

2018-2021 Furharvester Diary Survey Report

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ABSTRACT The Iowa Department of Natural Resources (IA DNR) has collected annual harvest records for furbearer species since 1930. Historically, these data have been used to monitor population trends and served as an indicator of trapping and hunting effort for each species. However, the relative proportion of species harvested each year is not always an accurate indicator of annual fluctuations in species abundance. In 2018, the Iowa Furharvester Diary Survey was initiated to specifically collect information on furharvester trapping and hunting effort separate from harvest records. The primary objectives for this survey were 1) to document the species furharvesters are currently pursuing most frequently, 2) to quantify the amount of effort spent pursuing each species using the number of traps checked or hours spent hunting, and 3) to determine the effort needed for trappers and hunters to harvest different furbearer species (i.e., catch-per-unit-effort [CPUE]). We sent the first survey to licensed furharvesters during the 2018-2019 furbearer season and repeated the survey again in the 2019-2020 and 2020-2021 seasons. Participants recorded the greatest amount of effort targeting raccoon (207,263 traps checked and 2,686 hours hunted) and coyote (133,118 traps checked and 2,902 hours hunted) across all years but little effort was reported for gray fox, opossum, striped skunk, or weasel. Muskrat and raccoon had the highest CPUE (approximately 21 and 13 captured/100 traps checked, respectively), while bobcat, coyote, red fox, and weasel had the lowest (all 1-2 captured/100 traps checked). Results from this survey will be used to formulate a standardized, independent index for monitoring furbearer population trends that can be compared to other statewide population indices in Iowa.

INTRODUCTION

The Iowa Department of Natural Resources (IA DNR) is responsible for managing a wide diversity of native Iowa furbearer species, including badger (*Taxidea taxus*), beaver (*Castor canadensis*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), opossum (*Didelphis virginiana*), river otter (*Lontra canadensis*), raccoon (*Procyon lotor*), striped (*Mephitis mephitis*) and spotted (*Spilogale putorius*) skunk, red (*Vulpes vulpes*) and gray (*Urocyon cinereoargenteus*) fox, and weasel (*Mustela* spp.; Evelsizer 2019). Collecting reliable, standardized data to evaluate population trends for these species is vital to make informed management decisions and accomplish conservation goals (Poole and Mowat 2001; White et al. 2015). Currently, the IA DNR utilizes three main sources of information to monitor furbearer species in the state: 1) annual harvest and CITES reports, 2) Spring Spotlight Survey data, and 3) Bow Hunter Observation Survey data (Harms et al. 2019; Kaminski et al. 2020). The latter two surveys provide valuable information on population trends for most furbearer species statewide. However, some species are difficult to detect on these surveys due to their behavior and life history characteristics (e.g., coyote, river otter).

Furbearers are particularly challenging to detect because they are primarily nocturnal, exist at relatively low densities on the landscape, and exhibit secretive behavior (Ruetter et al. 2003; White et al. 2015). For species that are not regularly observed in Iowa's annual Spring Spotlight or Bow Hunter Observation surveys, harvest-based indices may provide the best information on long-term population trends. The IA DNR has been collecting harvest information from licensed Iowa fur dealers since 1930. Each year, all fur dealers are required to submit a report which lists the total number of furs purchased for each species from Iowa trappers and hunters (Iowa Code 109.97; Evelsizer 2019).

Annual harvest reports provide insight on changes in species distribution or abundance and are essential to furbearer management in Iowa. However, one disadvantage of using raw harvest to monitor abundance is that it can vary greatly based on external factors (e.g., the fur market, weather conditions, and social trends) that do not necessarily reflect true population changes (McDonald and Harris 1999; Poole and Mowat 2001). Controlling harvest numbers for furharvester effort is crucial to assessing abundance (DeVink et al. 2011; Bridger et al. 2017). Integrating effort data with harvest reports not only corrects for varying effort in fur trapping and hunting but also accounts for species catchability (DeVink et al.

2011). Despite the benefits of including effort information, these data are lacking in many furbearer management programs because they are often difficult and time-consuming to collect. The method most commonly used to obtain effort data is a survey of licensed furharvesters to determine number of traps they set or hours they spent hunting (McDonald and Harris 1999; Poole and Mowat 2001).

In order to collect furharvester effort statewide, the IA DNR initiated the Iowa Furharvester Diary Survey for the 2018-2019 furbearer season and repeated it in the 2019-2020 and 2020-2021 seasons. The specific objectives of the survey are 1) to document the species furharvesters are pursuing most frequently, 2) to quantify the amount of effort spent pursuing each species using the number of traps checked or hours spent hunting, and 3) to determine the effort needed for trappers and hunters to harvest different furbearer species (i.e., catch-per-unit-effort [CPUE]).

STUDY AREA

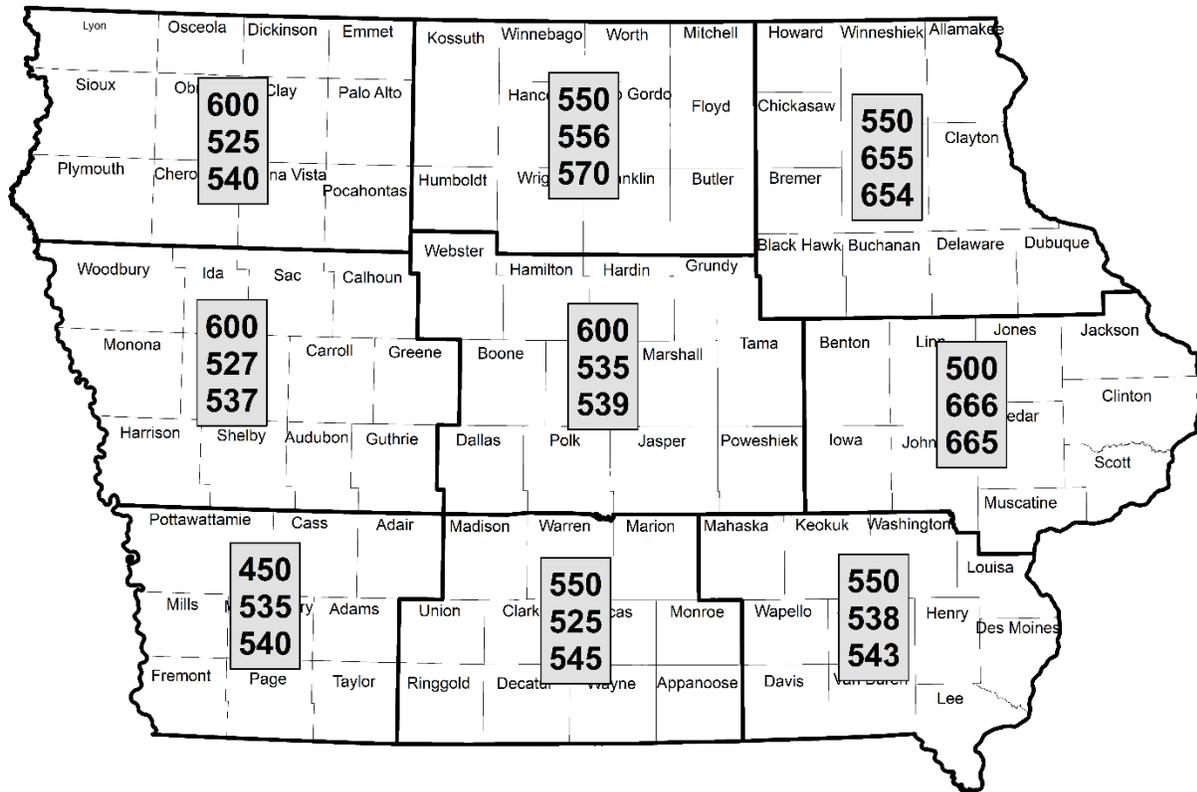


Figure 1. Sample size of survey recipients in 2018-2019, 2019-2020, and 2020-2021 (represented by the top, middle, and bottom numbers, respectively) by agricultural region in Iowa.

