

Iowa Bow Hunter Observation Survey: 2021 summary

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ABSTRACT Each year, the Iowa Department of Natural Resources (DNR) solicits responses from bow hunters as part of the Bow Hunter Observation Survey conducted from 1 October to early December. The primary objectives of this survey are to 1) collect observations of white-tailed deer which serve as an independent index of regional deer populations across the state, 2) supplement other deer data collected by the DNR, and 3) collect observations of other select species to monitor their long-term population trends. The DNR selects survey participants each year using a two-stage, stratified-random sampling design in which a sample of 9,000 individual bow hunters are selected from the list of all hunters who purchased an archery hunting license in each of the preceding three years. Each participant receives a diary for recording the number of hours hunted during each hunting trip, as well as the number of deer, wild turkey, and select furbearer species seen during each trip. To standardize observations, we estimate the mean number of animals seen per 1,000 hours hunted statewide and by survey region for 12 species. In 2021, we collected responses from 1,726 bow hunters (19% response rate) consisting of 22,300 hunting trips and 74,184 hours of total observation time (3.31, 95% CI = 3.14, 3.47). With the exception of north-central Iowa, the total number of deer observations decreased between 2020 and 2021. However, the 10-year trend for total deer is increasing in all regions except southwest Iowa. Between 2020 and 2021, wild turkey observations increased in all regions except northwest, central, and southeast Iowa. According to 10-year trends, bobcat and opossum observations continue to increase statewide while striped skunk observations are decreasing statewide. Observations for badger, coyote, raccoon, and red fox are mostly stable statewide, and otter observations are increasing across the northern one-third of the state. Data from this survey are extremely valuable in monitoring population trends for harvested species such as white-tailed deer and raccoon and serve as the only index for monitoring population trends for uncommon species such as gray fox.

INTRODUCTION

Reliable long-term indices of wildlife population trends are critical for making informed decisions on management of harvested species such as white-tailed deer (*Odocoileus virginianus*) and bobcat (*Lynx rufus*) and for monitoring the population status of rare species or species of conservation concern such as gray fox (*Urocyon cinereoargenteus*). Data to generate such indices, however, can be logistically challenging to collect at a statewide scale. Hunter observation surveys have been implemented by several natural resource agencies throughout the U.S. as a means for collecting data to successfully monitor population trends for a variety of species, including white-tailed deer (Winchcombe and Ostfeld 2001, Haskell 2011), moose (*Alces alces*; Ericsson and Wallin 1999, Crum et al. 2017), and gray wolf (*Canis lupus*; Rich et al. 2013). These citizen-science surveys provide a wealth of information at broad spatial scales for a small cost relative to other standardized surveys using paid staff. Therefore, hunter observation surveys are an extremely cost-effective approach for obtaining quality data to guide management decisions for both harvested species and species of conservation concern.

In 2004, the Iowa Department of Natural Resources (DNR) implemented the annual Iowa Bow Hunter Observation Survey. Designed in cooperation with Iowa State University, the survey had two primary objectives: 1) to collect observations of white-tailed deer to serve as an independent supplement to other deer indices used by the DNR, and 2) to develop a database of long-term observations for other select species to monitor trends in relative abundance. Since the development of the Iowa survey, several other Midwest states have implemented similar surveys, including Illinois (Bluett 2013), Indiana, Missouri, Minnesota (Norton et al. 2017), Ohio (Ohio DNR 2015), and Wisconsin (Rees Lohr 2017). Bow hunters are ideal for

collecting wildlife observational data because they typically employ stationary hunting methods (e.g., camouflage, scent masks, etc.) from a ground blind or tree stand which is conducive to observing wildlife in an undisturbed state. Additionally, many bow hunters have access to privately-owned lands that may not be accessible by paid staff, which increases the coverage area of the survey. Furthermore, the archery season in Iowa (October 1 to early December and mid-December to January 10) is longer than any other deer hunting season and, as a result, bow hunters often spend more time in the field than other types of hunters. This allows for collection of repeated observations that can be used for a variety of purposes related to monitoring both short- and long-term wildlife population trends.

The purpose of this report is to summarize results from the 2021 survey and relative abundance trends of surveyed species for the past 10 years.

STUDY AREA

The Iowa Bow Hunter Observation Survey was conducted statewide and administered to participants in each of nine regions in Iowa (Figure 1).

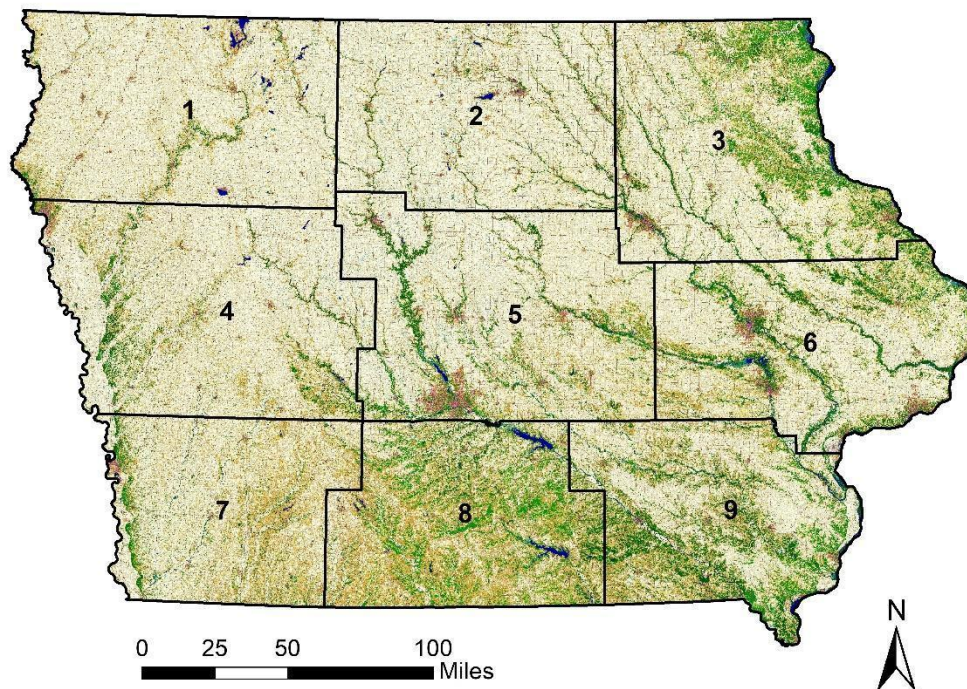


Figure 1. Survey regions in Iowa used for distributing the Iowa Bow Hunter Observation Survey, 2021.

METHODS

We selected survey participants using a two-stage, stratified random sampling design (Figure 2). The first stage of the sampling process involved selecting a list of bow hunters that 1) indicated interest in participating on a pre-survey sent to all avid Iowa bow hunters in 2021 (i.e., individuals who purchased an archery hunting license in Iowa for each of the past three years) or 2) responded to the survey in one of the last two years (“core” sample; Figure 2). The core sample is refreshed every three years to maintain a consistent response rate and was refreshed prior to the 2021 survey. For the second sampling stage, we selected individuals from a list of bow hunters who were not on either of the aforementioned lists as a “supplemental” sample (Figure 2). We selected a total of 999 individuals from the combined core and supplemental samples for each of the nine climate regions in Iowa (Figure 1) which resulted in approximately 91 survey participants selected for each of Iowa’s 99 counties. Our final statewide sample size was 8,991, which is approximately 15% of the population of all archery hunters in recent years ($N = \sim 60,000$ individual hunters annually).

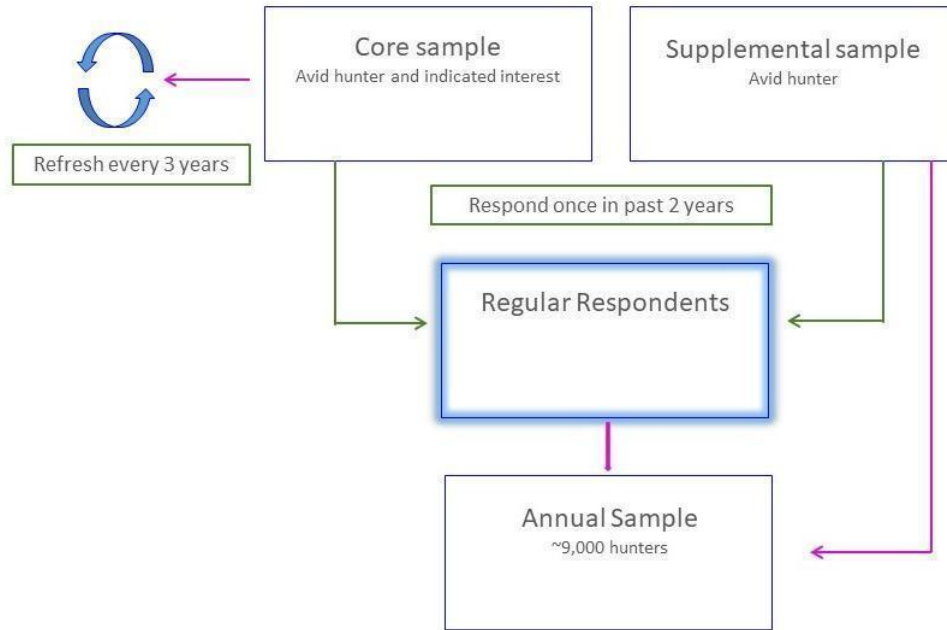


Figure 2. Sampling process schematic for Iowa Bow Hunter Observation Survey, 2021.

The survey consisted of a two-page diary in which hunters were asked to record the four counties in which they most frequently hunted, and subsequently the date, county (one of the four already listed above), number of hours spent hunting, and the number of individuals of 12 different species observed during each hunting trip (see Appendix for species surveyed). For white-tailed deer, hunters were asked to record the number of antlered (i.e., buck) and antlerless (i.e., doe or fawn) deer observed during each hunting trip, as well as the number of deer in which sex could not be determined (i.e., unknown). We mailed surveys, along with a cover letter explaining the purpose of the survey, to hunters prior to the start of the Iowa archery season on October 1 each year. We did not mail reminder postcards to hunters in 2021 due to mailing constraints. Hunters were asked to return their survey by December 3 or when they were finished hunting, whichever came first.

We standardized observations for each species by 1,000 hours hunted to account for differences in the number of hunting trips taken and number of hours per hunting trip by region of the state. We reported the mean observations per 1,000 hours hunted and 95% confidence intervals (CI) for each species and summarized 10-year trends for each species.

RESULTS

A total of 60 surveys were returned as undeliverable in 2021, therefore, the realized sample size was 8,931. We obtained responses from 1,726 bow hunters statewide for a response rate of 19%. Statewide, participants spent a total of 74,184 hours hunting on 22,300 trips for an average of 3.31 (95% CI = 3.14, 3.47) hours per trip. Participants reported a median of 13 trips during the 64-day hunting season. The number of trips and hours hunted varied by region and ranged from 1,633 trips (5,249 total hours) in northwest Iowa (Region 1) to 3,291 trips (11,045 total hours) in southeast Iowa (Region 9; Appendix).

