PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
PROJECT ANNUAL JOB REPORT

PROJECT CODE NO.: 06710

TITLE: Special Concern Species Research/Management

JOB CODE NO.: 70008

TITLE: Summer Bat Concentration Survey/Appalachian Bat Count

PERIOD COVERED: 1 July 2016 to 30 June 2017

COOPERATING AGENCIES AND ORGANIZATIONS: Allegheny National Forest, Beaver Run Hunting and Fishing Club, Blair County Conservation District, Fort Roberdeau Association, East Stroudsburg University, Friends of the Allentown Parks, Friends of Oil Creek State Park, Gettysburg Municipal Authority, Heritage Conservancy, Juniata Valley School District, Lycoming College, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Natural Heritage Program, National Park Service, The EADS Group, The Nature Conservancy, Tinicum Civic Association, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, University of Scranton, Venango Conservation District, Western Pennsylvania Conservancy, and many private landowners and volunteers.

WORK LOCATION: Statewide

PREPARED BY: Nathan J. Zalik

DATE: 31 July 2017

ABSTRACT Pennsylvania's colonial-roosting bats provide a valuable ecological service as major predators of night-flying insects. A viable bat population provides economic, environmental, and recreational benefits. Monitoring summer bat populations continues to be important in assessing the effects of white-nose syndrome (WNS). For these reasons the Wildlife Diversity Program coordinates the Summer Bat Concentration Survey/Appalachian Bat Count in which participants count bats at summer roosts. Reports from 229 sites were submitted in 2016, a 7% increase in participation over 2014 and an 88% increase since 2010. Volunteer crews reported on 94 sites, Pennsylvania Game Commission staff reported on 94, the Department of Conservation and Natural Resources on 24 and the U. S. Forest Service on 17. These surveys resulted in yearly maximum counts of 11,307 bats in 55 Pennsylvania counties. Total bats counted by crews, including multiple counts at many sites, was 21,158 bats. Roost structures surveyed were 108 bat boxes, 28 occupied houses, 38 barns, 20 bat condos, 10 utility buildings, 7 churches, 2 unoccupied houses, 5 bridges, and 11 other structures. One hundred eighty-four of the sites surveyed in 2016 have data from at least 1 previous year. A comparison between this year's maximum counts and all-time maximum counts shows an overall decline of 92.4% for these 184 sites. However, a 2.3% 1-year increase

was seen between 2015 and 2016. Regional increases were seen in western (+13.7%) and central (+4.3%) Pennsylvania, whereas a decline was observed in eastern Pennsylvania (-13.9%) This contrasts with the previous three years, where statewide declines were driven primarily by declines in western Pennsylvania. Colonies of big brown bats (*Eptesicus fuscus*) are faring better than little brown bats (*Myotis lucifugus*). As best as can be determined given the reliance on volunteer species identification, of the 184 sites with history, 108 are identified as containing primarily little brown bats and 38 are identified as primarily big brown bats (the primary species is unknown at 38 sites). The little brown bat colonies have declined 95% from all-time maximums whereas big brown bat colonies have declined 29%.

OBJECTIVES

1. To evaluate the welfare of bat maternity colonies that use manmade structures, and to assess the nature and longevity of significant colonies ($\geq$50 bats).

2. To arrange informal agreements and provide assistance to cooperators in the Summer Bat Concentration Survey/Appalachian Bat Count for management of colonies they monitor.

3. To monitor proven and experimental bat boxes annually to assess their efficacy in housing displaced (or new) maternity colonies.

4. To encourage the installation of artificial roosts where large summer concentrations are in jeopardy of losing roosting habitat, or where the addition of such habitat will increase the protection of summer bat concentrations.

5. To determine and evaluate the impacts of white-nose syndrome (WNS) on maternity colonies.

METHODS

Volunteer surveyors for Pennsylvania's Summer Bat Concentration Survey/Appalachian Bat Count (ABC) are asked to find a structure (barn, church, etc.) housing bats and to count (from the outside) bats as they exit at twilight. Basic surveys are conducted between late May and August on evenings with no precipitation, a temperature above 60^{o}F, and winds below 4 on the Beaufort scale (13-18 mph). Tallies of exiting bats start with the departure of the first bat and continue until bats cease to exit. For a detailed description of protocols, levels of commitment, and survey forms, refer to Zalik and Butchkoski (2014). At each site, 1 or more counts may be conducted during the summer, and the highest from any of these counts is used as the yearly maximum count.

