Wildlife Monitoring in Cook County

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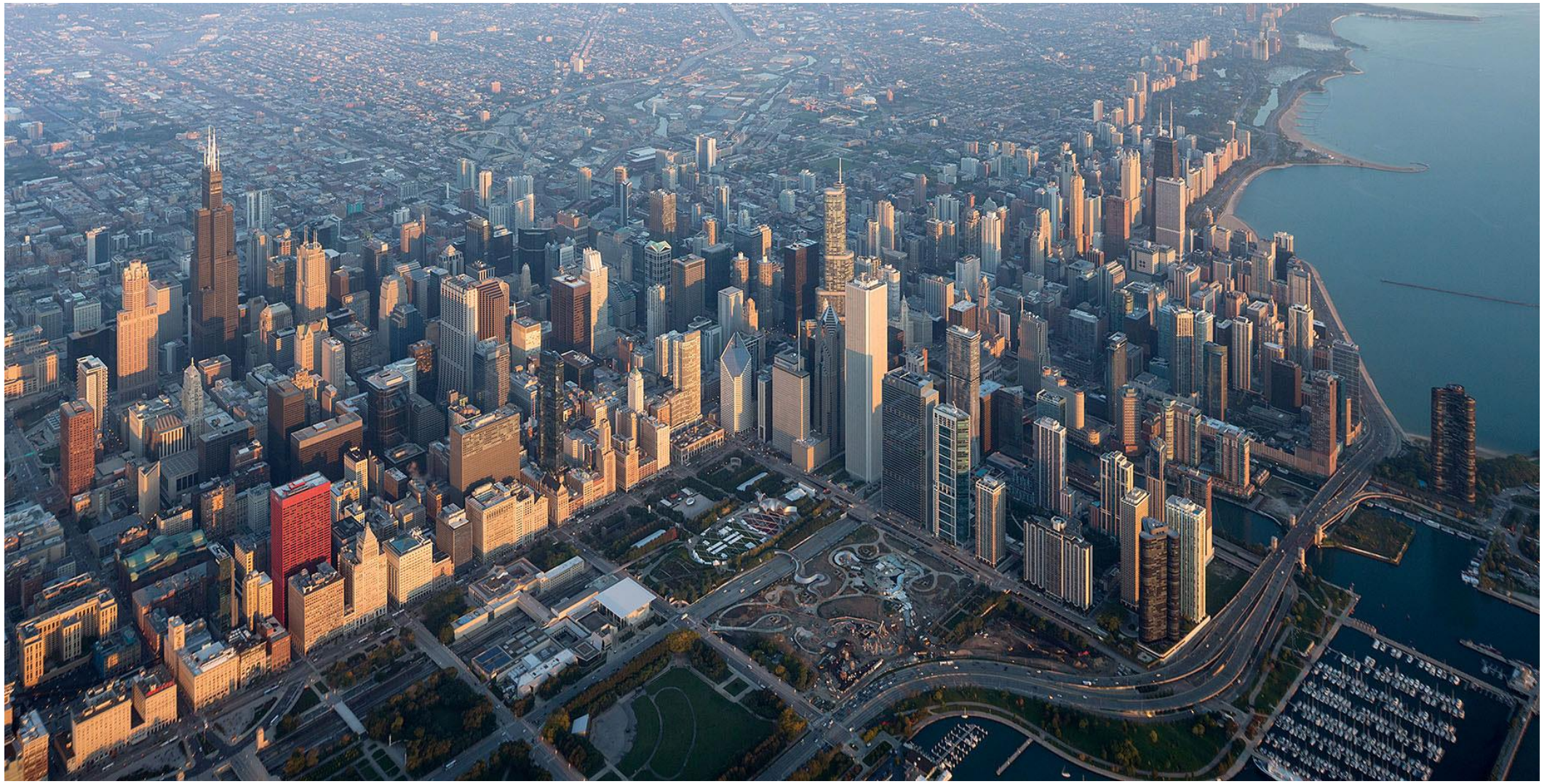
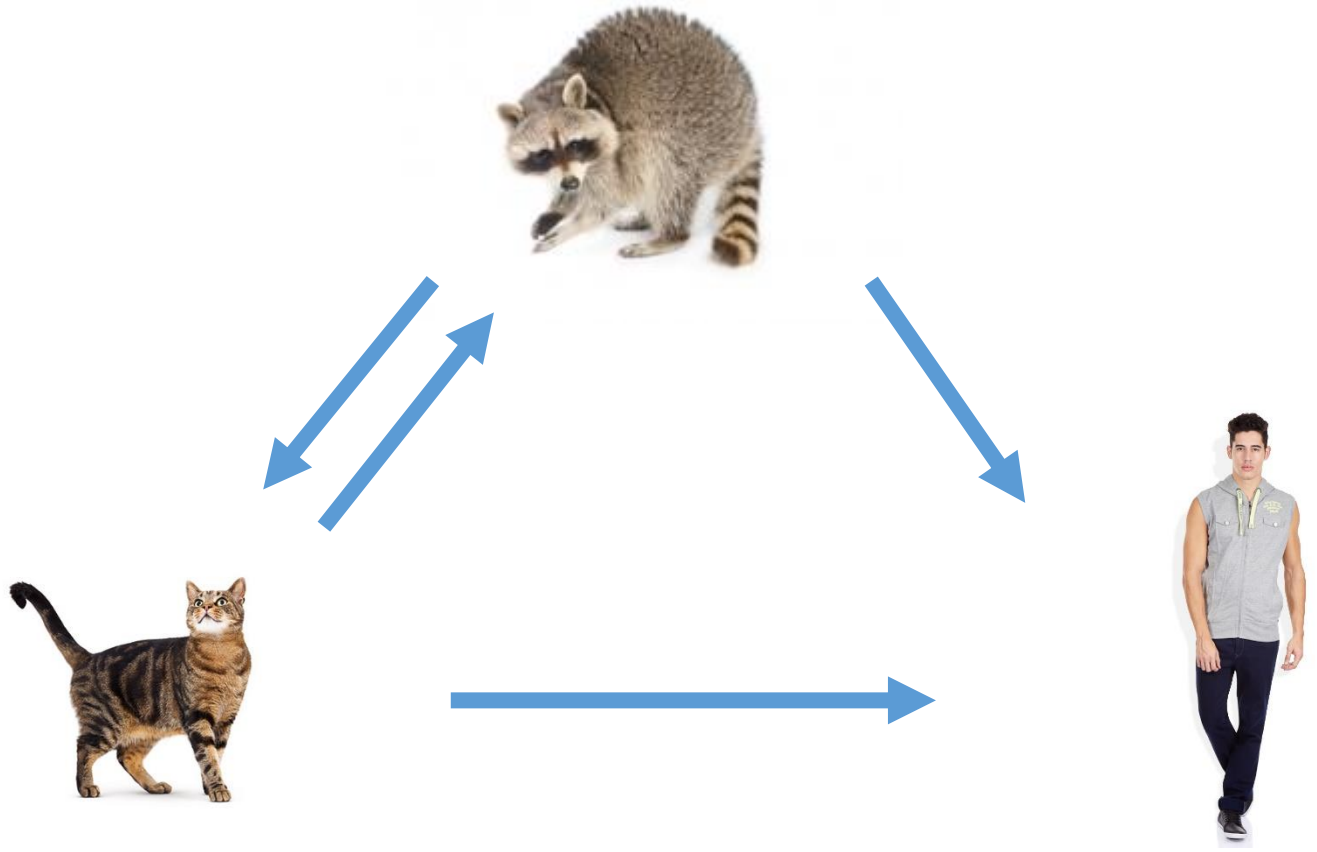
Most Emerging Infectious Diseases are associated with wildlife

Wildlife species host a variety of zoonotic diseases

Potential for transmission and spread is greatest in metropolitan areas



Urban areas create elevated contact rates



Wildlife Monitoring, Surveillance

- Cities create unnatural host densities
- Important to conduct surveillance
- Important to determine densities and contact rates for management
  - Contacts among wildlife
  - Contact between wildlife and public/pets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36°F
RECONYX

Mammals host a variety of zoonoses: Species we monitor

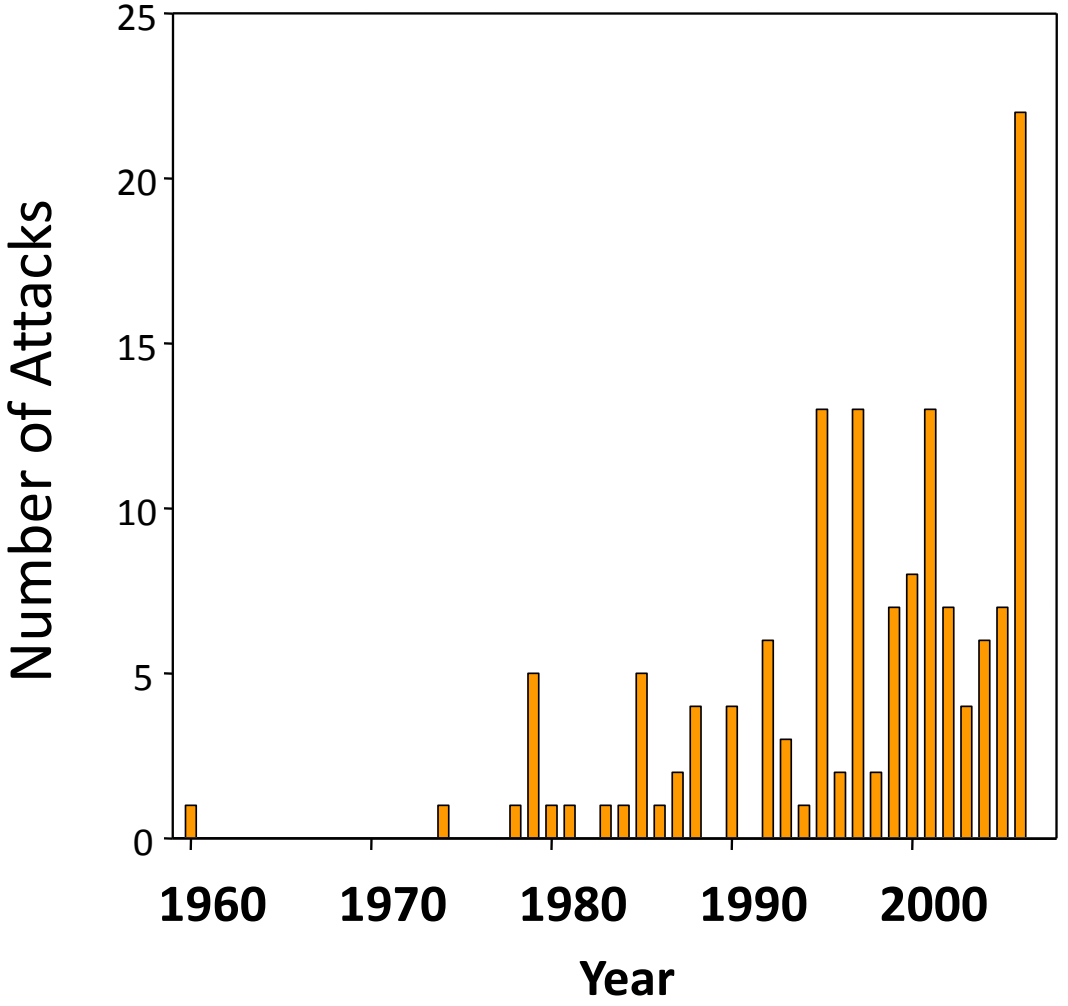
Coyote
Canis latrans

Raccoon
Procyon lotor

Coyote Pathogens

- Rabies
- Leptospirosis
- Echinococcus sp
- Mange
- Heartworm
- Canine Distemper
- Canine Parvovirus
- Toxocara sp.

