Cimicids (Family Cimicidae) of Colorado

Residential/Commercial Session

Category 304 (2)

Feb 15th, 2023 from 9am-10am

Melissa (Mel) Schreiner

COLORADO STATE UNIVERSITY EXTENSION

Melissa (Mel) Schreiner

Extension Entomologist
Phone: (970) 244-1838

Email: Melissa.Schreiner@colostate.edu

Celebrating my 11th year at CSU!

COLORADO STATE UNIVERSITY EXTENSION

Presentation Agenda

Family Cimicidae

- Bed Bug (*Cimex lectularius*)
- Bat Bug (*Cimex pilosellus*)
- Swallow Bug (*Oeciacus vicarius*)
- *Hesperocimex coloradoensis*

Presentation Agenda

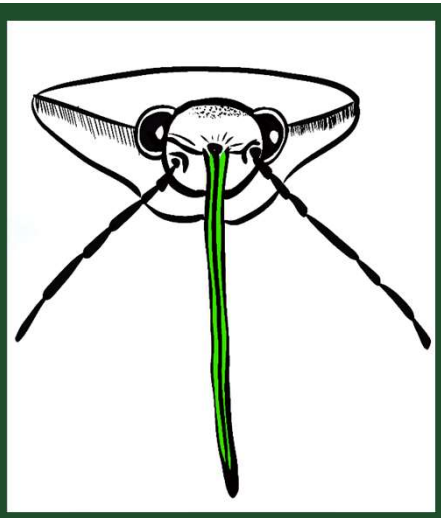
Identification
Biology
Behavior
Hosts and Life Cycles
Integrated Pest Management

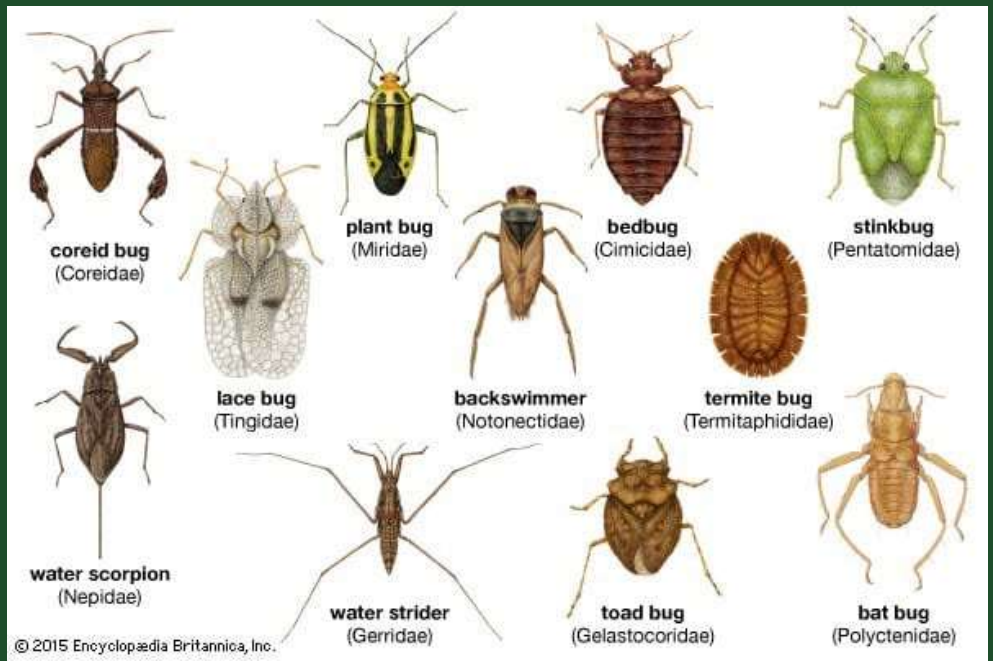
Order Hemiptera

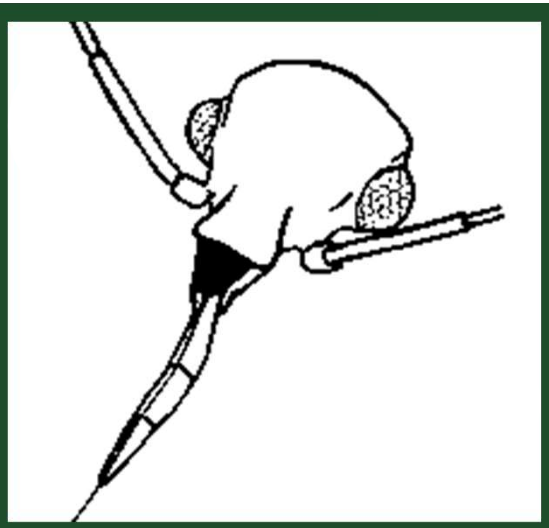
True bugs

- Piercing-sucking mouthparts
- Feed on mainly plant fluids, other insects
- Diverse group- many different environments like forests, grasslands, and wetlands

- Some are ectoparasites – e.g. bed bugs, bat bugs, etc.







Family Cimicidae

Bed bugs, bat bugs, bird bugs

Members of this insect family are hematophagous

(insects that feed primarily on the blood of humans, birds, and bats)

Family Cimicidae

Bed bugs, bat bugs, bird bugs

All of these species are generally similar in appearance.

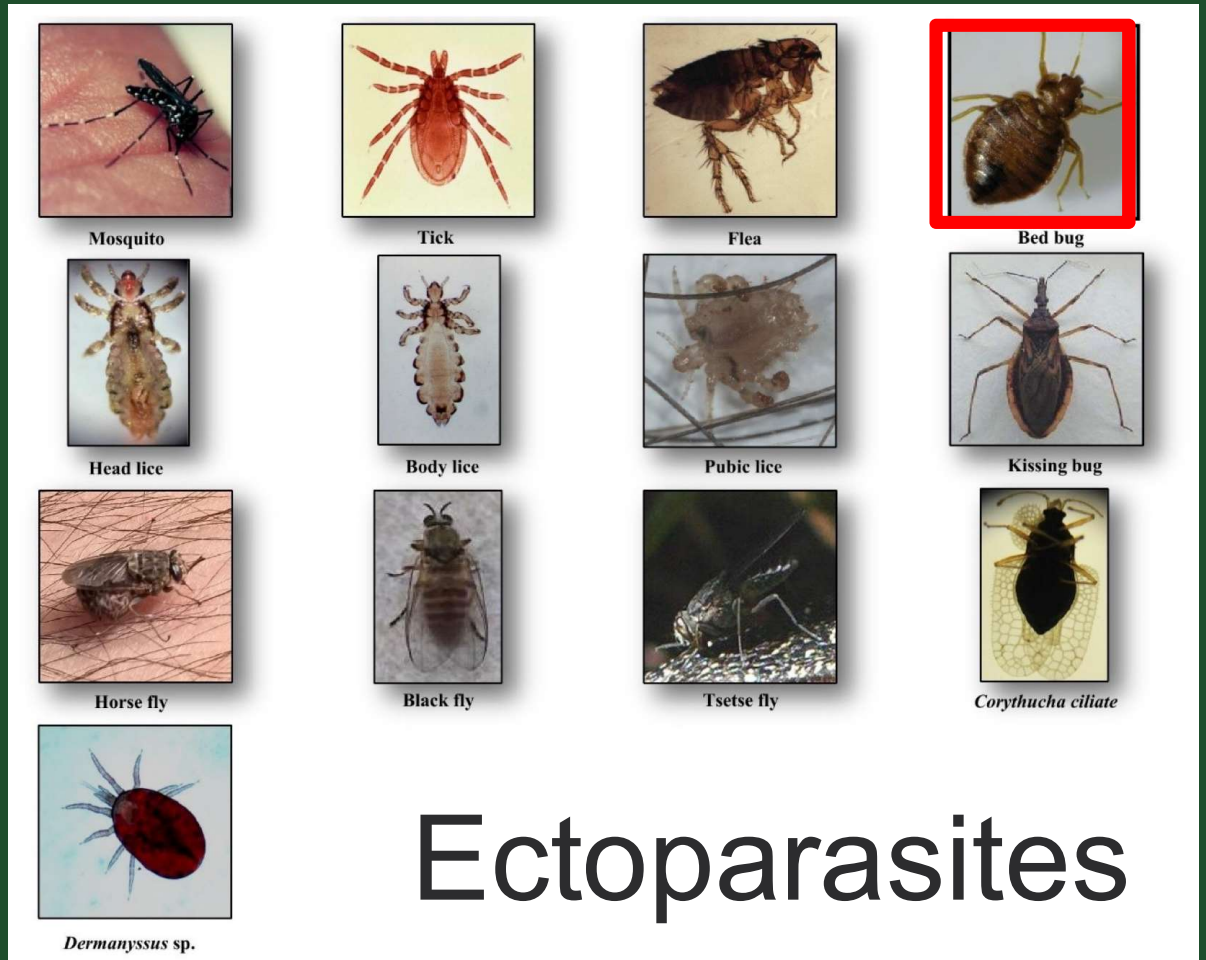
They are reddish-brown to grayish-brown with an oval body form and about 3/8-in long when full-grown.

All are wingless, although small wing pads are present on the back.

The various species found in Colorado can be separated by both length/pattern of their hairs and wing pad structure/wing pad shape

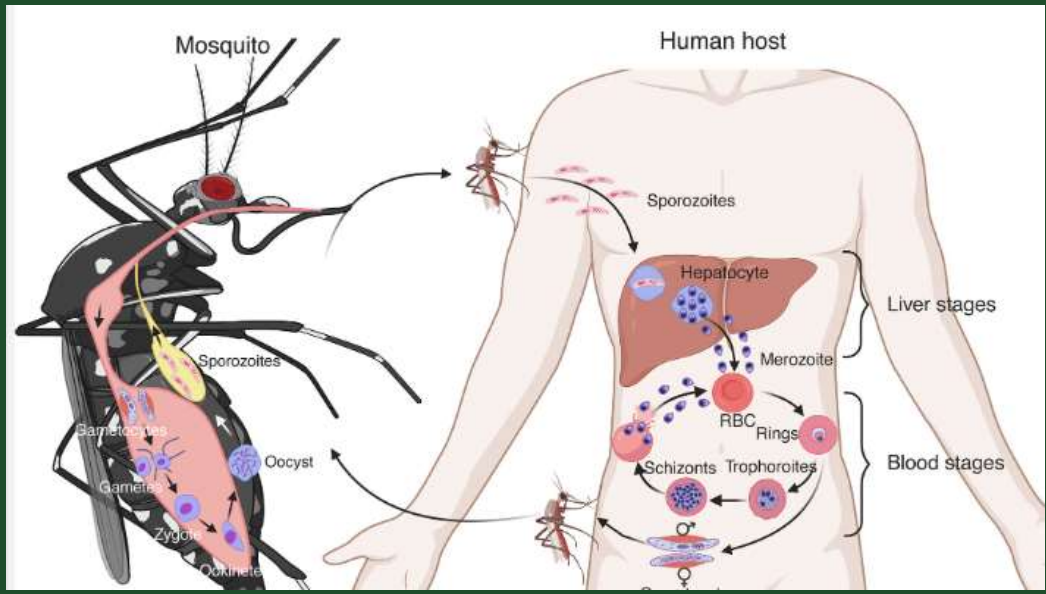
Cimicids are ectoparasites

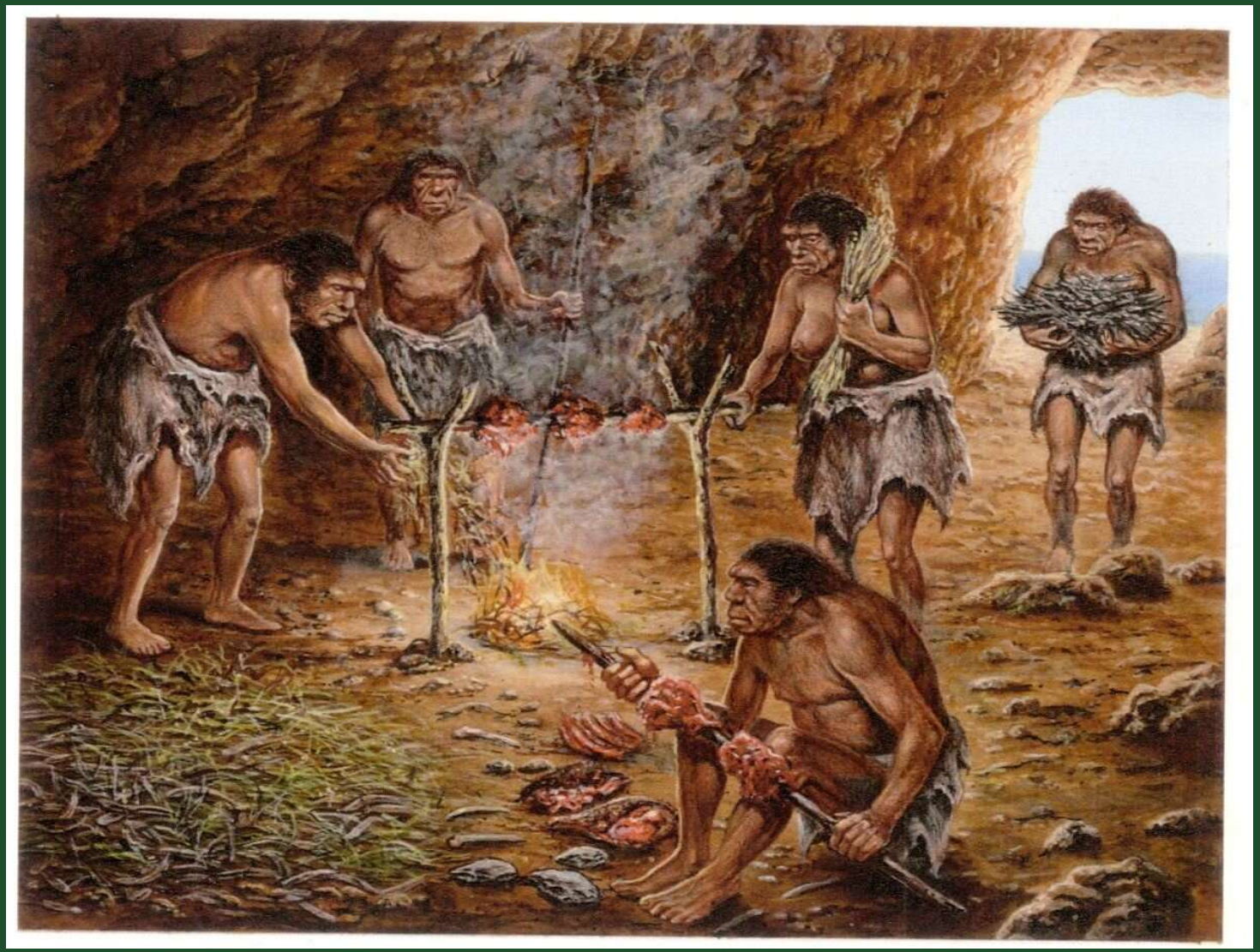
Ectoparasites live on the **outside** of their host