White-nose syndrome (WNS) is an emerging bat disease associated with a fungus, causing devastating losses in hibernating bats (Gargas et al. 2009). The disease was first recorded in New York on 16 February 2006, and was first detected in Pennsylvania during the winter of 2008-09. As of July 2017, bats with WNS have been confirmed in 31 states and 5 Canadian provinces. Although bats do not retain the fungus during the summer months, it has been shown that the fungus can persist in the soil of caves and mines for extended periods of time, and bats can become reinfected annually (Langwig et al. 2015, Lorch et al. 2013). Monitoring of summer roosts is an

essential tool to measure impacts of the disease on summer bat populations.

Bat roosts are monitored to detect trends. Due to the voluntary nature of the survey, the same sites are not always monitored in any given year. For each site with more than 1 year of survey data, we used the maximum count from 2016 (yearly maximum) and the maximum count over the history of the Summer Bat Concentration Survey/ABC (all-time maximum; 1989-2016) to summarize colony size. Each site's 2016 yearly maximum is reported as a percentage of the site's all-time maximum (Table 1). A value of 100% would therefore indicate that the yearly maximum was equal to the all-time maximum. Next, we averaged yearly maximum counts across the set of sites surveyed this year (AVG $_{\text{YEAR MAX}}$) and averaged all-time maximum counts for those same sites (AVG $_{\text{ALL-TIME MAX}}$). We then divided AVG $_{\text{YEAR MAX}}$ by AVG $_{\text{ALL-TIME MAX}}$ and report it as a percentage. The percentage is graphed by year to illustrate trends (Fig. 1). Additionally, for those sites surveyed in both 2015 and 2016, the sums of yearly high counts are compared to compute a 1-year increase or decrease, reported as a percentage. These annual comparisons are also reported on a regional basis (western, central, and eastern Pennsylvania).

RESULTS

Reports on 229 sites were submitted in 2016, including 29 new sites, a 7% increase in participation over 2015 and an 88% increase since 2010. Sites were located in 55 Pennsylvania counties. Volunteers reported on 94 sites, Pennsylvania Game Commission staff reported on 94, the Department of Conservation and Natural Resources on 24 and the U. S. Forest Service on 17. The total number of bats counted by participants, including multiple counts at many sites, was 21,158.

Sites with bat counts are summarized by county (Table 2). Included are the structure types and sum of site high counts by county for 2016. For those sites where more than 1 count was conducted in 2016, the highest count is used in Table 2. These surveys resulted in high count tallies of 11,307 bats. Roost structures surveyed were 108 bat boxes, 28 occupied houses, 38 barns, 20 bat condos, 10 utility buildings, 7 churches, 2 unoccupied houses, 5 bridges, and 11 other structures. Examples of other structures are park restroom, garage, one-room schoolhouse, dining hall, and a conduit casing on a telephone pole. A running tally of bat high counts by year documents the sum of the high counts and average bat count per site (Table 3). The 2016 survey marks the 28th year of this project in Pennsylvania, begun in 1989. The average count of 49 bats is tied with 2015 for the lowest since surveys began (Table 3). From 1989 to 2016, surveyors have reported on 431 sites with relatively accurate location information (latitude and longitude coordinates).

One hundred eighty-four sites were surveyed in 2016 that have at least 1 previous year's count for comparison (Table 1). Survey forms were submitted for some sites where no count was conducted or no bats were ever known to use the structure. Most often these are artificial roosts (bat boxes and bat condos) with no documented bat use to date. These sites are not included in Table 1. The average yearly maximum count in 2016 was 7.6% of the all-time average maximum count for these 184 sites, down from 8.0% in 2015 (Fig. 1). Roost eviction, disturbance, mortality, recruitment, structure deterioration, landscape changes, available food resources and the behavior of selecting new roosts all play a role. However none of these factors are as dramatic as seen since the introduction of WNS.

To examine short-term changes in summer bat counts, 2015 and 2016 counts were compared, revealing a 2.3% statewide increase (n = 157 sites). Contrary to the large declines observed in western Pennsylvania during the past 3 annual reports, 2016 counts were 13.8% greater than 2015 in the western counties (n = 65 sites; Zalik and Butchkoski 2014, Zalik 2015, Zalik 2016). Counts in central Pennsylvania counties increased by 4.4% (n = 54 sites), whereas counts in eastern Pennsylvania counties decreased by 13.9% (n = 38 sites). With the exception of eastern counties this year, counts in eastern and central Pennsylvania have been stable or increasing over the past 3 years. It will be interesting to see if next year's counts suggest that western Pennsylvania populations have stabilized at low levels.

