NJ Mobile Acoustic Bat Survey
2012 Summary

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Heading Into 2012

NJ's Mobile Acoustic Bat Survey began in earnest in 2011, with an ambitious 50 driving transects covering almost 800 miles of road and trail across the state. As a pilot year, our goals were to collect data from a wide diversity of areas, engage the help of as many interested volunteers as we could manage (hence the 50 routes), and test the mechanics of shuffling just 4 AnaBat SD2 detectors amongst all those different people within a 2 month period.

We learned important lessons: 1) Some areas of the state are too high-traffic to find a route that's at least 10 miles long and safely drivable at 12-15 mph; 2) The Pinelands have plenty of long, forested roads through amazing bat habitat, but most of them are sand (and many of them are "sugar sand")…sorry to those of you who sunk! 3) Keeping those detectors moving is a lot of work. It may be better to monitor fewer routes more often by keeping each detector "local" to a region of the state.

So in 2012, we narrowed down the acoustics list to 17 safe and manageable transects statewide (Figure 1). Two of these were bicycle trails rather than roads. A couple routes were still new or revised due to problems in 2011.

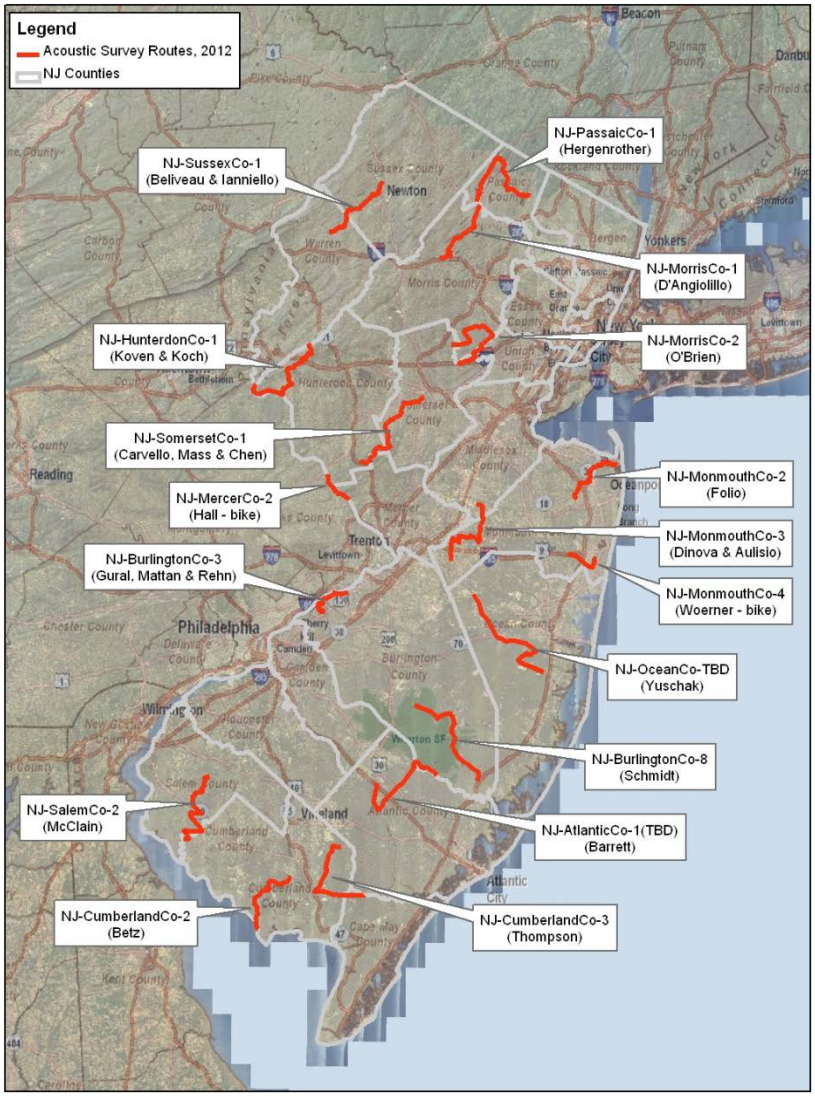

Figure 1. A map of the 17 unique driving transects monitored in 2012, labeled with the route name and surveyor(s) name.

