

**PENNSYLVANIA GAME COMMISSION
BUREAU OF WILDLIFE MANAGEMENT
PROJECT ANNUAL JOB REPORT**

PROJECT CODE NO.: 06290

TITLE: Ruffed Grouse Research/Management

JOB CODE NO.: 29002

TITLE: Statewide Grouse Hunting Survey

PERIOD COVERED: 1 July 2014 to 30 June 2015

COOPERATING AGENCIES: Bureau of Wildlife Habitat Management, Pennsylvania Game Commission

WORK LOCATION(S): Statewide

PREPARED BY: Lisa M. Williams

DATE: 24 June 2015

ABSTRACT Ruffed grouse populations for different seasonal periods and geographic regions throughout Pennsylvania were monitored via a summer sighting survey and a fall and winter hunting survey. For the 2014 summer sighting survey, 51 Pennsylvania Game Commission foresters and surveyors recorded grouse seen while working in the woods during 1,986 observer days. Observers averaged seeing 5.2 broods/100 days and 30.8 total grouse/100 days. Brood observations were well below 2013 figures (down 21%) and also 21% below long term (1981-2013) average. Total grouse observations also fell below 2013 figures (down 8%) and were 27% below long term average. Based upon these decreased observations, the forecast for the 2014-2015 hunting season was for a below-average grouse season. For the fall and winter hunting survey, avid grouse hunters (i.e. cooperators) were sent a grouse hunting survey form in October 2014. Replies were received from 290 (46%) of 628 cooperators contacted by mail. Cooperators averaged 27 hours hunted, 26 grouse flushed, and 1.9 grouse bagged during the 2014-2015 hunting season. Daily effort was greatest during the October (129 hrs/available day) and November (97 hours/available day) portions of the early season, followed by the post-Christmas season (70 hours/available day). The November portion of the early season accounted for 41% of the statewide cooperator harvest, followed by the late season (29%) and October season (20%). Statewide, cooperators hunted 6,355 hours and recorded 5,995 flushes for an average rate of 0.94 flushes per hour. This is the lowest statewide flush rate since record-keeping began 50 years ago. The 2014-2015 flush rate of 0.94 flushes per hour represents a 22% decrease in flush rate compared to the previous season and is 33% below the long term (49-year) average of 1.40 flushes per hour. Compared with the previous year, 4 regions exhibited dramatically decreased flush rates (Northcentral -31%; Southeast -25%; Northwest -23%; Southcentral -21%). The remaining two

regions exhibited slight to moderate changes (Northeast +6% and Southwest -8%). The southern regions are most depressed when compared to region 34-year long-term averages (Southwest -44%; Southcentral -73%; Southeast -51%). The northern regions are faring slightly better, but still disturbingly below their respective 34-year averages (Northwest -33%; Northcentral -26%; Northeast -23%). Aggressive and focused grouse habitat management and investigation into non-habitat factors contributing to declines must be prioritized in order to protect dwindling grouse populations. A review and re-assessment of the current season and bag limit structure is also warranted, given the precipitous population declines occurring in the southern regions of the Commonwealth. In addition, investigation into the feasibility of non-harvest dependent population monitoring methods should be pursued. Currently, this job is the only major source of data for trends in huntable grouse populations statewide, and it must be continued in order to monitor the grouse resource.

OBJECTIVE

To monitor ruffed grouse populations for different seasonal periods and geographic regions throughout Pennsylvania.

METHODS

The summer grouse sighting survey was conducted during the months of June, July, and August 2014. Agency foresters and surveyors kept records of grouse and grouse broods seen while working on State Game Lands. Results of the summer sighting survey were used primarily to develop a pre-season grouse hunting forecast.

Additionally, avid grouse hunters were selected for participation in a fall/winter hunting survey by personal contact and by solicitation via various news media. They were sent a grouse hunting survey form in October 2014, with instructions to record dates hunted, county of hunt, hours hunted, number of grouse flushed (including reflashes), and number of grouse bagged for the 2014-2015 grouse season. The completed forms were to be returned after the end of the hunting season.

A newsletter including the previous year's grouse hunting season results and the 2014-2015 season forecast, along with survey forms, were sent to cooperating hunters 2 weeks prior to the season opener. Typical of the survey, a reminder mailing was sent to non-respondents in mid-February.

RESULTS

Fifty-one foresters and land surveyors recorded grouse observations during days spent in the field in June, July, and August 2014. Observer field days during June, July and August totaled 684, 668, and 634 days respectively, for a total of 1,986 observation days. This represents a 33% increase in observation days from 2013. One hundred four broods and 612 individual grouse were observed during the survey. Average sightings during the summer survey were 5.2 broods/100 days and 30.8 individual grouse/100 days. Observations of individual grouse were 8% below 2013 figures, and brood observations were 21% lower than 2013 figures. Decreased observations were most pronounced among broods in June and July, which were down 22% and 33% from 2013 levels. Individual grouse sightings were 27% below long term (1981-2013) average, and brood observations

were 21% below long-term average (Table 1). Observations of adults were 13% below the most recent 10-year average, while brood observations were 5.5% below most recent 10-year average. Based upon the low number of brood observations, particularly those observed in June and July, the forecast for the 2014-2015 hunting season was to have a below-average fall flushing rate. This prediction was later borne out by the Cooperator survey results.

