Species Status Assessment

Class: Mammalia
Family: Vespertilionidae
Scientific Name: *Perimyotis subflavus*; formally *Pipistrellus subflavus*
Common Name: Tricolored bat, Eastern pipistrelle

Species synopsis:

This species has undergone taxonomic revision. Most of the literature is published under the name *Pipistrellus subflavus*. Hoofer *et al.* (2006) revised the generic status to *Perimyotis*. The common name "tri-colored bat" has been used as an alternative to the technically incorrect classification of eastern pipistrelle.

The tri-colored bat is found throughout eastern North America and parts of Central America. New York is peripheral to the core distribution of the species.

The tri-colored bat prefers partly open country with large trees and woodland edges, typically foraging at treetop level and often over water. They are thought to avoid deep woods and open fields. Summer roosts probably are mainly in tree foliage and occasionally in buildings (Schmidly 1991, Veilleux *et al.* 2003). Hibernation sites are usually in caves and mines that may contain other species, although the species tends to segregate into areas with higher humidity and warmer temperatures than other hibernating bats (DEC winter survey data).

Recent trends suggest this species is in severe decline in New York and elsewhere in the Northeast (Turner *et al.* 2011).

I. Status

a. Current and Legal Protected Status

i. **Federal** ____Not Listed__________________ **Candidate?** __No___

ii. **New York** ____Not Listed______________________________________

b. Natural Heritage Program Rank

i. **Global** ____G2G3____

ii. **New York** ____S3________ **Tracked by NYNHP?** ____No______

Other Rank:

IUCN Red List— Least Concern (ranked prior to WNS)

Status Discussion:

The tri-colored bat was never common in New York. Since 2008, *P. subflavus* has been one of the least frequently encountered bats and it is now presumed to be rare. Its listing status thus does not reflect the current population trends and abundance.

II. Abundance and Distribution Trends

a. North America

i. **Abundance**

__X___ **declining** ____**increasing** _____**stable** ____**unknown**

ii. **Distribution:**

__X___ **declining** ____**increasing** _____**stable** ____**unknown**

Time frame considered: ____1985 – present_______________________________

b. Regional

i. Abundance

__X__ declining ____increasing ____stable _____unknown

ii. Distribution:

__X__ declining ____increasing ____stable _____unknown

Regional Unit Considered: __Northeast____________________________________
Time Frame Considered: ____1985 - 2017_________________________________

c. Adjacent States and Provinces

CONNECTICUT **Not Present _______** **No data _______**

i. Abundance

__X__ declining ____ increasing ____ stable ____unknown

ii. Distribution:

__X__ declining ____ increasing ____ stable ____unknown

Time frame considered: ______2007 – 2017________________________________
Listing Status: ____Endangered________________________SGCN? ___Yes______

MASSACHUSETTS **Not Present _______** **No data _______**

i. Abundance

__X__ declining ____ increasing ____ stable ____unknown

ii. Distribution:

__X__ declining ____ increasing ____ stable ____unknown

Time frame considered: ____2007 – 2017_________________________________
Listing Status: ________Endangered_______________________ SGCN? _Yes____

NEW JERSEY **Not Present** _______ **No data** _______

i. **Abundance**

__X__ **declining** ____ **increasing** ____ **stable** ____ **unknown**

ii. **Distribution:**

____ **declining** ____ **increasing** __X__ **stable** ____ **unknown**

Time frame considered: 2008 – 2017
Listing Status: Not listed SGCN? Yes

ONTARIO **Not Present** ________ **No data** _______

i. **Abundance**

_X__ **declining** ____ **increasing** ______ **stable** ____ **unknown**

ii. **Distribution:**

____ **declining** ____ **increasing** ______ **stable** __X__ **unknown**

Time frame considered: 2009 – 2017
Listing Status: Endangered

PENNSYLVANIA **Not Present** ________ **No data** _______

i. **Abundance**

__X__ **declining** ____ **increasing** ____ **stable** ____ **unknown**

ii. **Distribution:**

__X__ **declining** ____ **increasing** ____ **stable** ____ **unknown**

Time frame considered: Rapid recent decline 2004 - 2011
Listing Status: Not Listed SGCN? Yes