We added headphone extension cables to each kit so the volunteers could hear when a bat was overhead – a nice way to keep people engaged and gratified during their otherwise slow, sleepy surveys. We had planned to incorporate GPS into the surveys but struggled with the technology and ran out of time before the detectors had to be deployed. Hopefully we'll have GPS up and running for 2013. This will allow us to map each recorded bat and further analyze our data by habitat class and surrounding land use. It will also supply the Endangered and Nongame Species Program with "sighting" location data, now that all of NJ's 9 bat species are of conservation interest. (See how to report Rare Species Sightings.)

Results

We had help from 32 volunteers to complete each route twice during June and July (maternity season, when bats are active in their summer range and not migrating). Thirty-three surveys were completed, amounting to 577 miles of bat recordings across NJ. A few people were stopped by curious police officers, but no one was arrested and no one got stuck!

In Fall 2012, a beta version of a software program called EchoClass was released by the US Army Engineer Research and Development Center to allow auto-identification of acoustic bat call files. EchoClass uses an extensive library of confirmed-species bat calls and distinguishes them by a host of mathematical parameters. While it has its limitations, the software gives us a much (much, much) faster way of reviewing our acoustic results. After organizing the season's data and manually deleting thousands of ultrasonic clutter files (static, wind, insect noises, car brakes, etc.), we ran it through the software. The result was 2,018 files containing around 41,500 "pulses" of bat calls.

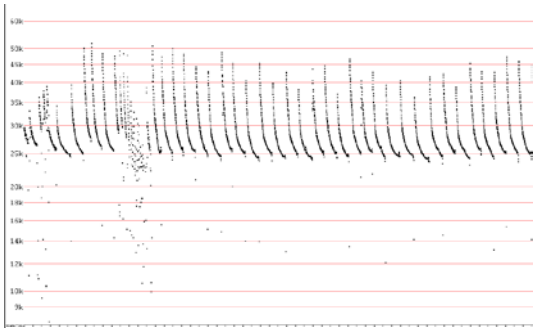

Figure 2. Sonogram of a big brown bat call sequence with searching and feeding behavior.

The results are summarized below. As a caution, the EchoClass software is still in the trial stage and is not – nor will it ever be – foolproof. Bat calls are incredibly variable within and among species. For example, NJ is home to four species belonging to the genus *Myotis*, and their calls are very similar. In fact, there is such strong mathematical overlap in the calls of these four species that they can seldom be distinguished from each other with 100% certainty. It's unfortunate, because one member of the genus is the federally endangered Indiana bat (*Myotis sodalis*), and information about this bat is especially valuable. On the other hand, all of the small cave-hibernating bats (the little brown, long-eared, tri-colored, small-footed, and Indiana bats) have been heavily impacted by White-nose Syndrome and can at least be reasonably lumped together in terms of their (negative) population trends. These cave bats are clearly rare across the survey (Figure 3).

