STATUS OF MINNESOTA BLACK BEARS, 2017

Final Report to Bear Committee

March 14, 2018

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All data contained herein are subject to revision, due to updated information, improved analysis techniques, and/or regrouping of data for analysis.

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**Overview: Permits, licenses, harvest, and success rates**

Permit applications for bear licenses exceeded 20,000 for the first time since 2002. However, 2,800 applicants, a record high number, applied for area 99, meaning that they only sought to raise their preference level for the permit system. Permit availability was 13% lower than 2016. The low permit availability has driven up sales of no-quota licenses, which were the highest on record in 2016 and nearly the same in 2017. Harvest was reduced 23% from 2016 because of the reduction in quota zone hunters and a slightly lower success rate of quota zone hunters (yet still the second-highest all-time success rate in the quota zone). Hunting success is inversely related to the number of hunters.

**Quota zone permits and licenses**

In 2016, Bear Management Unit (BMU) 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). The number of quota zone permits available in 2017 was reduced by 10–30% for all BMUs, except 22 and 41 (which remained the same). This was the 7th year of a system whereby licenses for the quota zone that were not purchased by permittees selected in the lottery could be purchased later as surplus. All surplus licenses (~400) were purchased.

**Quota zone applicants**

Statewide, quota zone applications increased by 21% over the past 10 years, but much of that increase was for area 99 (preference level application). Among applications for specific BMUs, only BMU 45 showed a significant, steady increase, nearly tripling from 2008 to 2017. Applications for some BMUs showed a decline.

**Quota zone lottery**

The low quota zone permit availability over the past 5 years has made it more difficult to succeed in the lottery. In 2012, before the large drop in permits (Table 2), all 3rd-year applicants (preference level 3) were drawn, and ~50% or more of 2nd-year applicants were drawn in all but two BMUs (44, 45). By 2017, with the exception of BMU 22 (wilderness area hunt), preference level 2 applicants were drawn only in two BMUs (13, 25; <20% drawn in both), and in four BMUs (28, 46, 47, 45), only some hunters with preference 4 were drawn (i.e., preference 5 was required to guarantee being drawn).
Table 5

**Harvest by BMU**

In 2017, most BMUs had lower harvests than in 2016, although many were near the previous 5-year mean. The total quota zone harvest (1,547) and no-quota harvest (493) were both close to the respective 5-year means. The sex ratio of the harvest was more male-biased than normal (63%), although typical of the past 4 years (Table 1). Two BMUs had record-high percent males (69–70%). The highly skewed sex ratio may be indicative of increased hunter selection (with a lower hunter density due to reduced quotas) as well as sex-related differences in attraction to baits (given that the no-quota area had an even larger skew toward males: 68%). The only notable harvests were in BMU 10 (Fig. 2) at the south-western fringe of the bear range (record high 18 bears), and the first-known bear legally harvested in southeastern Minnesota.

Table 6

**Harvest by quota vs no-quota zones**

Permit availability continuously declined during the decade 2003–2013 (Table 1), and with that, total harvests declined and the percent of the harvest in the no-quota zone increased. The percent harvest in the no-quota zone has leveled off in recent years (~26%), with stabilization of the number of quota-zone permits available. However, the percent of bear hunters purchasing a no-quota license reached a new high of 50% in 2017.

Table 7

**Hunting success by BMU**

Hunters in the quota zone had a record high (50%) success in 2016; this was true for most BMUs. Success rates were slightly lower, but still second-highest throughout the quota zone in 2017. BMU 45 had a record high success, and BMU 28 (split from BMU 26 in 2016) had the highest success of any BMU in any year (70%). Success rate was more normal in the no-quota zone — only one-third that of the quota zone in 2017. The distribution of hunters in the no-quota zone is gleaned from where they said they would hunt when they purchased their license: notably, a growing number (137 in 2017) indicated that they planned to hunt in the quota zone.

Table 7

**Harvest by date**

During years of normal fall food abundance, about 70% of the harvest occurs during the 1st week of the bear season, and ~83% occurs by the end of the 2nd week. The distribution of the harvest by date followed this normal pattern in both 2016 and 2017, which was very unlike the delayed harvest pattern in 2015.
### Nuisance complaints and kills

The total number of recorded bear complaints slowly increased over the past decade, reaching a peak in 2015 and 2016. Number of complaints declined in 2017, despite a higher number of DNR personnel recording complaints. A new recording system was instituted in 2017 whereby Wildlife Managers recorded all bear complaints online as they were received, instead of submitting reports at the end of each month (thus, unlike previous years, Managers who had no complaints were not counted in the number of personnel participating). Conservation Officers continued to use the monthly reporting system (and recorded zero when they had no complaints). Six Wildlife Managers and 2 Conservation Officers received 20 or more (up to 40) nuisance bear reports in 2017. The number of nuisance bears killed in 2017 was less than half that of 2015 and 2016. Conservation Officers recorded 4x the number of bears killed than Wildlife Managers. A new effort to target nuisance bears through an “area 88” quota hunting license resulted in only 1 bear being killed. No bears were killed by permittees.