QUEBEC **Not Present** ________ **No data** ______

i. **Abundance**

__X__ **declining** ____**increasing** _____**stable** ____**unknown**

ii. **Distribution:**

____ **declining** ____**increasing** ______**stable** __X__**unknown**

Time frame considered: 2009 – 2017
Listing Status: Likely to be designated

VERMONT **Not Present** ________ **No data** _______

i. **Abundance**

__X__ **declining** ____**increasing** ____**stable** ____**unknown**

ii. **Distribution:**

__X__ **declining** ____**increasing** ____**stable** ____**unknown**

Time frame considered: 2004 – 2017
Listing Status: Endangered SGCN? Yes

d. NEW YORK **No data** _______

i. **Abundance**

__X__ **declining** ____ **increasing** ____ **stable** _____ **unknown**

ii. **Distribution:**

__X__ **declining** ____ **increasing** ____ **stable** ______ **unknown**

Time frame considered: 1985 – 2017

Monitoring in New York.

Winter hibernacula surveys

Summer acoustic surveys

Mist netting (non-target species for surveys mostly aimed at detecting presence/absence of Indiana bats or northern long-eared bats)

Trends Discussion:

White-nose syndrome has led to dramatic declines in tri-colored bat populations throughout northeastern North America (Franci *et al.* 2012, Langwig *et al.* 2012). While range-wide trends are currently unknown, several states have experienced declines of 95%+, with complete extirpations from some hibernacula (Langwig *et al.* 2012, Frick *et al.* 2015, Frick *et al.* 2017). Evidence suggests that the rate of decline of tri-colored bat populations decreased with time, with populations stabilizing at much lower levels 3-4 years after WNS was detected (Langwig *et al.* 2012, Frick *et al.* 2015); although in some sites fewer than five tri-colored bats remain (Frick *et al.* 2017). Even with this stabilization, it is possible that the lower population levels could still result in extinction or extirpation (Langwig *et al.* 2012, Frick *et al.* 2017). In New York, the 20 largest tri-colored bat hibernacula have declined by approximately 98% post-WNS (NYSDEC winter survey database).

Before the onset of white-nose syndrome (WNS), the population was previously believed to be stable (Ellison *et al.* 2003); however, recent analyses of abundance data suggest that the species declined by about 30% between 1999 and 2011 in New York, Pennsylvania, West Virginia, and Tennessee (Ingersoll *et al.* 2013). The reasons for this apparent gradual decline are unclear, although the authors suggested that the declines could be related to the loss of critical roosts and foraging sites (Thomas 1995, Jones *et al.* 2009); altered roost microclimates, foraging habitats and prey communities as a result of climate change (Rodenhouse *et al.* 2009, Frick *et al.* 2010); and mortality from collisions with wind turbines, vehicles, and buildings (Arnet *et al.* 2008, Russell *et al.* 2009, Ingersoll *et al.* 2016). While WNS is undoubtedly the main driver of tri-colored bat population declines, it is likely that these other threats act synergistically to contribute to the declines (Ingersoll *et al.* 2016).

Figure 1. Distribution of the tri-colored bat in North and Central America (USGS 2013).

