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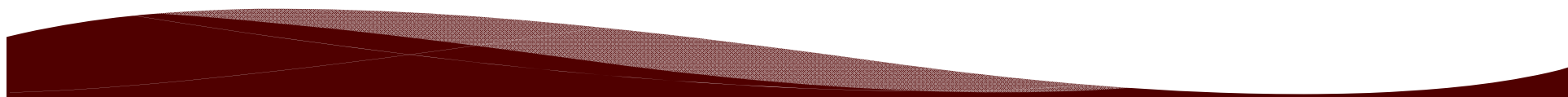
Cattle Fever Ticks: Relevant Biology and Ecology

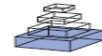
Garrapatas de Fiebre Bovina: Aspectos Biológicos y Ecológicos Relevantes

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College Station, Texas, and

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Laboratory and Veterinary Pest Genomics Center, Kerrville,
Texas





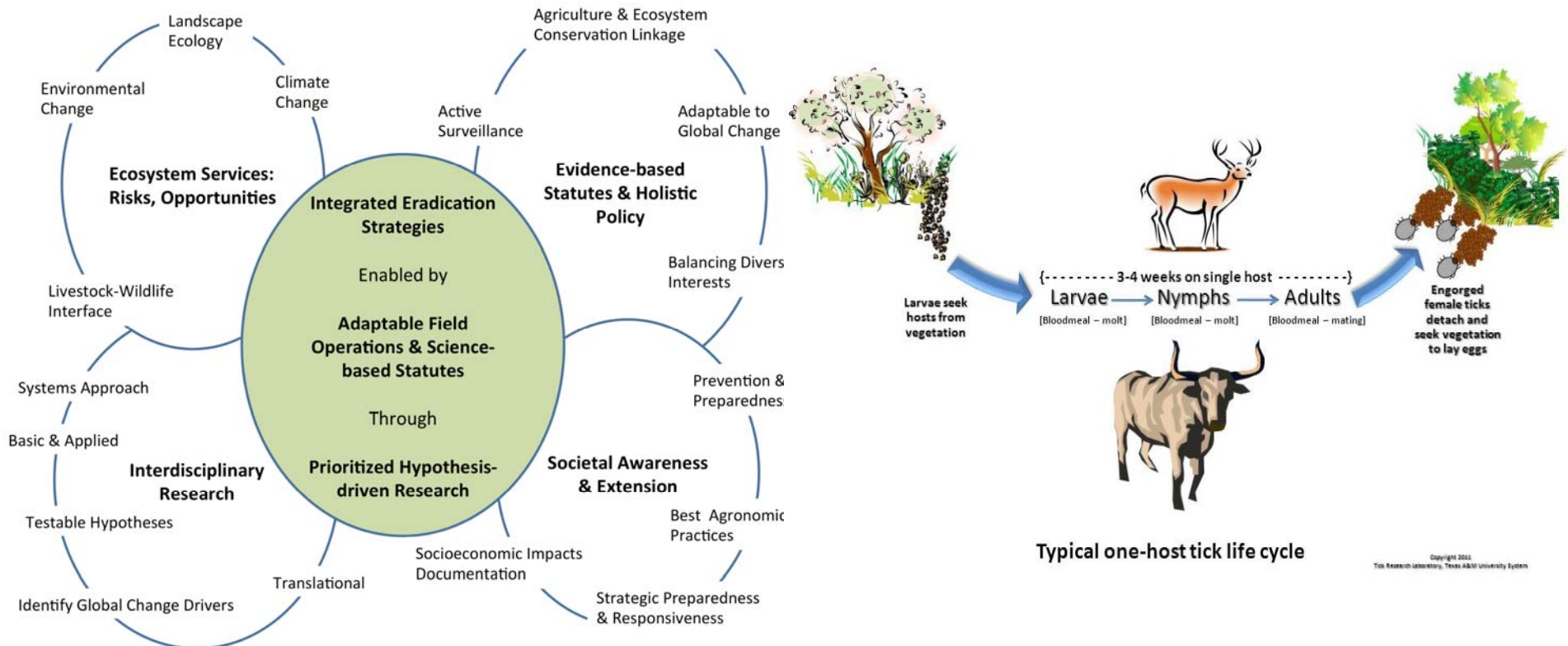
Integrated strategy for sustainable cattle fever tick eradication in USA is required to mitigate the impact of global change