White-tailed deer was the most frequently observed species with an average of 1,657 (95% CI = 1,474, 1,865) observed per 1,000 hours hunted statewide, which included an average of 492 (95% CI = 437, 547) antlered deer and 1,069 (95% CI = 927, 1,210) antlerless deer observed per 1,000 hours hunted. Total deer observed per 1,000 hours hunted ranged from a low of

1,402 (95% CI = 1,251, 1,554) in east-central Iowa (Region 6) to a high of 2,109 (95% CI = 1,843, 2,375) in north-central Iowa (Region 2). The 10-year trend for total deer, antlered deer, and antlerless deer observations is increasing in all regions except southwest Iowa (decreasing; Region 7; Appendix). Despite increasing 10-year trends in most regions for all deer, observations decreased between 2020 and 2021 in most regions.

Wild turkey (*Meleagris gallopavo*) continue to be the second-most frequently observed species on the survey with an average of 507 birds (95% CI = 370, 645) observed per 1,000 hours hunted statewide. Wild turkey observations ranged from 216 birds (95% CI = 175, 258) per 1,000 hours hunted in southeast Iowa (Region 9) to 814 birds (95% CI = 600, 1,028) per 1,000 hours hunted in north-central Iowa (Region 2). Between 2020 and 2021, wild turkey observations increased in six of nine regions. However, the regional 10-year trends show long-term decreases in wild turkey observations in six of nine regions, mostly in southern and eastern Iowa (Appendix).

Bobcat (*Lynx rufus*) observations are increasing statewide according to the 10-year trends with the most pronounced increases occurring in northwest Iowa (Regions 1; Appendix). Statewide, an average of 4 bobcats (95% CI = 2, 6) were observed per 1,000 hours hunted in 2021, a decrease from 7 (95% CI = 2, 12) observed per 1,000 hours hunted in 2020. Observations of badger (*Taxidea taxus*) are mostly stable statewide according to the 10-year trends with the exception of a declining trend in southwest Iowa (Region 7; Appendix). River otter (*Lontra canadensis*) observations decreased mostly statewide between 2020 and 2021 (Appendix). However, the regional 10-year trends continue to show increasing otter observations in six of nine regions, mostly in northern Iowa (Regions 1-3; Appendix). The 10-year trend across all regions shows a mostly statewide decline in observations of raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*), whereas trends in observations of coyote (*Canis latrans*), opossum (*Didelphis virginiana*), and red fox (*Vulpes vulpes*) are stable to slightly increasing statewide.

DISCUSSION

Total white-tailed deer observations decreased in all regions except north-central Iowa (Region 2; Appendix) between 2020 and 2021 with the most significant decreases observed in west-central, southwest, and south-central Iowa (Regions 4, 7, and 8, respectively; Appendix). Iowa experienced its second-largest outbreak of Epizootic Hemorrhagic Disease (EHD) in 2019 during which 78% of the 1,927 reported mortalities statewide came from south-central Iowa (Region 8; Appendix). Since 2019, mortalities likely due to EHD have continued to be reported throughout west-central and southwest Iowa (Regions 4 and 7, respectively; Appendix). EHD was first discovered in Iowa in 2012 and has since been documented annually in the state, though the severity and spatial extent of the disease has varied drastically. EHD mortality tends to be high in deer, particularly in naive populations (Ruder et al. 2015). Therefore, the virus can significantly reduce local deer populations in years immediately following outbreaks, especially if outbreaks occur repeatedly in the same area. The repeated presence of EHD in west-central, southwest, and south-central Iowa is likely the cause for decreased deer observations in 2021. Despite this decrease, the 10-year trend in total deer observations is increasing in west-central and south-central Iowa (Regions 4 and 8, respectively; Appendix) and only slightly decreasing in southwest Iowa (Region 7; Appendix). The decrease in total deer observations in 2021 coincides with a decrease in deer harvest during 2021 deer hunting seasons (Iowa DNR, unpublished data), another index used to monitor deer population trends in Iowa, and corroborates reports from both hunters and field staff that fewer deer were observed during the fall of 2021.

Wild turkey observations are decreasing in all regions except northwest, north-central, and west-central Iowa (Regions 1, 2, and 4, respectively; Appendix), likely due to decreased fecundity across much of the state. Rolley et al. (1998), using data from Wisconsin, suggested an average poult-to-hen ratio of 2.6 was needed to sustain wild turkey populations. In 2020, poult-to-hen ratios ranged from 1.3 to 2.6 in northwest and southeast Iowa, respectively, and the 5-year average ratio ranged from 1.7 to 2.3 statewide (Iowa DNR 2021). Similar decreasing trends in fecundity have been observed and cited as the primary reason for wild turkey population declines in Missouri (Tyl 2021). In 2020, the Iowa DNR initiated a pilot

research project to monitor movements of female wild turkeys and their broods as well as investigate cause-specific mortality of hens and poults in order to better understand regional turkey population dynamics and declines.

Trends in bobcat observations are stable to mostly increasing statewide despite observations decreasing in nearly every region between 2020 and 2021 (Appendix). These increases are especially pronounced in northwest Iowa as bobcats expand north along the Des Moines, Little and Big Sioux, and other major river systems, and in southeast Iowa as bobcats continue to thrive in suitable habitat. The Iowa DNR intentionally set conservative harvest quotas for bobcats to allow for continued growth and expansion of the population which has occurred in a south to north direction in Iowa. The first modern-day bobcat harvest season began in 2007 in the southern two tiers of counties in Iowa. As the bobcat population expanded northward, additional counties were added to the bobcat harvest zone to include the southernmost four tiers of counties as well as counties adjacent to the Missouri River in western Iowa. Additionally, in 2020 the season limit increased to three bobcats per furharvester for the southern three tiers of counties in Iowa. Bobcat harvest peaked at 980 animals in 2020 (Iowa DNR 2021) and survey data continue to show growth and expansion of the bobcat population in Iowa.

Increasing trends in river otter observations continued in the northern one-third of Iowa (Regions 1-3) but have stabilized elsewhere in the state (Appendix). A total of 853 otters were harvested during the 2020-2021 fur harvest season, the highest total harvest since the harvest season began in 2006 (Iowa DNR 2021). Farm pond nuisance complaints related to otters have increased over the past two years across eastern and southern Iowa (Iowa DNR, unpublished data). Other Midwest states are also experiencing significant increases in river otters following reintroduction, including Illinois (Bluett et al. 2004), Missouri (Mowry et al. 2014), and Ohio (Ellington et al. 2018). Although this survey wasn't originally designed to detect river otters, it remains as one of the only indices (in addition to annual harvest data) available for monitoring population trends of this species statewide.

Raccoon observations decreased in northwest, north-central, and southwest Iowa between 2020 and 2021 (Regions 1, 2, and 7, respectively; Appendix). However, regional 10-year trends in raccoon observations remain mostly stable statewide. Observations of raccoons on the annual spring spotlight survey also remain relatively stable and higher than the long-term average, likely the result of reduced furharvester effort and low pelt prices in recent years (Kaminski et al. 2021). Striped skunk observations decreased notably in seven of nine regions between 2020 and 2021 and regional 10-year trends continue to show a statewide decline (Appendix). Kaminski et al. (2021) also noted a decrease in striped skunk observations in five of nine regions in Iowa on the annual spring spotlight survey, although the long-term trends of striped skunk observations on that survey remain relatively stable statewide. Opossum observations also decreased notably in all regions between 2020 and 2021, though regional 10-year trends are still increasing for this species statewide. Opossum observations decreased in six of nine regions during the annual spring spotlight survey, likely the result of harsh winter conditions in 2021 (Kaminski et al. 2021). Trends in observations of coyotes, red foxes, and gray foxes are highly variable statewide, though observations of coyotes remain more numerous than the other two species (Appendix). Kaminski et al. (2021) documented a 96% increase in red fox observations on the annual spring spotlight survey between 2020 and 2021, while bow hunter observations of red foxes remained relatively stable between 2020 and 2021. The reason for this difference in observations between surveys is unclear and it will be interesting to see if this difference is perpetuated in future years. Gray foxes continue to be rare and likely declining in Iowa according to both survey and harvest data. More research is needed to determine the causative factors for the decline of this once-common species in Iowa.

MANAGEMENT IMPLICATIONS

Effective management of wildlife populations must be based on sound science. This survey provides a consistent, long-term data set for monitoring trends and spatial distribution of Iowa wildlife populations and allows for future modeling and analysis that provide robust metrics to guide harvest management and conservation decisions for some of Iowa's most charismatic species.

ACKNOWLEDGEMENTS

We are extremely grateful for the effort and time of the many Iowa bow hunters who assisted this year with collecting valuable observations to guide wildlife management in Iowa. Thanks also to S. Roberts and W.R. Clark for their thoughtful design of this survey. The survey would not be possible without the help of P. Fritzell, who assisted with survey distribution and data entry.

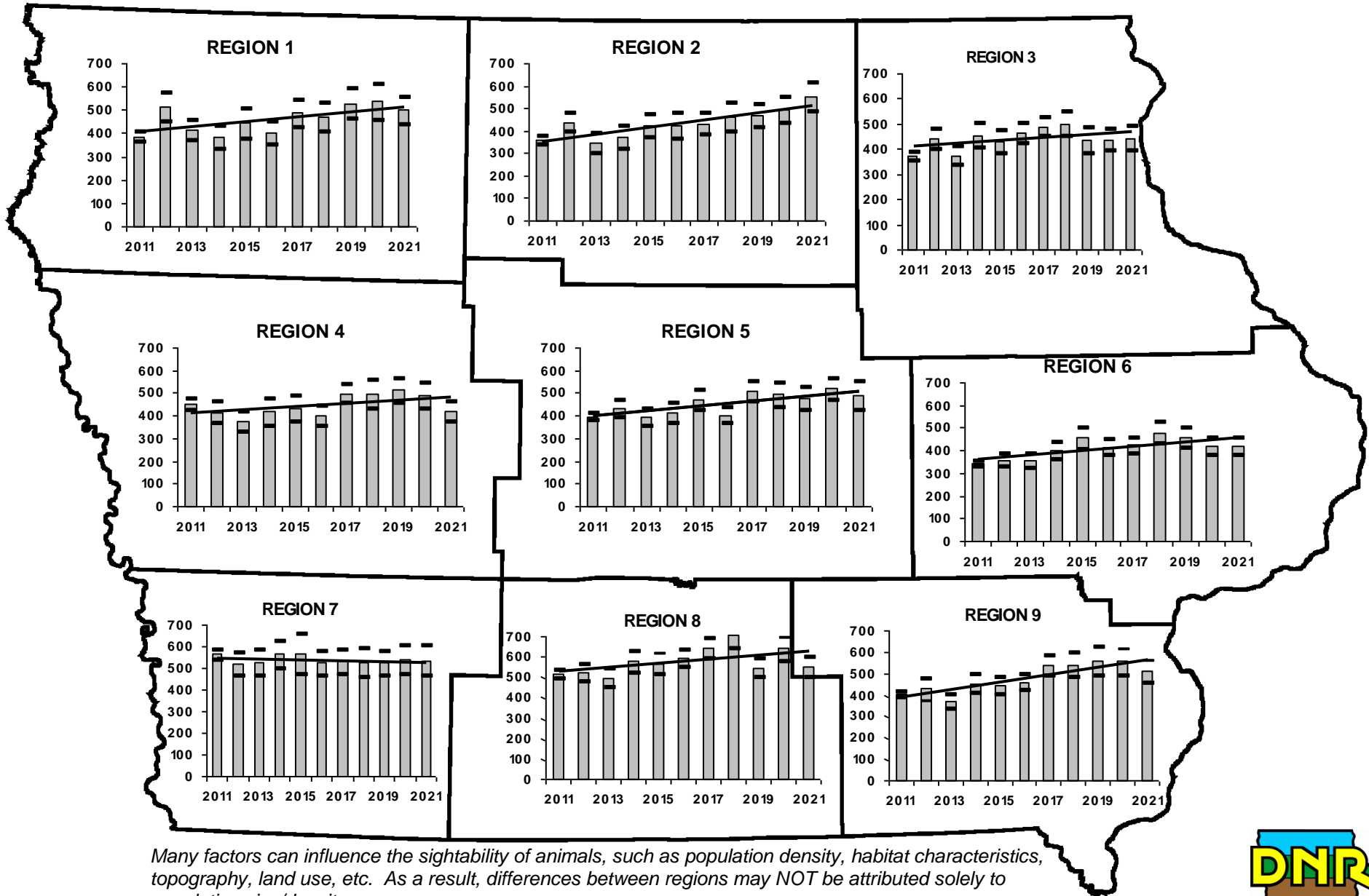
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Appendix: Summary of trips, hours hunted, hours per trip, and species observations per 1,000 hours hunted (95% confidence interval) by region from the Iowa Bow Hunter Observation Survey, 2021.