METHODS

In the fall of 2018, we selected 4,950 furharvesters to receive the first ever Iowa Furharvester Diary Survey out of 15,599 2018 furbearer license holders (approximately 32%) using a stratified random sampling design. Recipients were stratified by Iowa’s nine agricultural regions to ensure even spatial distribution across the state (Fig. 1). In the second survey year (2019-2020), we selected participants using a two-stage stratified random sampling design. The first stage of the sampling process involved selecting a list of furharvesters that 1) returned a completed furharvester diary the previous year or 2) indicated interest in participating in the survey on a pre-survey postcard sent out to avid furharvesters in Iowa. We defined “avid” furharvesters as those individuals who purchased a furharvester license in each of the previous two years (2017 and 2018). In the second sampling stage, we randomly selected participants from a list of avid furharvesters from 2017 and 2018 (totaling 9,420 individuals) and excluded 1) participants included on either of the aforementioned lists, 2) individuals who indicated on their pre-survey postcard that they did not wish to participate, or 3) individuals who returned an incomplete furharvester diary the previous year. Recipients were again stratified by Iowa’s nine agricultural regions similar to 2018. The

number of participants selected from the combined sampling stages resulted in 5,062 total survey recipients. In the third survey year (2020-2021), we repeated the 2018-2019 selection process, which resulted in 5,133 total survey participants (Fig. 1).

We designed the survey as a diary-style booklet consisting of three main sections. The first section was a one-page questionnaire that included general questions about trapping and hunting practices. We asked participants to 1) list the counties where they spend the most time trapping and hunting furbearers, 2) indicate whether they were planning to harvest beaver or coyote the following spring (i.e., in February - April after the regular fur season), 3) estimate their years of experience trapping and hunting furbearers (2019-2020 and 2020-2021 diaries only), and 4) provide any additional comments on furbearers in Iowa. The second and third sections of the diary focused on effort and success of trapping and hunting, respectively. In both sections, we asked participants to record their daily effort (quantified as either number of traps checked or hours spent hunting) and success (number of animals harvested) for each furbearer species separately. In the trapping section, participants were instructed to record any non-target furbearers captured (e.g., an opossum captured in a raccoon set). In the 2019-2020 and 2020-2021 surveys, we also asked hunters to list which hunting methods they used (e.g., dogs or calling), if any. During the first survey year, badgers were unintentionally left out of the diary and were not included in the analysis of 2018-2019 data. Badgers were added to the survey in the subsequent seasons.

We asked participants to return their diary surveys after they had finished all trapping and fur hunting, or at the end of the regular furbearer season (January 31st), whichever came first. In both 2019 and 2020, a reminder postcard was sent out in late December to all diary recipients to complete and return their diary if they had yet to do so. Data entry was completed during the spring and summer following the furbearer season, and in both 2019-2020 and 2020-2021 we randomly selected 10% of the returned, completed diaries for cross-validation to estimate a data entry error rate. Data obtained by survey respondents were summarized statewide for all survey years separately in Program R (v. 3.6.2).

RESULTS

Diaries with the daily hunting and trapping sections completed (Sections 2 and 3 of the diary) were returned by 2.95%, 6.19%, and 5.22% of recipients in 2018-2019, 2019-2020, and 2020-2021, respectively. Additionally, in each survey year we received a small number of diaries (between 0.5 and 1.5%) from respondents who completed only the one-page questionnaire (Section 1 of the diary) but did not include any information on their daily trapping or hunting effort (Table 1). Based on the combined responses from all survey years, we received data from furharvesters who trapped or hunted in almost every county in Iowa. Participants reported trapping and hunting more in the eastern part of the state (Appendices A and B). The majority of diary respondents participated in trapping (83.45%) while fewer recorded hunting for furbearers (35.33%). Approximately half (48.14%) indicated that they intended to hunt late winter coyote while 31.26% said they would trap for spring beaver. On average, survey respondents reported 29.5 (± 17.7) years of trapping experience and 28.8 (± 16.7) years of furbearer hunting experience. In all years, most trappers tended to be active during the first few weeks of the season, which begins in early November. As the season continued, the proportion of active trappers slowly declined until the end of the season (Appendix C). The overall data entry error rate estimated by cross validating a subset of the returned and completed diaries was 3.12% in 2019-2020 and 2.03% in 2020-2021.

Table 1. Summary of diaries sent and completed during the 2018-2019, 2019-2020, and 2020-2021 furbearer seasons. Section 1 = the one-page questionnaire at the beginning of the diary. Sections 2/3 = the daily trapping and hunting log portions of the diary, respectively.

Survey Year	Total Sent	Undeliverable	Adjusted Sent	Number Completed		Percent Completed	
				Section 1	Sections 2/3	Section 1	Sections 2/3
2018-2019	4,950	100	4,850	29	143	0.60%	2.95%
2019-2020	5,062	51	5,011	59	310	1.18%	6.19%
2020-2021	5,133	38	5,095	63	266	1.24%	5.22%

Trapper Effort

The average Iowa trapper checked 703 ($\pm 1,336$), 800 ($\pm 1,652$), and 627 (± 946) traps during the 2018-2019, 2019-2020, and 2020-2021 seasons, respectively. In all seasons combined, the total number of traps respondents reported checking was 430,167. The average number of days respondents reported checking traps (i.e., the number of days where at least one or more traps were checked) was 28 days in the first two survey years (± 23 in 2018-2019 and ± 24 in 2019-2020) and 26 (± 21) days in 2020-2021. In all seasons combined, the total number of days respondents reported checking traps was 16,224.

Overall, raccoons were the most targeted furbearer species by trappers. Of the respondents who trapped, 83% reported checking at least one raccoon trap. In the three survey years combined, respondents reported checking 207,263 total raccoon traps. On days spent actively trapping, the average Iowa raccoon trapper checked approximately 15, 23, and 18 raccoon traps in 2018-2019, 2019-2020, and 2020-2021 respectively. The second highest targeted furbearer species was coyote, with 52% of all trappers reporting checking at least one coyote trap. In the three survey years combined, respondents reported checking 133,118 total coyote traps. On days spent actively trapping, the average Iowa coyote trapper checked approximately 22, 16, and 14 coyote traps in 2018-2019, 2019-2020, and 2020-2021, respectively. Muskrat and beaver ranked third and fourth (34,372 and 21,565 total traps checked in all survey years combined, respectively) for species being targeted by trappers (Appendices D, F, and G).

Gray fox were the least targeted furbearer species in all survey years (no respondents recorded checking traps for gray fox in any year). Trappers reported the second-lowest amount of effort for weasel in 2018-2019 (99 total traps checked), badger in 2019-2020 (175 total traps checked), and striped skunk in 2020-2021 (185 total traps checked; Appendices F and G).

Fur Hunter Effort

The average Iowa fur hunter spent 25 (± 36), 23 (± 29), and 25 (± 30) hours hunting during the 2018-2019, 2019-2020, and 2020-2021 seasons, respectively. In all three seasons combined, the total number of hours respondents reported hunting was 6,197. In 2018-2019, fur hunters reported hunting an average of 7 (± 8) days (i.e., the number of days when they spent at least one or more hours hunting) and in both 2019-2020 and 2020-2021 fur hunters reported hunting an average of 8 (± 8) days. In all seasons combined, the total number of days respondents reported hunting furbearers was 2,028.

Coyote was the most targeted furbearer species by hunters, followed closely by raccoon. In the three survey years combined, respondents reported hunting 2,902 total hours for coyotes and 2,686 total hours for raccoons. Of all the respondents who hunted, 60% hunted for coyote and 58% hunted for raccoon on at least one hunting trip. The average Iowa coyote hunter spent 25.7 (± 38.4), 13.5 (± 18.4), and 20.5 (± 28.0) hours hunting for coyote in 2018-2019, 2019-2020, and 2020-2021 respectively. The average Iowa raccoon hunter spent 12.3 (± 17.9), 21.6 (± 24.1), and 17.9 (± 21.6) hours hunting for raccoon in 2018-2019, 2019-2020, and 2020-2021, respectively. The next highest targeted furbearer species was red fox (combined 318 hours reported for all survey years; Appendices E, H, and I).

No respondents reported hunting for gray fox or striped skunk in the first and third survey years, and no hunting effort was reported for opossum in 2018-2019. Of the species actively pursued, the least targeted furbearer was red fox in 2018-2019 (43.5 total reported hours hunted). In 2019-2020 respondents recorded the least amount of time hunting for striped skunk and gray fox (10 and 10.5 total hours, respectively) while in 2020-2021 the least effort was reported for opossum (5.5 total hours; Appendices H and I).

Many fur hunters reported using calling or dogs to hunt furbearer species in the 2019-2020 and 2020-2021 surveys. The majority of hunters targeting bobcat, coyote, and gray fox used calling while about half of raccoon and opossum hunters used dogs (Appendix J).