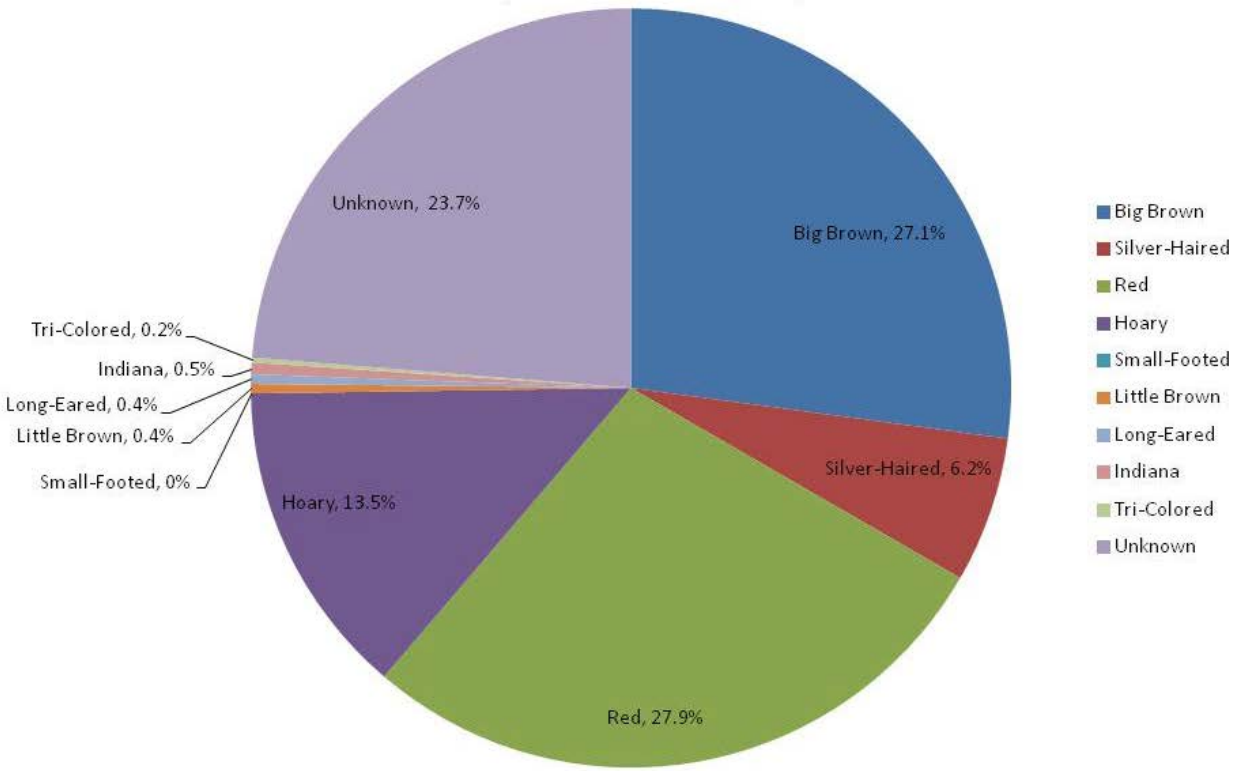

Figure 3. The overall percentage of all 2,018 bat call files collected across the state, by species.

Two other bats that are difficult to tell apart acoustically are the big brown bat and silver-haired bat. In most acoustic summaries these species are lumped together. We've left them separate, so keep in mind that the IDs are not perfect. Big brown bats and silver-haired bats may be acoustically similar, but their ecologies are quite different; big browns are common "house bats," living in attics, barns, bat houses, and the like, while silver-haired bats almost exclusively roost in trees. Big brown bats remain in our area and hibernate through the winter (sometimes in caves, sometimes in attics, and probably in the forest, too), whereas silver-haired bats are mostly migratory. Based on Summer Bat Count surveys at 6 well monitored roost sites, big brown bat colonies have grown an average 27% since pre-White-nose Syndrome counts (2008 or earlier). Figure 3 supports their relative commonness.

EchoClass left nearly a quarter of all bat call files as "Unknown." Unless or until we go through all of these call files manually, we cannot say whether the majority of these Unknowns were simply poor quality calls – perhaps fragments – or whether they could at least be categorized with the cave bats or with the big brown/silver-haired guild.