obligate parasite =
a parasite that depends on its host for **nourishment, reproduction, habitat, and survival**.

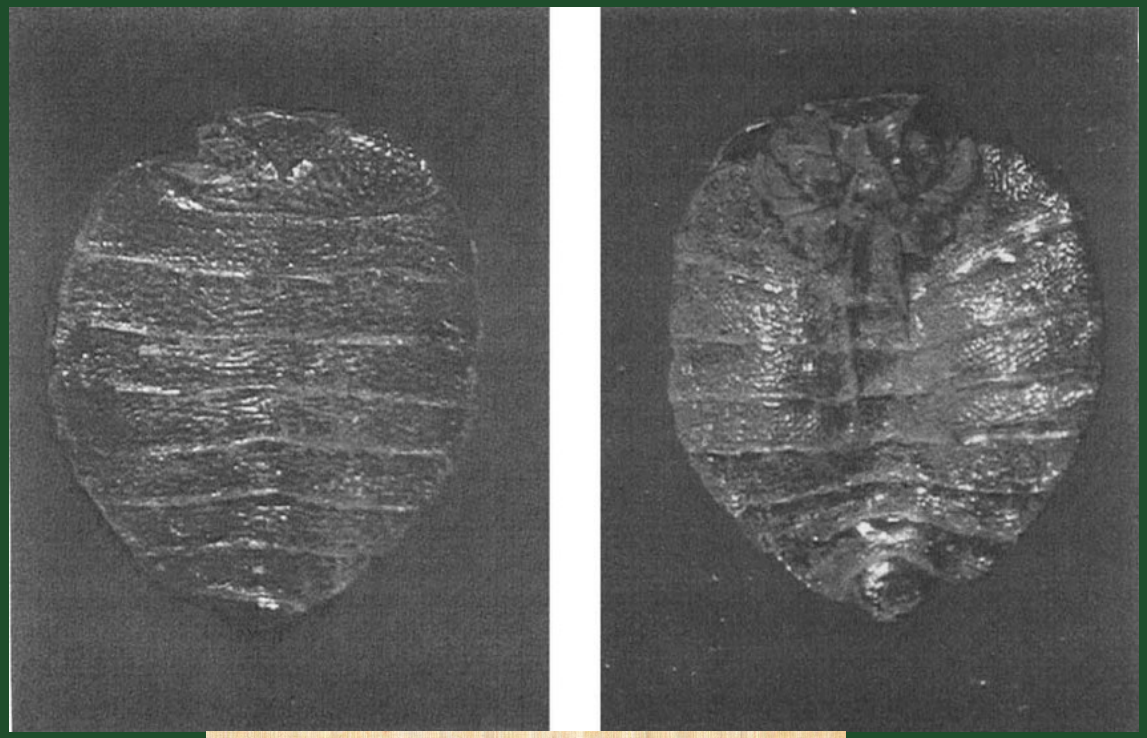
An obligate parasite will not be able to survive if away from its host

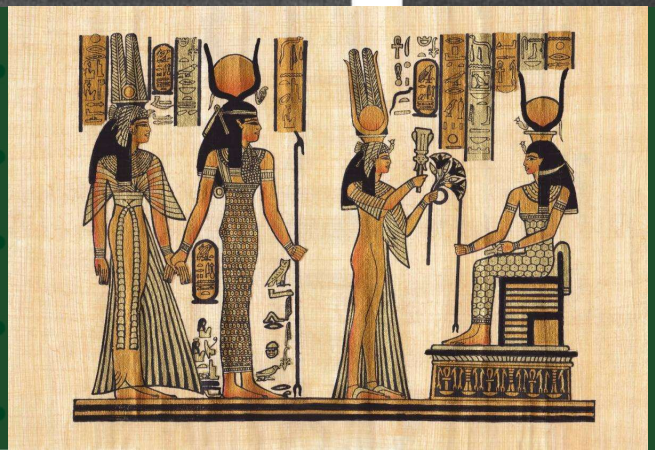




Cimicids are thought to have evolved as parasites of bats before adapting to human hosts.

With the growth of civilization, they multiplied





Occurred in early civilizations in the Middle East, regions such as the ancient city of Egypt.

Bed bugs have been documented throughout human history

Reportings of bed bugs in the 1500's all over the world.

Shortly thereafter, they arrived in the Americas, stowing away with the European explorers and the settlers.

DDT

Their Resurgence

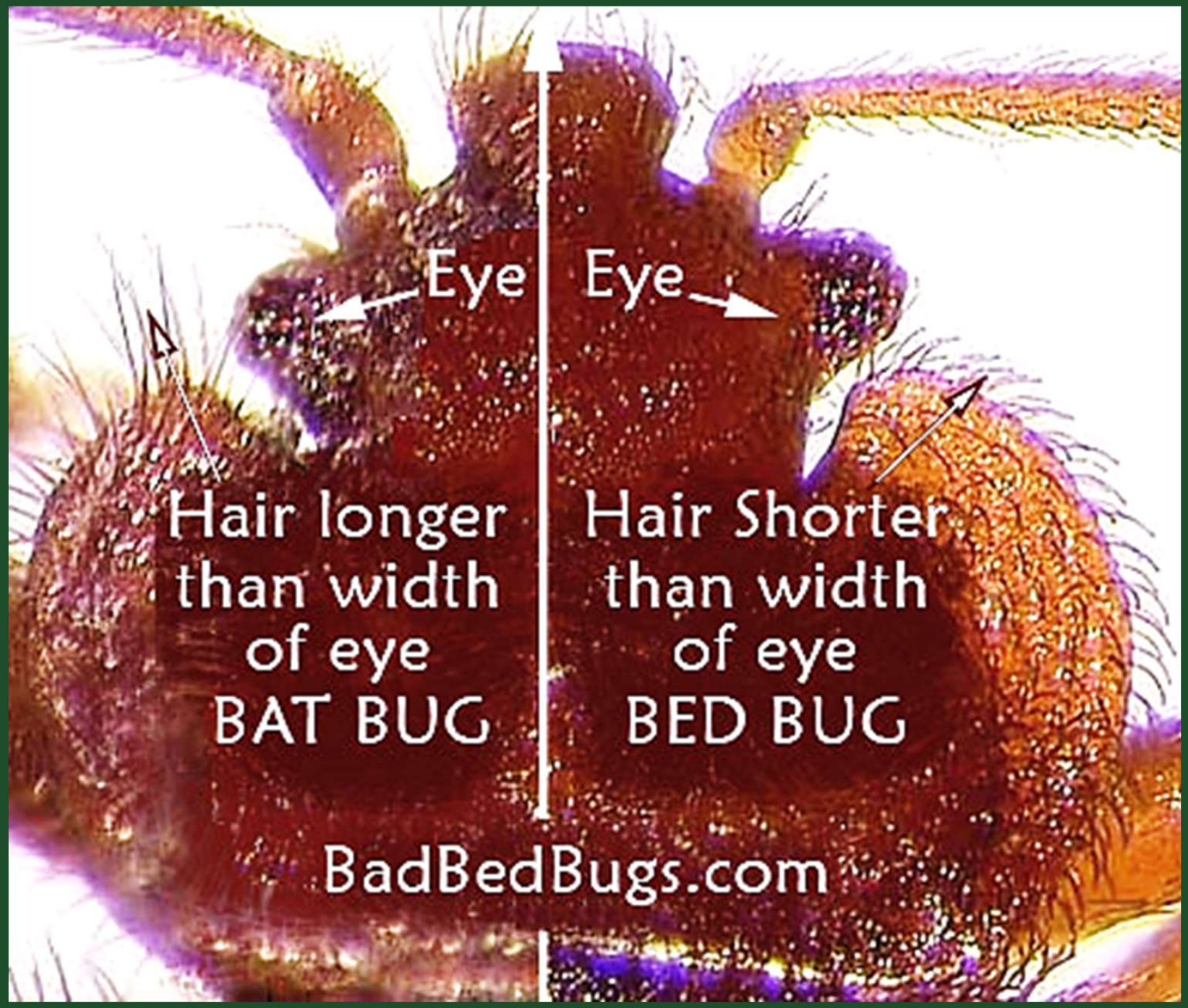
Cheap travel, ineffective pesticides (DDT and other pesticides, have been banned for decades,) and a lack of awareness has jump started their resurgence.

- Researchers in Oregon found the earliest evidence of bugs in the *Cimex* genus co-inhabitating with humans, in Oregon's Paisley Caves.
- Paisley Five Mile Point Caves complex is a system of eight caves in an arid, desolate region of south-central Oregon
- Arceoentomologists with PaleoInsect Research analyzed the remains of bed bug cousins, recovered from prehistoric camps
- And they pinned the insects to three different species within the *Cimex* genus up to 11,000 years of age

Next… I want to introduce you to the Cimicids we encounter in Colorado

bed bug

bat bug

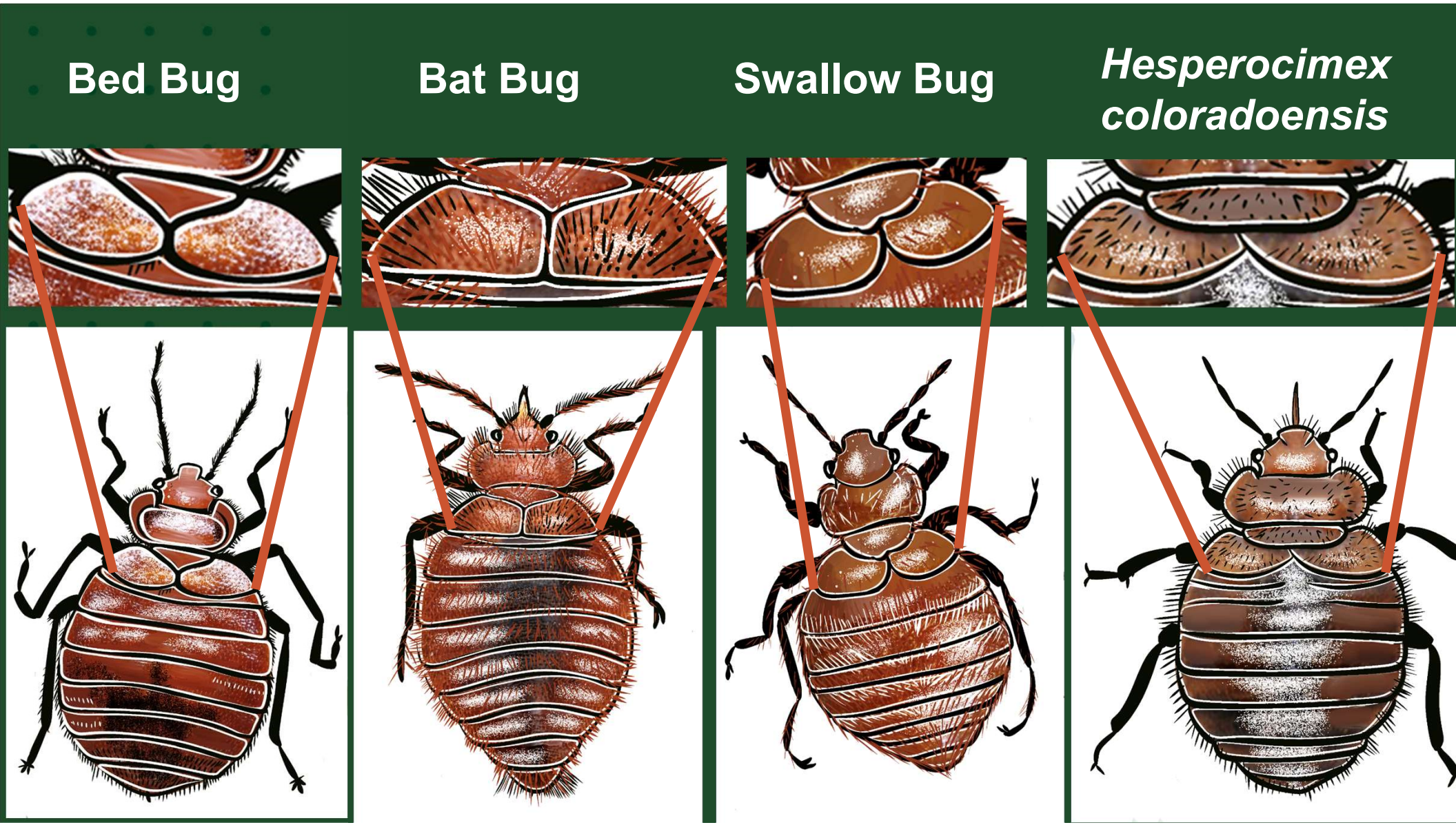

Eye
Eye
Hair longer than width of eye
BAT BUG
Hair Shorter than width of eye
BED BUG
BadBedBugs.com