Trapper Success

Results from this survey show raccoon trappers experienced the highest proportion of success among trappers and harvested the greatest number of animals (38.6 ± 71.3 , 74.2 ± 242.7 , and 40.5 ± 63.2 raccoons/trapper in 2018-2019, 2019-2020, and 2020-2021, respectively). Weasel trappers were least successful in 2018-2019, reporting no captures during the season. Trappers targeting bobcat and badger had the lowest proportion of success in 2019-2020 and 2020-2021, respectively. On average badger, bobcat, river otter, and weasel trappers all captured the fewest animals (<1

captured/trapper; Table 2; Appendices K and L).

The species with the highest CPUE in all survey years was muskrat, followed by raccoon. Badger, bobcat, coyote, red fox, river otter, and weasel all had a relatively low CPUE (<5 captured/100 traps checked) in all years (Table 2).

Table 2. Percent of successful Iowa trappers (success = captured at least one animal regardless of effort) and raw CPUE (1 unit effort = 100 traps checked) for all furbearer species based on survey responses in 2018-2019, 2019-2020 and 2020-2021 survey seasons.

Species	Percent of Successful Trappers			Catch/100 Traps Checked		
	2018-2019	2019-2020	2020-2021	2018-2019	2019-2020	2020-2021
Badger*	N/A	50.0%	30.0%	N/A	3	2
Beaver	91.1%	83.7%	93.1%	6	8	9
Bobcat	25.0%	40.9%	42.1%	1	1	1
Coyote	76.4%	71.1%	75.0%	1	2	2
Gray Fox†	N/A	N/A	N/A	N/A	N/A	N/A
Mink	60.0%	49.3%	48.8%	4	6	5
Muskrat	86.0%	90.7%	91.8%	20	25	20
Opossum	83.3%	63.2%	76.5%	11	6	5
Raccoon	96.9%	96.1%	95.8%	13	15	12
Red Fox	73.3%	60.7%	47.4%	2	2	2
River Otter	35.7%	54.4%	53.3%	3	2	3
Striped Skunk	100.0%	62.5%	71.4%	11	4	6
Weasel	0.0%	50.0%	50.0%	0	1	2

*Badger was not included in the 2018-2019 survey.

†No participants recorded checking traps for gray fox in any survey year.

The most frequently captured non-target species was opossum (4,289 reported unintentional captures). Most often, opossum were unintentionally captured in traps set for raccoon. The second most common non-target species captured was raccoon (1,222 reported unintentional captures) in traps set to target coyote. The non-target species least often captured was gray fox (1 reported unintentional capture in a coyote trap; Appendix M).

Fur Hunter Success

In 2018-2019, coyote and raccoon hunters harvested the most animals per hunter (9.3 ± 19.2 and 9.0 ± 14.3 , respectively) while raccoons were the most often harvested species in 2019-2020 and 2020-2021 (21.3 ± 33.8 and 15.6 ± 24.6 raccoons/hunter, respectively). The percent of successful hunters was highest for participants targeting red fox in 2018-2019, opossum and striped skunk in 2019-2020, and opossum in 2020-2021. Overall, participants hunting for bobcat had the least success in all years, harvesting the fewest animals per hunter (0.2 ± 0.4 , 0.6 ± 0.5 , and 0 ± 0.0 in 2018-2019, 2019-2020, and 2020-2021, respectively) and had the lowest proportion of successful hunters (Table 3; Appendices N and O).

Raccoon had the highest CPUE in all three survey years, followed by coyote in 2018-2019 and opossum in both 2019-2020 and 2020-2021. Bobcat had the lowest CPUE during the first and third survey years while gray fox had the lowest CPUE in 2019-2020 (Table 3).

Table 3. Percent of successful Iowa hunters (success = captured at least one animal regardless of effort) and raw CPUE (1 unit effort = 100 hours hunted) for all furbearer species based on survey responses in 2018-2019, 2019-2020, and 2020-2021.

Species	Percent of Successful Hunters			Harvest/100 Hours Hunted		
	2018-2019	2019-2020	2020-2021	2018-2019	2019-2020	2020-2021
Bobcat	16.7%	50.0%	0.0%	1	8	0
Coyote	54.8%	70.2%	64.6%	36	33	26
Gray Fox*	N/A	0%	N/A	N/A	0	N/A
Opossum*	N/A	100.0%	100.0%	N/A	40	73
Raccoon	80.0%	83.6%	80.4%	73	99	87
Red Fox	85.7%	62.5%	85.7%	23	11	15
Striped Skunk*	N/A	100.0%	N/A	N/A	30	N/A

*No participants recorded hunting gray fox and striped skunk in 2018-2019 and 2020-2021 or opossum in 2018-2019.

DISCUSSION

The number of returned and completed diaries was lowest during the first survey year, but doubled during the second year (an increase of 3.2%) and remained relatively high in 2020-2021 (an increase of 2.3% from 2018-2019). Still, our response rate was lower than furharvester surveys conducted in other Midwestern states. Indiana, Kansas and Missouri reported return rates of 34.7%, 36.7%, and 50.0% from furharvesters, respectively (Peek 2015; Rossler 2017; Frawley 2019). This may be due in part to the diary-style nature of our survey, which is more time-intensive to complete than post-season questionnaires used by other state agencies. However, despite relatively low return rates, our diary survey yielded the type of specific, fine-scale effort information that we were targeting.

Furharvester Demographics and Practices

In the 2019-2020 and 2020-2021 surveys, we asked respondents to estimate the number of years they have trapped or hunted. On average, participants reported having almost three decades of experience. Other surveys of furharvester experience in the Midwest have had similar results. In a 2012 survey, trappers in Minnesota also had an average 30 years of experience and Michigan reported an increasing proportion of furharvesters are from higher age classes, such as the “baby-boomer” generation (Schroeder 2013; Frawley 2019).

We found that the greatest number of trappers were active during the first few weeks of the furbearer season in November, and that a higher proportion of participants reported their trapping and hunting activity in the eastern half of the state. This information coincides with our previous knowledge, but had never been quantified in Iowa. Additionally, we determined that the number of respondents intending to continue to target coyote and beaver after the regular season is high and likely contributes meaningfully to annual harvest of both species.

The average total number of traps checked per respondent during the furbearer season was variable among the three survey years. Differences in overall trapping effort among years may be due to annual changes in the fur market, weather conditions (e.g., timing of freeze up), relatively low survey return rates, late distribution of the 2018-2019 survey, or difference in 2019-2020 sampling strategy (i.e., targeted sampling of avid furharvesters). However, the number of hours spent hunting, and number of days spent hunting or trapping all remained similar among the three survey years. Overall, participants spent fewer days pursuing furbearers than their counterparts in two other Midwestern states. Based on a 2012-2013 survey, trappers in Indiana spent an average of 6 more days checking traps while Kansas furharvesters spent approximately 12 more days both trapping and hunting than Iowans (Peek 2015; Rossler and Albers 2017). Since Iowa is located at a higher latitude than both Indiana and Kansas, the differences reported in days pursuing furbearers may be due to cooler temperatures and earlier timing of freeze-up conditions. For example, air temperatures in Iowa during the regular furharvester season (November – January) average 7°F lower than Indiana and 8°F lower than Kansas (Midwestern Regional Climate Center 2021).

Our study provides specific information on number of hunters and the type of hunting methods they are using to pursue each furbearer species. Calling for predators (i.e., coyote and bobcat) has emerged as a popular method of hunting, due in part to relatively new technology such as electronic calls, night optics, and an array of modern rifles. Alternatively, running dogs as a technique to hunt furbearers has become less common as access to private land for houndsmen to use has declined over the past 20 years. In 2015, Kansas reported a relatively low percent of hunters running dogs, but did not separate proportion of hunters participating in this method by species pursued or capture other hunting methods, such as calling (Peek 2015). It should be noted that although diary respondents returned their surveys by January 31st each year, additional coyote hunting usually takes place during February and early March. We are confident that this survey captures the methods used by most of our furharvesters and also represents Spring coyote hunting practices.

Incorporating Effort and CPUE with Annual Harvest Records

The composition of furbearer species harvested annually has changed since the IA DNR first began collecting harvest records in 1930, but determining whether harvest trends reflect true population change is challenging without quantifying effort. Evaluating annual harvest data within a CPUE framework is vital to developing a harvest-based index that can appropriately monitor abundance while controlling for furharvester effort. This survey provides the first ever data on trapping and hunting effort by Iowa furharvesters, and is currently one of the only sources of CPUE data reported within the Midwest.

