

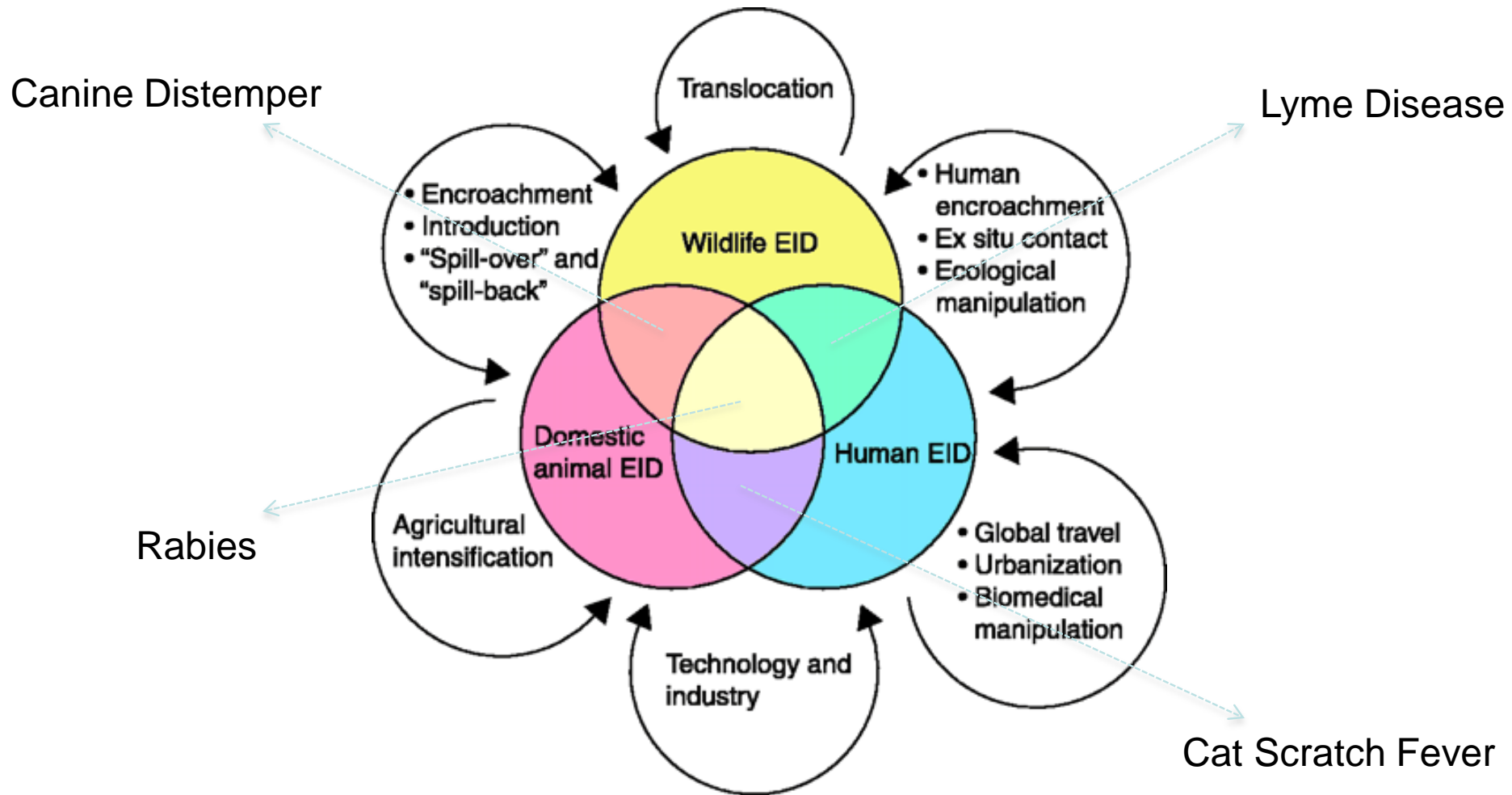
# Wildlife Disease



# Important Qs

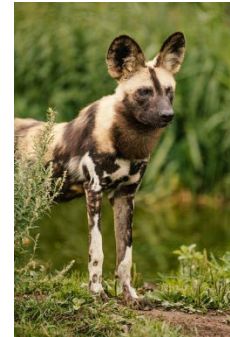
- What role does disease play in wildlife management and conservation?
- What causes disease in wildlife?
- What are the consequences of anthropogenic pathogen introduction?
- How to prevent and/or manage for disease?
- Think about examples:
  - Global, national, and local level
  - Captive & wild
  - Plants & animals

