

## QUARTERLY PROGRESS REPORT

Quarter: (circle one) 2020\_1st 2020\_\_2<sup>nd</sup> 2020\_\_3<sup>rd</sup> 2020\_\_4<sup>th</sup>

Grant Program, Number and Title: RCN 2017-03 GSA 00029, Amendments #2 and #3

Contractor: Terwilliger Consulting, Inc.

Project Leader: Karen Terwilliger

Abstract: The objective of this five-year RCN project is to continue to identify and update shared priority regional conservation implementation of NEAFWA's Regional Species of Greatest Conservation Need, while simultaneously influencing regional and national conservation by developing technical tools and communication products that clearly define conservation needs and priorities and that move us towards conservation success. Specifically:

1. Provide technical support to facilitate appropriate data use by members and partners
2. Continue to track database use
3. Annually solicit information from users regarding specific applications of the regional WAP database in addressing other program priorities and actions
4. Perform database maintenance to ensure consistency with database platforms and servers.
5. Develop queries and reports that best serve users and that facilitate periodic SWAP revisions
6. Expand RSGCN review and analyses to facilitate the inclusion of additional invertebrate taxa
7. Engage and coordinate vertebrate and invertebrate taxa teams and to respond to data requests for at-risk and endangered species
8. Compile, analyze, update, and interpret the RSGCN status, updates and priority actions for RSGCN
9. Provide draft and final technical reports / communication products for the tech committee and NEAFWA

Were planned goals/objectives achieved last quarter? Yes- additional tasks were added and completed however all funds were expended except \$153.49. An addendum allowed us to complete the additional work requested. Both the remaining funds and addendum are billed in this quarter.

Progress Achieved: completed all original and expanded tasks with an additional addendum

Objective 1: identify and review and update RSGCN information.

NEFWDC identified (at their September meeting) the need to research and compile data prior to expert review (January- March) of the most limiting factors of NE RSGCN. Originally, state agency experts were to contribute their knowledge and populate the RSGCN species information to the database. However, in order to address the additional task requested by NEAFWA/NEFWDC and meet the original deadline for engaging taxa teams/state fish and wildlife diversity experts no later than March 30, Terwilliger Consulting, Inc (TCI) was asked to perform this additional work in an expedited manner. Our approach was 3 phased:

**1-Design and development of the process, data fields and database module:** The Northeast State Wildlife Action Plan Database (Database) was enhanced to capture priority aspects of food, reproduction, mortality, and habitat. Monitoring protocols and data gaps were also captured, to identify conservation action goals that address concerns across many taxonomic groups.

**2- Literature search and data entry:** TCI conducted a literature search of best available key scientific taxonomic references (including NatureServe, SWAPs, State and Federal Listing documents, taxonomic literature, etc.). The newly designed data tables and fields were used to capture this additional, current information. TCI prepopulated all RSGCN vertebrate species worksheets from October through January to prepare and format the data for taxa teams. TCI used the Northeast State Wildlife Action Plan Database and available scientific literature to identify specific habitat features required by RSGCN; proximate population threats to RSGCN, and applied research and monitoring needs for RSGCN that will advance practical regional conservation for RSGCN.

**3-Taxa team review:** Taxa expert lists were updated with new agency staff from 13 states and DC. Teams were assembled comprised of a representative from each state for the following taxa:

- Mammals
- Birds
- Herpetofauna
- Freshwater and Anadromous fish
- Crayfish
- Freshwater Mussels

From January 1- March 31, we set up and conducted taxonomic expert reviews for each vertebrate and selected invertebrate taxa. This review entailed the following steps:

1. Contacting state agency staff to update expert lists
2. Assembling experts from all 14 states/district
3. Sending invites and instructions in January
4. Setting up doodle polls and webinars
5. Assembling data to send to experts with prepopulated data and detailed instructions
6. develop survey monkey survey and analysis to capture expert input
7. Prepare PPT to present and lead team
8. Conduct webinar (1.3/4 hrs- 3 hrs each), facilitate
9. Record all input audio and written notes
10. Incorporate notes and new data into access database
11. Develop a report for each call summary
12. Send report to taxa team for corrections/additions
13. Incorporate results into report to NEFWDC
14. Synthesize data
15. Develop list of proposed RSGCN
16. Develop list of critical research, monitoring, and conservation needs
17. Develop draft report for NEFWDC

The assembled information was presented to Taxonomic Review Teams composed of state fish and wildlife agency staff and academic or NGO partners identified through the Northeast Fish and Wildlife

Diversity Technical Committee (NEFWDTC). Taxa teams were sent a project briefing, instructions in December and their prepopulated files for their taxa in January.