Figure 4 shows how some of the Unknowns could be explained. Here we look at the evenness of each species' distribution between routes. The blue and red bars depict different levels of confidence in the identification, with the blue bars representing a lower level of confidence (<90%) than the red (>90%). For some species, like the silver-haired bat, their identification is most often based on a confidence level of <90%, probably due to high overlap with big brown bat calls. Hoary bat calls can be very distinctive – they go "deeper" than any other bat in NJ – but can also be confused with big browns and silver-haired bats when calling at a higher frequency (such as when flying close to trees). Again, the 5 cave bat species on the right-hand side are scarce across the survey, with the small-footed bat being absent entirely.

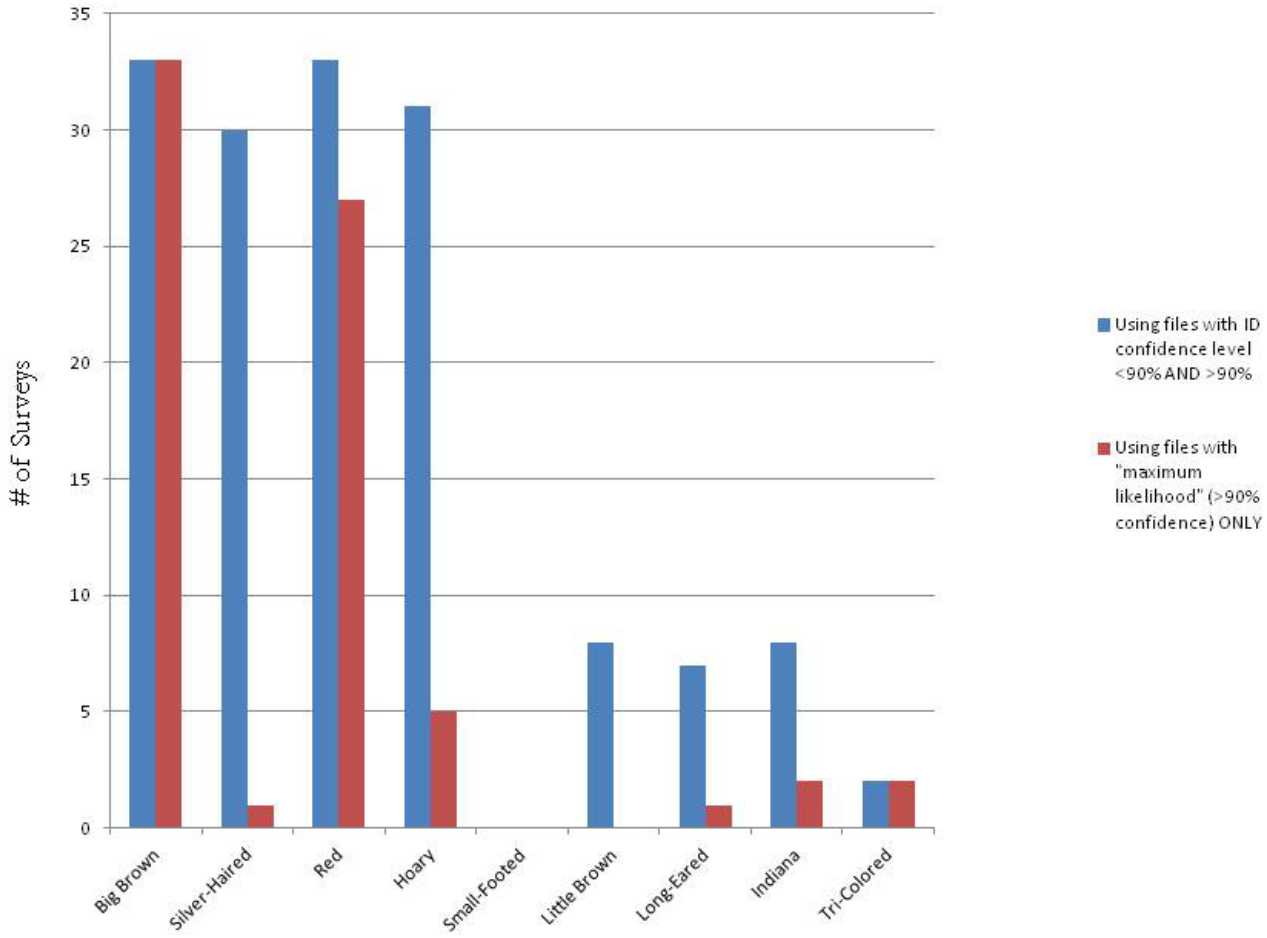

Figure 4. The number of surveys that each species turned up in, by confidence level, out of 33 total surveys.