Indications are that big brown bat colonies are doing better than little brown bat colonies. As best as can be determined given the reliance on volunteer species identification, of the 184 sites with history, 108 are identified as little brown bats and 38 are big brown bats (Table 1). The primary species is unknown at 38 sites. The little brown bat colonies have declined 95% in numbers whereas big brown bats have declined by 29%.

RECOMMENDATIONS

1. Enlist additional volunteers to find and monitor at least 10 previously un-surveyed colonies of bats in manmade structures and any roosts in trees.

2. Continue to update the Summer Bat Concentration Survey/Appalachian Bat Count database to reflect the added benefits of linking it with ArcView so that the sites can be mapped and analyzed with other geographic information system data.

3. Develop procedures for timely management of nuisance bat populations through cooperation with wildlife pest management businesses.

4. Attempt to sample concentrations of bats for the presence of Indiana bats.

5. Continue to encourage and assist local involvement in bat management issues.

6. Continue to work with new developments in artificial bat roosts, especially those requiring minimal maintenance.

7. Continue to develop analysis procedures to correlate the spread of WNS with effects on summer roosts.

8. Net sites during emergence in early July to document reproduction through the capture of juveniles and band a portion of those juveniles to research survivorship.

LITERATURE CITED

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Table 1. Roosts with bats counted in 2016 that were surveyed in at least one prior year.

	County	Site Number	Structure Code	First Year	Total Years Counted	All-time Max Count	2016 Max Count	Original Primary Species	% of All-time Max Count
1	Adams	0901C2	3	2009	8	104	104	Unknown	100.0%
2	Allegheny	1302C1	7	2013	4	72	72	Unknown	100.0%
3	Armstrong	0903C1	1	2009	7	214	0	M.lucifugus	0.0%
4	Berks	0306C3	6	2003	7	151	23	Unknown	15.2%
5	Berks	0606C1	6	2006	6	260	260	Unknown	100.0%
6	Berks	0606C2	1	2006	5	82	2	E.fuscus	2.4%
7	Berks	1206C1	6	2012	5	126	100	E.fuscus	79.4%
8	Berks	1206C2	3	2012	5	65	46	E.fuscus	70.8%
9	Berks	1306C2	6	2013	4	3	3	Unknown	100.0%
10	Berks	1306C3	6	2013	4	1	1	Unknown	100.0%
11	Berks	1306C4	1	2013	4	84	64	E.fuscus	76.2%
12	Berks	9806C1	1	1998	11	4000	114	M.lucifugus	2.9%
13	Blair	0207C1	5	2002	11	1613	9	M.lucifugus	0.6%
14	Blair	0207C2	6	2002	12	765	4	M.lucifugus	0.5%
15	Blair	0607C1	6	2006	8	544	82	M.lucifugus	15.1%
16	Blair	0607C2	1	2006	8	255	208	E.fuscus	81.6%
17	Blair	8907C1	2	1989	24	22642	209	M.lucifugus	0.9%
18	Blair	9707C1	8	1997	14	4796	3	M.lucifugus	0.1%
19	Bradford	1008C1	6	2010	7	108	108	E.fuscus	100.0%
20	Bradford	1208C1	1	2012	5	11	2	M.lucifugus	18.2%
21	Bradford	1208C2	5	2012	5	1	1	M.lucifugus	100.0%
22	Bucks	1109E1	3	2011	6	59	59	M.lucifugus	100.0%
23	Bucks	0409C1	1	2004	13	42	41	E.fuscus	97.6%
24	Bucks	1109C1	13	2011	6	15	15	Unknown	100.0%
25	Bucks	1209C1	3	2012	5	60	35	Unknown	58.3%
26	Bucks	1309C1	3	2013	4	71	20	M.lucifugus	28.2%
27	Bucks	1409C1	3	2014	3	13	4	E.fuscus	30.8%
28	Bucks	1509C5	6	2015	2	63	63	M.lucifugus	100.0%
29	Butler	0310C2	8	2003	8	4710	148	M.lucifugus	3.1%
30	Butler	0710C1	6	2007	7	1	0	Unknown	0.0%
31	Butler	1010C1	8	2010	6	2	0	M.lucifugus	0.0%
32	Butler	1010C3	6	2010	6	490	0	M.lucifugus	0.0%
33	Butler	1010C6	6	2010	5	4	0	M.lucifugus	0.0%
34	Butler	1010C7	6	2010	6	2	0	M.lucifugus	0.0%
35	Butler	1310C1	8	2013	4	73	10	M.lucifugus	13.7%
36	Butler	1310C2	6	2013	4	128	0	M.lucifugus	0.0%
37	Butler	1410C1	5	2014	3	66	2	Unknown	3.0%
38	Cambria	0211C1	9	2001	7	427	0	M.lucifugus	0.0%
39	Cambria	9511C1	1	1995	9	1000	315	M.lucifugus	31.5%

Table 1. Cont.

