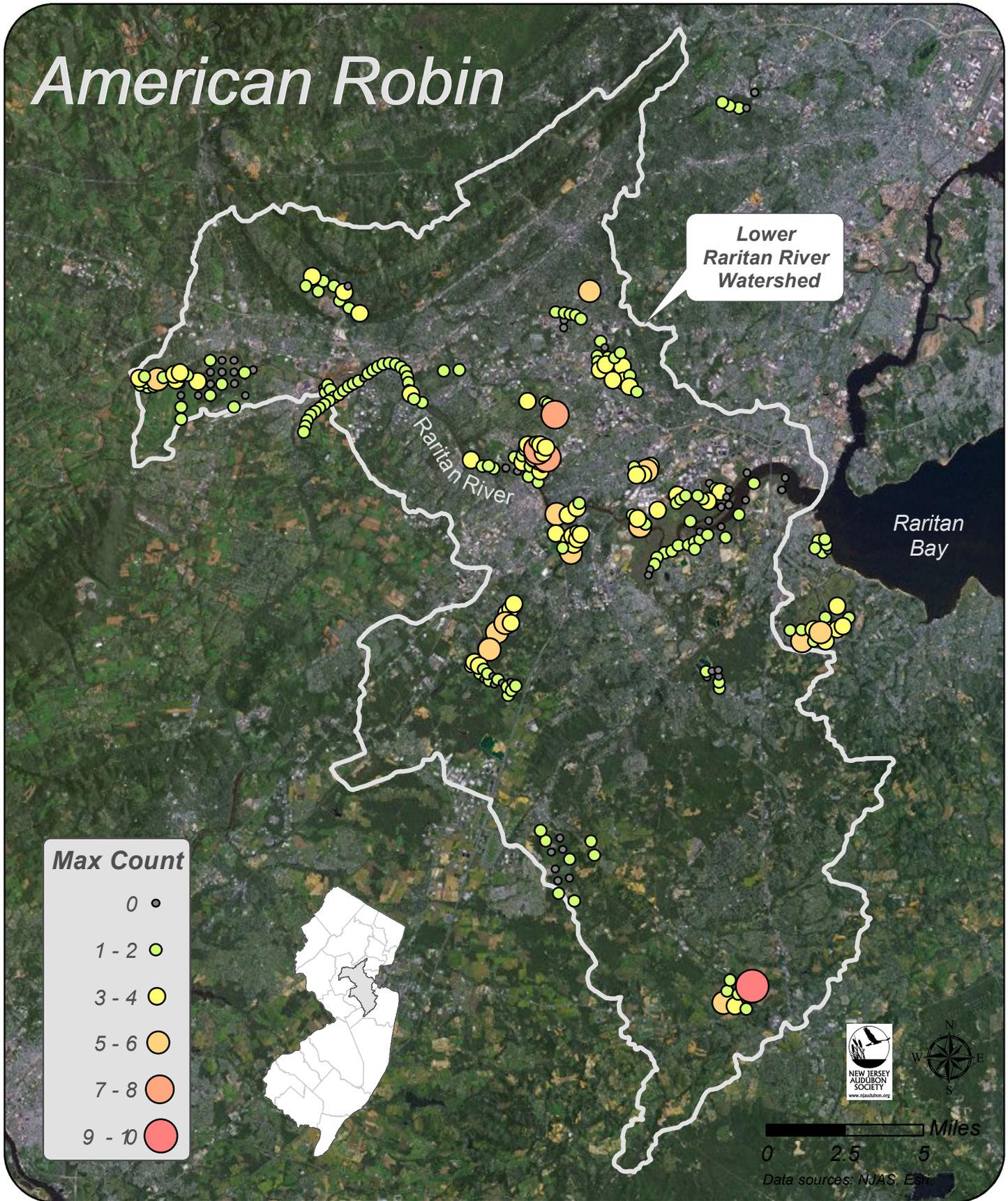


Figure 13. Abundance of American Robin detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

