COMPARING TECHNIQUES FOR COUNTING RIO GRANDE WILD TURKEYS AT WINTER ROOTS

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Abstract: Counting Rio Grande wild turkeys (Meleagris gallopavo intermedia) at winter roosts is a technique commonly used to index their abundance because they congregate in specific roost sites throughout the winter. We compared 5 techniques for counting wild turkeys on winter roosts. We used direct observation during evening and morning hours, and advanced technology such as a night vision device (NVD), a thermal infrared camera (thermal IR), and an automated video monitoring system (AVMS). Morning counts were 8.7 ± 5.9% (SE) larger than evening counts and 25.8 ± 5.4% larger than NVD counts. Morning counts were similar (28.6 ± 12.6%) to counts from the AVMS. Also, counts from the thermal IR were 46.5 ± 8.9% smaller than the evening counts and were similar (14.0 ± 31.5%) to the NVD counts. Overall, we found the advanced technology (e.g., NVD, thermal IR, or AVMS) was ineffective for counting wild turkeys at winter roosts and the more traditional morning counts provided the largest counts. Thus, we suggest using morning counts when counting Rio Grande wild turkeys at winter roosts.

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Rio Grande wild turkeys often congregate in specific roost sites throughout winter (Thomas et al. 1966, Watts and Stokes 1971). Many techniques have been used to count Rio Grande wild turkeys at winter roost sites. For example, counts have been obtained from surveying landowners (Thomas et al. 1966, Cook 1973), counting wild turkeys in the general area of known roosts (DeArment 1975, Healy and Powell 1999), and counting wild turkeys as they flew into or from roosts (Thomas et al. 1966, Cook 1973, Smith 1975). Also, increased interest in the use of advanced technology such as NVD, thermal IR, and AVMS for counting wild turkeys at winter roosts has emerged. However, little information comparing counting techniques is available. Variation exists among the potential techniques for counting wild turkeys at winter roosts. However; only direct counts obtained by wildlife professionals and landowner surveys have been compared (Thomas et al. 1966, Cook 1973). Those comparisons suggested that landowner surveys were adequate to index direct winter roost counts in areas with stable winter roosting patterns. Thus, our objectives were to compare several techniques for counting wild turkeys at winter roosts and

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examine the relationships among counts generated with these techniques. Specifically, we were interested in counts obtained from direct observation of roosting wild turkeys during evening hours, from direct observation during morning hours, from a NVD, from a thermal IR, and from an AVMS. Our results will help researchers and managers eliminate ineffective techniques and focus future evaluation and validation efforts.

STUDY AREA

We conducted counts of wild turkeys at winter roosts at 3 study sites in the Texas Panhandle and 1 site in southwestern Kansas (Fig. 1). The Texas study sites were centered on (1) the Matador Wildlife Management Area (WMA), located northwest of Paducah in Cottle County along the confluence of the Middle and South Pease rivers; (2) the Gene Howe WMA, located east of Canadian in Hemphill County along the Canadian River; and (3) private ranches surrounding the Salt Fork of the Red River, located north of Hedley in western Collingsworth and eastern Donley counties. The Kansas study site was centered on the Cimarron National Grasslands north of Elkhart in Stevens and Morton counties, Kansas, and Baca County, Colorado along the Cimarron River. The riparian areas of the 4 study sites were dominated by eastern cottonwood (Populus deltoides), western soapberry (Sapindus drummondi), hackberry (Celtis occidentalis), netleaf hackberry (C. reticulata), sugarberry (C. leveigata), honey locust (Gleditsia triacanthos), black locust (Robinia pseudoacacia), tamarisk (Tamarix chinensis), and sand plum (Prunus angustifolia). More detailed descriptions of the study sites were provided by Holdstock (2003), Hall (2005), Huffman (2005), and Butler et al. (2005).