Of the 628 cooperators that were sent survey forms, 290 (46%) returned replies, a slight increase in response rate (+4%) compared to the prior year (Table 2). Of these 290 responses, 228 (79%) included useable data. Since the second reminder postcard used in 2012-13 did not appear to increase either overall response rate (57% in 2011 versus 58% in 2012) or useable return rate (84% in 2011 versus 78% in 2012), a second postcard was not sent to non-respondents in 2014-2015. Cooperators did receive a de-facto second reminder as part of a separate survey initiated during the reporting year. Responding cooperators averaged 27 hours hunted, 26 grouse flushed, and 1.9 grouse bagged during the 2014-2015 hunting season. Statewide hunter participation (hours hunted/cooperator) was on par with 2013-2014 (up 4%), but number of grouse flushed was down 16%, and grouse harvested per hunter was down 14 %.

Relative to the number of days available to hunt, statewide hunter effort was greatest during the October (129 hrs/available day) and November (97 hours/available day) portions of the early season, followed by the post-Christmas “late season” (70 hours/available day) (Tables 3 and 4). The pre-Christmas December segment ranked lowest in hunter effort among grouse cooperators (59 hrs/available day). When corrected for the number of useable returns each year, Cooperator participation during the late season (i.e. post-Christmas) continues to show a steady increase over time (Fig. 1). Late season effort was 7% higher than in 2013-2014 and 24% higher than in 2012-2013. The late season accounts for a relatively small proportion of overall grouse hunter effort, but it may represent additive mortality in portions of the state where forest fragmentation produces isolated coverts and high harvest rates. Given the potential impacts of extended late winter hunting on grouse populations, it is important to follow late season participation trends over time. Additionally, Game Take Survey results should be used to assess whether cooperator effort during the late season reflects a trend among general grouse hunters.

Forty-one percent of 420 grouse harvested by cooperators were bagged during November, followed by the late season segment which accounted for over one-quarter (29%) of the statewide harvest. The remaining season segments accounted for nearly one-third of the total grouse harvested by Cooperators [20% in the October segment; 10% in the pre-Christmas December segment] (Table 4). Statewide, the 2014-2015 hunting season required that cooperators hunt an average of 15.1 hours per every grouse harvested (Table 5). This represents more than 3 hours of additional hunting required to bag a grouse compared to the previous year (15.1 vs. 11.9 hours).

Statewide hunter success rates varied by season segment, with lowest hunter success (18.3 hours of hunting per grouse bagged) occurring during the October season segment. Highest statewide hunter success (12.1 hours per grouse bagged) occurred in the mid-December season (Table 5).

Overall, indices of hunt ‘quality’ (i.e. flushes per hour; hours required to harvest a grouse) declined fairly dramatically in 2014-2015 compared to 2013-2014 (0.94 versus 1.21 flushes/hr; 15.13

versus 11.92 hours/bagged grouse), with hunters seeing 22% fewer birds per hour and requiring 27% more hours of effort to harvest a grouse. The most successful hunting period occurred in mid-December in the Northcentral Region when 6.7 hours were required to bag a grouse (Table 5). The least successful hunting period was the post-Christmas season in the Southcentral Region when no grouse were bagged in spite of 175 hours of hunting.

The 2014-2015 flush rate of 0.94 flushes per hour represents a 22% decrease in flush rate compared to the previous season and is 33% below the long term (49-year) average of 1.40 flushes per hour (Fig. 2). Statewide, flush rate was highest in the mid-December season segment (1.04 flushes/hour). Flush rates across all other season segments ranged from 0.87 in the post-Christmas season to 1.02 in October (Table 5). Compared with the previous year, 4 regions exhibited dramatically decreased flush rates (Northcentral -31%; Southeast -25%; Northwest -23%; Southcentral -21%). The remaining 2 regions exhibited slight to moderate changes (Northeast +6% and Southwest -8%) (Table 6). The southern regions are most depressed when compared to region 34-year long-term averages (Southwest -44%; Southcentral -73%; Southeast -51%). The northern regions are faring slightly better, but still disturbingly below their respective long term averages (Northwest -33%; Northcentral -26%; Northeast -23%). Continued declines in the northern regions would lead to precipitous declines in the statewide flush rate, since most hunting and most harvest occurs in these areas. Without the annual contribution of the Northwest and Northcentral regions the statewide flush rate would be precipitously lower. In fact, it is largely under-production in these regions in the 2014-15 license year that has resulted in this year marking the lowest grouse population index in the 50 year history of this survey.

For the fifth consecutive year, the statewide flushing rate was below the long term (49-year) average (0.94 versus 1.40 flushes per hour). Pennsylvania's huntable grouse populations hit high levels (>10% above the long-term average) during each decade from the 1960s through the 1990s (Fig. 2). These high statewide indices have not occurred since 2000, however, and only 5 of the past 15 years have supported flush rates approximating long term average (range 1.39 to 1.51 flushes per hour). The introduction into Pennsylvania of West Nile Virus (WNV), an exotic pathogen which was detected statewide by late summer 2002 and is now well-established in the Commonwealth, is hypothesized to be a contributing factor in recent changes to the grouse population trend. Average statewide flush rate for the post-WNV period (i.e. fall 2002 to present) is 17% below the 1965-2001 average. Six of 8 years of the lowest flush rates on record (flush rates < 1.2 birds/hour) have occurred since 2002 (Table 6). A laboratory trial is currently underway to assess the impact of WNV on Pennsylvania grouse.

After the severe grouse declines that occurred statewide from 2002-2005, a period of relative improvement in flush rates was observed in all regions beginning in license year 2006-2007 and extending to license year 2010-11 (Table 7; Fig. 2). This improvement was most dramatic in the Northwest and Northcentral regions, where successive population highs increased to the point where they regularly exceeded long term region averages (Fig. 3, Fig. 4). Grouse population recovery was not as dramatic in other regions, yet all exhibited either an uptick in trend or a moderation of the decline in grouse indices for the period of 2006 through 2010 (Fig. 5, 6, 7, 8). Unfortunately, it now appears that somewhat anemic recovery is finished in all regions except, perhaps, the Northeast (Fig. 5).