### Food abundance

The composite range-wide, all-season abundance of natural bear foods (fruits and nuts) in 2017 was similar to 2016; this was lower than 2013 and 2014 (both good food years) and above 2015 (a poor food year). Regionally in 2017, more summer foods were below than above the long-term (33-year) average. The statewide fall food index (productivity of dogwood+oak+hazel), which helps predict annual harvest after accounting for hunter effort (Fig. 7), was equivalent to 2013 and 2014, and considerably higher than 2015 and 2016. Dogwood and hazelnut production were low in the north-central and northeast, but high in east-central. Oak was above average in the northwest and north-central, and average elsewhere.

### Predictions of harvest from food abundance

The 2017 statewide harvest was close to what was expected, based on regression of harvest as a function of hunter numbers and the fall food productivity index. This regression is particularly strong (and has accurately predicted previous harvests) when only the past 15 years are considered. However, for the quota zone, the actual harvest in 2017 was higher than predicted by this regression.
<table>
<thead>
<tr>
<th><strong>Fig. 8</strong></th>
<th><strong>Harvest sex ratios</strong></th>
</tr>
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<tbody>
<tr>
<td>Sex ratios of harvested bears reflect both the sex ratio of the living population (which varies with harvest pressure) as well as the relative vulnerability of the sexes to hunters (which varies with natural food conditions and hunter selectivity). In general, harvest sex ratios favoring males provide more resilience to the population. Harvest sex ratios within BMUs varied considerably year-to-year over the past 2 decades. Only two BMUs have shown a generally increasing trend in percent males that has continued through 2017 (BMUs 25, 31; both record high in 2017); however, statewide there has been a clear shift toward more males in the harvest (the last 5 years all &gt;60% males; see Fig. 10).</td>
<td></td>
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<table>
<thead>
<tr>
<th><strong>Figs. 9–11</strong></th>
<th><strong>Harvest ages</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Statewide, the median age of harvested females increased for the third year in a row (exceeding 3 years old for the first time since 2011). Accordingly, the proportion of the female harvest composed of 1–2 year-olds declined and 4–10 year-olds increased. The median age of harvested males (slightly over 2 years old) has been relatively stable, but creeping upward. On a BMU-basis, variability in median ages has been too extreme to discern a trend over the past 20 years (only BMU 11 shows a continuing declining trend).</td>
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<table>
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<tr>
<th><strong>Figs. 12–13</strong></th>
<th><strong>Submission of bear teeth for aging</strong></th>
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<tr>
<td>Ages of harvested bears are used as the principal means of monitoring population trends. Although hunters are required to submit a tooth from their harvested bear, historically &gt;25% did not comply. Reminder notices were sent to non-compliant hunters each year since 2014, which spurred a higher initial compliance the following years (&gt;80%). However, ~90% compliance was achieved only through a reminder mailing. Since 2013, hunters could register by phone or internet, and pick up a tooth submission envelope later: tooth submission compliance by these hunters has been significantly less than for hunters who registered their bear in person and picked up a tooth envelope at that time. No-quota zone hunters have the poorest rate of tooth submission.</td>
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</table>
**Population trend**

Ages of harvested bears accumulated since 1980 were used to reconstruct minimum statewide population sizes through time (i.e., the size of the population that eventually died due to hunting) using a technique formulated by Downing. This was scaled upwards (to include bears that died of other causes), using 4 statewide tetracycline mark–recapture estimates as a guide. Whereas both the tetracycline-based and reconstructed populations showed a “humped” trajectory, with an increase during the 1990s, followed by a decline during the 2000s, the shapes of the 2 trajectories differed somewhat (the reconstructed population curves were less steep). Therefore, it was not possible to exactly match the curve from the reconstruction to all 4 tetracycline-based estimates.

Downing population reconstruction assumes equal harvest pressure through time: as harvest pressure is diminished, and fewer bears are killed (as has been the trend since 2003), ensuing population estimates will be biased low, so it is possible that the curve for the most recent years should be higher.