swallow bug

Hesperocimex coloradoensis

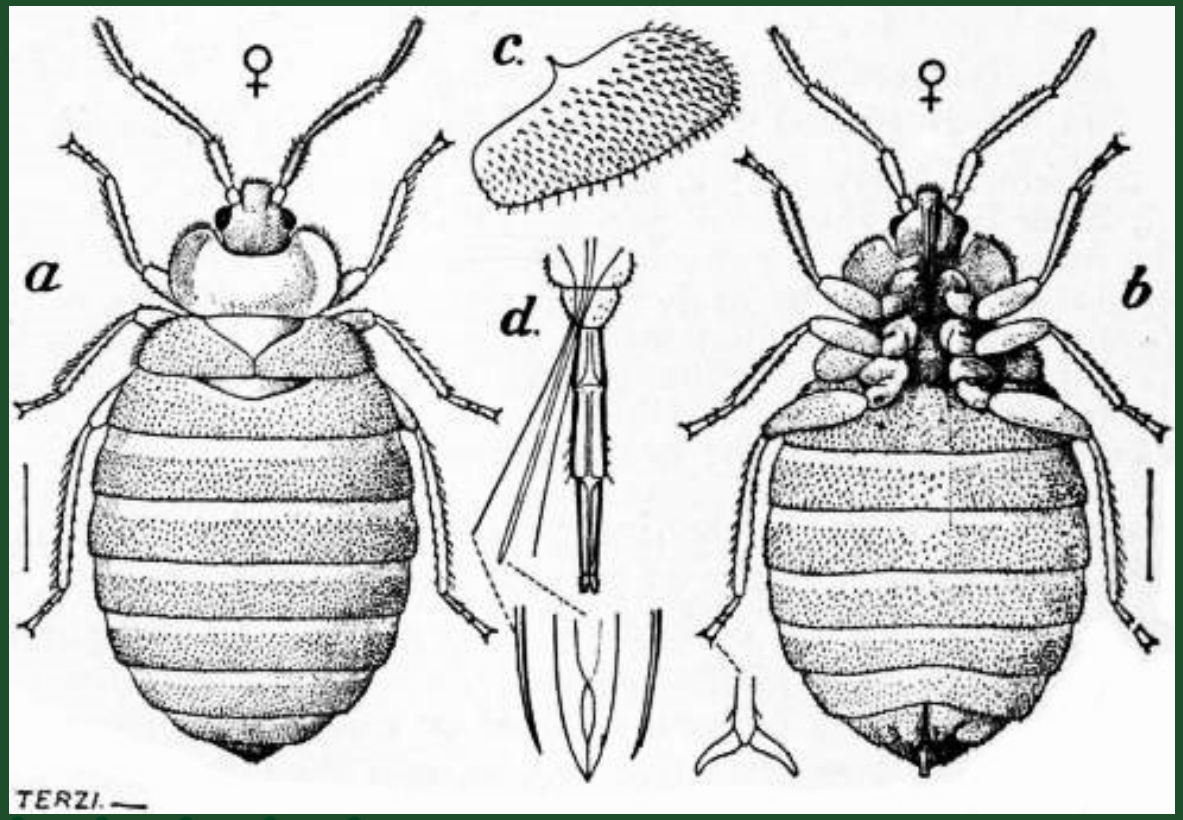
It can be difficult for a non-specialist to positively identify members of the family Cimicidae, call CSU Extension in the Tri-River Area, ask for Mel



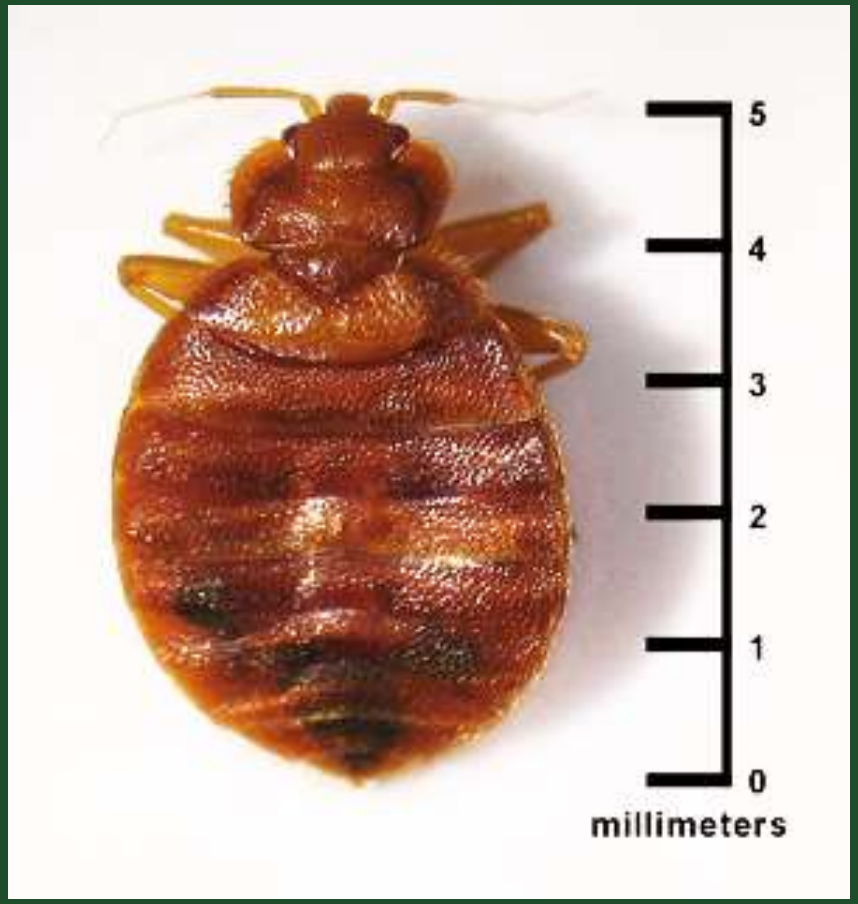


Bed Bug
Bat Bug
Swallow Bug
Hesperocimex coloradoensis

Common Bed Bug

Cimex lectularius



EPA



A Few Bed Bug Facts

- **Bed bugs have likely co-existed with humanity for as long as humanity has been around**
- There are several species of bed/bird/bat bugs that can be associated with humans
- Bed bugs do not transmit any diseases
- Bed bug control is difficult, expensive, and disruptive to households and businesses

The Bed Bug Situation

- Bed bugs are out-of-control
  - The press & internet love it
- They are present in virtually every state/county/city/town/village
- They are equal opportunity pests
- When people move, bedbugs hitch a ride

Why the Bed Bug Crisis?

1. Highly mobile human population
   private, commercial, government

2. Reduction in broad spectrum
   insecticide use in living areas

3. Unfamiliarity with pest due to long
   time population suppression

Bed Bugs

Of the 92 species of bed bugs described worldwide, 16 species are found in Northern America

The common bed bug is worldwide in distribution and is reported throughout the United States

Bed Bug Identification

Small obligate parasites

Human blood required to grow & reproduce

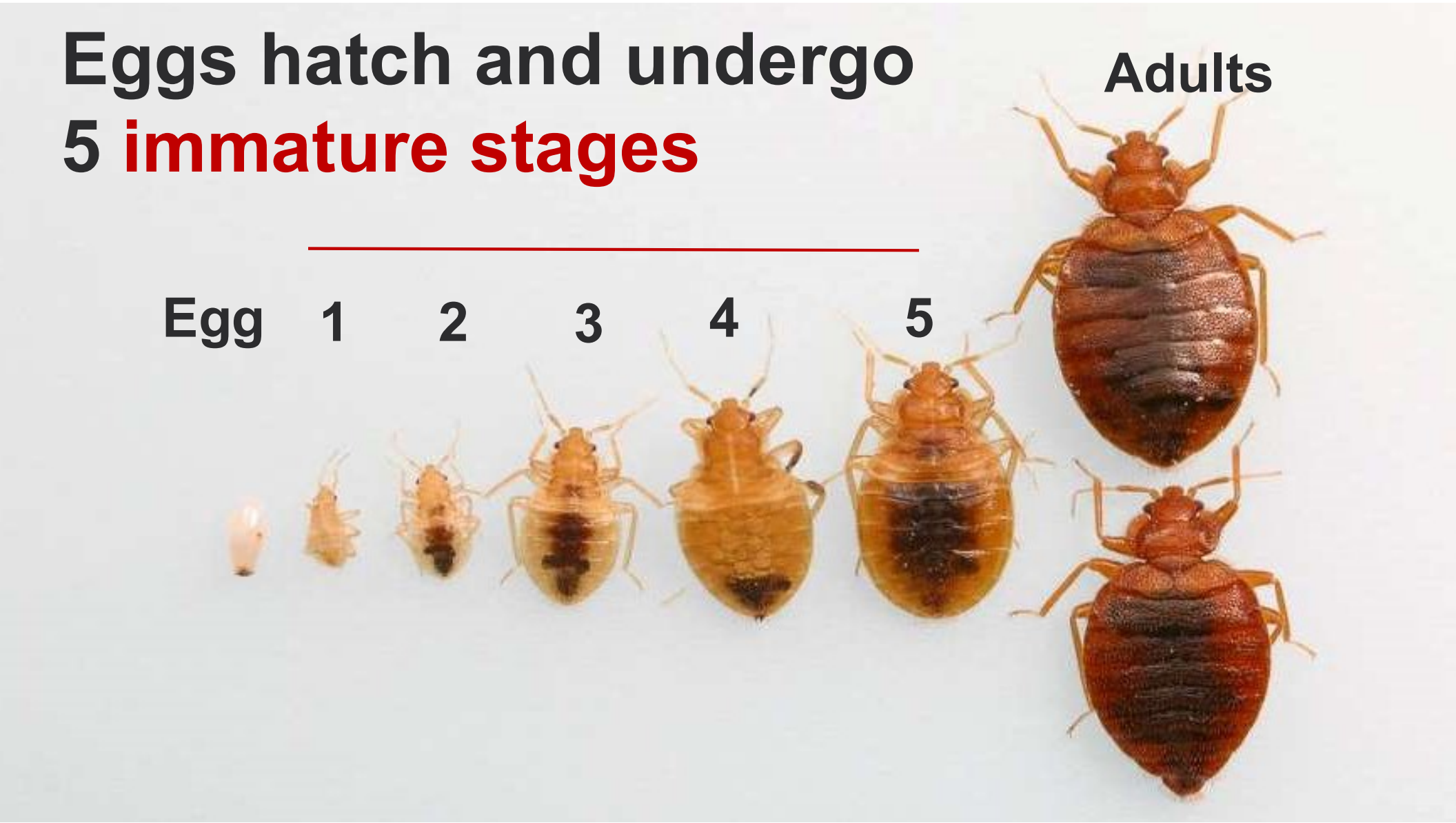
Can feed on other mammals

Dorso-ventrally flattened

allows crack/crevice shelter

Adults cannot fly!