TCI scheduled and facilitated Taxonomic Team email and webinar participation throughout the review process. Taxonomic Teams were guided through the review of information for accuracy and omissions and asked to provide additional expert recommendations for actions and needs. Teams provided their written comments, which TCI compiled, organized and created a presentation to lead team discussion. Final compilation was distributed back to the teams to prepare for the team discussion webinar.

TCI scheduled team webinars and presented all summary/new information and led each team to consensus on each item that required discussion and informed consent. The taxa team review was conducted from January-March and allowed experts throughout the region to contribute additional details or discuss differences in species' requirements across the region. TCI captured all discussion by the Taxonomic Teams, compiled all recommended corrections and additions.

This quarter we coordinated with NEFWDTC and SWAP coordinators on the January, February and March webinars/conference calls to provide project updates. We are following up on the feedback provided by the NEFWDTC at their annual meeting. We have populated the new data fields over this quarter and sent to the taxa teams 2/13-31/19 so they can be engaged over the winter (non-field work season). Taxa Team Webinars were scheduled for January, with doodle polls sent to set up follow up February meetings.

We worked with state fish and wildlife biologists and SWAP coordinators to improve the classification and description of habitat requirements for RSGCN continued. Data sources have been compiled and used to prepopulate the worksheets for each vertebrate taxa and selected invertebrate taxa.

We planned an additional 2020 symposium to highlight the RSGCN/RCN projects similar to the April 2019 NEAFWA annual meeting to provide updates and communication on the broad array of effective regional projects. We worked with key RCN PIs to highlight key taxa and geographic priority projects and organized the NEAFWA Symposium to focus on RSGCN efforts regionwide. The conference was canceled, but we organized a follow up webinar to discuss next steps and advance the symposium information dissemination.

#### **Summary report provided to NEFWDTC on Northeast RSGCN: key limiting factor Themes**

Regional Species of Greatest Conservation Need (RSGCN) List update

The RSGCN list is maintained by the Northeast Association of Fish and Wildlife Agencies' (NEAFWA) Northeast Fish & Wildlife Diversity Technical Committee. **The purpose of this non-regulatory regional list is to provide focus, resources, and collaboration to secure species of mutual conservation concern (and their habitats) for current and future generations in the northeast.** The list includes vertebrate and invertebrate Species of Greatest Conservation Need (SGCN) from State Wildlife Action Plans in the NEAFWA planning geography (Maine to Virginia, including D.C.). Northeast RSGCN are species for which the region has stewardship responsibility due to high conservation concern and/or populations that are centered in the Northeast Region. The list is updated every 5 years to support focused action on high priority northeast species by the NEFWDTC, development of SWAPS, and conservation planning and implementation by state fish and wildlife agencies and their partners.

**The objective of this year's effort was to identify key limiting factors impacting Northeast RSGCN.** NEFWDTC identified the need for current data and expert review of the most limiting factors of NE RSGCN. To accomplish this, a system for documenting key limiting factors was developed, populated, and reviewed. Results are

summarized below and detailed information for these factors and others is available for all RSGCN, referencing over 350 publications.

#### Approach

**Design and development of the process, data fields and database module:** The Northeast State Wildlife Action Plan Database (Database) was enhanced to capture priority aspects of food, reproduction, mortality, and habitat. Monitoring protocols and data gaps were also captured, to identify conservation action goals that address concerns across many taxonomic groups.

**Literature search and data entry:** TCI prepopulated RSGCN worksheets using the database and the best available scientific literature to identify specific habitat requirements of RSGCN, proximate population threats to RSGCN, and applied research and monitoring needs for RSGCN that advance practical regional conservation for RSGCN.