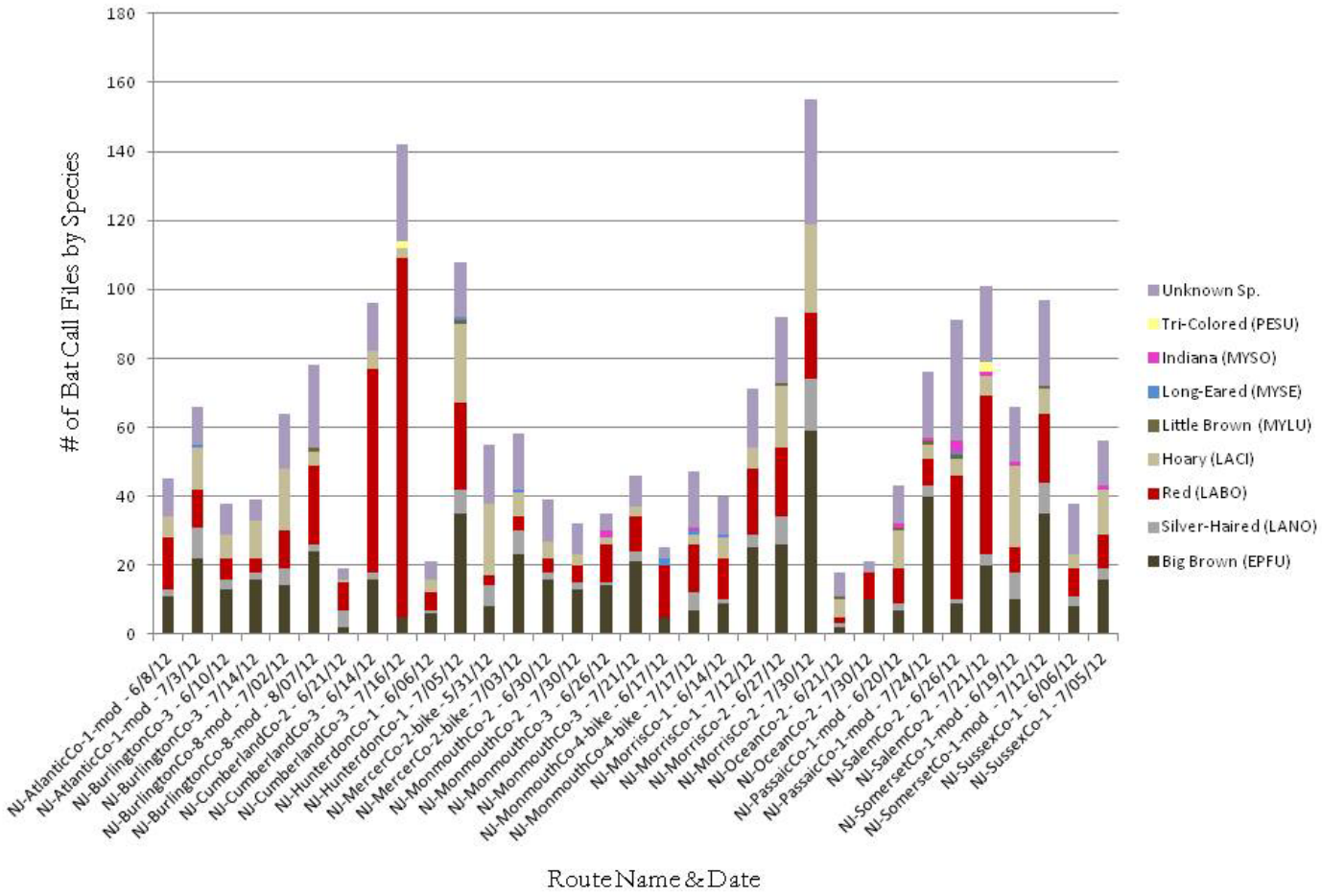

Figure 5. Illustrating the abundance and diversity of bats calls encountered during each individual survey.

Figure 5 does not necessarily indicate the most bat-dense routes, however, since the length of each route varied between 5.8 miles and 24.6 miles. To give a better sense of "bat density," we looked at the average number of bat files per mile recorded along each route (Figure 6 on next page). We may be interested next in looking at the differences in surrounding land use and habitat composition along these routes, which may explain why some routes have higher bat densities than others. With the use of GPS in future years, this will be a more fruitful exercise. Other variables that may influence bat use include vehicle traffic rates, noise, and artificial light, all of which would require a high level of ground recon to investigate.

"On the beat!"

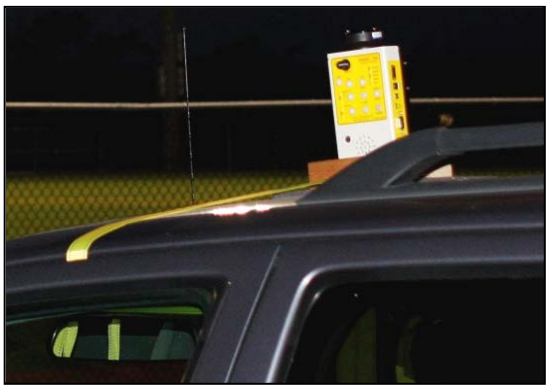

Figure 7. An AnaBat detector is mounted and ready to record bats. Photo by Jim Wright, NJ Meadowlands Commission.

Figure 8. Melissa Woerner uses some ingenuity and takes off on a bike route. Photo by Pat Woerner.

