



The Temperate Times

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Rocky Interidal Monitoring Rises Closer to Full Implementation

In late August, Network staff enhanced the set-up of rocky intertidal monitoring plots in Acadia National Park. Plots on the Schoodic Peninsula, Bass Harbor, Otter Point, and Ship Harbor have had high accuracy GPS readings taken, reference bolts drilled and installed, barnacle and mussel plots set-up, temperature readers bolted in, and point-intercept transects laid out (to get a close-up view of all the park's monitoring plots, check out Acadia's Google Earth map available from NETN's website). Boston Harbor Islands should have all of its plots finished next summer sometime.

NETN selected the rocky intertidal zone as a vital sign, or key indicator, for long-term natural resource monitoring early in the network's formation. Specifically, intertidal habitats in Acadia National Park, the Boston Harbor Islands, and the Maine Coastal Islands National Wildlife Refuges will be monitored under this program. The rocky

intertidal zone is a unique habitat that is used by a variety of species, many of them at the edge of their physical and ecological tolerances, and they provide important food sources for birds and mammals that forage along the shoreline. Climate change, energy development and oil spills are all threats to these resources.

Monitoring intertidal ecosystems helps NETN determine the level of negative impacts to rocky shorelines that are so popular with park visitors in both Acadia and the Boston Harbor Islands. These parks also contain several stretches of relatively untouched intertidal habitat that will be useful to monitor as a baseline and to track more indirect anthropogenic impacts such as climate change. With respect to climate change, these communities are ideal for sampling because two climate-related factors that are predicted to change over the next few decades – sea level and temperature – are critical to determining

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NETN and Acadia staff help to finish establishment of rocky intertidal monitoring plots during a misty day in the park. Ed Sharron photo.

Coastal Birds Update

2011 was the 4th consecutive year of coastal bird monitoring at Boston Harbor Island NRA. The full monitoring report can be downloaded from NETN's website. For a brief summary of this years findings, continue reading below.

Boat-based surveys of the Outer Harbor Islands were conducted five times during the latter half of the nesting season to search for adult female Common Eiders tending ducklings. Some ducklings were also incidentally observed on the water during gull and cormorant surveys. The high count for eider ducklings was 191 observed in late June. Comparatively, in 2010, a high count of 341 was obtained in mid-June.

In general, Common Eider experience high annual adult survival rates (over 80% in several studies), but generally experience a highly variable degree of reproductive success in any given year and years of 'near disaster' are not uncommon. In a stable population, low survival of young is compensated by their comparatively long average life span (5 to 6 years). The number of ducklings observed in 2011 was lower than 2010, but similar to previous years and do not suggest a particular concern for nesting eider productivity.

A combination of boat-based and ground-based surveys detected a total of 21 American Oystercatcher pairs on 13 islands. On Great Brewster, two American Oystercatcher nest locations were documented. At least 12 pairs were successful in fledging chicks.

Five pairs of territorial Willets were detected on Snake Island in May, but no nests were located and only a limited survey effort was conducted due to disturbance concerns. Boat-based surveys were successful in detecting territorial pairs of American Oystercatchers and Willets, but ground-based surveys of beach habitat undoubtedly provide more reliable results by reducing

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A Least Tern feeds its chick on Lovells Island. Carol Trocki photo.

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the elevational range of intertidal species. These changes, combined with the short distances across which these changes occur and the growth and turnover rates of these species, make the intertidal a model community for examining consequences of climate change.

The monitoring methods of the rocky intertidal program are comparable to the standard, or "core," procedures of the Multi-Agency Rocky Intertidal Network (MARINe) that currently surveys target species at 80 Pacific coast sites that include six national parks. This will facilitate the ability of managers and scientists to make comparisons and predictions across coasts. Following the recommendations of MARINe, the monitoring program focuses on target species (also called key or indicator species) that dominate particular zones, or living assemblages of organisms in rocky intertidal habitats.