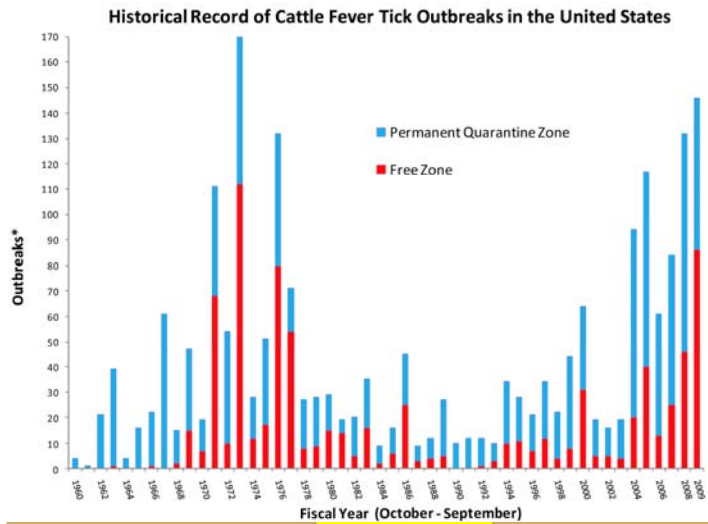
Adalberto A. Pérez de León^{1*}, Pete D. Teel^{2†}, Allan N. Auclair³, Matthew T. Messenger⁴, Felix D. Guerrero¹, Greta Schuster⁵ and Robert J. Miller⁶

Estrategia Integrada para Erradicación Sustentable de Garrapata de Fiebre en E.U.A. para Mitigar el Impacto del Cambio Global

