Too Many Turkeys ??
Did Raising Extra Corn for Turkeys Put Too Much Stress on Pueblo Farming in the AD 1200s?

A Talk by Bill Lipe
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First, some archaeological background on the tumultuous 1200s in the Ancestral Pueblo world
For over 120 years, archaeologists and the general public have asked “Why did the Mesa Verde people leave, and where did they go?”
Where did the people go?

In the 1200s, they joined existing Pueblo communities or established new ones in the Northern Rio Grande, and at Zuni, Hopi, and other areas to the south and southeast.
Archaeologists from WSU and the Crow Canyon Center have recently compiled survey data showing a dramatic population movement in the AD 1200s.

These two study areas had large populations but represent only part of the larger regions occupied by Pueblo farmers in the Mesa Verde and Northern Rio Grande areas.
By the end of the 1200s, Mesa Verde people had moved to various places in the blue-shaded area on the map above. In the 1400s and 1500s, Pueblo settlement contracted further into fewer but larger villages.
It was long thought that the “Great Drought” of 1276-1299 drove people out of the Mesa Verde area, but it longer seems that simple. Several lines of evidence indicate regional population decline started by about 1250.

A combination of “push” and “pull” factors seems more likely, with the Great Drought providing the last “push.” Did the cost of raising turkeys also give a nudge?
In the late 1100s and early 1200s, “plaza-oriented” villages begin to appear in the blue area of the map shown earlier. Inhabitants looked inward to the plaza, where kivas that drew membership from across the community were located. This was a big contrast with the Mesa Verde pattern of “household kivas.”

A “pull factor”: new forms of socio-religious organization

Left: Broken K Pueblo, Upper Little Colorado region (Hill 1966)
Warfare among Pueblo communities raged in the 1200s, and at peak regional population, communities in marginal farming areas lost the option of moving to better land when crops were poor.
In the Mesa Verde area, wild game was also becoming depleted around the settlements as population grew in the late 1100s and early 1200s. For the first time, people began to depend on domestic turkeys for meat.
But raising turkeys has a price—feeding them maize.

Evidence comes from analysis of stable carbon isotopes. C-4 pathway plants such as maize incorporate more $^{13}$C than do C-3 plants, which predominate in the temperate zones outside the tropics.

Figure at left shows that the isotope signatures of archaeological turkeys group with humans, not with wild turkeys.

Lipe et al. 2016)
The earliest evidence we have of domestic turkeys in the SW is from a Basketmaker II midden in Turkey Pen cave, Grand Gulch, SE Utah.
In the late 1890s, Richard Wetherill dug in Turkey Pen Cave, but not extensively. His notes say: “The debris seemed too much for us to work in the limited time we had. Also too filthy as it was composed almost entirely of desicated [sic] turkey droppings.”
In 1972, RG Matson dug a single test pit into the BM II midden in Turkey Pen Cave, and also found that indeed there were lots of turkey droppings, and they were around 2000 years old!
In 2009, my colleague Brian Kemp and I picked through samples collected in 1972 and extracted some turkey droppings for a new genetic study of Southwestern turkeys from archaeological sites.
Our turkey droppings contributed mtDNA to a large study of archaeological turkey genetics put together by Camilla Speller at Simon Fraser U. Our samples from Turkey Pen were the earliest by several hundred years.
Surprisingly, the Speller et al. study identified a turkey variety (aHap1) that differs from the local Merriams’ subspecies and also from the Mexican domestic turkey. The aHap1 line was maintained in the Upland SW from ca. 100 BC until at least the AD 1600s. An independent center of domestication.
In a study recently published in the journal *American Antiquity*, we reviewed the evidence on how turkeys were used from the BM II through Late Pueblo II periods (late BC times until about AD 1100) in the Mesa Verde region. We concluded:

1) They were fed maize throughout
2) Only small numbers were kept but their breeding was controlled
3) They were important as a source of feathers for blankets and ritual items
4) They were often ritually buried, indicating symbolic importance
5) They didn’t become a major food source until the late 1100s and especially the 1200s
Here are two feather blankets on display at the Edge of the Cedars Museum in Blanding, UT. Both were found in dry caves.

The one on the right still has its feathers. It was seized in an ARPA raid. We recently obtained an AMS date of about AD 1240 from it.