Harvests were intentionally reduced in the quota zone when it was surmised (in the mid-2000s) that the population was declining. Since 2013, quotas were maintained at a low and fairly consistent level (Table 2), although harvests varied with food. Population reconstruction does not provide reliable estimates for the 2 most recent years, so the most recent estimate is pre-hunt 2015. This estimate shows an increase of about 10%, following the very low harvest of 2014. Both quota and no-quota zones increased by about the same percent. However, the unexpectedly high harvest of 2016 (in both quota and no-quota zones) is not yet reflected in the model estimates.

**Trends in harvest rates**

The sex ratio of harvested bears varies by age in accordance with the relative vulnerability of the sexes. Male bears are more vulnerable to harvest than females, so males always predominate among harvested 1-year-olds (67–75%). Males also predominate, but less strongly among 2 and 3-year-old harvested bears. However, older-aged harvested bears (≥7 years) are nearly always dominated by females, because, although old females continue to be less vulnerable, there are far more of them than old males in the living population. The age at which the line fitted to these proportions crosses the 50:50 sex ratio is approximately the inverse of the harvest rate. Segregating the data into time blocks showed harvest rates increasing from 1980–1999, then declining with reductions in hunter numbers (Fig. 1). Harvest rates since 2014 have been significantly less than what they were in the early 1980s, when the bear population was increasing (Fig. 14).

<table>
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<tr>
<th>Year</th>
<th>Permit applications</th>
<th>Permits available</th>
<th>Licenses purchased (total)</th>
<th>Quota zone</th>
<th>Quota surplus/military</th>
<th>No-quota zone</th>
<th>% Licenses bought</th>
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a Includes area 99, a designation to increase preference but not to obtain a license (2008 = 528, 2009 = 835; 2010 = 1194; 2011 = 1626; 2012 = 1907; 2013 = 2129; 2014=2377; 2015=2455; 2016=2641; 2017=2803 (record high); additionally, in 2017, area 88 nuisance-only bear license applications counted in this total [n=3]).
b Permits reduced because of a new procedure in 2011 that ensures that all available licenses are purchased (see Table 2).
c Quota zone established in 1982. No-quota zone established in 1987. Surplus licenses from undersubscribed quota areas sold beginning in 2000; originally open only to unsuccessful permit applicants, but beginning in 2003, open to all. In 2011, surplus licenses offered for all lottery licenses not purchased by August 1. Free licenses for 10 and 11 year-olds were available beginning 2009.
d Quota licenses bought (including surplus)/permits available, or licenses bought (prior to surplus)/permits issued. Beginning in 2008, some permits were issued for area 99; these are no-hunt permits, just to increase preference, and are not included in this calculation. In 2011–17, all unpurchased licenses were put up for sale and were bought.
e Number of licensed hunters x percent of license-holders hunting. Percent hunting is based on data from bear hunter surveys conducted during 1981–91, 1998 (86.8%), 2001(93.9%) and 2009 (95.3%). Beginning in 2011 all unpurchased quota licenses were sold as “surplus” in August, and this process is quick and competitive; thus, for 2011–17 all Surplus and Military license-holders were considered to have hunted.
f Sex ratio as reported by hunters; hunters classify about 10% of female bears as males, so the actual harvest has a lower %M than shown here. In good food years, the harvest is more male-biased.
g Success rates in 2001–2012 were calculated as number of successful hunters/total hunters, rather than bears killed/total hunters, because no-quota hunters could take 2 bears. After 2012, hunters could take 2 bears only if they bought 2 licenses (1 quota + 1 no-quota). In both 2016 and 2017, 5 hunters legally killed 2 bears.
h Record high number of no-quota zone licenses purchased in 2016; record high % of licenses in no-quota zone in 2017 (nearly 50%; see Fig. 4).
i Record high % males in statewide harvest.
Fig. 1. Relationship between licenses sold and hunting success (*note inverted scale*) in quota zone, 1987–2017 (no-quota zone first partitioned out in 1987). Number of licenses explains 48% of variation in hunting success during this period. Large variation in hunting success is also attributable to food conditions.
Fig. 2. Bear management units (BMUs) within quota (white) and no-quota (gray) zones. Hunters in the quota zone are restricted to a single BMU. In 2016, BMU 26 was divided into 27 and 28, and BMU 44 was split into 46 and 47 (BMUs 28 and 47 comprise the Leech Lake Reservation). No-quota hunters can hunt anywhere within the gray-colored zone, including the southeast corner of Minnesota (not shown; designated area 60).
Table 2. Number of bear hunting quota area permits available, 2012–2017. Highlighted values show a change from the previous year. BMUs 26 and 44 were divided into 27/28 and 46/47, respectively, in 2016.