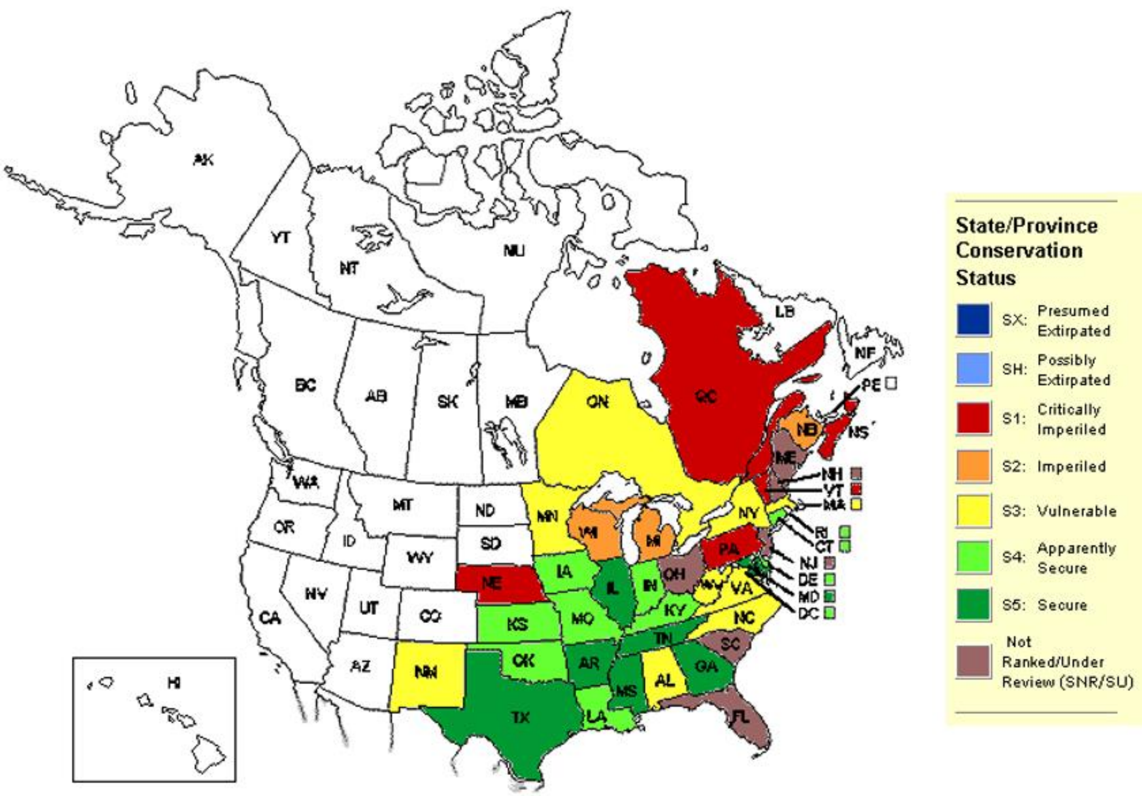

Figure 2. Conservation status of the Eastern pipistrelle in North America (NatureServe 2017).