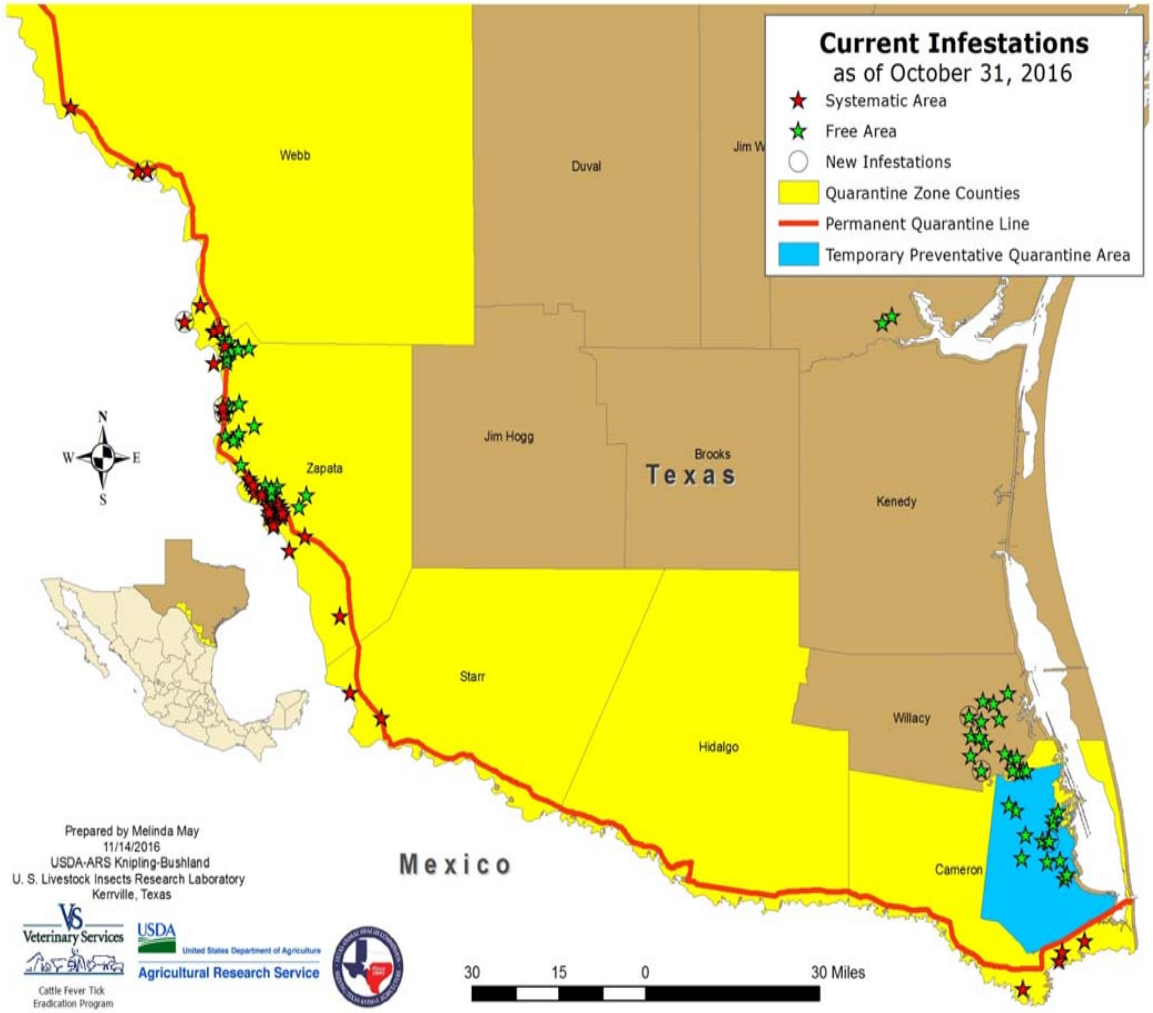
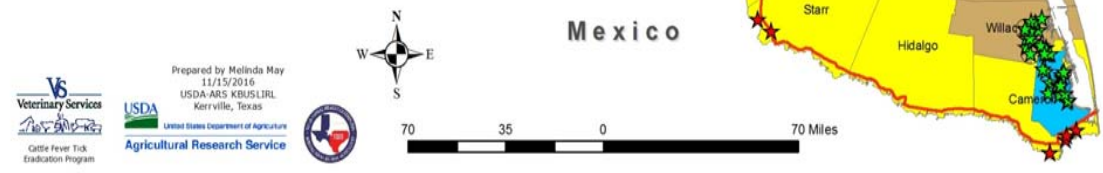
Framework for integrated CFT eradication strategies: interconnectedness of critical elements for sustainability of bovine babesiosis-free status in the U.S.

Marco para estrategias de erradicación integrada para garrapatas de fiebre: nexo de elementos críticos para mantener estado libre sustentable de fiebre bovina en los E.U.A.





- ★ Systematic Area - 45
- ★ Free Area - 63
- New Infestation
- Permanent Quarantine Line
- Temporary Preventative Quarantine Area (TPQA)
- Counties Encompassing Quarantine Area & Office Locations