Trap CPUE was similar (± 5) for all furbearer species among our three survey years, with the exception of opossum and striped skunk, which both had an approximately 50% decrease in individuals captured/100 traps checked between 2018-2019 and the 2019-2020/2020-2021 furbearer seasons. Opossum populations are known to fluctuate with weather, and can show declines after one year of unfavorable conditions. In 2019, Iowa experienced an unusually severe winter, which may be the reason CPUE in subsequent years of the furharvester dairy declined. A similar decline in opossum observations during the past two years is reflected in the annual Spring Spotlight Survey relative to observations in 2018 (Kaminski et al. 2020).

Hunter CPUE was variable among our three survey years, which may be a result of low sample size, especially in the 2018-2019 season. Almost each species experienced fluctuations in hunting CPUE. We hope data in additional survey years will clarify this information.

The only other Midwest state that currently provides CPUE estimates is Kansas, which recorded trap CPUE estimates similar to those estimated by our survey. Notable differences between the two states was that Kansas trappers reported a higher CPUE for river otter, but a lower CPUE for muskrat and raccoon (Peek 2015). These data provide a baseline in which we can use to put future population changes into context, and will be used to monitor species with recently expanded harvest regulations (i.e., bobcat and river otters).

Coyotes have shown a consistently increasing harvest over the past decade (up 59.4% in 2020 over the 10-year average); despite having a relatively low trap CPUE. Coyotes were one of the most frequently targeted species by our survey respondents, a trend reflected in survey and harvest reports from other Midwestern states such as Michigan, Missouri, and Kansas (Peek 2015; Conlee et al. 2019; Frawley 2019). This supports data from the IA DNR Spotlight and Bow Hunter Observation surveys indicating that coyote populations have remained relatively stable to over the past decade, although may have slightly declined in recent years (Harms et al. 2019; Kaminski et al. 2020).

Although muskrats have a high trap CPUE and were heavily targeted by survey respondents, their annual harvest has experienced substantial decreases (down 72.1% in 2020 from the 20-year average). This supports concerns that the muskrat population has been declining not only in Iowa, but also on a larger regional scale (Ahlers and Heske 2017). Additional research projects specific to muskrats will likely be necessary to understand their population changes in the Midwest (Evelsizer 2019).

For decades, raccoon have remained one of the most sought-after furbearer species, which was also reflected in our survey results. However, the annual raccoon harvest in 2020 had decreased almost 10% from the 20-year average, likely due in part to historically low pelt prices rather than population declines. Between 2018-2019 and 2020-2021 the proportion of survey respondents trapping raccoon dropped even as CPUE remained consistent and other population indices suggest that

their populations are high (Evelsizer 2019). Results from the IA DNR annual Spring Spotlight Survey show raccoon numbers continue to trend upward (Kaminski et al. 2020). Michigan also saw a similar decline in effort for raccoon despite increasing abundance (-21% hunters pursuing; Frawley 2019).

The first river otter and bobcat seasons opened in the early 2000s, when populations had grown enough to support a limited harvest. Over time, increased opportunity for furharvesters has led to higher annual harvests in both species (Evelsizer 2019). Despite an increase in harvest pressure, CPUE did not vary greatly among our survey years for either species. This coincides with results from the Spring Spotlight and Bow Hunter Observation Surveys, indicating that conservative, gradual changes to the regulations for these rare species is a successful strategy to maintaining healthy populations.

MANAGEMENT IMPLICATIONS

Information from this survey will help guide future bobcat management in Iowa. Utilizing CPUE information provides the IA DNR with a reliable, non-biased index to both justify and evaluate regulation changes on the population. The number of furharvesters targeting bobcats, their success, and the type of methods used to hunt bobcats will all be valuable resource as the IA DNR attempts to maintain a strong bobcat population and provide a positive overall furharvester experience.

Despite having a population considered relatively stable, the Spring Spotlight and Bow Hunter Observation Surveys have shown slight regional decreases in coyote observations during the past few years. In Iowa, coyote have a year-round open hunting season, no bag limits, and are experiencing increased trapping and hunting pressure by furharvesters each year. Time will tell how the population will respond to the increased effort and historically high harvest over the next few years.

Gray fox populations have been dropping since the 1980's, although the driving force behind their low numbers has not been determined. There are indications that their decline could be due to disease, predation, habitat changes, or a combination of these factors (Evelsizer 2019). Diary respondents reported no effort to trap and very little effort to hunt gray fox (one respondent in all survey years), indicating that closing the season will not likely help recover their numbers. Instead, closing the gray fox season may be done for primarily social, rather than biological reasons.

The IA DNR has considered implementing east and west harvest zones for river otters. Results from this survey show that a higher amount of overall trapping pressure occurs in eastern Iowa, which corresponds with current survey and harvest information showing the greatest density of river otters and the most harvest in that half of the state. Results from this survey may also help by utilizing otter CPUE information by strengthening otter population modeling efforts currently underway in a partnership Ph.D project with Iowa State University.

There is an increasing utility in the development of integrated population models (IPMs) for other species of furbearers that are hard to detect with Spring Spotlight or Bow Hunter Observation Surveys. CPUE data from this survey will be integrated with other data sources to build IPMs to estimate furbearer populations as accurately as possible. The IA DNR is currently utilizing IPMs for wildlife species in Iowa as they emerge as a valuable technique in furbearer management.

As reflected in our survey, the "baby-boomer" age cohort has consistently represented the largest proportion of licensed furharvesters dating back to the late 1960's and early 1970's. During the next 5-10 years, many furharvesters in this generation may no longer be actively pursuing furbearers. Since trapping and hunting are an important management tool to maintain healthy populations, it will be vital in the coming years to re-invigorate Iowa's Furharvester Education Program in an effort to recruit new furharvesters of all ages and pass on the heritage and tradition of trapping and hunting.

Furbearers are an important natural resource in Iowa and provide a variety of ecological, economic, and recreational services. Not only will this information be used to inform regulation changes and supplement other furbearer research, it provides a unique opportunity for the IA DNR to connect with furharvesters in the state. This voluntary survey is a valuable method to gather feedback directly from licensed furharvesters, and offers a way for the IA DNR to share statewide survey results and the most current furbearer information with the hunting and trapping community. The furharvester diary survey will be conducted periodically (every 3-5 years) in an effort to continually improve our ability to manage furbearer populations and evaluate population changes over time.

ACKNOWLEDGMENTS

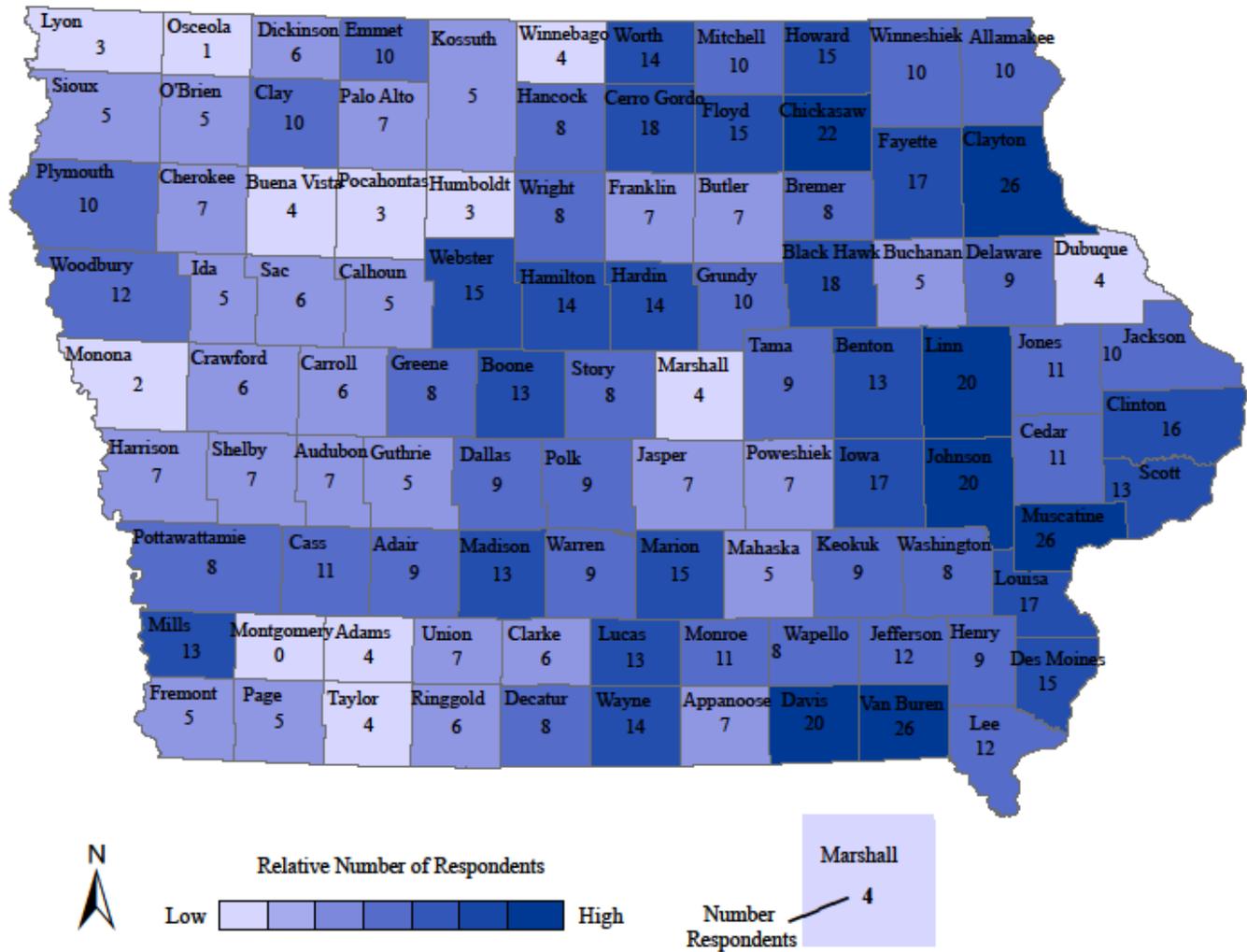
We would like to thank all Iowa furharvesters who participated in the Furharvester Diary Survey. Your contributions are greatly appreciated and will advance furbearer management and conservation in the state. Thanks also to J. Ford and C. Lahn for their assistance entering survey data as well as C. Ensminger and M. Klemesrud for their support during diary design and distribution.

