Wolf–Deer and Guild Camera-trap Detections Across Wisconsin's Statewide Wolf Range (2018–2025), Resolved by Deer Class:

Buck Selection in the Hard-Antler Season, Bears and Fawns, and Class-Specific Reference Values for Displacement

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Preprint — companion to Vraniak (2026d); 15 August 2026.

Abstract

A statewide analysis of wolf-enriched Snapshot Wisconsin camera data (Vraniak 2026d) reported four things: wolves following deer, a temporary rise in that following after the February 2021 wolf harvest, displacement of deer by wolves, and avoidance of people across five co-occurring species. All of it treated deer as a single class. This companion resolves the deer into antlered bucks, antlerless does, and fawns. Each class is analyzed within the season in which it can actually be measured reliably from a photograph. The record is the same statewide extract (7,791,771 detections on 5,371 cameras, 2018–2025; 461 sequential wolf–deer encounters), the measures are identical, and before any new analysis the data pipeline was required to reproduce the parent study's published values exactly, which it did. The wild turkey again serves as the control, now resolved by class. A turkey poses no danger to deer, so each deer class's return delay after a turkey is that class's own reference value. The classes differ substantially (bucks 2.21×, fawns 1.84×, does 1.36×). Raw comparisons between classes therefore overstate differences in fear. Four results were obtained: (1) In the hard-antler months (September–December), an antlered deer is reliably a buck. In those months the wolf's nearest deer was a buck 1.40× more often than the bucks' share of deer detections t the same cameras would predict ($P = 0.004$). In the October–November rut the selection rose to 1.48×. The same test run across the whole year finds almost nothing (1.10×), because for most of the year antlers cannot separate the sexes. (2) The bear's and the coyote's following of deer resolve to the same target and the same season. When a bear and a fawn passed the same camera within half an hour in May–August, the bear was the second-comer 82% of the time; behind a doe, 59% ($P = 0.00001$). The coyote behind a fawn was second 76% of the time; behind a doe, 49% — chance ($P < 10^{-17}$). The coyote followed a median 5.1 minutes behind the fawn, tighter than the bear (11 minutes) and as tight as the wolf behind any deer (5.9 minutes). In the warm months the coyote did not follow does at all; its following arrow pointed only at the fawn. For both hunters the pursuit fades by fall. (3) Compared each against its own class reference, paired within camera (June–November), the bear is the only species that significantly displaces all three classes (bucks 1.55× over the reference, $P < 10^{-6}$; does 1.21×; fawns 1.22×). The buck's raw delay after a bear (4.29×) is the largest return value in the record. The coyote displaces no class at all (0.99–1.01×). The fawn's delay exceeds its reference only after the bear and the bobcat — the two predators that kill summer fawns at close range. (4) In the hard-antler months the buck looks to be much warier of people than the doe

(2.17× against 1.54×). That difference nearly levels once each sex is measured against its own reference (bucks 1.08×, does 1.15× over their references, paired within camera). Most of the buck's extra delay after a person is the buck's extra delay after anything. The turkey, resolved by class, also shows a small preference for the company of does: its nearest deer is a doe 1.07× more often than availability predicts (P = 0.0001). There is no arrow of following in it — the bird is second-comer at chance in every season and class. Resolved by class and season, the record separates pursuit (the wolf and the rutting buck; the bear, the coyote, and the summer fawn), displacement (owned by the bear, absent in the coyote), and company (the turkey among the does) — three relationships that pooled analyses blur into one. The coyote states the separation most sharply: it pursues the fawn on the trail, yet no deer class treats its passage as a reason to stay away — it is pursuit without displacement.

Keywords: camera trap; gray wolf; Canis lupus; white-tailed deer; Odocoileus virginianus; black bear; Ursus americanus; fawn predation; rut; prey selection; wild turkey; reference value; Snapshot Wisconsin.

Introduction

The statewide study this report accompanies (Vraniak 2026d) measured three relationships on Wisconsin's trail-camera record: whether a species tends to arrive after deer (following), how long deer wait to return after a species passes (displacement), and how long each species waits to return after a person. All three were measured with deer as a single class. That pooling was deliberate, because the parent analyses had shown the classes to be readable only in season. But it left one word doing too much work. "After" can mean a predator pursuing particular prey. It can mean a prey animal yielding a trail to a threat. It can also mean two species simply keeping the same company on the same ground. Which of these the record contains cannot be decided until the deer are resolved to buck, deer or fawn.

Resolving them requires honoring two clocks. An antlered deer is reliably a buck, and an antlerless deer reliably a doe, only in the hard-antler months of September through December; for most of the rest of the year antlers are absent or in velvet, and the antlered class shrinks to a fraction of the bucks actually present. A fawn is reliably a fawn while it carries spots, from birth in late May through roughly August; by fall, volunteers classing a spotless six-month-old will often record it as antlerless. Any class-resolved analysis run across the whole year therefore dilutes real signals with months of misreading. This report demonstrates that point directly: the wolf's selection of bucks is clear in the hard-antler window, and it disappears when the same test is run across all months.