**Vida
Silvestre:
Reservorios
de Garrapata**



Venado rojo



**Venado cola
blanca**



Wapiti

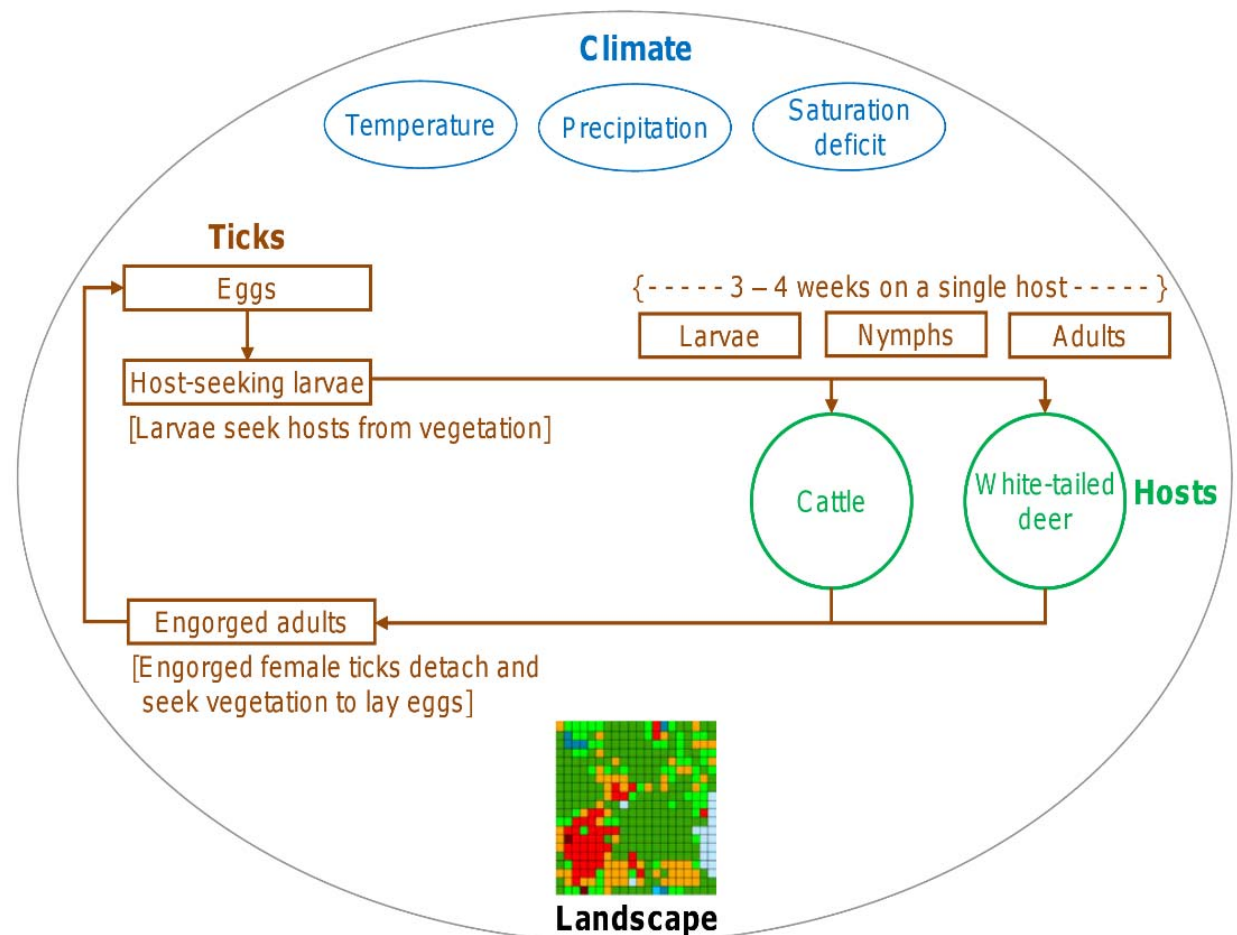


Nilgai

Simulated interactions of white-tailed deer (*Odocoileus virginianus*), climate variation and habitat heterogeneity on southern cattle tick (*Rhipicephalus (Boophilus) microplus*) eradication methods in south Texas, USA

Hsiao-Hsuan Wang^{a,*}, Pete D. Teel^b, William E. Grant^a, Greta Schuster^c, A.A. Pérez de León^d