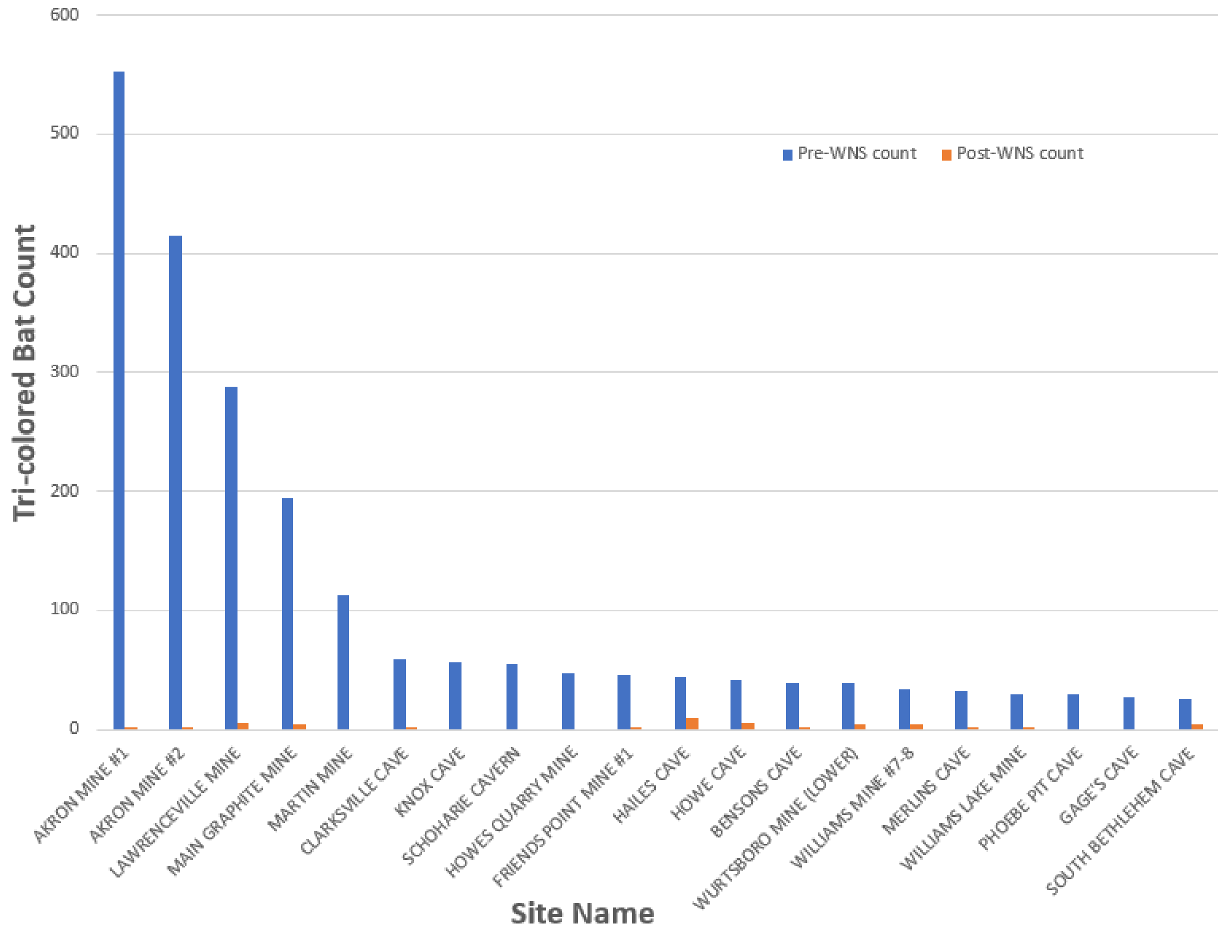

Figure 3. Tri-colored bat counts at the 20 largest tri-colored hibernacula in New York State.

III. New York Rarity, if known:

Historic	**# of Animals**	**# of Locations**	**% of State**
prior to 1970	________	________	________
prior to 1980	________	________	________
prior to 1990	________	________	________

Details of historic occurrence:

Most records in NY refer to hibernation. The species was observed in 57% of hibernacula surveyed within NY, although never in large numbers (NYSDEC winter survey database). Summer captures have always been infrequent and sporadic, suggesting the species has always been rare in NY (NYSDEC files).

Current	**# of Animals**	**# of Locations**	**% of State**
	________	________	________

Details of current occurrence:

The species has been extirpated from many hibernation sites since the arrival of white-nose syndrome and has suffered severe decline in virtually all others. State-wide population decline for the species is estimated at around 98%, based on hibernation counts (NYSDEC winter survey database). Consistent with the observed decline in hibernation sites, no summer captures have been reported for the species in NY since 2010 (NYSDEC files).

Table 1. Historic and recent tri-colored bat counts at the 20 largest hibernacula in New York State.

Site	Hibernacula Count		Percent Change
	Pre-WNS	Recent	
AKRON MINE #1	553	1	-100
AKRON MINE #2	415	1	-100
LAWRENCEVILLE MINE	288	6	-98
MAIN GRAPHITE MINE	194	4	-98
MARTIN MINE	112	0	-100
CLARKSVILLE CAVE	59	2	-97
KNOX CAVE	57	0	-100
SCHOHARIE CAVERN	55	0	-100
HOWES QUARRY MINE	47	0	-100
FRIENDS POINT MINE #1	46	1	-98
HAILES CAVE	45	10	-78
HOWE CAVE	42	5	-88
BENSONS CAVE	39	1	-97
WURTSBORO MINE (LOWER)	39	4	-90
WILLIAMS MINE #7-8	34	4	-88
MERLINS CAVE	32	2	-94
WILLIAMS LAKE MINE	30	1	-97
PHOEBE PIT CAVE	29	0	-100
GAGE'S CAVE	27	0	-100
SOUTH BETHLEHEM CAVE	26	4	-85