Antlered Deer Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

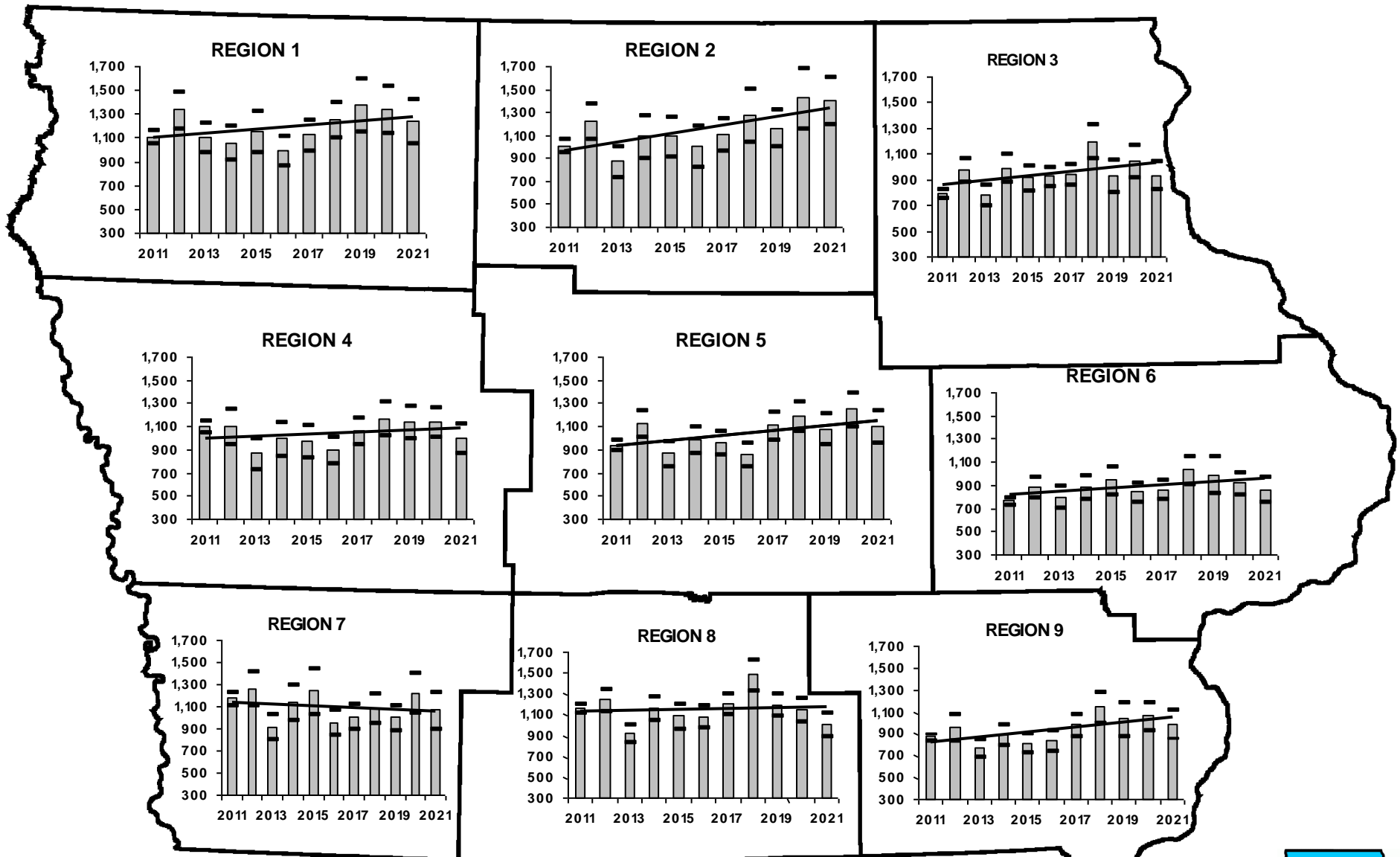


Many factors can influence the sightability of animals, such as population density, habitat characteristics, topography, land use, etc. As a result, differences between regions may NOT be attributed solely to population size/density.



Antlerless Deer Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

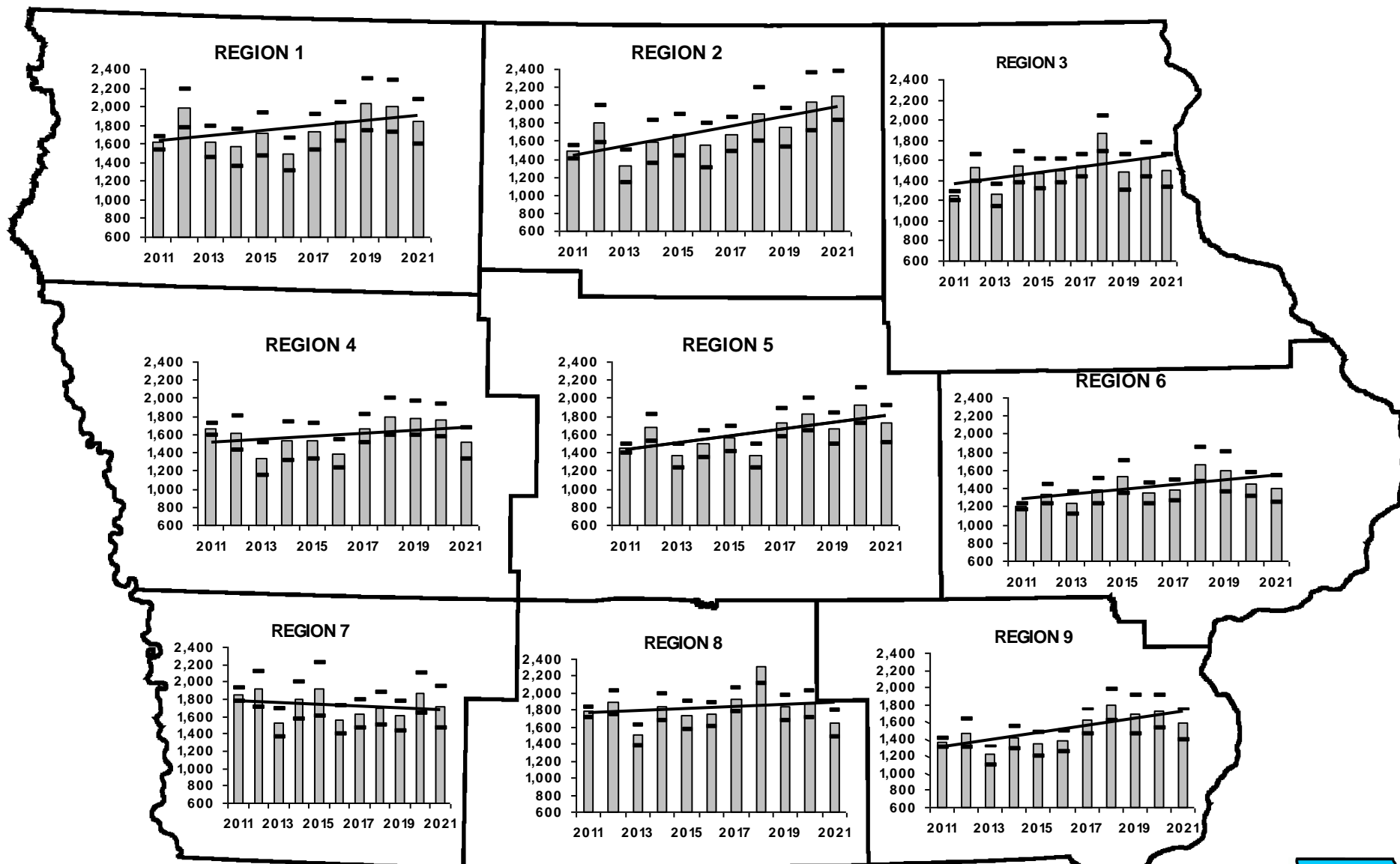


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Total Deer Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