Most regions have once again experienced grouse declines since 2010, with southern regions showing little to no continued recovery. Long term grouse population declines are linked to the approximately 40% loss of young forest acreage from the landscape in recent decades (McWilliams et al. 2004). Several other factors may also influence grouse trends in Pennsylvania: forest fragmentation and isolation of remaining suitable habitat; disease, changing weather patterns that include altered temperatures and precipitation; reoccurring spring freezes that reduce soft mast availability; lack of structural and dietary diversity in the forest understory; and over-reliance upon food sources that are unpredictable (i.e. acorns) or of low nutritional value (i.e. mountain laurel). All can potentially have deleterious impacts on grouse populations (NEUGBTC 2013, Stauffer et al. 2010).

Many factors affecting grouse populations are beyond Pennsylvania Game Commission control. However, recent flush rates indicate that Pennsylvania can still produce robust and abundant grouse populations in areas of good habitat. There are concrete steps the Game Commission can take to improve the outlook for grouse. Focused implementation of best management practices for grouse habitat, as called for in the Ruffed Grouse Management Plan (Williams et al. 2011), can improve grouse populations. Continued management of the deer herd to encourage forest regeneration and the development of a diverse understory should also improve grouse habitat conditions and localized grouse flush rates in areas where deer have impacted forest understory structure and diversity in recent decades. Additionally, a review of current season structure and daily bag limit should be undertaken immediately to assess if changes are warranted in the face of recent population trends.

RECOMMENDATIONS

This job should be continued as planned, because it enables us to monitor long term trends in huntable grouse populations (i.e. those in suitable habitat) on both a statewide and regional basis. The survey also provides a vehicle for communicating with dedicated grouse and woodcock hunters. Given the multiple factors that can influence grouse abundance, continued monitoring of these region-level trends is warranted. Focused investigations into non-habitat factors that may be influencing grouse trends should be prioritized. Investigation into the feasibility of non-harvest dependent population monitoring methods should be pursued. A review and re-assessment of the current season and bag limit structure is also warranted given ongoing population declines in most regions of the Commonwealth.

LITERATURE CITED

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Stauffer, D. F., J. W. Edwards, W. M. Giuliano, and G. W. Norman. 2010. Ecology and Management of Appalachian Ruffed Grouse. Hancock House Publishers, Blaine, Washington, USA.

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Table 1. Pennsylvania summer grouse sighting survey results, 1981-2014.

Year	Grouse broods/100 observer days	Total grouse/100 observer days
1981	8.9	57.7
1982	7.7	46.2
1983	4.7	35.2
1984	6.0	39.3
1985	9.5	59.7
1986	9.0	54.7
1987	7.5	45.8
1988	6.6	43.7
1989	6.6	39.7
1990	7.8	48.5
1991	6.8	47.3
1992	11.8	71.1
1993	9.7	64.2
1994	7.4	57.1
1995	9.6	60.0
1996	4.4	30.3
1997	5.9	40.4
1998	5.4	33.3
1999	6.7	42.0
2000	4.7	29.0
2001	6.0	37.7
2002	6.6	42.9
2003	2.5	14.9
2004	3.0	20.1
2005	3.3	23.3
2006	6.5	43.9
2007	7.8	39.6
2008	6.6	37.8
2009	4.9	36.4
2010	7.0	48.2
2011	5.4	45.0
2012	4.0	26.7
2013	6.6	33.4
2014	5.2	30.8

Table 2. Grouse cooperator contacts and returns and season average of hours hunted, grouse flushed, and grouse bagged in Pennsylvania, 1984-2015.

Season	Cooperator number of				Season average/cooperator		
	Contacts	Returns	Useable returns		Hours Hunted	Grouse Flushed	Grouse Bagged
			Flush Data	Bag Data			
84-85	739	547	513	500	34	42	3.0
85-86	888	556	523	510	34	53	3.6
86-87	638	500	474	454	35	52	3.3
87-88	654	455	434	426	34	58	3.9
88-89	851	442	422	408	37	53	3.8
89-90	873	366	348	332	37	51	3.8
90-91	735	478	442	416	31	45	3.5
91-92	713	479	447	441	34	54	3.7
92-93	738	463	425	417	32	45	3.0
93-94	790	456	384	373	28	46	3.3
94-95	806	467	417	412	35	61	4.2
95-96	842	485	415	407	26	45	3.0
96-97	878	479	415	410	29	40	2.6
97-98	915	459	389	385	28	39	2.5
98-99	961	468	379	371	28	35	2.5
99-00	947	451	382	377	30	45	3.1
00-01	929	405	346	345	29	40	2.7
01-02	683	447	388	379	31	46	3.3
02-03	694	412	336	333	25	30	2.0
03-04	687	361	288	286	26	27	1.7
04-05	716	380	295	292	24	23	1.7
05-06	706	370	358	357	22	24	1.6
06-07	733	338	292	288	32	45	3.2
07-08	745	347	290	289	29	36	2.3
08-09	486	304	243	243	25	35	2.6
09-10	539	314	261	261	28	39	2.7
10-11	530	269	223	223	26	34	2.1
11-12	550	314	263	263	30	39	2.4
12-13	588	343	266	263	29	33	2.3
13-14	609	255	201	199	26	31	2.2
14-15	628	290	228	227	27	26	1.9

Table 3. Seasonal comparison of grouse cooperator statistics, by region, in Pennsylvania, 2014-2015.