For the blanket on the left, insects have stripped the feather vanes. But you can see the framework of yucca cord around which feathers were wrapped.
Excellent examples of ritual burial of turkeys (and some other animals) were found at the Champagne Spring site in SW Colorado, dating to the Early PII period (early AD 1000s.)

Members of the Verde Valley Archaeological Center assisted in these excavations.
Finally, back to the question of how much extra maize had to be raised to feed turkeys once they became an important meat source in the Central Mesa Verde area in the late AD 1100s.
<table>
<thead>
<tr>
<th>Animal Group</th>
<th>Edible Meat Weight</th>
<th>Protein Yield g/kg</th>
<th>Weighting Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artiodactyl</td>
<td>36 kg</td>
<td>300 g</td>
<td>10800</td>
</tr>
<tr>
<td>Jackrabbit</td>
<td>1.38 kg</td>
<td>330 g</td>
<td>455</td>
</tr>
<tr>
<td>Cottontail</td>
<td>0.6 kg</td>
<td>330 g</td>
<td>198</td>
</tr>
<tr>
<td>Turkey</td>
<td>4.13 kg</td>
<td>290 g</td>
<td>1198</td>
</tr>
<tr>
<td>Squirrels &amp; prairie dogs</td>
<td>0.56 kg</td>
<td>300 g</td>
<td>168</td>
</tr>
</tbody>
</table>

Weighting bone counts by protein yield of the Animals they come from is a way to compare the food value of various animals in a faunal assemblage (e.g., 10 cottontail bones = 10 x 198 = 1980; 10 turkey bones = 10 x 1198 = 11980)
It has been recognized for a number of years that the raw bone counts (NISPs) show a big increase in turkey and rabbit bones in the P III period.

Weighting the bone counts by protein yield enabled us to assess the meat value of five animal groups at each site.
These two figures show the shift in meat preferences from two P I (AD 800s) sites to several Early to Middle P III sites (1150-1250).
In late P III in the CMV, sites became quite large and compact. Sand Canyon Pueblo (above) had about 500 rooms. Some P IV sites in the NRG were even larger. Arroyo Hondo grew to over 1000 rooms in the 1300s.
For the late P III (1250-1280) sites, the trash deposits continue the trend to ever more turkeys. The site totals also include a lot of non-trash deposits and show a rebound in artiodactyls. The P IV sites show a return to “normal” dependence on deer as a meat source. Perhaps another “pull” of the Rio Grande area?
How Many Food Turkeys Were Required at The Sites?

• Protein-weighted NISPs indicate percent animal protein from turkey

• Two levels of human need for animal protein compared: 5 g/pers/day and 10 g/pers/day

• If assemblage is 50% turkey, the 5 g level requires 2.5 g/pers/day of turkey protein; twice that at the 10 g level

• Adult turkey yields 1198 g usable protein

• 5 g target: 2.5 g x 365 days = 912.5 g turkey protein = 0.76 turkeys/pers/yr

• 10 g target: 1825 g from turkeys = 1.5 turkeys/pers/yr
Number of Turkeys Eaten Per Year, Per 100 People, at Various Sites, by Time Period

- **P I V Sites**: 16 (5 g model) / 31 (10 g model)
- **L P III Sites**: 56 (5 g model) / 111 (10 g model)
- **L P III, Sec Ref**: 101 (5 g model) / 201 (10 g model)
- **E/M P III Sites**: 77 (5 g model) / 153 (10 g model)
- **P I Sites**: 1.4 / 2.8

Turkeys 0 50 100 150 200 250
Additional maize required at estimated levels of turkey consumption (we assume each turkey requires 44 kg of maize per year and each human requires 187 kg)
Conclusions:

- P III sites in the CMV had an unusually high reliance on domestic turkeys.
- Producing extra maize for turkeys imposed significant costs and risks on CMV communities in the AD 1200s.
- The 5 g/pers/day target for animal protein is more realistic for P III than a higher target.
- Relocation of CMV populations to the N Rio Grande permitted a return to artiodactyls as the primary source of animal protein.
“Movement is part of us…People have moved from place to place and have joined and separated again throughout our past, and we have incorporated it into our songs, stories, and myths because we must continually remember that, without movement, there is no life.”

Tessie Naranjo, Santa Clara Pueblo 1995