Focusing on these dominant, structure forming species is advantageous because most other members of the community rely on these species in some way. Monitoring intertidal habitats in these parks and the refuge allows NETN to determine if changes are occurring across broad scales (hundreds of kilometers) and to measure a gradient of human visitation and management practices.

The program monitors rocky shores across multiple scales (biological, ecological, and landscape) and across relevant disciplines (marine ecology, physical oceanography, and the study of climate change). This long-term, regional, interdisciplinary approach to monitoring will vastly improve the NPS's ability to manage these resources.

An updated monitoring protocol for rocky intertidal monitoring was approved early this year, and implementation of the monitoring program may begin either this coming year or the next. Field



Some intertidal species, such as barnacles, are especially susceptible to trampling impacts. Mo Riza photo.

methods include using photoquadrats to monitor the surface cover of permanently attached target species like seaweeds and barnacles. Point-intercept transects that extend from the low to the high intertidal zone will be used to monitor changes in the range of species with respect to intertidal height. Tide pool band transects will help monitor the number and size of sea stars and sea urchins within 2 meter by 10 meter areas. Motile invertebrates (those capable of moving around), including snails and limpets, are counted in every photoquadrat, and the recruitment of barnacles is also monitored at each site.

Water temperature is currently being measured once an hour using three "tidbit" temperature sensors that are deployed in the low intertidal (i.e. red algae) zones at each site. A series of overlapping photos, or overview photographs, will be taken of each fixed plot and shot from the same location each time to place changes occurring within the plots into a broader spatial context. Long-term monitoring programs represent an important step towards managing resources. The rocky intertidal monitoring program will ensure that detected changes are occurring in nature and not simply a result of measurements taken by different people or in slightly different ways.

For complete details, see the finished protocol, read resource briefs, and check out the rocky intertidal vital signs page all available from our website. ^{TT}

Forest Monitoring Logs Another Year

The 2011 field season marked the second year of repeat sampling in forest monitoring plots, and now half of all Network forest plots have been sampled twice. A recently published report details results for Acadia National Park, Morristown National Historical Park, the Roosevelt-Vanderbilt National Historic Sites, and Weir Farm National Historic Site. The report also includes analysis of forest soil chemistry and a power analysis of key forest metrics for all NETN parks monitored for forest health. For the full report and individual park resource briefs, go to NETN's website. A brief summary of results is highlighted below.

Ecological integrity metrics suggest that forests in **Acadia National Park** are approaching mature stages of forest succession, but late-successional features, such as medium to large snags, are still lacking on Mount Desert Island and Schoodic Peninsula. As long as forest composition metrics remain stable (e.g., no new invasive species, stable tree condition/forest pests, and continued regeneration), late-successional structure is expected to develop over time. The park continues to be the least invaded of all NETN parks, with a mere three out of 176 plots found to contain an indicator invasive exotic species. Damage from beech bark disease and balsam woolly adelgid were the only major tree condition issues reported in 2011. Continued vigilance and outreach are vital to preventing the spread of forest pests such as hemlock woolly adelgid, emerald ash borer, and Asian longhorned beetle. Ongoing exotic plant management and early detection efforts are equally important to maintain forest health in the park.

Tree regeneration appears to be adequate, and impacts from deer browse are minimal. Tree growth rates are lower than the regional growth rates calculated by the U.S. Forest Service. Though these lower growth rates are likely due, in part, to the higher proportion of late successional plots in the park. While overall tree mortality is at acceptable levels, balsam fir and big tooth aspen are both experiencing elevated mortality rates. Higher mortality rates for balsam fir are likely being influenced by the presence of balsam woolly adelgid. Big tooth aspen mortality is likely the natural result of forest succession, and is not a forest health concern.

An overabundance of white-tailed deer and invasive exotic species continue to significantly impact forest health in **Morristown NHP** with the most extreme impacts in successional forest stands. It is important that the park continue to move forward on its white-tailed deer management plan (which also includes plans for invasive species control).