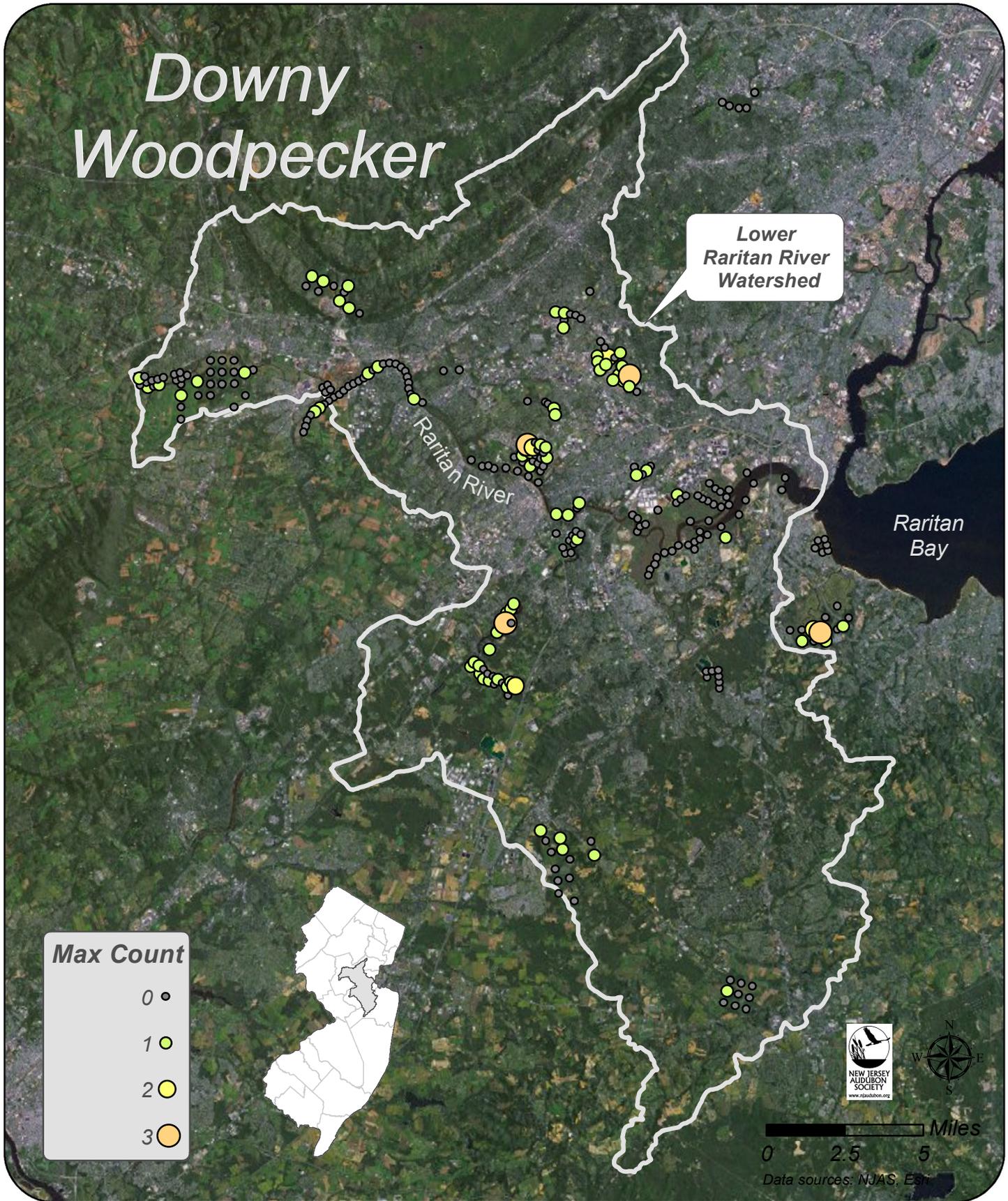


Figure 14. Abundance of Downy Woodpecker detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