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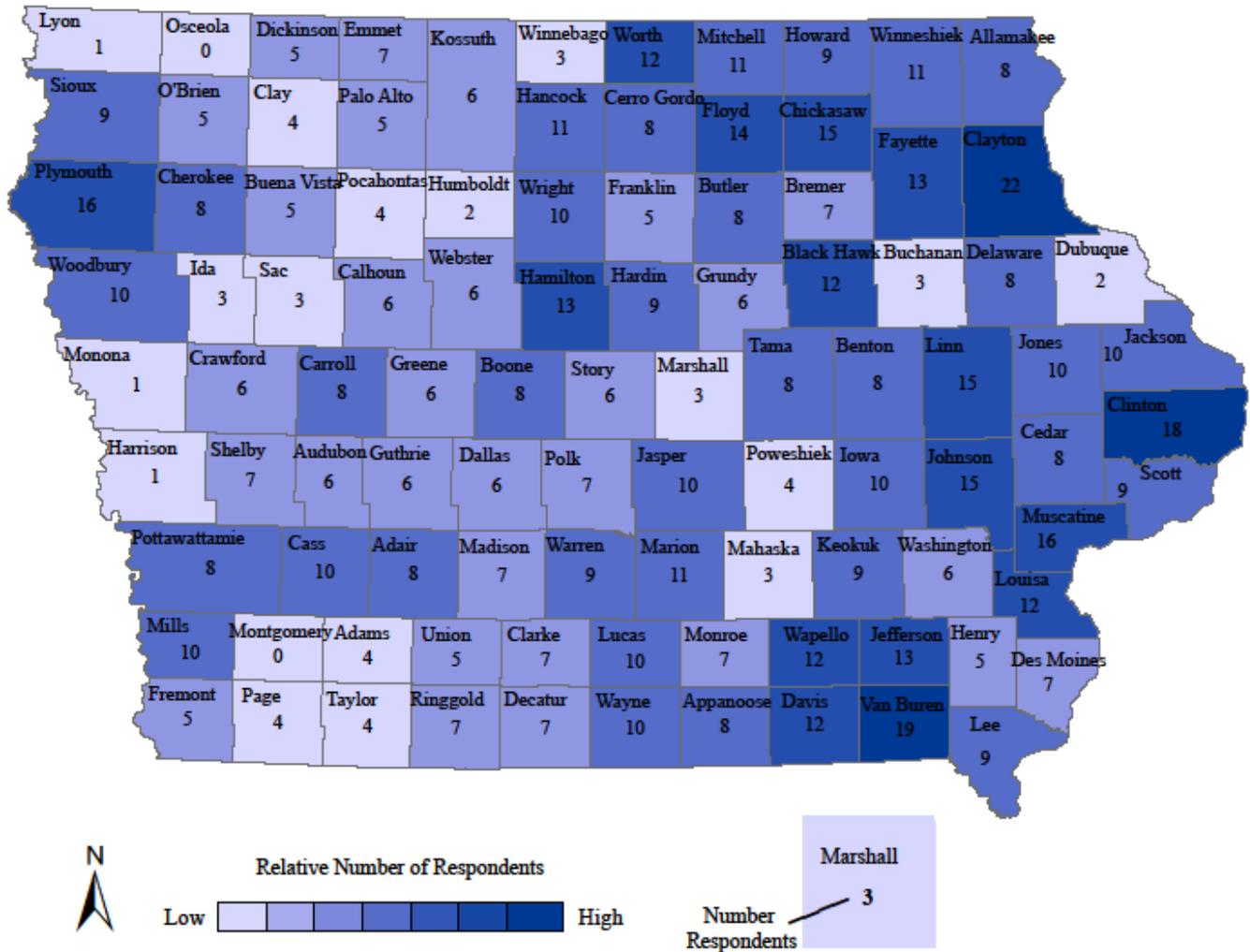
APPENDICES

Top Counties Trapped by Respondents



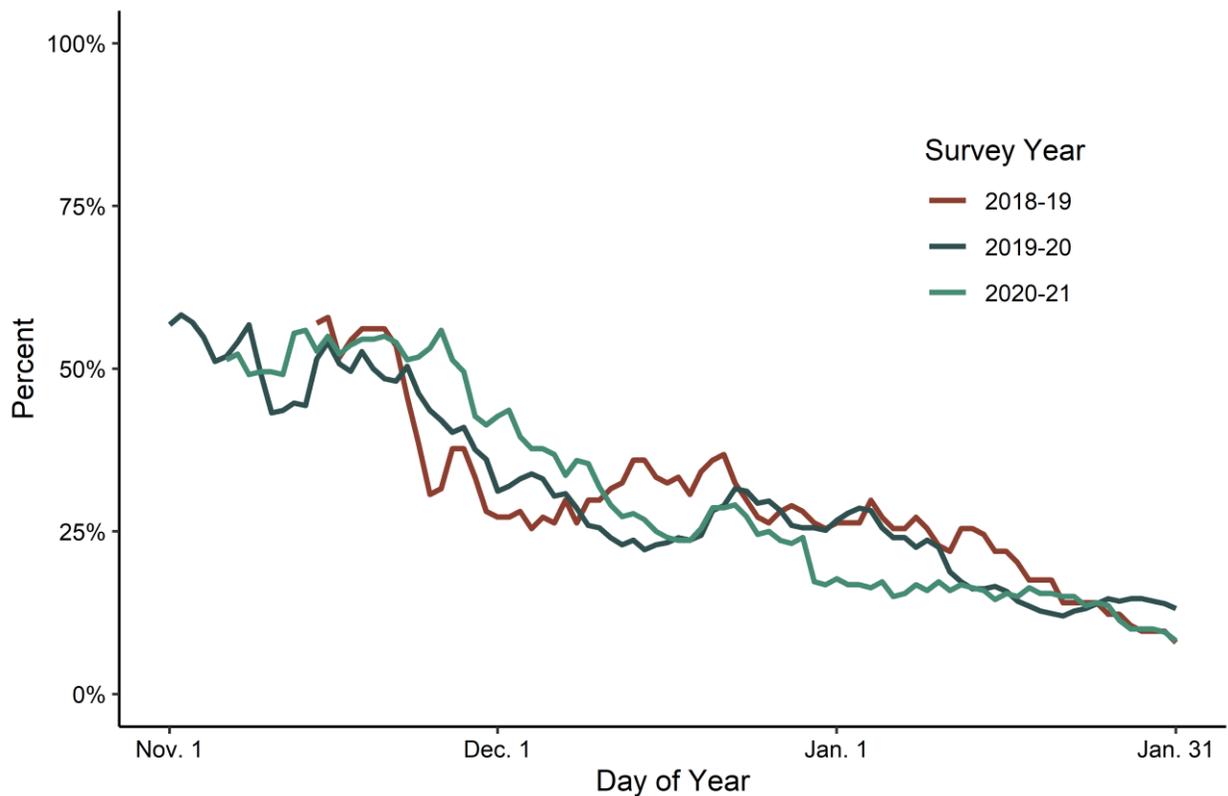
Appendix A. Number of respondents indicating the top two counties they trap most in using combined responses from 2018-2019, 2019-2020, and 2020-2021 survey data.