Three prior findings frame the questions. The parent five-county study reported that wolves arrive after antlered bucks more often than the bucks' numbers would predict (Vraniak 2026b), a finding whose statewide, season-honest test is run here. Male deer in the rut range widely and attend to mates over vigilance (Foley et al. 2015), which predicts both that wolves should find bucks disproportionately in those weeks and that bucks should carry longer baseline gaps between camera visits. And the fawn-survival literature identifies the black bear and the bobcat — alongside the coyote — as the principal killers of young fawns in the upper Midwest (Vreeland et al. 2004; Kilgo et al. 2012; Warbington et al.

2017), which predicts a seasonal, target-specific structure in the bear's trailing of deer and in the fawn's own avoidances.

One methodological choice carries this report: the reference value, resolved by class. The parent study used the wild turkey — no predator of deer — to price the part of any passage-keyed return delay that has nothing to do with danger, and found deer return 1.53× more slowly even after a turkey. Here that discipline is applied for each class, and it matters more than the pooled study could see and find. Bucks, does, and fawns carry different reference values (2.21×, 1.36×, 1.84× in June–November), because their visit patterns differ in rarity and burstiness. Every cross-class comparison in this report is therefore made twice: raw, and against each class's own reference, paired within camera. Several apparent differences between the classes do not survive the second analysis.

Materials and methods

Dataset, pipeline, and validation

The data, tables, joins, and quality checks are exactly those of the parent statewide study (Vraniak 2026d): a statewide extract of the Snapshot Wisconsin citizen-science camera network (Wisconsin DNR Office of Applied Science) holding 7,791,771 detections on 5,371 cameras from January 2018 through December 2025, with deer resolved by volunteers to antlered, antlerless, and fawn classes (deer whose class could not be resolved — about 11% of deer detections — are excluded from class shares). All measures are unchanged: sequential encounters (nearest deer within 30 minutes of a focal detection; co-occurrences within 30 seconds excluded; follow fraction tested against 500-iteration day-reassignment permutation nulls) and per-camera return-delay ratios (median return after a passage divided by the responder's own median interval between independent detections; cameras qualify with at least three baseline intervals and three returns; Wilcoxon signed-rank on log ratios). Before any class-resolved analysis was run, the full data pipeline was rebuilt from the raw statewide file and required to reproduce the parent study's values exactly — every row of its encounter tables and every camera in its five return-delay tables. It did, and the identical code produced everything reported here. Analyses were run in Python 3 (numpy, scipy, statsmodels). The human-modification covariate was re-pulled at its native 1-km scale and verified against the parent extracts' layer ($r = 0.97$ on shared cameras, identical medians) before use; the class-resolved development-gradient analysis appears below.

Class windows and class-resolved measures

Class-resolved analyses run inside the windows in which the classes are measurable. Buck–doe analyses use the hard-antler months, September–December, with October–November reported separately as the rut; fawn analyses use May–August as the reliable window, with September–November reported and flagged for the classification loss described above; the full three-class displacement grid uses June–November, the widest window in which all three classes are present on the landscape. Within a window, baseline intervals and return delays are computed from detections inside the window only, and intervals that span the off-season are dropped.

Class selection — whether a species' nearest deer departs from what its cameras offer — is tested against availability: the expected share is the class composition of deer detections at the same cameras within the same window, and significance comes from 10,000 Monte Carlo draws in which each encounter's class is drawn from its own camera's class shares. Class-specific reference values are the return-delay ratio of each class after the wild turkey, computed identically to every other ratio; excess over the reference is evaluated as a paired comparison within camera — the log of a class's ratio after the focal species minus the log of that same class's ratio after a turkey on the same cameras — tested by Wilcoxon signed-rank. This pairing controls camera identity, season, and the class's own visit pattern at once, and it is the discipline behind every "over the reference" statement in this report.

Results

The wolf selects bucks — in the window where bucks can be read

The hard-antler window holds 151 wolf–deer encounters statewide, and following is at its strongest there: the wolf arrived second in 79% of them, against a permutation value of 0.50 (P = 0.004). Among the 125 encounters whose nearest deer is a classed adult, 43.2% are bucks, against 30.9% available at the same cameras in the same months — the wolf's nearest deer is a buck 1.40× more often than chance (P = 0.004). The rut sharpens the selection. In October–November, 52.2% of the wolf's nearest classed adults are bucks, against 35.2% available (1.48×, P = 0.004). In those weeks a wolf's nearest deer is more likely a buck than a doe, even though does outnumber bucks nearly two to one on the same cameras. Run across the whole year, the same test finds almost nothing (1.10×, P = 0.37; Figure 1). Outside the hard-antler months most bucks are recorded as antlerless or unknown, so the all-year record dilutes a real seasonal signal to invisibility. This is the statewide, season-honest confirmation of the parent studies' buck-selection finding (Vraniak 2026b), and it carries a warning for any camera study that reads deer classes across the whole year.