Coyote Attacks on People



Annual number of attacks, nationally

Trend is for increasing frequency

White & Gehrt 2009

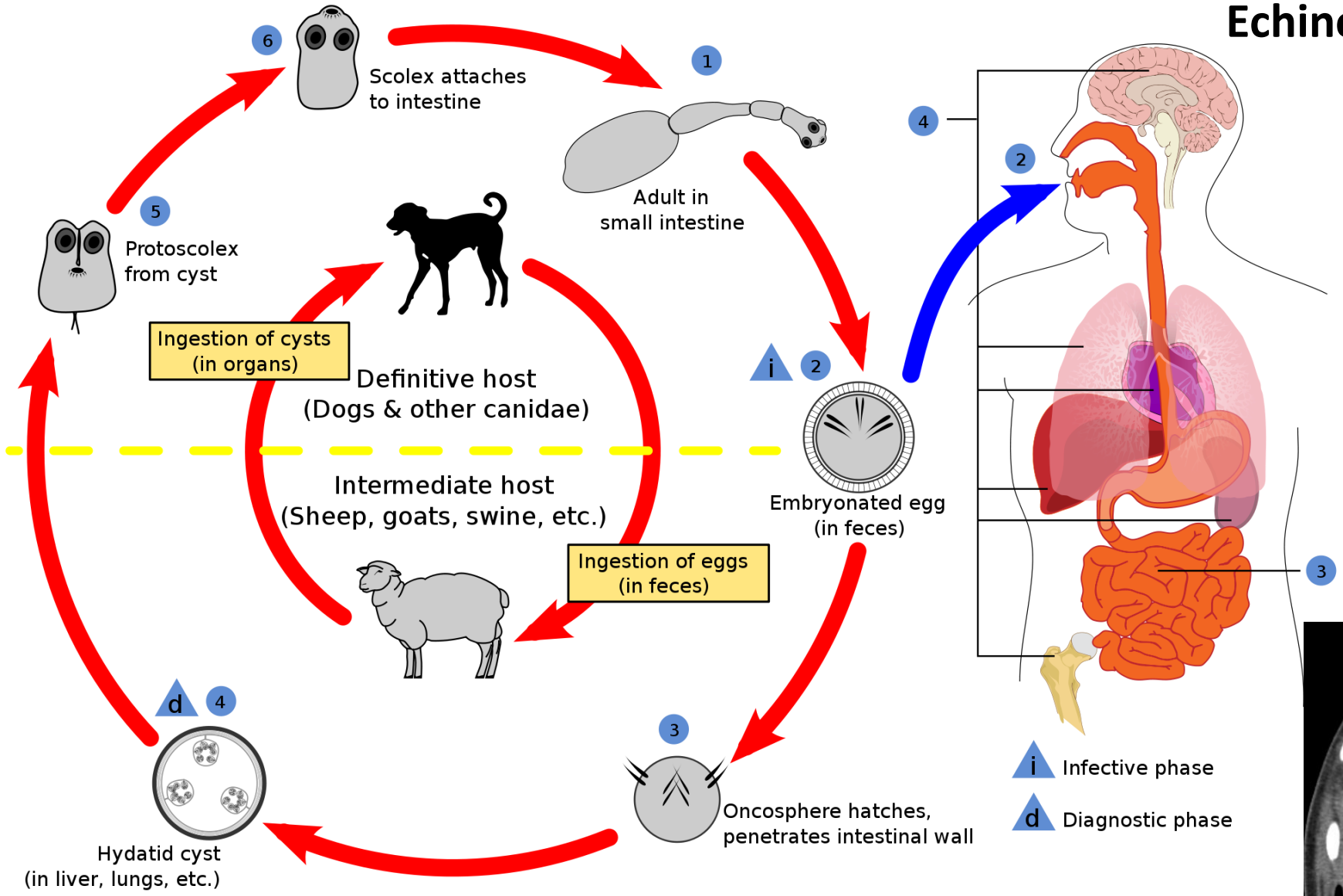
Cook County Coyote Project

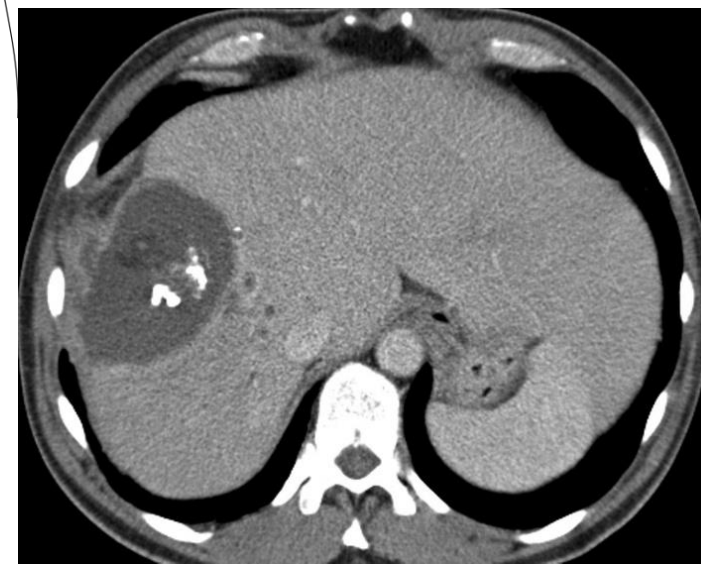
- Coyotes pose a potential risk in two ways:
  - Direct risk, Attack on pets or people
  - Direct or indirect transmission of disease

Causes of Mortality (%)

Year	n	Vehicle	Shot	Mange	Unknown	Other	Conflict
2009-12	139	41	28	15	14	1	1
2014	38	37	18	21	13	8	3
2015	23	48	9	26	9	9	0
2016	17	53	0	0	35	0	0

Echinococcus multilocularis





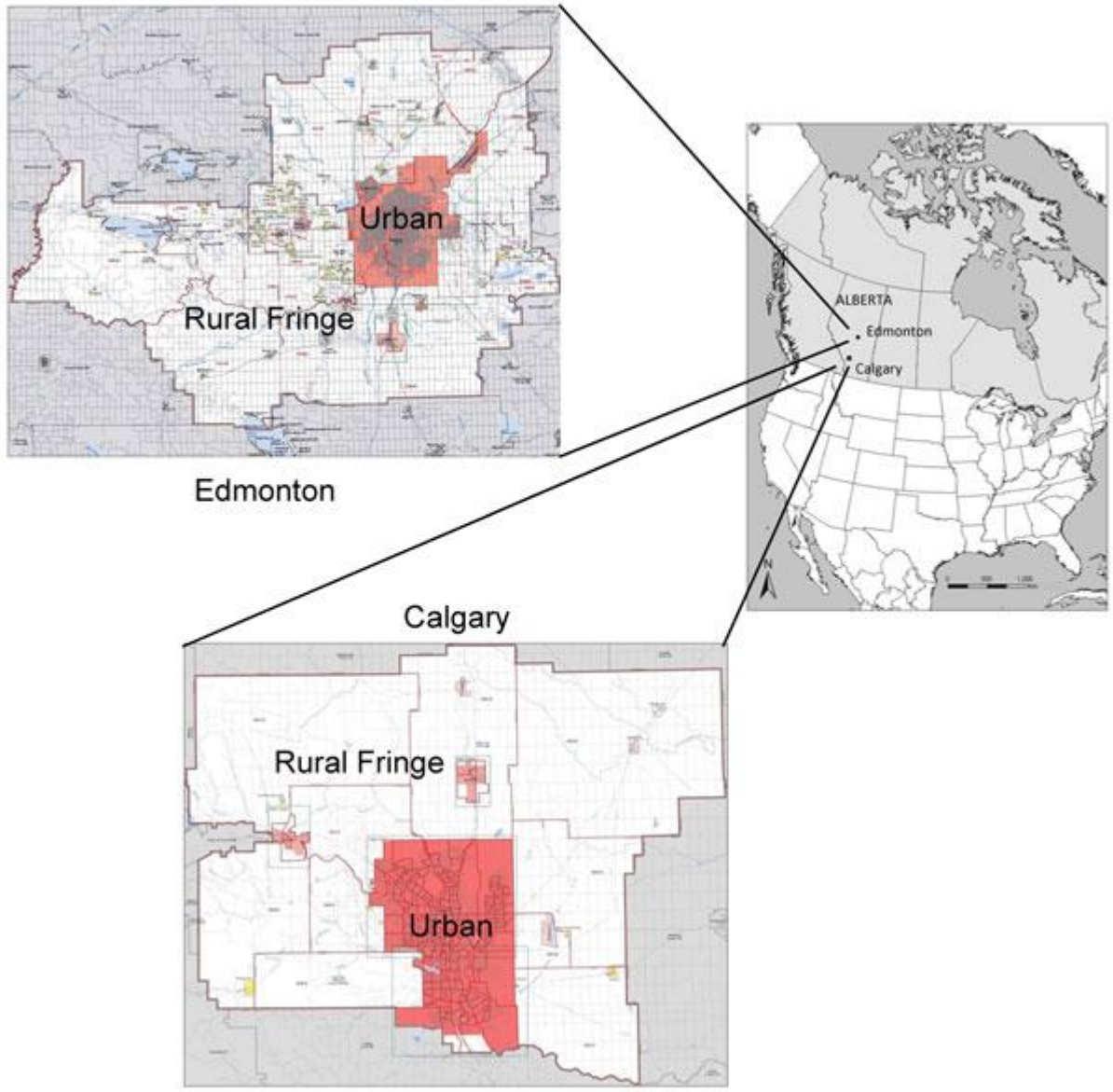
- University of Calgary,
- Dr. Alessandro Massolo