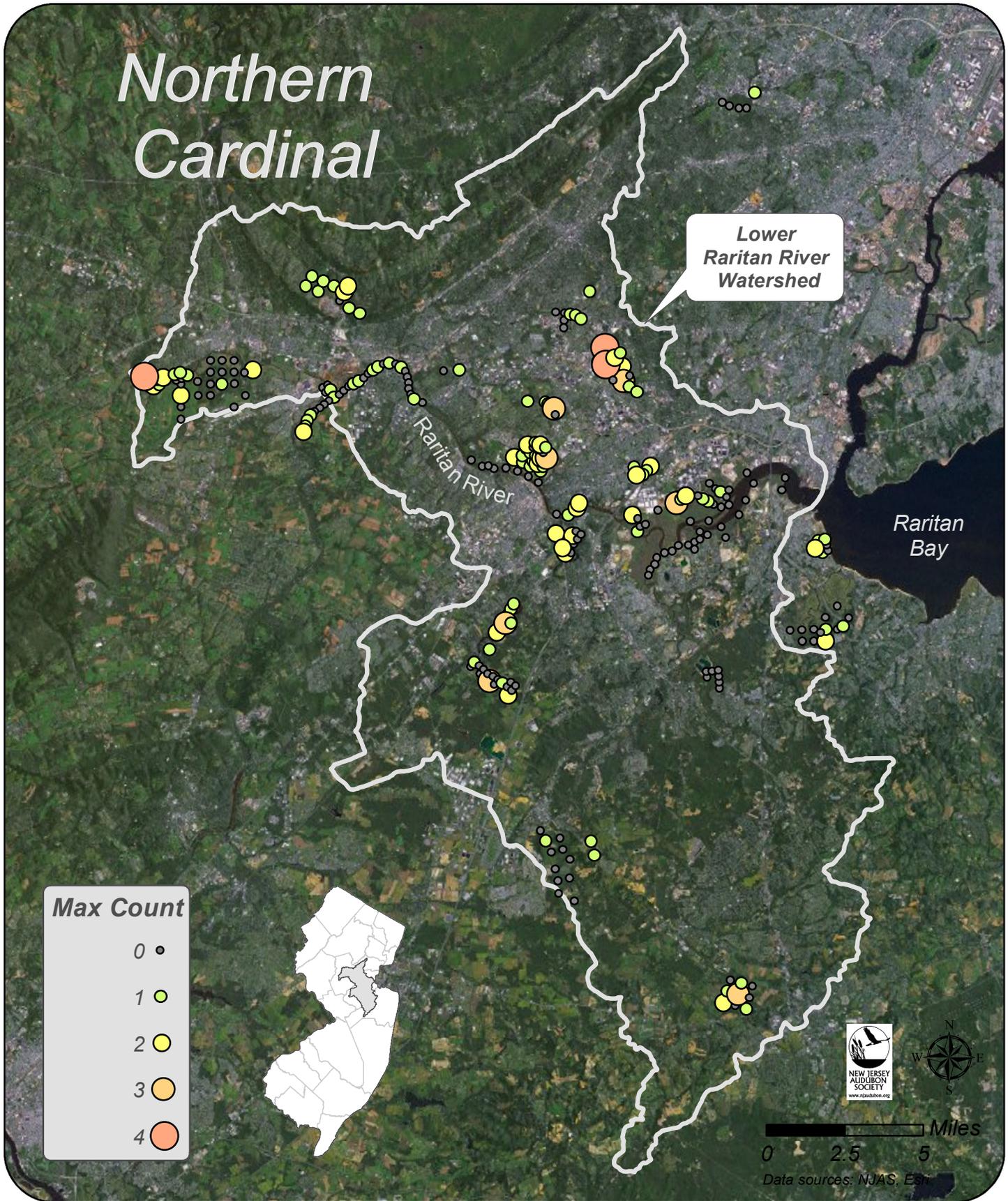


Figure 15. Abundance of Northern Cardinal detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