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<td>3750</td>
<td>3700</td>
<td>3850</td>
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*a In 2016, the Leech Lake Reservation was split from BMUs 26 and 44 to form BMUs 28 (north) and 47 (south), with the remaining area of BMU 26 renamed BMU 28 and remaining area of BMU 44 renamed BMU 46. The column shows permit allocation before the split in order to compare with previous years.*
Table 3. Number of quota BMU permit applicants (Apps), licenses bought (after permits drawn) and surplus licenses bought, 2012–2017. Shaded values indicate undersubscribed (applications less than permits available).

<table>
<thead>
<tr>
<th>BMU</th>
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</table>

a Beginning in 2011, all licenses not purchased by permittees were sold as “surplus”. In all cases but one (see footnote b), all of the surplus licenses were purchased. Surplus = Permits available (Table 2) minus Bought license (±4 to account for groups applying together).

b Even after purchase of surplus licenses, this BMU remained undersubscribed.

c Beginning in 2008, applicants could apply for area 99 in order to increase future preference, but not buy a license; these are not included in the total number of applications (unlike Table 1, where they are included).
Fig 3. Trends in number of applicants for quota zone permits by BMU over past 10 years, 2008–2017. For 2016 and 2017, BMUs 27 and 28 were grouped into old BMU 26 and BMUs 46 and 47 were grouped into old BMU 44. BMU 45 is highlighted because applications there nearly tripled over this time period.
Table 4. Percent of quota BMU lottery applicants with preference levels 1 (1st-year applicants), 2, 3, and 4 who were drawn for a bear permit during 2012–2017. Blank spaces indicate 100% of applicants were drawn. All preference level 2 applicants were drawn, except where 0 preference level 1 applicants were drawn. Likewise, all preference level 3 applicants were drawn, except where 0 preference level 2 applicants were drawn.

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As an example, in 2017: BMU 12: 0% of preference level 1 and 2 applicants were drawn, 57% of preference level 3, and 100% of preference level 4 and above were drawn for a permit; BMU 22: all preference level 1 applicants were selected; BMU 45: no preference level 1–3 applicants were drawn, 16% of hunters with preference 4 were drawn, and 100% of hunters with preference level 5 and above were drawn.

BMU 26 was split into 27/28 and BMU 44 was split into 46/47 in 2016.
Table 5. Minnesota bear harvest tally for 2017 by Bear Management Unit (BMU)<sup>a</sup> and sex<sup>b</sup> compared to harvests during 2012–2016 and record high and low harvests (since establishment of each BMU).

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<th>M (%M)</th>
<th>F</th>
<th>Total</th>
<th>2016</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
<th>2012</th>
<th>5-year mean</th>
<th>Record low harvest (yr)</th>
<th>Record high harvest (yr)</th>
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<sup>a</sup> Some tooth envelopes were received from hunters who did not register their bear. These were added to the harvest tally: 2012:7; 2013:6; 2014:3; 2015:6; 2016:7; 2017:4. Some hunters with no-quota licenses hunted in the quota zone, and their kills were assigned to the BMU where they apparently hunted: 2012:8; 2013:11; 2014:12; 2015:6; 2016:8; 2017:2. Some quota area hunters also apparently hunted in the wrong BMU, based on the block where they said they killed a bear, but these were recorded in the BMU where they were assigned (presuming most were misreported kill locations).

<sup>b</sup> Sex recorded on tooth envelopes may differ from the registered sex. Sex shown on table is the registered sex.

<sup>c</sup> BMU 60 designates SE Minnesota, which is within No-quota zone. This is the first hunter-harvested bear in this area.

**Notable harvests:**

<sup>d</sup> Record low harvest since this area was established in 1987.
<sup>e</sup> Lowest harvest since 1988.
<sup>f</sup> Record low harvest since this area was established in 1989.
<sup>g</sup> Lowest harvest since 1996.
<sup>h</sup> Record low harvest since this area was established in 1991.
<sup>i</sup> Record low harvest since this area was established in 1990.
<sup>j</sup> Lowest harvest since 1988 (quota—no-quota split in 1987).
<sup>k</sup> Lowest harvest since 1999.
<sup>l</sup> Highest harvest since 2007.
<sup>m</sup> Record high harvest.
<sup>n</sup> Record high % males.
Fig. 4. Trends in statewide bear harvest and proportions of harvest and licenses in the no-quota zones, 1987–2017.
Table 6. Bear hunting success (%) by BMU, measured as the registered harvest divided by the number of licenses sold\(^a\), 2012–2017.