Top Counties Hunted by Respondents



Appendix B. Number of respondents indicating the top two counties they hunt most in using combined responses from 2018-2019, 2019-2020, and 2020-2021 survey data.

Proportion of Active Trappers Over Season



Appendix C. Percent of respondent trappers active during the season by date (e.g., of the respondents who trapped furbearers in 2019-2020 approximately 55% were checking traps on November 3rd). The first two weeks of the trapping season were truncated in 2018-2019 to correspond with date diary was received by trappers.

Species	Number of Trappers			Proportion of Total Trappers		
	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Badger*	N/A	6	10	N/A	2%	5%
Beaver	45	123	101	39%	46%	46%
Bobcat	16	44	38	14%	17%	17%
Coyote	55	135	124	48%	51%	56%
Gray Fox†	0	0	0	0%	0%	0%
Mink	35	69	41	31%	26%	19%
Muskrat	43	107	85	38%	40%	39%
Opossum	6	19	17	5%	7%	8%
Raccoon	97	233	167	85%	88%	76%
Red Fox	15	28	19	13%	11%	9%
River Otter	14	57	45	12%	21%	20%
Striped Skunk	7	8	7	6%	3%	3%
Weasel	2	8	6	2%	3%	3%

Appendix D. The number and proportion of total trappers that reported checking traps for each species. For example, in 2018-2019 45 trappers (39% of total trappers) reported checking at least one trap for beaver.

*Badger were not included in the 2018-2019 survey.

†No participants reported checking traps for gray fox.

Species	Number of Hunters			Proportion of Total Hunters		
	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Bobcat	6	8	6	11%	8%	6%
Coyote	31	57	65	58%	56%	66%
Gray Fox*	0	1	0	0%	1%	0%
Opossum*	0	3	4	0%	3%	4%
Raccoon	30	61	56	57%	60%	57%
Red Fox	7	8	7	13%	8%	7%
Striped Skunk*	0	1	0	0%	1%	0%

Appendix E. The number and proportion of total hunters that reported hunting for each species. For example, in 2018-2019 30 hunters (57% of total hunters) reported hunting any amount of time for raccoon.

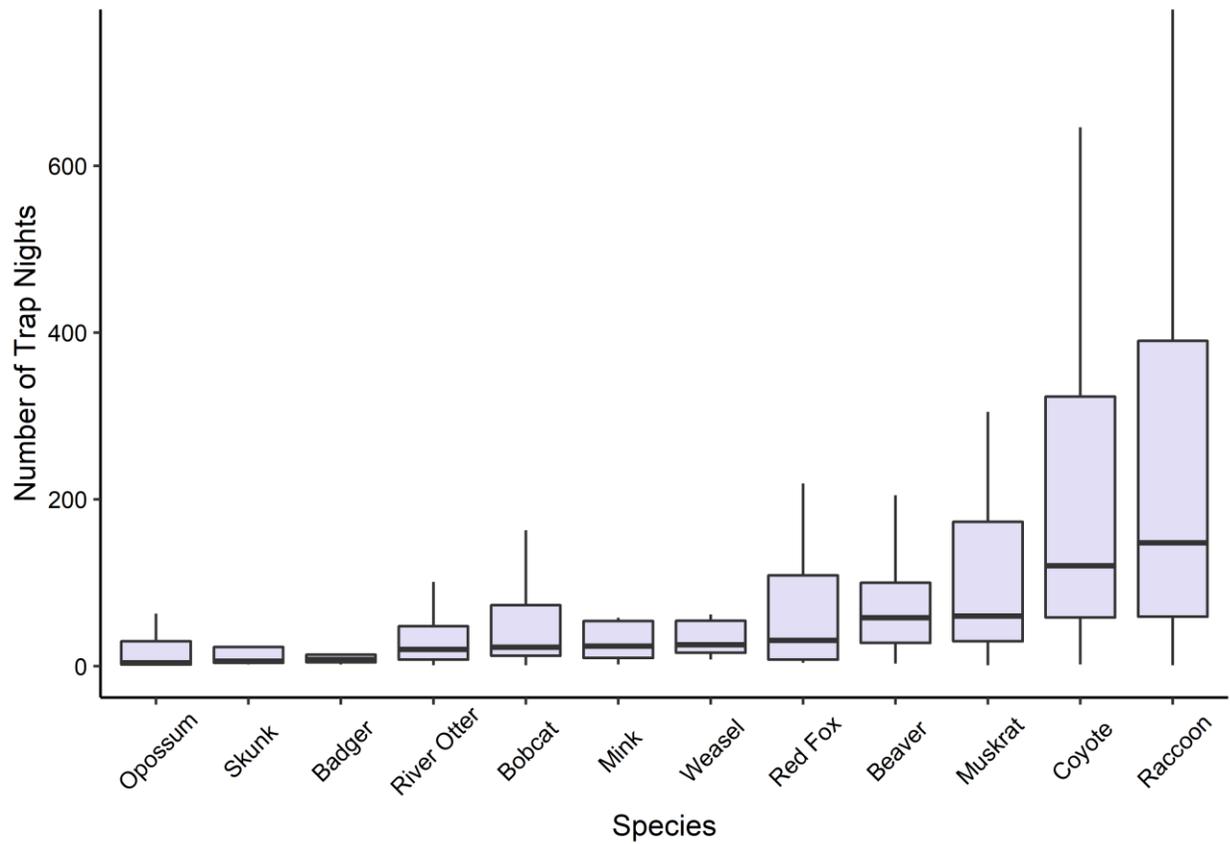
*No participants reported hunting for gray fox and striped skunk in the 2018-2019 and 2020-2021 surveys or opossum in the 2018-2019 survey.

Species	Average Trap Nights/Trapper			Average Days Trapping/Trapper			Average Traps Checked Daily/Trapper			Total Traps Reported		
	2018-2019	2019-2020	2020-2021	2018-2019	2019-2020	2020-2021	2018-2019	2019-2020	2020-2021	2018-2019	2019-2020	2020-2021
Badger*	N/A	29 (±23)	20 (±32)	N/A	10 (±3)	10 (±12)	N/A	3	2	N/A	175	204
Beaver	81 (±110)	66 (±82)	97 (±200)	17 (±17)	14 (±12)	15 (±12)	5	5	6	3,650	8,076	9,839
Bobcat	39 (±37)	76 (±96)	83 (±149)	17 (±17)	21 (±18)	16 (±18)	2	4	5	624	3,339	3,162
Coyote	625 (±1,577)	412 (±1,262)	348 (±675)	29 (±25)	26 (±23)	25 (±21)	22	16	14	34,351	55,655	43,112
Gray Fox†	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0
Mink	134 (±255)	68 (±121)	77 (±184)	20 (±23)	12 (±12)	14 (±16)	7	6	6	4,707	4,726	3,158
Muskrat	116 (±172)	142 (±222)	166 (±293)	9 (±9)	11 (±12)	13 (±15)	13	13	13	5,003	15,230	14,139
Opossum	49 (±83)	64 (±167)	104 (±291)	4 (±2)	6 (±14)	6 (±12)	12	11	17	292	1,218	1,767
Raccoon	305 (±499)	511 (±1,361)	351 (±569)	20 (±19)	22 (±20)	19 (±16)	15	23	18	29,554	119,059	58,650
Red Fox	82 (±123)	60 (±96)	96 (±193)	19 (±21)	17 (±18)	15 (±21)	4	4	6	1,227	1,685	1,823
River Otter	21 (±15)	38 (±46)	35 (±38)	12 (±8)	11 (±11)	12 (±12)	2	3	3	299	2,157	1,575
Striped Skunk	44 (±86)	34 (±83)	26 (±44)	4 (±3)	2 (±2)	7 (±8)	11	17	4	311	274	185
Weasel	50 (±15)	54 (±78)	68 (±102)	30 (±13)	19 (±25)	12 (±7)	2	3	6	99	432	408

Appendix F. The average (±SD) trap nights/trapper (trap night = one trap checked in a 24-hour period), number of days spent trapping (i.e., days where at least one trap was checked), traps checked per day, and number of total traps checked during the season for each furbearer species. For example, in the 2018-2019 furbearer season the average Iowa bobcat trapper checked 39 traps over a period of 17 days (on average checking approximately 2 traps/day) and a total of 624 bobcat traps checked were reported by all respondents.