# Host-Disease Ecological Continuum



# Basic principles of epidemiology

- High rates of *contact* between hosts and pathogens helps spread diseases
  - When humans and their animals enter “ecologically naïve” areas, such as wilderness and remote regions.

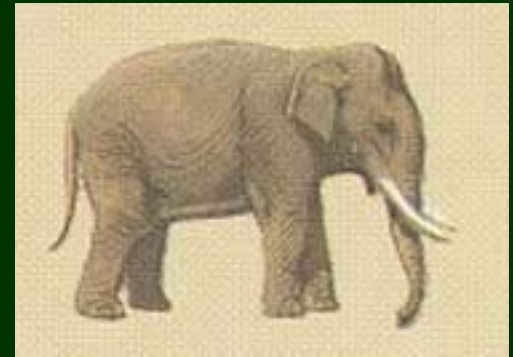
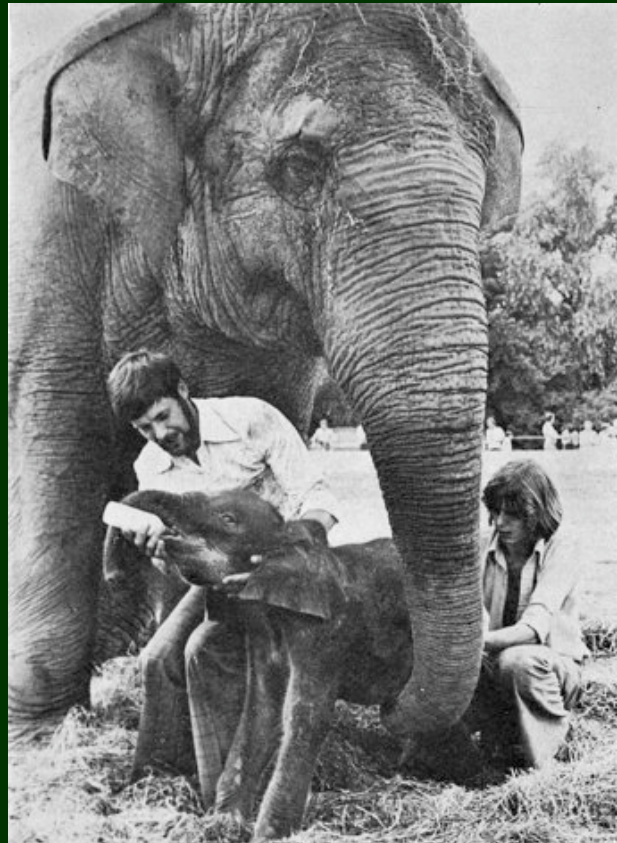
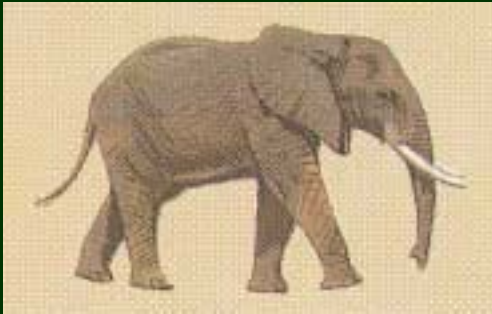


# Some basic epidemiological principles applied to management of biodiversity (particularly threatened and endangered species)

