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Pre-construction risk assessment & post construction on-site surveys & mitigation for bird-wind turbine interactions

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Today's presentation

- Pre-construction risk assessment
- Post-construction surveys
- Mitigation

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Pre-construction surveys

- Count numbers of individuals present
  - Birds: point counts or transects
  - Bats: acoustic surveys
  - Live animals

- Two problems:
  - Pre- and post surveys – can't compare (live vs dead)
  - Weak correspondence: pre- and post data

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Pre-construction surveys

- 3 part process (USA)

1. Preliminary site assessment
   - desk
2. Site-specific evaluation
   - on-site
   - presence/absence
   - environmental risk factors
3. Risk assessment
   - on-site
   - quantitative risk assessment
   - taxon-specific

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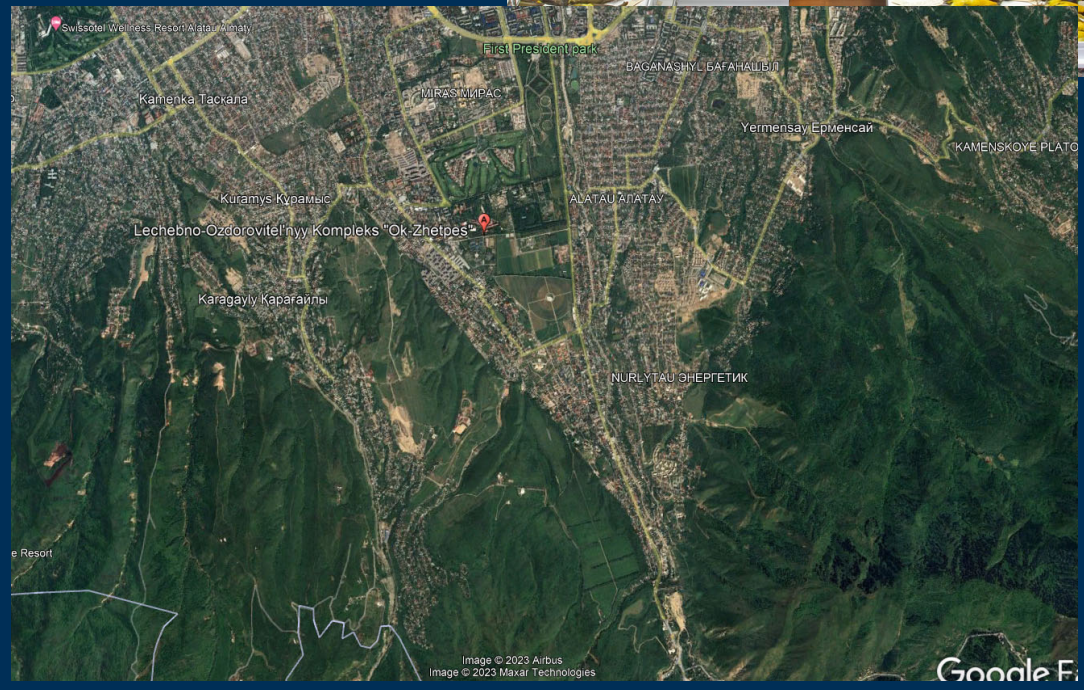
Michael Lanzone

Pre-construction surveys

- Preliminary site assessment
  - desk study – review literature and remote images, etc.
  - evaluate & select sites
  - species presence & behavior
    - migratory corridors



