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Tick and Tick-Borne Pathogen Surveillance as a Public Health Tool

Updating Kansas Geographic Distribution Map

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BACKGROUND

Ticks act as the vector for a multitude of diseases relevant to public health through the transmission of viruses, bacteria, protozoa, and helminths. Diseases with thoroughly researched symptoms such as Lyme and Anaplasmosis as transferred by *Ixodes scapularis* (Deer Tick), Ehrlichiosis as transferred by *Amblyomma americanum* (Lone Star Tick), and Spotted Fever Rickettsiosis as transferred by *Dermacentor variabilis* (American Dog Tick), all result from a tick bite.¹ Greater surveillance efforts identifying the prevalence of these tick species, and the variation in prevalence due to environmental factors in the Great Plains area is needed.

The surveillance efforts for tick populations in southeastern Kansas has been limited, resulting in the data on reported and established tick populations in Kansas counties being under-represented compared to disease reports.¹

This study is a collaborative effort with Kansas Department of Health and Environment (KDHE) involving:

- 1) collection of ticks at selected counties of Kansas to establish tick populations according to KDHE guidelines;
- 2) update the geographic distribution map annually;
- 3) record influence of environmental factors on tick population.

METHODS

Collection sites:

- Wilderness Park & Mined Land Wildlife Area Unit 1 (Frontenac, KS) in Crawford County were visited once a month (Mar-Aug 2023) (Fig. 1).
- Lake Garnett Park & Cedar Valley Reservoir (Garnett, KS) in Anderson County (Fig. 2) and was visited a total of three times during the May-Aug 2023. All these sites had frequent visitors, hikers, bikers, and campers.

- Ticks were collected using the flag-drag technique along the side of walking trails and gravel roads.
- Environmental data (temperature, humidity, wind, speed, and ambient light) were recorded on-site.
- Collected ticks were sorted by species, sex, life stage at our lab.²