	County	Site Number	Structure Code	First Year	Total Years Counted	All-time Max Count	2016 Max Count	Original Primary Species	% of All-time Max Count
40	Cambria	9811C1	4	1998	7	1751	3	M.lucifugus	0.2%
41	Carbon	0213C1	5	2002	13	71	0	M.lucifugus	0.0%
42	Carbon	1013C1	3	2010	7	105	80	M.lucifugus	76.2%
43	Carbon	1313C1	3	2013	4	98	98	Unknown	100.0%
44	Carbon	1513C1	7	2015	2	59	40	Unknown	67.8%
45	Carbon	9613C1	3	1998	17	412	0	M.lucifugus	0.0%
46	Centre	1014C2	6	2010	6	217	0	M.lucifugus	0.0%
47	Centre	1114C1	1	2011	6	87	45	E.fuscus	51.7%
48	Centre	1214C1	6	2012	5	6	1	Unknown	16.7%
49	Clarion	1216C1	8	2012	5	9	0	M.lucifugus	0.0%
50	Clarion	1310C3	1	2013	4	119	12	M.lucifugus	10.1%
51	Clarion	1316C1	6	2013	4	1	1	Unknown	100.0%
52	Clearfield	0117C1	6	2001	13	978	0	M.lucifugus	0.0%
53	Clinton	0218C1	3	2002	11	149	149	E.fuscus	100.0%
54	Clinton	1518C1	6	2015	2	35	35	Unknown	100.0%
55	Columbia	1419C1	1	2014	3	56	56	Unknown	100.0%
56	Crawford	0920C1	6	2009	7	100	0	M.lucifugus	0.0%
57	Crawford	0920C2	6	2009	7	90	83	E.fuscus	92.2%
58	Crawford	0920C3	6	2009	7	320	4	M.lucifugus	1.3%
59	Crawford	0920C4	6	2009	7	275	41	M.lucifugus	14.9%
60	Crawford	0920C5	6	2009	7	175	9	M.lucifugus	5.1%
61	Crawford	1220C1	6	2012	5	65	0	E.fuscus	0.0%
62	Crawford	1220C2	6	2012	5	96	1	M.lucifugus	1.0%
63	Crawford	1220C3	6	2012	5	100	10	M.lucifugus	10.0%
64	Crawford	1220C4	6	2012	5	100	60	E.fuscus	60.0%
65	Crawford	1320C1	6	2013	4	75	70	E.fuscus	93.3%
66	Crawford	1420C1	1	2014	3	358	358	E.fuscus	100.0%
67	Crawford	1520C2	5	2015	2	22	20	E.fuscus	90.9%
68	Crawford	1520C7	1	2015	2	100	100	E.fuscus	100.0%
69	Crawford	9320C2	6	1993	2	427	0	M.lucifugus	0.0%
70	Dauphin	0122C1	1	2001	9	11258	34	M.lucifugus	0.3%
71	Dauphin	0222C1	1	2002	2	1512	0	Unknown	0.0%
72	Dauphin	9622C1	6	1996	5	350	0	M.lucifugus	0.0%
73	Elk	1224C1	6	2012	5	55	0	Unknown	0.0%
74	Elk	1224C2	5	2012	5	241	3	E.fuscus	1.2%
75	Erie	0325C1	6	2003	5	122	0	Unknown	0.0%
76	Erie	0525C1	6	2005	12	416	24	M.lucifugus	5.8%
77	Erie	0525C2	8	2007	9	488	0	M.lucifugus	0.0%
78	Erie	1125C1	6	2011	6	265	1	M.lucifugus	0.4%

Table 1. Cont.