- Help assess CFT outbreak dynamics & spatial attributes in tick-host-landscape systems involving diverse hosts
- Allow testing treatment efficacy & integration of strategies for sustainable eradication



Simulated larval distribution shows links to habitat and host utilization of the landscape - infested pasture

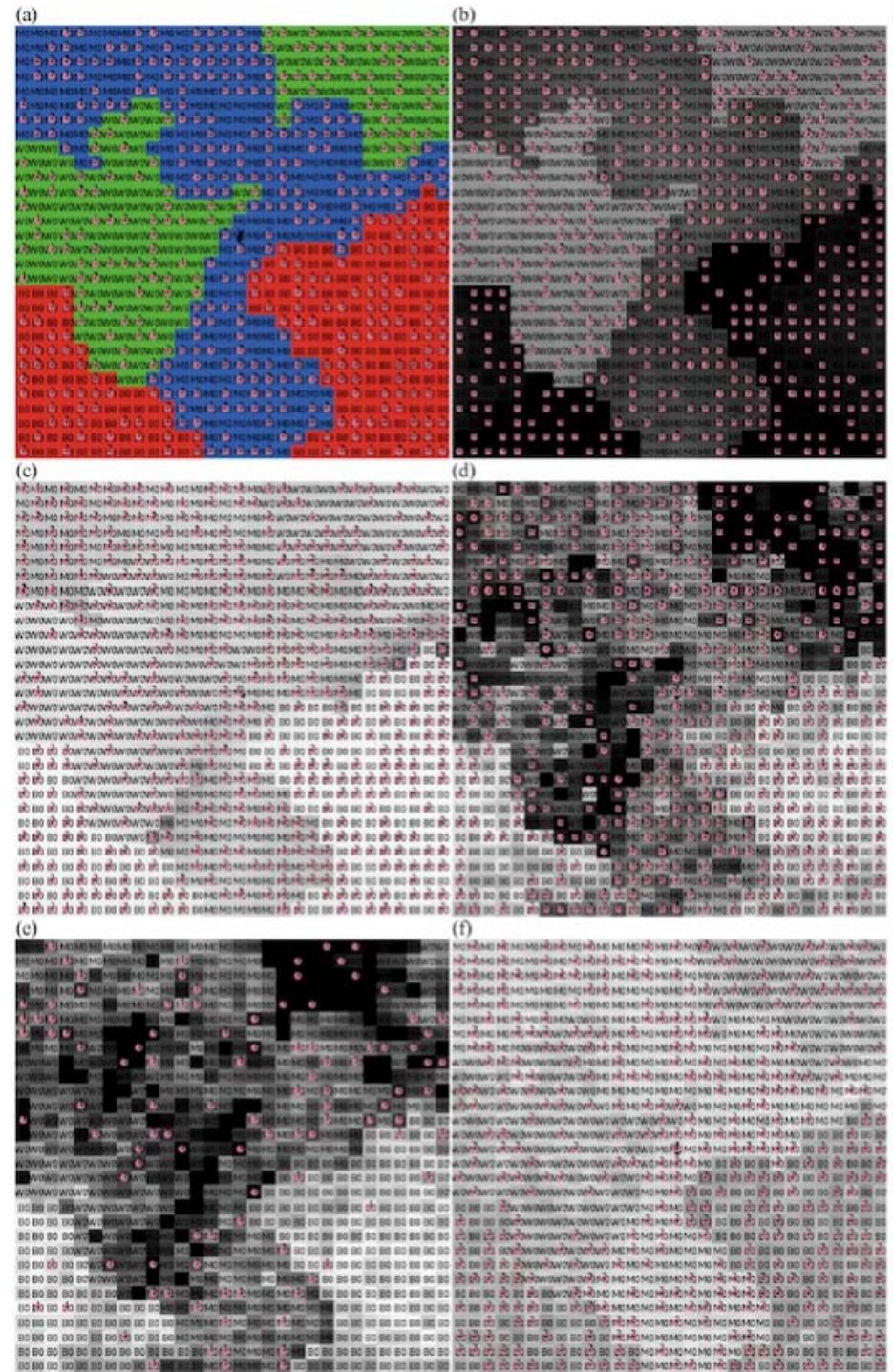
Maps indicate:

- (a) distribution of 3 habitat types (mesquite savanna, green; mixed brush savanna, red; open rangeland, blue)
- (b) levels of habitat use by cattle
- (c) levels of habitat use by WTD

and the resulting densities of host-seeking larvae*

- (d) in simulations during which both cattle and WTD were present
- (e) in simulations during which only cattle were present
- (f) in simulations during which only WTD were present

*darker shading indicates heavier habitat use or higher host-seeking larvae density



Simulation responses of CFT populations to 3 tick eradication protocols on the spatial distribution of host-seeking larvae*

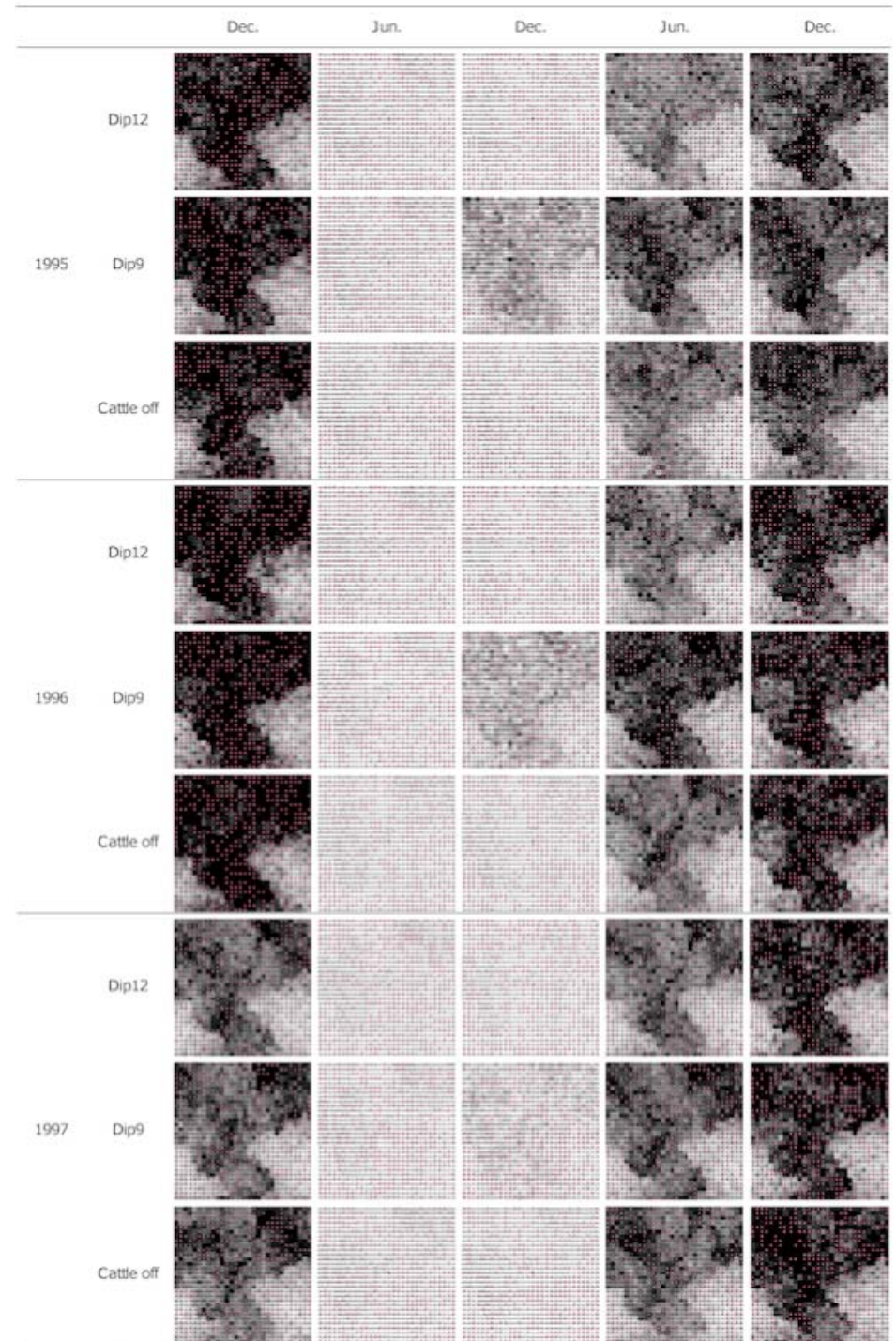
Strategies tested: removing for 12 months, Cattle off; dipping cattle in acaricide ca. 2 wk for 9 mo, Dip 9; dipping cattle in acaricide ca. 2 wk for 12 mo, Dip 12)