Eggs hatch and undergo 5 immature stages

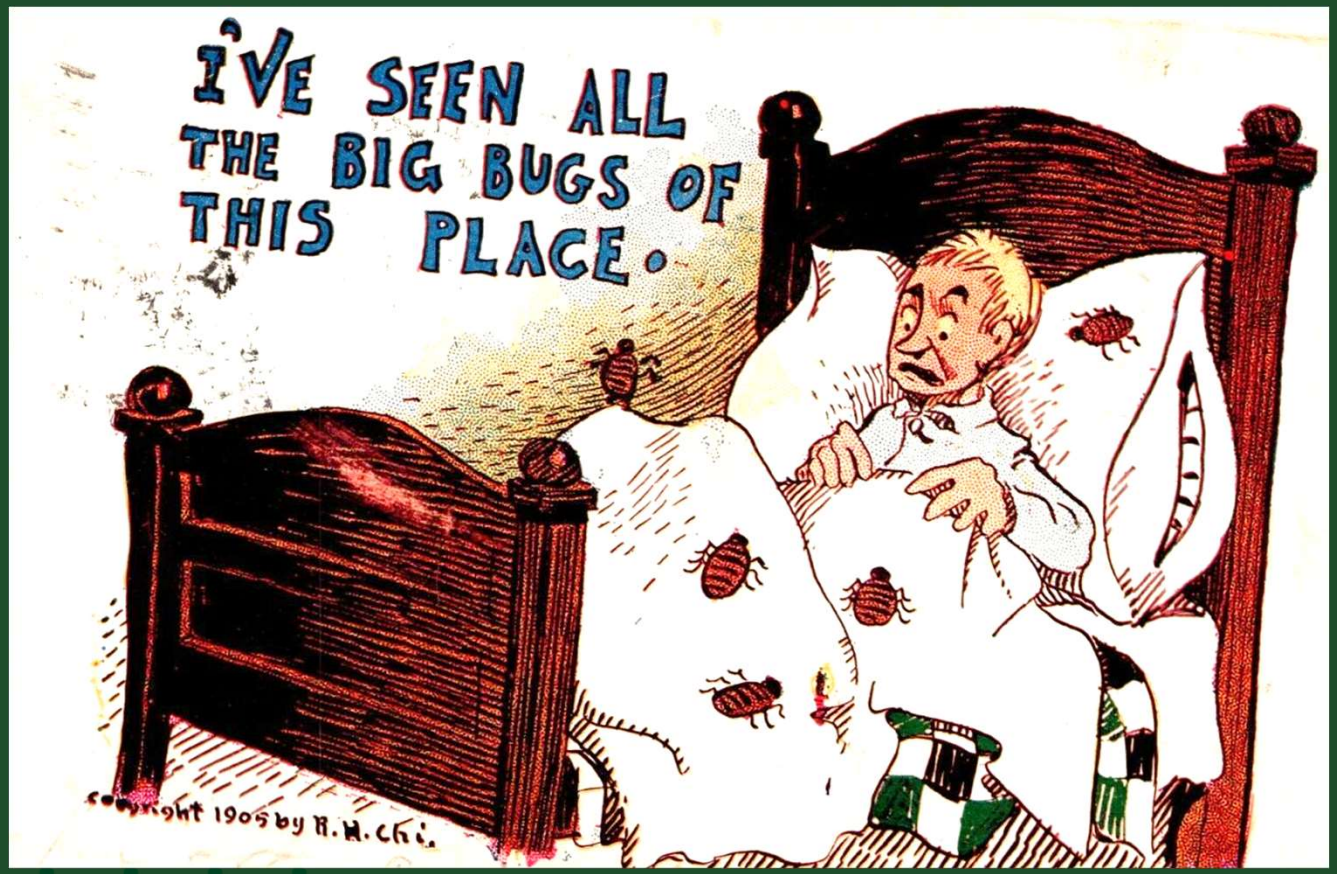


Bed Bug Eggs

- Eggs hatch and undergo 5 immature stages
- < 1/8” long, can be seen with close examination
- Laid in cracks & crevices and are glued to surfaces in dark areas near feeding sites
- Hatch in 6 – 10 days depending on conditions
- A female may lay 200 eggs in her lifetime

Immature Bed Bugs

- Newly hatched bugs are <1/8” long
- Need blood meal between molts
- Egg to adult in 6 weeks with ideal conditions
- Bugs change shape and color with age within an instar



Vintage 1905 Comic Postcard, Michigan USA

Several species of Cimicids bite humans under certain circumstances

Diet

human blood;
can feed day or night
must feed between
every life stage

recent blood meal

Cimicids do not transmit diseases!

Bed bugs are more of a nuisance than a danger, although they *can* prompt serious allergic reactions in some people

Beg bugs feed on a wide variety of hosts including cats, dogs, birds, and rodents

Host preference is poorly understood. It is unclear how readily bed bugs will feed on alternate hosts when humans are also present

Feeding Behavior

- **Feeding lasts ~10 minutes**
- When they are done they head back to some type of harborage to digest their meal.
- They tend to prefer tight dark places to hide which is why they are often found in mattress seams or in headboard/boxspring.
- **Attracted to CO_2 from host**
- **Peak feeding is from 2-5 AM**
- **Feeding is painless to host. Host reactions vary, some are allergic**
  - **anticoagulant**
  - **numbing agent**

Bed bug settling on arm


Two minutes after feeding initiated
5393563

Five minutes after feeding initiated

Nine minutes after feeding initiated

Eleven minutes after feeding initiated

14 minutes – *El Fin!*

Survival of Bed Bugs in Days After Feeding		
Stage	50°F	80°F
1st Instar	275	28
2nd Instar	399	46
3rd Instar	413	71
4th Instar	433	73
5th Instar	485	40
Adult Female	425	87
Adult Male	402	43

Table. 1. Bed bug survival between blood meals in days after feeding (data adapted from Pinto, 2007[2]).

Bed bugs can survive 6 months to one year between meals.

Adults are resistant to starvation

Nesting Habits

- rest in crevices and cracks near or on/in furniture

- student backpacks, clothing, wheelchairs, books, personal items, etc.

- can be found anywhere!

Harborage

- When bed bugs are done feeding, they move away from the feeding site to a harborage site
- Their flattened shape allows them to utilize small cracks and crevices
- Learning to identify a harborage site is the key to an inspection

Under furniture

Under rugs or carpet

Behind wall hangings

On window coverings

Recent data from **16 infested apartments** shows where bed bugs prefer to hide

- 60% in box springs
- 13% in sofa and chairs
- 22% in mattresses and mattresses edges
- 4% in bed frames
- 1% other areas

Utah Pests
Extension

Protecting Yourself from Bed Bugs

Which of these rooms are more likely to be infested with bed bugs?

- Don’t bring an infestation home!
- Beware of high risk situations!
  - -Hotels
  - -Thrifting
  - -Hand-me-downs
- Regular inspections of living areas
- Maintain a clutter free environment

Bed Bug Risk?

Highest risk situations

- High occupant turnover
  - Motels & Hotels
  - Apartment complexes
  - Dormitories
  - Student lockers
  - Public housing
  - Nursing homes
  - Second hand furniture

Lower (but still) risky situations

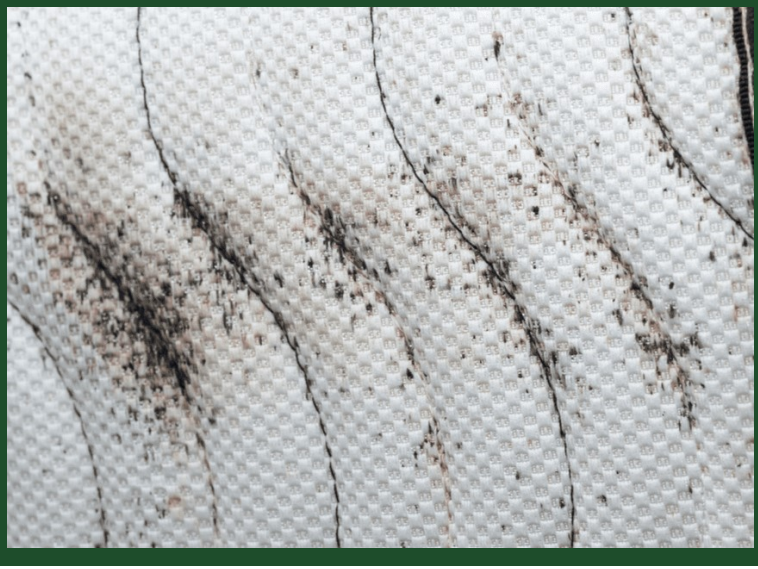
- Incidental transfer
  - Locker rooms
  - Planes
  - Trains
  - Busses
  - Theaters
  - Restaurants

Bed Bug Inspections

- **Where to inspect?**
  - anywhere people sleep
  - association with travel
  - surrounding areas
  - focus on harborage
- **What to look for?**
  - fecal spotting
  - exuvia

Fecal Spotting

- Bed bugs feed, then move to harborage
- Blood meal is quickly digested
- Waste is excreted in rust colored spots, sometimes dark black
- Fecal spots indicate history of bed bugs!



Molting & Exuvia

- All insects shed skins when growing
- Cast skins resemble empty shells
- Bed bugs molt 5 times during their life
- Exuvia are excellent indicators of bed bug presence and activity

Inspecting Hotel Rooms

- Price is no indicator of bed bug activity
- Management is an better indicator
- Activity is most likely to be found near head of bed
  - Headboard
  - Night stand
  - Mattress seams

A simple precaution to prevent accidentally picking up bed bugs while travelling

Do not leave anything near the bed or places where people rest, particularly overnight

While you are inspecting…

- The bathtub or shower stall is the least bed bug risk part of the hotel room (limited hiding spots, removed from sleep area)
- Check the luggage rack
- If you find some…change rooms
- Not directly above, below or adjacent

Business Managers

- No lodging business is immune to bed bugs!
- Take a proactive approach!
- Will it hurt business to advertise that you train your staff to inspect for bed bugs daily????
- Will it hurt business to advertise that you take special measures, such as regular inspections by a specially trained dog and handler???
- Will it hurt your business to tell customers that “We don’t have a bedbug problem here???

Misconceptions About Bed Bugs

- “Bedbugs are resistant to most pesticides”
- “They live only with filthy conditions”
- “We don’t know why they are returning”
- “Throwing out the mattress will solve the problem”
- “The Internet is a good source for bed bug information”
- “Shopping at thrift stores means I will get bed bugs”

Bed Bug Dogs

- Specially trained dog & handler work as team
- Can detect low level infestations – a single bug!
- A good team can have 97% accuracy with <5% false positive
- Can differentiate live bugs from debris!

Bed Bug Dogs

- **Proactive**
  - To find low level infestations early to make eradication easier
- **Targeted**
  - To inspect suspected areas of bed bug activity and adjoining rooms
- **Post Treatment**
  - To be certain the bed bugs have been killed

Bed Bug Control?

Woman burns down Cincinnati, Ohio, home trying to kill bedbugs

Treating Bed Bug Infestations

- Treatments are:
  - expensive $
  - time consuming
  - emotionally challenging

"Get a professional to do the job"

"This is not a job for the janitor, maintenance personnel or building superintendent"

Preventive Measures

1. Mattress and Box Spring Encasements
2. Interception Devices- pitfall traps, other passive mechanical barriers
3. Daily routine inspections
4. Periodic intensive inspections
5. Periodic specialized professional inspections
6. Use of active monitoring devices (CO_2, heat, and chemical attractants)

Pest Management Professionals

- Should understand how and where to look for bed bugs
- How to recognize harborage, preexisting conditions that pose challenges
- Look for various signs of activity (fecal spotting, eggs, exuvia)
- Inspect obvious sites such as mattresses, box springs, bed frames, head boards, upholstered furniture (sofas, arm chairs,
- Interview clients to learn their nightly habits

Key Points of Control

- The majority of bed bugs are found in close association with sleeping and resting areas
- New infestations tend to be fairly localized, while the percentage of bed bugs and egg clutches will become more widespread and unpredictable over time
- Feeding activity and egg hatch complicate control efforts and require follow up visits
- Bed bugs will readily move between units in multi-occupancy dwellings

Key Points of Control *cont..*

- Behavior of bed bugs in the absence of its host is poorly understood
- The role of alternate hosts are poorly understood and may have an impact on control
- Cassation of new bites may be the best indicator that an infestation have been eliminated
- Low level populations often go undetected

Preparing for Bed Bug Treatments

- Every potential hiding spot must be inspected/treated
- Rooms must be disassembled
- Adjacent rooms must be inspected & treated if necessary

Treatment must account for:
Baseboards, outlet covers, wall hangings, bedding, furniture, electronics, …

Heat Treatments

- Heat treatments can be very effective if conducted properly
- Heat treatments usually take specialized equipment and temperature monitoring
  - *Do not try it yourself!*

Heat Treatments

Temperature / Time to kill all stages

- **113° --- 7 hours**
- **118° --- 90 minutes**
- **122° --- 1 minute**

Steam treatments

- Surface temps should reach 160-180 °

High Temperatures?

Bed bugs *will be effectively killed* by exposure to 125^{0}F for 10-20 minutes

PackTite Portable Heater

above 120°F

Clothes Dryer

125 to 135 degrees Fahrenheit

Cold Temperatures?

Dry Ice/Freezing

Bed bugs are tolerant of low temperatures.

Deep freezing for days will kill bed bugs.