	Region						Total	%
	NW	NC	NE	SW	SC	SE		
Hours hunted								
Oct	375.25	511	328.5	235.75	53.5	52	1556	24.48
Nov	684.75	652	447.25	367.75	154.75	123.5	2430	38.24
Dec	144.75	120.25	83	114	54	17.5	533.5	8.39
Dec 26/Jan	388.5	470	326.25	384.75	174.75	91.5	1835.75	28.89
Total	1593.25	1753.25	1185	1102.25	437	284.5	6355.25	100
Grouse flushed								
Oct	509	521	398	125	11	16	1580	26.36
Nov	771	749	347	298	48	51	2264	37.76
Dec	171	153	69	125	23	12	553	9.22
26 Dec/Jan	356	560	251	323	65	43	1598	26.66
Total	1807	1983	1065	871	147	122	5995	100
Grouse bagged								
Oct	34	30	14	6	1	0	85	20.24
Nov	53	70	18	24	4	2	171	40.71
Dec	15	18	2	9	0	0	44	10.48
26 Dec/Jan	22	55	15	26	2	0	120	28.57
Total	124	173	49	65	7	2	420	100

Table 4. Seasonal comparison of cooperator grouse hunting effort and kill in Pennsylvania, 2014-2015.

Region	October ^a		November ^b		December ^c		26 Dec/Jan ^d	
	% of hours hunted	% of kill	% of hours hunted	% of kill	% of hours hunted	% of kill	% of hours hunted	% of kill
NW	23.55	27.42	42.98	42.74	9.09	12.10	24.38	17.74
NC	29.15	17.34	37.19	40.46	6.86	10.40	26.81	31.79
NE	27.72	28.57	37.74	36.73	7.00	4.08	27.53	30.61
SW	21.39	9.23	33.36	36.92	10.34	13.85	34.91	40.00
SC	12.24	14.29	35.41	57.14	12.36	0	39.99	28.57
SE	18.28	0	43.41	100.0	6.15	0	32.16	0
State	24.48	20.24	38.24	40.71	8.39	10.48	28.89	28.57

^a12 days available (18-31 Oct)^b25 days available (1-29 Nov)^c9 days available(15 Dec-24 Dec)^d26 days available(26 Dec-24 Jan, extension 19-24 Jan)

Table 5. Grouse cooperator average grouse flushes/hour, and average hours/grouse bagged^a for 2014-2015 in Pennsylvania Game Commission Regions.

Rate Month	Region						State
	NW	NC	NE	SW	SC	SE	
Flushes/hour							
Oct	1.36	1.02	1.21	0.53	0.21	0.31	1.02
Nov	1.13	1.15	0.78	0.81	0.31	0.41	0.93
Dec	1.18	1.27	0.83	1.10	0.43	0.69	1.04
26 Dec/Jan	0.92	1.19	0.77	0.84	0.37	0.47	0.87
Total	1.13	1.13	0.90	0.79	0.34	0.43	0.94
Hours/grouse bagged							
Oct	11.04	17.03	23.46	39.29	53.50	^b	18.31
Nov	12.92	9.31	24.85	15.32	38.69	61.75	14.21
Dec	9.65	6.68	41.50	12.67	^b	^b	12.13
26 Dec/Jan	17.66	8.55	21.75	14.80	87.38	^b	15.30
Total	12.85	10.13	24.18	16.96	62.43	142.25	15.13

^a Includes only data where hours, flushes, and kills were recorded.

^b Indicates there were no grouse bagged during that month.

Table 6. Hunting season grouse cooperators average grouse flushes/hour by Pennsylvania Game Commission Region, 1980-2014.

Season	Region					
	NW	NC	NE	SW	SC	SE
80-81	1.89	1.45	1.34	2.03	1.57	1.34
81-82	1.82	1.58	1.44	1.95	1.29	1.36
82-83	1.83	1.42	1.22	1.74	1.44	1.03
83-84	1.24	1.15	1.12	1.42	1.41	0.90
84-85	1.28	1.21	1.09	1.39	1.44	0.93
85-86	1.61	1.61	1.35	1.82	1.59	1.14
86-87	1.51	1.58	1.14	1.63	1.81	1.28
87-88	1.80	1.79	1.57	1.77	1.91	1.23
88-89	1.71	1.37	1.04	1.65	1.49	0.92
89-90	1.52	1.31	1.25	1.33	1.58	1.08
90-91	1.44	1.42	1.21	1.52	1.76	0.76
91-92	1.95	1.49	1.54	1.65	1.43	0.81
92-93	1.50	1.51	1.15	1.65	1.46	0.68
93-94	1.95	1.80	1.55	1.86	1.23	0.67
94-95	1.74	2.05	1.52	1.88	1.48	1.03
95-96	1.84	1.75	1.52	1.92	1.82	1.21
96-97	1.51	1.45	1.27	1.59	1.13	0.74
97-98	1.45	1.47	1.44	1.33	1.37	1.08
98-99	1.51	1.25	1.09	1.51	1.12	0.84
99-00	1.84	1.51	1.31	1.59	1.33	0.98
00-01	1.77	1.47	0.83	1.66	1.29	0.85
01-02	2.08	1.84	1.01	1.46	1.22	0.94
02-03	1.47	1.41	0.90	1.19	0.94	0.76
03-04	1.43	1.25	0.87	0.96	0.83	0.67
04-05	1.20	1.08	1.00	0.79	0.77	0.70
05-06	1.36	1.46	0.91	0.97	0.78	0.60
06-07	1.76	1.65	1.30	1.21	1.22	0.79
07-08	1.81	1.44	1.04	1.05	1.16	0.73
08-09	1.88	1.86	1.13	1.20	1.07	0.82
09-10	1.90	1.82	1.16	0.91	0.86	0.47
10-11	2.16	1.80	0.87	0.84	0.71	0.80
11-12	1.97	1.64	0.86	0.97	0.98	0.55
12-13	1.83	1.54	0.75	0.72	0.57	0.52
13-14	1.47	1.64	0.85	0.86	0.43	0.57
14-15	1.13	1.13	0.90	0.79	0.34	0.43