	County	Site Number	Structure Code	First Year	Total Years Counted	All-time Max Count	2016 Max Count	Original Primary Species	% of All-time Max Count
79	Erie	1520C6	7	2015	2	12	1	E.fuscus	8.3%
80	Erie	8925C2	5	1989	22	560	0	M.lucifugus	0.0%
81	Fayette	0826C1	7	2008	9	1317	6	M.lucifugus	0.5%
82	Forest	0127C1	8	2001	15	2576	1	M.lucifugus	0.0%
83	Forest	0327C1	8	2003	10	6	1	Unknown	16.7%
84	Forest	0927C1	1	2009	8	250	0	Unknown	0.0%
85	Forest	9527C1	1	1995	20	1716	62	M.lucifugus	3.6%
86	Franklin	1528C1	3	2015	2	159	159	Unknown	100.0%
87	Fulton	0329C3	6	2003	11	635	36	M.lucifugus	5.7%
88	Fulton	8929C1	6	1989	25	3067	367	M.lucifugus	12.0%
89	Huntingdon	0231C4	6	2002	11	2787	829	M.lucifugus	29.7%
90	Huntingdon	0331C2	6	2003	8	36	0	E.fuscus	0.0%
91	Huntingdon	0331C3	6	2003	8	70	0	M.lucifugus	0.0%
92	Huntingdon	0331C5	6	2003	5	3	0	M.lucifugus	0.0%
93	Huntingdon	0431C1	6	2004	3	476	476	M.lucifugus	100.0%
94	Huntingdon	0531C1	6	2005	12	675	93	M.lucifugus	13.8%
95	Huntingdon	0531C2	6	2005	12	1030	31	M.lucifugus	3.0%
96	Huntingdon	0731C1	7	2007	10	27	0	M.lucifugus	0.0%
97	Huntingdon	0831C1	6	2008	9	49	26	M.lucifugus	53.1%
98	Huntingdon	0831C2	6	2008	9	488	0	M.lucifugus	0.0%
99	Huntingdon	0931C1	6	2009	8	734	197	M.lucifugus	26.8%
100	Huntingdon	0931C2	6	2009	5	456	456	M.lucifugus	100.0%
101	Huntingdon	1331C1	8	2013	4	107	69	Unknown	64.5%
102	Huntingdon	9031C1	6	1990	13	1434	0	Unknown	0.0%
103	Huntingdon	9331C2	6	1993	2	32	31	M.lucifugus	96.9%
104	Huntingdon	9331C3	6	1993	2	391	0	M.lucifugus	0.0%
105	Huntingdon	9431C1	5	1994	8	132	125	E.fuscus	94.7%
106	Indiana	1032C1	1	2010	7	42	42	E.fuscus	100.0%
107	Jefferson	0733C1	8	2007	10	909	0	M.lucifugus	0.0%
108	Jefferson	0933C1	6	2009	8	100	12	Unknown	12.0%
109	Jefferson	0933C2	6	2009	8	3	0	Unknown	0.0%
110	Jefferson	1133C1	6	2010	7	900	0	M.lucifugus	0.0%
111	Jefferson	1133C2	6	2010	7	463	24	M.lucifugus	5.2%
112	Jefferson	1233C1	6	2012	4	78	78	E.fuscus	100.0%
113	Jefferson	1233C3	1	2012	5	63	55	E.fuscus	87.3%
114	Jefferson	1433C1	6	2014	3	46	40	E.fuscus	87.0%
115	Juniata	0934C1	3	2009	8	5110	162	M.lucifugus	3.2%
116	Lackawanna	1135C2	5	2011	6	3	0	M.lucifugus	0.0%
117	Lackawanna	1135C3	6	2011	6	1	0	M.lucifugus	0.0%

Table 1. Cont.