Chemical Treatments

All infestation sources must be treated simultaneously

-Several insecticides are registered and used for bed bug control
    - pyrethroids are commonly used

- Chemical treatments must directly contact the bed bug

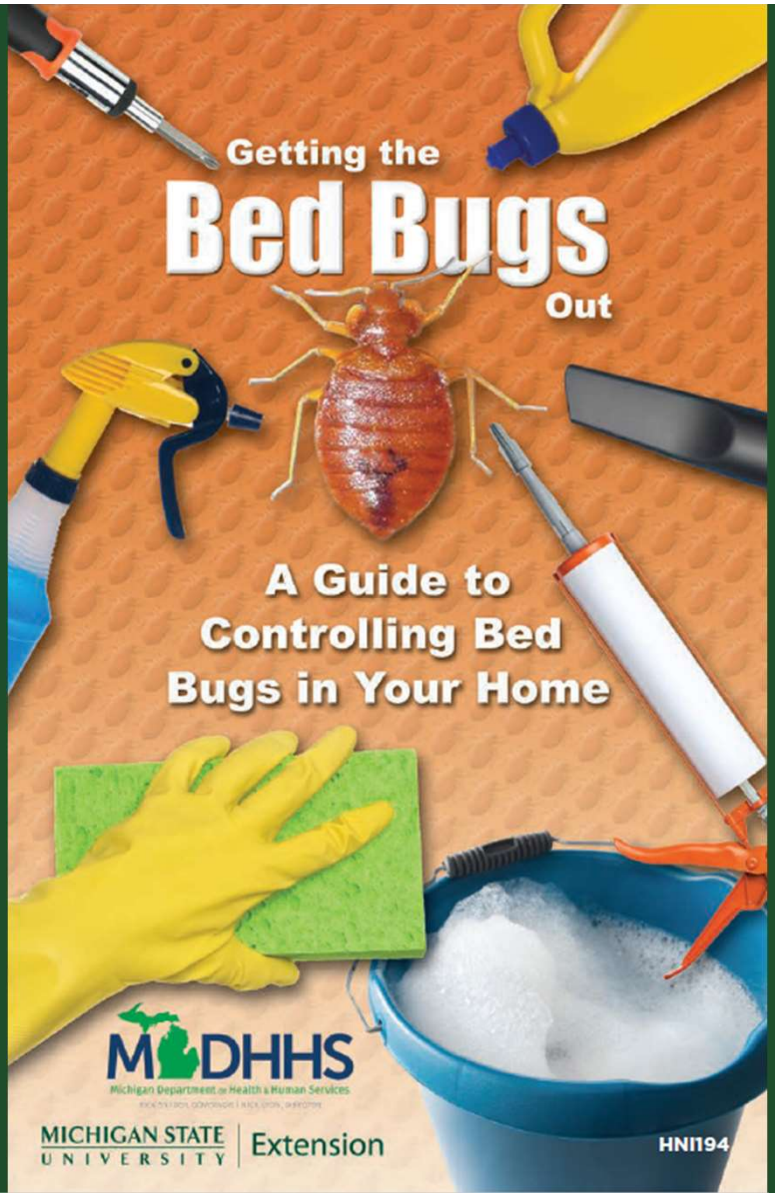
- Currently used insecticides will NOT effectively kill the egg stage

- Over the counter products will have limited usefulness

- Bug “bombs” will NOT work

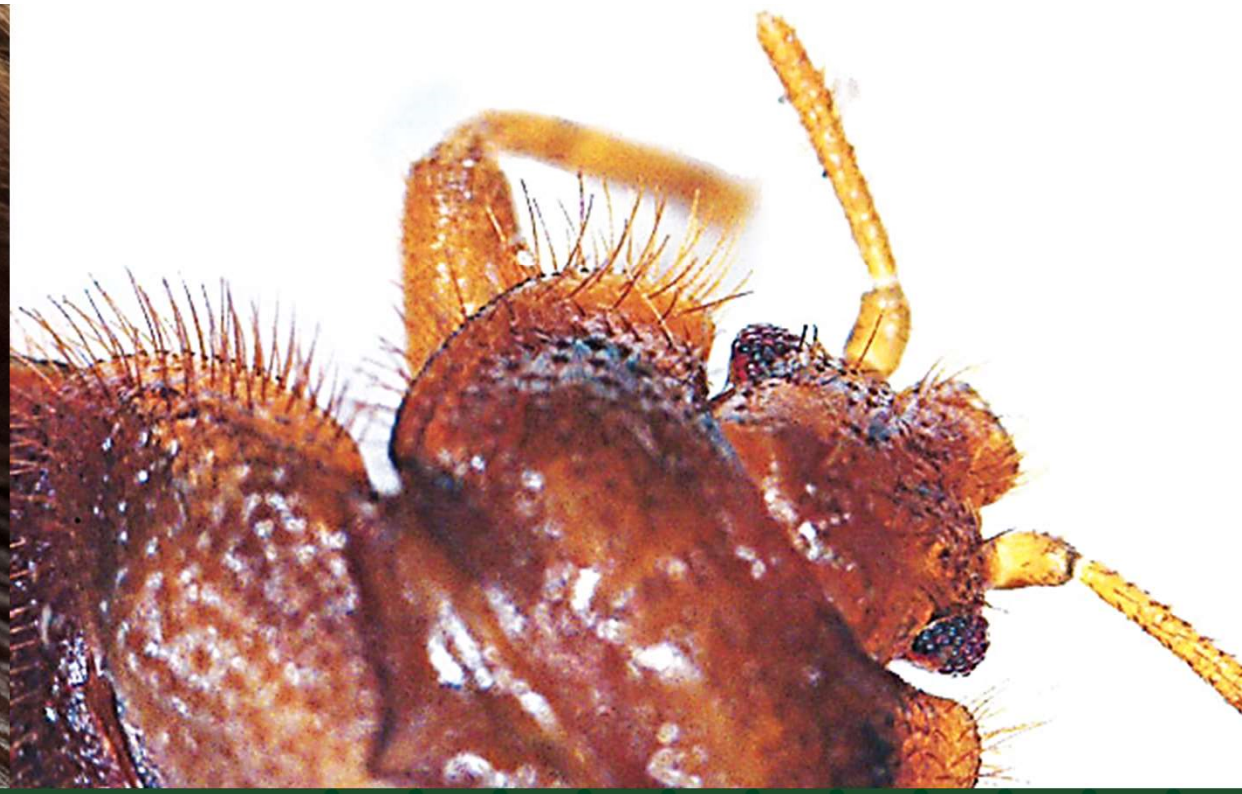
Interception Devices- pitfall traps, other passive mechanical barriers

CLIMBUP®
INSECT INTERCEPTOR



MICHIGAN STATE
UNIVERSITY
EXTENSION

Excellent treatment for how to try and manage bed bugs within a home



Bat Bugs

"I just heard that bats have bed bugs, too."

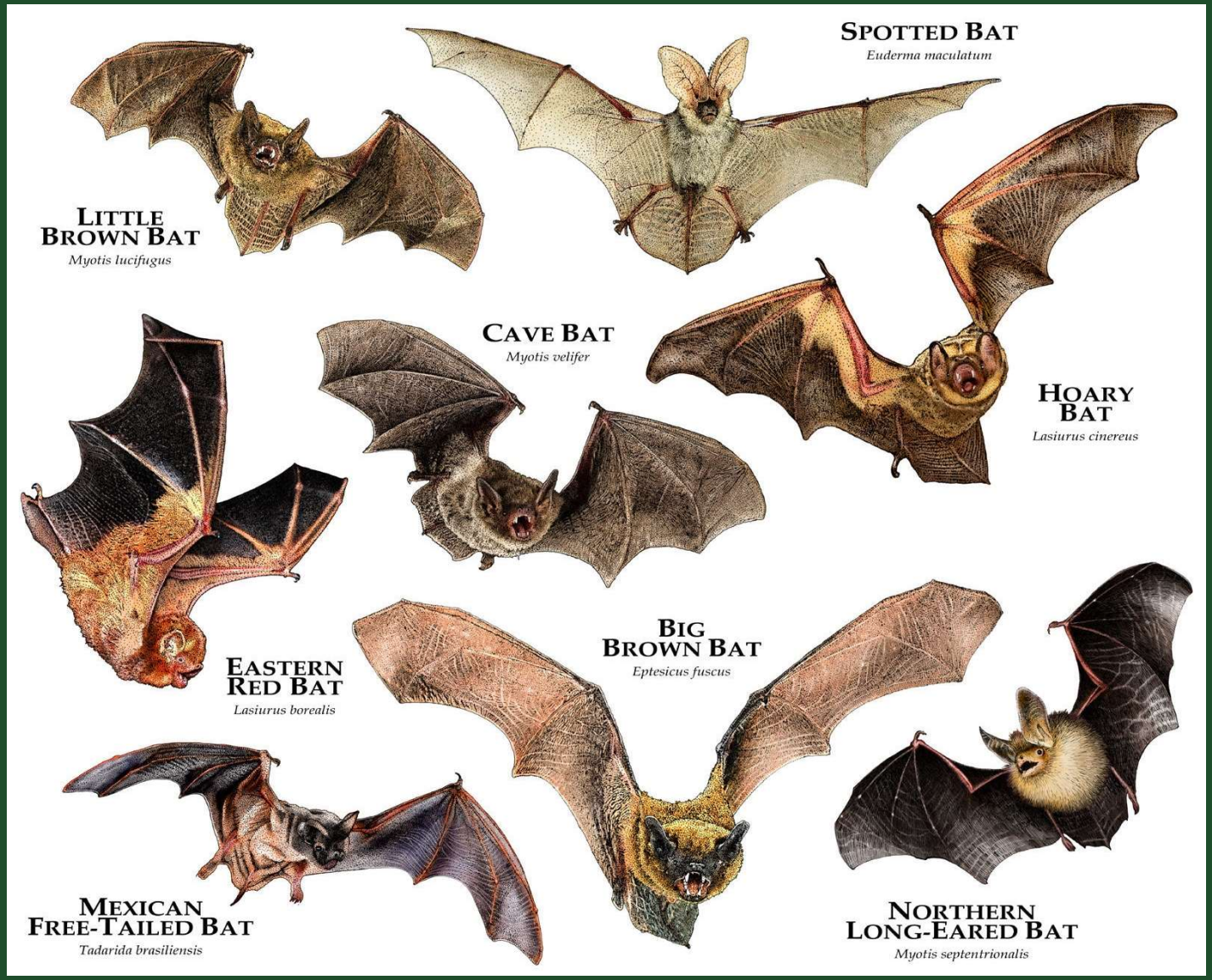
COLORADO STATE UNIVERSITY EXTENSION

Bats are mammals that belong to the Order Chiroptera (Greek -CHEIR – “hand” AND PTERON -“wing”).

Bats have been on Earth for more than 50 million years!

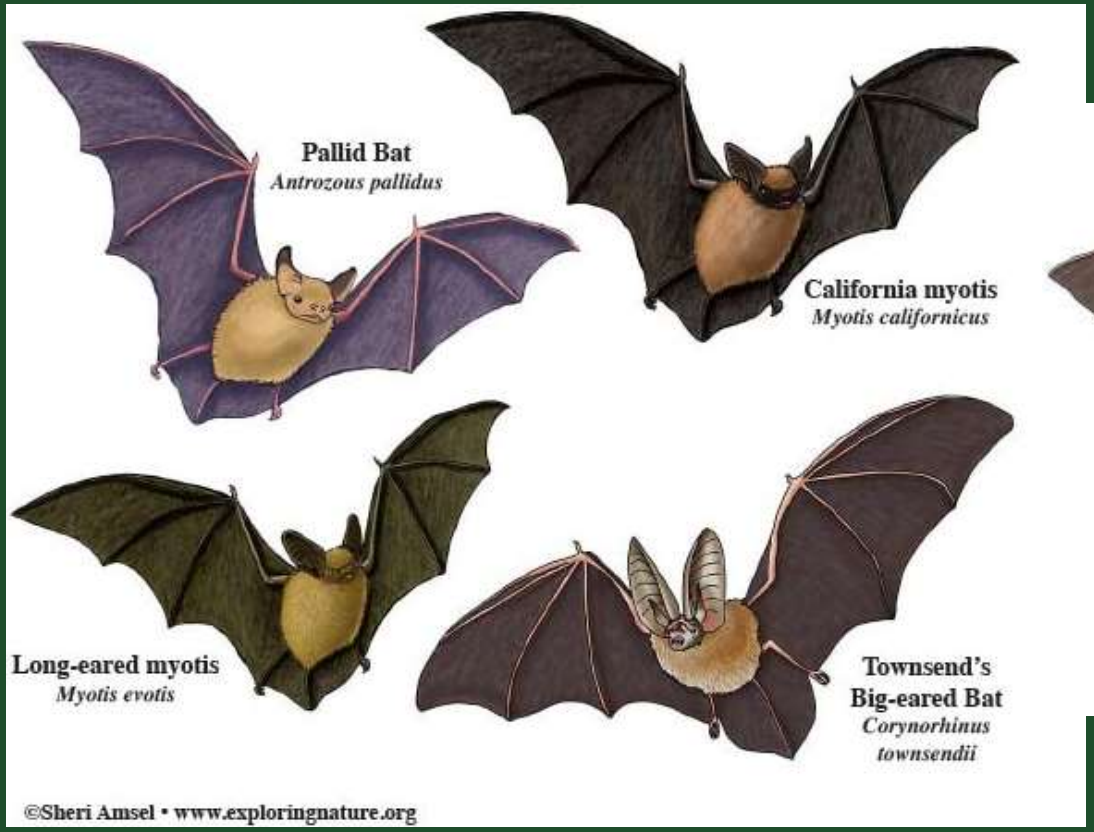
More than 1,400 described species

Bats are the second largest order of mammals, and are widely dispersed across six continents.