Table 7. Long-Term Average annual grouse cooperators hunting season flushes/hour in Pennsylvania, 1965-2014.

Season	Rate								
65-66	1.62	75-76	1.19	85-86	1.56	95-96	1.74	05-06	1.07
66-67	1.48	76-77	1.04	86-87	1.50	96-97	1.37	06-07	1.41
67-68	1.66	77-78	1.33	87-88	1.72	97-98	1.39	07-08	1.25
68-69	1.61	78-79	1.37	88-89	1.44	98-99	1.27	08-09	1.42
69-70	1.53	79-80	1.53	89-90	1.37	99-00	1.49	09-10	1.40
70-71	1.43	80-81	1.69	90-91	1.42	00-01	1.39	10-11	1.32
71-72	1.42	81-82	1.66	91-92	1.56	01-02	1.51	11-12	1.32
72-73	1.27	82-83	1.52	92-93	1.42	02-03	1.17	12-13	1.14
73-74	1.23	83-84	1.23	93-94	1.65	03-04	1.05	13-14	1.21
74-75	1.24	84-85	1.24	94-95	1.73	04-05	0.95	14-15	0.94

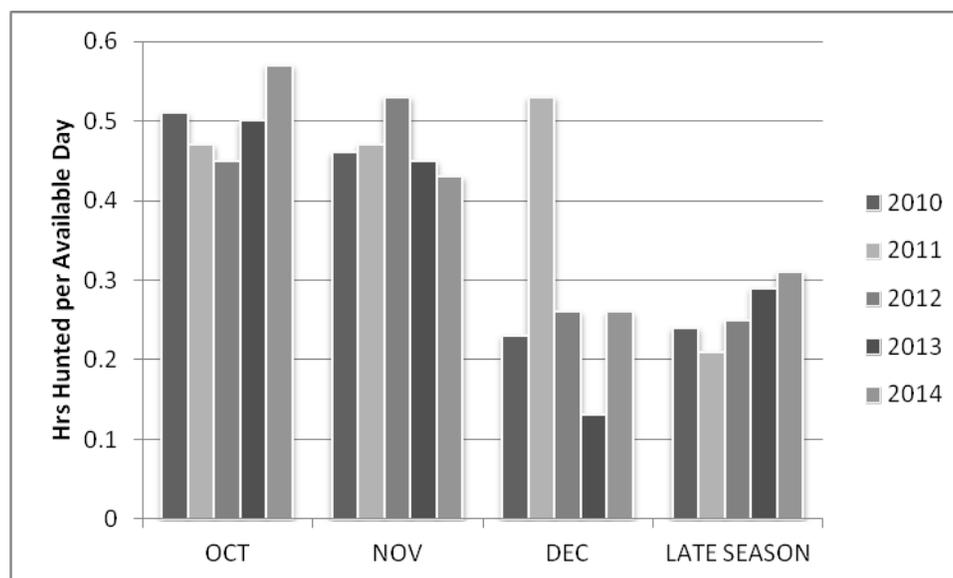


Figure 1. Cooperators participation trends in grouse hunting season segments during the 2010 – 2014 license years. Index is hours hunted per available day, corrected for useable flush returns received each year.

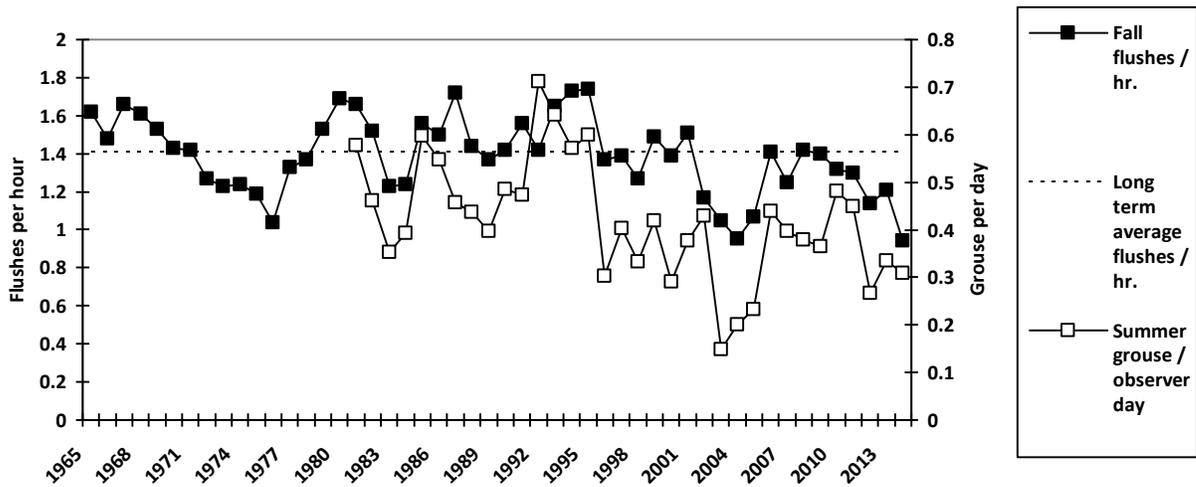


Figure 2. Average annual grouse cooperators flushes/hour and summer grouse sightings in Pennsylvania, 1965-2014.