METHODS

Rio Grande wild turkey winter roosts were identified from historical data (Texas Parks and Wildlife Department, unpublished data), recent radiotelemetry efforts (Holdstock 2003, Phillips 2004), and communication with land managers. Wild turkeys were counted periodically at these winter roosts from mid-November through mid-March during 2003–2005. We conducted counts after leaf fall in autumn and before leaf emergence in spring.

We conducted morning and evening counts to obtain direct observations of wild turkeys congregating on the ground, flying to and from the roost, and settling in the roost trees. During morning and evening counts, observers used 10 power binoculars as needed; roosts were typically observed from <100 m. We used infrared technology to observe roosts after dark (i.e., 1 hr after sunset to 1 hr before sunrise). We used a Generation-III NVD (U.S. Night Vision® Goggle PVS-7B Ultra with an attachable 3X lens, U.S. Night Vision Corporation, Costa Mesa, California, USA) and a handheld thermal IR (Raytheon Thermal-Eye 250D thermal-infrared camera, L-3 Communications, New York, New York, USA) to observe roosting wild turkeys; roost were typically observed from <50 m. The NVD cost approximately $3,500 (U.S.) and relies on reflected light in the visible and near-infrared wavelengths. The thermal IR cost approximately $13,000 (U.S.) and relies on infrared light emitted from thermal sources.

We also used the AVMS to record roosting activities on 1.25 cm vertical helical scan (VHS) tape (Sony® T-160 VHS, Sony Corporation, Tokyo, Japan). The AVMS was a hybridization of the designs of King et al. (2001), Kristan et al. (1996), and Lewis et al. (2004) as reported in McGee et al. (2005). The AVMS had zoom capabilities and recording times were programmable (McGee et al. 2005). The AVMS cost approximately $1,600 (U.S.). After monitoring roosts several times to determine typical roost trees, we positioned the AVMS to allow the best, but likely incomplete, coverage of roost trees. The AVMS was programmed to record approximately 1 hr before and after sunrise and sunset allowing recording of wild turkeys as they flew into and from the winter roost. Counts of wild turkeys in the roosts were obtained from the VHS recordings.

Wild turkeys fly into a roost around sunset and usually remain there until sunrise. We considered the period of time from the evening flight to the morning flight as a roosting event. For each roosting event, ≥2 of the 5 techniques were used to count wild turkeys on the winter roost, which allowed pairing of the techniques for comparison with paired t-tests (Zar 1999). To avoid potential
bias from prior knowledge of the number of turkeys in a roost, different observers were used for each technique during a specific roosting event. Data for comparing thermal IR counts with the morning and AVMS counts were not available because the thermal IR was only available to us for a short period of time.

RESULTS

Comparisons were conducted on 105 roosting events. The number of Rio Grande wild turkeys observed during those roosting events ranged from 2 to 319. Evening counts resulted in $20.9 \pm 3.5\%$ larger counts than the NVD counts (Table 1). Morning counts were $8.7 \pm 5.9\%$ and $25.8 \pm 5.4\%$ larger than evening and NVD counts, respectively (Table 1). Counts from the thermal IR were $46.6 \pm 8.9\%$ smaller than evening counts but were similar ($14.0 \pm 31.5\%$) to the NVD counts (Table 1).

Though we attempted to position the AVMS to allow the best coverage of a roost, on 9
Table 1. Paired comparisons of techniques used for counting Rio Grande wild turkeys at winter roosts in the Texas Panhandle and southwestern Kansas during mid-November through mid-March, 2003–2005