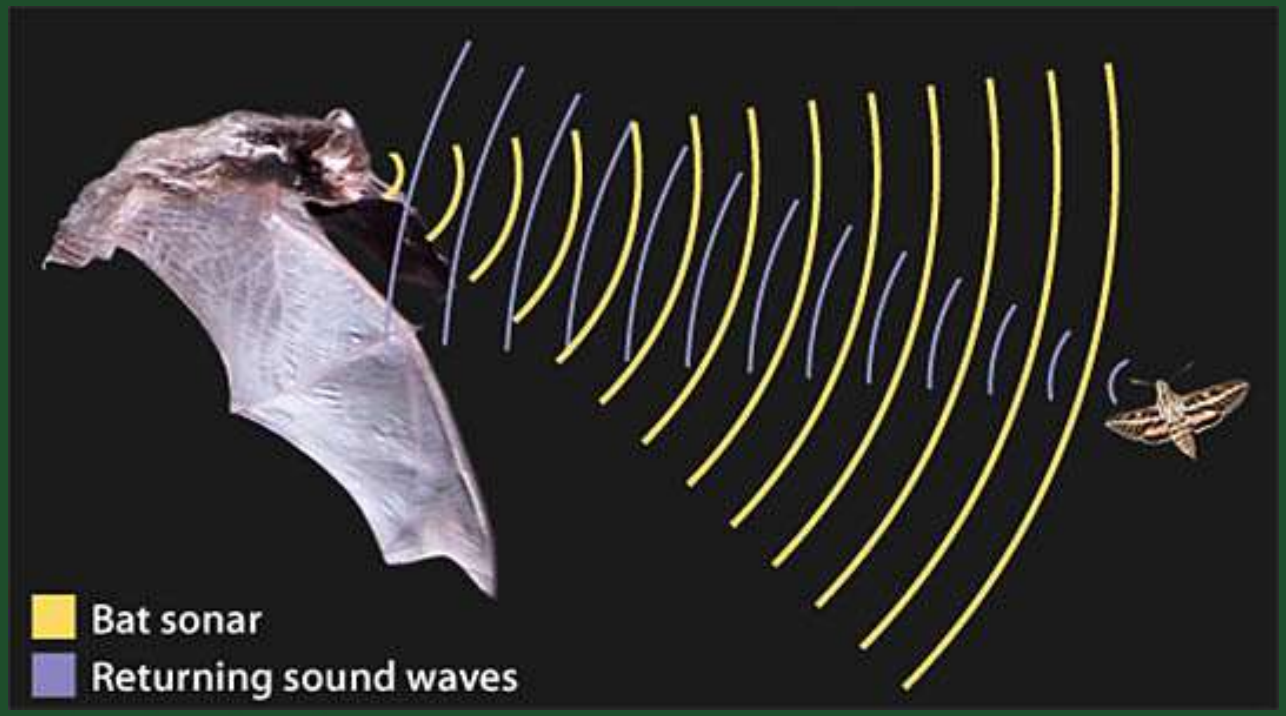


Common Bats of North America

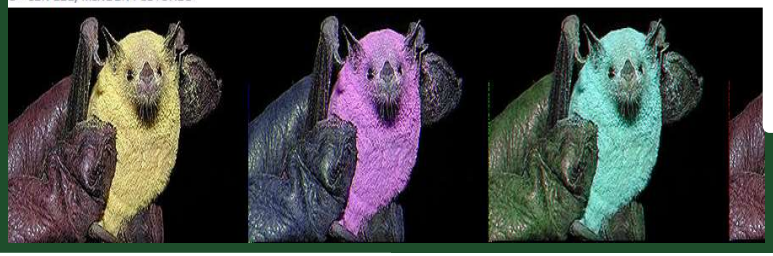
Bats of Western North America



Globally, bats provide vital ecosystem services in the form of insect pest consumption, plant pollination, and seed dispersal, making them essential to the health of global ecosystems.



CH'IEN LEE/MINDEN PICTURES



Some bats are important mammalian pollinators

Bats and bat bugs have co-existed together for more than 50 million years!

In some bat roosts, the abundance of cimicid bugs is indeed high.

Točník, Czech Republic

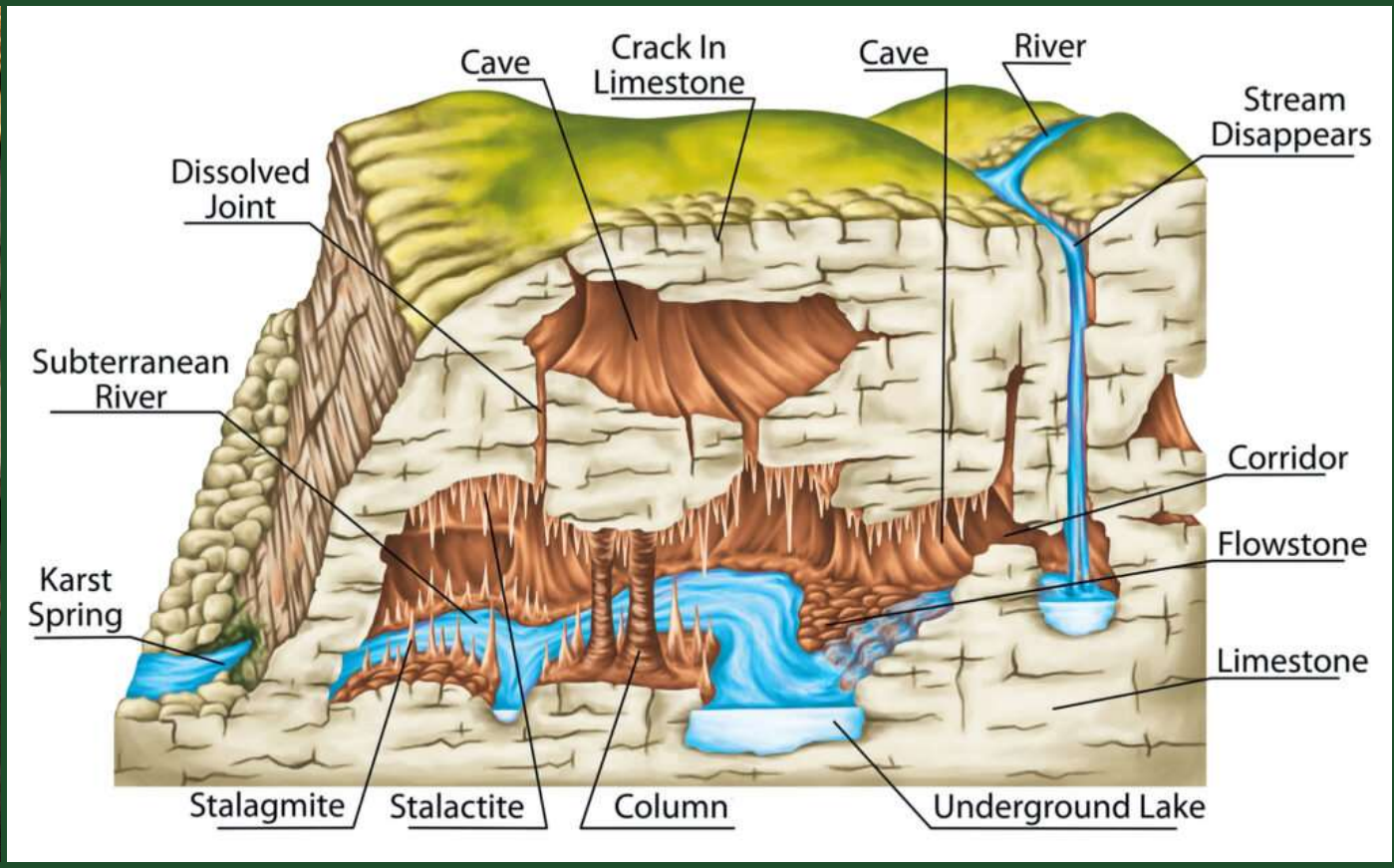
(photo by O. Balvín).

The more communal species of bats leave their young in nursery colonies when they hunt

As a result, the flightless young pups are fed upon more often by bat bugs compared with the adult bats

Bat bugs are common in bat roots and may occasionally bite humans, typically if bats have vacated the property

Bats often roost in voids and cavities and retreat into dark spaces in man-made structures



Challenges of having bats in structures

Guano accumulations
Parasites
Health code violations

(e.g., bridge renovation; Keely and Tuttle 1999) or daycare centers with toddlers not old enough to know not to touch bats.

Swallow Bugs

Oeciacus vicarius

Associated with the nests of cliff swallows

Hosts: Barn Swallows and Cliff Swallows

- The **barn swallow and cliff swallow** are among the more common species seen in Colorado
- There are ~8 species of swallows in Colorado

All About Birds

TheCornellLab

Cliff Swallow

Petrochelidon pyrrhonota

ORDER: Passeriformes

FAMILY: Hirundinidae

Swallows

Habitat
Lakes and Ponds

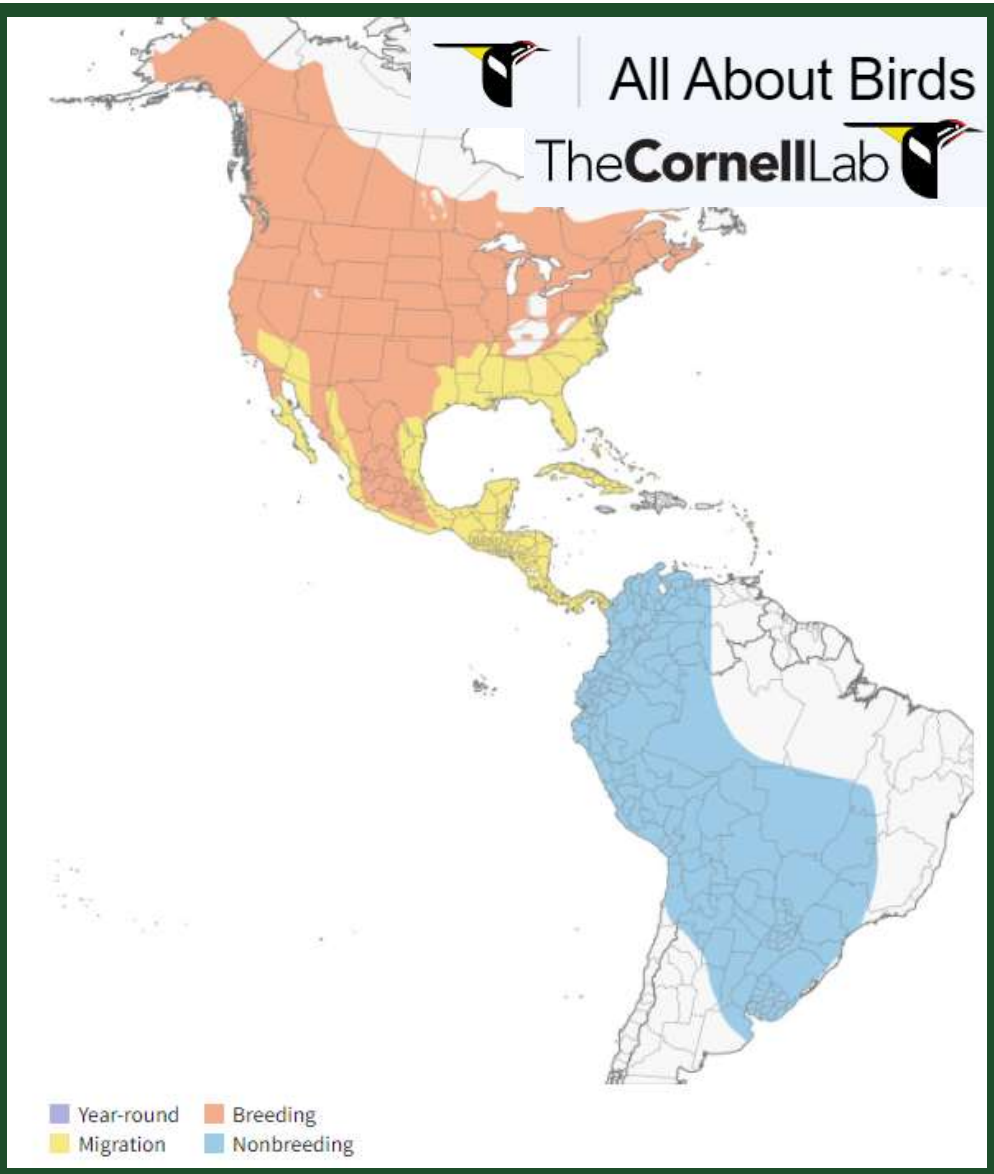
Food
Insects

Nesting
Cliff

Behavior
Aerial Forager

Conservation
Low Concern

Low



Cliff Swallows

Long-distance migrant

Cliff Swallows spend several months migrating at a leisurely pace through Mexico, Central America, and eastern South America to reach their wintering grounds.