New York's Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
____ **100 (endemic)**	____ **Core**
____ **76-99**	__X__ **Peripheral**
____ **51-75**	____ **Disjunct**
____ **26-50**	**Distance to core population:**
__X__ **1-25**	________

IV. Primary Habitat or Community Type:

1. Caves and Tunnels
2. Mine/Artificial Cave Community
3. Northeastern Upland Forest
4. Northeastern Wetland Forest
5. Residential/Commercial

Habitat or Community Type Trend in New York:

____ **Declining** __X__ **Stable** ____ **Increasing** ____ **Unknown**

Time frame of decline/increase: ________________________________

Habitat Specialist? _____ **Yes** __X__ **No**

Indicator Species? _____ **Yes** __X__ **No**

Habitat Discussion:

Tri-colored bats have been documented roosting in a variety of different habitats. It is believed that the species primarily roosts in the foliage of canopy trees (Harvey *et al.* 2011), although they have been documented roosting in barns, buildings, and other anthropogenic structures, as well as in caves (Fujita and Kunz 1984, Veilleux *et al.* 2003). Female tri-colored bats form maternity colonies (Veilleux *et al.* 2003). The species appears to prefer to roost in clusters of dead leaves on live trees (Veilluex *et al.* 2003). Research in Indiana has found tri-colored bats preferentially roosting in oak trees (Veilleux *et al.* 2003). In Nova Scotia, tri-colored bats appear to preferentially roost in bearded lichen (*Usnea* spp.) in coniferous trees (Quinn and Broders 2007). Roosts are often located in more mature forest within riparian buffers or corridors (Perry and Thill 2007, O'Keefe 2009), and farther than expected from roads (Perry *et al.* 2008).

Tri-colored bats are adapted for flight in relatively open areas. It is known to forage above the canopy, in early successional habitat (Loeb and O'Keefe 2006), over waterbodies (Quinn and Broders 2007), and along forest-field and forest-water edges (Arroyo-Cabrales *et al.* 2008). The species appears to avoid dense woods and open fields (Farrow and Broders 2011).

In winter, tri-colored bats hibernate in caves and abandoned mines. It was previously believed that tricolored bats hibernate within approximately 100 km of summer roosting areas (Griffin 1940). However, recent research suggests that some tri-colored bats migrate on a larger geographic scale, similar to non-hibernating tree bat species (Fraser *et al.* 2012). They are typically found using the same hibernacula as other species of bats, although they prefer areas with relatively warm, stable temperatures and high humidity levels (Menzel *et al.* 1999, Vincent and Whitaker 2007). Studies have found tri-colored bats roosting in hibernacula microclimates ranging from -6 to 14°C (Barbour and Davis 1969, McNab 1974, Sandel *et al.* 2001, Amelon 2006). It is believed that that the stable, relatively high temperatures allows tri-colored bats to remain in torpor for longer periods of time (Vincent and Whitaker 2007). Tri-colored bats have also been documented hibernating in buildings (Sandel *et al.* 2001).

V. New York Species Demographics and Life History

__X__ **Breeder in New York**

__X___ **Summer Resident**

__X___ **Winter Resident**

_____ Anadromous

_____ Non-breeder in New York

_____ Summer Resident

_____ Winter Resident

_____ Catadromous

_____ Migratory only

_____Unknown

Species Demographics and Life History Discussion:

Tri-colored bats mate in late summer, when they 'swarm' at the entrances of hibernacula. During this period, females mate with multiple males and store sperm until spring, when eggs are fertilized (Whitaker and Hamilton 1998). Mating has also been observed in late winter and in spring (Vincent and Whitaker 2007, Dodd and Johnson 2012). After hibernation, females migrate from hibernacula to maternity colonies. Tri-colored maternity colonies are relatively small, with an average size between 3.7 (Veilleux and Veilleux 2004) and 15 bats (Whitaker 1998). Tri-colored bat females exhibit a fairly high degree of roost fidelity, returning to the same roosting area throughout the summer, although they change specific roost sites an average of every 4 - 6 days (Veilleux and Veilleux 2004). Female tri-colored bats give birth to two pups between June and July (Wimsatt 1945). Young tri-colored bats can begin flying around three weeks, and are fully independent at five weeks (Fujita and Kunz 1984). Females and young probably feed within a five mile radius of the roosting site (NatureServe 2017).

