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Title: 2023 State Park Deer Management Hunt Results
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Abstract: The year 2023 marked the 30th anniversary of deer management hunts in Indiana State Parks. The first management hunt was held in 1993 as an effort to mitigate damage to vegetation and unique habitat by an overpopulation of white-tailed deer (*Odocoileus virginianus*) in Brown County State Park. Multiple parks have hosted deer management hunts annually since 1995 and have included up to 21 parks and one natural area. The decision to start management hunts at individual parks has been based on scientific vegetation monitoring. Decisions to continue management hunts at individual parks are made annually using harvest data and consideration of occurrences of rare, threatened, and endangered flora that could be affected by excessive browsing by deer. In 2023, 4,583 hunter efforts were used to assist 16 parks, 1 natural area, and 1 recreation area. The result was a harvest of 1,500 deer. Two new properties were added in 2023, O'Bannon Woods State Park and Raccoon State Recreation Area, and held successful hunts with high harvest rates. Daily standby drawings were held at several parks. Such drawings are conducted from time to time to reduce the impact of originally drawn hunters not showing up or not returning on the second day of each hunt. The 2023 harvest yielded a mean harvest per effort of 0.35, which is above the program target of 0.22-0.20.

Introduction

White-tailed deer (*Odocoileus virginianus*) have thrived in Indiana State Parks since they were reintroduced to Indiana in the middle 20th century. Mild winters, absence of once-present natural predators, and a decades-long lack of human hunting within protected state park boundaries resulted in excessive browsing by deer that compromised the overall composition, structure, and function of most natural communities throughout the state park system. Browse lines and small, malnourished deer were a common sight at most state park properties by the late 1980s.

The first deer management hunt was held in 1993, with 466 hunters harvesting 392 deer. Since 1995, as many as 21 parks, 22 if including Cave River Valley Natural Area (CRV), have held management hunts in the same year (Table 1.). The decision to start management hunts at any one park has been supported by data from monitoring particular herbaceous species at individual parks. Once parks begin management hunts, harvest data are incorporated into annual decisions regarding habitat recovery and whether specific parks require a management hunt the next year. Research indicates that vegetation and habitat begin to recover from overbrowsing at a property once a rate of firearm harvest per effort (H/E) lowers to 0.22-0.20 and/or harvest per square mile (H/Mi^2.) is between 12 and 16 deer. Hunters are drawn for each park to fit a density of one hunter per 15-20 acres. Parks where archery is regularly used (Clifty Falls, Fort Harrison, and

Trine SRA) due to urban interface or size, have a H/E target of 0.10-0.08 and one hunter per 7-10 acres. Participants have been allowed to take up to three deer each (up to one of which could be antlered). These deer are in addition to regular statewide bag limits.

Table 1. Number of State Parks and Deer Harvest 1993-2023

Year	Number of Parks	Total Deer
1993	1	**392**
1994	0	**0**
1995	5	**1,422**
1996	7	**2,027**
1997	9	**2,430**
1998	10	**1,735**
1999	10	**1,599**
2000	15	**1,697**
2001	13	**1,483**
2002	14	**1,609**
2003	20	**2,121**
2004	15	**1,253**
2005	16	**1,336**
2006	17	**2,213**
2007	18	**1,300**
2008	17	**1,468**
2009	17	**1,334**
2010	16	**1,689**
2011	22	**1,546**
2012	14	**1,292**
2013	22	**1,763**
2014	19	**1,004**
2015	14	**806**
2016	18	**1,219**
2017	18	**1,158**
2018	19	**1,302**
2019	17	**775**
2020	17	**1,243**
2021	17	**943**
2022	18	**1,322**
2023	18	**1,500**
Total Deer:		**42,981**

2023 Summary

Eighteen state parks (including one recreation area and on natural area) required deer management hunts in 2023. The first two-day hunt was held Nov. 14 and 15 and the second was held Nov. 28 and 29. A total of 1,500 deer were harvested with 4,583 hunter efforts across two, two-day hunts. This was the highest overall harvest number since 2013. The mean 2023 H/E was 0.35, which is a substantial increase over the 2022 H/E of 0.27.