- 14 – 23% infected in Edmonton/Calgary

Catalano et al. 2012, EID

- **10% infected (n=72) from Cook County**

- Preliminary Analysis indicates it is European strain

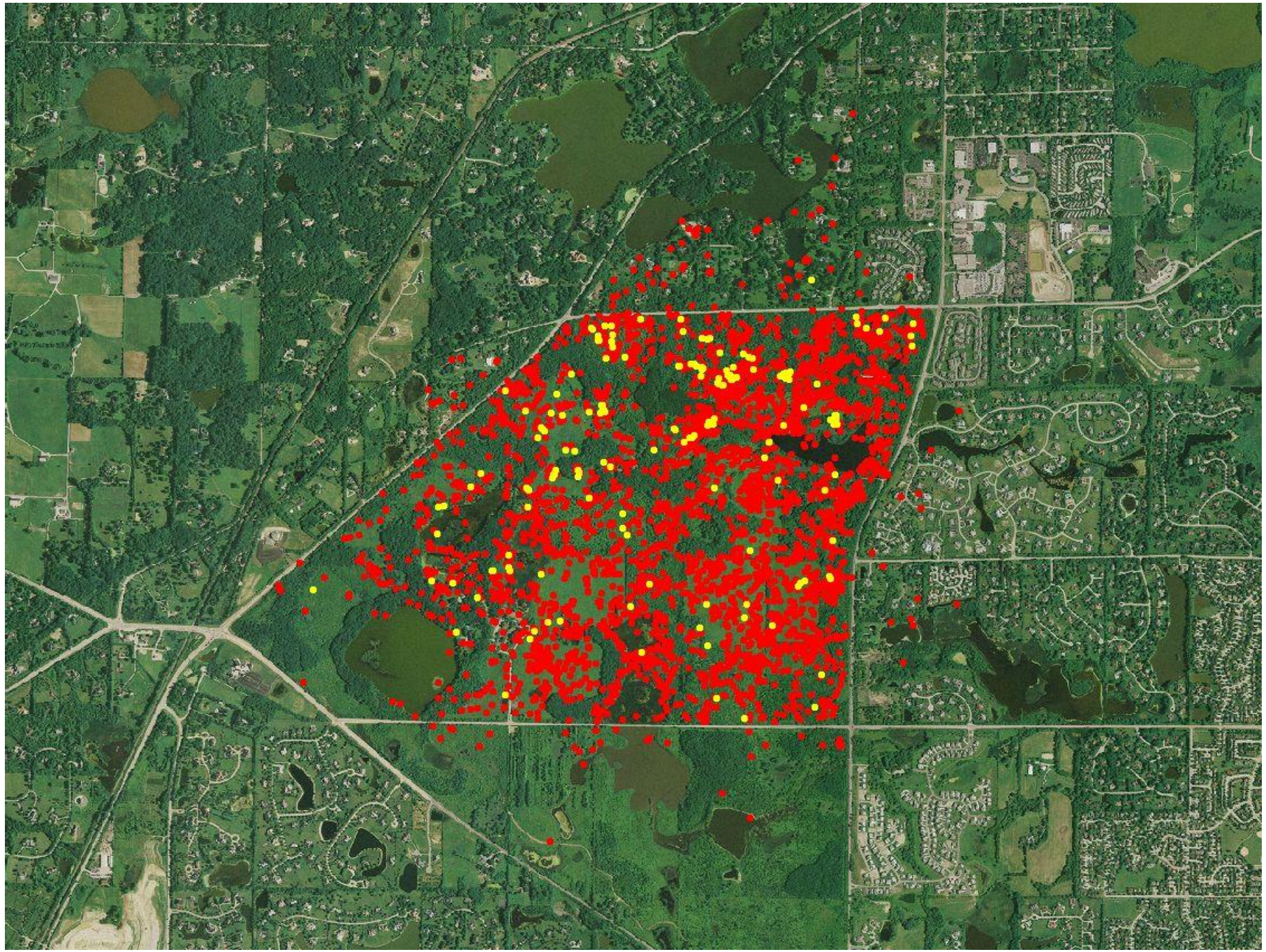


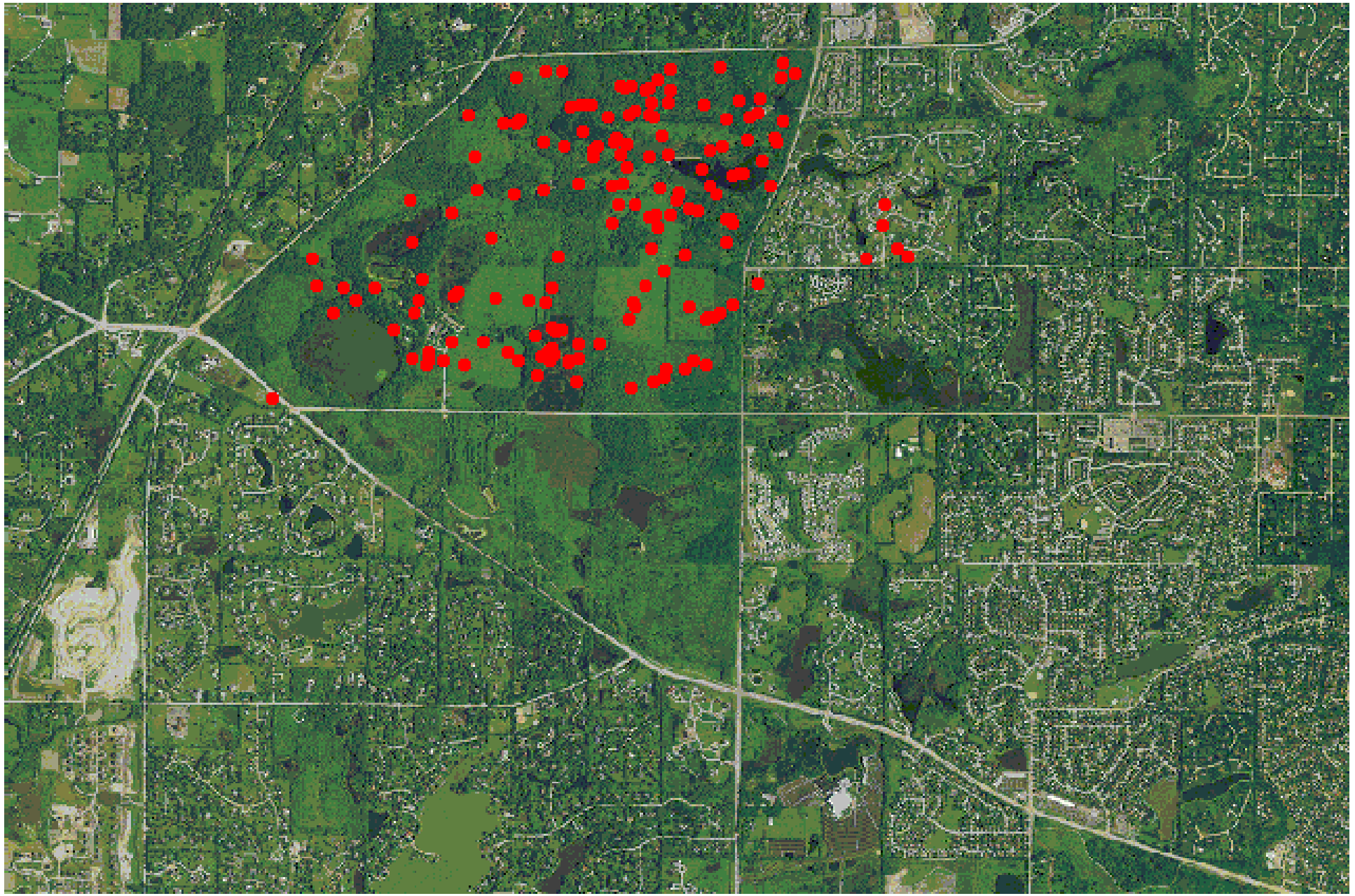
Serology

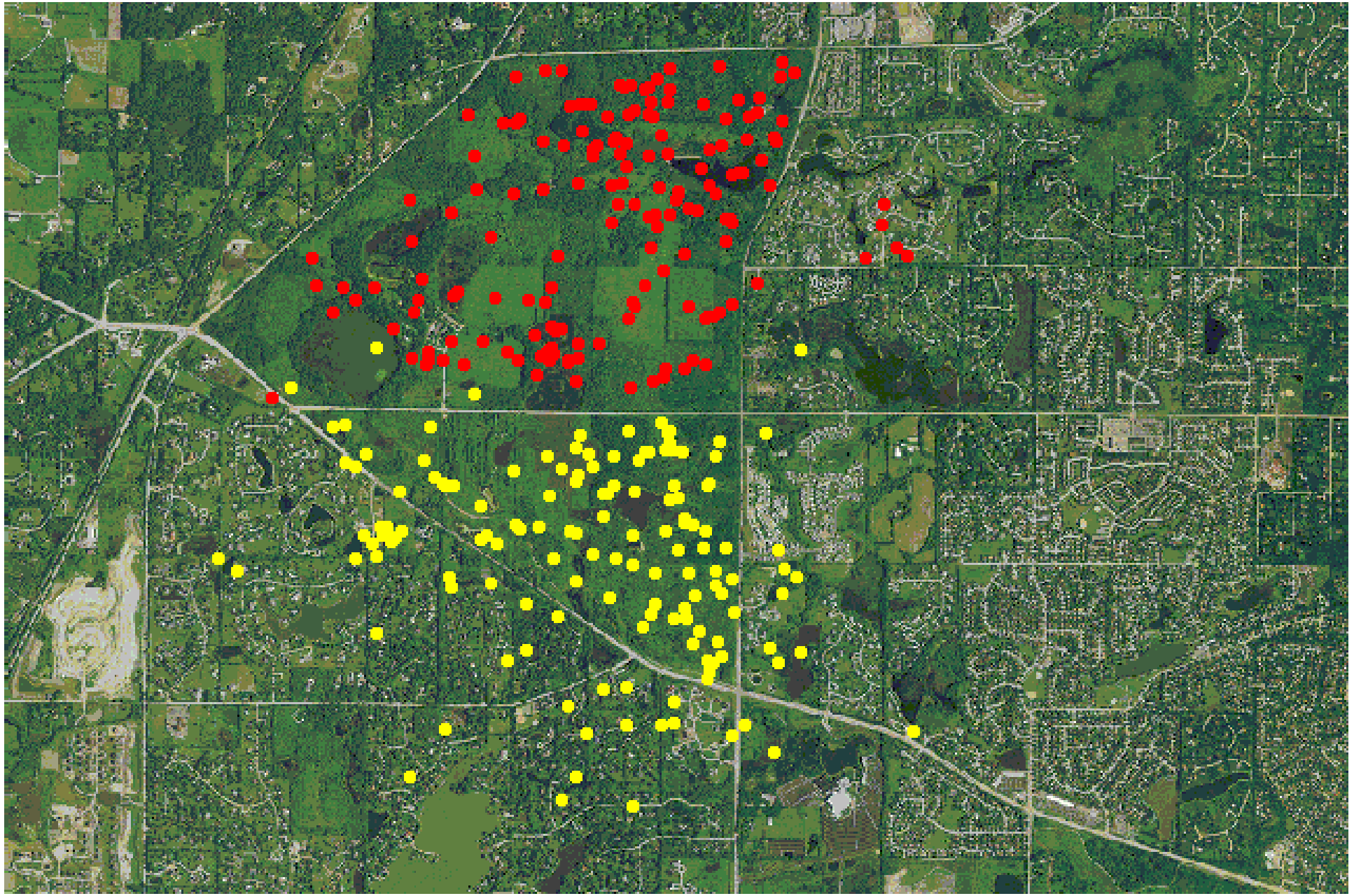
- Coyotes
  - Toxoplasmosis gondii - ELISA
    - IgG & IgM
  - Leptospirosis – Microscopic agglutination microtiter
    - autumnalis, bratislava, canicola, grippotyphosa, hardjo, icterohaemorhhagiae, pomona
  - Dirofilaria immitis (Canine Heartworm) - ELISA
  - Anaplasmosis – Canine Snap 4DX Panel
  - Ehrlichia - Canine Snap 4DX Panel
  - Lyme Disease - Canine Snap 4DX Panel
  - Canine Distemper Virus (CDV) - ELISA
  - Canine Parvovirus (CPV) - ELISA