Threatened and Endangered Species

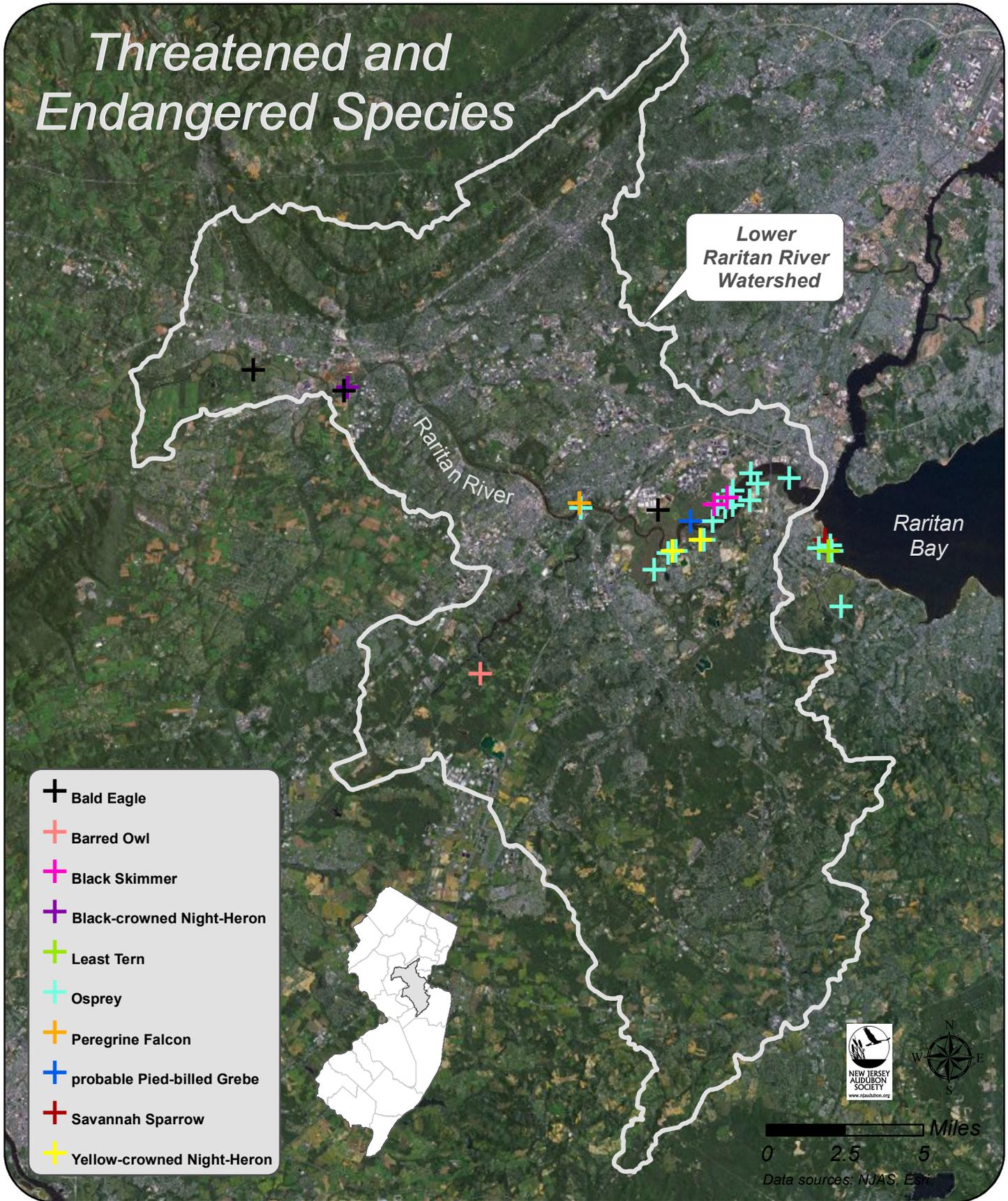


Figure 16. Locations of state threatened or endangered species detected at surveyed points in the lower Raritan River watershed. Point count surveys were conducted 26 May - 30 June 2012 by citizen scientists and NJ Audubon staff.