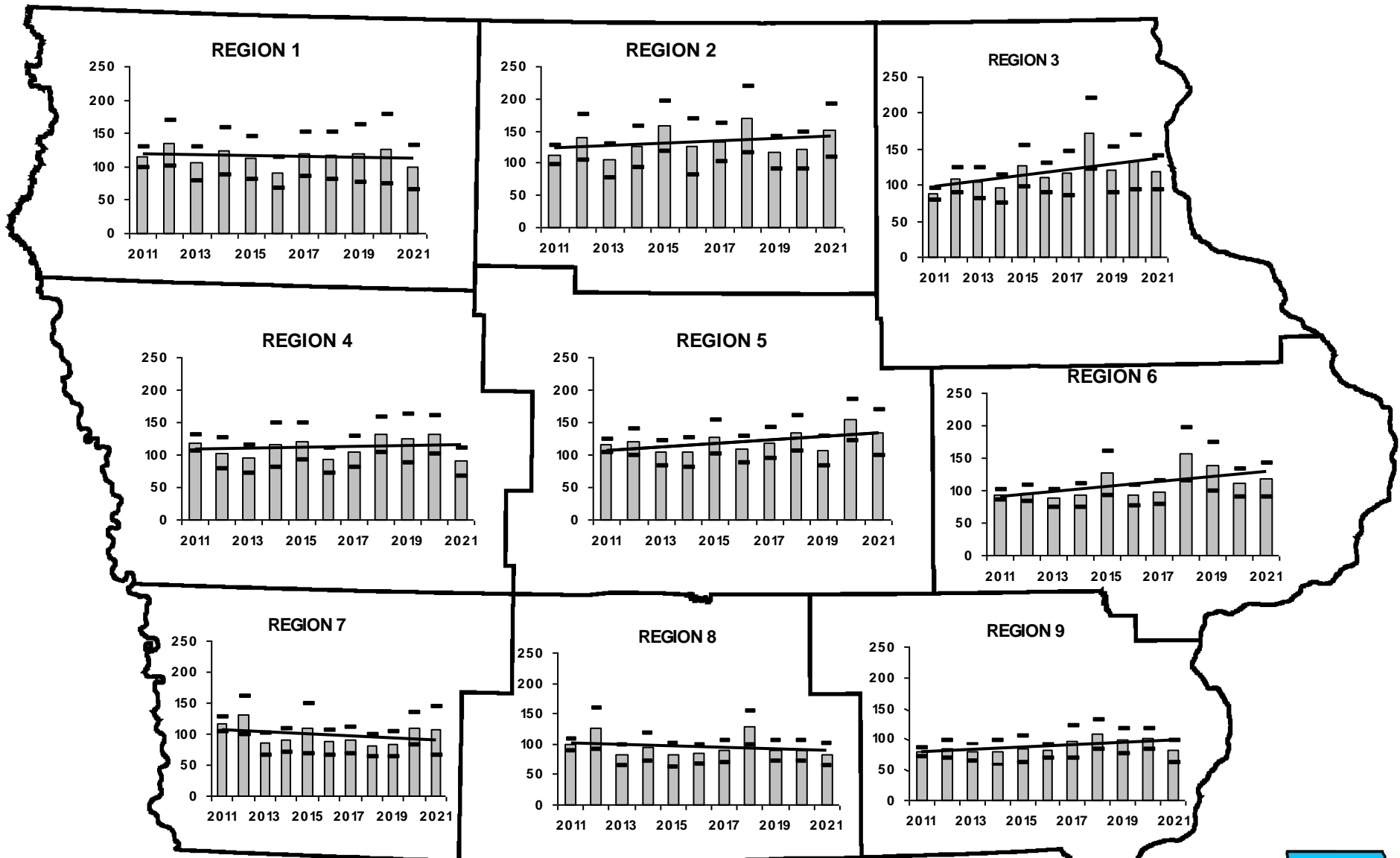


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Unknown Deer Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

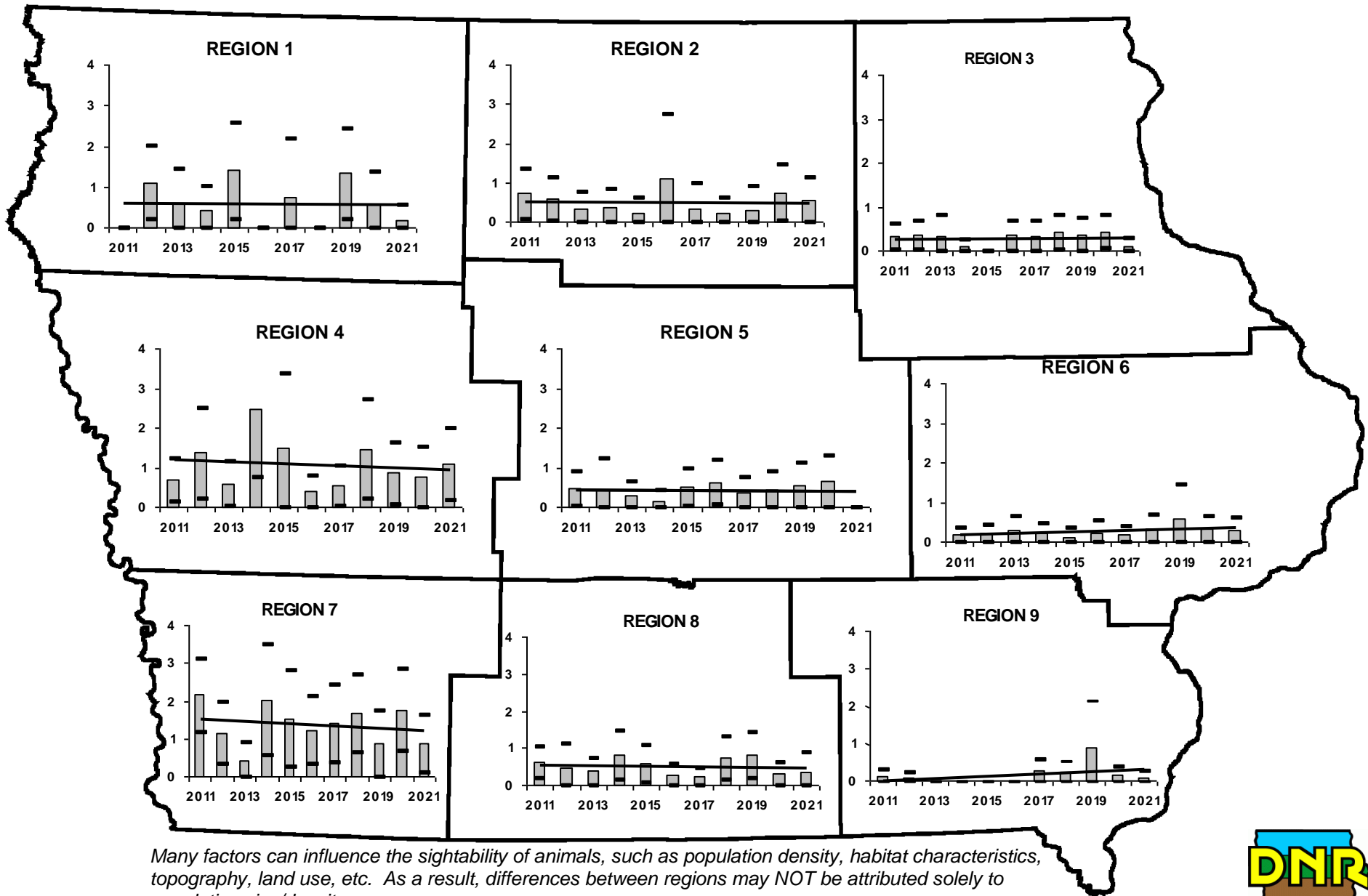


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Badger Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

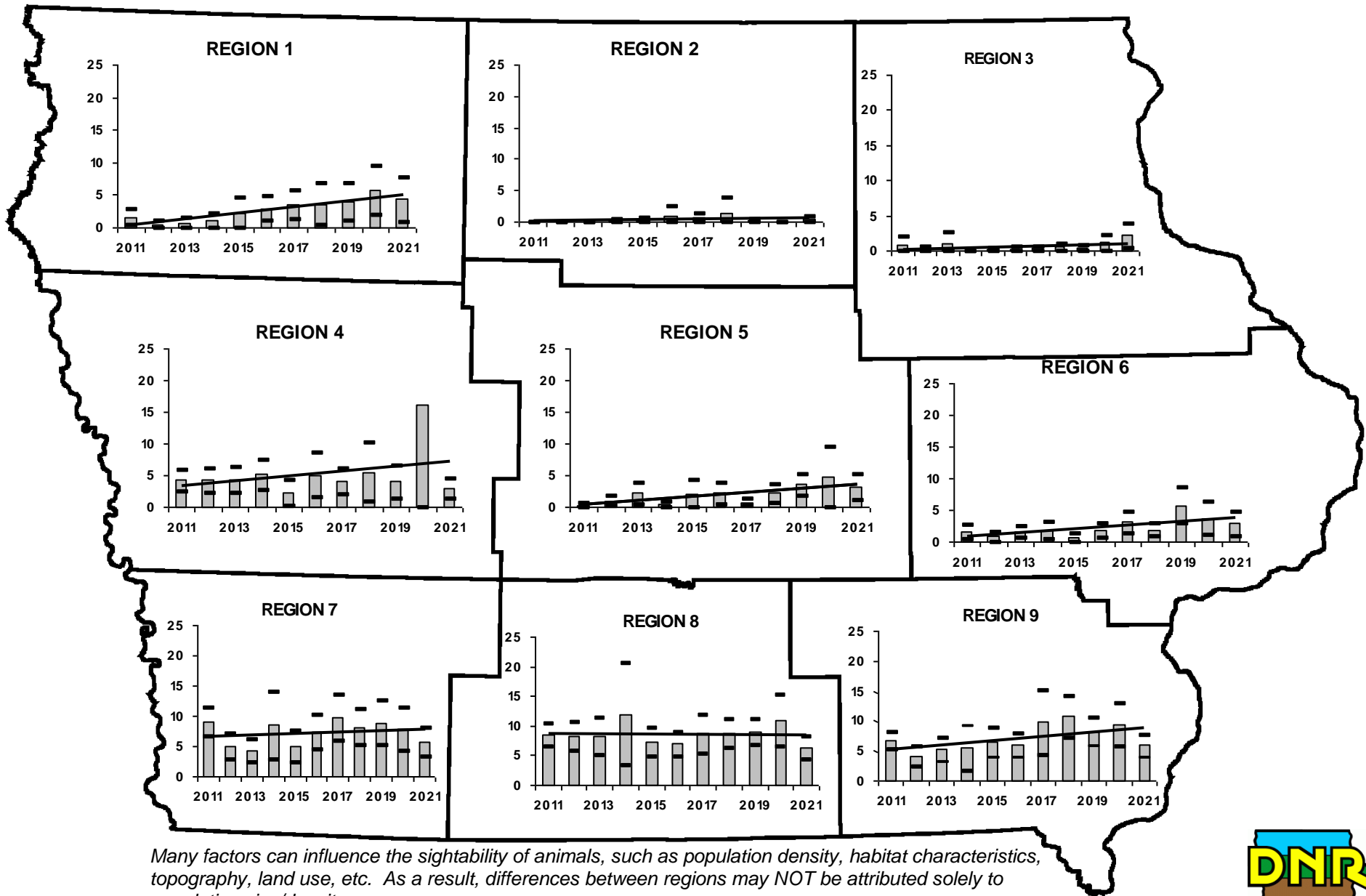


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Bobcat Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