**Taxa team review:** TCI managed and facilitated over 100 taxonomic experts during a six-month review process for each of the following taxa: Mammals, Birds, Herpetofauna, Freshwater, Anadromous, and Marine Fish, Crayfish, and Freshwater Mussels.

#### Results and Outcomes

Taxa teams identified 47 additional species which may meet RSGCN criteria and will discuss these species as part of the 5-year comprehensive review in 2022. The NEFWDTC is currently reviewing new research and monitoring needs for potential RCN funding. In the coming months, an updated database including this new information will be posted on the NEAFWA website. The new data will be available for use by state agency staff and their partners including USFWS at-risk species coordination. Results were compiled and synthesized and are summarized below.

## Food

Very few RSGCN are known to be population-limited due to limited availability of food. However, 66% of vertebrate RSGCN rely primarily on invertebrates (Fig.1). Thresholds of food availability related to decline in terrestrial insect or aquatic invertebrate biomass are unknown. Taxa teams expressed concern about impacts of insecticides and other environmental pollutants (e.g. forest pest control and runoff into aquatic systems) with food resources as a primary exposure.

## Toxicity

Pollution (including sedimentation from land and road chemical and nutrient runoff) of our diverse Northeast aquatic systems affects up to 75% of mussels, crayfish, fish, and amphibians. High water quality is a habitat requirement of Eastern Hellbenders (*Cryptobranchus a. alleganiensis*). Birds also have known vulnerabilities to oil spills and bioaccumulation of heavy metals. While toxicity is suspected as a cause of decline for terrestrial and aquatic species, in general this is considered a research need. For example, diamondback terrapins (*Malaclemys t. terrapin*) near JFK airport are currently being studied to learn about toxicity impacts, and several states noted impacts to SGCN from algal blooms in 2019.

## Disease

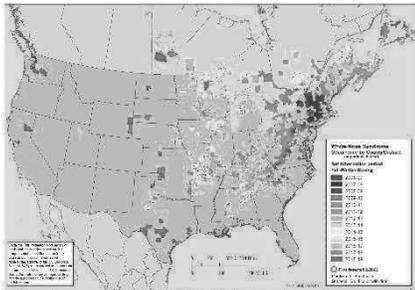


Figure 2. Spread of white nose syndrome (2005-present). credit: [www.whitenosesyndrome.org](http://www.whitenosesyndrome.org)

White nose syndrome has caused precipitous population declines and continues to be a very serious concern for cave-hibernating bats (Fig. 2). Amphibians and reptiles have several known diseases with many confirmed positive tests, but population level impacts are still uncertain. West Nile virus has significantly affected some bird species but impacts to RSGCN remain unknown. Disease impacts to most aquatic crayfish, mussel, and fish taxa are unknown and baseline information is lacking in most RSGCN taxa. Climate change could affect disease impacts for RSGCN. Fungal diseases are expected to change with warmer and wetter conditions, as are insect born vectors for bacterial diseases. If climate change presents additional stresses to RSGCN they may also become more susceptible to disease.

## Genetic Diversity

Loss of genetic diversity becomes an independent threat for isolated populations or species with precipitous declines. Several of the cave-dwelling bats, decimated by white nose syndrome, are now at risk due to loss of genetic diversity. Some populations of the New England Cottontail (*Sylvilagus transitionalis*), Eastern Spotted Skunk (*Spilogale putorius*), and Allegheny Woodrat (*Neotoma magister*) (Fig. 3) are known to be limited by genetic diversity. Six species of freshwater mussels and two species of crayfish are suffering from genetic diversity due to low abundance and isolated populations, as are several freshwater and anadromous fish species. Birds, which have greater dispersal capacity, are less affected by this threat, however Roseate Tern (*Sterna dougallii*) and Golden-winged Warbler (*Vermivora chrysoptera*) are at risk.