Nov. 14 and 15 saw mild, warm weather throughout much of the state, with temperature highs in the 60s and some wind. Skies were largely sunny and clear. Overnight low temperatures were in the 30s in many locations. Nov. 28 and 29 were much colder, with highs in the upper 20s to 30s and lows in the upper teens to low 20s. Many areas saw light snow and strong winds. Skies were overcast in many areas.

Weather during the first hunt period was generally favorable, despite the unseasonably warm temperatures, and was not considered a limiting factor. Weather during the second hunting period saw more extreme cold due to the combination of low temperatures and high winds, resulting in some hunters leaving the fields early. This may have contributed to lower harvest rates during the second hunt period in some areas. However, weather impacts are specific to each location and generalizations about their influence on the hunt have limited utility.

The mean no-show rate was 41.3%. This is less than the current five-year mean no-show rate of 46.0%. This percentage represents the number of total hunters who participated in the hunt compared to the total number of hunters who were drawn to hunt.

The H/E data for 2023 were considerably higher than results from recent years. The data for H/E were relatively stable from 2007 to 2022, compared to the gradual decline from prior years. The 2023 mean H/E of 0.35 was a large increase over the 2022 mean H/E of 0.27 and was the highest since 2006 (Figure 1). The five-year mean H/E was 0.27, or slightly greater than the target. Only 1 firearms property fell at or below the

target H/E threshold after the 2023 hunts and will likely not require a hunt in 2024. Both archery properties were above target harvest rates. These parks will likely continue to require annual hunts for some time. It is not clear exactly why the H/E data were so much higher for 2023. Two new properties were added to the hunts in 2023 (see below), which experienced high harvest rates due to a lack of hunting in prior years. While these high H/E levels contributed to the increase in the mean H/E, they alone do not explain the increase. After removing these properties from the harvest data, the mean H/E is 0.31, which is still much higher than recent hunt years and the highest since 2012. Factors such as weather conditions, EHD outbreaks (or lack thereof), and changing statewide deer harvest limits are all possible factors that may influence harvest levels within the parks. Future hunts will continue to take into consideration fluctuating harvest levels.