One nuance runs against the selection. When the wolf does trail, it trails does more decisively. In hard-antler encounters where the nearest deer is a doe, the wolf is second-comer 87% of the time, against 72% when it is a buck (Fisher's exact P = 0.041). Selection and decisiveness are different things. The wolf is found near bucks more often than chance, but the arrival order behind a doe is more consistent. The camera record cannot say which reflects hunting intent and which reflects the buck's own wider wandering in those weeks (Foley et al. 2015).

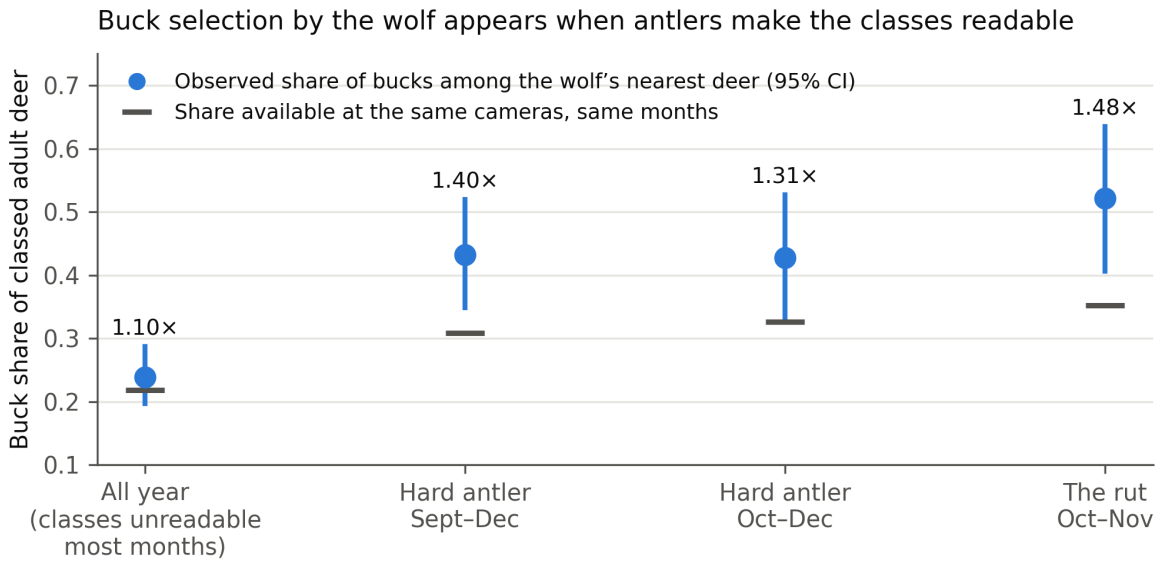

Figure 1. Observed share of bucks among the wolf's nearest classed adult deer (dots, 95% Wilson intervals) against the share available at the same cameras in the same months (gray dashes), for the all-year record and three hard-antler windows. Ratios above each point are observed ÷ available. Data: statewide Snapshot Wisconsin extract, 2018–2025.

The bear, the coyote, and the fawns: warm-season pursuits that fall ends

The bear's following of deer, 0.63 pooled across all deer in the parent study, resolves to a target. In May–August, when a bear and a fawn passed the same camera within the half-hour window, the bear was the second-comer in 82% of encounters (78 of 95), against 59% when the nearest deer was a doe (Fisher's exact P = 0.00001), arriving a median 11 minutes behind. The pattern holds in both halves of the warm season separately (May–June 0.80, n = 20; July–August 0.83, n = 75, P = 0.0001 against the doe rate; Figure 2). Whatever brings a bear and a fawn to the same trail in the same half hour, the order of arrival is far from even — the bear is behind.

September–November is where the relationship goes quiet: 7 bear–fawn encounters in the entire statewide record, with the arrival order even (3 of 7), against 493 bear–deer encounters overall in those months. Two things are true at once. Bear–fawn contact genuinely collapses as fawns grow and begin traveling with doe groups. And part of the collapse is bookkeeping, because a September fawn without spots is recorded as antlerless. The record cannot fully separate the two. What it can say is that in every season the fawn is under-represented as the bear's nearest deer relative to availability (May–June 0.46× of expected, P = 0.0001; July–August 0.76×, P = 0.006; September–November 0.47×, P = 0.03): fawns are not where bears are — except when they are, in which case the bear tends to be behind them. Both readings are consistent with the fawn-survival literature, in which the black bear is a principal predator of young fawns in exactly these months and takes almost none after the fawns' first summer (Vreeland et al. 2004; Warbington et al. 2017).