- High rates of *contact* between hosts and pathogens helps spread diseases
  - When humans and their animals enter “ecologically naïve” areas, such as wilderness and remote regions.
    - For example dogs and cats often transmit diseases such as rabies, distemper, parvoviruses, etc. to wild animals and vice-versa, particularly when those wild species are closely related (e.g. dogs transmitting diseases to African wild dogs)
    - When humans travel (globalization) has greatly increased disease sharing
- Indirect effects of habitat loss, destruction, and degradation (e.g. stress, reduced body condition) can make an individual or population more susceptible to infection from diseases.
  - For example, the “crowding effect” caused by habitat loss can increase contact and thus disease transmission among individuals in a wild population
  - For example we know that stress often causes immunosuppression. Animals stressed out would have reduced ability to resist or fight off infection from diseases, including parasites. Captive breeding programs often are challenged with very stressed animals that die or won’t reproduce in captivity.
    - How might plants be stressed by such effects?

# Epidemiology Cont'd

- Species in conservation programs may contract diseases from related species, and even from humans; for example between African and Asian elephants.





# Wildlife Disease Management

- Three basic forms of management strategies exist for wildlife disease, as follows:
  - Prevention of introduction of disease
  - Control of existing disease
  - Eradication
- Management of diseases of wild animals usually requires a change in human activities
- Most important method is by restricting translocation of wild animals to prevent movement of disease.