*Badger were not included in the 2018-2019 survey.

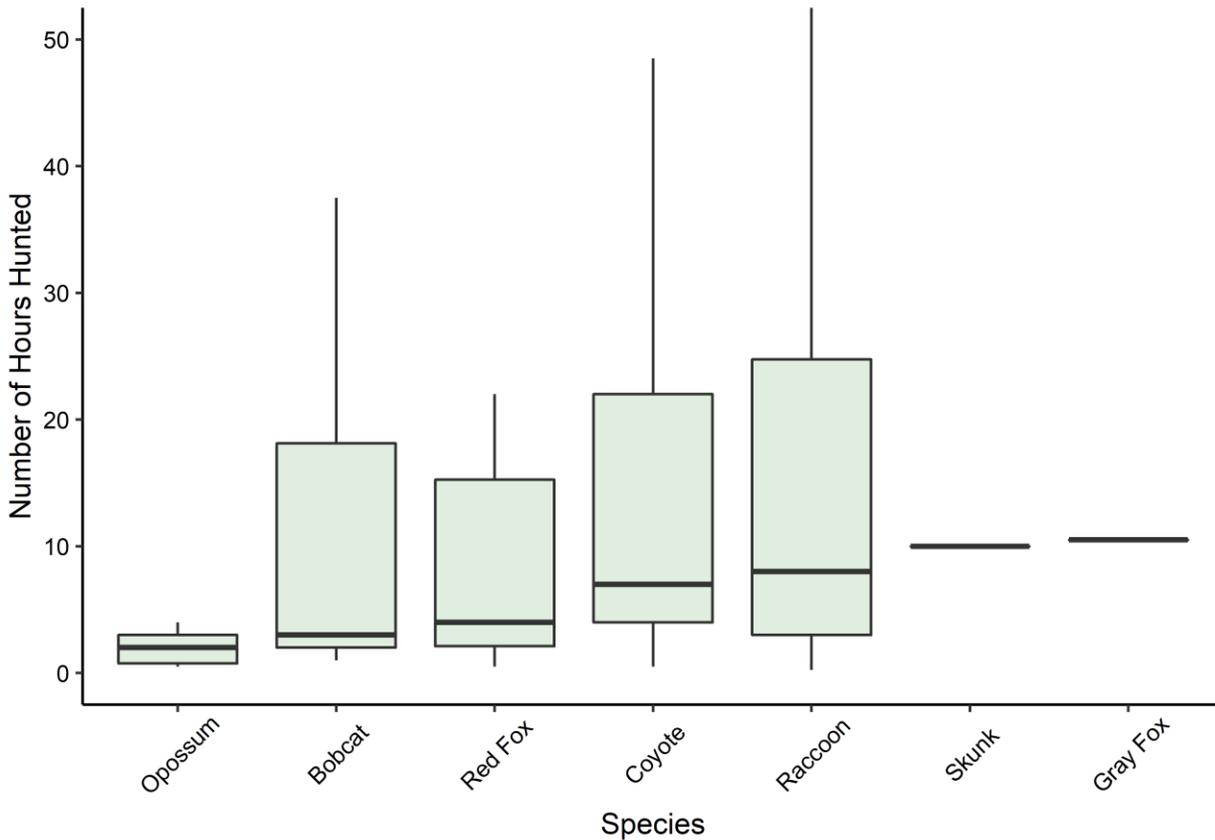
†No participants reported checking traps for gray fox.



Appendix G. The number of trap nights by each respondent per species using combined responses from 2018-2019, 2019-2020, and 2020-2021 survey data. Trap Night = one trap checked in a 24-hour period.

Species	Average Hours Hunted/Hunter			Total Hours Hunted		
	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Bobcat	20.5 (± 17.6)	6.2 (± 11.9)	10.1 (± 9.6)	123.0	49.5	60.5
Coyote	25.7 (± 38.4)	13.5 (± 18.4)	20.5 (± 28.0)	797.8	771.5	1,332.2
Gray Fox*	N/A	10.5 ($\pm N/A$)	N/A	0.0	10.5	0.0
Opossum*	N/A	10.8 (± 15)	1.4 (± 0.8)	0.0	32.5	5.5
Raccoon	12.3 (± 17.9)	21.6 (± 24.1)	17.9 (± 21.6)	369.0	1,316.8	1,000.2
Red Fox	6.2 (± 6.1)	21.9 (± 29.8)	14.1 (± 23.8)	43.5	175.5	99.0
Striped Skunk*	N/A	10 ($\pm N/A$)	N/A	0.0	10.0	0.0

Appendix H. The average (\pm SD) hours hunted for each respondent per species over the season. Total Hours Hunted = sum of all hours reported across all hunters. For example, in the 2018-2019 furbearer season the average Iowa raccoon hunter spent 12.3 hours hunting for raccoons and a sum of 369 hours spent hunting raccoons was reported by all respondents. *No participants reported hunting for gray fox and striped skunk in the 2018-2019 and 2020-2021 surveys or opossum in the 2018-2019 survey.



Appendix I. Number of hours hunted by each respondent per species using combined responses from 2018-2019, 2019-2020, and 2020-2021 survey data.

Species	Hunting Method		
	Calling	Dogs	Other
Bobcat	71.43%	0.00%	21.43%
Coyote	66.39%	7.38%	27.05%
Gray Fox	100.00%	0.00%	0.00%
Opossum	14.29%	57.14%	28.57%
Raccoon	37.61%	52.99%	9.40%
Red Fox	20.00%	0.00%	80.00%
Striped Skunk	0.00%	0.00%	100.00%

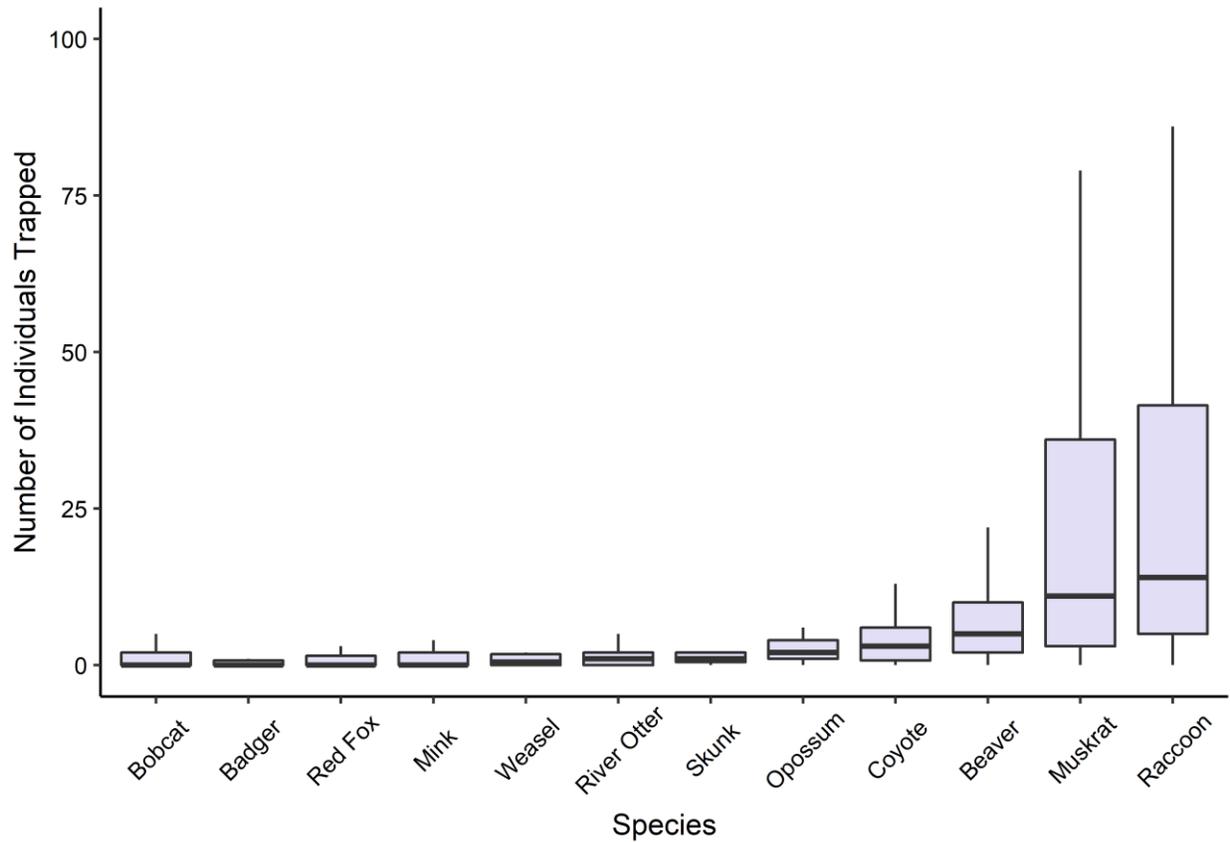
Appendix J. Percent of 2019-2020 and 2020-2021 survey respondents who used calling, dogs, or another method to hunt furbearer species.