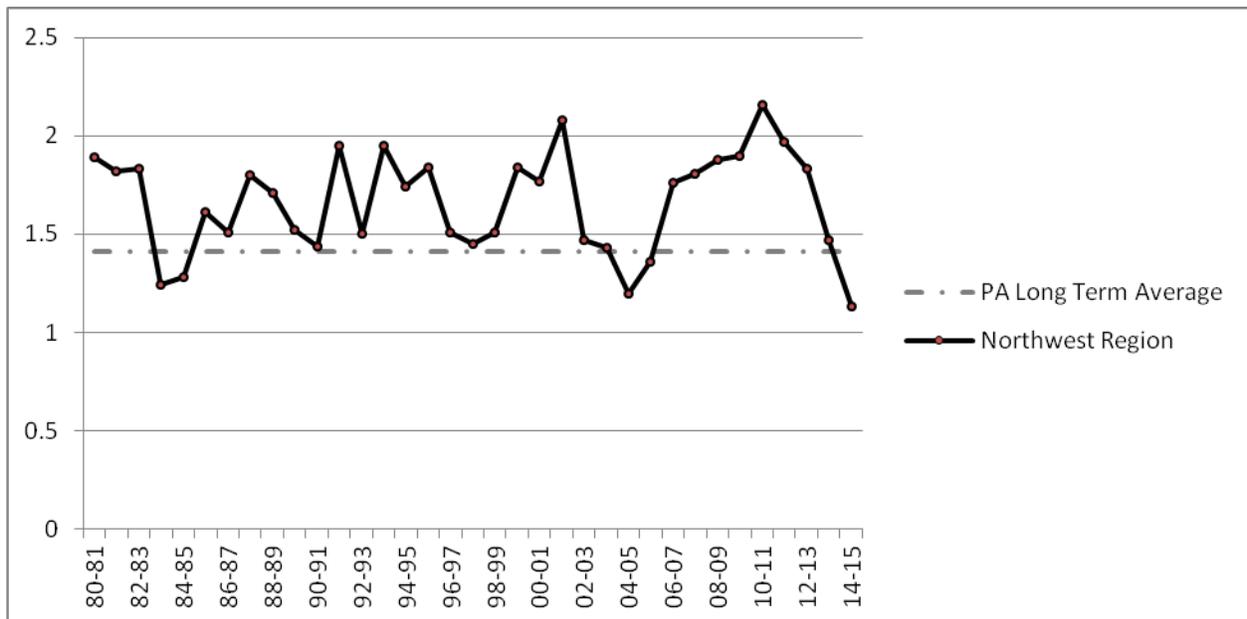


Figure 3. Annual grouse cooperators survey grouse flushes/hour in the Northwest Region of Pennsylvania, 1980–2014.

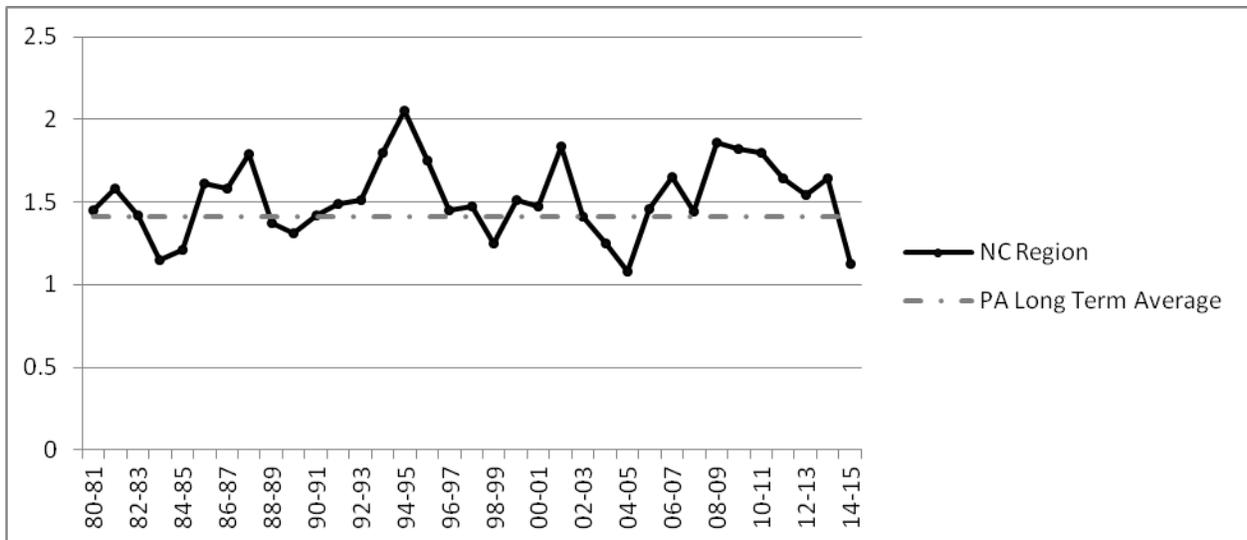


Figure 4. Annual grouse cooperators survey grouse flushes/hour in the Northcentral Region of Pennsylvania, 1980–2014.