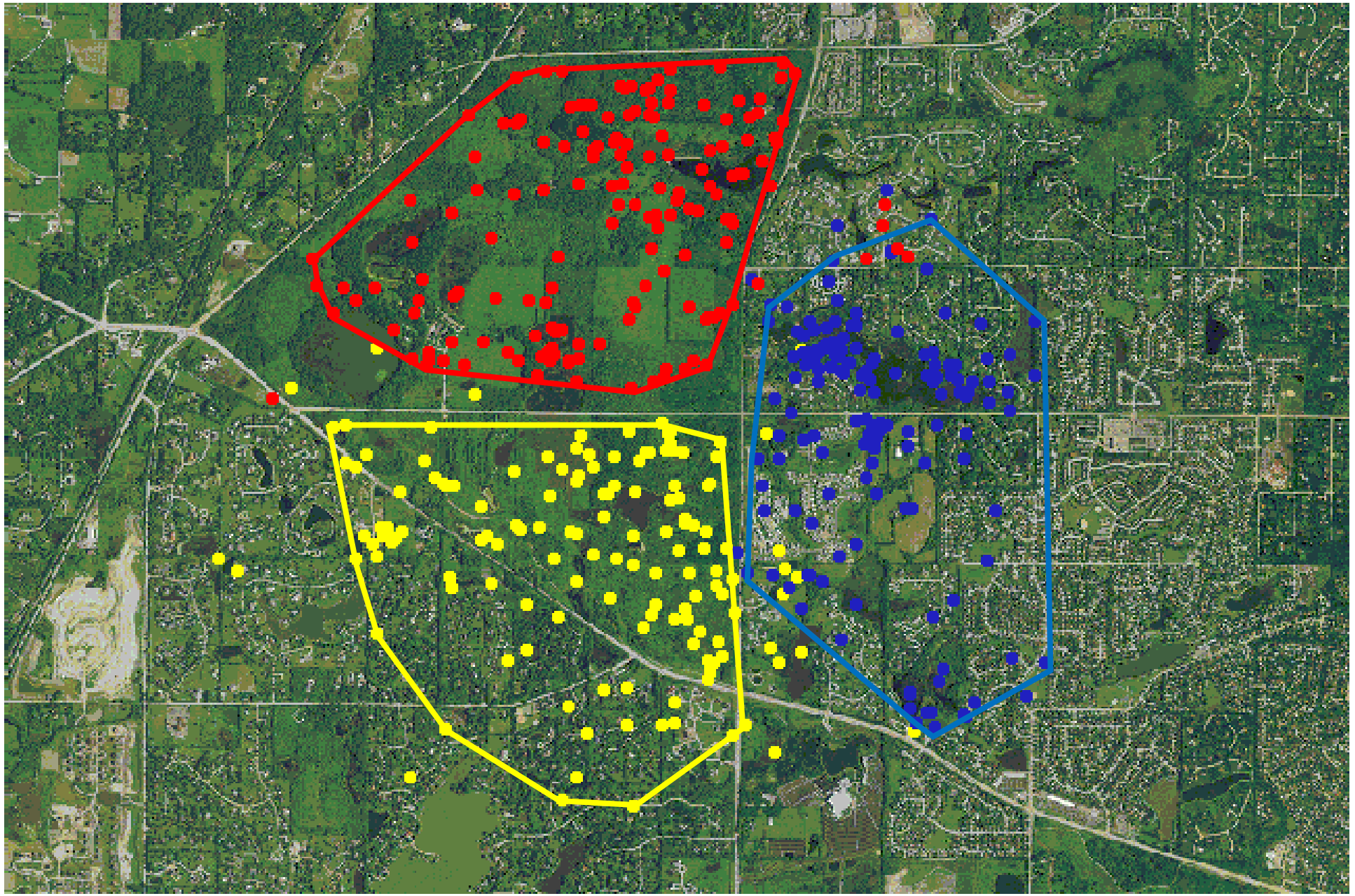
Coyote Serology - % Positive (2000-2015)

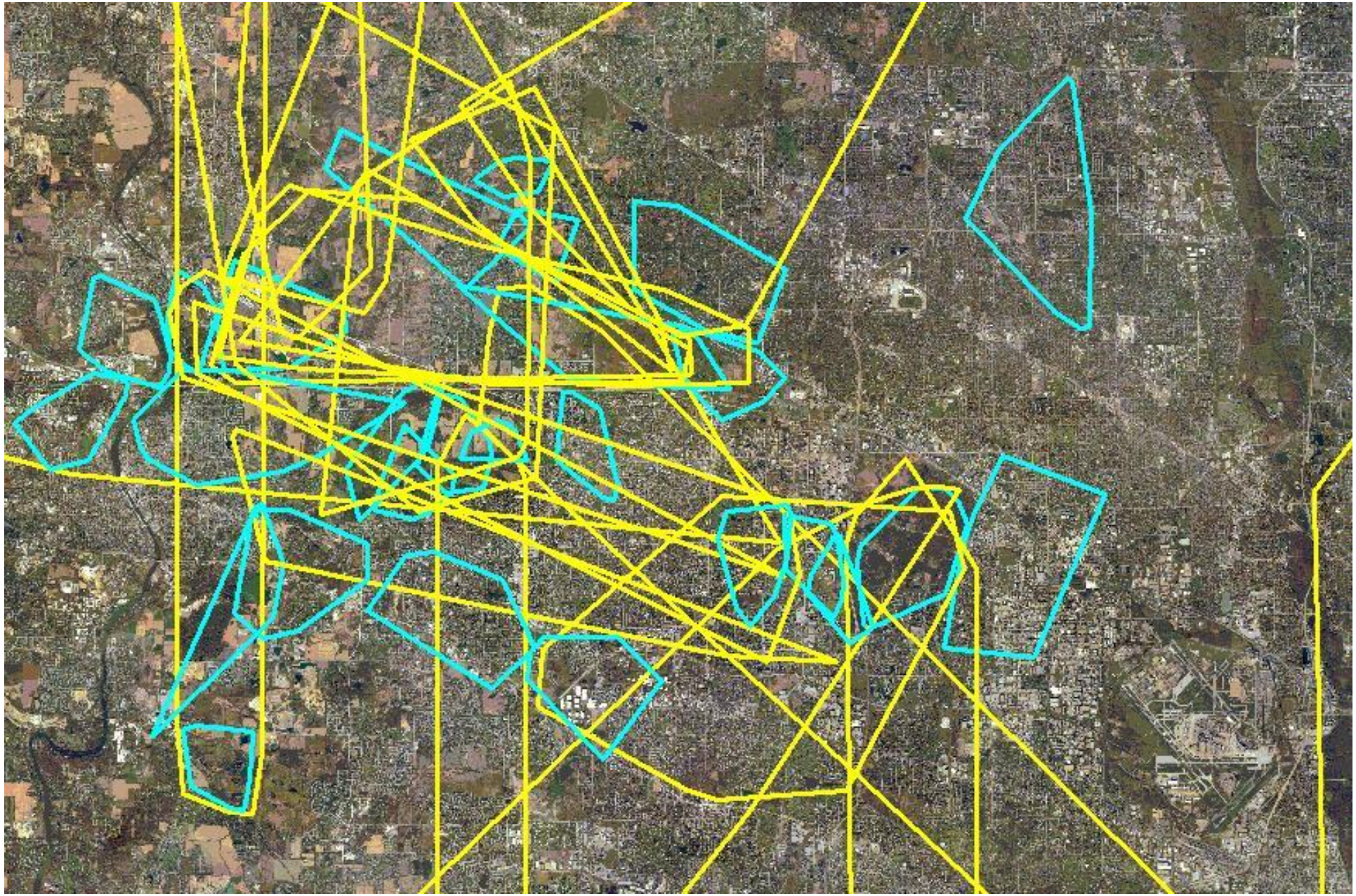
Pathogen	Sample size (n)	% positive
Canine Parvo	427	91%
Canine Distemper	429	41%
Leptospirosis	422	26%
Heartworm	397	26%
Toxoplasmosis IgM	399	5%
Toxoplasmosis IgG	424	49%
Lyme	233	24%

