Estimating Inter-annual Variability in Project Take for Rare Events

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TETRA TECH

Auwahi Wind

Overview

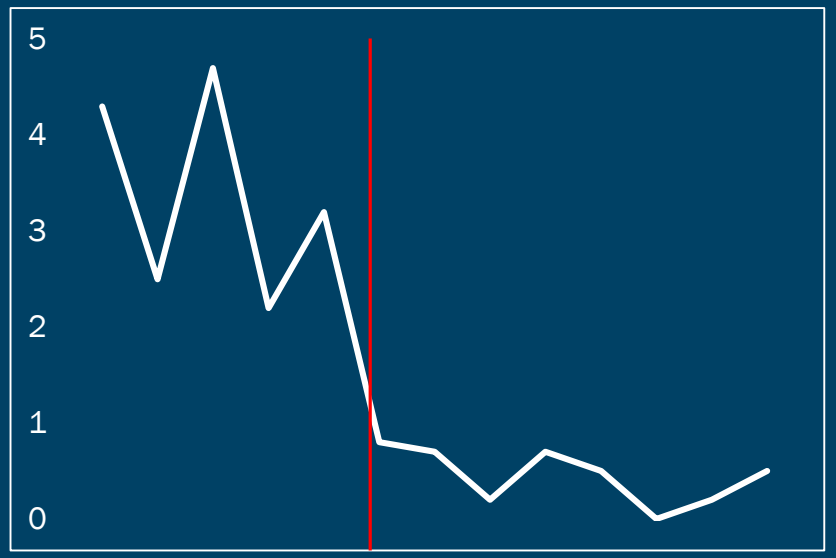
- Estimating Take for Incidental Take Permits
- Variation in Take
  - Sources of variation
  - Effects of variation
- Rare events
- Hawaiian Hoary Bats – A Case Study

Estimating Take for Incidental Take Permits

- Anticipated Impact
  - Predicting future take
  - Take limits
- Mitigation triggers
- Compliance
  - Monitoring
  - Reporting

Variation in Take

- Natural sources
  - Random
  - Environmental fluctuations
  - Cyclic
  - Population change
- Operational sources
  - Operational changes
  - Future technologies
- Directional changes in take



Variation in Take

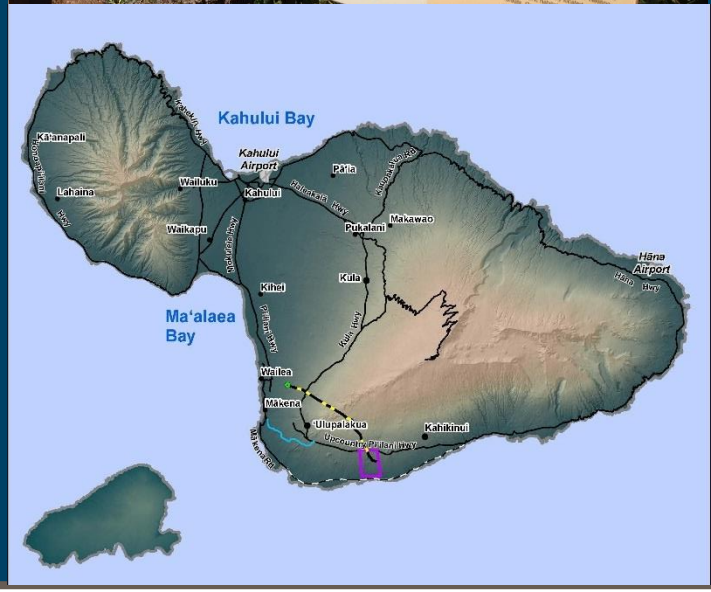
- Assessing inter-annual variation
  - Sample sizes and monitoring effort
  - Effects of variation on fatality estimates
  - Effectiveness of operational changes and deterrents
    - When does change occur?
    - What is the scale of change?
    - Confounding variation

Rare events

- Why rare?
  - Endangered species
  - Low detectability
- Rare vs. common events
  - Limitations of fatality estimators
  - Impacts of variability
- Approaches to estimation
  - Common surrogates
  - Evidence of Absence

Auwahi Wind

- Auwahi Wind Farm
  - East Maui, Hawaii
  - Eight Siemens 3.0 MW wind turbines
  - Commercial operation December 2012
  - Anticipated operational life – 20 years
- Incidental Take Permit
  - ITP issued February 24, 2012
  - Hawaiian petrel, Hawaiian goose, Blackburn's sphinx moth, Hawaiian hoary bat
- HCP Amendment (in progress)



Auwahi Wind - Hawaiian Hoary Bat

- Status
  - Federally endangered – listed 1970
  - Limited information on population size and distribution
  - Taxonomy
- Requested Take – Auwahi HCP (2012)
  - Direct – 19 adults
  - Indirect – 8 young
  - Rationale
    - Low numbers acoustic detections
    - Lack of roosting habitat
    - Low mortality rate at other wind farms
- Tiered Approach