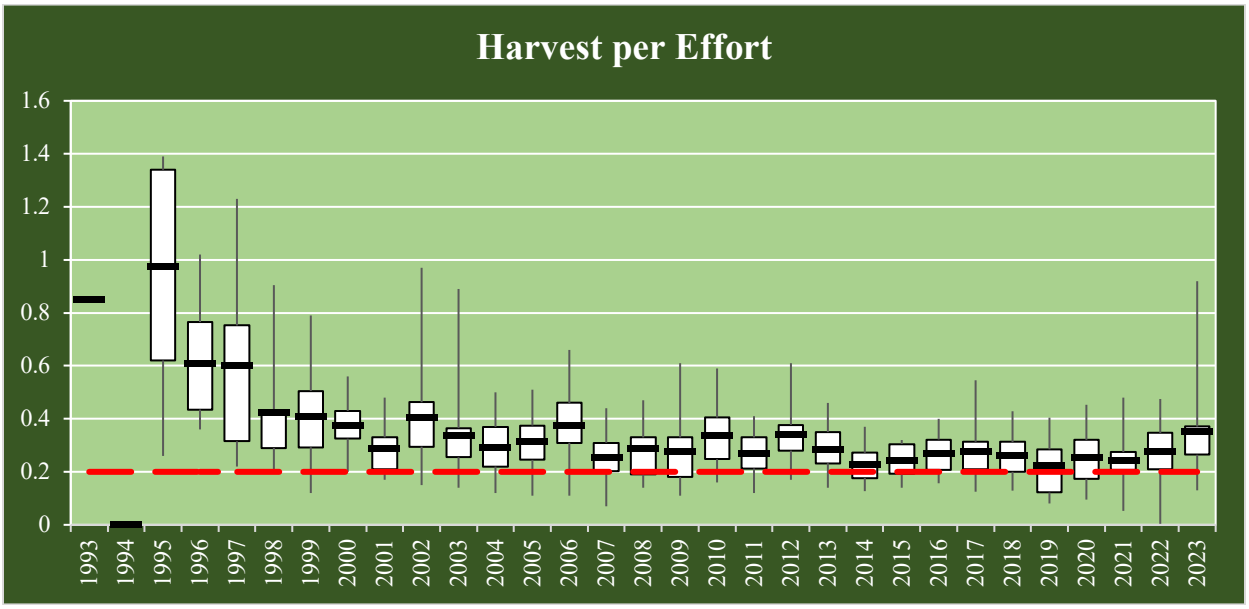

Figure 1. 1993-2023 Harvest per Effort. The center black bar indicates the mean H/E for each year. The white box indicates the first and third quartile. The whiskers (vertical black lines) represent the minimum and maximum H/E for each year. The red dashed line highlights the target of 0.20 H/E for firearms properties. Only one property was hunted in 1993, and no properties were hunted in 1994.

The trend for H/Mi.^{2} is similar to that of H/E. The data for H/Mi.^{2} also support 2023 being a standout year in terms of high harvest rates. The 2023 mean H/Mi.^{2} increased from 19.8 in 2022 to 27.5 this year (Figure 2), which is the highest since 2006. Excluding data from newly added properties, the mean H/Mi.^{2} is 25.3, which would be the highest since 2012. The five-year mean H/Mi.^{2} is 19.8. Two firearms properties fell at or below the target H/Mi.^{2} threshold after the 2023 hunts. One archery property fell below target H/Mi.^{2} rates.

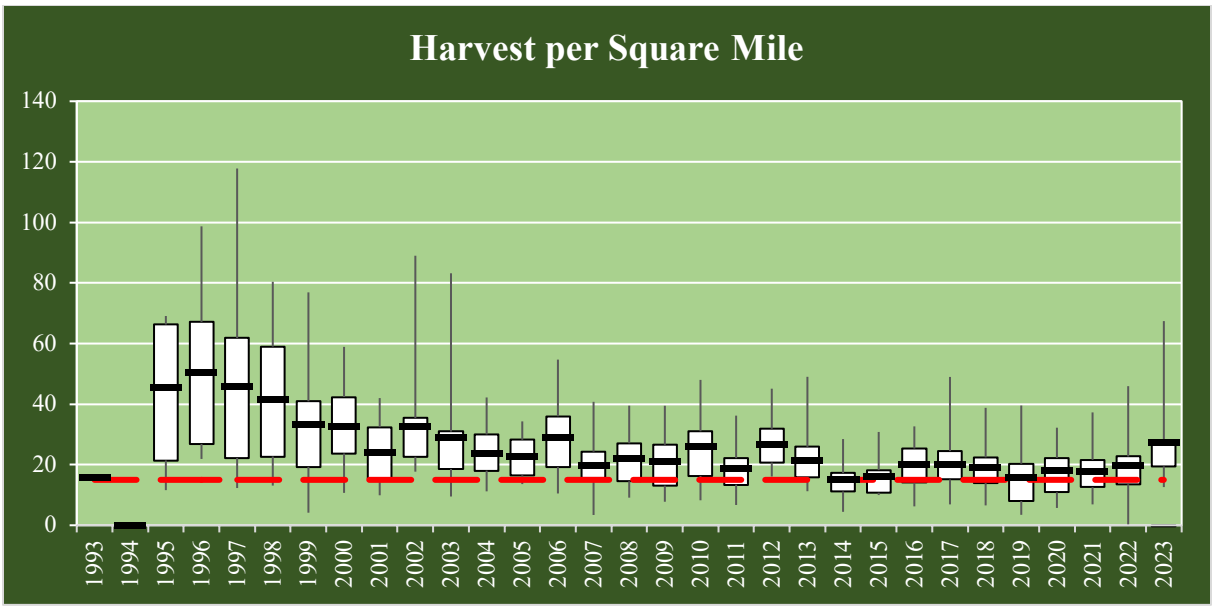

Figure 2. 1993-2023 Harvest per Square Mile. The center black bar indicates the mean H/Mi.^{2} for each year. The white box indicates the first and third quartile. The whiskers (vertical black lines) represent the minimum and maximum H/Mi.^{2} for each year. The red dashed line highlights the target of 15 H/Mi.^{2} level for firearms properties. Only one property was hunted in 1993, and no properties were hunted in 1994.