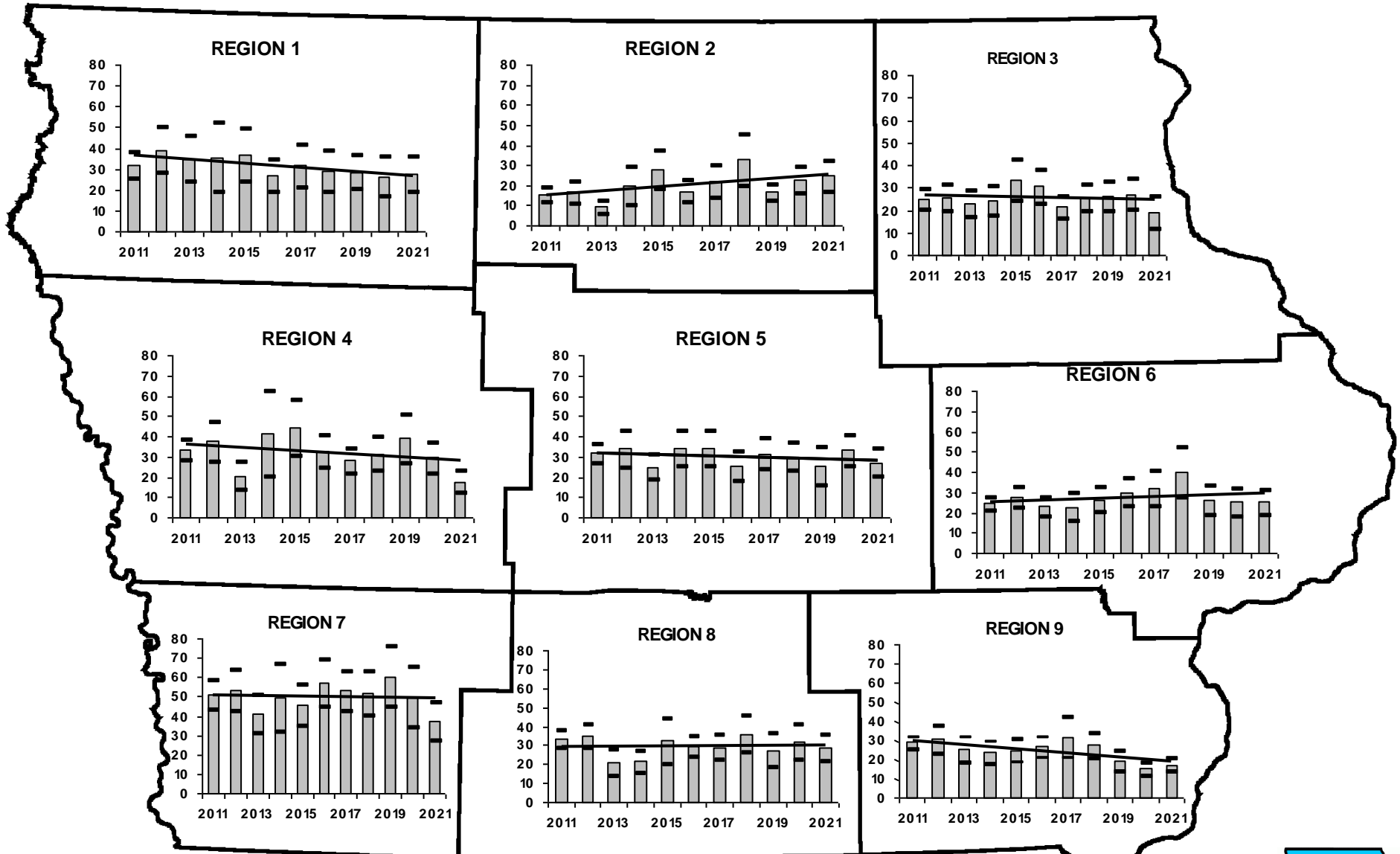


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Coyote Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

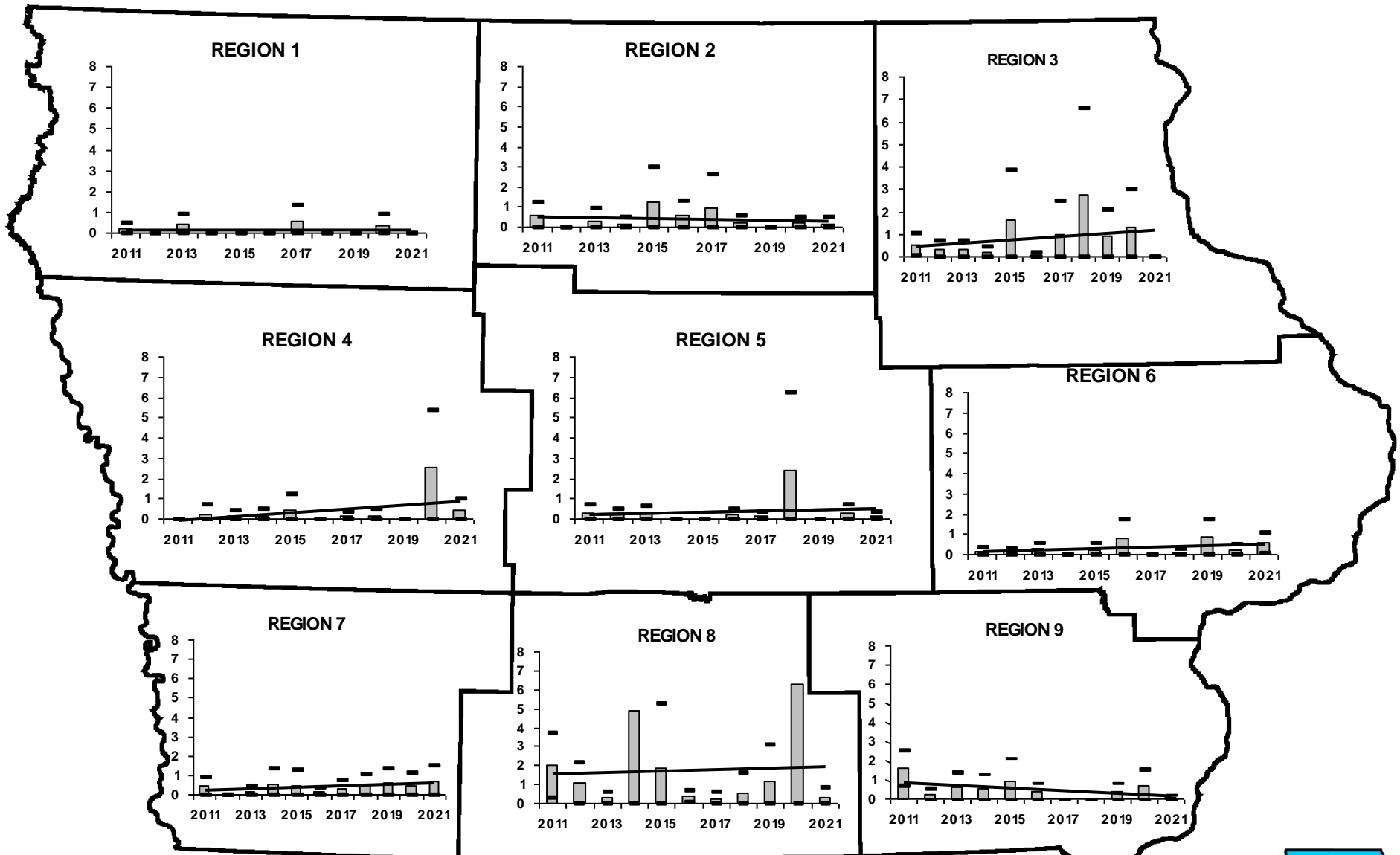


Many factors can influence the sightability of animals, such as population density, habitat characteristics, topography, land use, etc. As a result, differences between regions may NOT be attributed solely to population size/density.



Gray Fox Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

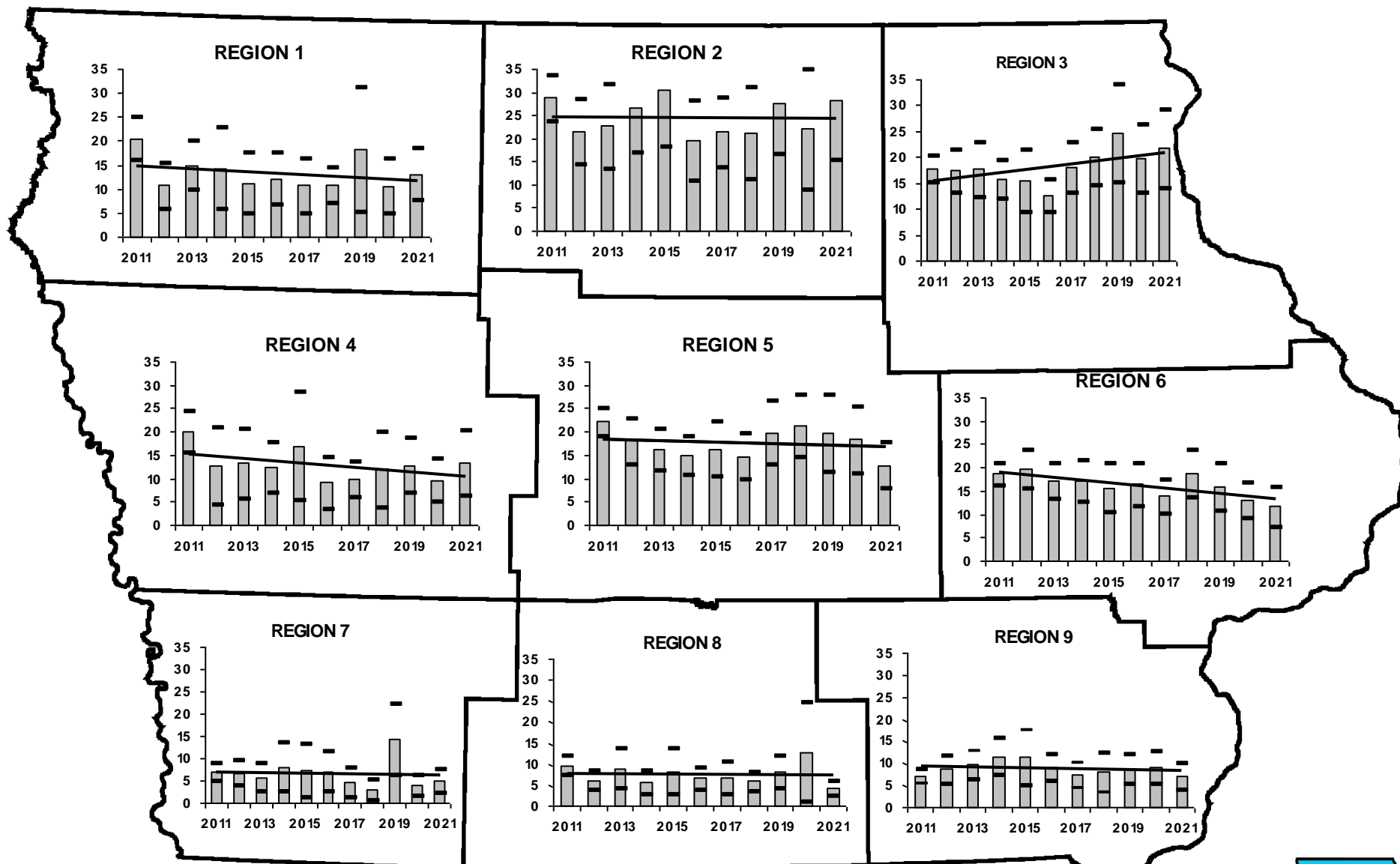


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House Cat Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