<table>
<thead>
<tr>
<th>Paired comparison</th>
<th>n</th>
<th>$\bar{x}$</th>
<th>SE</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning – evening</td>
<td>32</td>
<td>8.7</td>
<td>5.91</td>
<td>2.121</td>
<td>0.042</td>
</tr>
<tr>
<td>Morning – NVD</td>
<td>38</td>
<td>25.8</td>
<td>5.39</td>
<td>3.174</td>
<td>0.003</td>
</tr>
<tr>
<td>Morning – AVMS</td>
<td>8</td>
<td>28.6</td>
<td>12.57</td>
<td>1.841</td>
<td>0.108</td>
</tr>
<tr>
<td>Evening – NVD</td>
<td>77</td>
<td>20.9</td>
<td>3.52</td>
<td>5.340</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Evening – thermal IR</td>
<td>10</td>
<td>46.6</td>
<td>8.94</td>
<td>3.344</td>
<td>0.009</td>
</tr>
<tr>
<td>Evening – AVMS</td>
<td>8</td>
<td>15.2</td>
<td>13.51</td>
<td>1.492</td>
<td>0.179</td>
</tr>
<tr>
<td>AVMS – NVD</td>
<td>8</td>
<td>3.3</td>
<td>15.11</td>
<td>0.617</td>
<td>0.557</td>
</tr>
<tr>
<td>NVD – thermal IR</td>
<td>7</td>
<td>14.0</td>
<td>31.46</td>
<td>0.523</td>
<td>0.620</td>
</tr>
</tbody>
</table>

of 17 events we did not record wild turkeys in the roost because turkeys did not use their usual trees. Also, on 2 occasions, no wild turkeys were recorded during the morning because of dew on the lens or foggy conditions. Otherwise, 8 attempts resulted in a count. Morning (28.6 ± 12.6%), evening (15.2 ± 13.5%), and NVD (3.3 ± 15.1%) counts were similar to those 8 counts obtained from the AVMS (Table 1).

**DISCUSSION**

Though the AVMS counts were similar to morning counts, it was not an effective technique. To properly setup the AVMS, roosts were observed for several days to determine the typical roost trees used by wild turkeys in a roost area. However, because of unstable roosting patterns, only 8 of 17 attempts at using the AVMS were successful. Other techniques allowed the observer to move in response to wild turkey movements (e.g., wild turkeys sometimes choose to roost in different trees on different nights). Thus, without stable roosting patterns, we do not recommend using an AVMS to count Rio Grande wild turkeys at winter roosts.

Direct observation of roosts during the morning resulted in the largest counts. Because wild turkeys may not roost in the same trees from night to night, direct observation was more difficult during the evening. In large stands of trees, it was more difficult to predict where wild turkeys would roost during a particular roosting event. But, during the morning it was easier to locate roosts (via visual location and sound) before turkeys begin to depart, resulting in larger counts. Also, wild turkeys often fly into open areas during morning, allowing for better counts. However, few morning roost counts of vultures (Cathartes aura and Coragyps atratus) were successful because a large number of vultures would depart the roost at once (Sweeney and Fraser 1986). We also found it was difficult to count wild turkeys when many departed the roost at once. However, this behavior occurred during morning and evening hours; it was unpredictable and varied among roosts and days.

Many factors such as tree, limb, and twig densities and illumination strongly affected NVD ability. With the NVD, wild turkeys appeared as silhouettes against the night sky. However, in low light conditions, wild turkey silhouettes were often indistinguishable from other shadows. In more illuminated conditions (e.g., full moon), wild turkey silhouettes were usually obscured by limbs and twigs that were much more visible due to reflected moon light.

Thermal IR counts were smaller than evening counts and similar to NVD counts. We observed that wild turkeys tuck their heads under their wings at night leaving little exposed skin. Because of the insulating capacity of their feathers, little heat escapes for detection. Wakeling et al.
(2003) had similar difficulties with aerial thermal IR counts for Memram’s wild turkeys (M. g. merriami). However, we learned counts could be improved by emulating a yelp with a box or diaphragm call because wild turkeys would usually expose their heads revealing a thermal signature.

Advanced technology such as NVD, thermal IR, or AVMS was not as effective at determining the number of wild turkeys in a winter roost. But, the more traditional morning counts typically provided the largest counts. Thus, we suggest researchers and managers strive to obtain the best possible counts using morning counts; however, several survey attempts may be necessary to obtain the best possible count.

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LITERATURE CITED


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