Tree regeneration is well below levels required to restock the forest in the future, and is especially low in

forests, cont. page 6

Landbird Study Soars to its 6th Season

Another successful year of landbird monitoring was completed in the spring and early summer of 2011. Breeding birds were chosen as a high priority NETN vital sign because they are a reliable indicator of ecological integrity and a high profile taxonomic group. Many bird species are easily detected and identified, and well-established survey methods are available. A report and accompanying resource briefs for each participating park summarizes data collected from 2006 through 2011 and all are available for download from NETN's website. Read on for a brief summary of the 2011 monitoring season.

During 2011 in Acadia NP, observers conducted a total of 56 point counts, detecting a total of 437 birds representing 48 species. A total of 65 species have been recorded over the 5 years of monitoring. The number of birds detected per point on only the first site visit in a given year provides a better estimate of abundance than the total number of detections (which can vary with the number of sites and number of surveys). Average abundance during the first site visit dropped from 11.7 birds per point in 2010 to 7.3 birds per point in 2011, the lowest since point counts began in the park in 2007. However, despite the low number of individuals in 2011, species richness was the highest in the survey's history, with 46 species detected during the first round of surveys.

At Eleanor Roosevelt NHS, a total of 129 individuals representing 40 species were detected, including seven species detected for the first time. In total, 48 species have been recorded during the 6 years, with an average abundance of 9.48 birds per point. In 2011, both relative abundance (11.73 birds per point) and species richness (40) were the highest in the survey's 6-year history. A total of five species of conservation concern were detected.

The Home of Franklin Roosevelt NHS had a total of 67 individual birds representing 23 species detected in 2011. In total, 44 species have been recorded, with an average abundance of 7.27 birds per point. Compared to 2010, relative abundance declined from 7.58 to 5.58 birds per point, the lowest in the survey's 5-year history, while species richness held steady for the third consecutive year.

Volunteers in Marsh-Billings-Rockefeller NHP observed a total of 407 birds representing 42 species. A total of 57 species have been recorded over the 6 years of



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A Nashville Warbler was observed during surveys for the first time in the forests of Marsh-Billings-Rockefeller NHP in 2011. Seabrooke Leckie photo.

the chance of missing pairs. A combination of annual boat-based surveys and periodic walking surveys that cover all islands on a three-year rotation may be the best balance of effort. Regular surveillance of all islands will be undertaken. Many nest locations appear to be used repeatedly, which should increase search efficiency for known nesting locations in the future.

In 2011, 75 Least Tern nests were detected on Lovells Island in June. A smaller colony was present in the same location in 2010, presumably as the result of a re-nesting effort following a predation event at nearby Winthrop Beach. Prior to this re-colonization, Least Terns had been absent in the park since a predation event on Lovells Island in 2007. Subsequent observations in June 2011 from outside the colony indicated good productivity with 85-90 adults defending the colony site and many chicks present. In early July there were approximately 35 adults still attending the colony, with some young chicks present as well as some near to fledging. By late July, the colony site had disbanded, suggesting a productive season.

The history of Least Terns highlights the importance of continuing to manage for them in the park, even in years when they may not be present. It is highly recommended that island managers continue to post informational signage and employ all other reasonable efforts to reduce human disturbance at previously known colony sites on Rainsford, Lovells, and Snake islands every season so that appropriate habitat remains available for future use.

The nesting platform on Spinnaker Island was visited in mid-June, and 133 adult Common Terns were estimated to be nesting there.

Spotted Sandpipers were observed feeding in the intertidal zone on Calf, Green, Middle, Gallops, Outer and Little Brewster Islands, and Shag Rocks during boat-based surveys for other species.

Spotted Sandpiper.
Kenneth Cole
Schneider photo.



Territorial
Spotted
Sandpipers
were
incidentally
observed on Rainsford
and Lovells Islands
during ground-based
surveys.