	County	Site Number	Structure Code	First Year	Total Years Counted	All-time Max Count	2016 Max Count	Original Primary Species	% of All-time Max Count
118	Lackawanna	1335C1	1	2013	2	36	36	Unknown	100.0%
119	Lebanon	0136C1	8	2001	3	8	0	M.lucifugus	0.0%
120	Lehigh	1339C1	9	2013	4	95	70	M.lucifugus	73.7%
121	Luzerne	0940C1	3	2009	8	80	3	M.lucifugus	3.8%
122	Luzerne	1140C1	4	2011	5	74	46	E.fuscus	62.2%
123	Lycoming	1241C1	3	2012	5	93	47	E.fuscus	50.5%
124	Lycoming	1641C1	2	2012	5	493	297	Unknown	60.2%
125	Lycoming	9641C1	3	1996	13	130	67	Unknown	51.5%
126	Lycoming	9941C1	2	1999	13	1200	42	M.lucifugus	3.5%
127	McKean	1142C1	8	2007	9	1456	24	M.lucifugus	1.6%
128	McKean	1142C2	6	2003	11	283	0	Unknown	0.0%
129	McKean	1142C3	6	2003	11	371	0	M.lucifugus	0.0%
130	McKean	1142C4	6	2002	9	270	0	Unknown	0.0%
131	McKean	1142C5	6	2002	9	520	0	M.lucifugus	0.0%
132	Mercer	0743C1	3	2008	7	553	3	M.lucifugus	0.5%
133	Mercer	0943C1	2	2009	2	58	58	E.fuscus	100.0%
134	Mercer	1343C1	6	2013	4	85	30	M.lucifugus	35.3%
135	Mercer	1443C1	8	2014	3	3	2	E.fuscus	66.7%
136	Mifflin	0944C1	3	2009	8	1305	137	M.lucifugus	10.5%
137	Mifflin	0944C3	3	2009	6	962	0	M.lucifugus	0.0%
138	Mifflin	0944C5	3	2009	8	694	9	M.lucifugus	1.3%
139	Mifflin	0944C6	1	2009	8	3104	61	M.lucifugus	2.0%
140	Mifflin	1244C1	6	2012	5	330	330	M.lucifugus	100.0%
141	Mifflin	9844C1	7	1998	7	225	120	E.fuscus	53.3%
142	Monroe	0945C1	6	2009	8	455	57	M.lucifugus	12.5%
143	Montgomery	1346C1	2	2013	3	90	48	E.fuscus	53.3%
144	Montour	1547C1	1	2015	2	181	91	Unknown	50.3%
145	Northampton	1448C1	3	2014	3	6	4	M.lucifugus	66.7%
146	Northampton	1548C2	1	2015	2	46	35	E.fuscus	76.1%
147	Northumberland	0149C1	8	2001	8	4058	36	M.lucifugus	0.9%
148	Northumberland	1149C1	1	2011	6	116	94	E.fuscus	81.0%
149	Northumberland	9549C1	1	1995	7	2733	1	M.lucifugus	0.0%
150	Perry	0450C1	9	2004	3	2515	85	M.lucifugus	3.4%
151	Pike	0952C1	6	2009	7	184	0	M.lucifugus	0.0%
152	Pike	1552C1	6	2015	2	124	85	E.fuscus	68.5%
153	Potter	0853C1	6	2008	2	950	5	M.lucifugus	0.5%
154	Potter	0853C2	6	2008	2	172	0	M.lucifugus	0.0%
155	Potter	1353C1	3	2013	4	107	73	Unknown	68.2%
156	Potter	1553C1	6	2015	2	26	26	Unknown	100.0%

Table 1. Cont.

	County	Site Number	Structure Code	First Year	Total Years Counted	All-time Max Count	2016 Max Count	Original Primary Species	% of All-time Max Count
157	Snyder	0955C1	3	2009	8	1728	0	M.lucifugus	0.0%
158	Somerset	0756C1	6	2007	10	1639	236	M.lucifugus	14.4%
159	Somerset	0756C2	6	2008	7	420	1	M.lucifugus	0.2%
160	Somerset	1156C1	6	2011	2	299	39	M.lucifugus	13.0%
161	Somerset	1156C2	6	2011	2	203	0	M.lucifugus	0.0%
162	Tioga	1059C1	6	2010	7	147	1	M.lucifugus	0.7%
163	Tioga	1059C2	6	2010	7	157	0	M.lucifugus	0.0%
164	Tioga	1059C3	6	2010	7	98	0	M.lucifugus	0.0%
165	Tioga	1159C1	6	2011	5	2	0	M.lucifugus	0.0%
166	Tioga	1459C1	1	2014	3	66	42	E.fuscus	63.6%
167	Union	0960C1	3	2009	7	389	8	M.lucifugus	2.1%
168	Union	1060C1	1	2010	7	107	107	E.fuscus	100.0%
169	Venango	1261C1	3	2012	5	100	0	M.lucifugus	0.0%
170	Venango	1261C2	6	2012	5	200	6	M.lucifugus	3.0%
171	Warren	1162C1	6	2005	11	332	0	M.lucifugus	0.0%
172	Warren	1162C2	6	2009	8	290	0	Unknown	0.0%
173	Warren	1162C3	6	2005	11	286	0	Unknown	0.0%
174	Warren	1162C4	6	2005	10	110	0	Unknown	0.0%
175	Warren	1162C5	7	2011	6	690	38	M.lucifugus	5.5%
176	Washington	1063C1	6	2010	7	256	0	M.lucifugus	0.0%
177	Washington	1063C2	7	2010	7	393	0	Unknown	0.0%
178	Washington	1263C1	6	2012	5	789	75	M.lucifugus	9.5%
179	Westmoreland	0365C1	6	2003	8	1200	6	M.lucifugus	0.5%
180	Westmoreland	0965C1	2	2009	8	2053	27	M.lucifugus	1.3%
181	Westmoreland	0965C2	2	2009	7	180	180	M.lucifugus	100.0%
182	Westmoreland	0965C3	1	2009	8	45	7	E.fuscus	15.6%
183	Wyoming	1266C1	3	2012	5	10	2	M.lucifugus	20.0%
184	York	1467C1	1	2014	3	89	78	E.fuscus	87.6%
	TOTAL					**127,698**	**9,719**		
	AVERAGE					**694**	**53**		**7.6%**[b]

