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Facilitating timely and responsible development of wind energy while protecting wildlife and wildlife habitat

AWWI Eagle Initiative:

National Eagle Research Framework: Predicting and Mitigating Eagle Take at Wind Energy Facilities

NWCC Webinar

March 5, 2014

National Eagle Research Framework

- Based on Implementation of the Eagle Conservation Plan Guidance. Module I. Version 2
  - Collect data on eagle use at the proposed site to accurately predict potential take of eagles by collisions and disturbance
  - Implement Advanced Conservation Practices (ACPs) that will reduce the predicted take to the maximum extent practicable
  - Implement compensatory mitigation to numerically offset remaining unavoidable eagle take

National Eagle Research Framework

- What the Framework Is Not:
  - Determining population status of bald and golden eagles
  - Evaluation of trends in eagle numbers relevant to establishing take thresholds
  - Estimating total number of eagles killed at wind energy facilities

Framework Consultants

- Todd Katzner, West Virginia University
- Brian Millsap, USFWS
- Jeff Smith, Consultant, H. T. Harvey
- Leslie New, USGS

Framework Premises

- Eagle fatalities, and risk, are higher at some facilities than others
- Evaluating risk factors against hypothesis that eagle risk is related only to eagle use
- Research testing ACPs tied to fatality monitoring

Study Design Recommendations

- Projects with high estimated take best for evaluating risk factors and ACPs
- Evaluation of risk factors should include sites with low take
- Data should be collected at finest temporal scale to promote pooling and “scaling up”
- Turbine will typically be sample unit of interest
- Assumptions about fatality estimate distribution should be made explicit

I. Improving Take Predictions

- Evaluate existing data
- Conduct enhanced fatality monitoring
- Evaluate risk factors
    - Turbine location
    - Turbine attributes
    - Environmental features
    - Eagle demography, ecology, and behavior

II. Evaluating ACPs

- No approved ACPs; all considered experimental
- Projects with take; pooling data across projects
- Some options
  - Turbine micro-siting
  - Curtailment
  - Diverters/deterrence measures
  - Perch management
  - Nest management
  - Prey management

Framework Implementation

- Funding – public-private partnership
- Create Technical Advisory Committee
- Secure data storage to promote synthesis and analysis

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III. Compensatory Mitigation

- No-net-loss; unavoidable take must be offset by compensatory mitigation that is quantifiable and verifiable
- Options include:
  - Eliminating or reducing golden eagle mortality from pre-2009 sources, e.g.,
  - Or, enhancing habitat/prey to increase survival or productivity

Offsetting Eagle Take – Current

Power Pole Retrofitting → **# poles/eagle** → Net Change in Eagle Deaths

AWWI Compensatory Mitigation Project

- Goal: develop predictive models for compensatory mitigation that will numerically compensate for eagle mortality
- Start by prototyping with one (or few related) mitigation methods in an iterative process with technical experts
- Utilizing expert elicitation to parameterize models
- Long term vision to expand the toolbox of reliable compensatory mitigation options

Expert Elicitation

- Ecological systems have complex dynamics, multiple drivers, and a lack of data
- Conservation decision-making is often required – if hard data are lacking, expert knowledge provides a path forward
- Use of expert judgment follows formal elicitation procedures using systematic, well-defined protocols
    - Data acquisition
    - Recognized sources of uncertainty

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Factor Affecting Eagle Populations Potential Sources of Mitigation	factor effect	mitigation effect	Total
Lead poisoning	3.94	4.31	8.25
Loss of high quality habitat	4.00	4.25	8.25
Other poisoning	3.31	3.25	6.56
Vehicle collisions	3.25	3.25	6.50
Habitat restoration – prey management	2.75	3.19	5.94
Disturbance to nests – nest enhancement	2.63	3.31	5.94
Starvation - supplemental feeding	3.50	2.38	5.88
Habitat management – fire regime	2.75	3.06	5.81
Mortality at older wind projects - repowering	2.44	3.25	5.69
Poaching	2.75	2.75	5.50
Mortality at older wind projects – prey reduction	2.44	2.93	5.37
Livestock depredation control	2.38	2.88	5.25
Artifical nesting structures	2.47	2.38	4.84
Secondary trapping	1.88	2.25	4.13
Stock Tank Drowning	1.67	2.25	3.92
Fence collisions	1.25	1.63	2.88

Factor Effect represents the relative rank of the factor in its impact on eagle populations
Mitigation Effect represents the relative rank of the effectiveness of mitigation in reducing the factor impact

Offsetting Eagle Take

Model Development

- Assembled team of eagle biologists and lead toxicologists
- Utilized structured approach to elicit expert judgments
  - Model design
  - Parameter vales
- Created a custom computer model estimating eagle deaths due to lead exposure
  - Specified geographic area – Wyoming
  - Specific time period – big game harvest season