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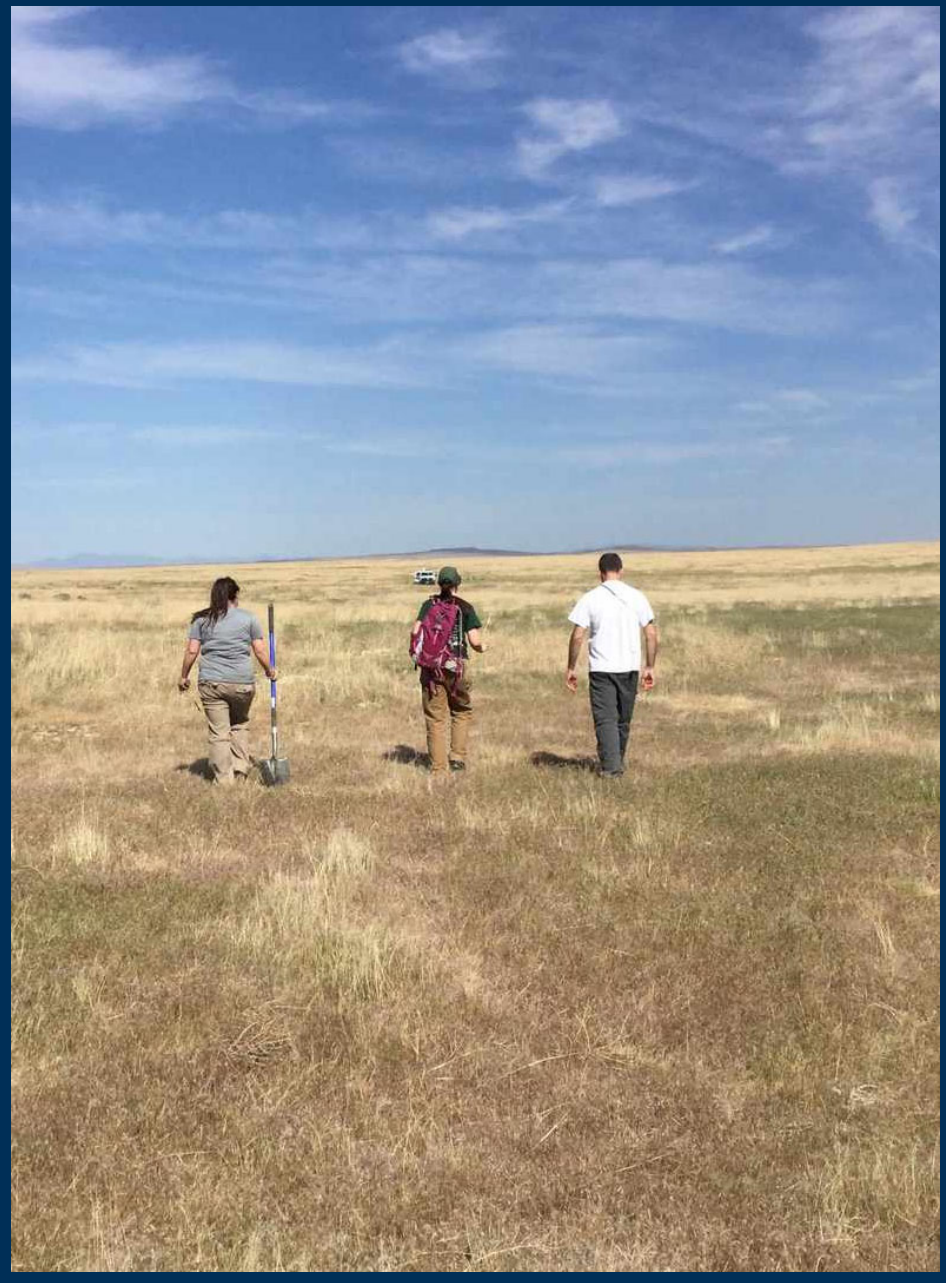
Pre-construction surveys

- Site-specific evaluation
  - confirm species presence
  - confirm habitat features
  - identify important habitat
    - places bats hibernate
    - areas used by rare species
  - does not estimate numbers present



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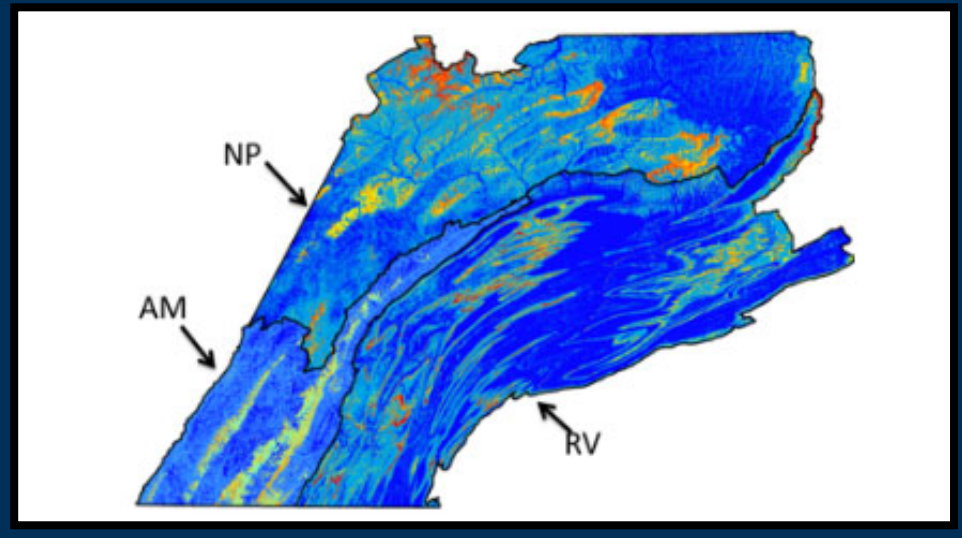
Pre-construction surveys

- Risk assessment
  - on-site, taxon-focused
    - radar
    - capture & tracking
    - acoustic surveys
    - point counts, transects, behavioral observations (birds)
    - migration count sites (birds)
    - risk modeling
  - requires detection rates (rare)
  - for final site assessment
  - can guide mitigation



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Post-construction surveys

- Counting fatalities
- Estimate detection rates
  - *searcher efficiency & scavenger removal*
- Intellectual contradictions
  - fatalities never counted pre-construction
  - rarely standardized across facilities