RESULTS

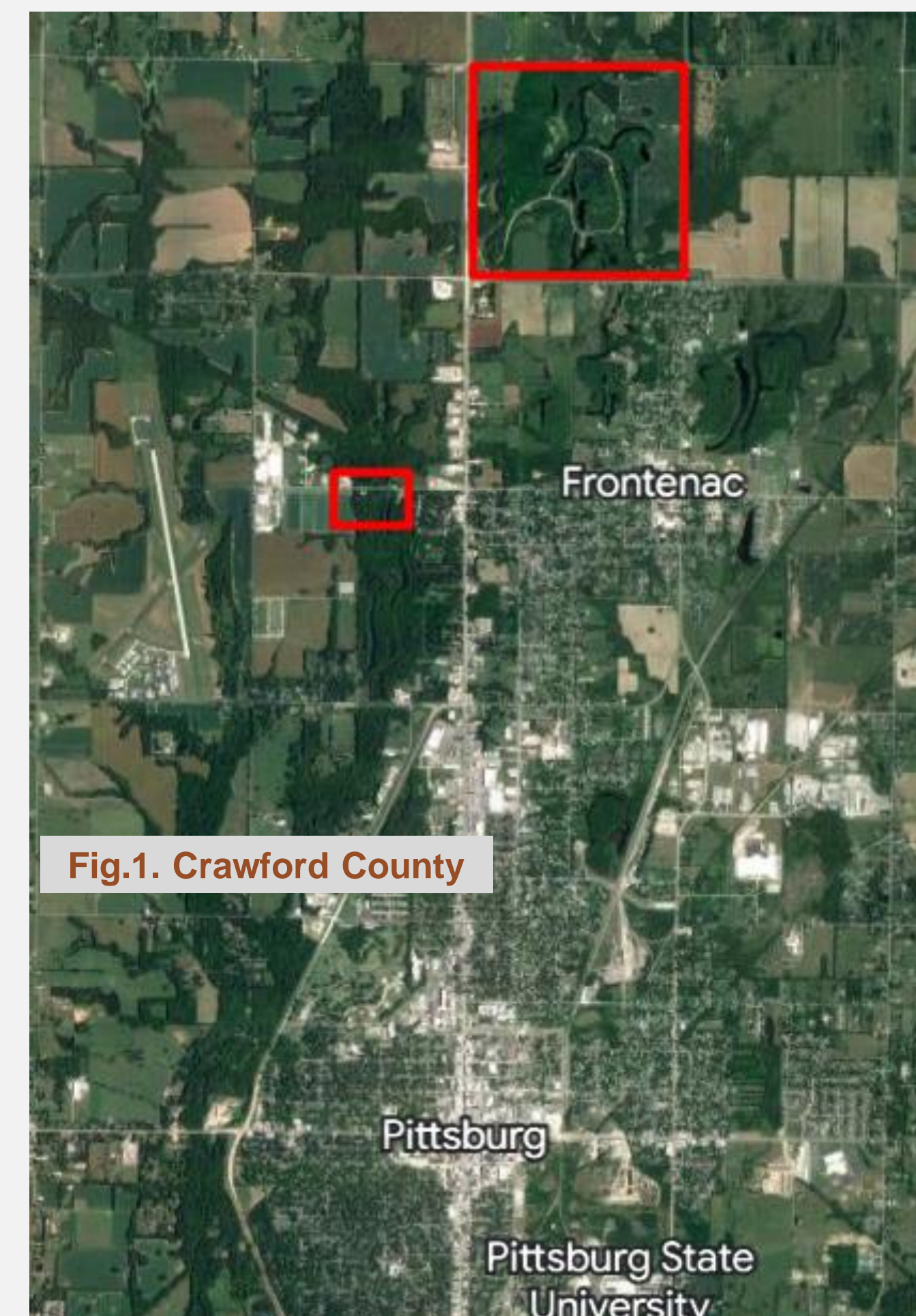


Fig. 1. Crawford County

A total of 495 adults and nymphs have been collected. The majority of ticks collected were identified as *A. americanum* (90.3%; Males-203, Females-170, Nymphs-74) followed by *D. variabilis* (9.7%; Males-25, Females-23, Nymphs-42) (Fig. 3).

On our July-Aug visits at Crawford County, hundreds of larvae were collected on flags but were not identified. On our last visit to Anderson County in Aug, numerous larvae were collected as well. None of the collected ticks were *I. scapularis*, the primary vector of Lyme disease and Anaplasmosis.