Tri-colored bats have been known to migrate up to 85 miles to hibernation sites from summer roosting areas (NatureServe 2017, Whitaker and Hamilton 1998), with evidence suggesting that some individuals, particularly males and bats in the northern part of the range, engage in longer distance migrations (Fraser *et al.* 2012). During the winter, tri-colored bats arouse infrequently from hibernation. These bats typically hang singly from walls in warmer sections of a cave or mine. Individuals may occupy the same locations in a cave for consecutive winters. Researchers have found higher numbers of male tri-colored bats in hibernacula, with a sex ratio as high as 4:1 in favor of males (Fujita and Kunz 1984). In the spring, females awaken and leave caves earlier than males; some males may remain in the caves until June (MNHESP 2012, Whitaker and Hamilton 1998).

Typical lifespan is thought to be four to eight years in the wild (Fujita and Kunz 1984, Nowak 1991,) with higher probability of survival for males and relatively high juvenile mortality (Davis 1966). A male holds the maximum reported longevity record of fifteen years (Walley and Jarvis 1971).

Little is known about the natural mortalities of this species. Most predation is presumably by chance. The chief cause of natural mortality is probably young falling from the maternity roost. There are two records of tri-colored bats being attacked by hoary bats (Whitaker and Hamilton 1998).

VI. Threats:

White-nose syndrome (WNS), discovered in New York in 2006, has caused severe mortality in several species of bats, including the tri-colored bat (Langwig *et al.* 2012) and clearly the threat posed by WNS far exceeds all other threats. Even prior to the arrival of the disease, hibernating populations were known to be susceptible to depletion of stored energy reserves and subsequent death due to excessive arousal during hibernation, as might take place during human intrusion in hibernacula. The presence of the disease greatly exacerbates this threat (Carl Herzog, pers. comm.).

Wind energy is second only to WNS in top causes of bat mortality events since 2000 (O'Shea *et al.* 2016). While migratory "tree bats" represent the majority of deaths resulting from wind turbines, tri-colored bats are killed more often than any other hibernating species (Arnett *et al.* 2008). Throughout their range, tri-colored bats may account for 25% of total bat mortality at wind farms (Fraser *et al.* 2012). This is likely at least partially a result of the seasonal migration patterns of this species (Fraser *et al.* 2012).

Hibernacula flooding and collapse threaten bats in some hibernation sites, but the threat is not significant at the population level. Hibernating bats are also susceptible to direct harm from vandalism, although this is thought to be a relatively minor threat.

Are there regulatory mechanisms that protect the species or its habitat in New York?

___X____ **No** _____ **Unknown**

______ **Yes**

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Prevention of intrusions into hibernacula is the only currently known management action able to reduce the impact of WNS.

Recent species declines attributed to disease suggest that habitat availability is not limiting for populations (Carl Herzog, pers. comm.).

Conservation Actions discussed at Expert Meeting in December 2013:

- Work with landowners to erect gates to regulate access to selected hibernacula. Barton, Walter Williams Preserve, Eagle [Partially completed]
- Continue to survey new potential hibernacula as they are discovered. Star Lake, Keene, Lowville, [Ongoing]
- Survey winter populations as indicated in the objectives, develop alternative population monitoring techniques including automated/acoustic counters, spring emergence counting [Ongoing]
- Public education
- Nuisance control officer guidelines
- Support WNS research; research cure
- Operational measures for wind turbines
- Post-WNS spring emergence studies
- Create summer habitat (antifungal roost boxes) esp little brown bats
- Determine sex ratio and reproductive status
- Develop semi-captive management for WNS
- Regulatory listing
- Silvicultural BMPs; forester education
- Research effects of contaminants
- Research effects of wind turbines (Are there population effects?)

VII. References

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