Model Development (cont'd)

- Individual expert uncertainty and diversity in responses captured as probability distributions
- Variance in expected outcomes estimated by 1,000 simulations with stochastic sampling
- Conducted sensitivity analyses of key parameters
  - Maximum gut piles eaten
  - Blood lead exposure per gut pile consumed
  - Mortality rate due to blood lead
- Iterative Process

Participating Experts

- Pete Bloom – Bloom Consulting, Inc.
- Michael Collopy – University of Nevada - Reno
- Chris Franson – U. S. Geological Survey
- Grainger Hunt – The Peregrine Fund
- Todd Katzner – University of West Virginia
- Terra Kelly – UC Davis
- Mike Kochert – U. S. Geological Survey (ret.)
- Brian Millsap – U. S. Fish and Wildlife Service
- Robert Murphy – U. S. Fish and Wildlife Service
- Patrick Redig – University of Minnesota
- Bruce Rideout – San Diego Zoo
- Leslie New – U. S. Geological Survey

* Names listed in green are lead toxicology experts; names in blue are eagle experts.

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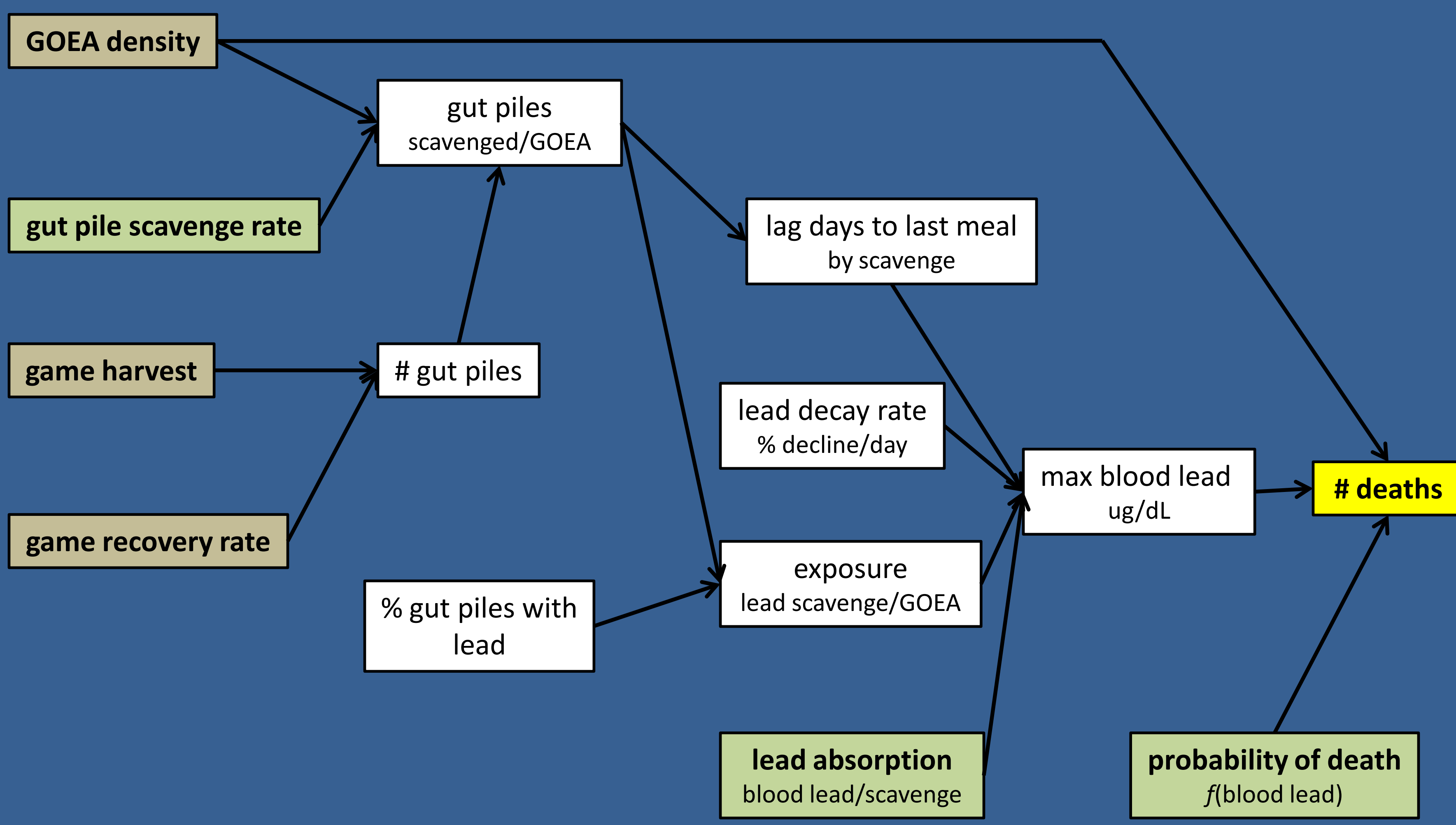
Some Model Assumptions

