Radon Exposure to Bats Roosting in Uranium Mines

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URANIUM
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Another Rock.

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Background

- Abandoned hardrock mines
  - ~100,000’s
- Hazards
  - Instability
  - Hazardous gases
  - Explosives
- Uranium mines
  - Radiation
Bats and Mines

- Mines remain accessible
- Wildlife usage
  - Bats
- Current land management guidelines
  - Bat gating
Townsend’s big-eared bat

- Subterranean obligate
- Common in abandoned mines
- High site-fidelity
- Status
- Declining?
- Limiting factors
- Hibernate
Microhabitat Use by Bats and What About Radon?
Study Area

Moab
Colorado
Utah
Bat Surveys

- Presence
  - 59 mines in summer 2012
  - 30 mines in winter 2013
- We recorded:
  - species or species group
  - use type:
    - hibernacula
    - day roost
    - maternity roost
    - night roost
  - height from floor
  - distance from entrance
Radon Surveys

- Surveyed
  - 18 mines in summer 2012
  - 10 mines in winter 2013
- Placed throughout mines and where bats found
  - one on floor
  - one on ceiling
- Factors
  - height from floor
  - distance from entrance
- Regression
- Absorbed dose estimate
Results From Bat Surveys

- **Summer:**
  - 4 bats and 60 locations

- **Winter:**
  - 56 bats

### Bar Chart

- **Townsend's big-eared bat**
- **big brown bat**
- **silver-haired bat**
- **large myotis species**
- **small myotis species**

**Type of use**
- Day
- Night
- Winter
Radon Results

Summer and winter
- Radon predicted by height and distance (P<0.0001, P = 0.0003)
Radon Results

Summer

Winter
Radon Results

EPA
4.0 pCi/L

<table>
<thead>
<tr>
<th>Radon concentration (pCi/L)</th>
<th>Summer</th>
<th>Winter</th>
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<tr>
<td>mine</td>
<td>600</td>
<td></td>
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<tr>
<td>bat</td>
<td>100</td>
<td></td>
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<tr>
<td>mine</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>bat</td>
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</tbody>
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Discussion

Summer

hot air

Radon

cooler air
Discussion

Winter

Cold air

Warmer Radon
Discussion

- Duration
- Respiration rates
  - Absorbed dosage
Discussion

- Summer
  - 1 mGy per day, ~1.5 mGy

- Winter
  - ~0.08 mGy
Discussion

• Seasonal usage
• Dead bats
• Effects of radon
  - Lung cancer
• Life span
• Radon is natural
• Other studies
• Bat DNA
Additional Research and Recommendations

- Effects of radon on bats
- Spring and fall
- Other risks
  - radiation
  - toxicity
- Population study
- Suitable hibernacula
- Gating
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