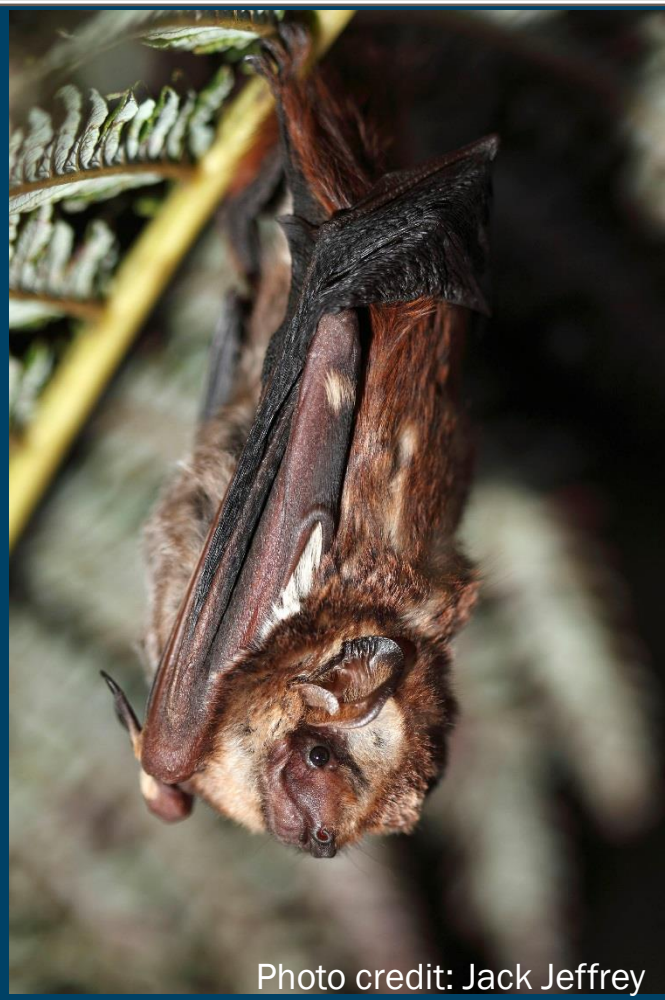


Photo credit: Jack Jeffrey

Auwahi - Hawaiian Hoary Bat

- Monitoring program
  - Pulsed monitoring
    - Intensive monitoring (2013-2014)
    - Systematic monitoring
    - Interim inspections
  - Bias trials
  - Fatality estimation
  - Mitigation triggers

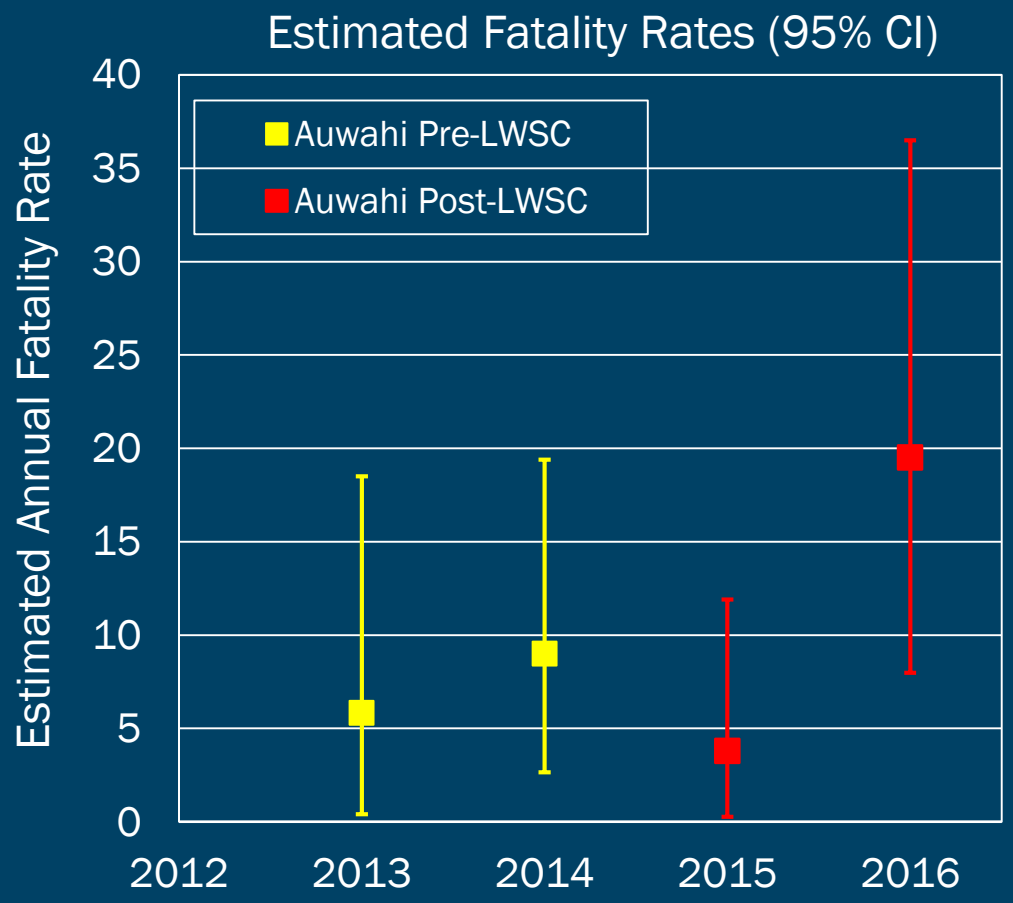
Auwahi Wind - Hawaiian Hoary Bat

- Sources of variation
  - Natural
    - Random
    - Seasonal
    - Population changes
    - Environmental fluctuations
  - Operational changes
    - Low wind speed curtailment (February 2015)
    - Deterrents
    - Other