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<td>59(^b)</td>
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<td>38</td>
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<tr>
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</tr>
<tr>
<td>52(^f)</td>
<td></td>
<td></td>
<td>17</td>
<td>14</td>
<td>19</td>
<td>15</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>No Quota</td>
<td>32 (95)</td>
<td>18</td>
<td>15</td>
<td>21</td>
<td>16</td>
<td>13</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>Statewide</td>
<td>40 (95)</td>
<td>29</td>
<td>31</td>
<td>37(^f)</td>
<td>28</td>
<td>25</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

\(a\) Registered harvest/licenses instead of harvest/hunters because BMU-year-specific estimates for the proportion of license-holders that hunted are unreliable. Statewide estimates of harvest/hunters are presented in Table 1.

\(b\) Record high (or tied record high) success.

\(c\) Second highest success.

\(d\) Highest success ever for any BMU.

\(e\) Tied record lowest success.

\(f\) Since 2013, an attempt was made to differentiate the number of no-quota (NQ) hunters by BMU in order to estimate success rates. When no-quota hunters bought licenses, they recorded the deer block where they anticipated hunting. A significant number chose blocks in the quota zone; those who did not harvest a bear in the quota zone were divided up into NQ-BMUs in proportion to those who chose blocks in or adjacent to NQ-BMUs. A few chose BMU 60 (SE Minnesota); the first bear was harvested there in 2017. Table shows % indicating where they planned to hunt (number of hunters in parentheses for BMU 60 and Quota zone):

<table>
<thead>
<tr>
<th>BMU</th>
<th>2017</th>
<th>2016</th>
<th>2015</th>
<th>2014</th>
<th>2013</th>
</tr>
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<tbody>
<tr>
<td>11</td>
<td>29.8</td>
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<td>4.4</td>
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</tr>
<tr>
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<td>61.2</td>
<td>63.9</td>
<td>64.7</td>
<td>62.6</td>
</tr>
<tr>
<td>60 (n)</td>
<td>0.1 (4)</td>
<td>0.4 (12)</td>
<td>0.2 (8)</td>
<td>0.6 (17)</td>
<td>0.4 (10)</td>
</tr>
<tr>
<td>Quota zone (n)</td>
<td>4.2 (137)</td>
<td>3.2 (105)</td>
<td>3.1 (101)</td>
<td>2.1 (60)</td>
<td>4.5 (127)</td>
</tr>
</tbody>
</table>
Table 7. Cumulative bear harvest (% of total harvest) by date, 1997–2017.

<table>
<thead>
<tr>
<th>Year</th>
<th>Day of week for opener</th>
<th>Aug 22/23 – Aug 31</th>
<th>Sep 1 – Sep 7</th>
<th>Sep 1 – Sep 14</th>
<th>Sep 1 – Sep 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Mon</td>
<td>76</td>
<td>88</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>Tue</td>
<td>76</td>
<td>87</td>
<td>96</td>
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<tr>
<td>1999</td>
<td>Wed</td>
<td>69</td>
<td>81</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>Wed</td>
<td>57</td>
<td>72</td>
<td>82</td>
<td>96</td>
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<tr>
<td>2001</td>
<td>Wed</td>
<td>67</td>
<td>82</td>
<td>88</td>
<td>98</td>
</tr>
<tr>
<td>2002</td>
<td>Sun</td>
<td>57&lt;sup&gt;a&lt;/sup&gt;</td>
<td>69&lt;sup&gt;a&lt;/sup&gt;</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Mon</td>
<td>72</td>
<td>84</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Wed</td>
<td>68</td>
<td>82</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Thu</td>
<td>72</td>
<td>81</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Fri</td>
<td>69</td>
<td>83</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Sat</td>
<td>69</td>
<td>82</td>
<td>96</td>
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<tr>
<td>2008</td>
<td>Mon</td>
<td>58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Tue</td>
<td>74</td>
<td>86</td>
<td>96</td>
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<tr>
<td>2010</td>
<td>Wed</td>
<td>69</td>
<td>84</td>
<td>96</td>
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</tr>
<tr>
<td>2011</td>
<td>Thu</td>
<td>65</td>
<td>78</td>
<td>93</td>
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<tr>
<td>2012</td>
<td>Sat</td>
<td>68</td>
<td>83</td>
<td>96</td>
<td></td>
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<td>2014</td>
<td>Mon</td>
<td>60</td>
<td>75</td>
<td>92</td>
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<tr>
<td>2015</td>
<td>Tue</td>
<td>58&lt;sup&gt;b&lt;/sup&gt;</td>
<td>75</td>
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<tr>
<td>2016</td>
<td>Thu</td>
<td>68</td>
<td>83</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>Fri</td>
<td>69</td>
<td>83</td>
<td>93</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> The low proportion of total harvest taken during the opening week (<60%) reflects a high abundance of natural foods.