## Predation

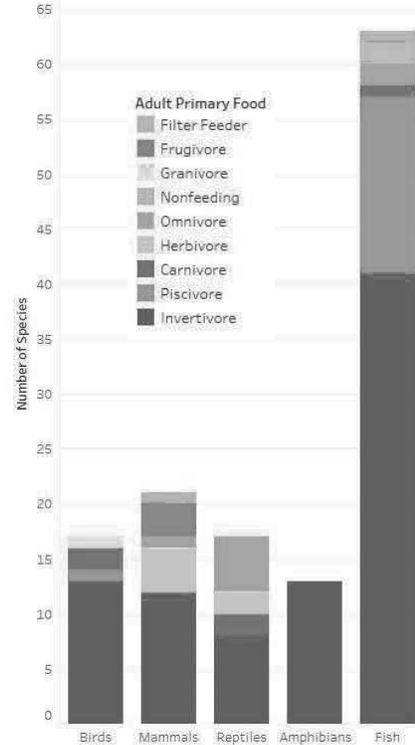


Figure 3. Allegheny Woodrat (*Neotoma magister*). Credit: Alan Cressler

Predation is a natural aspect of the food web however human activities can subsidize or cause imbalances in some taxa. Like loss of genetic diversity, predation can be an independent threat to the survival of a species when population declines due to other threats cross a threshold. Bird and turtle nests are commonly predated, and adult birds, rabbits, squirrels and other small mammals also have numerous predators. Some freshwater mussels may be experiencing compounded declines due to predation on the already small population. Several harvested fish species prey upon RSGCN fish (e.g. river herring, Blackbanded and Banded Sunfish (*Enneacanthus chaetodon* and *E. obesus*), Bluefish (*Pomatomus saltatrix*) and Winter Flounder (*Pseudopleuronectes americanus*)).

Take: Collection



Figure 4. Alewives. Credit: Robert Bukaty/AP

Several RSGCN taxa are still impacted by intentional collection or persecution. Freshwater turtle collection remains a concern, and because it is driven by global markets, collection effort and target species are extremely dynamic. Timber rattlesnakes and other snakes are still killed at rates that have population level consequences. Nearly all coastal and marine mammal and turtle species are affected by fisheries bycatch or vessel strikes. Many marine and anadromous fish species are also affected by over harvest. A lack of understanding about migration timing and routes (of migratory bats, birds, and marine fish) limits our ability to address or mitigate renewable energy impacts. Billions of larvae and juvenile fish continue to be lost due to entrainment or impingement at dams and intakes (Fig. 4).

#### Habitat

Habitat limitations and requirements were researched and discussed for all RSGCN. Across taxa, species associated with forest habitat are limited by the availability of suitable habitat and many are also limited by the condition of the habitat. For example, Spotted Turtles (*Clemmys guttata*) require forest habitat adjacent to wetlands, and development and fragmentation degrade these suitable habitats. Solar energy siting impacts habitat availability in a growing number of NE states. Meadow River Mudbug (*Cambarus pauleyi*) (Fig. 5) and Blue Crayfish (*Cambarus monongalensis*) require seepage wetlands which are lost when forests are logged. Species associated with coastal habitats including beaches and tidal marshes have long been imperiled by coastal development. Many species, including Saltmarsh Sparrow (*Ammodramus caudacutus*), Black Rail (*Laterallus jamaicensis*), and Dwarf Wedgemussel (*Alasmidonta heterodon*), are now also imperiled by sea level rise or associated saltwater intrusion.

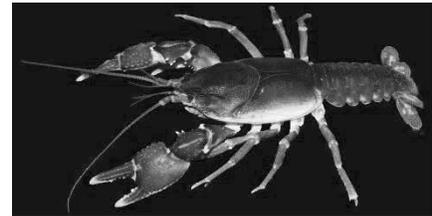


Figure 5. Meadow River Mudbug (*Cambarus pauleyi*) Credit: Zachary Loughman

## Climate Change

Many aspects of climate change risk were documented. Over 100 RSGCN are likely to be impacted by climate change. Some need climate vulnerability assessments that could be accomplished efficiently for taxonomic groups such as amphibians relying on vernal pools, freshwater mussels, and hibernating bats. In general, over-wintering strategies need to be better understood as some species appear to have temperature-dependent inactive states which will change in the future (e.g. snakes emerging from dens on warm winter days). Most known impacts due to climate change relate to changes in habitat availability and condition as well as population dynamics.