In addition, fawns returned 1.46× more slowly after a bear in July–August, against a fawn reference of 1.26× in the same window, and 1.87× in fall against a reference of 1.74×; the paired within-camera

excess over the reference in June–November is 1.22× (P = 0.0006). The bear moves fawns off trails a little; it does not empty the woods of them.

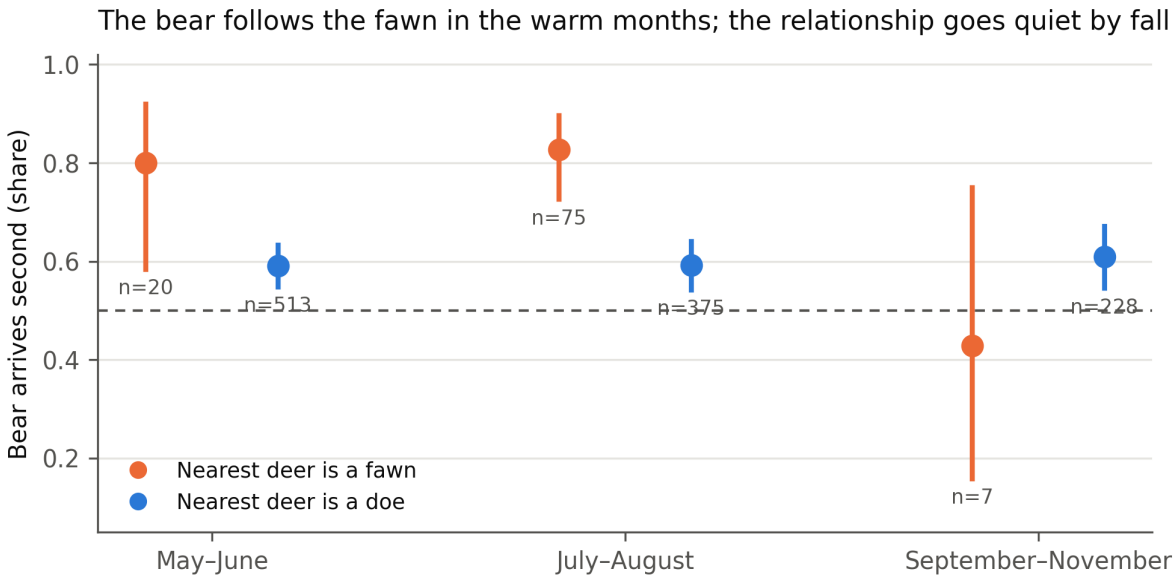

Figure 2. Share of bear–deer encounters in which the bear arrived second, by season, when the nearest deer is a fawn (orange) against a doe (blue); 95% Wilson intervals; the dashed line is even odds. The fall fawn estimate rests on 7 encounters. Data: statewide Snapshot Wisconsin extract, 2018–2025.

The coyote runs the same pursuit, and runs it tighter. In May–August, when the nearest deer was a fawn, the coyote was the second-comer in 76% of encounters (202 of 265). When the nearest deer was a doe, it was second in 49% — exact chance (1,794 of 3,646; Fisher's exact $P < 10^{-17}$). The signal is already present in the neonatal weeks alone (May–June: 77% against 48%, P = 0.00001) and fades by fall (67% against 60%, P = 0.28), the same seasonal shape as the bear's. The coyote follows a median 5.1 minutes behind the fawn — closer than the bear (11 minutes), as close as the wolf behind any deer (5.9) minutes. Two further readings follow. First, in the warm months the coyote does not follow does at all (0.49); its pooled following of deer (0.61) comes from the colder months, and its entire warm-season arrow points at the fawn. Second, the fawn is under-represented as the coyote's nearest deer in every season (0.29–0.53× of availability, all P = 0.0001), mirroring the bear. Yet the fawn's return delay after a coyote never exceeds the fawn's own reference (0.99× paired, June–November). The coyote is a true fawn-hunter on the trail — consistent with its documented share of fawn kills (Kilgo et al. 2012) — and displaces nothing: pursuit without displacement (Figure 3).