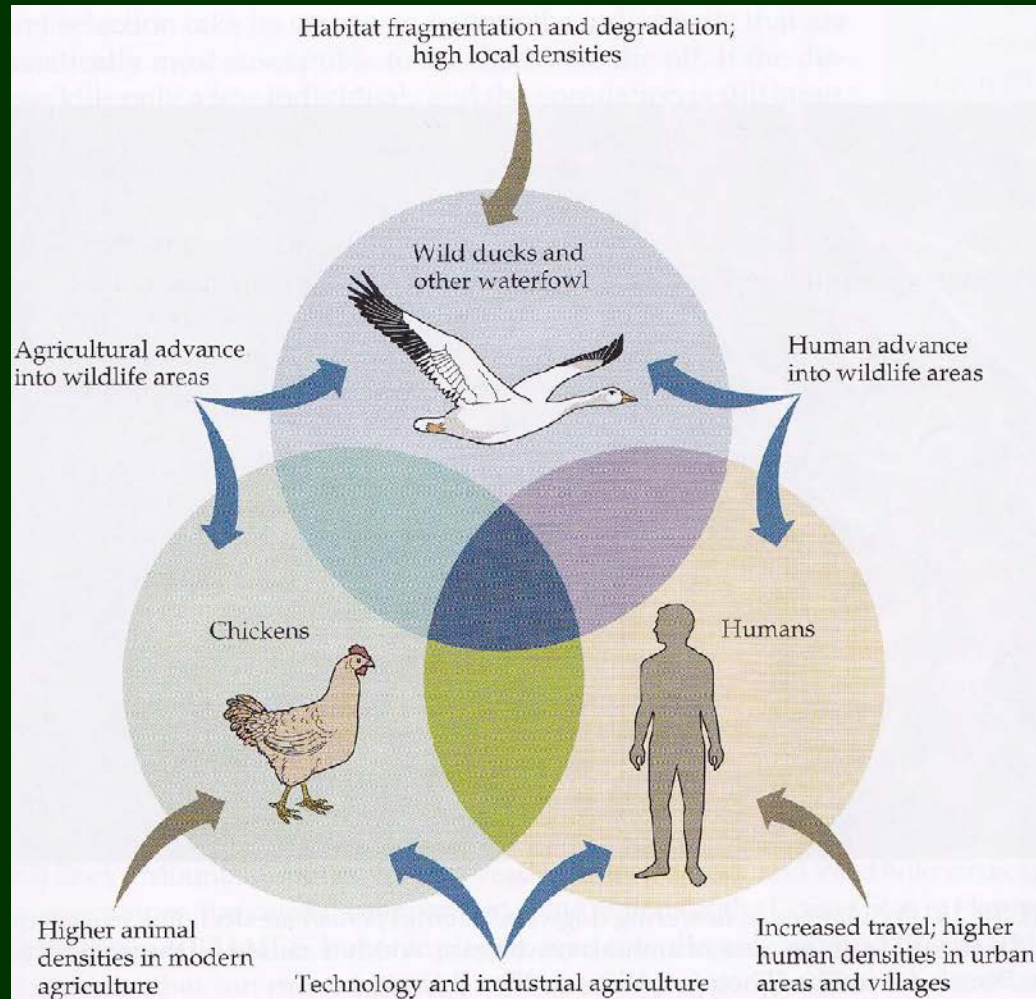
# WILDLIFE DISEASE



Devil facial tumour disease



# Avian Flu (interaction among wild species, domestic animals and humans)



**FIGURE 10.14** Infectious diseases—such as rabies, Lyme disease, influenza, bird flu, hantavirus, and canine distemper—spread among wildlife populations, domestic animals, and humans as a result of increasing population densities and the advance of agriculture and human settlements into wildlife areas. The figure illustrates the infection and transmission routes of bird flu—wild waterfowl, chickens, and humans are all susceptible to the virus. The shaded areas of overlap indicate that diseases can be shared among the three groups. Green arrows indicate factors contributing to higher rates of infection; blue arrows indicate factors contributing to the spread of disease among the three groups. (After Daszak et al. 2000.)

# Lyme Disease

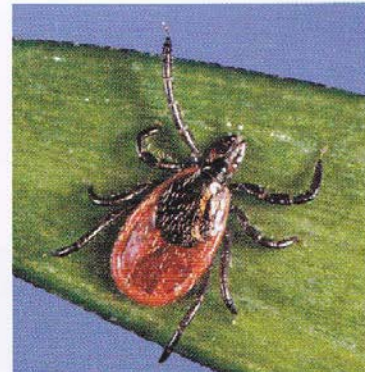
(A)



(B)



(C)



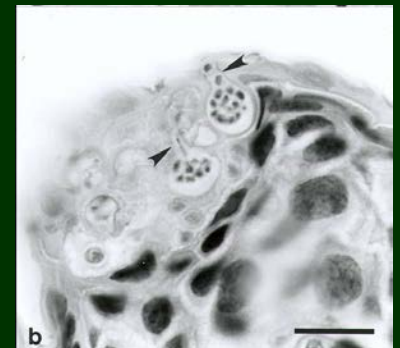
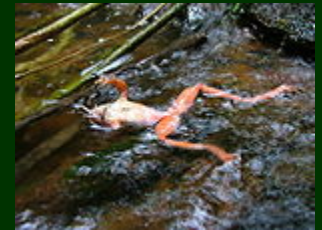
**FIGURE 10.13** (A) A white-footed mouse, one of the main hosts for Lyme disease, increases in abundance in habitat fragments created by suburban development. (B) Field biologists are sampling mice for the presence of infectious diseases, such as plague. (C) A black-legged tick, which can transfer Lyme disease to human, after acquiring the disease from an infected animal. (A, photograph © Rolf Nussbaumer/Naturepl.com; B, photograph from Crowl et al. 2008; C, photograph courtesy of Michael L. Levin/CDC.)