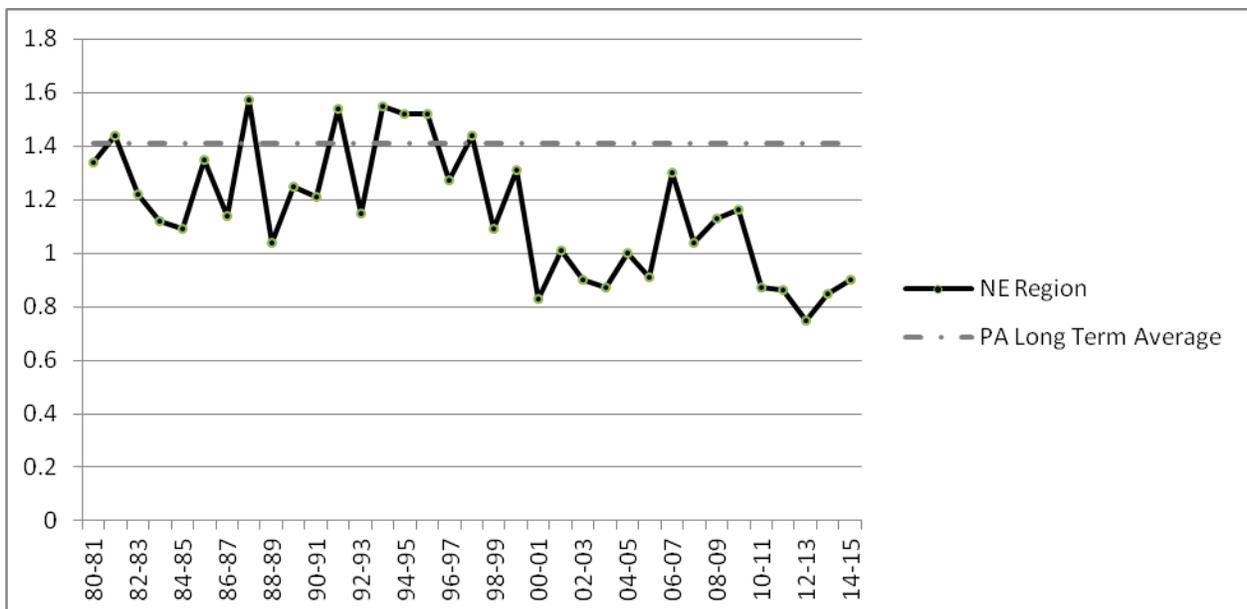


Figure 5. Annual grouse cooperators survey grouse flushes/hour in the Northeast Region of Pennsylvania, 1980–2014.

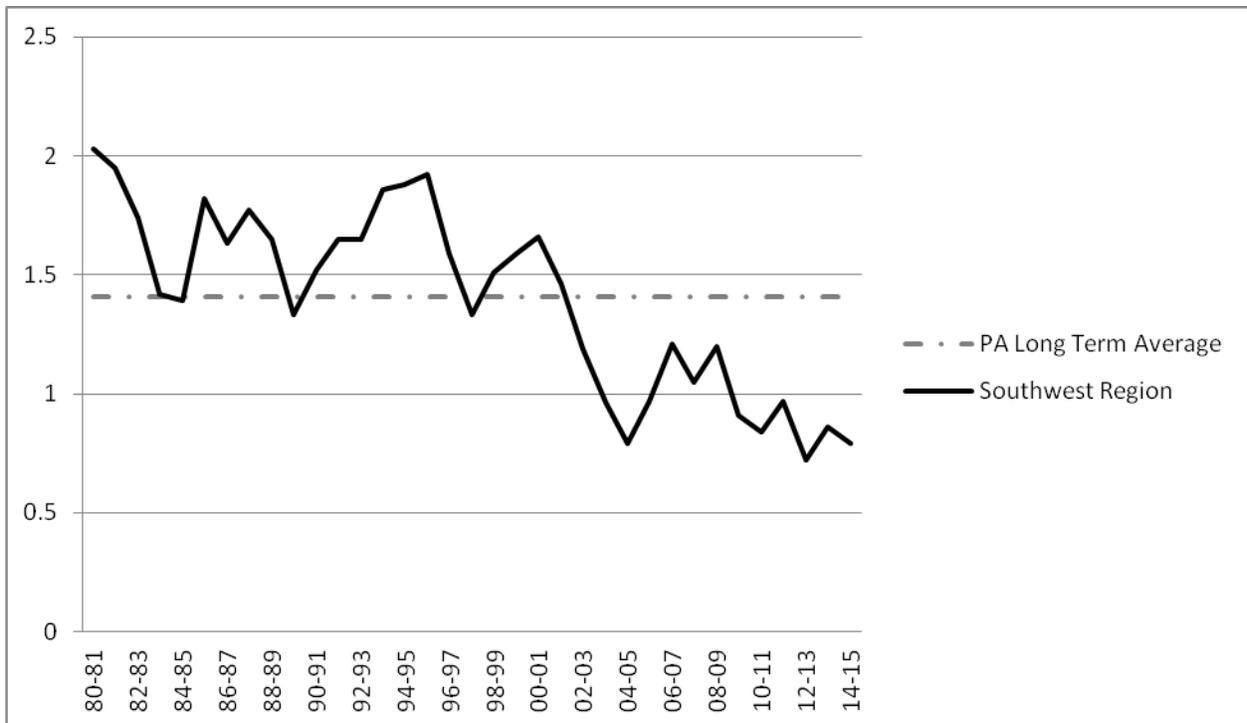


Figure 6. Annual grouse cooperator survey grouse flushes/hour in the Southwest Region of Pennsylvania, 1980–2014.