- **Salamanders** are likely to be affected by changes in hydrology related to shifting quantity or timing of precipitation and evapotranspiration. They are also vulnerable to warming water temperatures.
- Impacts to **birds** are primarily related to sea level rise and impacts include nesting success and food availability due to phenology changes (Fig. 6).
- **Fish** are affected by water temperature, ocean acidification, extreme precipitation or drought – with potential direct mortality, impaired health and fitness, impacts to food resources, and reproductive success.
- Warming temperatures will cause shifting sex ratios for **reptiles** (Northern Diamondback Terrapins (*Malaclemys t. terrapin*) in Maryland recently reproduced 9:1 females:males (Fig. 7)) Reptiles may also be affected by changes in hydrologic regimes, and warming winter temperatures may cause shifts in brumation.
- Concerns for **freshwater mussels, stoneflies, and crayfish** are primarily associated with the potential for scouring floods which have historically wiped out populations in northeast rivers, but also drought conditions which could expose mussels (Fig. 8).

In general, there is very little information projecting shifts in food resources related to climate change with the exception of coastal impacts from sea level rise and warming ocean waters causing temporal mismatches with migration and shifting of upwelling currents with impacts for a wide range of species.

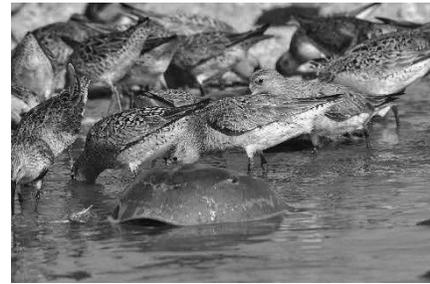


Figure 6. Red Knot feeding on horseshoe crab eggs, Mispillion Harbor, DE. credit: Gregory Breese, USFWS



Figure 7. Northern Diamondback Terrapin (*Malaclemys t. terrapin*) credit: Eric Sambol



Figure 8. Dead mussels in the Clinch River, VA. credit: Meagan Racey, USFWS

Objective 2: provide on-going technical support, and evaluation of use of regional Wildlife Action Plan database: We continued to track users regarding the regional SWAP database in addressing other program priorities and actions. Over additional users downloaded the database for use. Most users indicate that they are using it for grant applications and proposals in order to include the SGSN, key

threats and actions from the NESWAPs. We briefed several new partners on the database and it was sent to additional state and federal partners.

We implemented suggestions from two surveys, one for states and one for partners. The surveys asked users to explain what kind of information they were seeking, whether they were able to find it, how it could be made easier to use, and what additional information it should contain. The responses to the survey have been summarized in a draft report and incorporated in the updated database provided and posted on the NEAFWA website. We continued to monitor the use of the database from the NEAFWA website.

Data queries and reports of information designating species as Regional Species of Greatest Conservation Need has been updated and added. Species menus have been improved to allow more flexibility in searching the database for particular species. The launch page of the database was updated to provide additional access to the database from the Northeastern Association of Fish and Wildlife Agencies' website. States were asked to link it to their SWAP sites as well. Contact information and website links were also updated on the launch page. The database associate was engaged fully in the RSGCN update and created data forms and updates for us.

Difficulties Encountered in Meeting Goals and Objectives: funding was expended on the additional tasks added, therefore an addendum was requested for \$17,000

Expected End Date: February 29, 2023

Costs: federal expense to date: \$97,000

Total life to date expenses (include this quarter): \$195,420.06

Total Approved Budgeted Funds: \$80,000 + \$17k ammendment

Are you within the approved budget plan and categories? Yes- Amendment was approved

**The foregoing information is accurate as of the date set forth below.**

**TERWILLIGER CONSULTING, INC.**

By: *Karen Terwilliger* Name: Karen Terwilliger

Title: President, Terwilliger Consulting, Inc.

Date: 4-6-20