Species	Average Captured/Trapper			Total Captured		
	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Badger*	N/A	0.8 (± 1.0)	0.4 (± 0.7)	N/A	5	4
Beaver	5.1 (± 5.0)	5.5 (± 6.4)	8.9 (± 15.4)	230	681	902
Bobcat	0.2 (± 0.4)	0.8 (± 1.6)	1.1 (± 1.6)	4	37	43
Coyote	9.1 (± 17.5)	7.2 (± 14.5)	7.6 (± 15.6)	498	977	946
Gray Fox†	N/A	N/A	N/A	0	0	0
Mink	5.5 (± 12.5)	4.4 (± 10.6)	4.2 (± 11.3)	191	301	172
Muskrat	23.2 (± 38.8)	35.2 (± 61.8)	33.1 (± 61.3)	996	3,768	2,813
Opossum	5.5 (± 5.3)	3.9 (± 6.1)	5.0 (± 7.8)	33	75	85
Raccoon	38.6 (± 71.3)	74.2 (± 242.7)	40.5 (± 63.2)	3,745	17,300	6,764
Red Fox	1.7 (± 2.1)	1.5 (± 2.1)	1.8 (± 4.1)	25	41	34
River Otter	0.6 (± 1.2)	0.8 (± 0.8)	1.1 (± 1.3)	9	44	50
Striped Skunk	4.7 (± 5.3)	1.2 (± 1.5)	1.6 (± 1.7)	33	10	11
Weasel	0.0 (± 0.0)	0.5 (± 0.5)	1.3 (± 2.0)	0	4	8

Appendix K. The average (\pm SD) number of animals captured by each respondent per species and the total number of animals captured by all respondents from the 2018-2019, 2019-2020, and 2020-2021 survey data.

*Badger were not included in the 2018-2019 survey.

†No participants reported checking traps for gray fox.



Appendix L. The number of individuals captured by each respondent per species using combined responses from the 2018-2019, 2019-2020, and 2020-2021 survey data.

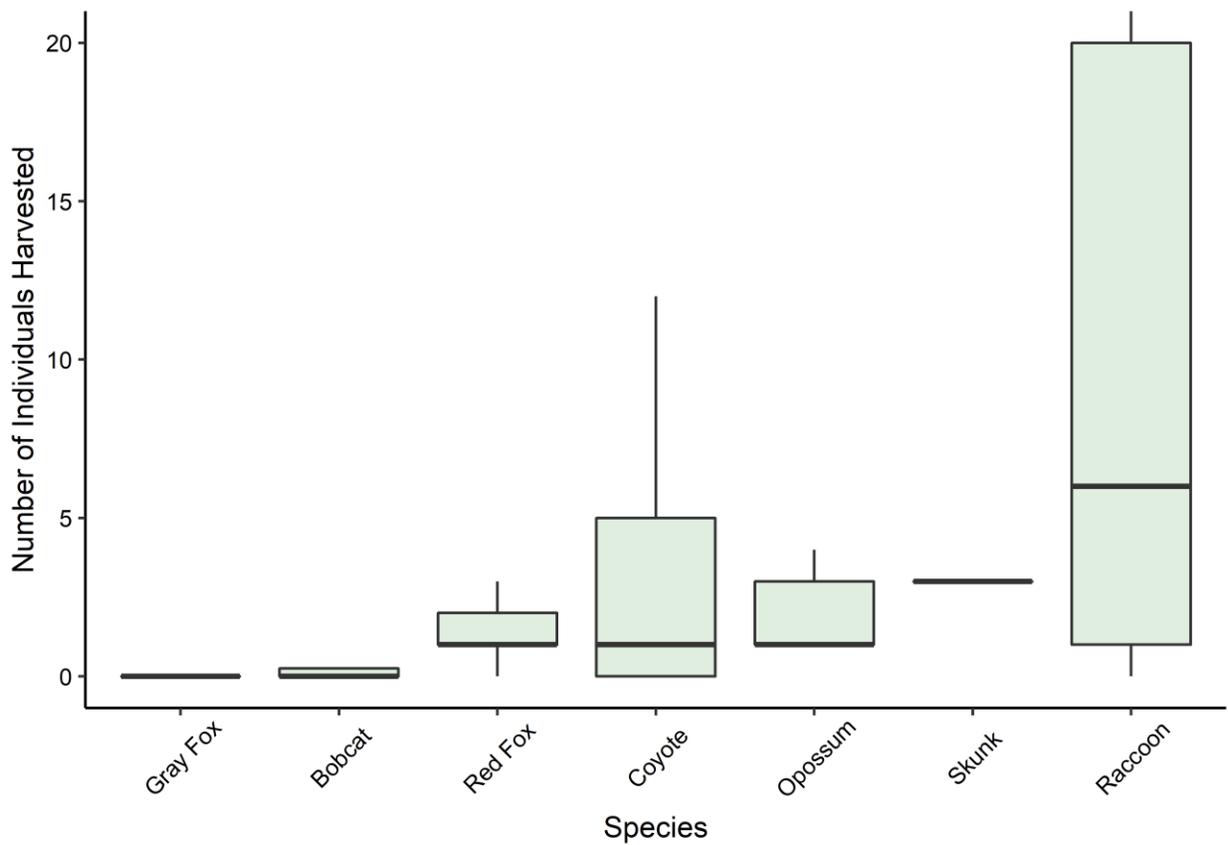
Species Captured	Number of Accidental Captures	Most Targeted Species
Badger	101	Coyote
Beaver	122	Raccoon
Bobcat	98	Coyote
Coyote	78	Mink
Gray Fox	1	Coyote
Mink	553	Raccoon
Muskrat	742	Raccoon
Opossum	4,289	Raccoon
Raccoon	1,222	Coyote
Red Fox	286	Coyote
River Otter	102	Beaver
Striped Skunk	878	Raccoon
Weasel	2	Unknown Species

Appendix M. The number of individuals unintentionally captured by trappers per species using combined responses from the 2018-2019, 2019-2020, and 2020-2021 survey data. Most targeted species = the species that was most commonly targeted for each species unintentionally captured. For example, 286 red fox were captured in traps by accident and most of the time they were captured in traps actually set for coyotes.

Species	Average Harvested/Hunter			Total Harvested		
	2018-19	2019-20	2020-21	2018-19	2019-20	2020-21
Bobcat	0.2 (\pm 0.4)	0.5 (\pm 0.5)	0.0 (\pm 0.0)	1	4	0
Coyote	9.3 (\pm 19.2)	4.4 (\pm 10.7)	5.3 (\pm 11.7)	288	253	347
Gray Fox*	N/A	0.0 (\pm NA)	N/A	0	0	0
Opossum*	N/A	4.3 (\pm 2.5)	1.0 (\pm 0.0)	0	13	4
Raccoon	9.0 (\pm 14.3)	21.4 (\pm 33.6)	15.6 (\pm 24.6)	270	1,307	872
Red Fox	1.4 (\pm 1.0)	2.4 (\pm 4.1)	2.1 (\pm 2.3)	10	19	15
Striped Skunk*	N/A	3.0 (\pm NA)	N/A	0	3	0

Appendix N. The average (\pm SD) number of individuals harvested by hunters per species. For example, in the 2018-2019 furbearer season the average Iowa raccoon hunter harvested 9 raccoon and a sum of 270 raccoon harvested was reported by all respondents.

*No participants reported hunting for gray fox and striped skunk in the 2018-2019 and 2020-2021 surveys or opossum in the 2018-2019 survey.



Appendix O. Number of individuals harvested by each respondent per species using combined responses from the 2018-2019, 2019-2020, and 2020-2021 survey data.