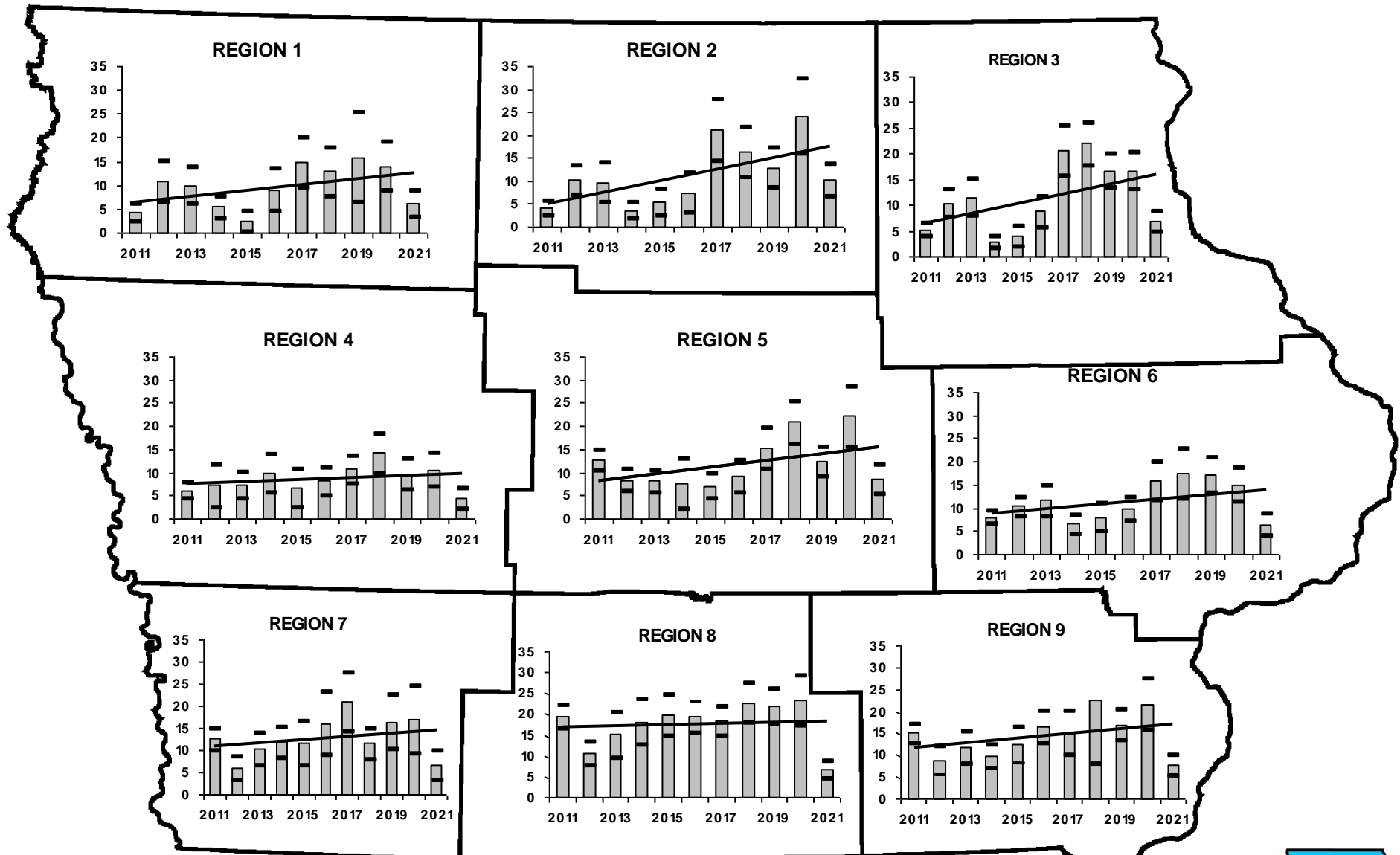


Many factors can influence the sightability of animals, such as population density, habitat characteristics, topography, land use, etc. As a result, differences between regions may NOT be attributed solely to population size/density.



Opossum Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

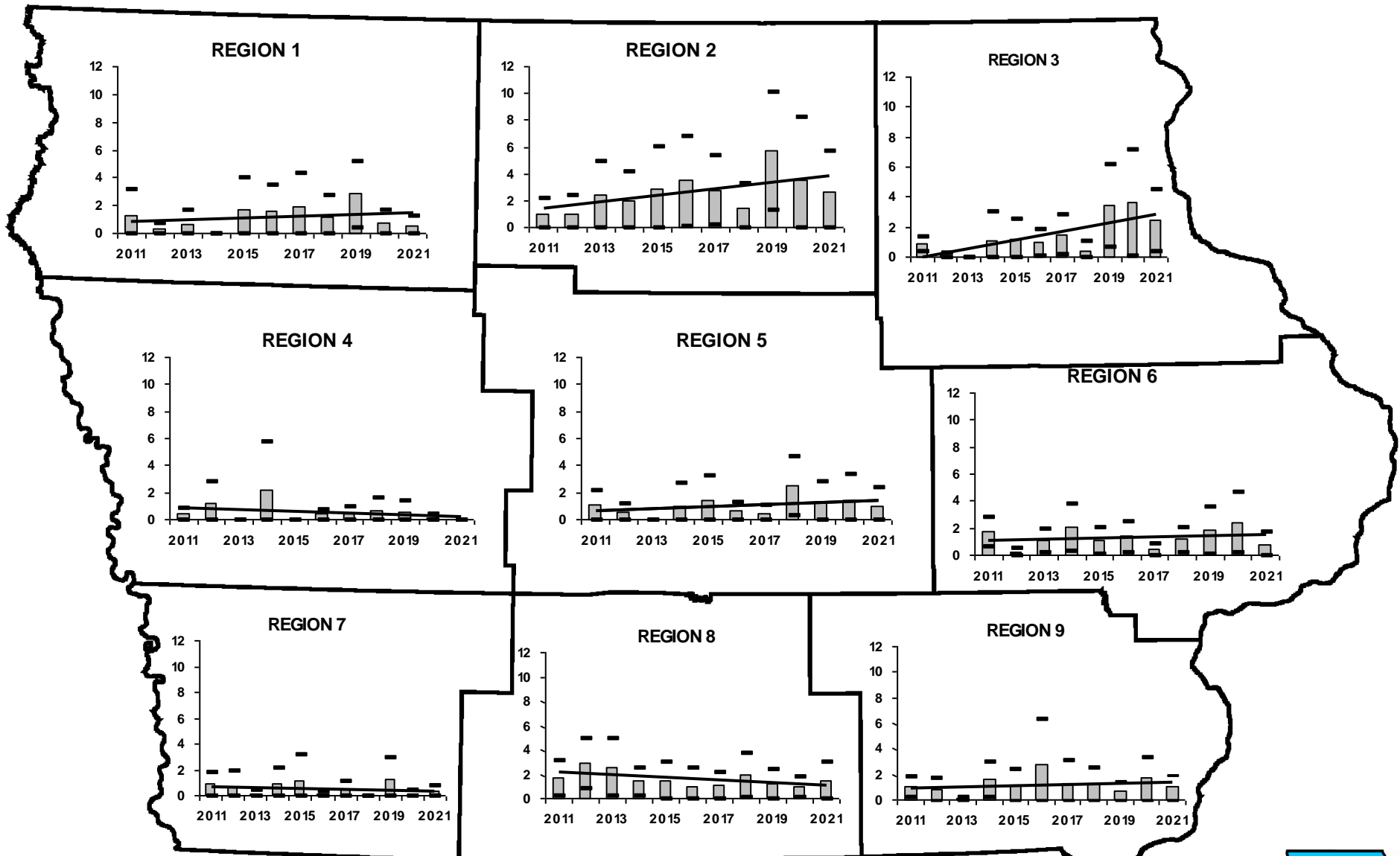


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Otter Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

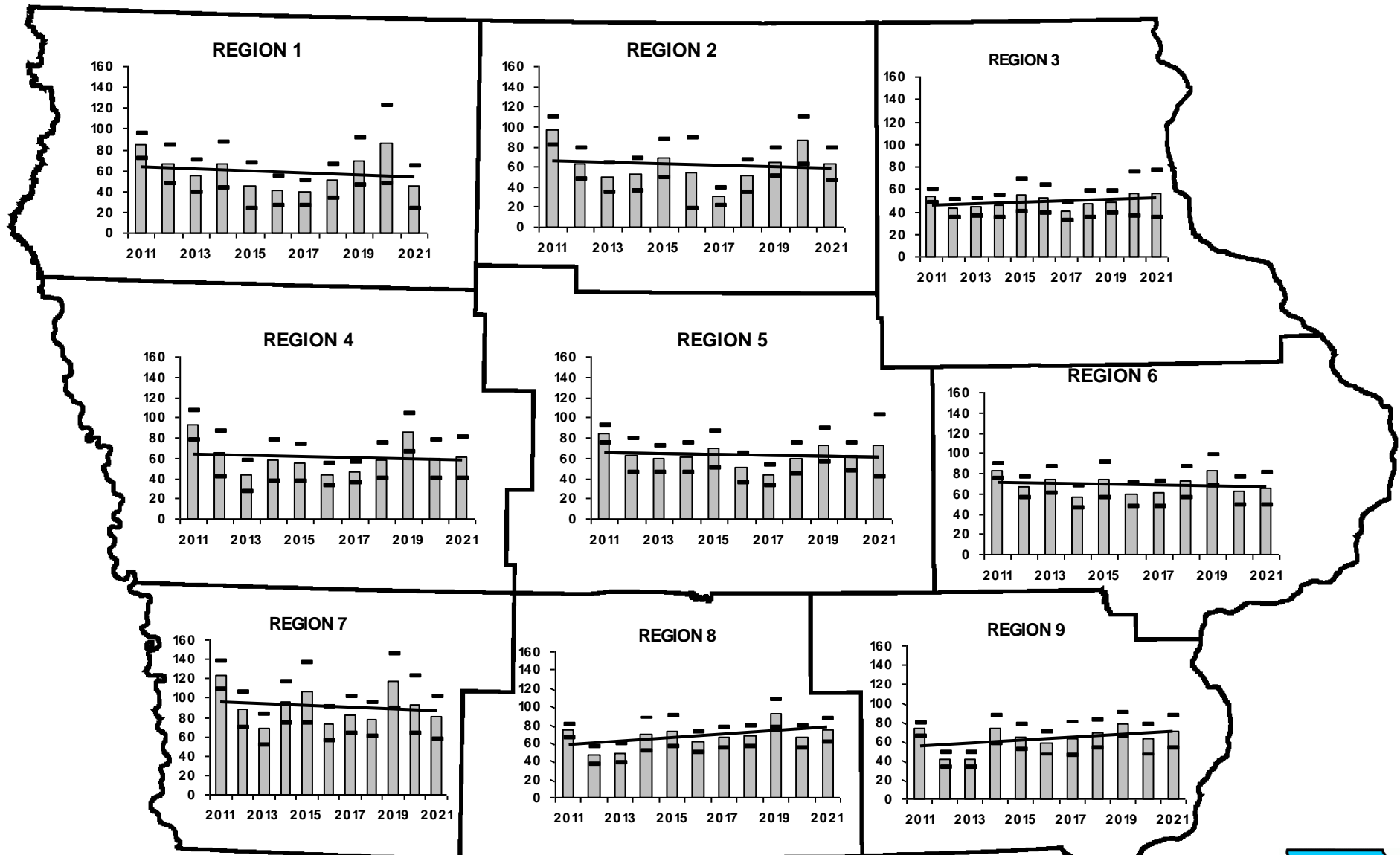


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Raccoon Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