New Properties

The management hunts in 2023 saw in addition of Raccoon State Recreation Area (Raccoon SRA), a unit within Cecil M. Harden Lake, and O'Bannon Woods State Park. While Cecil M. Harden Lake offers open hunting opportunities through normal, statewide deer hunting regulations, Raccoon SRA is normally a safety zone that is off-limits to hunting. This area contains a substantial amount of forest and offers a refuge for deer from normal hunting pressure.

O'Bannon Woods State Park was formerly known as Wyandotte Woods State Recreation Area and was managed as a sub-unit of Harrison-Crawford State Forest. Since becoming a state park in 2004, the property has not hosted deer hunting opportunities. Although the park is surrounded by the publicly huntable lands of Harrison-Crawford State Forest, the park is large enough that deer hunting outside the boundaries failed to manage the impacts of deer within the park. At both O'Bannon Woods and Raccoon SRA, localized impacts to forest vegetation were apparent in some areas, with tree seedlings and some wildflowers experiencing high browse pressure. The decision was made to include these properties in the 2023 hunts to begin reducing the impacts of overbrowsing.

O'Bannon Woods State Park offers 2,089 huntable acres of its overall 3.47 square miles. Raccoon SRA includes 550 huntable acres of its 0.85 square miles. Hunts at both properties were very successful (see Table 3). O'Bannon Woods saw a H/E of 0.40 and a H/Mi.^{2} of 23.9. Raccoon SRA saw a H/E of 0.92 and a H/Mi.^{2} of 67.1. The higher harvest rate at Racoon SRA is

likely due to the terrain being composed of a peninsula, resulting in deer being exposed to greater harvest pressure. Hunters were also drawn at a greater density at Raccoon SRA, at a rate of 1 hunter per 22 acres compared to 1 hunter per 26 acres at O'Bannon Woods. Relatively conservative hunter densities were utilized for these inaugural hunts. Future hunts will likely use hunter densities closer to 1 hunter per 20 acres to better saturate the areas with hunting pressure.

A subset of the deer harvested at these properties were sampled for age estimation. Ages were estimated using tooth replacement and wear criteria. Deer were sampled on the first day of the early hunt (Nov. 14) at O'Bannon Woods State Park and on the first day of the late hunt (Nov. 28) at Raccoon SRA.

A total of 24 deer were sampled at Raccoon SRA, resulting in a mean age of 1.9 years. A total of 45 deer were sampled at O'Bannon Woods, resulting in a mean age of 3.2 years. The females sampled displayed older ages, on average, than the males. Numerous older age class deer were detected during the sampling, which is indicative of a population with minimal hunting mortality. It should be noted that age estimates for deer greater than 6.5 years of age become less confident using tooth replacement and wear criteria. Future testing of sampled teeth via cementum annuli analysis may refine these estimates for older age class deer. Table 2 below provides the summary statistics of the age sampling.