Fig. 1a. Wilderness Park transect 1

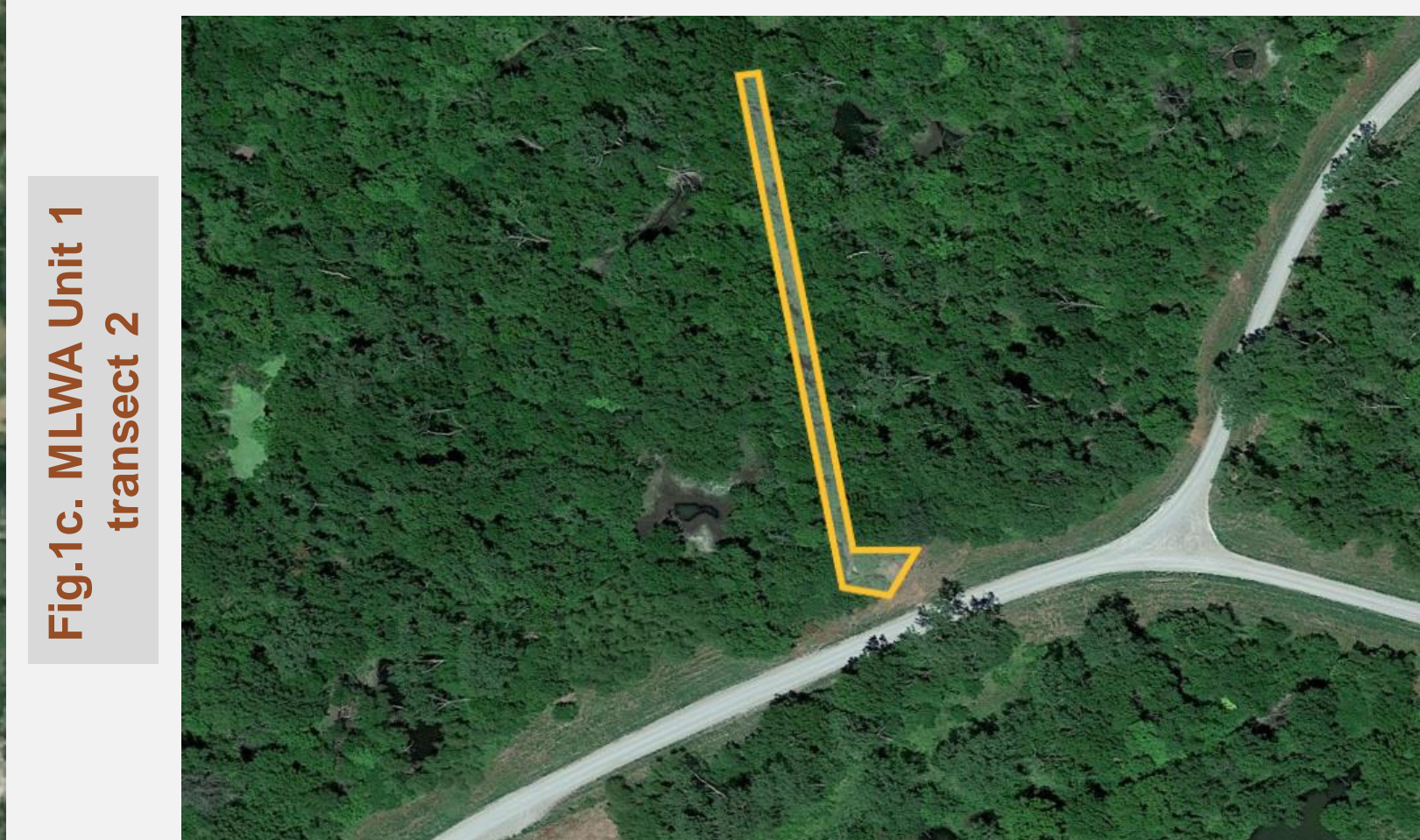


Fig. 1b. MLWA Unit 1 transect 1