Strategies applied: before-1995; during-1996; or after-1997, a particularly unfavorable year for ticks

Maps show distributions for the month before (December), and 6, 12, 18, and 24 mo after treatment application

Spatial distributions of level of habitat use by cattle & WTD were similar to those shown in previous figure

*darker shading indicates higher density



Early Alert System for Risk of Cattle Fever Tick Outbreaks in Permanent Quarantine Zone Along the Texas-Mexico Border

Allan N. Auclair¹, Matthew T. Messenger², and Adalberto A. Pérez de León³

- Periodicity in the intensity of CFT outbreaks in PQZ apparently linked to climate.
- Our early warning system approach relates historical CFT surveys, 1959-2014, to both local meteorology records and global climate indicators.
- CFT outbreak surges coincide with *cold-phase* (La Niña) Hale Cycles that drive hurricanes in the Caribbean Region, and subside during the *warm-phase* (El Niño) Hale Cycle.
- CFT outbreak surges in 1963-1976 and 2003-present correlate closely with a south Texas-Specific Hurricane Index based on the number, strength and proximity of storm tracks that bring moisture into the region.
 - Outbreaks surges also correlate with days of frost linked to tick egg-laying success.
- Fast Fourier Transform power spectrum analysis helped achieve long-term forecasts
 - Next major period of high outbreak activity will likely occur over the 2038-2057 interval.
- Strategic benefits of anticipating and preparing for these events: **preventive management by the CFTEP.**

Life History and Ecology of Cattle Ticks



- ⦿ Tick-Host-Pathogen-Landscape-Climate Interactions are complex in both space and time
- ⦿ Meeting the challenges posed by local-to-global changes requires constant reassessment and novel approaches
- ⦿ System-level simulation modelling provides a tool for assessment of ecological variation and evaluation of tactics and strategies prior to implementation
- ⦿ For more information we suggest:
 - ⦿ <https://www.youtube.com/watch?v=EVVioJiofM0&feature=youtu.be>
 - ⦿ Smart phone app <http://tickapp.tamu.edu>



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Evaluation of Unmanned Aerial Vehicles (UAVs) for detection of cattle in the Cattle Fever Tick Permanent Quarantine Zone

Goolsby¹, J. A., J. Jung², J. Landivar³, W. McCutcheon⁴, R. Lacewell⁴, R. Duhaime⁵, D. Baca⁵, R. Puhger⁵, H. Hasel⁵, K. Varner⁵, B. Miller⁶, A. Schwartz⁶ & A. Perez de Leon⁷