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Post-construction surveys

- Approaches
  - Human teams
  - Dog-handler team

- Dog-handler teams better
  - Humans: 6-30% small, 50-90+% large
  - Dogs: 60-96% small, 86-100% large

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Post-construction surveys

- Robust experimental design
  - define search area, season, & interval
  - detection rates: searcher efficiency & scavenger removal

- Accurate species identification
- Population-level consequences

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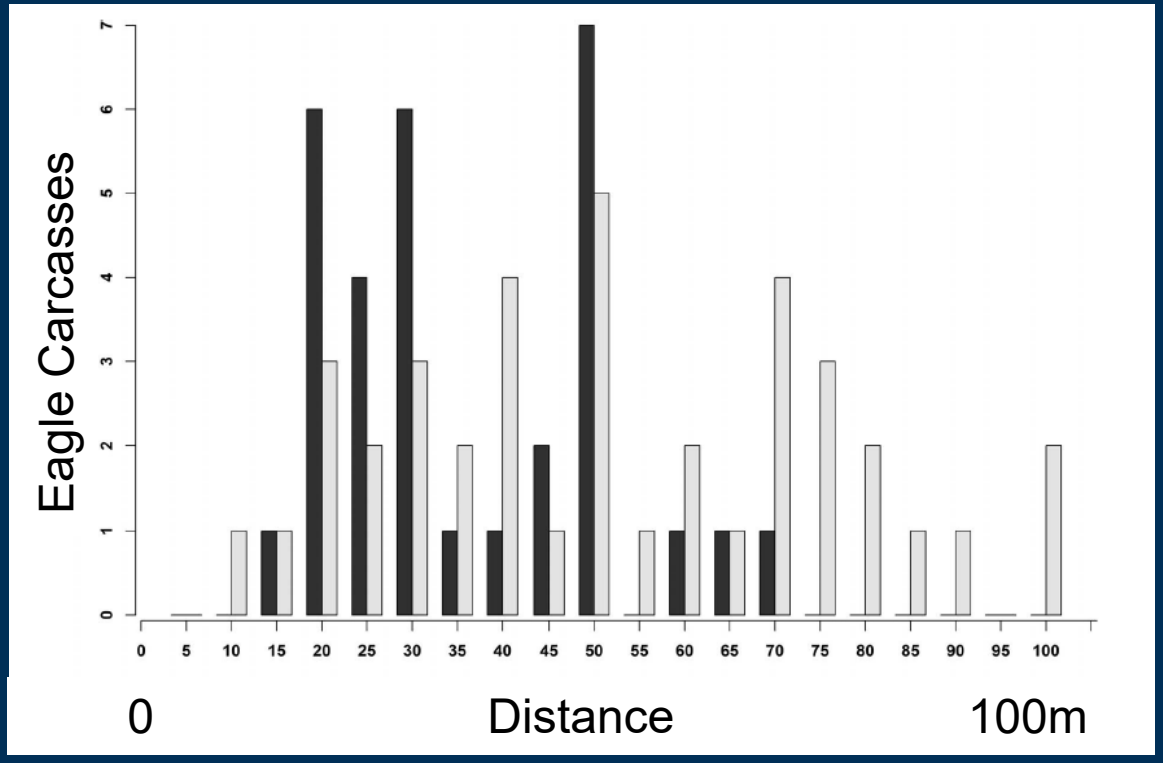
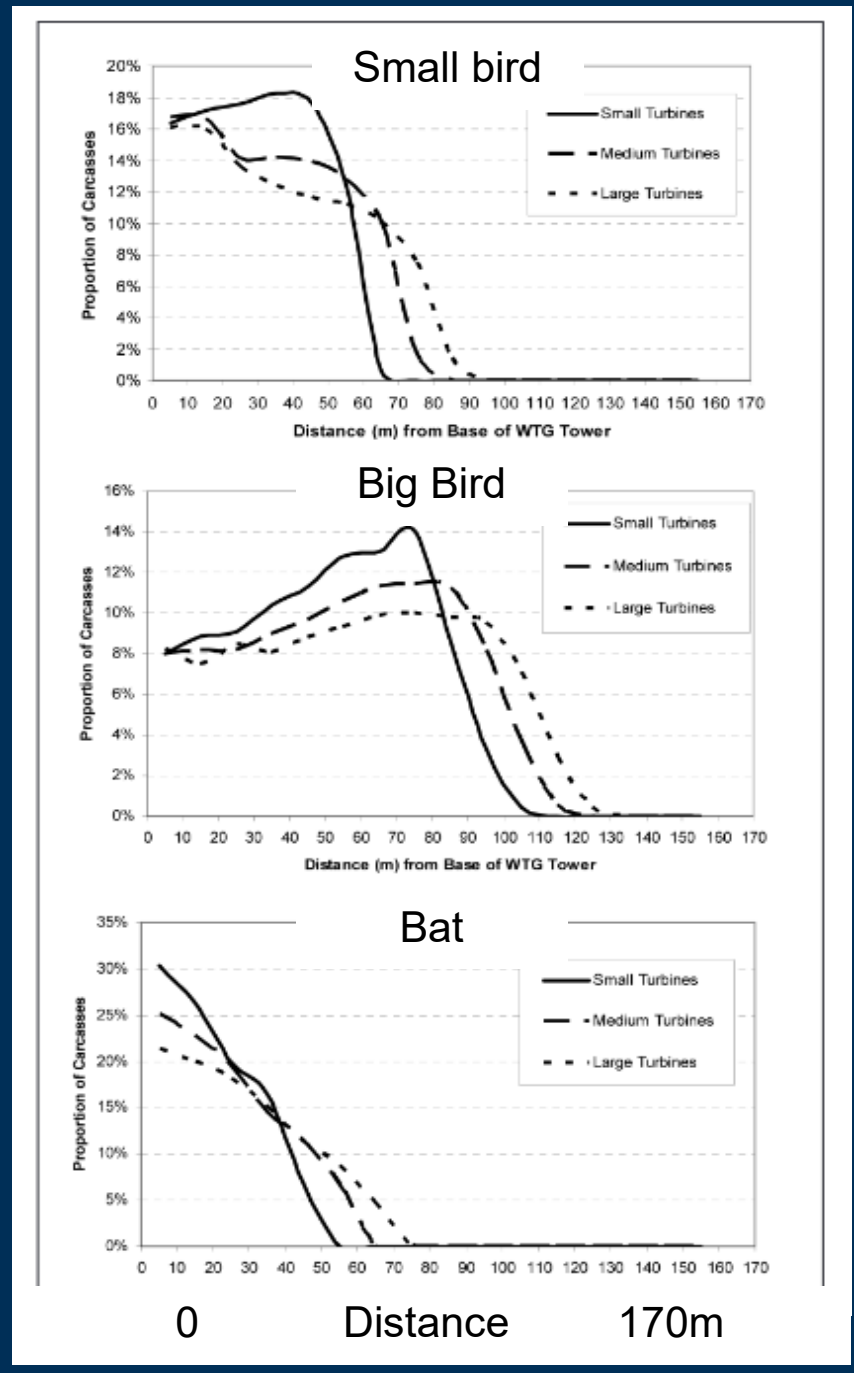
Post-construction surveys