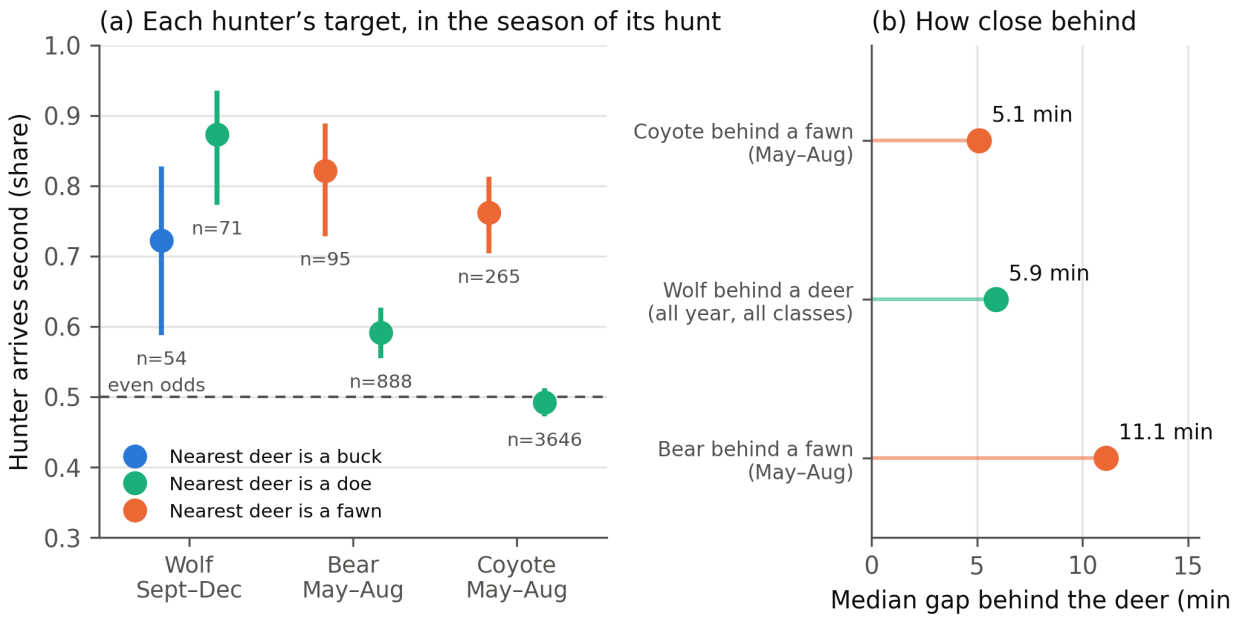

Figure 3. The three hunters and their targets. (a) Share of encounters in which the hunter arrived second, by the class of its nearest deer, each hunter shown in the season of its hunt: the wolf in the hard-antler months, the bear and the coyote in fawn season; 95% Wilson intervals; dashed line is even odds. The wolf's spatial selection of bucks (Figure 1) and its more decisive trailing of does are different measures — see text. (b) Median gap behind the deer when following. Data: statewide Snapshot Wisconsin extract, 2018–2025.

The grid: every class against every trail user, each against its own reference

June–November, the widest window holding all three classes, gives the full displacement grid (Table 1, Figure 4). Read raw, the buck column is dramatic everywhere — 2.3× to 4.3× — and the doe column modest. But the reference row disciplines the reading. After a turkey, which threatens no deer, bucks still delay 2.21×, fawns 1.84×, and does 1.36×. The class references differ because the classes' visit patterns differ: buck detections are rarer and burstier, and that alone inflates any measure keyed to a passage. Raw cross-class comparisons therefore largely reproduce those differences, not differences in fear.

Return after ↓ · class →	**Buck**	**Doe**	**Fawn**
Wolf	3.20× (206)	1.82× (219)	1.77× (141)
Coyote	2.29× (2,470)	1.39× (2,605)	1.93× (1,929)
Bear	4.29× (1,074)	1.56× (1,147)	2.01× (908)
Bobcat	2.58× (706)	1.54× (739)	1.99× (477)
Person	2.60× (3,412)	1.53× (3,653)	1.86× (2,624)
Turkey (reference)	2.21× (2,563)	1.36× (2,694)	1.84× (2,022)

Table 1. Median per-camera return-delay ratios (qualifying cameras in parentheses), June–November: each deer class's return after each species, ÷ that class's own usual interval. The turkey row is each class's danger-free reference. Data: statewide Snapshot Wisconsin extract, 2018–2025.

Paired within camera against those references (Table 2), the grid simplifies to three findings. First, the bear is the only species that significantly displaces all three classes: bucks 1.55× over their reference (P <