Rare Plant Surveys

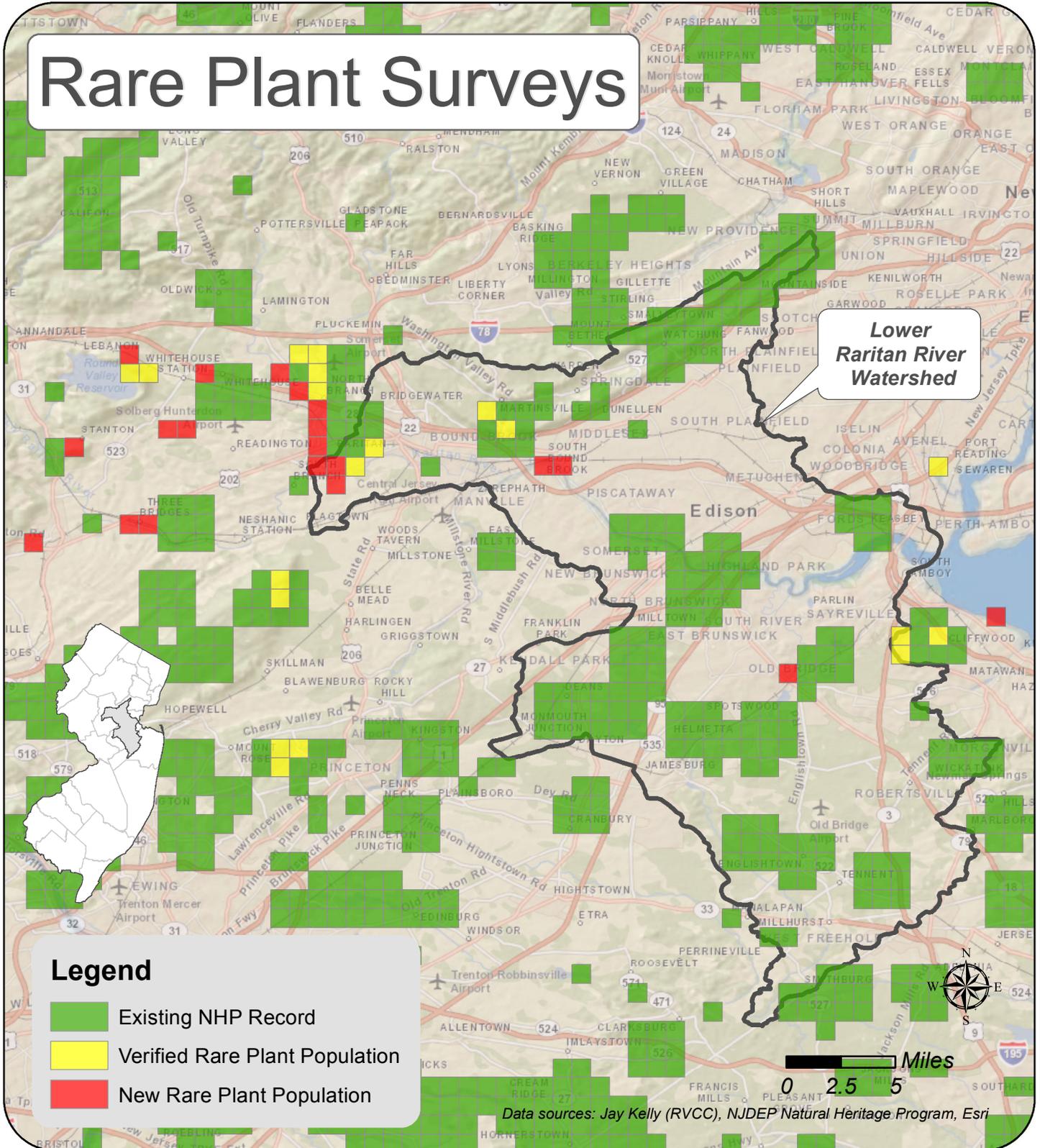


Figure 17. New and confirmed rare plant locations in the Raritan River basin. Green cells show existing rare species records from the NJ Natural Heritage Program (NHP) database; yellow cells show known rare plant populations that were re-found in 2012; red cells show new rare plant populations discovered in 2012. Plant surveys were conducted by Dr. Jay Kelly and his students at Raritan Valley Community College. For plant species names see Appendix 2.

APPENDIX 1: LOWER RARITAN BIRD SURVEY PROTOCOL

Migration survey dates: April 1- May 25
Breeding Survey dates (round one): May 26 – June 15
Breeding Survey dates (round two): June 16 – June 30



Time of day to conduct surveys: 5:30 am – 9:00 am

Pre-survey Wait Period	2	Wait 2 minutes prior to starting survey
Number of minutes at each point:	5	Separated into 3- and 2-minutes
Number of visits per point:	3	One for scouting, two for surveys
Bird surveys	2	Once at each point per survey period
Habitat surveys	1	One during scouting or bird survey

Minimum number of points surveyed in one day: 5-10 points

Total number of points assigned: Minimum 5-10 per person. No maximum.