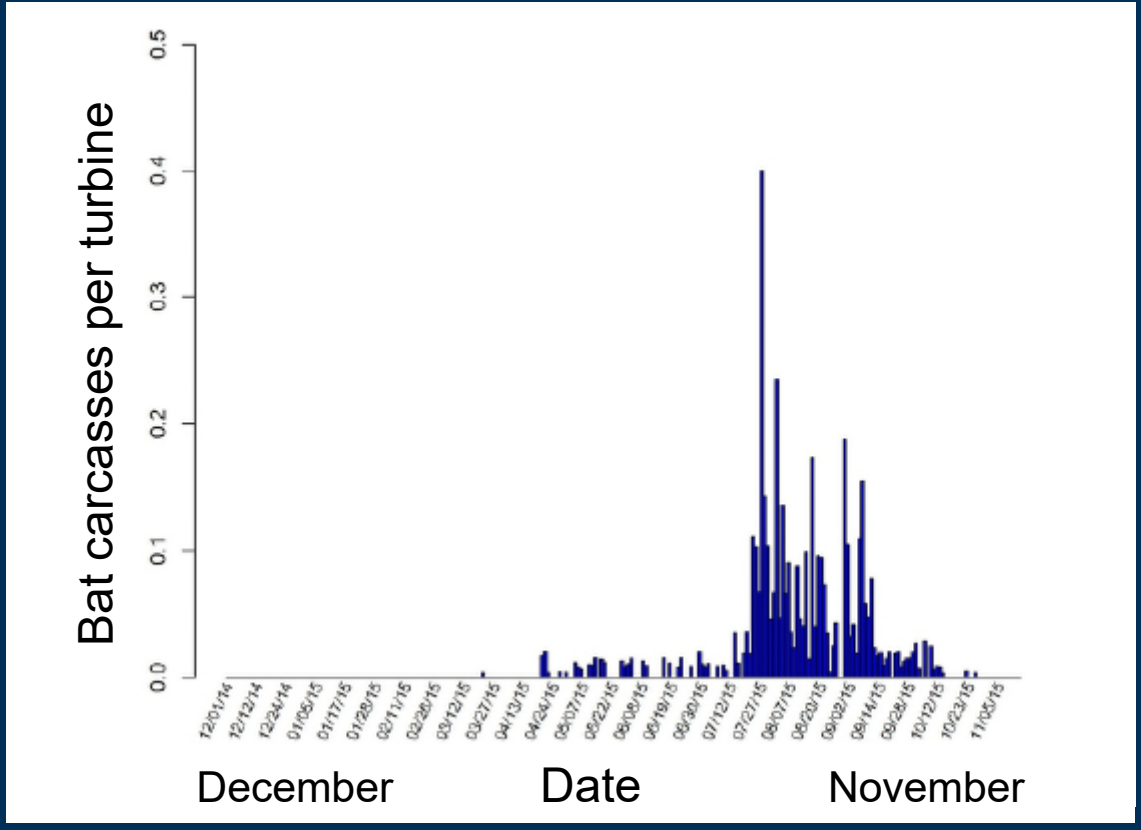
- Define search area
  - fall distributions vary by species, size, season