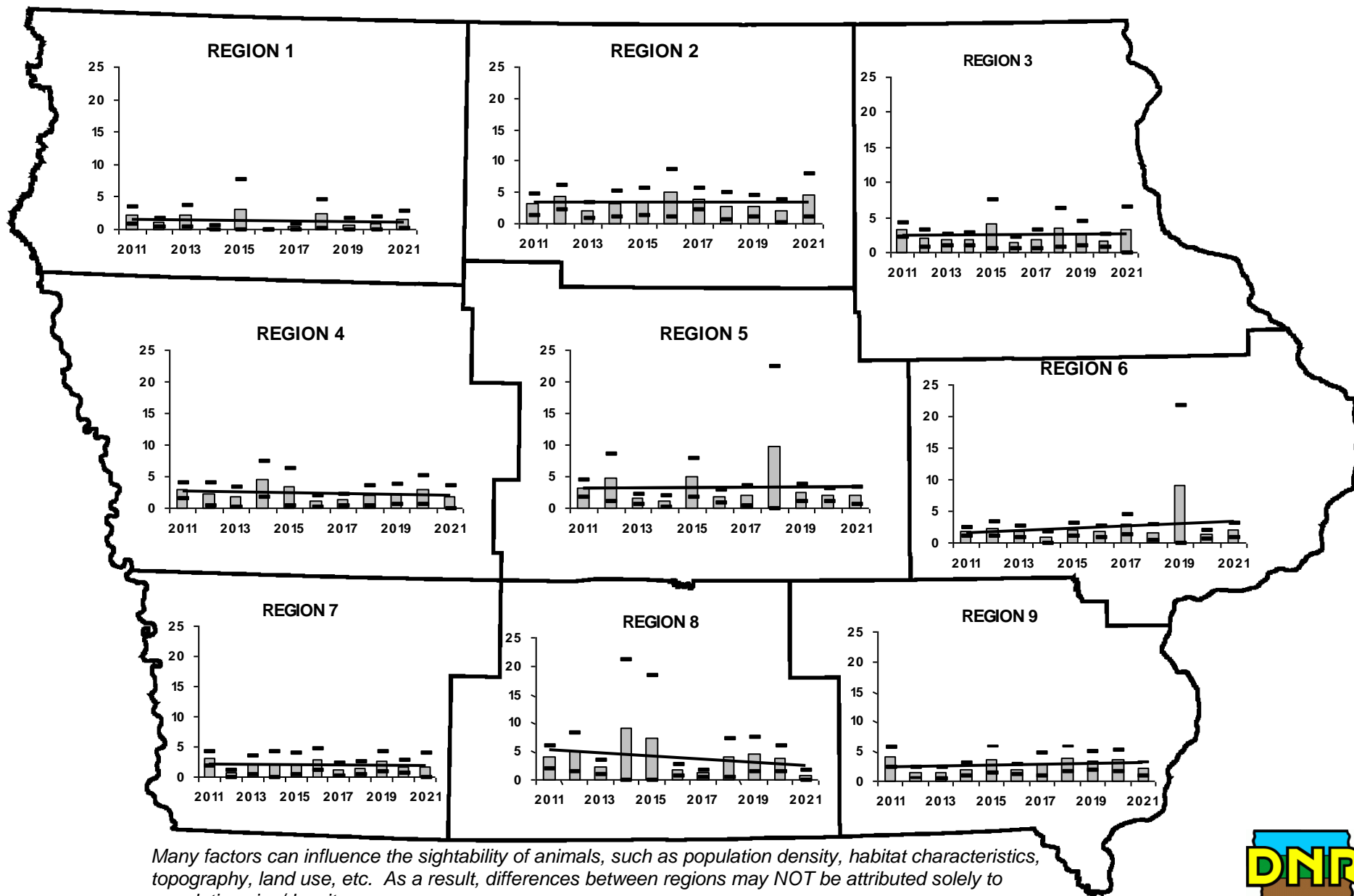


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Red Fox Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

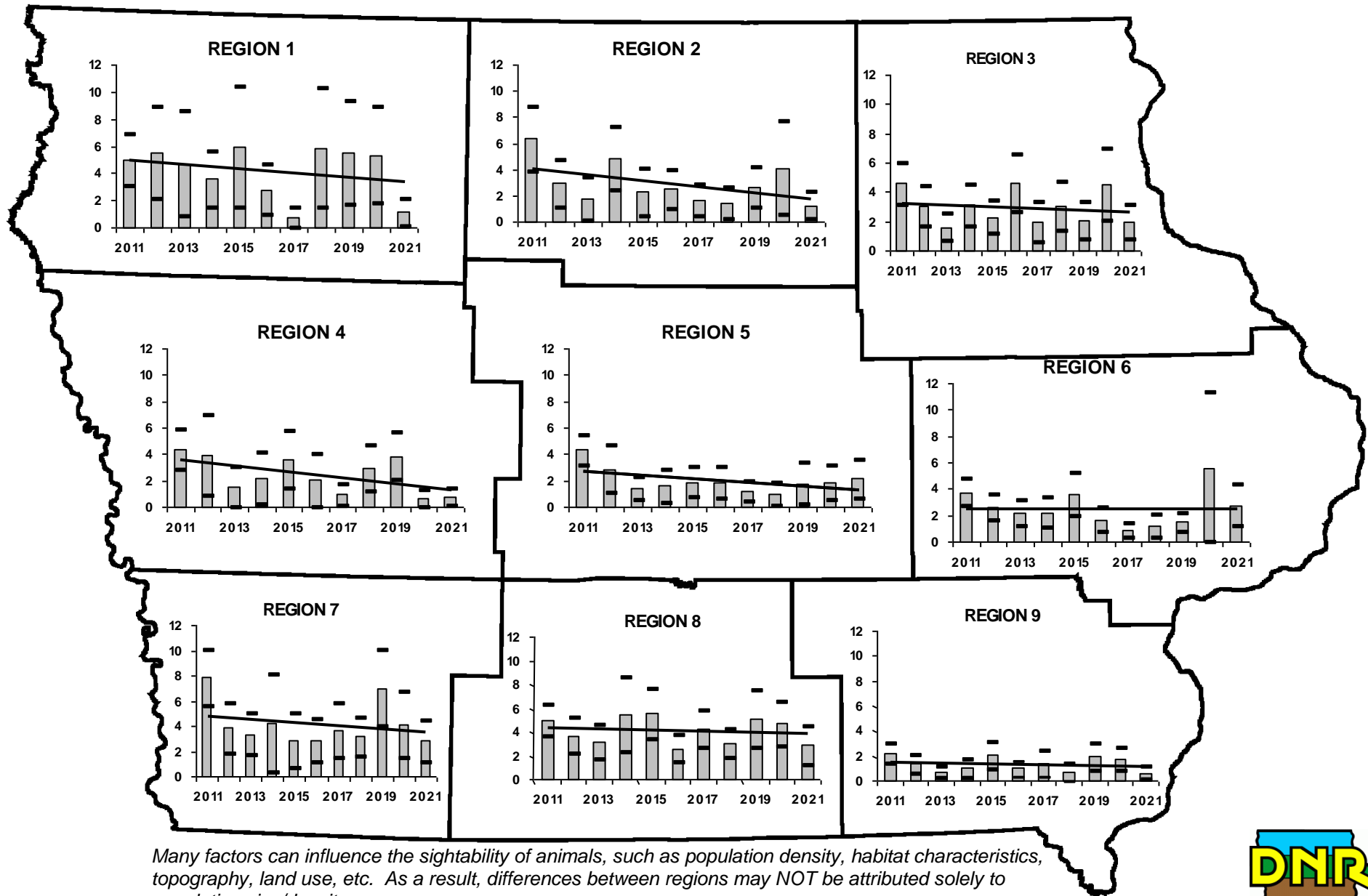


Many factors can influence the sightability of animals, such as population density, habitat characteristics, topography, land use, etc. As a result, differences between regions may NOT be attributed solely to population size/density.



Striped Skunk Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

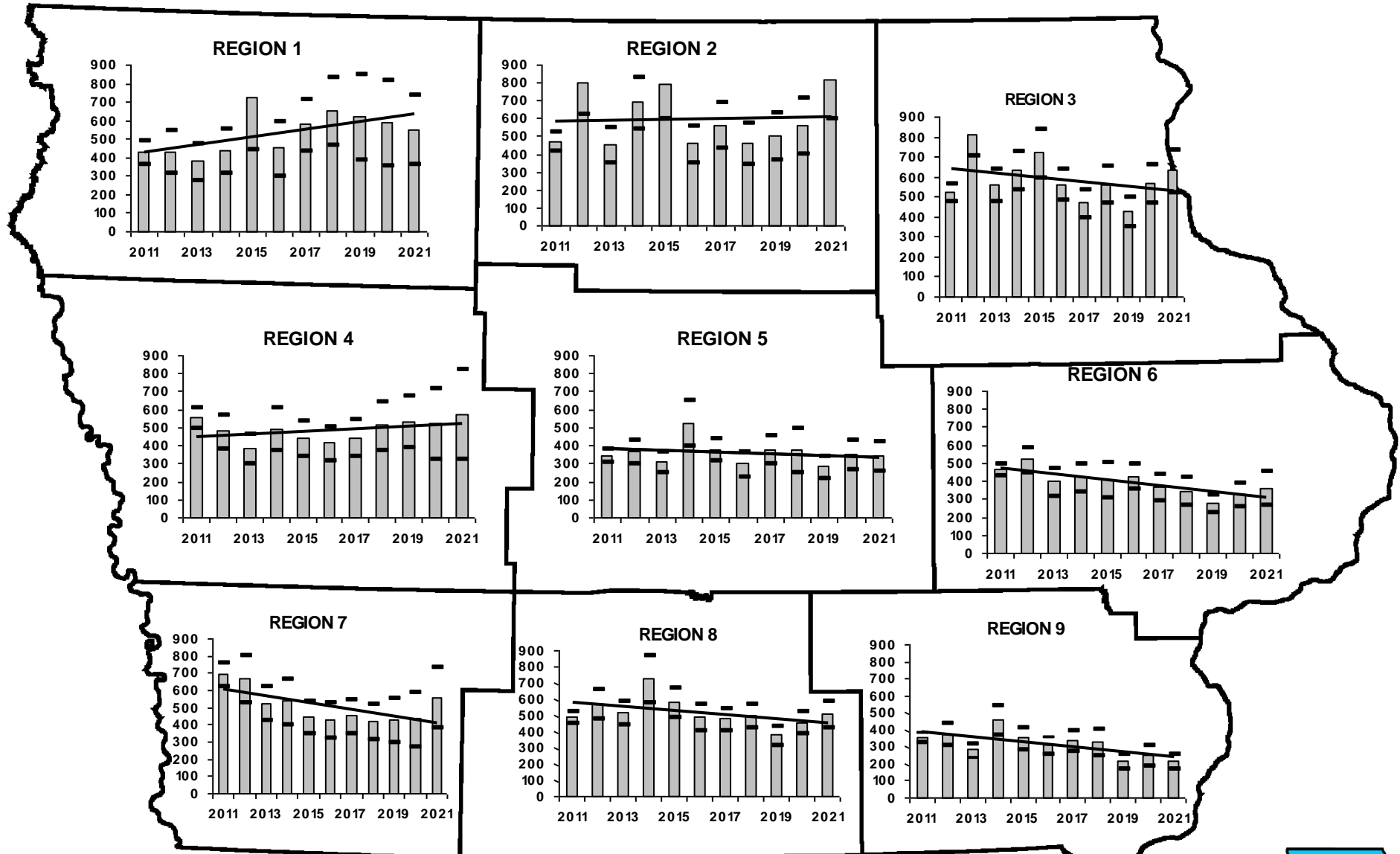


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Wild Turkey Observations Per 1,000 Hours Hunted

