OUTLINE

- What they are
- What they eat
- Where they live
- Prevention
- Monitoring and inspection
- Management

Bed bug nymphs, ~1 mm
WHAT IS A BED BUG?

- Blood-feeding insect
- Flat
- Size range-sesame seed to apple seed
- Light brown to mahogany red
WHY ARE THEY AN ISSUE?

- Common before WWII
  - Practically eradicated in the US
    - DDT use and improved hygiene
- Resurged last 2 decades
  - More travel
  - Lack of knowledge about preventing infestations
  - Ineffective pest control practices
  - Resistance to three different classes of pesticides
- Detected in cars, trains, ships, rooms, and airplanes
WHY SHOULD WE CARE?

- Litigation
- Possibility of high treatment costs
- Social stigma
- Why are we talking about bed bugs at a forestry conference?
HOW DO INFESTATIONS OCCUR?

- Great hitchhikers
  - Transported on luggage, clothing, beds, and furniture
- No real relationship between bed bugs and cleanliness
- **Turnover of residents**-important indicator of bed bug threats
  - Frequent relocation
  - Brief occupancy at places
  - Likely to stay at high-density accommodations
- Backpackers, homeless people, immigrants, and guest workers “targeted” as infesters
- Females lay about 200 eggs
- 1-5 eggs/day
- Egg to adult = 5 weeks to 4 months
- 5 nymph stages
- Molt (shed skin) 5 times
- Feed before each molt

Note: Bed bugs take 3-10 minutes to complete feeding

Life Cycle of the
Bed Bug
Cimex lectularius

Egg (1 mm long)
First Stage Larva
(1.5 mm long)
Second Stage Larva
(2 mm long)
Third Stage Larva
(2.5 mm long)
Fourth Stage Larva
(3 mm long)
Fifth Stage Larva
(4.5 mm long)
Adult
(5.5 mm long)

First Stage Larva
Takes a blood meal then molts.
Second Stage Larva
Takes a blood meal then molts.
Third Stage Larva
Takes a blood meal then molts.
Fourth Stage Larva
Takes a blood meal then molts.
Fifth Stage Larva
Takes a blood meal then molts.
Adult
Takes repeated blood meals over several weeks. Females lay up to 5 eggs per day, continuously.

Illustration by: Scott Charlesworth, Purdue University, based in part on Usinger, R. L. 1966, Monograph of the Cimicidae
LIFE CYCLE (CONT.)

[Image of the life cycle stages of a bed bug, including egg, 1st, 2nd, 3rd, 4th, 5th instars, and adult male and female.]
Adults can survive without a blood meal for up to 18 months
- Average for females: 131 days; males: 142 days
- Nymphs (1st and 2nd instars): 84 days

Frequency of feeding
- Adults: about a week
- Nymphs: can feed within 24 hrs

Enter a state of rest by folding legs in and ceasing activity
BEHAVIOR/BIOLOGY

- Elongated stylet to pierce skin and draw blood
- Feeding required for mating & egg production
- Feed at night during the peak hours of 1am-5am-deepest sleep
- Feed on any areas exposed while sleeping
- A line of bites might appear close to the edge of clothing or a sheet
  - Pattern of “three bites” a myth
- Return to their resting refuge through the presence of an aggregation pheromone
BEHAVIOR/BIOLOGY

- Response is variable
  - Bite is not immediately felt
  - Bites most common on arms, legs, back, face, and eyes
- About 30% of people do not react when bitten
- People are reacting to the saliva bed bug introduces while feeding
- Itching usually happens within a week
- Cannot transmit pathogens
BEHAVIOR/BIOLOGY

- Flightless
  - Reduction of wings characteristic of cave-like species
- Temperature limitations
  - Thermal death point between 111-113°F
    - Development tends to cease at 97-99°F
- Relative humidity variable
  - Found in areas with RH between 10-70%

Madrid bed bug infestation
BEHAVIOR/BIOLOGY

- Aggregation pheromone attracts other bed bugs for grouping and water conservation
  - Clear evidence of fecal spots
- *Thigomotactic*-body likes to be in touch with rough surfaces
- Odor is referred to as an “obnoxious sweetness”
- Group together in cracks and crevices
BEHAVIOR/BIOLOGY

- Hosts
  - Humans (followed humans everywhere!)
  - Chickens, bats
- Hide during day & close to humans
- Emerge from refuges through triggers of carbon dioxide or increased body temperature from humans
- They will travel from 5 to 20 feet to reach a victim
- Do not reside on people
  - A single bed bug will typically feed every 3-5 days for 5-10 minutes
  - Leave quickly after feeding
  - Remain motionless for several days after feeding
SCHUTTER LAB
BED BUG AND BAT BUG IDENTIFICATIONS 2008-2018

- **Bed bugs**
  - 23 counties
  - 46 identified

- **Bat bugs-Cimex sp.**
  - 17 counties
  - 48 identified

- **Swallow bugs**
  - 6 counties
  - 8 identified
WHERE BED BUGS LIVE

- Located in areas where blood meals are easily obtained
  - Furniture
  - Torn wallpaper
  - Mattresses, bed frames, picture frames
  - Any area close to the bed or couch that contains cracks or crevices
    - Prefer wood surfaces over metal/plastic
- Only contact with humans is for a blood meal
- Hitchhike on coats, bags, furniture, wheelchairs…
WHERE BED BUGS LIVE

- Do not have nests
- Hide in seams, folds of mattresses, box springs, bed frames, headboards
- During high infestations, a pungent sweet odor can persist throughout the room
Fecal Spotting

- Liquid fecal matter excreted very soon after feeding
- Common spots:
  - Mattress, bed linens, curtains, wallpaper, surrounding bed
SHED SKINS
INSPECTIONS