All citizen scientists are required to attend a training workshop. During this workshop, survey sites and points will be assigned and corresponding maps will be handed out. **Each point on the map will have a unique ID number that is composed of the site code (usually 4 letters) and the point number (usually 2 digits). This unique ID is what links your birds data to its map location in our Geographic Information System (GIS).** We ask that you look at our Raritan survey map and select your preferred site and points. We will make every attempt to match volunteers to their preferred sites. Volunteers are asked to survey at least 5-10 points, over a one to two day period. Do not try to be too ambitious and take on more than you can handle. If you feel that you are not able to survey that many points, please let us know. It will be much more difficult to reassign points after the surveys have been initiated.

2012 Lower Raritan bird survey

Developed by Nellie Tsipoura and Mike Allen, New Jersey Audubon Society

Introduction

The Raritan River is New Jersey's largest river and is located entirely within our state's borders. Including the watershed, the Raritan River Basin encompasses more than 1,100 square miles (262,941 acres). Its waters are used for drinking, recreation, transportation and industry. Despite the environmental pressure to which they have been subjected, the Raritan River and Raritan Bay Estuary provide important wildlife habitats. From wetland and estuarine habitats that support osprey, night herons and black skimmers, riparian corridors that support nesting bald eagles, to upland grasslands sustaining grasshopper sparrows and bobolinks, thousands of acres within the watershed provide habitat critical to the continued survival of a diverse array of threatened and endangered species that is unrivaled in New Jersey. Threats to this system include extreme pressure from commercial and residential developments. In addition, industrial development has resulted in contamination of parts of the river and associated wetlands for decades. However, large sprawling industrial complexes also include some of the last remaining undeveloped habitats in this heavily populated watershed.

New Jersey Audubon has been involved in surveys of urban habitats for birds for the past 30 years. Richard Kane, former Vice-president of Conservation, began conducting surveys and reporting on the Meadowland's avifauna in 1975. In 1991 Rich Kane headed up a team of NJAS staff that conducted the first year-long inventory of the Arthur Kill and Raritan. Much of what we currently know about the seasonal occurrences of avian species in the urban New Jersey wetlands is based on this work. More recently, the NJAS's Research and Monitoring Department undertook and completed a two-year, systematic study of avian abundance and distribution in the Meadowlands (2004-2006), an avian study in the Gateway National Recreation Area (2006-2007), and a survey of the Lower Raritan (2009).

Through this citizen science project we will continue and expand the 2009 surveys in Lower Raritan River to provide baseline information on bird use in the area. Results of this project will help set site acquisition priorities, and direct management and restoration activities related to reducing fragmentation and improving habitats for wildlife.

Reporting Time

All volunteer hours spent performing Lower Raritan bird surveys must be recorded on the provided timesheet. The project name is Lower Raritan Bird Surveys. In addition to the project name please record the Site Code, especially if you are working on more than one site. Make sure that all information is filled in every time you go into the field to work on this project. This includes scouting, habitat assessments, bird surveys, data entry, etc. Also be sure to record the miles traveled during each survey. NJAS must provide this timesheet to our partners at National Audubon/TogetherGreen. It is essential that this form be completed and returned to NJAS with your data sheets at the end of the field season. Thank you.

Scouting

Prior to the first bird survey, every point in each site needs to be scouted to determine suitability and accessibility. This initial visit must take place sometime between the workshops and the last week of May.

Record habitat characteristics and dominant plant species at each point during this initial visit. Recording habitat is not meant to bog you down, it is a quick assessment of the dominant vegetative species, the habitat structure and habitat type. It should only take 20 to 30 seconds at each point (see habitat protocol for further details).

If a point is inaccessible or unsuitable, the point may be moved to suitable habitat at a nearby location. To move a point, choose a location with suitable habitat on your route map that is at least 1000 feet or 300 meters (straight distance) from any other point. Points should be relocated to the nearest suitable area of the same habitat type as the original point (forest, shrub scrub, open field, wetland.) When you find the new point location, draw an arrow on the route map from the old point location to the new one and indicate why it was moved (developed, inaccessible, etc). Make sure to mark the new location on the route map or the aerial map and record the GPS coordinates and the units (UTM, decimal degrees, etc.). If there are no other suitable locations that meet the criteria to move a point, then mark it on the map with an X and indicate why it was not surveyed (developed, inaccessible, etc.).

PLEASE LET US KNOW (Nellie.tsipoura@njaudubon.org) about any points that you move. If the area around the original point has been developed, please let us know immediately.