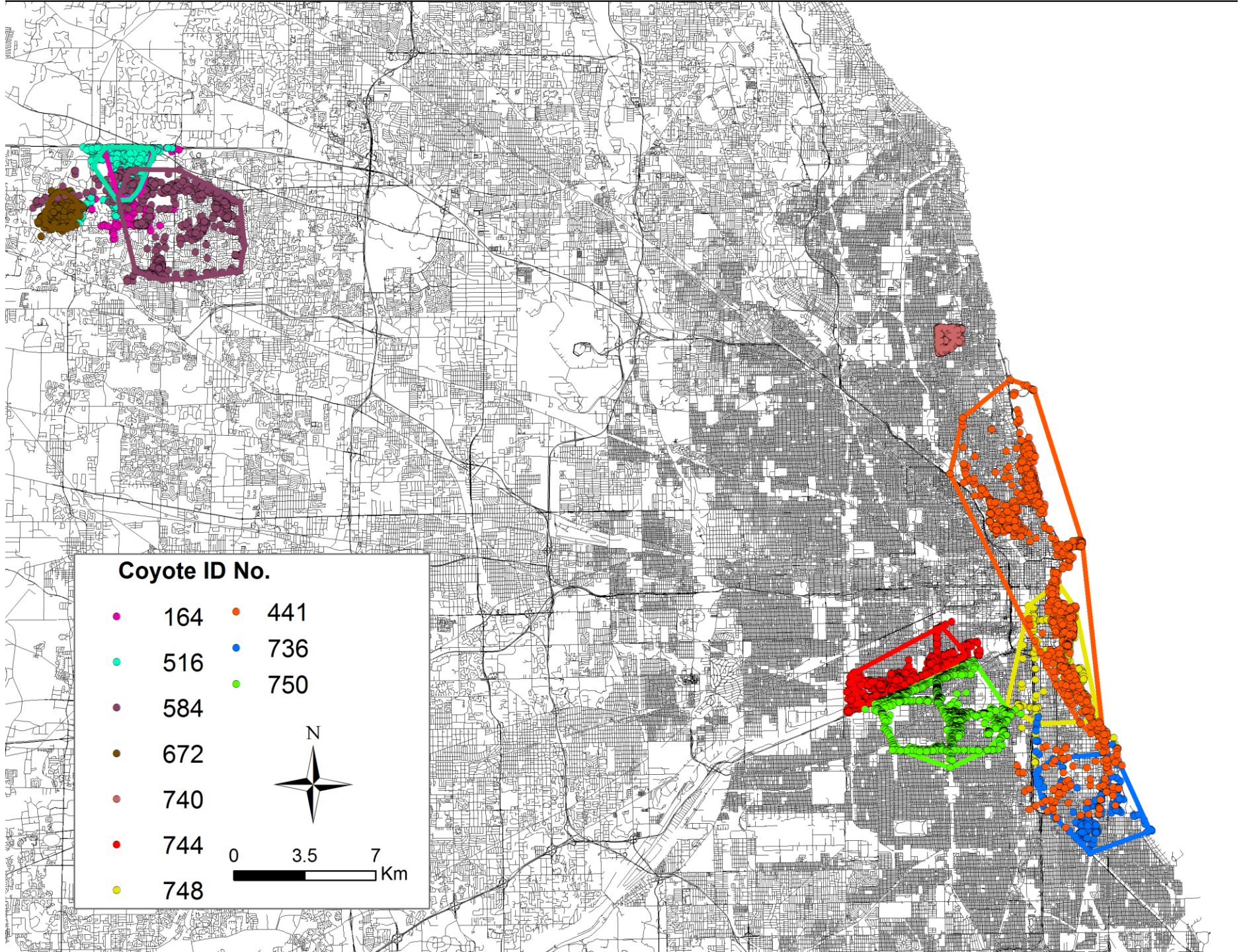


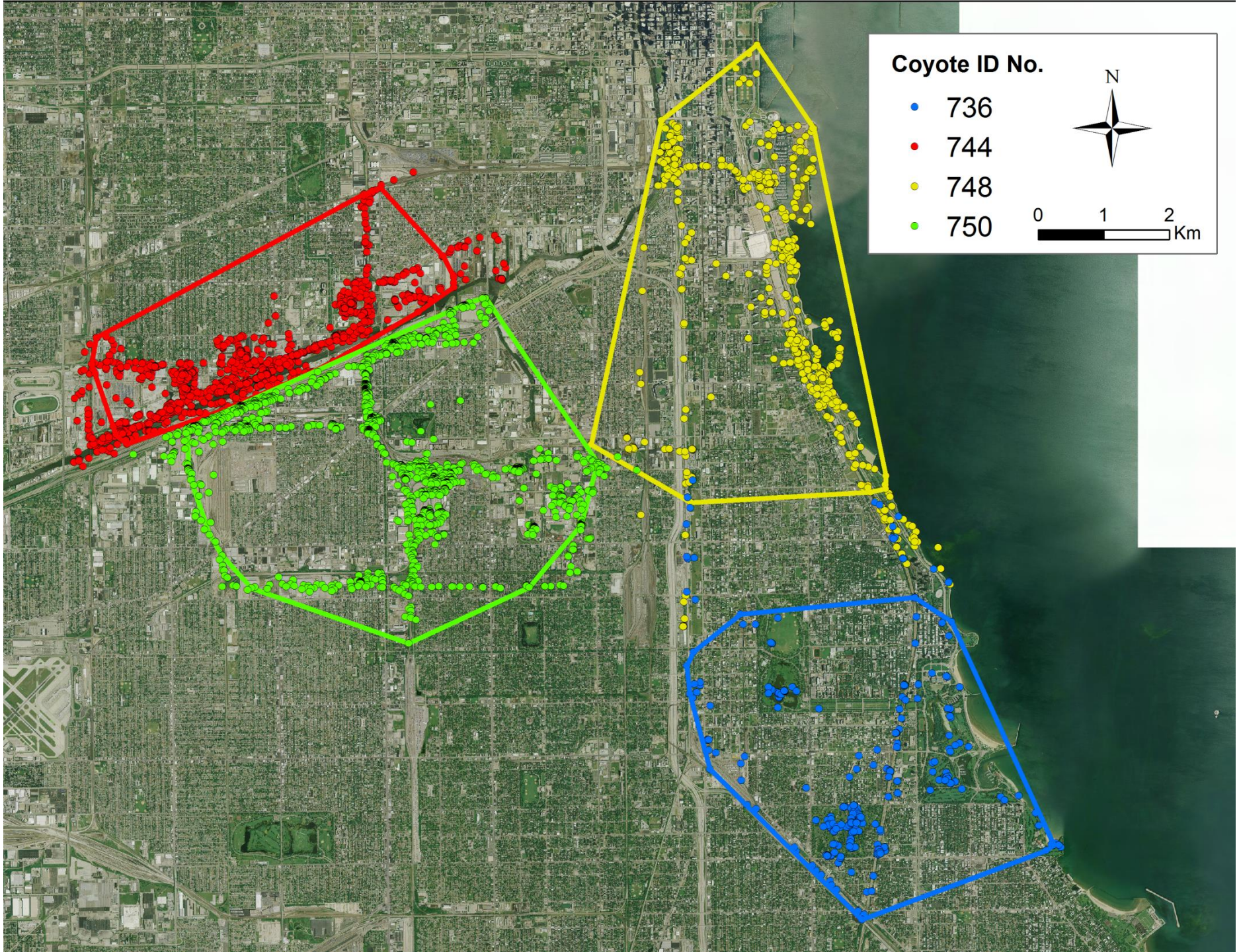









Coyote ID No.
164
516
584
672
740
744
748
441
736
750
N
0
3.5
7
Km


Coyote ID No.
736
744
748
750
N
0
1
2
Km


Exit
SOLDIER FIELD

Raccoon Pathogens

- Rabies
- Leptospirosis
- Roundworm (B. procyonis)
- Ehrlichia
- Salmonella
- Canine Distemper
- Canine Parvovirus

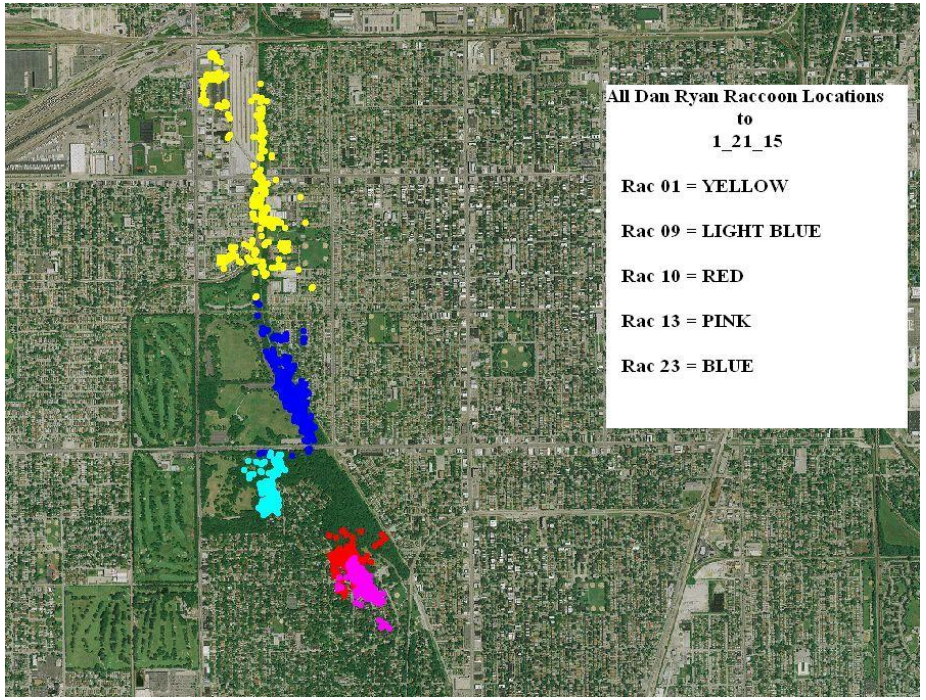
Raccoon Roundworm: Baylisascaris procyonis