- Cracks and crevices of bed frames (particularly wood)
- Wooden support slats
- Screw holes, knots, and other recesses
- Headboards
- Upholstered chairs, recliners, and sofas
INSPECTIONS (CONTINUED)

- With a flashlight, thoroughly inspect the entire room before unpacking
  - Behind the headboard
  - Under lights
  - Inside dressers, sofas and chairs
- Pull back sheets, inspect mattress seams and box springs (particularly at the corners)
- Avoid placing luggage on upholstered surfaces or luggage racks
- Vacuum luggage thoroughly before storing it
  - Garment hand steamer
  - Wash and dry all clothes – even those that have not been worn – on hot cycles
HOW TO IDENTIFY BED BUGS

- Identified under a microscope by a trained professional
  - Schutter Diagnostic Lab
- Separated from other insects
  - Flattened dorsal-ventrally
  - Obligatory blood feeders
  - No wings
- They are identified and separated from bat bugs based on “fringed hairs” on a segment of the body called their pronotum
BED BUG VS. LOOK ALIKES

Bed bug  
*Cimex lectularius*

Bat bug  
*Cimex adjunctus*

Swallow bug  
*Oeciacus vicarius*
**BED BUG IMPOSTERS**

- **Carpet Beetle**
  *Dermestes lardarius, (8mm)*

- **Minute Pirate Bug**
  *nymph (1.5mm)*

- **Boxelder Bug**
  *nymph*  
  *Boisea trivittata (2mm)*

- **Rocky Mountain Wood Tick**
  *Dermacentor andersoni (5-6mm)*

- **Root Weevil**
  *(1mm)*

- **Book Louse**
  *(1mm)*
Early detection is key

- Early infestations usually close to the bed
- Typically take 2-3 treatments
- Advanced infestations spread and cost more to control
  - 5 or more treatments

Slide: Courtesy of Susannah Reese, StopPests in Housing
MEASURES FOR PREVENTION

- Train staff and tenants
  - Inspections
  - Bed bug identification
  - Procedures
- Periodic inspections (beyond yearly health inspection requirement)
- Elevate suitcases off of the floor and bed
- Bed bug monitoring traps
- Reduce clutter
BED BUG INTERCEPTORS

- When combined with visual inspections, can detect up to 95% of infestations
- Small plastic trays with an inner and outer ring
- Place under the bed posts or under bed

Passive monitor

Active monitor (SenSci Activ Volcano)
TREATMENT OPTIONS

- Vacuuming
- Mattress Encasements
- Freezing *not as reliable as heat
  - Chest freezer
- Heat
  - Clothes dryer
  - Steam
  - Portable heat chambers
  - Whole unit

- Pesticides
  - Best to use a pest management professional
    - Formulations
      - Spray
      - Dust
      - Fumigation
TREATMENT
MATTRESS ENCASEMENTS

• For mattress and box spring
TREATMENT

HEAT

- Whole unit heat treatment - (training needed)
- Portable heat chambers
- Steam – (training needed)
- Clothes dryers – 30min on high

https://i.ytimg.com/vi/bJ4YvJOPhY/maxresdefault.jpg
TREATMENT
STEAM

- Provides immediate kill of all life stages
- Penetrates into cracks and 1-2 cm into fabric, up to 6 cm in cracks
- No pesticide residue
- Slow!

Photo: Courtesy of Susannah Reese, StopPests in Housing
TREATMENT
PESTICIDES

- Only PMPs should use
- Bed bugs tolerant of many insecticides
- Types of formulations
  - Aerosols
  - Dusts
  - Fumigants
  - Sprays

The label is the law!

Slide: Courtesy of Susannah Reese, StopPests in Housing
UNDERSTANDING CHEMICAL TREATMENTS

- No silver bullet
- Pesticide sprays have
  - Limited residual effect
  - Only work on contact
- Most effective chemicals
  - Combination products (neonicotinoids + pyrethroids)
- Dusts effective if kept dry

Slide: Courtesy of Susannah Reese, StopPests in Housing
ONLY PEST MANAGEMENT PROFESSIONALS SHOULD USE SPRAYS

- Sprays not effective when used by tenants/homeowners
- Over-the-counter-sprays and foggers cause bugs to scatter
  - More of a problem

Slide: Courtesy of Susannah Reese, StopPests in Housing
WHAT TO DO IF YOU FIND A BED BUG

- Notify hotel/building owner/landlord right away
- Save the insect
- Have it properly identified
  - Local extension agent
  - Schutter Diagnostic Lab
- Don’t disturb the area
- Don't apply pesticides
- Prevent carrying the bed bugs to other places **Don’t discard furniture**
- Landlord/building owner’s responsibility for treatment
WHAT TO DO IF YOU FIND A BED BUG

HUD GUIDELINES

- Hospitality businesses are not required to take any measures beyond yearly health department checks
- Health Department should respond to bed bug complaint within 24 hrs
- Complete inspections within 3 days
  - All adjacent units
- Treatment plan
  - Integrated pest management plan (multiple methods)
  - Least toxic methods, not just chemicals
- No bed bug laws
- Codes amended and adopted by Administrative Roles of Montana (ARM) Title 24, Ch. 301

**IPMC Sec. 309.1 Infestation.** All structures shall be kept free from insect and rodent infestation. All structures in which insects or rodents are found shall be promptly exterminated by approved processes that will not be injurious to human health. After pest elimination, proper precautions shall be taken to prevent reinfestation.
Montana tenants rights

Right #3-70-24-303

- Law requires the landlord to maintain the rental property
 QUESTIONS?

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