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# Chytrid Fungus and Amphibians

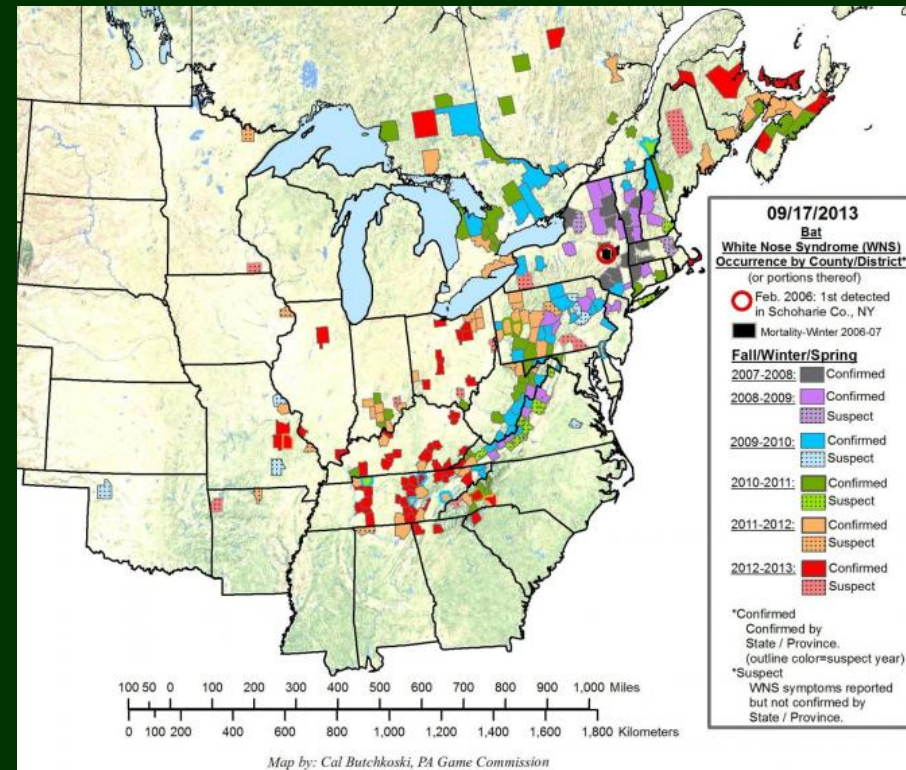
- Chytrids are primitive fungi that cause Chytridiomycosis in amphibian hosts leading to death
- Mechanism of death unknown but may be from hardening of moist skin, sometimes ulcers, hemorrhage, convulsions
- Also causes lethal changes in behavior (lethargy, failure to seek shelter)





# White Nose Fungus (*Geomyces destructans*) and Bats

- 1<sup>st</sup> recognized in NY State in 2006
- Psychrophilic (cold-loving) fungus
  - Maximal growth = 4-15°C
- Found on several cave-dwelling bats in N. America and Europe
- Only known pathogenic psychrophilic fungal species of animals (including humans)
- Proteolytic cocktail causes tissue necrosis and infarction of bats causing “white nose syndrome”
- Why are hibernating bats good hosts?
  - Max growth temps overlaps w/ bat hibernation temps = 1-15°C
  - Humid cave conditions (fungi love this!)
  - Bats are immunosuppressed during hibernation torpor
  - Many bats tend to cluster or perform social grooming which spreads the fungal spores
- What causes bats to die from WNS?
  - Bats wake up/arouse from torpor more frequently and burn up fat. They exhaust their fat reserves before spring and die.
    - A leading hypothesis (dehydration hypothesis) suggests that the fungus is causing increased evaporative water loss from infected tissue making the bats thirstier than usual and causing them to wake up more frequently to drink and to burn up more fat than uninfected bats