2012 monitoring activities have wrapped up for the year, and the accompanying report should be published sometime this winter or spring. *TT*

Water Quality Reports Go From a Trickle to a Flood

The flood gates for water quality monitoring reports from NETN parks were opened this summer and fall and they came in fast and furious for a few weeks. The vital signs for fresh water-bodies are water chemistry, nutrient enrichment, water quantity, and the detection of invasive plant species. At least one pond or stream from each park is sampled monthly from May through October, with Acadia having the most sites at 37 lakes and streams. Monthly sampling parameters include in-situ water quality measures (pH, specific conductance, temperature, and dissolved oxygen - for an explanation of all these parameters, see the Spring 2011 *Temperate Times* newsletter), transparency (ponds), weather, stream flow (discharge), and stream and pond stage (height). In 2011, Acadia NP staff, cooperators from the University of Vermont or NETN hydrologic technician Brian Schuetz measured physical and water chemistry parameters each month and periodically collected water samples for acid neutralizing capacity (ANC), color, and nutrients. The samples were analyzed at the University of Maine. In 2012, all monitoring activity is being conducted by Acadia staff and Mr. Schuetz. Below is a brief summary of findings for the most recent batch of reports (Marsh-Billings-Rockefeller and the Roosevelt-Vanderbilt parks appeared in the last edition of the *Temperate Times*). Full reports and briefs for all participating parks are available from NETN's website.

The majority of 2011 monitoring values for all NETN parks were within the ranges of the historic NETN monitoring data, as well as within each park's respective state standards (only Saugus Iron Works NHS met all state standards).

In Acadia National Park there were slightly higher summer ANC and pH measurements than average, which may reflect a reduction of acid deposition effects. Apparent color and transparency measurements indicated that park waters remained clear, and there were no major runoff

or sediment loading events detected by 2011 monitoring data. Nutrient levels (phosphorus and nitrogen) remained low, and chlorophyll *a* measurements suggested that most lakes retained their minimally to moderately productive status.

In Minute Man NHP, ANC measurements showed that all streams had sufficient buffering and can avoid severely depressed pH values from spring snowmelt and runoff that can contribute acidity and sediment to stream waters. Test results for total nitrogen (TN), total dissolved nitrogen (TDN), and nitrate (NO₃) were moderately high in most samples. Results for nitrite (NO₂) were low at all sites. All ammonia (NH₃) test results were below the method reporting limit. All total phosphorus (TP) results were significantly above the non-regulatory nutrient EPA criterion, and total dissolved phosphorous (TDP) and soluble reactive phosphorus (SRP) values were in the moderate range in all park streams. These results indicate that some nutrient enrichment is occurring in Minute Man's waters.

The readings for August Primrose Brook samples in Morristown NHP for apparent color, TP, and TN measurements clearly demonstrated the effects of the substantial precipitation and runoff event that occurred during the sampling visit. ANC measurements showed that all streams were very well-buffered, however most of the May ANC values were also the lowest in NETN data history at the park. Consideration of the ANC and color result sets suggests that spring snowmelt and runoff preceding the May sample visit likely contributed acidity and sediment to the stream water. Fortunately, the naturally high ANC of park streams provided sufficient buffering to avoid severely depressed pH values.

Saint-Gaudens NHS's apparent color and TP measurements from the August (summer) samples from Blow-Me-Down-Brook and Blow-Me-Down-Pond demonstrated the

water, cont. page 5

Google Earth Park Maps Increase Usability

NETN's Google Earth park maps have proven to be one of the most popular features on the website. Park managers and the public have found the user-friendly interface of Google Earth and the copious amount of NETN monitoring information available at their fingertips a good match.