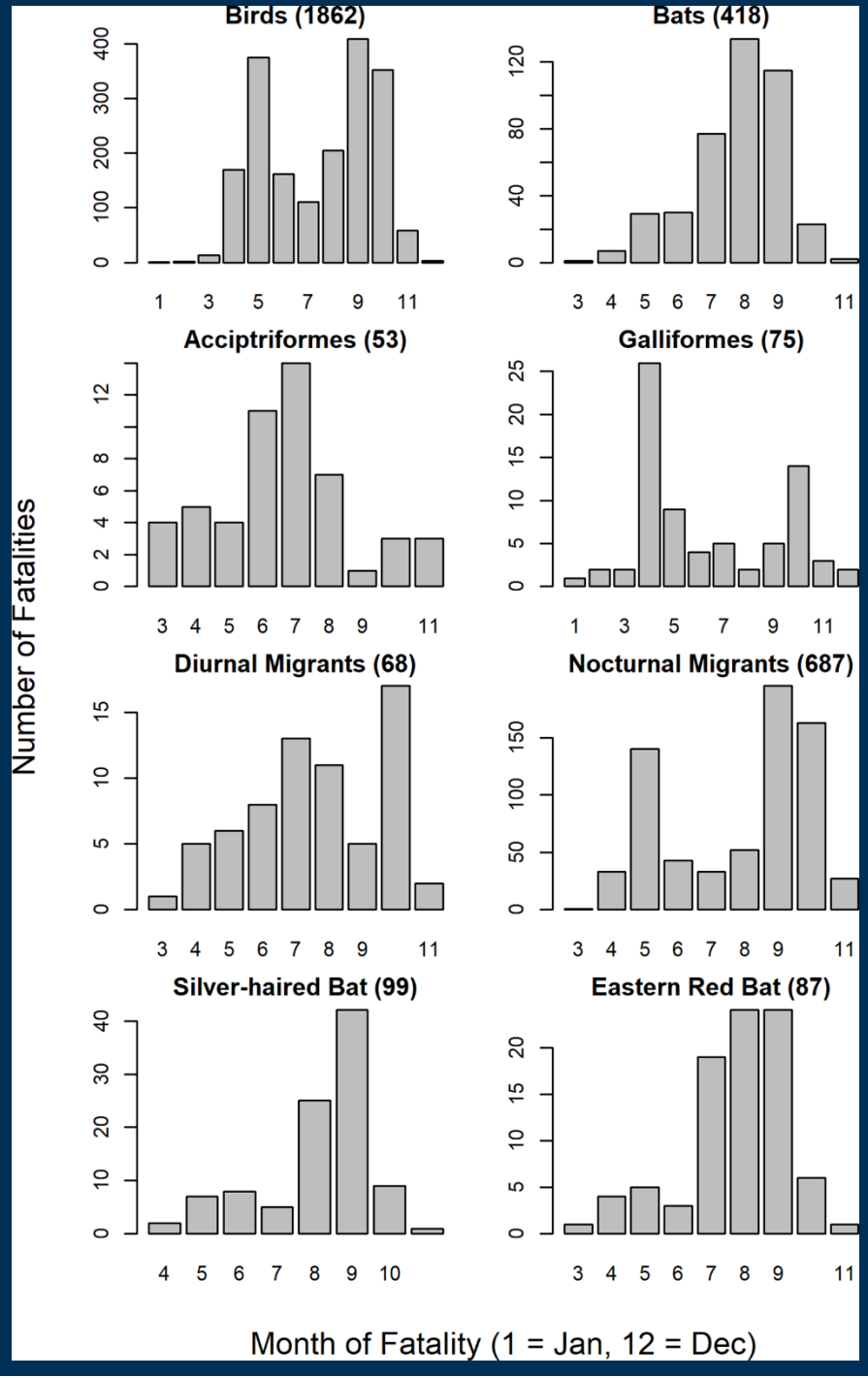




Post-construction surveys