# Lungworm (*Dictyocaulus viviparus*) in Elk Bronchia

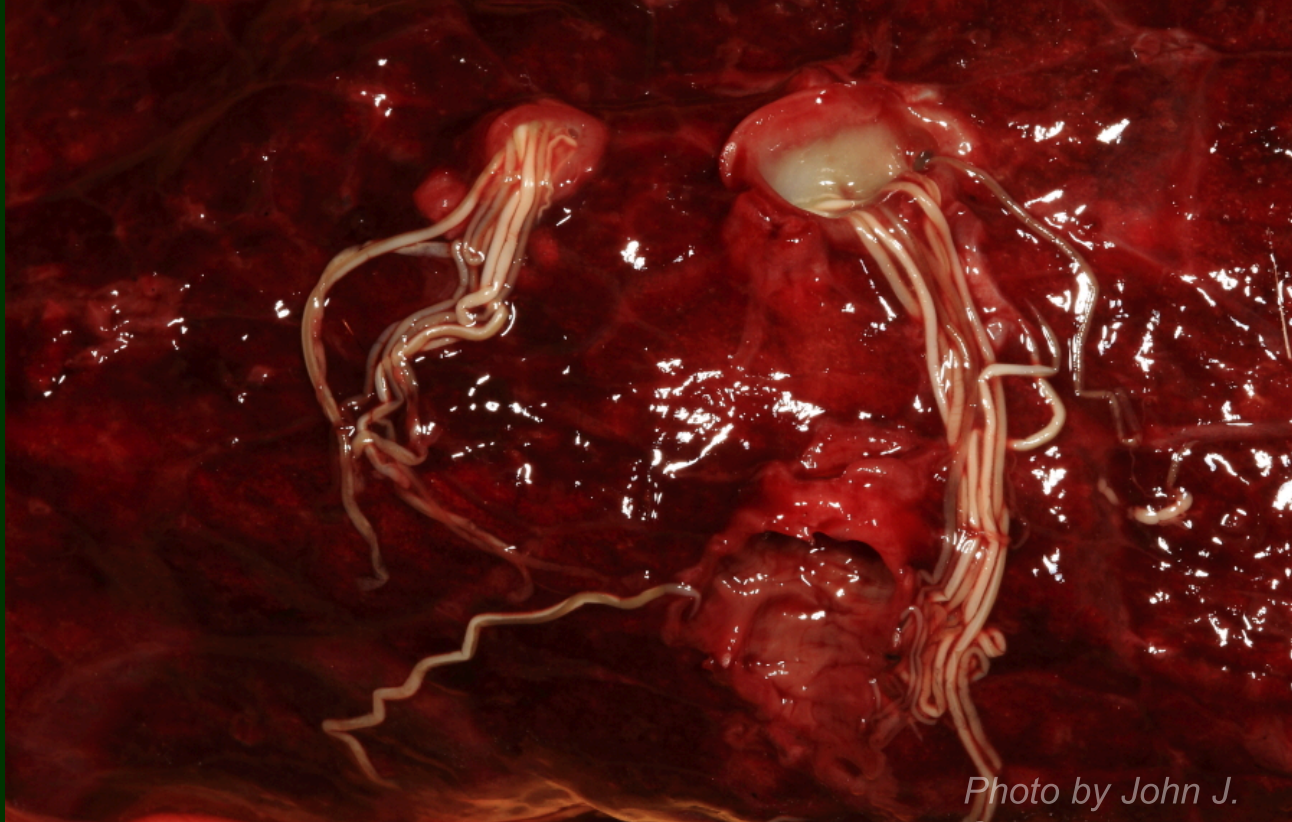
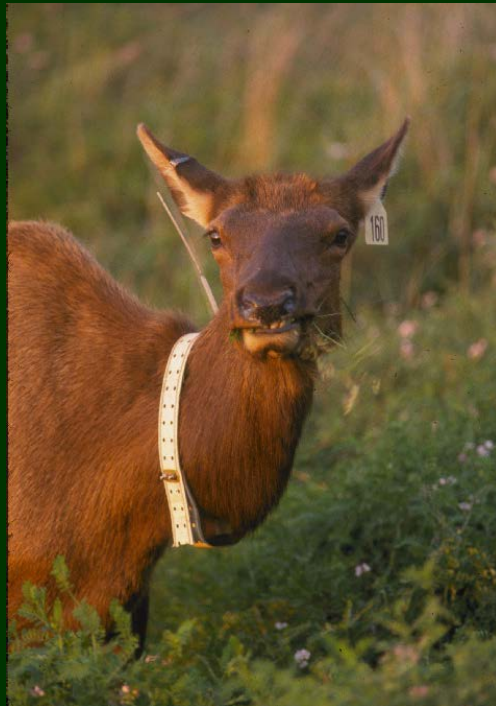