Table 2. 2023 Deer Age Statistics (in years) for One-Day Sampling at Raccoon SRA and O'Bannon Woods SP

	Raccoon State Recreation Area			O'Bannon Woods State Park		
	Both Sexes	Males	Females	Both Sexes	Males	Females
Mean	1.9	0.7	2.6	3.2	2.4	4.2
Median	1.5	0.5	2.5	2.5	2.5	3.5
Mode	0.5	0.5	2.5	0.5	2.5	2.5
Maximum	7.5	1.5	7.5	10.5	5.5	10.5
Number Sampled	24	9	15	45	24	21

Adult Buck Harvest

The mean adult buck harvest has increased steadily since the management hunt program began. The current five-year mean adult buck harvest is 36%. A decade ago (2013) the five-year mean was 34%, which was the approximate beginning of the increasing adult buck ratio trend. The 2023 mean adult buck harvest is 39%, which is slightly greater than the 2022 mean adult buck harvest of 38%. In 2023, 9 parks, or 50% of the properties, harvested more than 40% adult bucks (Figure 3). The current five-year mean for the percentage of parks exceeding a 40% adult buck harvest is 41%. This is greater than the five-year mean from a decade ago (2013) of 27%.

Overall, 2023 showed a slight increase over the last few years in the adult buck percentage, which matches the long-term trend of an increase in selective harvesting of adult bucks. At a few properties, the adult buck harvest consistently exceeds 40% of the total harvest. Such parks may

need to switch into a disincentive model for hunters to help ensure that over-selective hunting is not occurring. Examples include "earn-a-buck" and antler removal by park staff at check stations. One must first harvest an antlerless deer before harvesting an antlered deer within the "earn-a-buck" model.

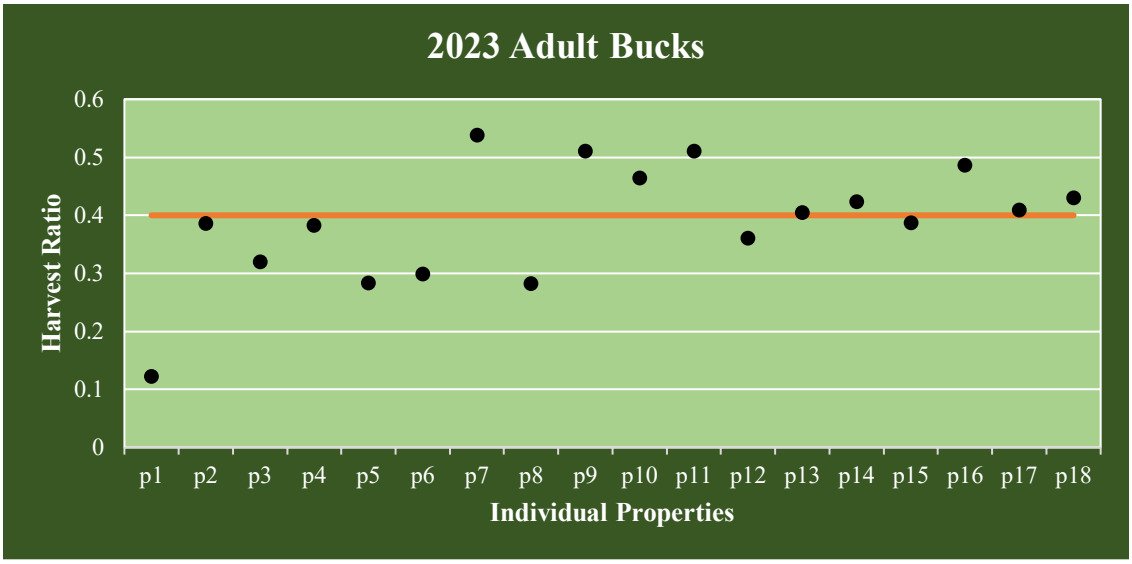

Figure 3. 2023 Adult Buck Harvest Percentage. Each label (p1-p17) represents one of the 18 properties hunted in 2023. Names are not given as to avoid encouraging selective harvest on these properties. The lowest and highest rates were at properties with very low harvest levels.

Standby Drawing

Standby drawings are sometimes held at parks in an attempt to fill spots left vacant by originally drawn hunters. The objective is to increase hunting pressure on deer. Participating properties are selected based on several factors, but they are generally experiencing no-show rates greater than 50% in recent years. These parks are also laid out in such a way that facilitates an ample staging area for the drawing while providing staff ability to monitor and control potential standby hunters' entry into the park.