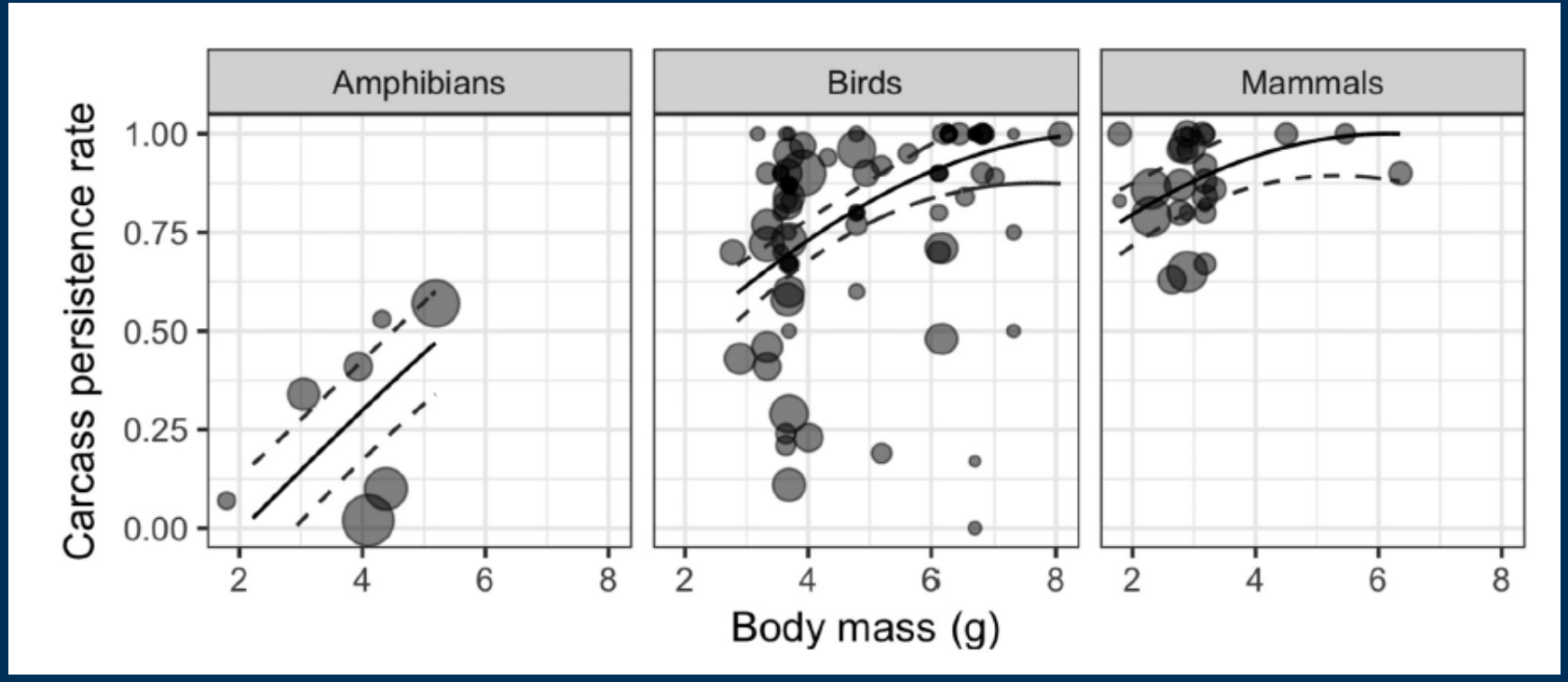
- Define search season
  - mortality rates vary by taxa