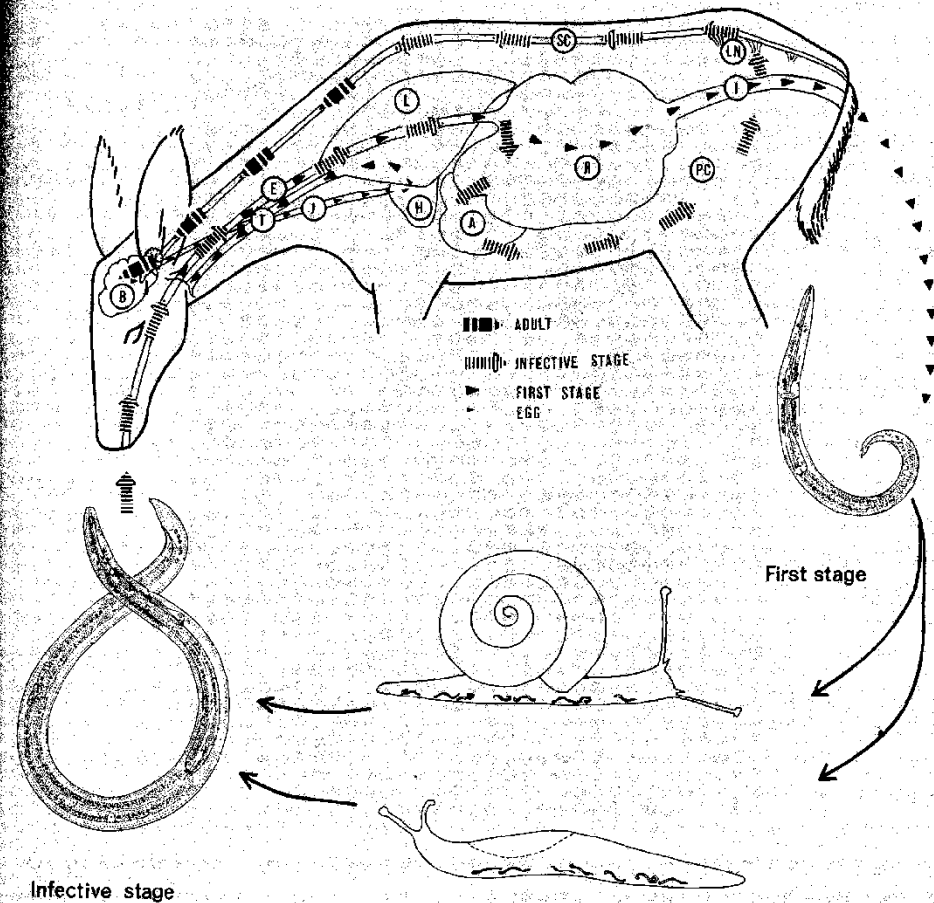
Photo by John J.  
Cox





## LUNGWORMS

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**Figure 21.7** Diagram of the life cycle of *Parelaphostrongylus tenuis* (A = abomasum, B = brain, E = esophagus, H = heart, I = intestine, J = jugular vein, L = lung, LN = lumbar nerves, PC = peritoneal cavity, R = rumen, SC = spinal cord, T = trachea) (Original; Uta R. Strélive).



# Elk Mortality



# American Chestnut



Estimate 4 billion trees occurred

25% of all hardwood

50% of all biomass

1904 Long Island fungus introduced  
from Asian chestnut trees

# Sudden Oak Death

- *Phytophthora ramorum*
- Water mold native range unknown
- Has been found on nursery stock in U.S. and Europe
- Several oak species are its terminal host (bole hosts)
- Harbored by a number of other species (foliar hosts)
- Thought to kill by girdling tree but also causes secondary infections

Canker



Steve Tjosvold, UC Cooperative Extension