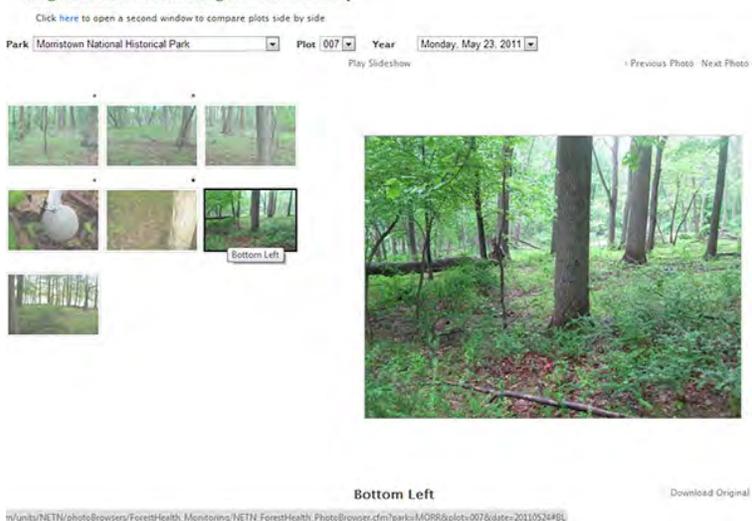
The park maps have always had the ability to show the locations of monitoring plots for landbirds and forest health studies, but recent updates have now made those two features even more useful. For landbird monitoring, viewers now have the ability to view species lists for point-count locations and the Avian Ecological Integrity Assessment (EIA) for each bird monitoring route. The EIA provides a snapshot of the condition of forest and grassland habitats. Baseline condition assessment values (based on the first 5 years of data) are

given for each route, followed by the most recent assessment condition values (based on the previous 5 years).

In the "Forest Monitoring Plots" section, the new forest plot photo viewer allows for the browsing of all available photos taken in each plot during the monitoring season. These photos help add a visual dimension to all the other data gathered during monitoring, and over time may make for some interesting comparison images. Explore these and all the other features available in Google Earth Park Maps from the Network's website. *TT*



Glimpses of the forest plot photo viewer and landbird information available in NETN's Google Earth park modules.



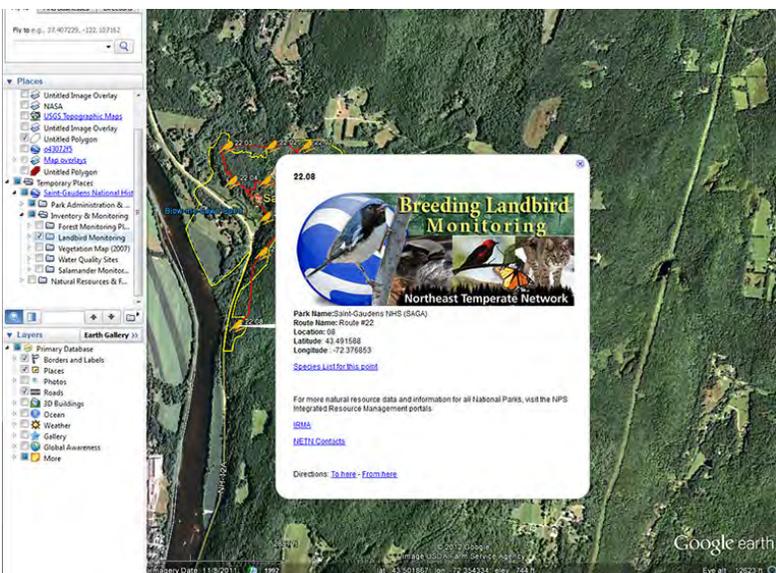
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effects of runoff and sediment input on water chemistry. ANC measurements showed that all sites were very well buffered, sufficient to avoid severely depressed pH values from episodic acid deposition. Test results for TN, TDN, and NO₃ were relatively low in most 2011 samples. Results for NO₂ were below the method reporting limit. All ammonia test results were below the method reporting limit as well.

Saugus Iron Works NHS had all measurements within state standards, where applicable. Phosphorus concentrations were in the moderate to high range, indicating that some nutrient enrichment is occurring. ANC measurements showed that all sites were very well-buffered, sufficient to avoid severely depressed pH values from episodic acid deposition. Test results for TN, TDN, and NO₃ were moderate in most 2011 samples. Results for NO₂ and NH₃ were low, with the NH₃ test results below the method reporting limit. Two extremely high specific conductance data points from the Turning Basin (August 2009 and 2010) that had no corresponding high values in the USGS conductance data from the Saugus River suggest that there are unique water quality influences and characteristics at each site, despite their close physical proximity. Tidal influence is clear from observations of park staff, and is further shown in the park's Turning Basin monitoring report.