<sup>b</sup> The slow start the first week was likely due to especially warm weather.
Table 8. Number of nuisance bear complaints registered by Conservation Officers and Wildlife Managers during 1997–2017, including number of nuisance bears killed and translocated, and bears killed in vehicular collisions.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of personnel participating in survey a</td>
<td>69</td>
<td>71</td>
<td>52</td>
<td>60</td>
<td>54</td>
<td>50</td>
<td>39</td>
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<td>40</td>
<td>34</td>
<td>56</td>
<td>63</td>
<td>64</td>
<td>61</td>
<td>55</td>
</tr>
<tr>
<td>Complaints examined on site</td>
<td>661</td>
<td>226</td>
<td>189</td>
<td>105</td>
<td>122</td>
<td>75</td>
<td>75</td>
<td>61</td>
<td>57</td>
<td>63</td>
<td>59</td>
<td>65</td>
<td>70</td>
<td>37</td>
<td>113</td>
<td>69</td>
<td>79</td>
<td>97</td>
<td>118</td>
<td>71 (22,49)</td>
</tr>
<tr>
<td>Complaints handled by phone b</td>
<td>2196</td>
<td>743</td>
<td>987</td>
<td>618</td>
<td>660</td>
<td>550</td>
<td>424</td>
<td>507</td>
<td>451</td>
<td>426</td>
<td>380</td>
<td>452</td>
<td>535</td>
<td>514</td>
<td>396</td>
<td>722</td>
<td>623</td>
<td>570</td>
<td>840</td>
<td>780</td>
</tr>
<tr>
<td>Total complaints received</td>
<td>2857</td>
<td>969</td>
<td>1176</td>
<td>723</td>
<td>782</td>
<td>625</td>
<td>505</td>
<td>582</td>
<td>512</td>
<td>483</td>
<td>443</td>
<td>511</td>
<td>600</td>
<td>584</td>
<td>433</td>
<td>835</td>
<td>692</td>
<td>649</td>
<td>937</td>
<td>898</td>
</tr>
<tr>
<td>% Handled by phone</td>
<td>77%</td>
<td>77%</td>
<td>84%</td>
<td>85%</td>
<td>84%</td>
<td>88%</td>
<td>84%</td>
<td>87%</td>
<td>88%</td>
<td>88%</td>
<td>86%</td>
<td>88%</td>
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<td>88%</td>
<td>91%</td>
<td>86%</td>
<td>90%</td>
<td>88%</td>
<td>90%</td>
<td>87%</td>
</tr>
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<td>Bears killed by:</td>
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<tr>
<td>Private party or DNR</td>
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<td>25</td>
<td>25</td>
<td>22</td>
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<td>21</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td>9</td>
<td>16</td>
<td>24</td>
<td>26</td>
<td>45</td>
<td>53</td>
<td>22 (4, 18)</td>
</tr>
<tr>
<td>Hunter before season c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– from nuisance survey</td>
<td>32</td>
<td>23</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>18</td>
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<td>4</td>
<td>3</td>
<td>3</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>– from registration file</td>
<td>35</td>
<td>31</td>
<td>24</td>
<td>43</td>
<td>20</td>
<td>11</td>
<td>8</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>25</td>
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<td>15</td>
<td>10</td>
<td>5</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Hunter during/after season d</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hunter by Area 88 license e</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Permittee f</td>
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<td>11</td>
<td>7</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>6</td>
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<td>5</td>
<td>4</td>
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<td>1</td>
<td>0</td>
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</tbody>
</table>

\( \text{Number of personnel participating in survey a:} \ 69, 71, 52, 60, 54, 50, 39, 34, 42, 46, 46, 37, 51, 40, 34, 56, 63, 64, 61, 55, 86 \) (51.35)

\( \text{Complaints examined on site:} \ 661, 226, 189, 105, 122, 75, 75, 61, 57, 63, 59, 65, 70, 37, 113, 69, 79, 97, 118, 71 \) (22,49)


\( \text{Total complaints received:} \ 2857, 969, 1176, 723, 782, 625, 505, 582, 512, 483, 443, 511, 600, 584, 433, 835, 692, 649, 937, 898, 715 \)