They migrate during daytime in groups of up to several hundred, foraging as they move

Cliff swallow nesting area, Photo by USGS

A few swallows live on their own, but most live in groups of up to 6,000 nests.

Cliff swallows build mud nests attached to vertical walls.
Photo by SARAH STIERCH/FLICKR

Cliff swallow breeding habitat historically just included **canyons, hills, valleys, and cliff faces**.

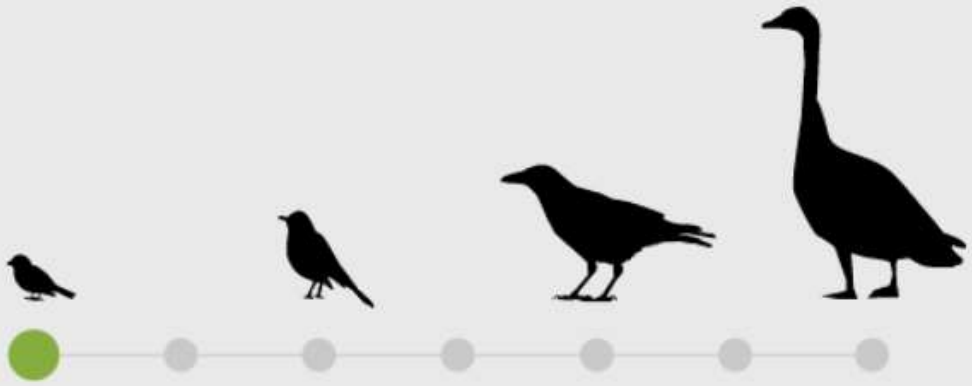
Man-made buildings and structures also provide shelter for nesting areas; any areas that have buildings or bridges serve as possible nesting sites, expanding their breeding areas to grasslands and towns.

Cliff swallows are compact and are smaller than a Purple Martian

TheCornellLab

RELATIVE SIZE

Smaller than a Purple Martin; slightly larger than a Bank Swallow.



sparrow-sized or smaller

Barn swallows live almost everywhere on the planet, recognizable by their forked tail and agility in the air.

All About Birds

TheCornellLab

Barn Swallow

Hirundo rustica

ORDER: Passeriformes

FAMILY: Hirundinidae

Swallows

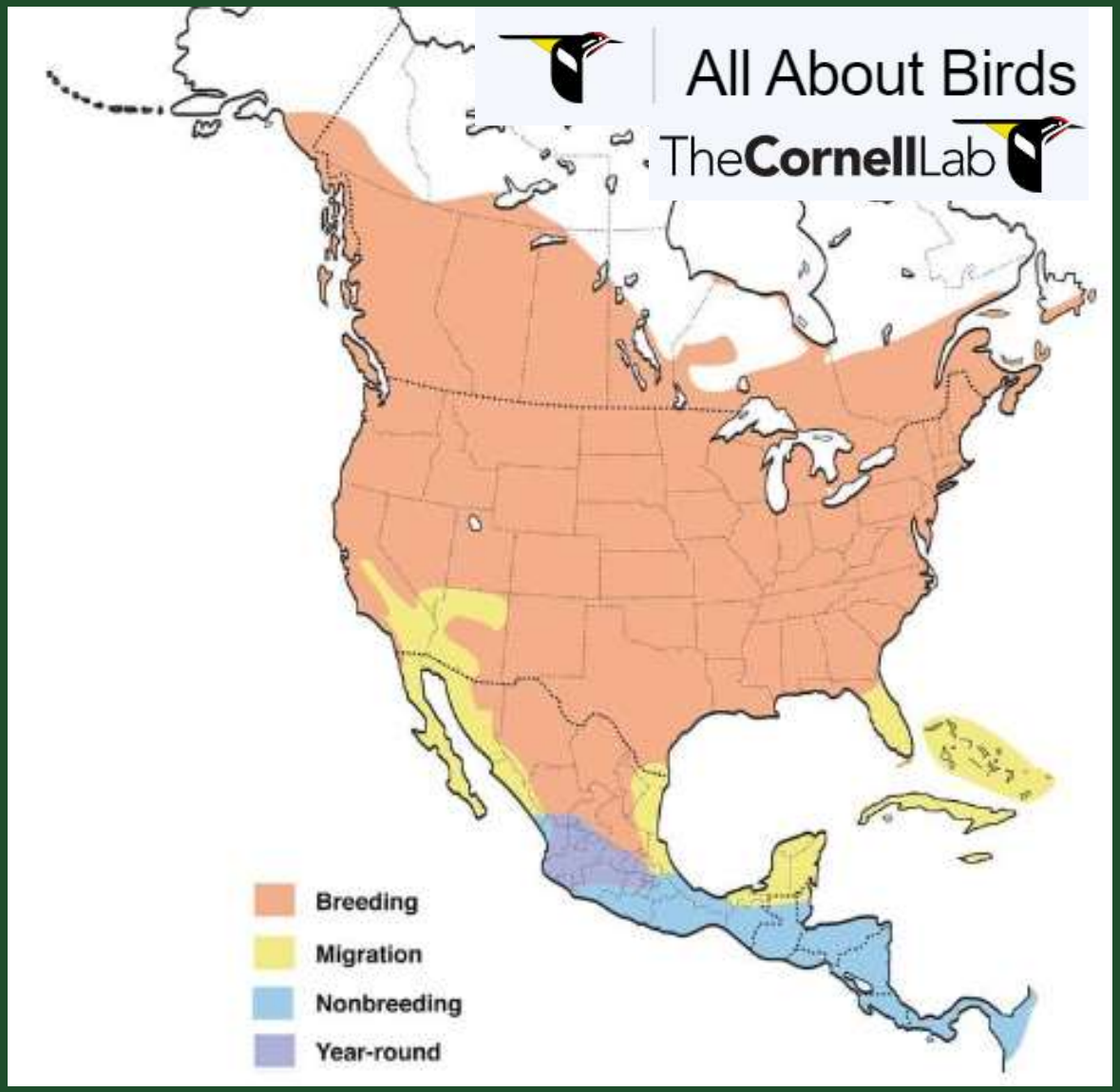
Habitat
Grasslands

Food
Insects

Nesting
Building

Behavior
Aerial Forager

Conservation
Low Concern



Barn Swallows

Long-distance migrant

Barn Swallows fly from North American breeding grounds to wintering areas in Central and South America.

Barn swallows nest under many man-made structures that make for suitable habitat

“we haven't appreciated just how important parasites might be in shaping the evolution of their hosts”
-Dr. Amanda Hund, CU Boulder

“the male birds’ breast color, throat color and tail shape allowed females to make informed choices about their health and level of parasites”

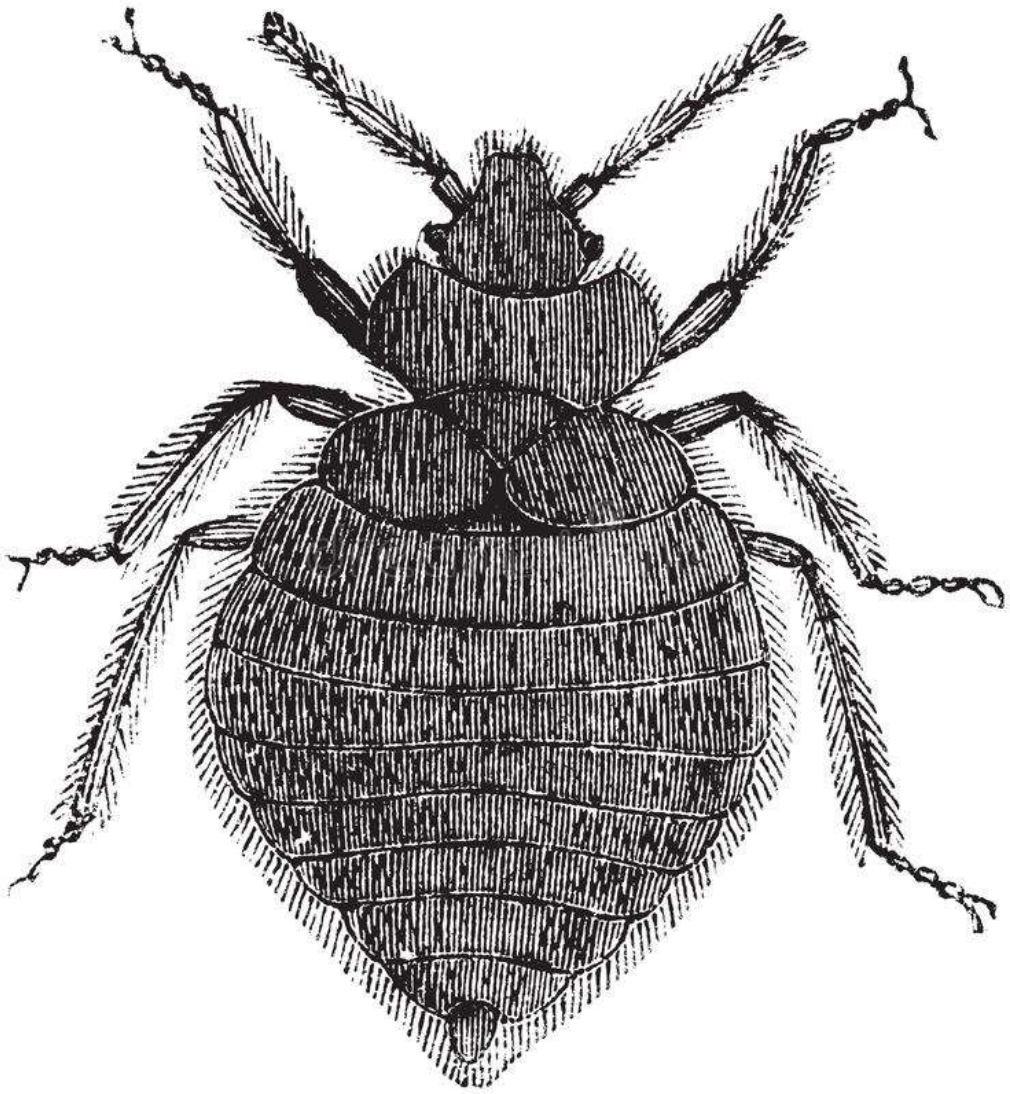
Swallow
bird nests

Swallow bugs exposed
after nest removed

“Colonies with parasite removal via fumigation were likely to have a late round of nesting **(a nesting season approximately doubled in length when treatment occurred)** than were colonies with typical numbers of swallow bugs,”

-Charles Brown of the University of Tulsa in Oklahoma and Mary Bomberger-Brown of the University of Nebraska in Lincoln

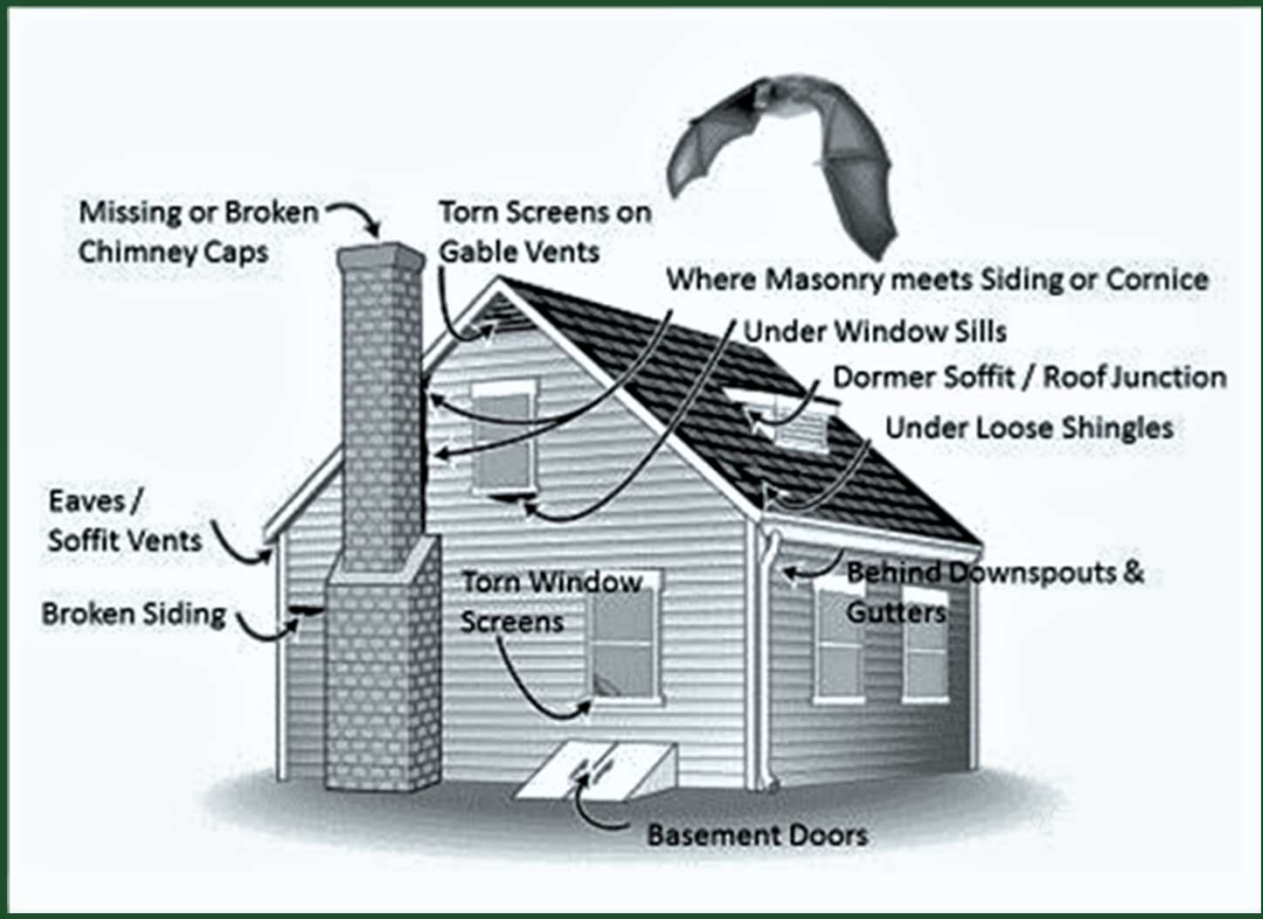
Both species of swallows are parasitized by the swallow bug, *O. vicarious,* however the cliff swallows seem to be the primary host, and barn swallow the secondary