Post-construction surveys

- Define search intervals
  - 24-hr persistence
  - Barrientos et al. 2018



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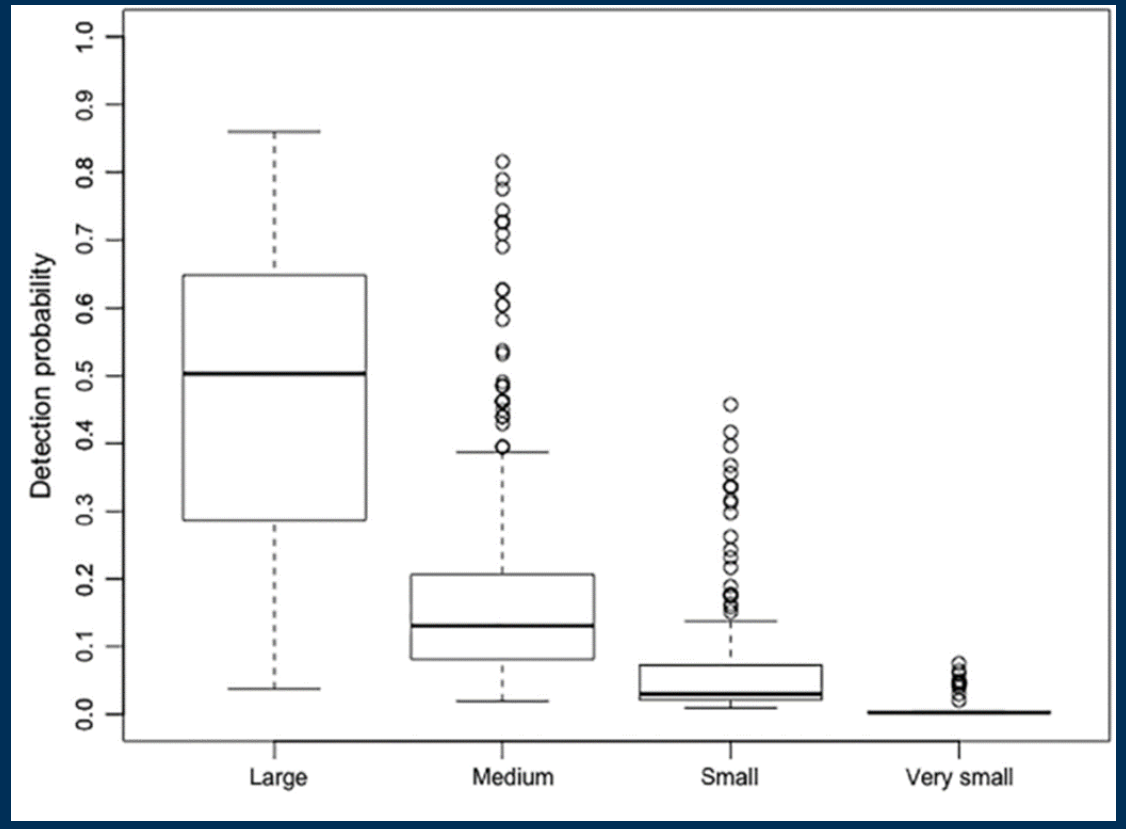
Estimating detection rates

- Critically important
- Experimental trials
  - birds & bats
  - searcher efficiency
  - scavenger removal
- Requires software & animal carcasses
  - GenEst
  - others?



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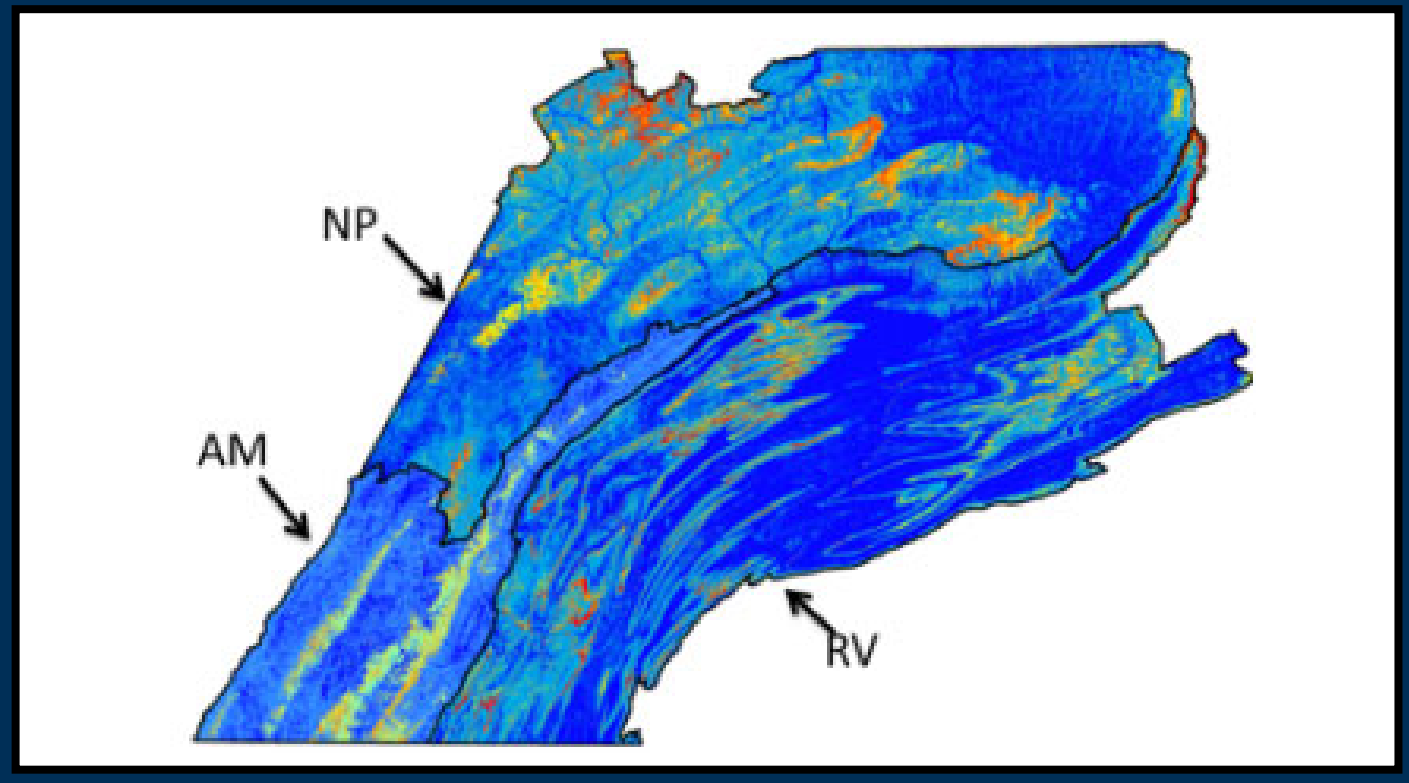
Mitigation