[a] Structure Codes: 1=barn; 2=church; 3=house(occupied); 4=house (unoccupied); 5=utility building; 6=bat box; 7=other structure; 8=bat condo; 9=bridge.

[b] 92.4% decline of total bat numbers when compared to all-time maximum counts.

Table 2. Summary of 229 bat concentration surveys conducted in 2016 by county. Included are the structure types and sum of high site counts by county.

	County	Barn	Bat Box	Bat Condo	Bridge	Church	House (occupied)	House (unoccupied)	Utility Building	Other Structure	2016 High Counts
1	Adams						1				104
2	Allegheny									1	72
3	Armstrong	2									55
4	Beaver									1	0
5	Berks	3	14				1				682
6	Blair	1	2	1		1			2	1	763
7	Bradford	1	1						1		111
8	Bucks	1	1				4			1	237
9	Butler		5	3					1		160
10	Cambria	1	1		1			1			318
11	Carbon						3		1	1	218
12	Centre	1	5								46
13	Clarion	1	2	1							13
14	Clearfield		1								0
15	Clinton		1				1				184
16	Columbia	1									56
17	Crawford	4	12						1		819
18	Dauphin	2	1	1							34
19	Elk		1						1		3
20	Erie		3	1					1	1	26
21	Fayette									1	6
22	Forest	2		2							64
23	Franklin						1				159
24	Fulton		2								403
25	Huntingdon	1	18	2	2				1	1	2876
26	Indiana	1									42
27	Jefferson	1	6	2							209
28	Juniata						1				162
29	Lackawanna	1	2						1		36
30	Lancaster	1									92
31	Lebanon			1							0
32	Lehigh	2	1	1	1						260
33	Luzerne		1				1	1			90
34	Lycoming					2	2				453
35	McKean		4	1							24
36	Mercer		1	1		1	1				93
37	Mifflin	1	1				3			1	657
38	Monroe		1								57
39	Montgomery					1					48

Table 2. Cont.

	County	Barn	Bat Box	Bat Condo	Bridge	Church	House (occupied)	House (unoccupied)	Utility Building	Other Structure	2016 High Counts
40	Montour	1									91
41	Northampton	1					1				39
42	Northumberland	2		1							131
43	Perry				1						85
44	Pike		2								85
45	Potter		3				2				112
46	Snyder						1				0
47	Somerset		4								276
48	Tioga	1	4								43
49	Union	1					1				115
50	Venango		1				3				160
51	Warren		4	2						1	38
52	Washington	1	2							1	152
53	Westmoreland	2	1			2					268
54	Wyoming						1				2
55	York	1									78
	Totals	**38**	**108**	**20**	**5**	**7**	**28**	**2**	**10**	**9**	**11,307**

Table 3. Summary of high bat counts by year.