Participants in the standby drawing are chosen daily, on-site, and have to meet the same criteria as those originally drawn (Indiana residents or those in possession of a lifetime license for harvesting deer, 18 years of age by the date of the first hunt, and possession of a valid license to hunt deer in Indiana). Given the timing of the hunts and the elevated success rates, parks generally expect no-show rates between 25-30%. The average no-show rate for the first day of each hunt in 2023 was 26%. The overall average no-show rate was 41%. This is below the current five-year average no-show rate of 46%.

Standby drawings were held at several properties in 2023, in parks with historically high no-show rates. Standby hunters at these parks continue to contribute significantly to the harvest total. The success of standby drawings continues to be monitored and explored throughout the park system.

Summary

Though there is year to year variation in harvest per effort, statistics continue to illustrate overall success for the deer management program. The program has performed well at coming close to target harvest levels with 2023 showing overall above average harvest metrics.

Though some parks are more successful than others at achieving a maintenance phase of taking a year off from management hunts every few years, the data have and continue to indicate habitat recovery as well as sustained deer populations. It should be reiterated that park management hunts are not intended to manage populations for optimal recreational hunting. The goal is simply to reduce the impact of browsing to a level that allows some of Indiana's rarest and most distinctive habitat to thrive and benefit multiple species.

Table 3. 2023 Parks Requiring Management and Resulting Harvest

Property	Harvest
Cave River Valley	**13**
Chain O'Lakes	**97**
Clifty Falls	**28**
Fort Harrison	**50**
Harmonie	**147**
Indiana Dunes	**43**
Lincoln	**73**
O'Bannon Woods	**83**
Ouabache	**95**
Prophetstown	**37**
Raccoon	**57**
Shades	**131**
Shakamak	**33**
Spring Mill	**58**
Tippecanoe River	**183**
Turkey Run	**79**
Versailles	**233**
Whitewater Memorial	**60**
Total	**1,500**

As noted in previous reports, browse lines and emaciated deer are no longer a problem in state parks. The extreme overabundance issues of the 1990s have been corrected. However, less-obvious damage persists throughout the parks as a legacy of decades of chronic deer herbivory. In some areas, unpalatable plant species such as pawpaw (*Asimina triloba*) and spicebush (*Lindera benzoin*) are overrepresented in the understory. In addition to competing with other fauna for limited resources within park boundaries, deer continue to affect rare, threatened and endangered flora as well as valuable habitat such as oak forests. Other impacts include compromised understory structure for ground- and shrub-nesting songbirds. Areas with high amounts of deer browse are also more susceptible to colonization by invasive plant species, such as Japanese stiltgrass (*Microstegium vimineum*). Invasive plant species further complicate ecological restoration and have severe negative impacts on wildlife habitat and plant diversity. Ongoing resource management projects will address lingering vegetation issues with mechanical and chemical treatment of target plant species.

The 2023 effort was once again a success in helping reduce and maintain browse effects. Cumulative 2023 harvest numbers are slightly higher than recent trends (Table 3). At the individual park level, most locations experienced relatively high harvests, while one was low enough to warrant removal from the 2024 management hunts.

Although there has been some concern voiced about the potential of overharvesting, it is clear that deer populations are still being sustained within parks. Harvest rates at parks consistently remain well above harvest rates on public properties open to deer hunting, such as reservoirs. Deer hunting continues to be a viable recreational pursuit, year in and year out, in such public hunting areas. A random sampling of harvest data from state reservoir properties on the first and second weekend of regular deer firearms season revealed an average H/E of 0.05. Park properties generally take a year off once the H/E is equal or below 0.20-0.22.

It should be noted that harvest totals alone have limited value in determining the success of a management hunt. Many factors such as park acreage, weather, rate of participation, and other local variables can influence an individual park's harvest from year to year. For this reason, H/E is the primary indicator of success rather than harvest numbers alone.

Pending a new regulatory approval, parks requiring management hunts in 2024 will be listed and applications made available at wildlife.IN.gov/5834.htm along with other DNR reserved hunts.