Bird Surveys

Make sure you are familiar with the songs of species likely to be seen during your surveys, and the points on identification. Some species are rather difficult to see through the vegetation or do not allow close approach for visual identification. We will provide CDs of songs to all participants in the training workshops, and you are encouraged to keep practicing. We recommend you use a good field guide for visual identification.

Each volunteer will be responsible for a minimum of 5-10 points. Each point is a pre-determined location from which the observer conducts a survey.

Surveys should not be conducted during rain. Surveys should also not be conducted during high winds (greater than 12mph {Beaufort 3}, which is enough to constantly move leaves or twigs and to extend a light flag.) Surveys will take place a half hour before to three hours after sunrise (approximately between 5:30 am and 9:00 am), during the breeding season. You will survey each point twice during the breeding season: once between May 26th and June 15th, and once between June 16th and June 30th. Spring migration surveys will take place between April 1st and May 25th.

Once the observer arrives at the survey point wait 2 minutes before beginning the count. This enables the observer to prepare for the count and allows the birds to calm down and return to

normal activity. During the survey the observer stands at the point for 5 minutes and records on the data sheet all grassland bird species seen or heard. This 5-minute period is divided into two periods; a 3- and a 2-minute period. The observer records the species and number of birds seen or heard during the first 3 minutes separately from those encountered during the next 2 minutes. Record all birds as less than 100 meters or greater than 100 meters away from the survey point on the data sheet. ***Do not count longer than five minutes.*** Do not exceed the 5-minute time limit because you are sure a certain "good bird" is there and not calling -- it will probably be recorded some other year, and valid negative data are as important as positive data in this survey. Species recorded that are not found on the form should be added at the bottom. ***If you observe any birds before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a "before" or "after" next to it.***

One and only one observer should conduct the count. Counting should be done from outside the car from a stationary point. Absolutely no method of coaxing birds should be used during the 5-minute survey period. This means no "spishing", tape playbacks or any other method of enticing a bird to sing or call or make itself visible. It is crucial that all surveys be done consistently. Target birds observed between stops should not be counted, but may be noted in the margin of the route map with a line indicating the location of the species. Such birds are of interest, but do not spend extra time pursuing them, as it is important to finish within the time limit; bird activity changes drastically after this time.

Be sure you record the survey site code, survey point number, observer, recorder (if applicable), date, start time and weather conditions on every datasheet.

Each survey will be undertaken singly or by two people. We prefer single observers because we do not want the volunteer's ability to concentrate on the birds to be compromised by the presence of another person. However, if you want to undertake the surveys with your birding partner, please take all precautions to avoid being distracted. Remember, only one person should be the primary observer. The second person can act as the recorder in this situation. If there are two observers, the primary observer says what she/he sees or hears to the recorder in a quiet voice and the recorder repeats back what she/he heard as the data are recorded. Only the birds seen and heard by the primary observer get recorded on the forms. ***If the recorder sees or hears a target species before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a statement that this is a recorder observation.***

*****Note on Counting the Same Bird: The same bird seen/heard in the 3-minute portion of the survey, then seen/heard again in the 2-minute portion is ONLY recorded in the 3-minute period as this is definitely a single individual. If you are sure that a bird observed in the 2-minute period is different from the one observed in the 3-minute period, by all means record it as a different individual in the 2-minute time slot. Noting on the data sheet that you were sure two different birds were observed will help with our data entry.***

In all situations, avoid biasing the data by disturbing the birds. Walk out of your car quietly, approach the survey point cautiously, avoid unnecessary movements and try to blend in as much as possible.

The method by which the bird was observed can be recorded as S (seen), H (heard), or SH (both

seen and heard). Make sure you record flyovers (birds flying over, not through habitat).

If females or juveniles are seen please note that information. Unless otherwise noted, we will assume that all detections are of singing males.

Habitat Surveys

At each point please describe general habitat characteristics of the area. Appendix I. (below) is a listing of the broad habitat categories. You can use the codes and record in the front of your data sheet, or circle the categories in the back of the data sheet.

Circle the habitat class (upland or wetland) and habitat type (Urban; Barren land; Agricultural; Natural grassland; Scrub/shrub; Forest; Open water; Mudflat; Other). Feel free to add any other information on habitat in the comments section.

Data Entry

All observers will have access to NJAS's online data entry website. Contact Nellie Tsipoura or Mike Allen for more instructions on how to use the data entry system.