10^{-6}), does 1.21× ($P < 10^{-6}$), fawns 1.22× (P = 0.0006) — and the buck-after-bear cell, 4.29× raw, is the largest return value in the whole record, wolf included. In these months bears work the oak woods and bait sites hard, and the bucks in particular cede the trail. Second, the coyote displaces no class at all beyond its reference (excesses 0.99–1.01×, all n.s.) — thirteen thousand encounters of a genuine fawn predator (Kilgo et al. 2012) that deer ignore on the trail. Third, the fawn's profile is its own: at its reference after the wolf and after people (1.09× and 1.00×, n.s.), above it only after the bear and the bobcat (1.22× and 1.11×). Notably, the fawn does not delay after the coyote — its most dedicated trail-pursuer — which sharpens the same lesson: the site-return measure registers what a passage says about a place, not the full danger of the passer-by. The wolf columns carry a caution: the June–November wolf cells rest on 107–165 shared cameras, a third of the all-year wolf table, so the wolf's non-significant excesses here (bucks 1.32×, P = 0.14; does 1.21×, P = 0.038 being the exception) are thin-sample readings, not exonerations; the parent study's all-year, all-class wolf excess over the turkey reference stands. The development gradient completes the class picture, as far as the samples allow. Pooled across classes, the deer's delay after a wolf declines continuously with the verified 1-km human-modification index (wilder half of cameras 2.53×, more-developed half 1.86×, P = 0.009; monotonic across thirds — Vraniak 2026d). Resolved by class within the seasonal windows, only the doe runs in the gradient's direction (wilder half 1.88×, developed half 1.63× in June–November; 2.05× against 1.79× in the hard-antler months; neither significant at 170–219 cameras), while the buck's delay does not ease near development in either window and the fawn's shows no pattern. This is consistent with the five-county reading that the near-town easing of wolf avoidance is carried by does — the only class whose direction agrees in both windows — but the class-resolved gradient is not yet significant at statewide sample sizes, and it is reported as direction, not magnitude.

Excess over own reference	**Buck**	**Doe**	**Fawn**
Wolf	1.32× (P = 0.14)	1.21× (P = 0.038)	1.09× (n.s.)
Coyote	1.01× (n.s.)	1.01× (n.s.)	0.99× (n.s.)
Bear	1.55× ($P < 10^{-6}$)	1.21× ($P < 10^{-6}$)	1.22× (P = 0.0006)
Bobcat	1.00× (n.s.)	1.10× (P = 0.036)	1.11× (P = 0.002)
Person	1.09× (P = 0.0003)	1.09× ($P < 10^{-5}$)	1.00× (n.s.)

Table 2. Median paired within-camera excess of each class's return delay over that class's turkey reference, June–November (Wilcoxon signed-rank on the paired log ratios). Cameras per cell: 107–165 (wolf), 424–804 (bobcat, bear), 1,490–2,378 (coyote, person).

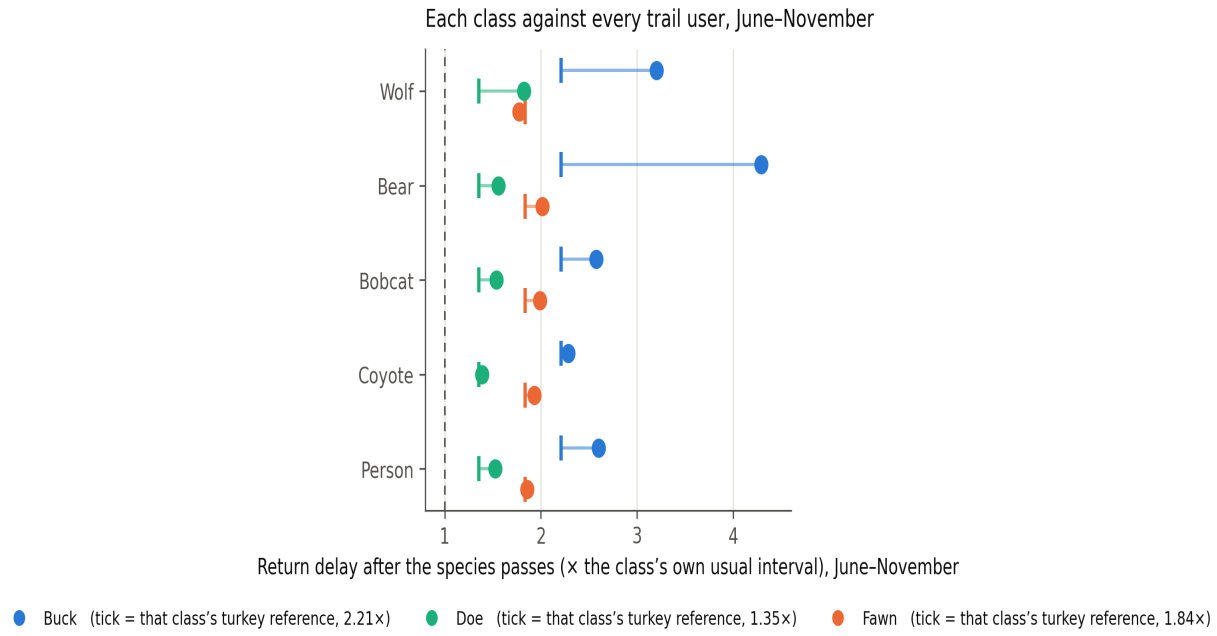

Figure 4. The June–November grid: each class's median return-delay ratio after each species (dots), with that class's own turkey reference marked as a tick of the same color; the connecting line is the distance above (or below) the reference. Dashed line is baseline (1.0). Data: statewide Snapshot Wisconsin extract, 2018–2025.