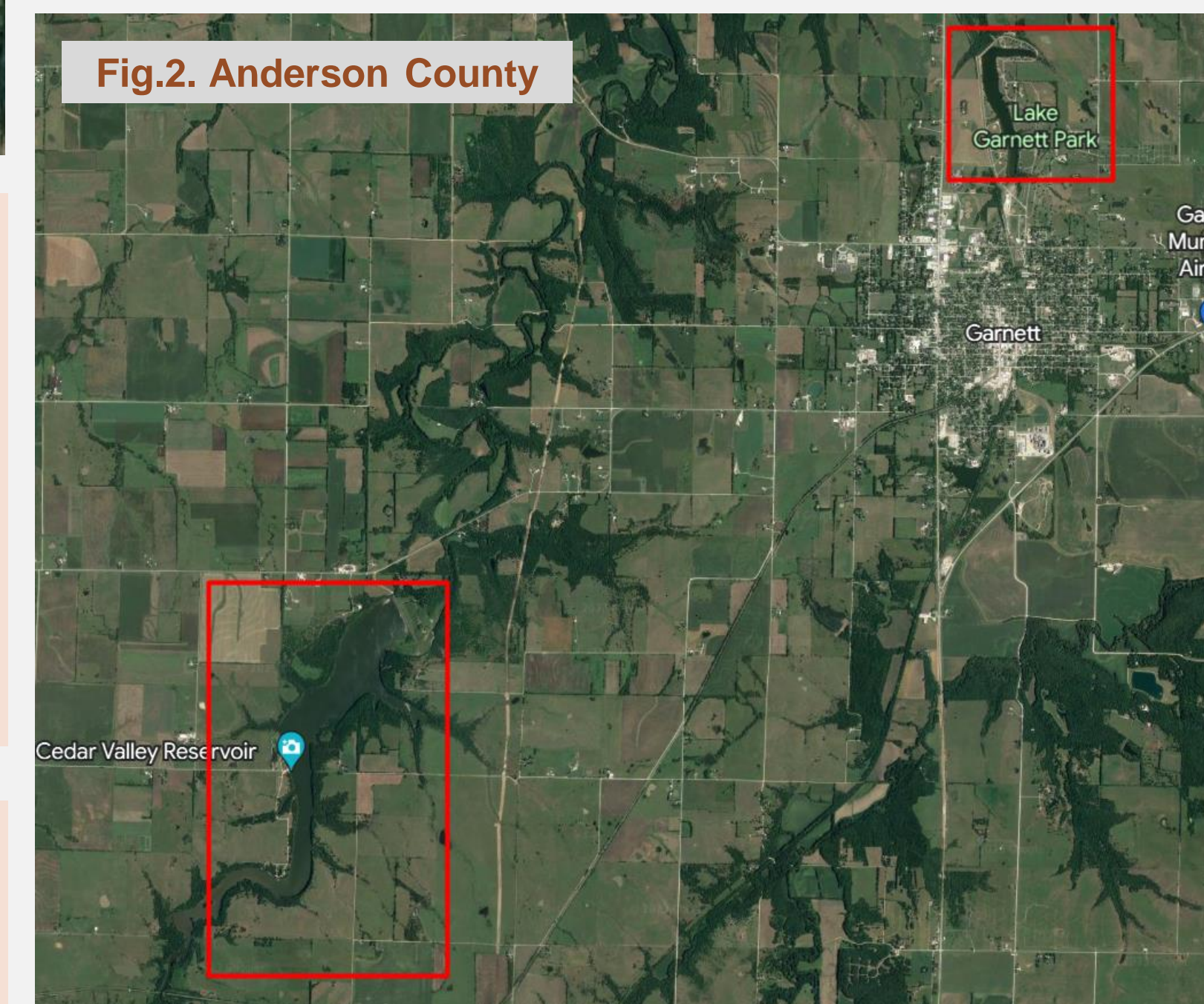
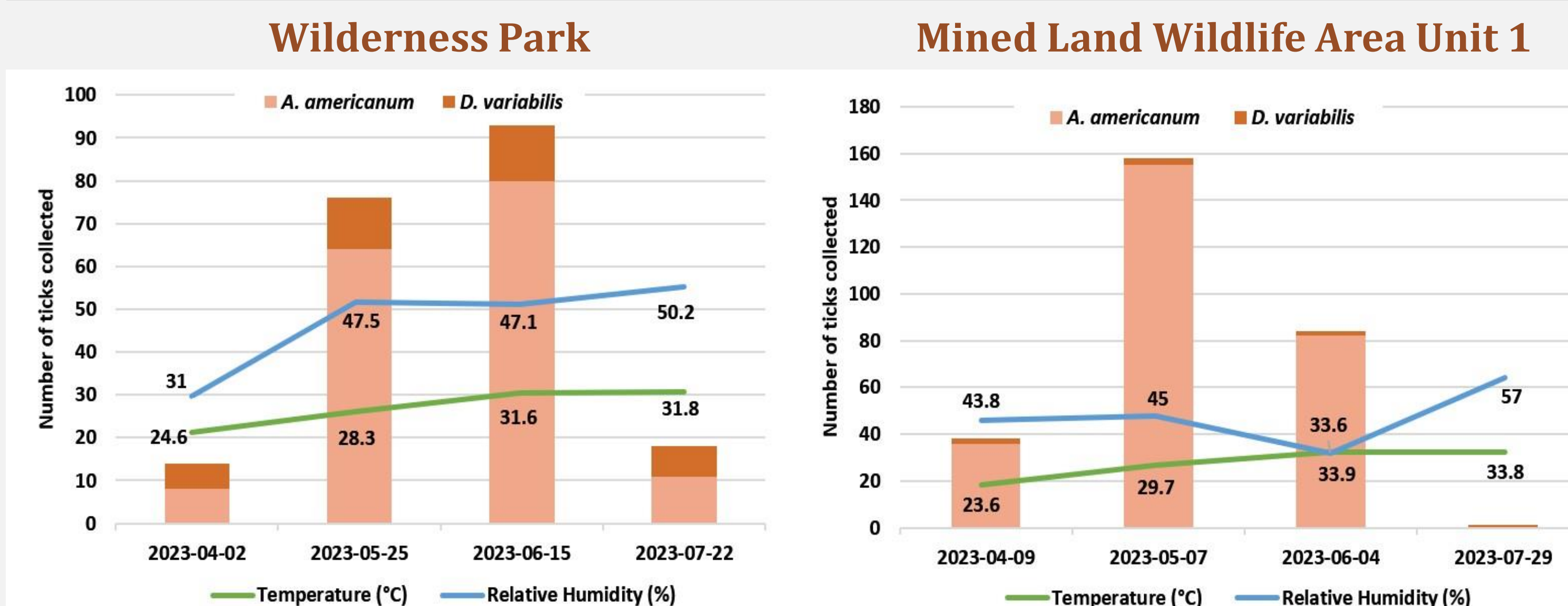