- Avoid (pre-construction, macro- or micro-scale)
- Minimize (pre- or post-construction)
  - detect & deter/curtail
  - curtailment
- Compensate



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Minimize - Detection

- Human observers
- Computer vision
  - eagles in Wyoming
  - can be effective (*McClure et al. 2018*)
  - several available tools

- Radar (birds)
- Acoustic (bats)

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Minimize – Deterrence

- Not well developed
- Tested approaches
  - Visual – mechanical
  - Visual – paint blades
  - Acoustic
    - Bats – ultrasonic
    - Birds – loud noise

May et al. (2020)

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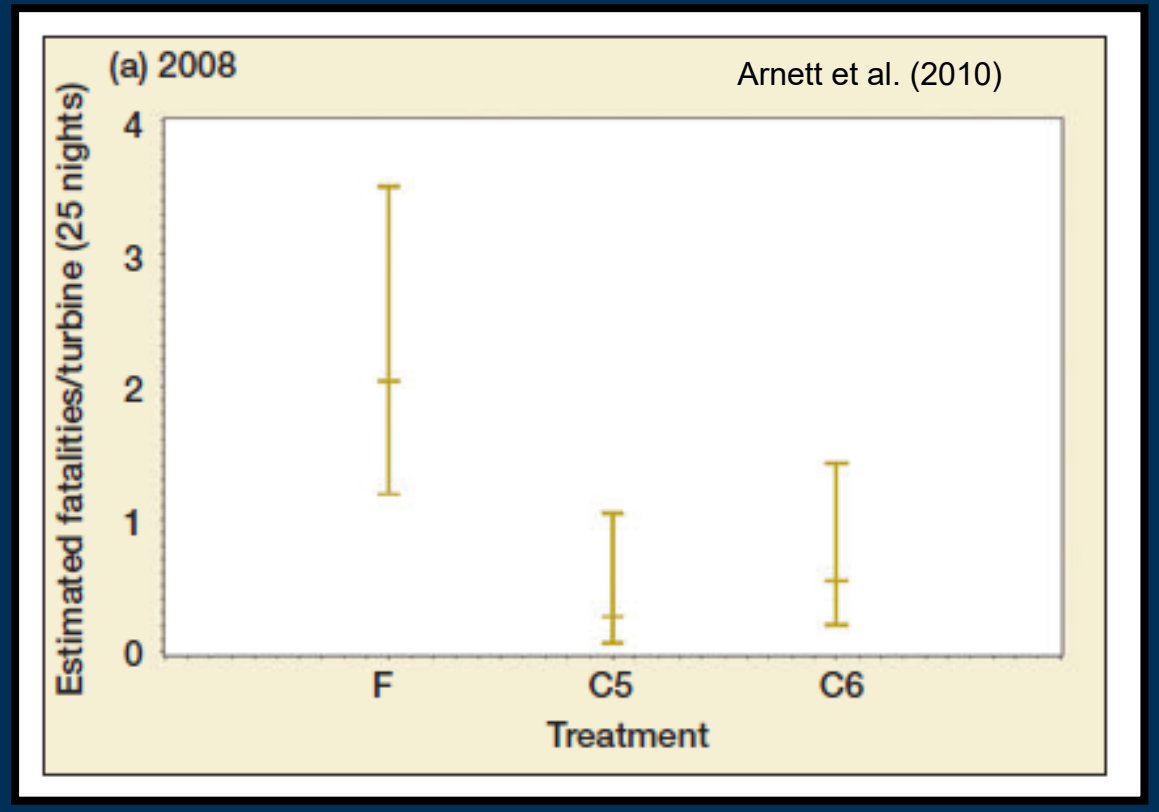
Minimize - Curtailment

- Birds
  - Seasonal (unclear results)
  - Informed (humans or computer vision)
    - can be effective (*McClure et al. 2021*)
    - can fail (*Duerr et al. 2023*)
- Bats
  - Season & weather specific
  - Bat fatality decrease >50%
  - Power production decrease <1%
    - *Arnett et al. 2010*



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Compensate

- Create new animals (in origin population)
  - Habitat improvement
    - survival and reproduction
  - Food supplementation
    - survival and reproduction
  - Threat reduction
    - powerpole retrofitting, toxicant removal
    - survival

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Conclusion

- Wind-wildlife interactions
  - real conservation concern
  - prior work in USA of limited scientific value
  - tools exist to assess and reduce impacts

- Opportunity to learn from limitations and improve science & management

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