\( \text{% Handled by phone:} \ 77\%, 77\%, 84\%, 85\%, 84\%, 88\%, 84\%, 87\%, 88\%, 88\%, 86\%, 88\%, 89\%, 88\%, 91\%, 86\%, 90\%, 88\%, 90\%, 87\%, 90\% \)

\( \text{Bears killed by:} \)

\( \text{Private party or DNR:} \ 93, 31, 25, 25, 22, 12, 13, 25, 11, 21, 22, 23, 22, 9, 16, 24, 26, 45, 53, 22 \) (4, 18)
Table 8. (continued)

<table>
<thead>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bears translocated</td>
<td>115</td>
<td>24</td>
<td>29</td>
<td>1</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
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<td>0</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>• % bears translocated</td>
<td>17</td>
<td>11</td>
<td>15</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>5</td>
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<td>61</td>
<td>60</td>
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<td>22</td>
<td>18</td>
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<td>28</td>
<td>15</td>
<td>33</td>
<td>32</td>
<td>28</td>
<td>47</td>
<td>27</td>
</tr>
</tbody>
</table>

- **a** Maximum number of people turning in a nuisance bear report each month. Monthly reports were required beginning in 1984, and included cases of zero complaints. In 2017, the recording system was changed, where it was no longer possible to differentiate Wildlife Managers who participated month by month. Instead, the number reflects the total number of people receiving and recording at least 1 complaint during that year. For consistency, the records from Conservation Officers were handled the same way.

- **b** If a complaint was handled by phone, it means a site visit was not made.

- **c** The discrepancy between the number recorded on the nuisance survey and the number registered before the opening of the season indicates incomplete data. Similarity between the two values does not necessarily mean the same bears were reported.

- **d** Data only from nuisance survey because registration data do not indicate whether bear was a nuisance.

- **e** Beginning in 2017, hunters could choose Area 88 in the quota lottery, and if drawn, could hunt for a nuisance bear, if authorized. In 2017, 11 hunters were authorized, but only 1 killed a bear.

- **f** A permit for non-landowners to take a nuisance bear before the bear season was officially implemented in 1992, but some COs individually implemented this program in 1991. Data are based on records from the nuisance survey, not directly from permit receipts. Only 4 bears have been killed by permittees since 2011.

- **g** Percent of on-site investigations resulting in a bear being captured and translocated.

- **h** Car kill data were reported on the monthly nuisance form for the first time in 2005. In all previous years, car kill data were from Enforcement’s confiscation records. In 2015, confiscation records had more car-kills than the nuisance survey (47 vs 33), so the higher number is shown here. In 2017, only 1 car-kill was in the confiscation records. The number of reported car-kills in 2017 was the lowest since record-keeping began in 1981.

- **i** Beginning in 2017, Wildlife Managers recorded nuisance bear complaints on an all-species wildlife damage app, whereas Conservation Officers continued to submit monthly nuisance bear survey forms (April–Oct). The 2 survey tools are not exactly the same, so data are presented separately for each in parenthesis (Wildlife Managers, COs). For consistency, only April–October data are included (in 2017 10 calls were received in other months).
Fig. 5. Trends in nuisance bear complaints, and nuisance bears killed and moved, 1981–2017, showing dramatic effect of change in nuisance bear policy, and slight increasing trend over past decade.
Table 9. Regional bear food indices\(^a\) in Minnesota’s bear range, 1984–2017. Shaded blocks indicate particularly low (<45; pink) or high (≥70; green) values.

<table>
<thead>
<tr>
<th>Year</th>
<th>NW</th>
<th>NC</th>
<th>NE</th>
<th>WC</th>
<th>EC</th>
<th>Rangewide</th>
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<td>32.3</td>
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<td>48.9</td>
<td>51.4</td>
<td>45.4</td>
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<td>1985</td>
<td>43.0</td>
<td>37.5</td>
<td>35.3</td>
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<td>1986</td>
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<td>54.7</td>
<td>74.7</td>
<td>61.1</td>
<td>67.7</td>
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<td>1987</td>
<td>62.7</td>
<td>57.3</td>
<td>46.8</td>
<td>67.4</td>
<td>69.0</td>
<td>61.8</td>
</tr>
<tr>
<td>1988</td>
<td>51.2</td>
<td>61.1</td>
<td>62.7</td>
<td>54.4</td>
<td>47.3</td>
<td>56.0</td>
</tr>
<tr>
<td>1989</td>
<td>55.4</td>
<td>58.8</td>
<td>48.1</td>
<td>47.8</td>
<td>52.9</td>
<td>51.6</td>
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<tr>
<td>1990</td>
<td>29.1</td>
<td>39.4</td>
<td>55.4</td>
<td>44.0</td>
<td>47.9</td>
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<td>71.2</td>
<td>64.8</td>
<td>72.1</td>
<td>78.9</td>
<td>68.4</td>
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<td>1992</td>
<td>52.3</td>
<td>59.9</td>
<td>48.6</td>
<td>48.1</td>
<td>63.3</td>
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<td>75.0</td>
<td>73.9</td>
<td>76.8</td>
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<td>61.3</td>
<td>81.5</td>
<td>68.2</td>
<td>72.3</td>
</tr>
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\(^a\) Each bear food index value represents the sum of the mean index values for 14 species, based on surveys conducted in that area. Range-wide mean is derived directly from all surveys conducted in the state (i.e., not by averaging survey area means).
Table 10. Regional mean index values\(^a\) for bear food species in 2017 compared to the previous 33-year mean (1984-2016) in Minnesota’s bear range. Shading indicates particularly high (green) or low (pink) fruit abundance relative to average (≥1 point difference for individual foods; ≥5 points difference for totals).