Saratoga NHP had ANC measurements that showed that all streams had sufficient buffering to avoid severely depressed pH values from spring snowmelt and runoff that can contribute acidity and sediment to the stream water. Test results for TN, TDN, and NO₃ were moderately high in most 2011 samples, especially in Kroma Kill and the Mill Creek Confluence site. Results for NO₂ were low at all sites. All NH₃ test results were below the method reporting limit. Most TP results were near or below the non-regulatory nutrient EPA criterion, and TDP and SRP values were low in all streams.

Weir Pond in Weir Farm NHS had apparent color, TP, and TN measurements from the August samples that were fairly high, with TP and TN exceeding state standards. The data indicate that there is some nutrient enrichment occurring in the pond. Residential areas within the watershed may contribute to this nutrient input. ANC measurements showed that Weir Pond was sufficiently buffered to avoid severely depressed pH values from episodic acid deposition. Test results for NO₃ and NO₂ were very low in 2011 samples with all results below the method reporting limit. August NH₃ test results were also below the method reporting limit. *TT*



successional stands. In areas where seed sources are absent, planting of native herbaceous and shrub species may be necessary to restore diversity in the understory.

Invasive exotic species are pervasive throughout park lands, averaging over five indicator invasive exotic species per plot, even comprising most of the plant cover in the understory of successional forests. Coarse woody debris (CWD) and large snags are also lacking in park forests. Tree condition was good, with only a few cases of elevated insect feeding and minor beech bark disease reported. Tree growth rates are lower than the regional growth rates, but the higher proportion of late successional stands may be influencing the lower growth rates in the park. Overall tree mortality is within accepted ranges, and is lowest for oak species. The high mortality rate for white ash may be of concern if it continues over multiple sampling periods.

Eleanor Roosevelt NHS & Home of Franklin D.

Roosevelt NHS had CWD at expected levels, but snags are lacking both in overall abundance and in the amount of medium to large diameter snags. Tree regeneration and deer browse indicator species both suggest moderate deer browse impacts. If these trends worsen, park managers may need to consider deer management.

Although average percent cover of invasive exotic species is low, indicator invasive exotics occurred in 21 out of 24 plots, and plots had an average of three indicator invasive exotic species. Hemlock woolly adelgid (HWA) and Elongate Hemlock Scale (EHS) continue to be observed on most eastern hemlocks in the parks, although hemlock mortality has not been observed in park plots since sampling was initiated in 2007. Control and early detection should be a high priority for both park units. This is especially important, considering the moderate deer impacts observed in the parks, as high densities of deer largely favors invasive exotic species. While no other major tree conditions have been reported, several plots had slightly elevated levels of leaf loss, necrotic leaves, and insect herbivory. Tree growth rates are below regional rates, but are likely due to differences in structural stage between these parks and Forest Service plots. Tree mortality rates are at expected levels for all tree species.



The forests of Vanderbilt Mansion NHS have the highest density of seedlings out of all NETN parks. NPS photo.

Vanderbilt Mansion NHS has the highest CWD volume and CWD ratio of any park in the network. Overall snag abundance is also relatively high, although medium to large snags are slightly below expected levels. With the highest average seedling density in NETN, tree regeneration also appears adequate. HWA and EHS were observed on one plot. While no other major tree conditions were reported, several plots had elevated insect feeding signs and leaf loss. Tree growth and mortality rates were both within accepted ranges.