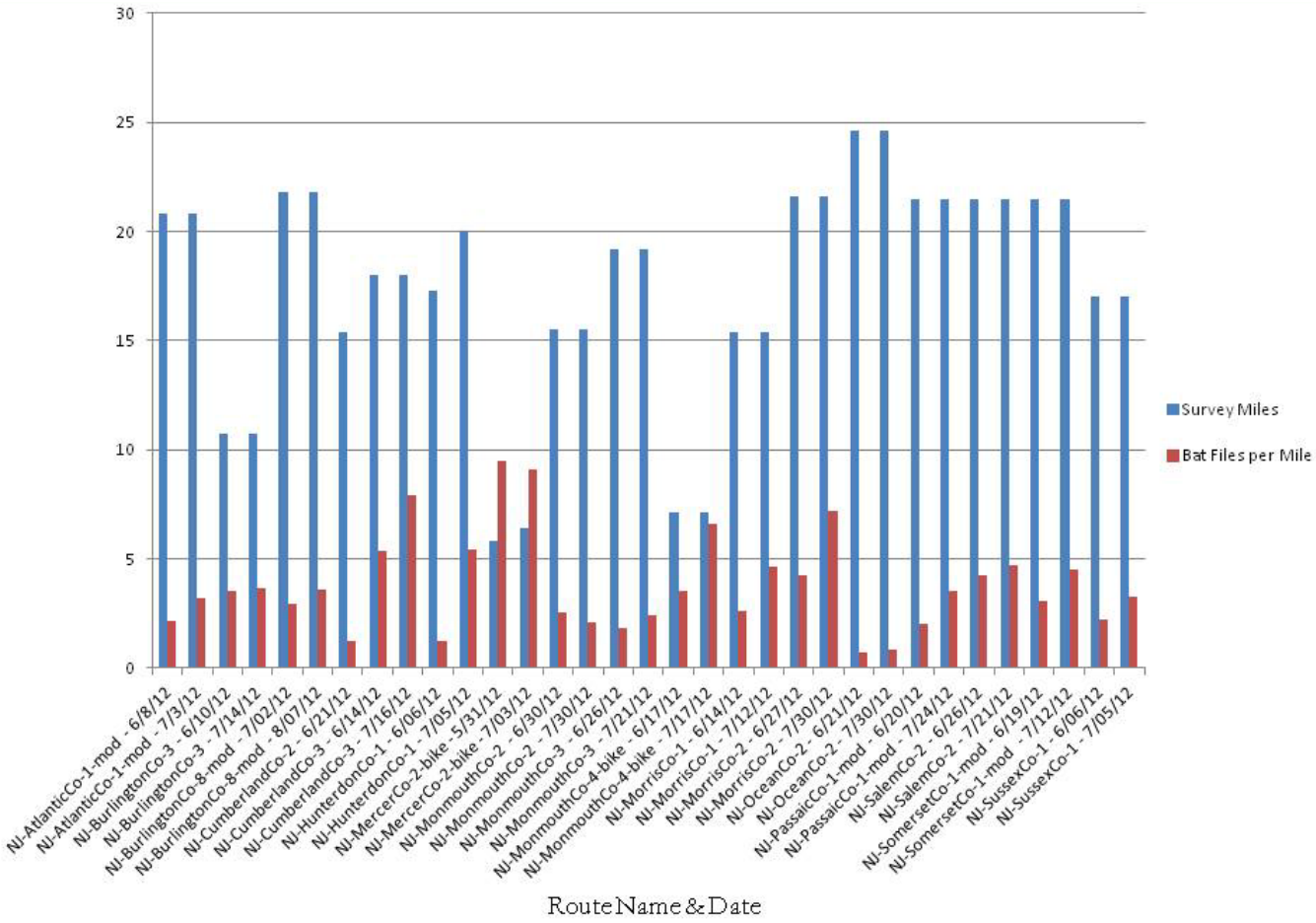

Figure 6. Illustrating the average number of bat calls files per mile recorded during each survey (i.e. bat density).

From Figure 6, our shortest route (NJ-MercerCo-2-bike) had the highest density of bats on both survey dates. It also had everything working in its favor: the transect runs along a pedestrian path on the D&R Canal State Park, parallels excellent foraging habitat, has no vehicle traffic, and is relatively low in noise and artificial light.

Conversely, our longest route (NJ-OceanCo-2) consistently had the *least* bat productivity. Despite traversing a lot of excellent-looking habitat (from an air photo perspective), this route had more vehicle traffic than any other route. More than 100 vehicles overtook the surveyor during each outing.

Heading Into 2013

We plan to run another statewide survey in summer 2013 using all or most of the same driving transects as 2012. More repetitions of the same routes will give us a stronger statistical ability to analyze the data relative to landscape variables. We hope to be GPS capable in 2013 as well, in order to collect point-specific bat locations and open up other analytical opportunities.

Acknowledgements

It took a lot of people to get this project up & running. First and foremost, we thank all of our enthusiastic volunteers! Folks came out of the woodwork to help with this project, and it's been uplifting to see all the public interest in bats. We also thank Mick Valent (ENSP) for his knowledge and guidance, the NJ Landowner Incentive Program for funding our first 2 AnaBat detectors in 2010, the Franklin Parker Small Grants Program (Conservation Resources Inc.) and the Conserve Wildlife Small Grants Program (ENSP) for funding the project start-up, and Erica Fischer, our 2011 summer intern who was simply invaluable to getting the mobile acoustic program off the ground and into the streets.