ROBOTICS



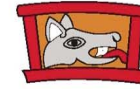




SALUD
SECRETARÍA DE SALUD



CENAPRECE
CENTRO NACIONAL DE PROGRAMAS PREVENTIVOS
Y CONTROL DE ENFERMEDADES



RICKETTSIOSIS



Enfermedades Transmitidas por Garrapatas: Sistemas Dinamicos en Flujo

TRANSLATING ECOLOGY,
PHYSIOLOGY, BIOCHEMISTRY,
AND POPULATION GENETICS
RESEARCH TO MEET THE
CHALLENGE OF TICK AND
TICK-BORNE DISEASES IN
NORTH AMERICA

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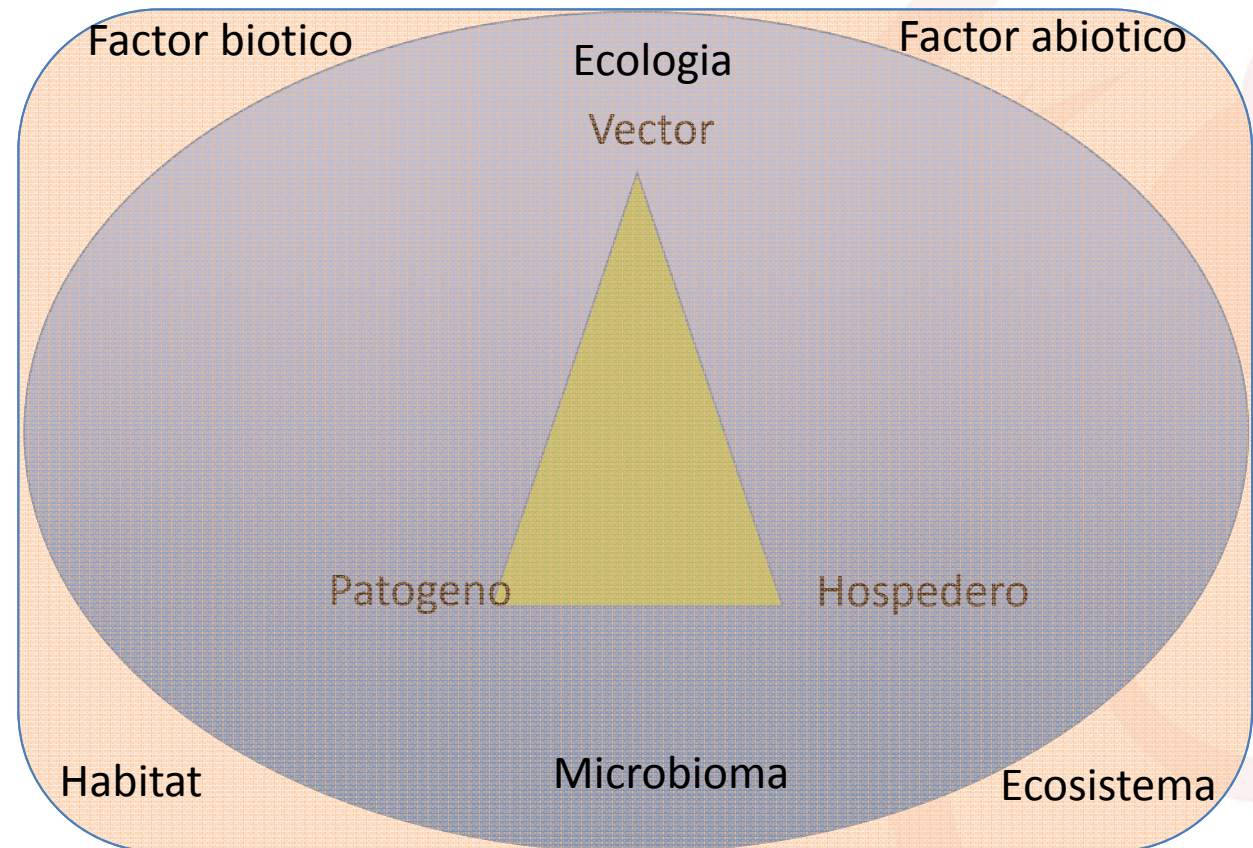
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Thank you!