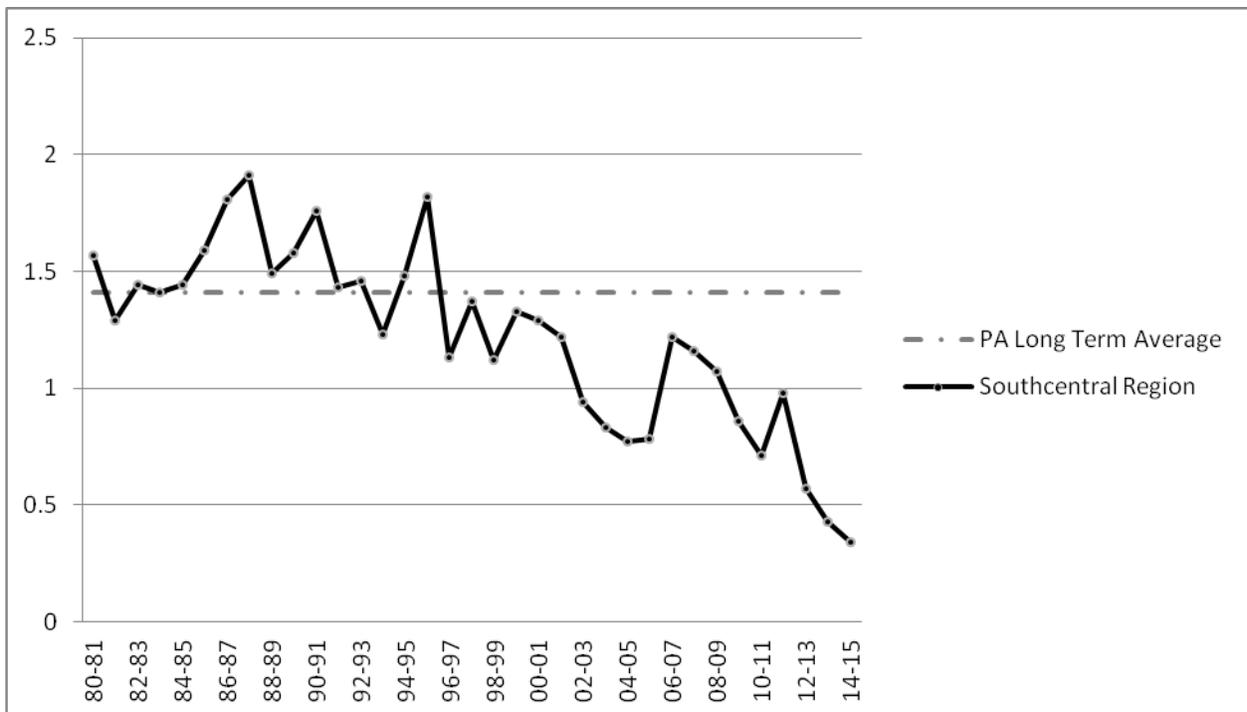


Figure 7. Annual grouse cooperator survey grouse flushes/hour in the Southcentral Region of Pennsylvania, 1980–2014.

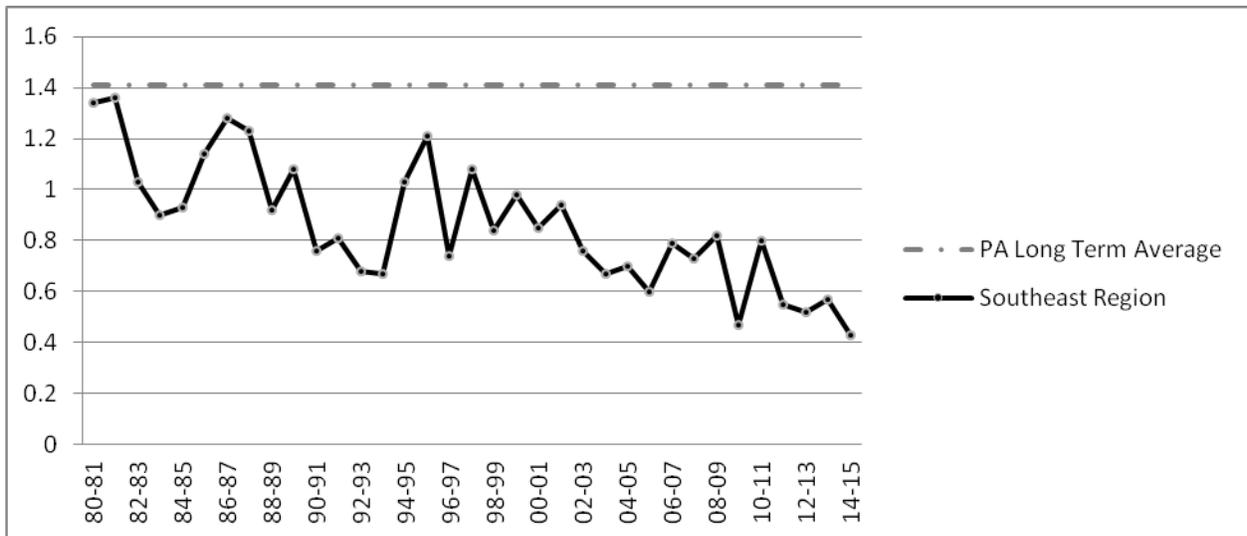


Figure 8. Annual grouse cooperators survey grouse flushes/hour in the Southeast Region of Pennsylvania, 1980–2014.