Year	Number of Sites	Number of Bat Tallies	Average Bats/Count
1989	18	12,162	676
1990	19	15,934	839
1991	10	3,707	371
1992	20	22,307	1,115
1993	18	16,737	930
1994	12	17,084	1,424
1995	22	31,051	1,411
1996	31	28,231	911
1997	24	35,923	1,497
1998	32	43,086	1,346
1999	22	40,138	1,824
2000	4	2,499	625
2001	38	62,310	1,640
2002	42	51,490	1,226
2003	51	60,016	1,177
2004	25	36,241	1,450
2005	36	21,228	590
2006	42	37,313	888
2007	43	43,538	1,013
2008	63	63,551	1,009
2009	92	65,679	714
2010	114	59,029	518
2011	159	45,853	288
2012	172	24,945	145
2013	183	15,196	83
2014	200	10,799	54
2015	215	10,506	49
2016	229	11,307	49

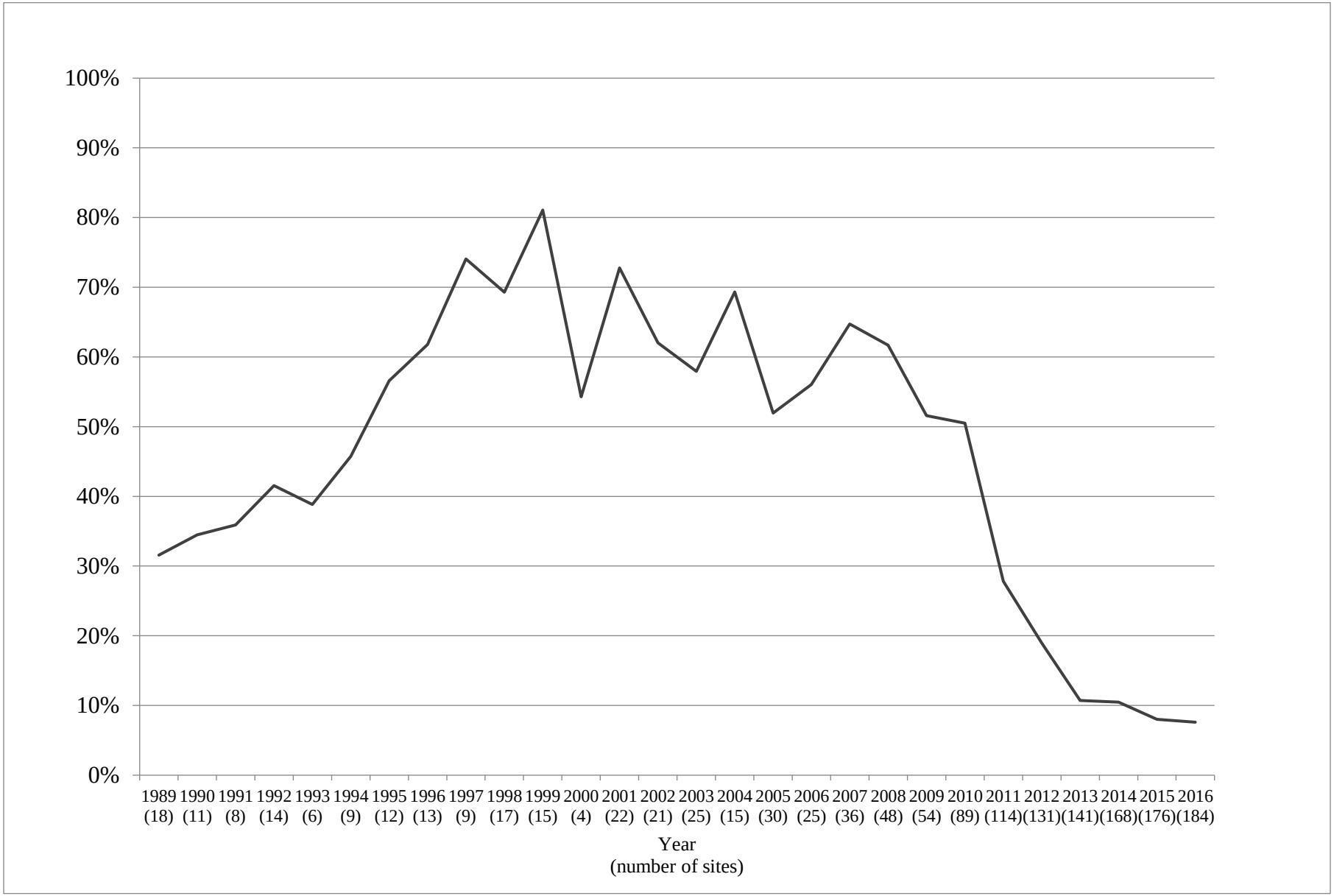

Figure 1. Percentage of yearly maximum counts in relation to all-time (1989 – 2016) maximum counts (yearly maximum counts averaged across the set of sites surveyed in a given year / all-time (1989 – 2016) maximum recorded counts for that set). Sample sizes for each year are listed in parentheses.