Forest health appears to be impacted by a number of factors at **Weir Farm NHS**. CWD and the abundance of snags are both below expected levels, though they are expected to increase over time as the park's second-growth forests mature. Tree regeneration and deer feeding indicator species suggest relatively high deer browse impacts. Invasive exotic species are also a concern, with Japanese barberry occurring in nine out of 10 plots, and an average of over three indicator invasive exotic species per plot. Management efforts to improve forest health should focus on controlling invasive species and reducing deer densities. Tree condition was influenced by hemlock woolly adelgid in one plot, and by elevated levels of insect feeding and necrotic (dead/dying) leaves in remaining plots. Tree growth rates were the lowest of all NETN parks, and below the Forest Service calculated regional average. However, these growth rates should be interpreted as preliminary due to the small sample size. The overall mortality rate was within the expected range, although the mortality rate for sugar maples was slightly elevated.^{TT}

birds, from page 3

monitoring. Average abundance during the first site survey across all 6 years was 13.92 birds per point. In 2011, relative abundance (13.4 birds per point) and species richness increased from 2010's 5-year low, and included a first-time detection of a Nashville Warbler.

At Minute Man NHP a total of 470 birds representing 41 species were detected in 2011. Average relative abundance during the first site survey across all 6 years was 12.97 birds per point. In 2011, relative abundance (12.35 birds per point) decreased from 2010, while species richness (38) increased (fewer points were surveyed in 2010). Of the ten most commonly detected species across all years, the relative abundances of half increased over 2010, while the relative abundances of only two species in 2011 were above the 6-year average. A total of 10 species of regional conservation concern have been detected during the 6-survey years.

Morristown NHP observers detected a total of 435 birds representing 39 species. A total of 57 species have been recorded during the 6 survey years. Average abundance during the first site visit was 12.58 birds per point, slightly above the 6-year average. Of the ten most commonly detected species across all years, the relative abundances of only two increased over 2010, while the relative abundances of four species in 2011 were above the 6-year average. A total of eleven species of regional conservation concern have been detected during the 6 survey years. In addition, Eastern Wood-Pewee and Wood Thrush were among the 10 most abundant species detected.

Saint-Gaudens NHS had a total of 174 birds representing 33 species detected in 2011. A total of 56 species have been recorded during the 5 survey years. Average abundance during the first site survey was 11.1 birds per point. In 2011, both relative abundance and species richness during the first survey decreased from the previous year. Of the ten most commonly detected species across all years, the relative abundances of three increased from 2010, while the relative abundances of only two species in 2011 were above the 5-year average.

In Saugus Iron Works NHS a total of 79 individual birds representing 25 species were detected during two surveys (which may include some double-

counted individuals). A total of 42 species have been detected at the park during the four years of surveys. Average abundance during the first site visit was 15.5 birds per point. In 2011, relative abundance and species richness for the first survey declined to 14.7 from the previous year (18.7). Of the 11 most commonly detected species across all years, the relative abundances of five declined from 2010, while the relative abundances of six species in 2011 were above the 4-year mean.

Saratoga NHP observers detected a total of 857 individual birds representing 53 species. During the 6 survey years a total of 4,139 individual birds representing 85 species have been detected, with a mean abundance of 20.59 birds per point. During 2011, relative abundance was the highest in the survey's history (31.7 birds per point), while species richness declined from 2010 (59 species) to 53 species. Of the 10 most commonly detected species across all years, the relative abundances of only two declined from 2010, while the relative abundance of only the Ovenbird was below the 6-year mean (not surprising since only two point counts were conducted in forested habitat in 2011). Eight species of conservation concern have been recorded during the surveys.

Fifty-seven individual birds of 12 species were detected in 2011 in Vanderbilt Mansion NHS, including the first detection of a Louisiana Waterthrush in the survey's 6-year history. In total, 34 species have been recorded, with an average abundance of 8.21 birds per point. Relative abundance decreased to 8.14 birds per point from 2010's 9.29 birds per point, and species richness dropped to the lowest yet recorded. Among the 10 most commonly detected species across all years, the relative abundances of four declined from 2010, and the relative abundances of three species in 2011 were below the 6-year average. Four species of conservation concern have been detected during the 6 survey years. ^{TT}



Louisiana Waterthrush.
Kelly Clogan Azar photo.



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