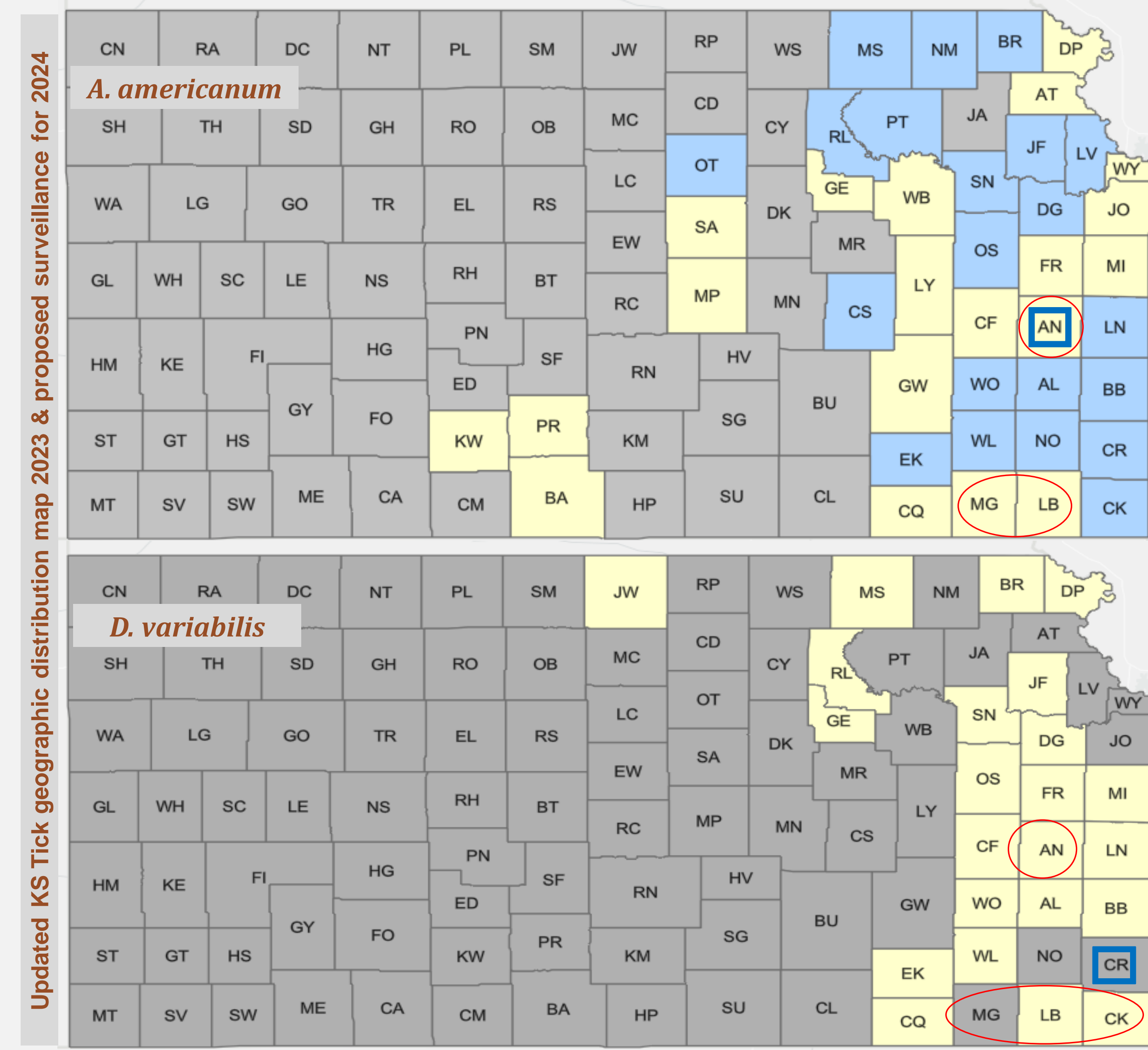
Fig. 2. Anderson County

A total of 12 ticks were collected from Anderson County: ten *A. americanum* (adults and nymphs) and two *D. variabilis* (only adults). Temperature was higher and humidity was lower in this county on collection days compared to Crawford.

Fig. 3. Distribution of tick species and corresponding environmental factors in Crawford County



MAPS



Updated KS Tick geographic distribution map 2023 & proposed surveillance for 2024

Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS Powered by ESRI Source: TBD Landing Page (state.ks.us)

- Established: Six or more *A. americanum* ticks of a single life stage, or more than one life stage of *A. americanum* collected in the county within a 12-month period
- Reported: Less than six *A. americanum* ticks of a single life stage collected in the county within a 12-month period.
- No Records: Counties classified as "no records" should not be interpreted as ticks being absent. "No records" classification can arise from a lack of either sampling efforts or tick collection, or from a lack of reporting or publishing the results of sampling efforts.

The updated changes to the KDHE map for *A. americanum* is established (blue square) population in Anderson county while for *D. variabilis* is established (blue square) population in Crawford county.

CONCLUSIONS

- ✓ *A. americanum* is the most prevalent tick species in southeast Kansas. *D. variabilis* also has a significant prevalence.
- ✓ Seasonality and the life-cycle of ticks appears to have a greater impact on tick prevalence than temperature and humidity on a given day of surveillance.
- ✓ Crawford Co. and Anderson Co. maps were updated with established as well as reported tick populations following KDHE guidelines.
- ✓ Follow-up surveillance in Anderson Co., and new surveillance in Montgomery, Labette, Cherokee Counties (red circles) in summer 2024 would increase reliable tick prevalence data and aid in public health efforts towards reducing tick-borne diseases.

REFERENCES

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2. Ticks of Veterinary Importance, Animal and Plant Health Inspection Service, USDA, Agriculture Handbook, No. 485.

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