The system may not be set up yet. Go to <http://www.njaudubon.org/SectionCitizenScience/LowerRaritanSurvey.aspx>. At the bottom of the page you can click on **Enter Data**. This will send you to a new page. Click on the link that allows you to **Enter Lower Raritan survey data**. At the bottom of the page click **Create a New Account**. Enter a User ID for yourself. Enter a password (at least 5 characters) and confirm that password. Enter your name, phone number and email address in the appropriate box. Nellie Tsipoura will provide **Site Password**. A page will open that asks you for the new User ID and password. Type them in, hit enter and you should be relocated to the data entry page. If you have any technical difficulties with this please let me know immediately so we can correct the problem.

Once you have entered all of your data mail your hard copies to:

Nellie Tsipoura
New Jersey Audubon Society
Scherman-Hoffman Wildlife Sanctuary
11 Hardscrabble Road
P.O. Box 693
Bernardsville, NJ 07924

Thank you for your assistance and good luck with all of your surveys.

PLEASE MAIL ALL DATA SHEETS BY August 15, 2012

Bird Survey Protocol Appendix I.

Weather conditions (from Breeding Bird Survey)

Beaufort Scale	Wind Speed in miles per hr.	Indicators of Wind Speed
0	Less than 1	Smoke rises vertically
1	1 to 3	Wind direction shown by smoke drift
2	4 to 7	Wind felt on face; leaves rustle
3	8 to 12	Leaves, small twigs in constant motion; light flag extended
4	13 to 18	Raises dust and loose paper; small branches are moved
5	9 to 24	Small trees in leaf sway; crested wavelets on inland waters

SKY CONDITION CODES:

- 0 Clear or a few clouds
 - 1 Partly cloudy (scattered) or variable sky
 - 2 Cloudy (broken) or overcast
 - 4 Fog or smoke
 - 5 Drizzle
 - 7 Snow
 - 8 Showers
-

Bird Survey Protocol Appendix II

Equipment Checklist

Clipboard Pencils

Forms

- Bird count datasheet
- Habitat Category Form

Route map

Binoculars

Watch with second hand (or timer)

Thermometer (optional)

APPENDIX 2: RARE PLANT SPECIES LIST

Developed by Dr. Jay Kelly, RVCC

Species*	No. Populations Found	NJ Natural Heritage Program Ranking**	State Status
<i>Arabis missouriensis</i>	1	S1.1 (Critically imperiled)	No Status
<i>Arenaria stricta*</i>	1	SH (Historical occurrences)	Endangered
<i>Asclepias verticillata</i>	1	S2 (Imperiled)	No Status
<i>Bouteloua curtipendula</i>	1	S1 (Critically imperiled)	Endangered
<i>Cynoglossum virginianum</i>	1	S2 (Imperiled)	No Status
<i>Lycopodiella virginiana</i>	1	S3 (Rare)	No Status
<i>Mertensia virginiana</i>	6	SU (Status uncertain)	No Status
<i>Mimulus alatus</i>	4	S3 (Rare)	No Status
<i>Obolaria virginiana</i>	2	S2 (Imperiled)	No Status
<i>Panax quinquefolia</i>	3	S2 (Imperiled)	No Status
<i>Platanthera ciliaris</i>	1	S2 (Imperiled)	No Status
<i>Quercus muhlenbergii</i>	1	S3 (Rare)	No Status
<i>Scirpus maritimus</i>	2	SH (Historical occurrences)	Endangered
<i>Scutellaria leonardii</i>	1	S1 (Critically imperiled)	Endangered
<i>Sedum telephioides*</i>	4	SX.1 (Presumed extirpated)	No Status
<i>Selaginella rupestris</i>	1	S2 (Imperiled)	No Status
<i>Stachys tenuifolia</i>	1	S3 (Rare)	No Status
<i>Taenidia integerrima</i>	1	S3 (Rare)	No Status
<i>Taxus canadensis*</i>	3	S2 (Imperiled)	No Status
<i>Tradescantia ohioensis</i>	2	S2 (Imperiled)	No Status
<i>Viola rostrata</i>	1	S2 (Imperiled)	No Status

*Species requires additional visits to confirm identification.

** ".1" indicates that the species has been documented from only one location.