People, the classes, and the company the turkey keeps

The parent five-county study reported bucks as markedly warier of people than does. The statewide hard-antler record reproduces the raw pattern: bucks return 2.17× more slowly after a person (3,015 cameras), does 1.54× (3,279). Then the class references nearly dissolve it. Bucks' reference in the same window is 1.88×, does' 1.31×; paired within camera, the buck's excess over his own reference is 1.08× ($P = 0.015$, 1,811 cameras) and the doe's 1.15× ($P < 10^{-6}$, 1,920 cameras) (Figure 5). Both sexes delay after people beyond their references, so the response to people is real. But the buck's famous extra wariness, at state scale and on this measure, is mostly his extra wariness generally. It is the same elevated reference he shows after a harmless turkey. What remains sex-specific in the statewide record is not the size of the person response but its context-blindness, established in the parent home-site study: does discriminate among kinds of human activity while bucks avoid all of it indiscriminately (Vraniak 2026a). The five-county finding was built on richer measures — known machines on known ground — and is not overturned by this leveling; what the statewide record adds is that any class comparison made on raw return delays alone will overstate the buck.

The turkey, run through the same class resolution, answers the last question. It does not follow does: in 21,605 turkey encounters whose nearest deer is a doe, the turkey is second-comer 47.0% of the time — chance, leaning the other way — and the same holds for bucks (48.5%) and fawns (50.6%), in spring and fall alike. What it does is keep company: the turkey's nearest deer is a doe 1.07× more often than its cameras' availability predicts (80.1% observed against 74.7% expected, n = 26,972, $P = 0.0001$), with bucks (0.85×) and fawns (0.63×) correspondingly under-represented. A small effect made real by sample

size, and its signature — association without direction — is precisely the opposite of the wolf's, whose association carries an arrow. Shared feeding places and hours, not pursuit.

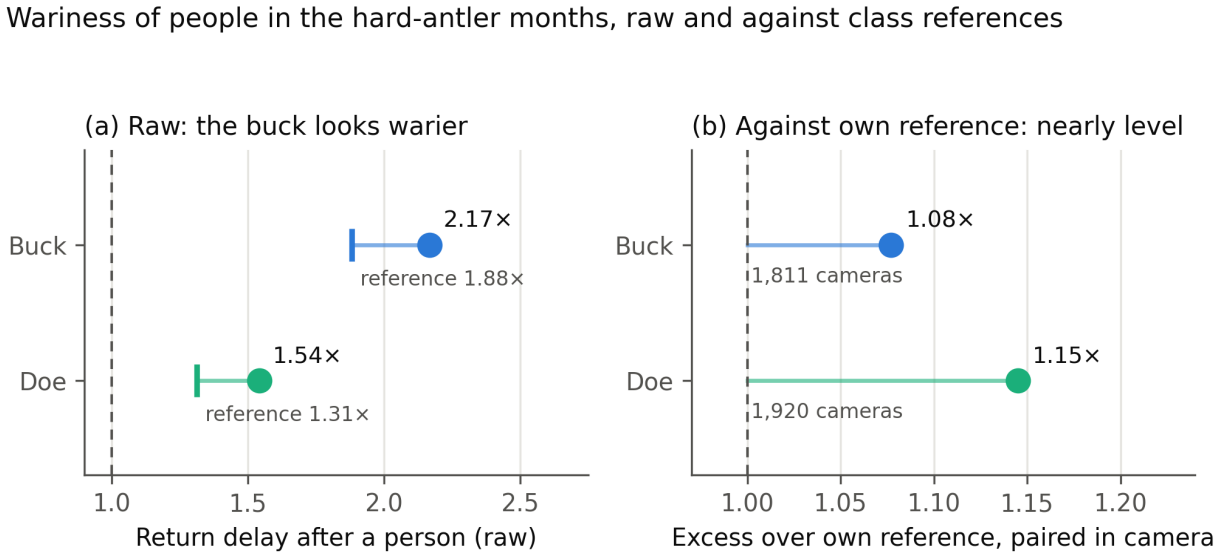

Figure 5. (a) Raw return delay after a person in the hard-antler months, bucks against does, each with its class reference (tick). (b) The same comparison as paired within-camera excess over each class's own reference: the sexes nearly level. Data: statewide Snapshot Wisconsin extract, 2018–2025.