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

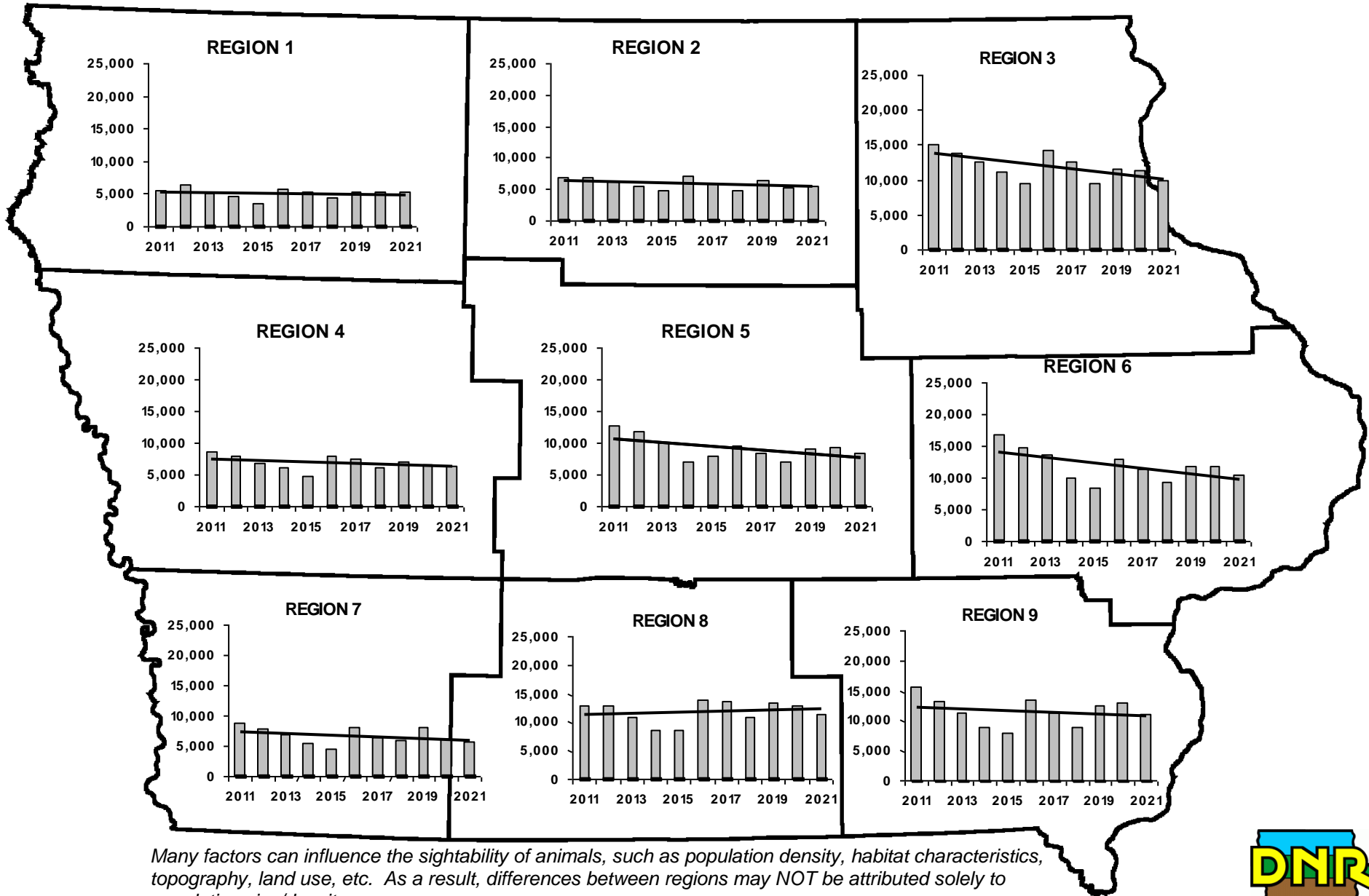


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Hours Hunted by Survey Participants

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

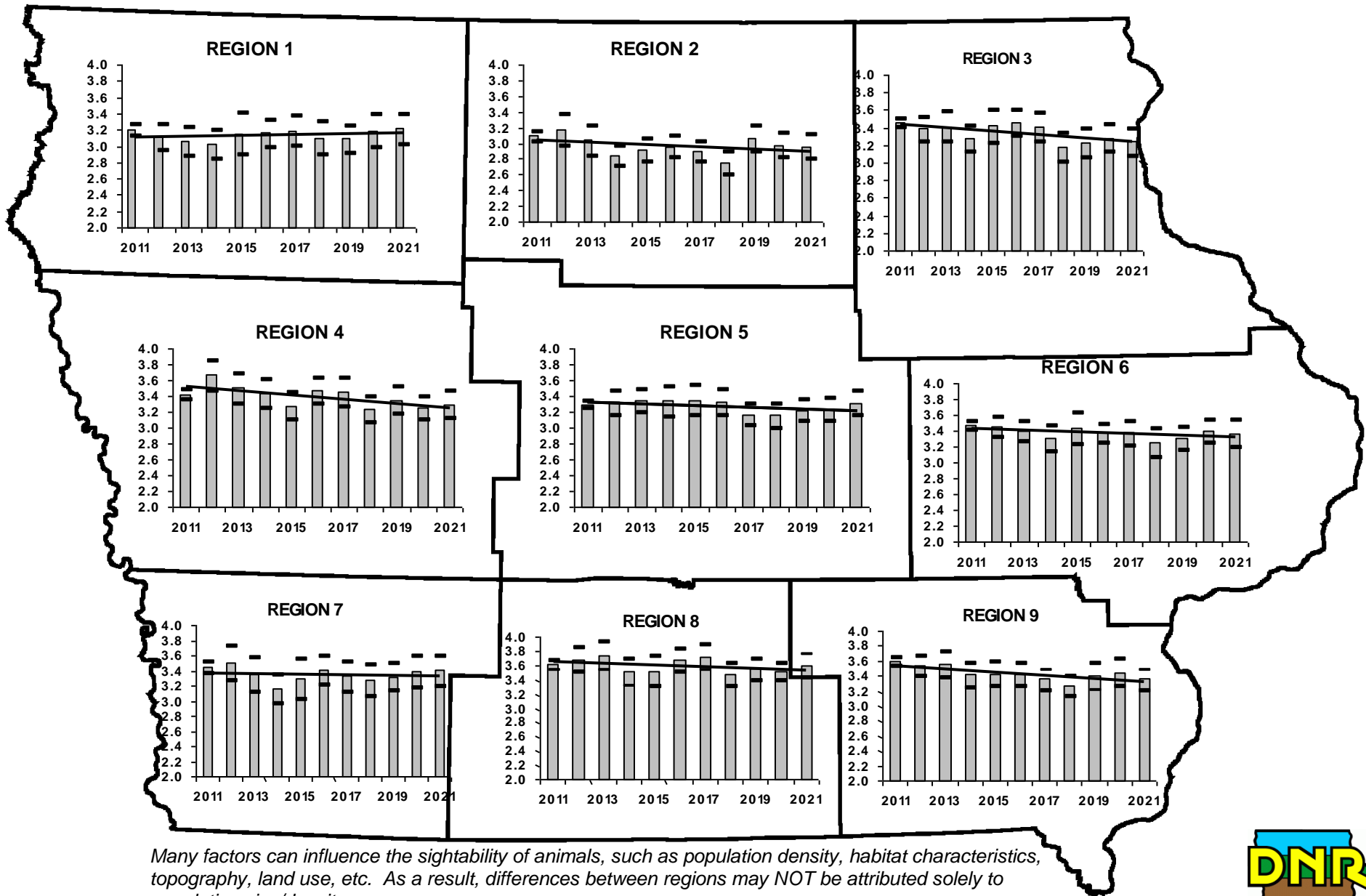


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Average Hours Hunted/Bowhunting Trip

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources

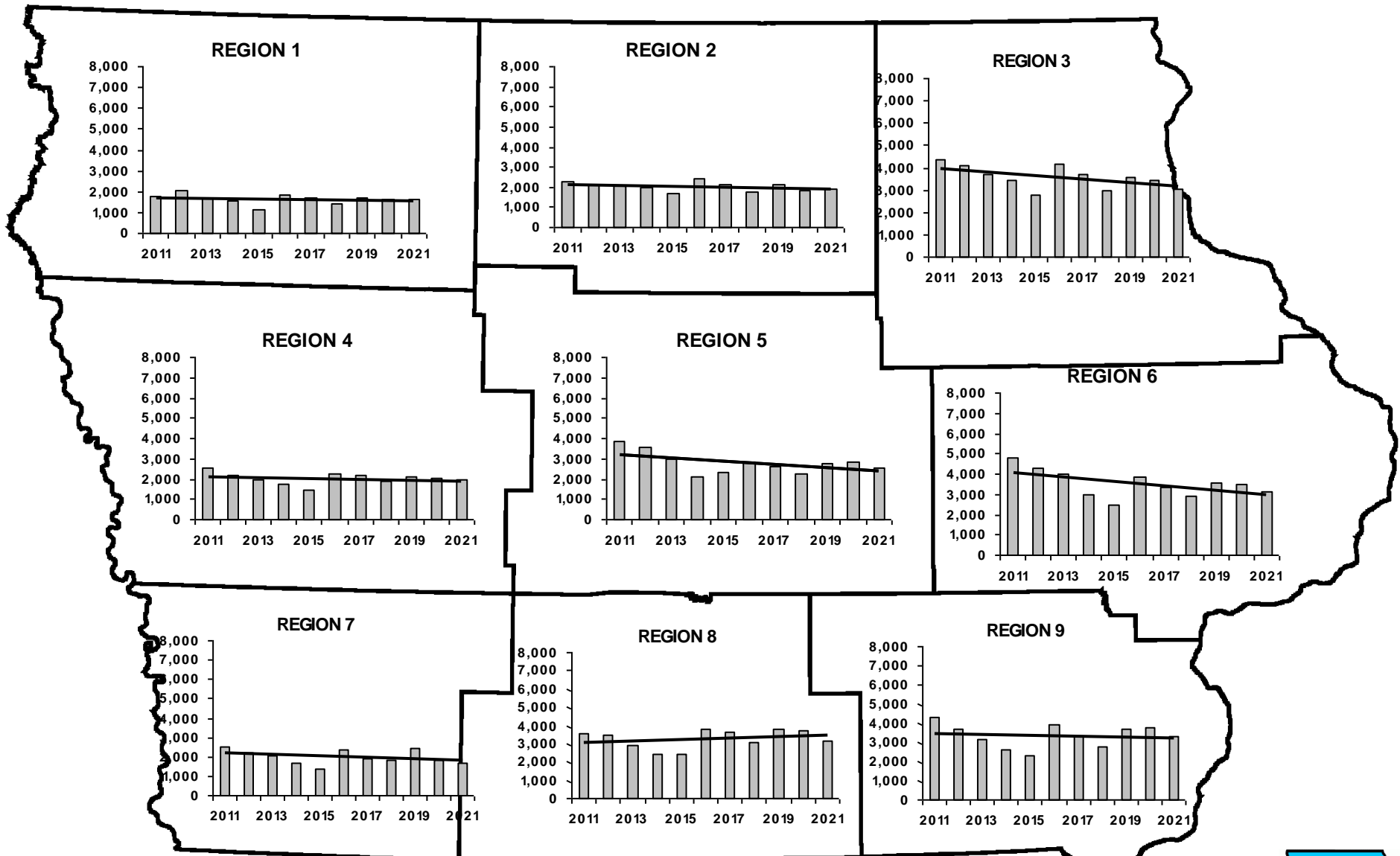


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Bowhunting Trips by Survey Participants

Bow Hunter Observation Survey, Iowa Dept. of Natural Resources



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