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<th>WC 33yr mean (n = 9)</th>
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\(^a\) Food abundance indices were calculated by multiplying species abundance ratings x fruit production ratings.

\(^b\) n = Number of surveys used to calculate area-specific means.

\(^c\) Sample size for the entire range does not equal the sum of the sample sizes of 5 survey areas because some surveys were conducted on the border of 2 or more areas and were included in calculations for both.
Table 11. Regional productivity index for important fall foods (oak + hazel + dogwood) in Minnesota’s bear range, 1984–2017. Shading indicates particularly low (≤ 5.0; yellow) or high (≥8.0; tan) values.

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^a^ Values represent the sum of mean production scores for hazel, oak, and dogwood, derived from surveys conducted in each survey area. Range-wide mean is for all surveys conducted in the state (i.e. not an average of survey area means).

^b^ Record low fall food score in survey area.
Fig 6. Production of fall bear foods (dogwood, oak, hazel) across Minnesota, 2017.
Fig. 7. Number of bears harvested vs. number predicted to be harvested based on number of hunters and fall food production — top panel: statewide 1984–2017; bottom panel: quota zone only, most recent 15 years. Regression for the full dataset included an interaction term between food and hunters to better predict the drastic changes in harvest when fall foods were extremely high or low.
% Males in Harvest

BMU

- 44
- 45
- 51
- 52

1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
**Fig 9.** Median ages of harvested female bears by BMU, 1997–2017. Thick lines show decreasing trends continuing through 2017. Breaks in line occur when sample sizes were too small to calculate a meaningful median.
Median age harvested females

1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017

BMU

- 44
- 45
- 51
- 52
Fig. 10. Statewide median ages (years) and sex ratio of harvested bears, 1982–2017.

Fig. 11. Statewide harvest structure: proportion of each sex in age category, 1982–2017. Trend lines are significant, but the last few years show a different trend.
Fig. 12. Percent of hunters submitting useable bear teeth for aging (vital for population monitoring, see Figs. 14–16). Cooperation levels exceeded 80% when registration stations were paid to extract teeth (this practice ended in 1993) and ~90% when non-compliant hunters were sent a reminder letter after the season.
Fig. 13. Percent of hunters who submitted a bear tooth in 2017 by method of registration (top panel) and by BMU (bottom panel). Beginning in 2013, hunters could register their bear by phone or internet, as well as in person at a station.
Fig. 14. Statewide bear population trend (pre-hunt) derived from Downing reconstruction using harvest age structures, 1980–2017. Curves were scaled (elevated to account for non-harvest mortality) to various degrees to attempt to match the tetracycline-based mark–recapture estimates (2 such curves shown here). Estimates beyond 2015 are unreliable.
Fig. 15. Population trends during 2000s derived from Downing reconstruction for quota and no-quota zones compared to respective harvests. Reconstruction-based estimates <2 years from the most recent harvest age data are unreliable (hence curves terminate in pre-hunt 2015). Population curves were scaled (elevated to account for non-harvest mortality) to match the lower curve in Fig. 14 (i.e., the actual scale of the population estimates is not empirically-based).
Fig. 16. Trends in proportion of male bears in statewide harvest at each age, 1–10 years, grouped in 5-year time blocks, 1980–2017 (last 2 intervals are 4 years). Higher harvest rates result in steeper curves because males are reduced faster than females. Fitting a line to the data for each time block and predicting the age at which 50% of the harvest is male (dashed tan line) yields approximately the inverse of the harvest rate (derived rates are shown in inset).