Eggs shed in feces

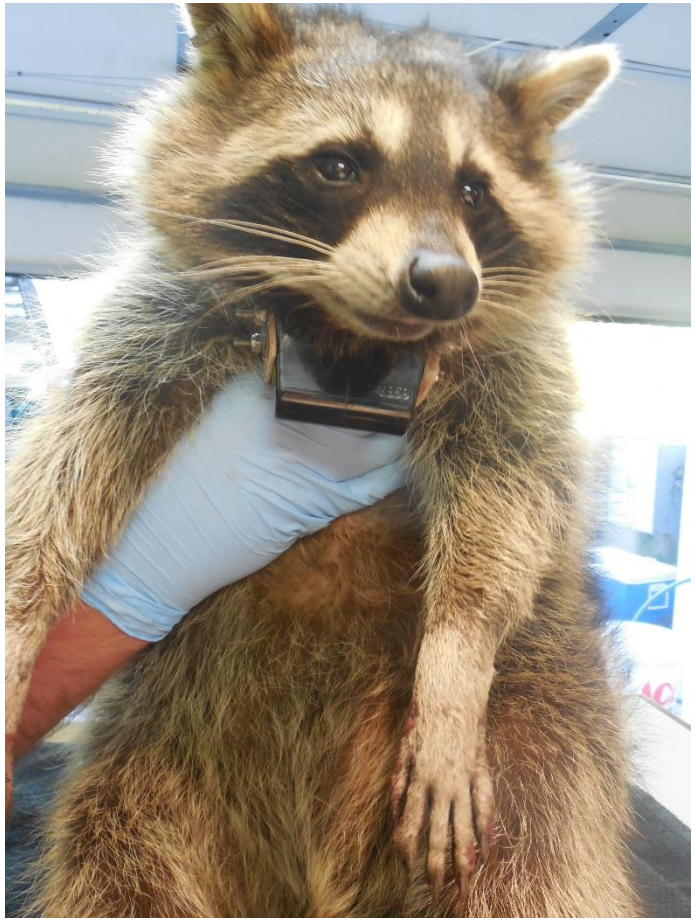
Adult worm in raccoon

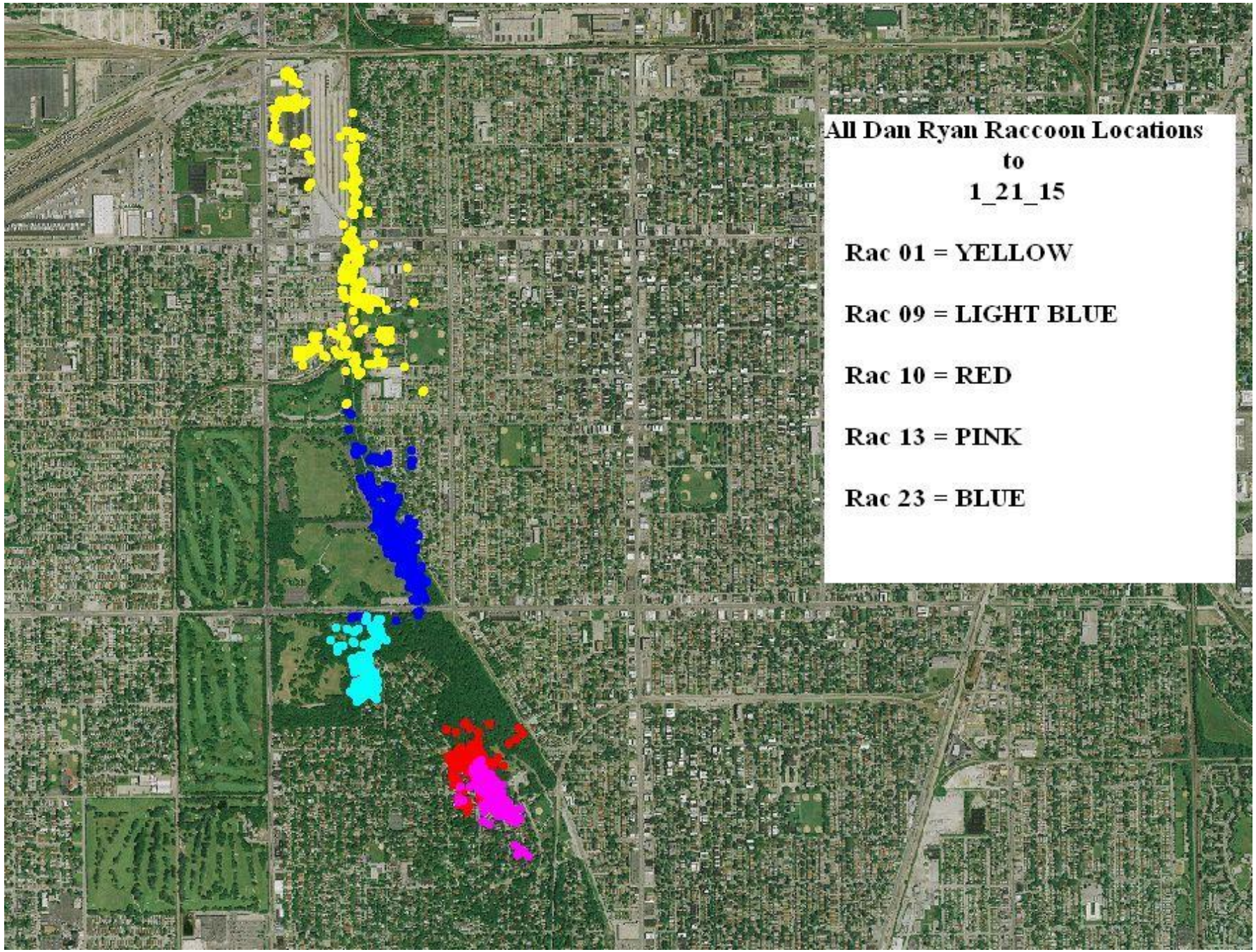
Human – Wildlife Conflict

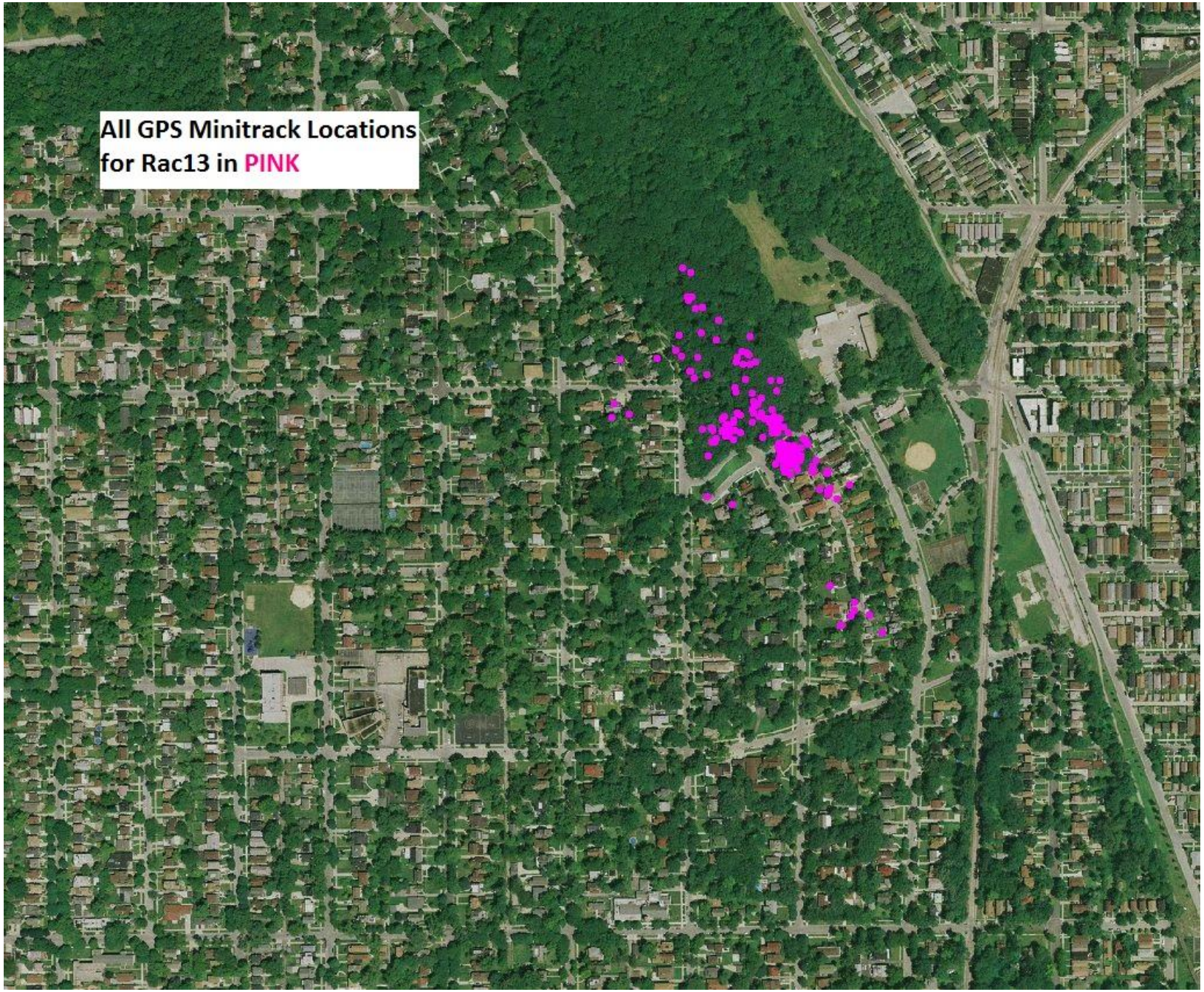
- Urban landscapes can result in increased human – wildlife contact
  - Transmission of zoonotic disease
  - Conflicts between speciesh
  - Especially true in urban green spaces
    - Altered host densities
    - High human use

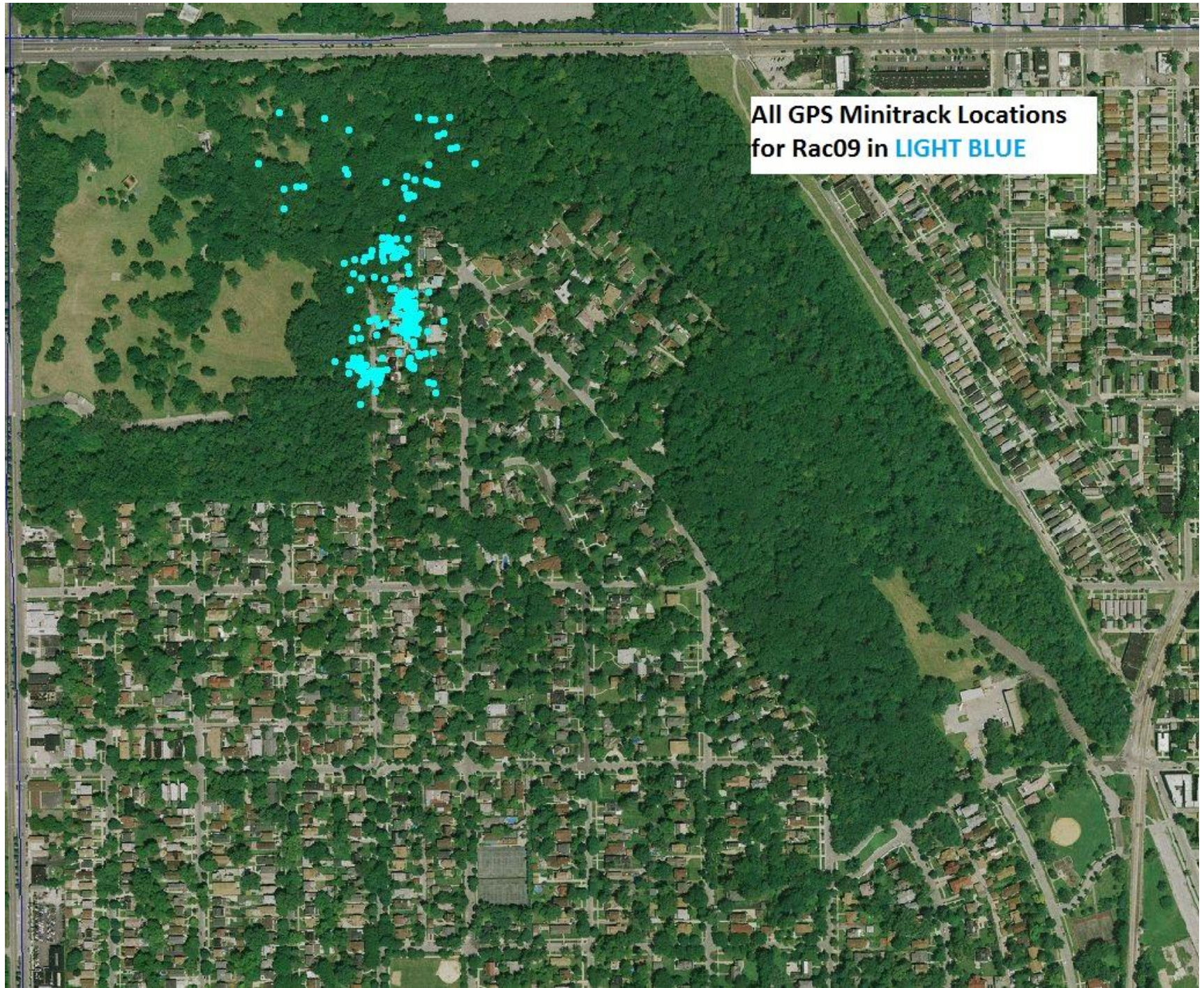


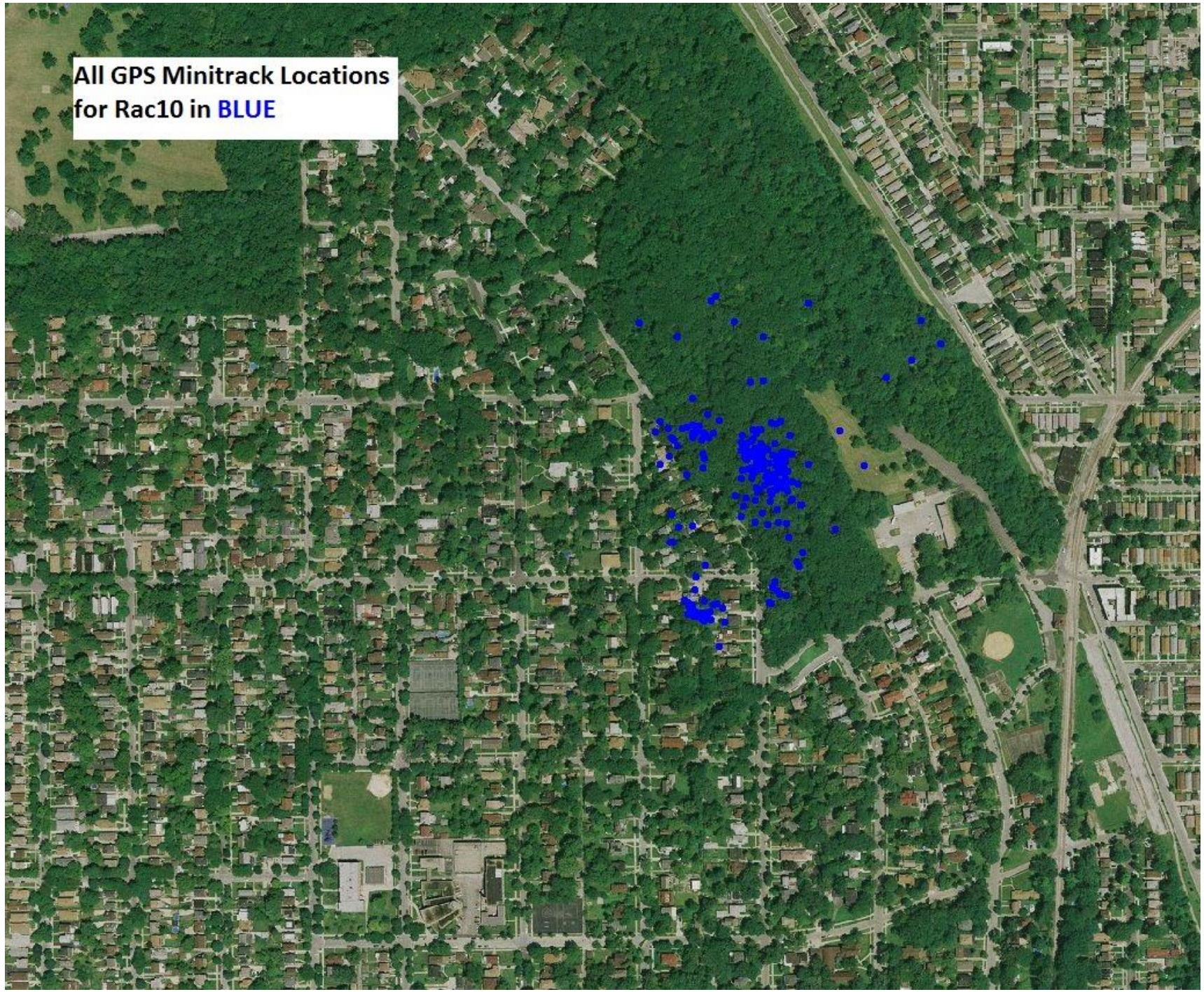
New Project: Raccoon GPS Monitoring




All Dan Ryan Raccoon Locations
to
1_21_15
Rac 01 = YELLOW
Rac 09 = LIGHT BLUE
Rac 10 = RED
Rac 13 = PINK
Rac 23 = BLUE


All GPS Minitrack Locations
for Rac13 in PINK


All GPS Minitrack Locations
for Rac09 in LIGHT BLUE


All GPS Minitrack Locations
for Rac10 in BLUE

Rabies

- Extremely widespread and common multi-host zoonotic wildlife disease.
- One rabies death every 15min (worldwide)
- In the USA:

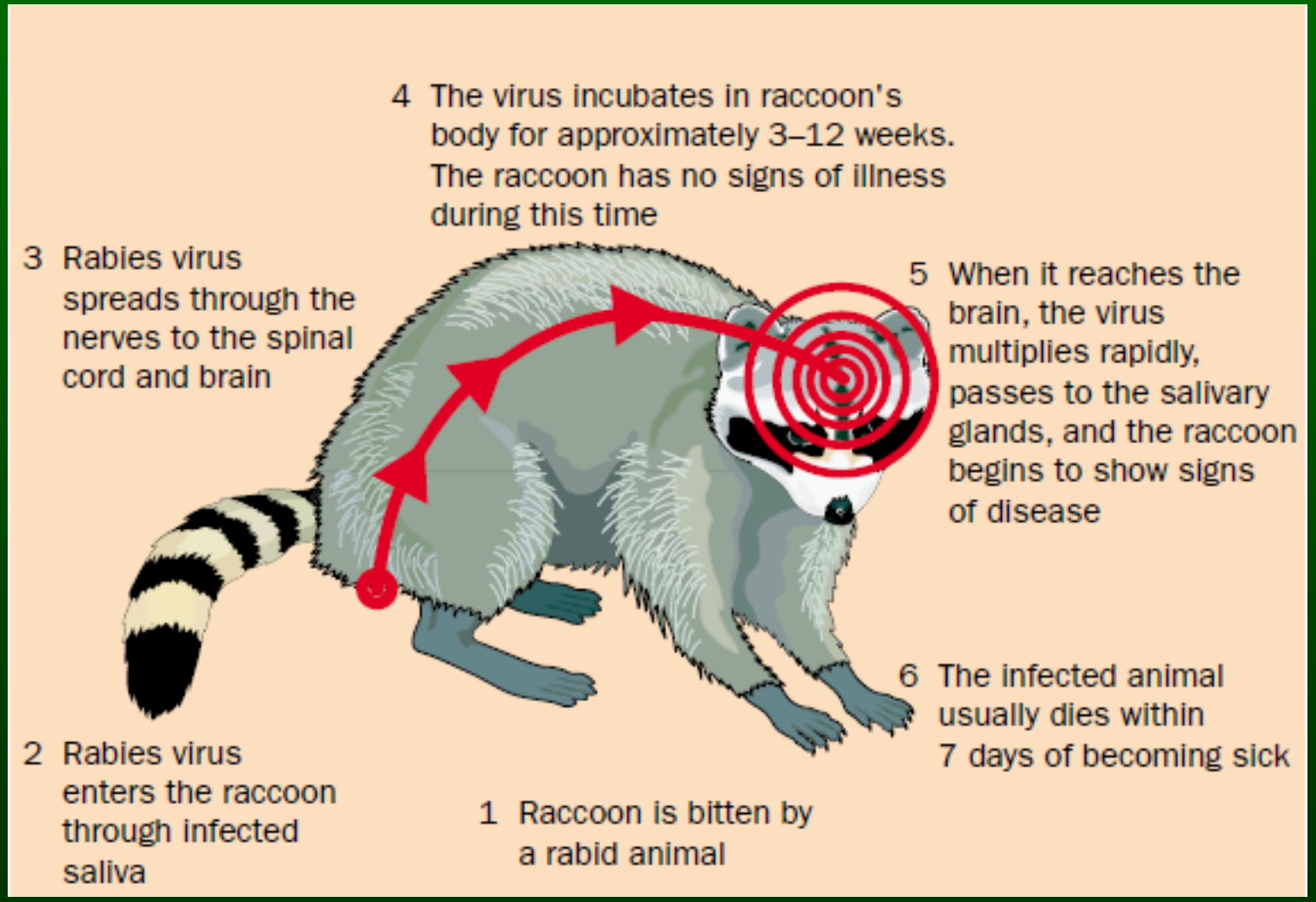
  Surveillance, treatment,

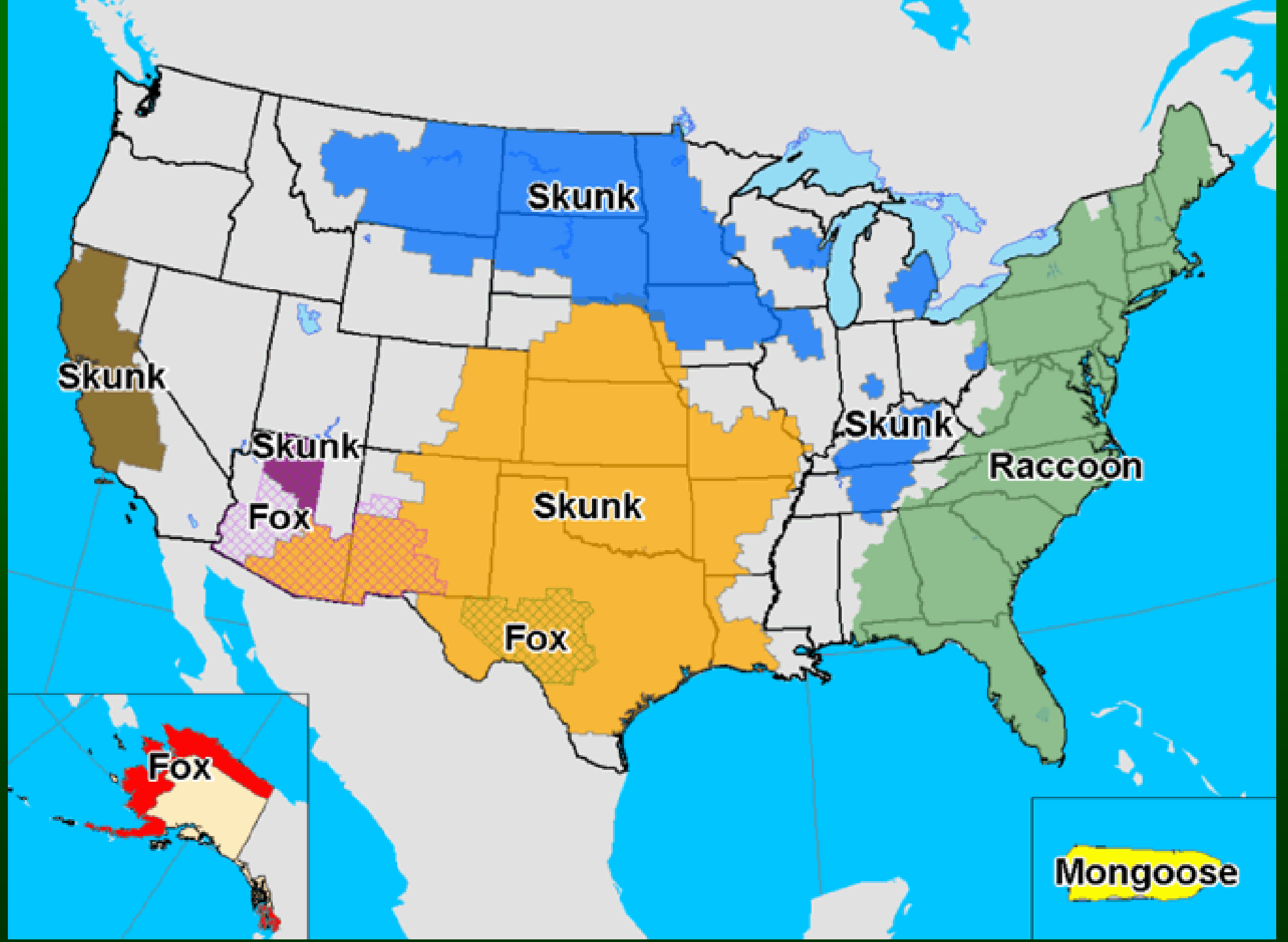
  and vaccine baiting:

  Between $300 million to

  $1 billion per year.

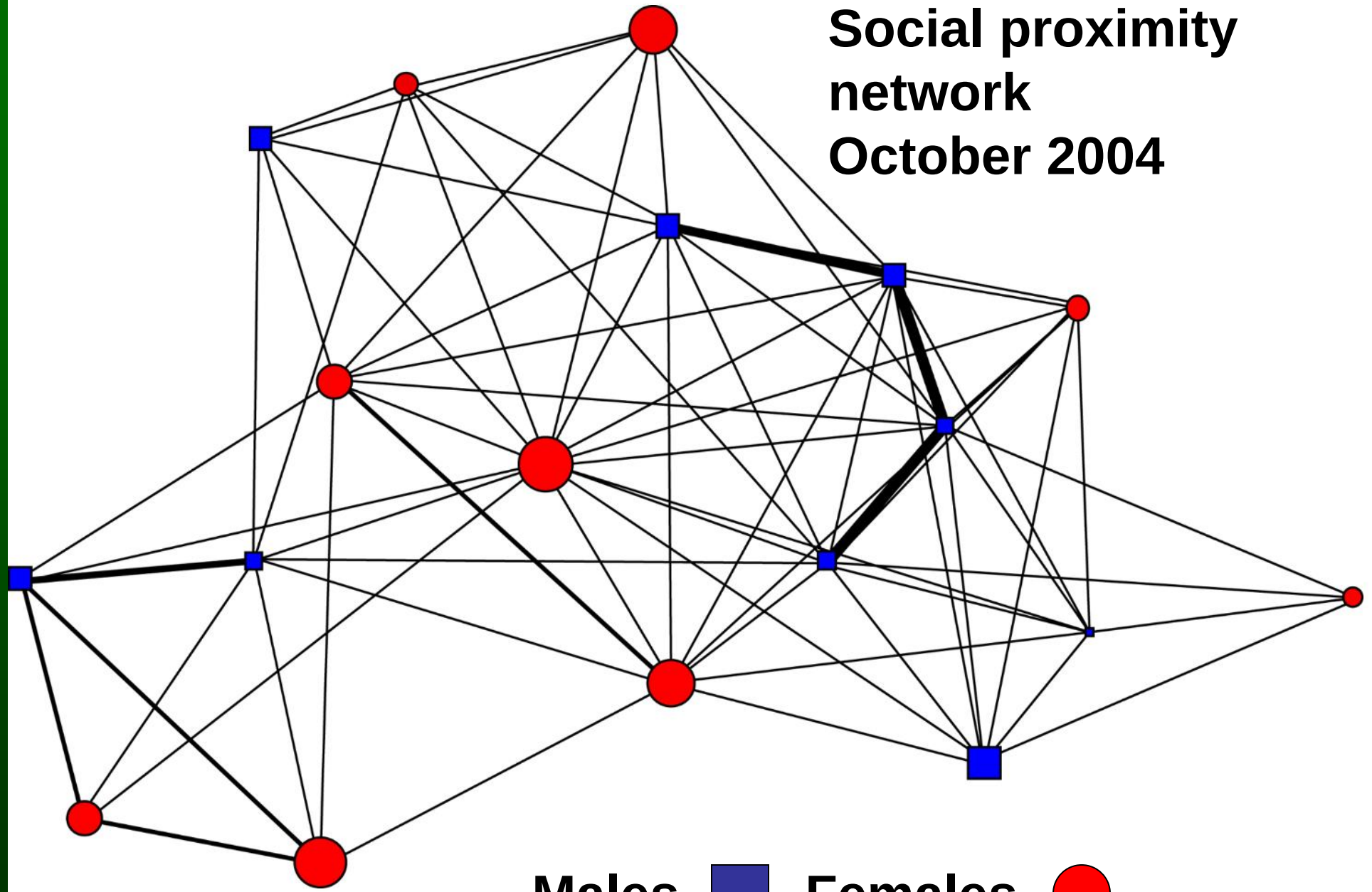
Rabies biology




Skunk
Skunk
Skunk
Fox
Skunk
Fox
Skunk
Raccoon
Fox
Mongoose

Contact rates

- Contact collars record individuals <1.5m
- 18 months of data.
- N= 42 raccoons.