An encephalitis virus has been isolated from swallow bugs (Rush et.al. 1980) which has created an interest within the birding community in controlling bird bugs and associated mites and ticks in order to protect martins and swallows

Bat Bug/Swallow Bug Control

- **Eliminate future breeding of host**
  1. Screen out entry areas of bats
  2. Prevent new nesting of swallows
     - Existing nests with young can not be disturbed

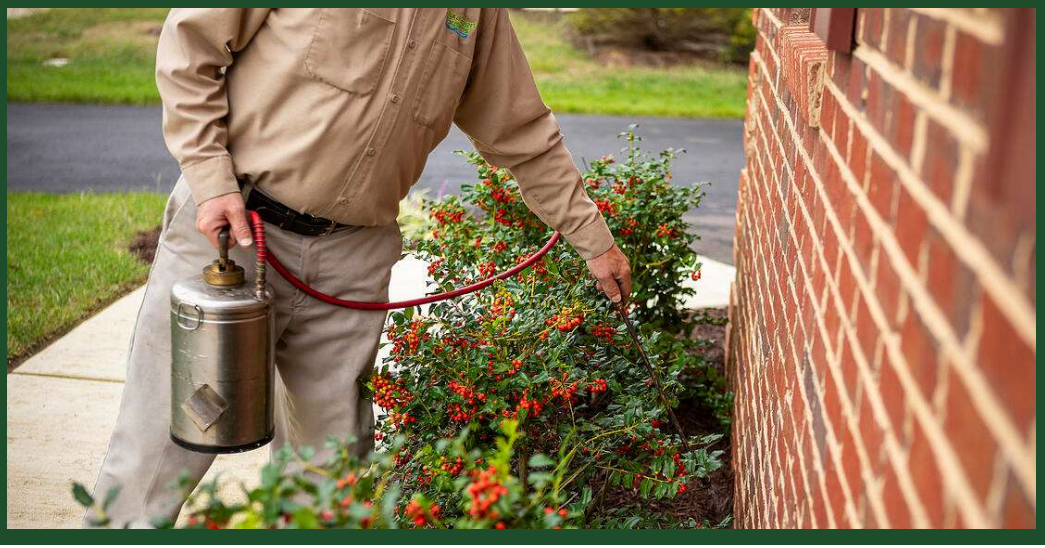


It is not uncommon to find other Cimicids in manmade structures; however, humans are not the primary host.

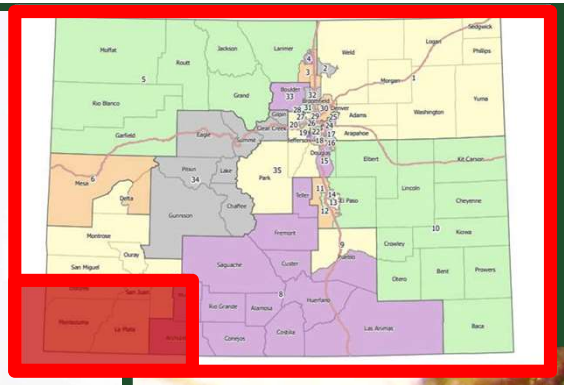
While they may be a nuisance, they rarely attack humans
if their host is present

Bat Bug/Swallow Bug Control

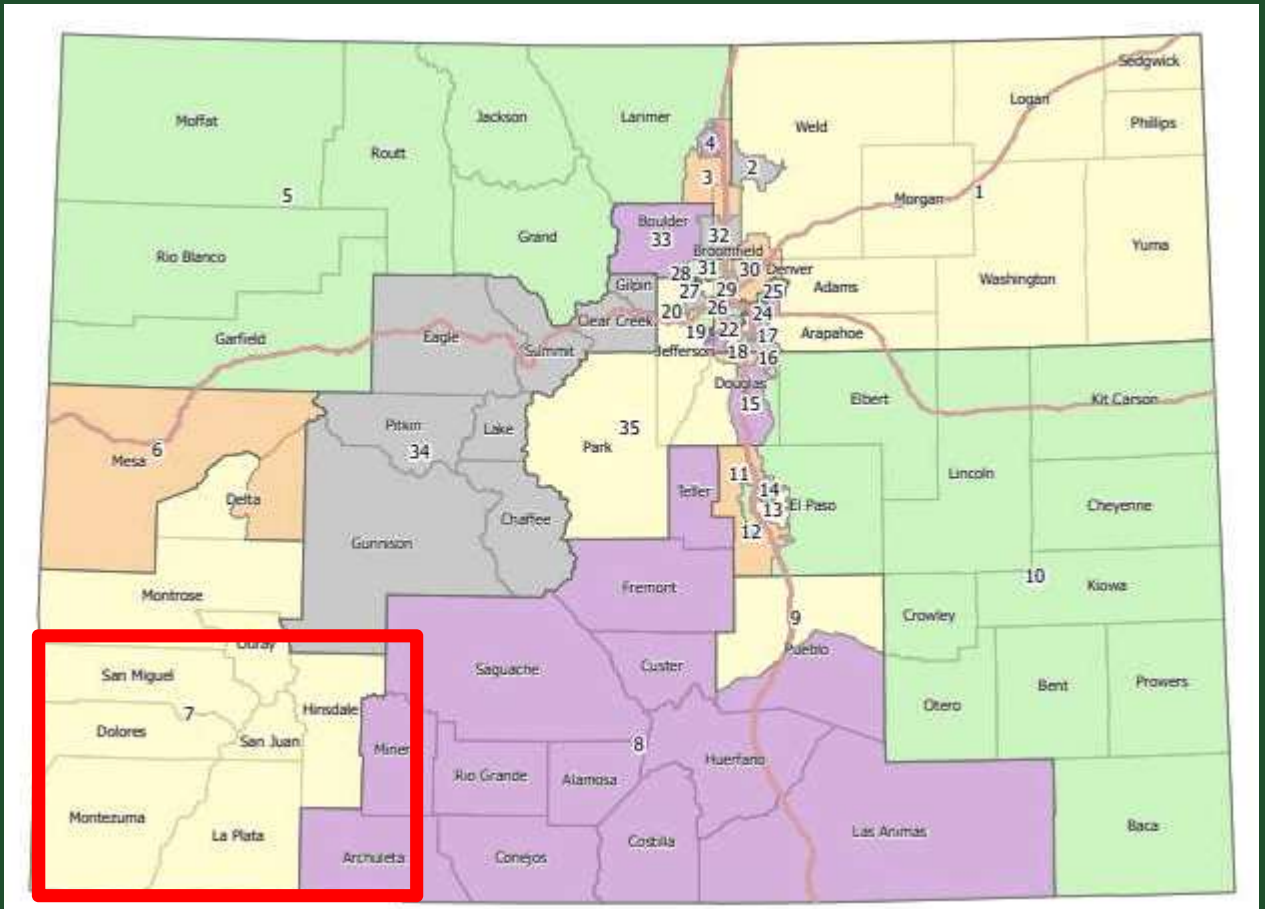
- **Prevent migration of bat/swallow bugs from nesting sites into living areas of building**
  - Seal points of entry
  - Crack/crevice use of insecticides at points of entry

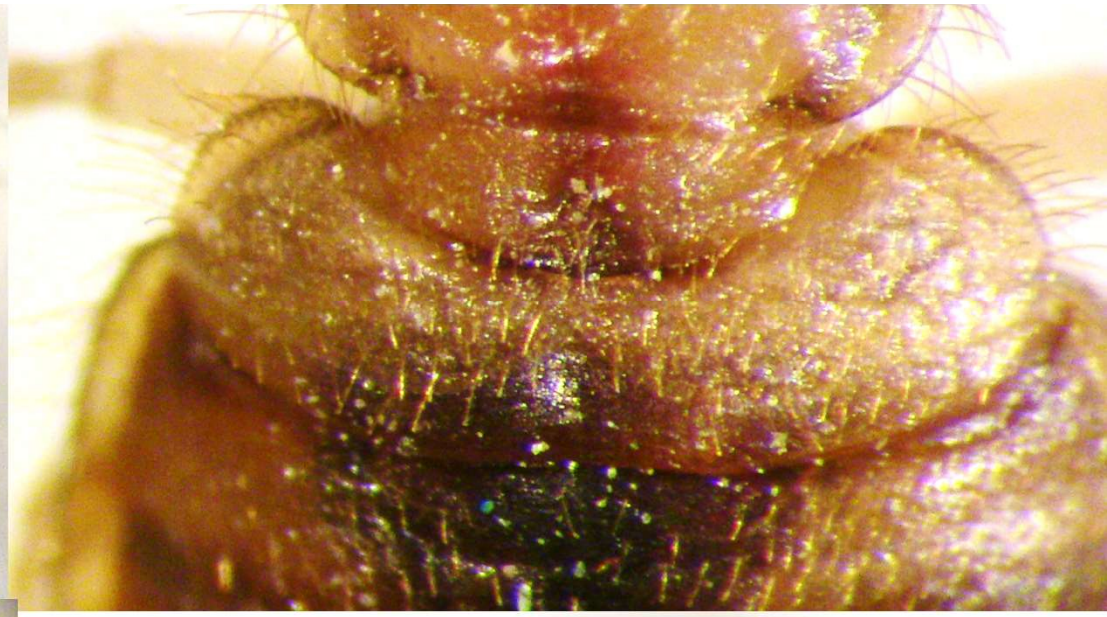


Hesperocimex coloradoensis



This species is present in the southwestern areas of the state

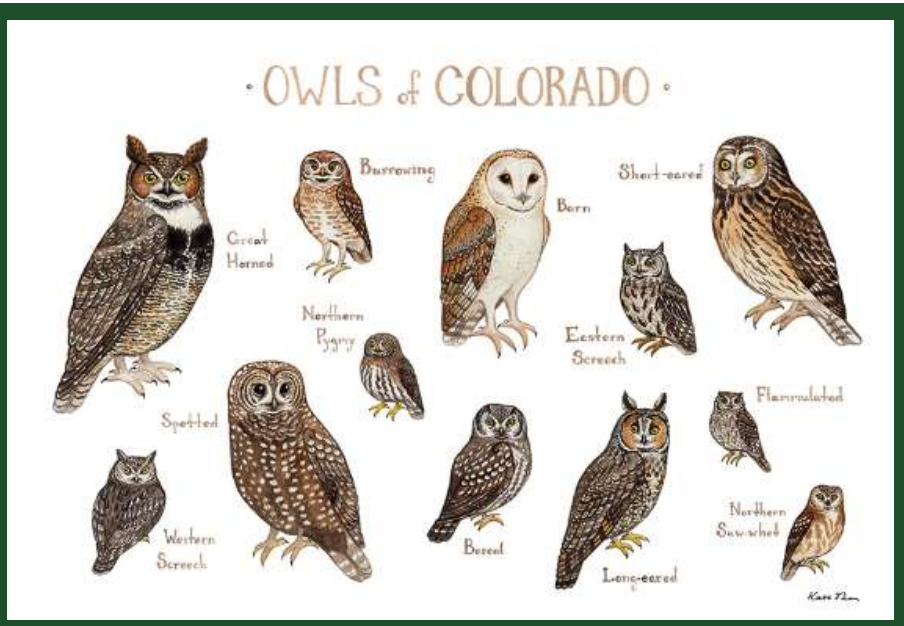




Known Bird Hosts

Purple martins and, less commonly, woodpeckers and owls are hosts for *Hesperocimex coloradensis*

This species is present in the southwestern areas of the state



Encounters with humans occur when bird hosts nest in buildings

Birds may abandon nests for a variety of reasons: disturbances, migration, disease, infertility, environmental conditions, adult can run into trouble, etc.

Wood packers can nest in or near buildings

Purple Martin nests are often made within in cavities

Olympic Peninsula Audubon Society

Thank you **to both Dr. Whitney Cranshaw and Bob Hammon** as many sides today were made possible from their guidance and resources kindly provided