Discussion

Resolved by class and season, the single word "after" separates into three relationships. Pursuit has a season and a target. The wolf's selection of bucks concentrates in the hard-antler months and peaks in the rut. In those weeks bucks travel widely, attend to does over vigilance, and are worn down by the effort (Foley et al. 2015). That is the season in which a coursing predator profits most from finding them. The bear's and the coyote's following both resolve to the fawn and to the fawn's first summer, matching the predation the fawn-survival literature documents for exactly those months (Vreeland et al. 2004; Kilgo et al. 2012; Warbington et al. 2017) — the coyote the closer follower of the two, and the more single-minded, since in those months it follows nothing else. Displacement, disciplined by class references, has an owner the pooled record understated: the bear, the one species all three classes yield to, with the buck yielding most. It also has a non-owner the pooled record overstated: the coyote, which moves no class off its schedule. The class-resolved following removes the mystery from that. The coyote is a genuine fawn-hunter on the trail — the closest follower of fawns in the record — and still displaces nothing. Pursuit and displacement are simply different currencies. Displacement is paid where a passage marks a place as dangerous. The coyote's hunt is on the move, behind a particular fawn, and it leaves no mark on the place that a returning deer treats as information. Its sheer constancy may also have priced it into the deer's ordinary schedule. And company is what the turkey keeps with the does — a preference for the same places with no directional structure — the pattern that in a pooled analysis would be indistinguishable from weak following.

The class-specific reference values are the report's methodological point, and they cut in both directions. They dissolve an apparent difference — the buck's extra wariness of people, most of which is the buck's extra delay after anything — and they reveal a real one the pooled record missed, the bear's displacement of every class. The general lesson for passage-keyed camera measures is simple. Classes of the same species can differ in their reference values as much as species do. Any between-class comparison not made against class references, paired in place, inherits those differences silently. The parent study's pooled turkey reference (1.53×) was the right discipline at the species level; at the class level it must be resolved, or the burstiest class will always look the most afraid.

The findings connect to the series' larger argument. The wolf emerges as a seasonal specialist within its staple prey — following deer everywhere and always, but finding bucks in the weeks the rut makes bucks findable. The bear emerges as the landscape's quiet heavyweight: barely registering in the pooled displacement table, owning it once the classes are resolved, and running its own targeted pursuit of fawns through the summer the fawn-survival studies say it converts. The deer's responses sort by mechanism — the fawn's clock registers the close-range killers of its own first summer; the buck's wariness is general rather than person-specific; the doe, the most-measured animal in the record, keeps the lowest references and the most discriminating responses, consistent with the home-site finding that she distinguishes among kinds of human activity while the buck avoids all of it (Vraniak 2026a). None of this alters the parent study's conclusions about the wolf; all of it sharpens what "after" meant.

Limitations, and the analysis that waits

These are detections of unmarked animals; "follow" and "return" describe passage order and spacing at a camera, not tracked movement (Gable et al. 2024). Class windows are conservative but not perfect: some antlerless detections in September are shed-antlered or button bucks, some September fawns are recorded as antlerless, and the deer_adult_unknown class (11% of deer detections) is excluded throughout. The fall bear–fawn quiet is accordingly a joint product of biology and bookkeeping, reported as such. The June–November wolf cells are thin (107–165 shared cameras), and the wolf rows of Table 2 should be read as direction, not magnitude. Many cells are reported; the findings leaned on are the ones that survive the paired reference discipline at $P < 0.001$ (the bear's three excesses, the person excesses, the buck selection, the bear–fawn following) and the clean negative controls (the coyote's null excesses, the turkey's chance-level order). The class-resolved development gradient, run on the verified covariate, is the report's thinnest result: the pooled gradient is clear, the doe's direction is consistent with the five-county doe-carried reading, and the class-level splits await either more years of record or a pooled-window design to reach significance.

Data and code availability

The statewide extract is drawn from the Snapshot Wisconsin citizen-science camera network (Wisconsin DNR, Office of Applied Science). The analysis pipeline is the parent study's (Vraniak 2026d), validated by exact reproduction of its published values, and is held by the author and available on reasonable request. Exact localities of sensitive species are withheld for conservation reasons.

Acknowledgments

I thank Jennifer Stenglein of the Wisconsin DNR Office of Applied Science, who built the statewide extract, and whose own fawn-survival work (Warbington et al. 2017) this report leans on; Eli Wildey, who designed the extract structure; A. Wydeven for review of the parent analyses; and the Snapshot Wisconsin program and its volunteers, whose class-level photograph reading made every analysis here possible.

Author contributions and disclosure

D.A.V. conceived the study, obtained and specified the Snapshot Wisconsin extract, directed all analyses, and is responsible for the content of this manuscript. Analysis code (Python) was used and all methods, statistics, results, and interpretations were specified, verified, and approved by the author, and the final text was reviewed and edited by the author.

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