Auwahi - Hawaiian Hoary Bat

- Years 1-4 results

Year	Observed Fatalities
2013	1
2014	3
2015	1
2016	7

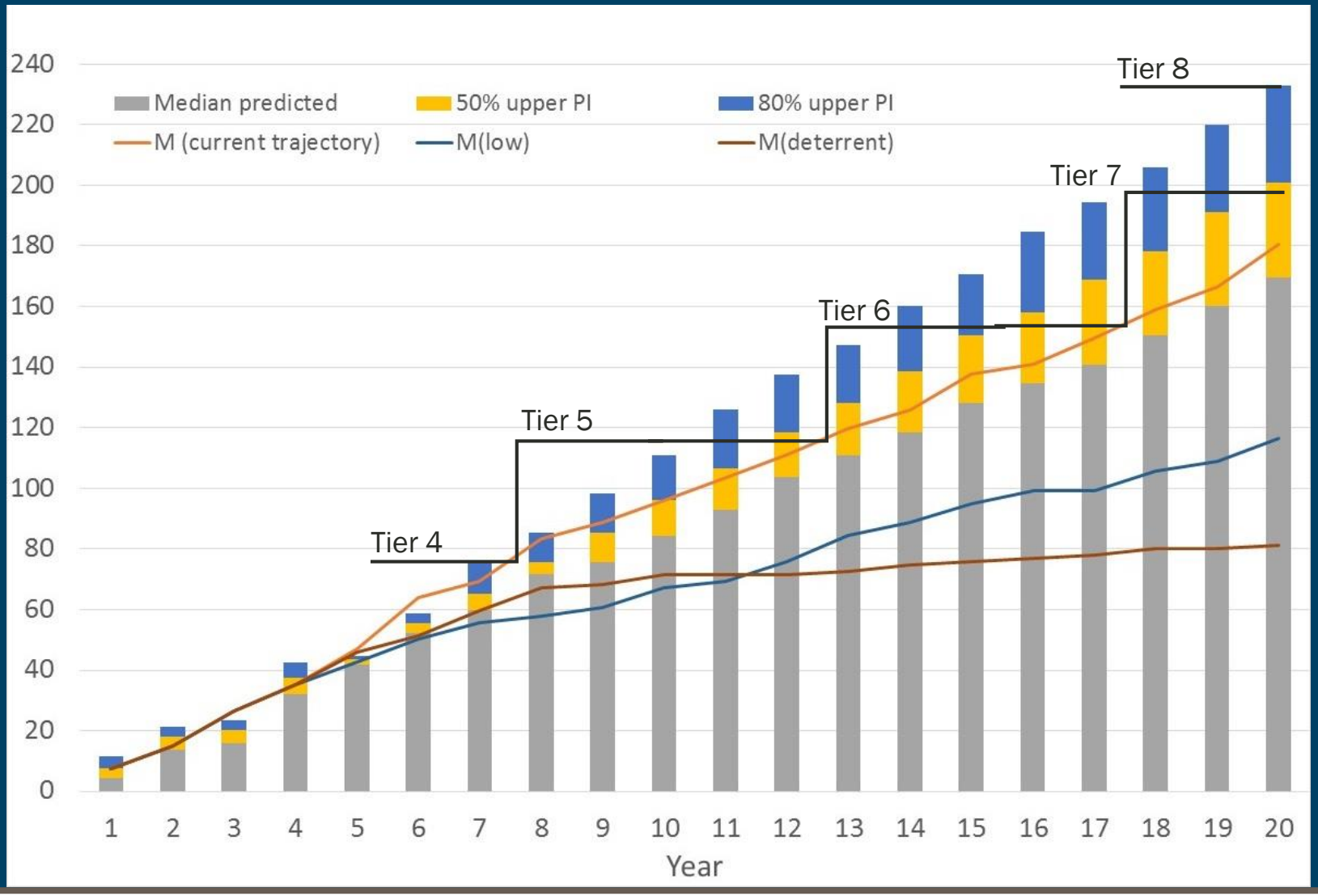


Auwahi - Hawaiian Hoary Bat

- HCP amendment (in progress)
  - Take higher than anticipated
  - Considerations
    - Curtailment effect
    - Deterrent available?
    - 2016 anomalous?


Photo: Bryan Berkowitz

Effects on predicted take



Summary

- Variation in fatality rates affects predictions of take and approaches for assessing compliance with permitted levels of take.
- When take occurs rarely, measuring effects of variation poses additional challenges for monitoring and assessment.
- Planning for alternative outcomes should be considered, as effects of variation and changes in take may not be immediately discernible.

Additional information or questions?

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