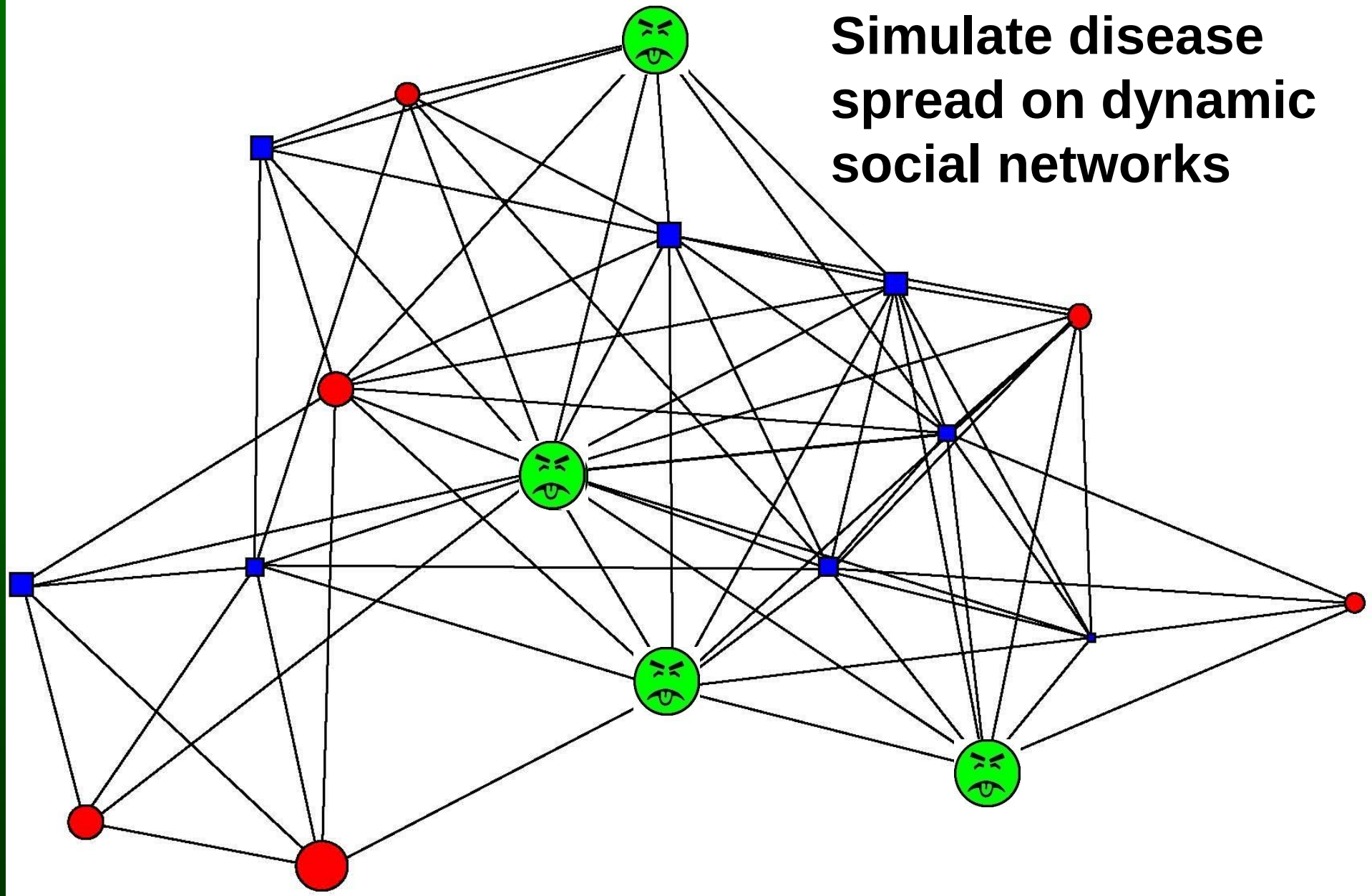

Social proximity network
October 2004
Males-
Females-

Disease spread

- Raccoon social networks are extremely well connected, & ideal for the transmission of rabies & other diseases.
- Next step:

  Simulate disease spread on observed social networks with observed contact durations= dynamic social network model.

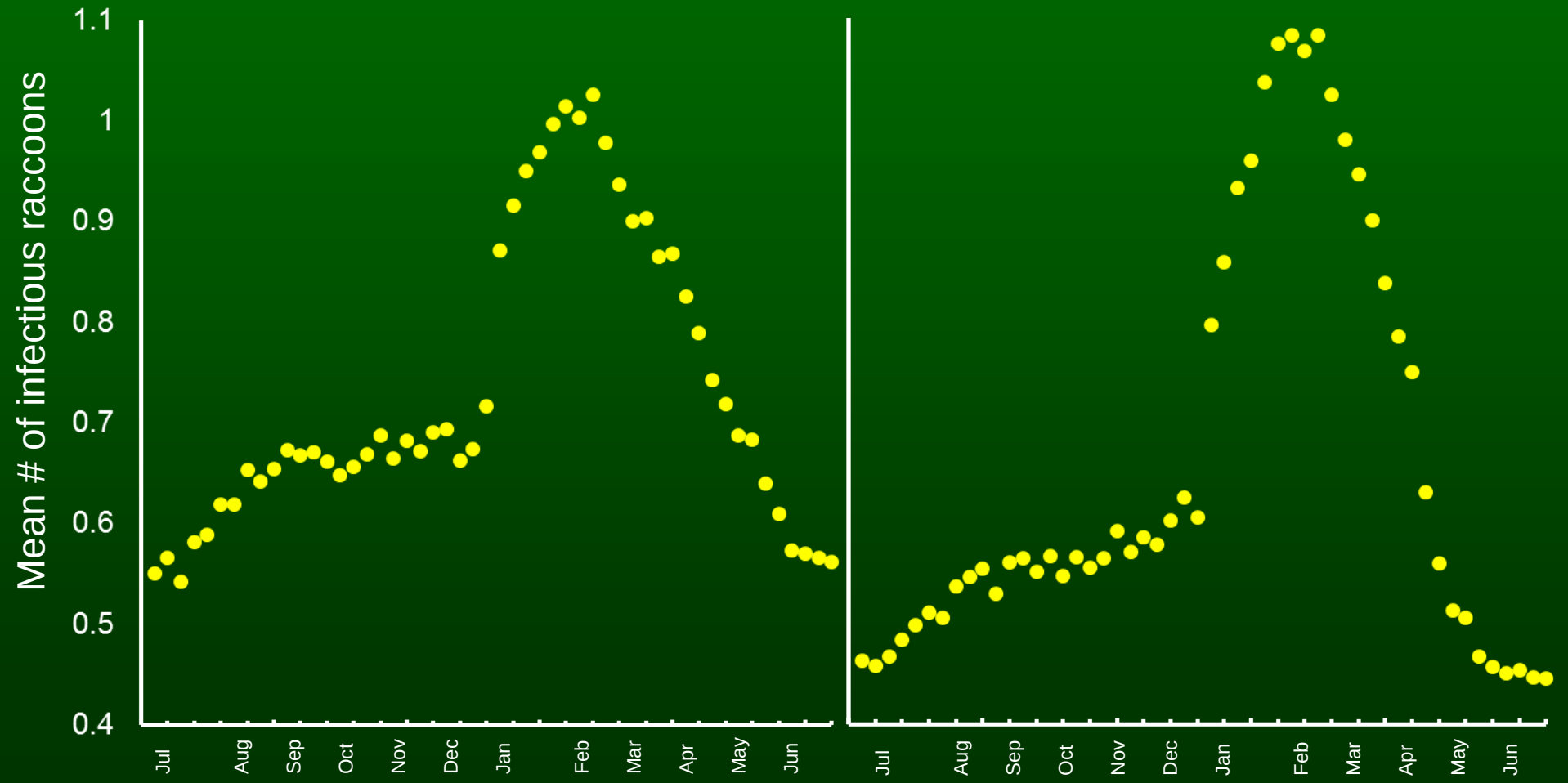
Simulate disease spread on dynamic social networks



Seasonal models

0. Normal model

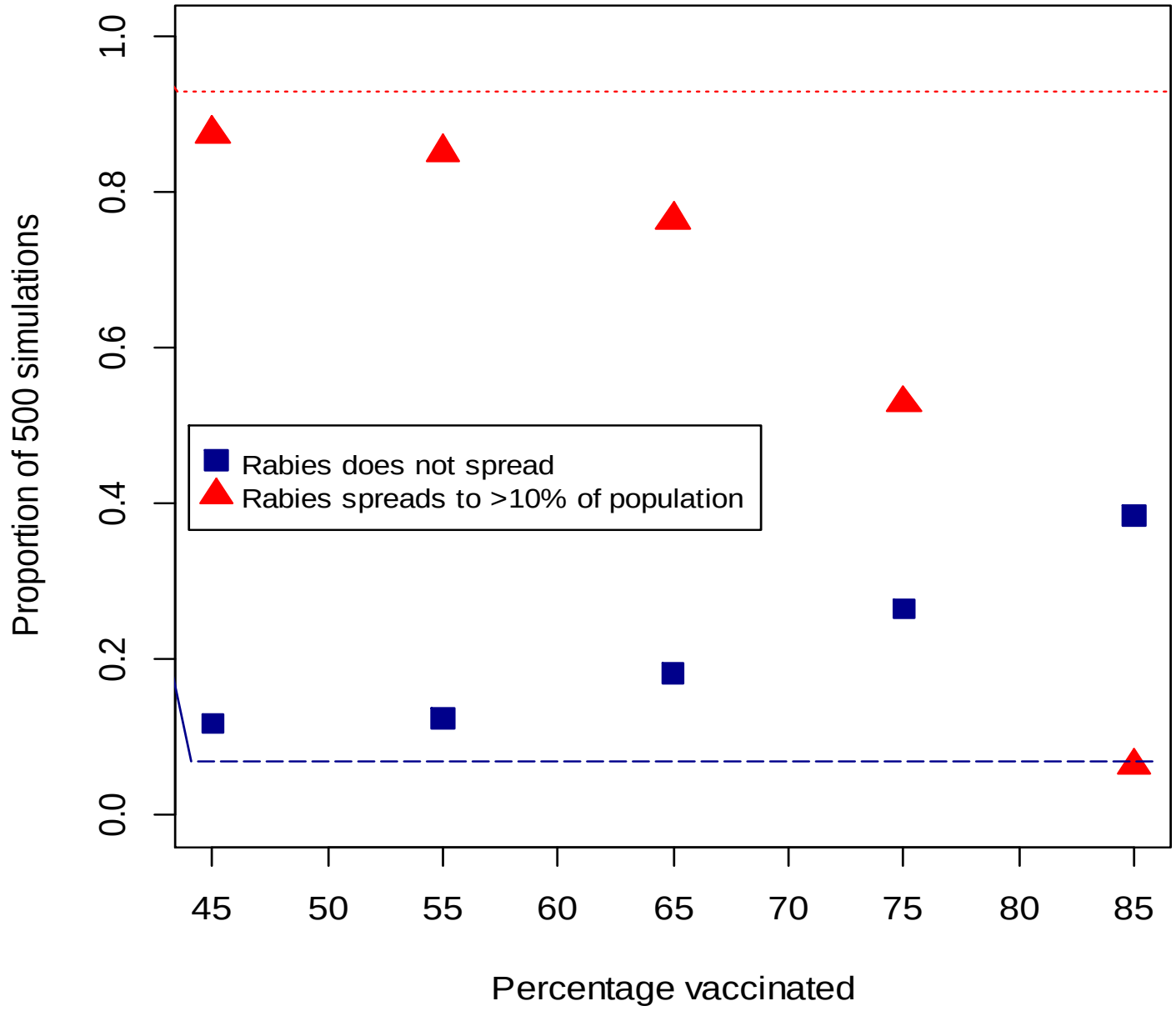
2a. Mating season contact patterns



ORV baiting levels

- What percentage of the population needs to be immunized to eradicate rabies?
- Current target levels 60-70% based on European fox and coyote data.
- Are these vaccination levels adequate in a suburban raccoon population?

ORV baiting effectiveness



ORV baiting levels

- Current target levels are not adequate for suburban raccoon populations- need 85%.
- High density populations may need higher vaccination levels:
  - Urban & suburban - trash raiding.
  - Rural - crop raiding.
- ORV distribution much harder in urban areas- no aerial drops, placed by hand.

Acknowledgements

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- Chris Anchor provided permits and access to study sites
- Special thanks to Heidi Garbe, Shane McKenzie, Justin Brown as well as numerous field technicians