- Eagles are adept at finding gut piles
- Expected scavenging rate can be calculate directly from eagle density
- Maximum blood lead a useful index of lead exposure and potential mortality
- Predicting probability of “acute” poisoning mortality within one month is reasonable approach
- Population-based model accurately represents natural variation in individual eagle deaths

Work Completed to Date

- One workshop and six web conference meetings with experts
- Extensive literature review
- Working model built with MatLab (with regional data on game harvests and eagle abundance as inputs)
- Estimates of number of adult golden eagles "saved" due to mitigation implemented during fall big game harvest season
- Can run scenarios with status quo and alternative degrees of lead abatement mitigation

Lead mortality model "influence diagram" = Baseline



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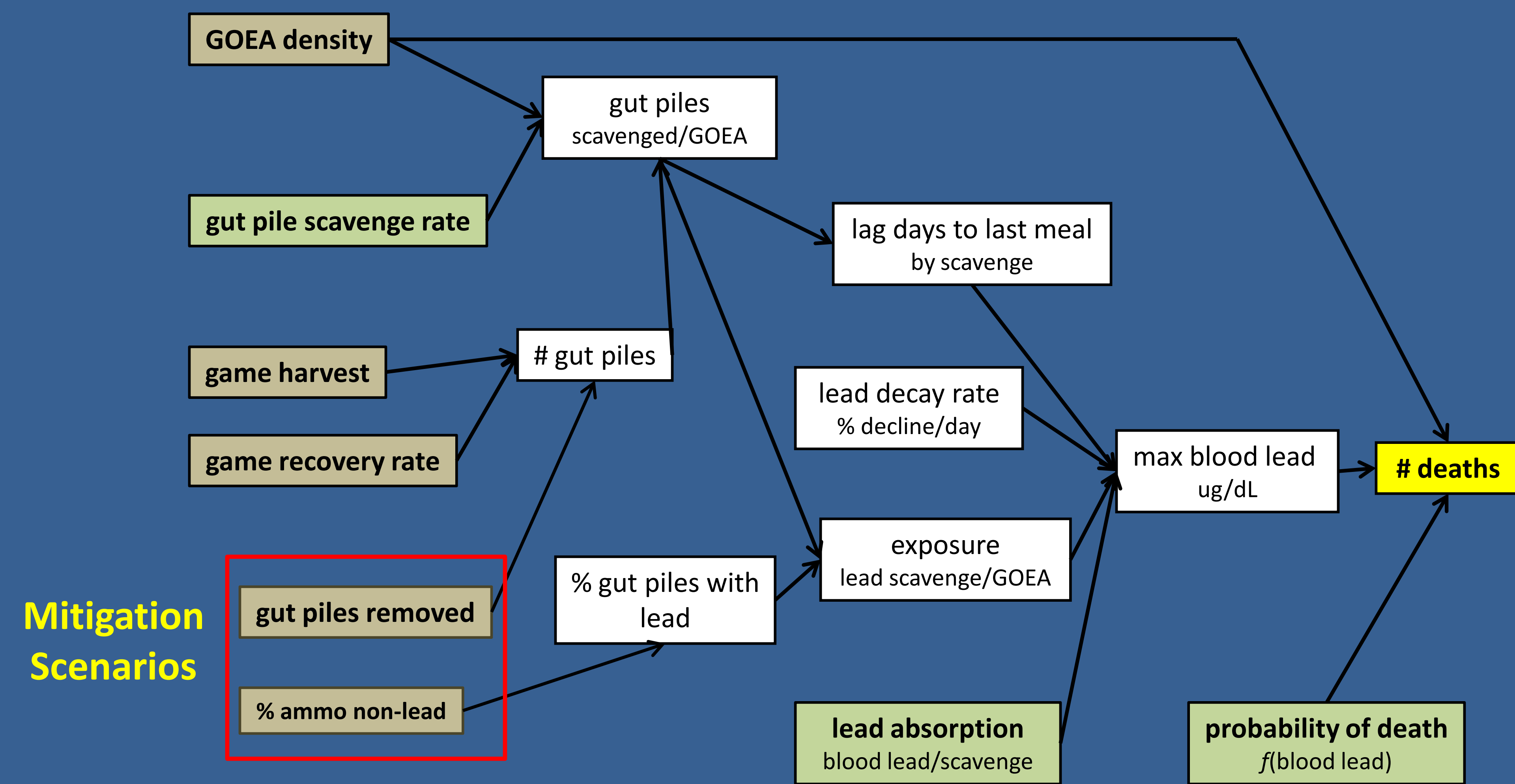
Lead mortality model with "mitigation"



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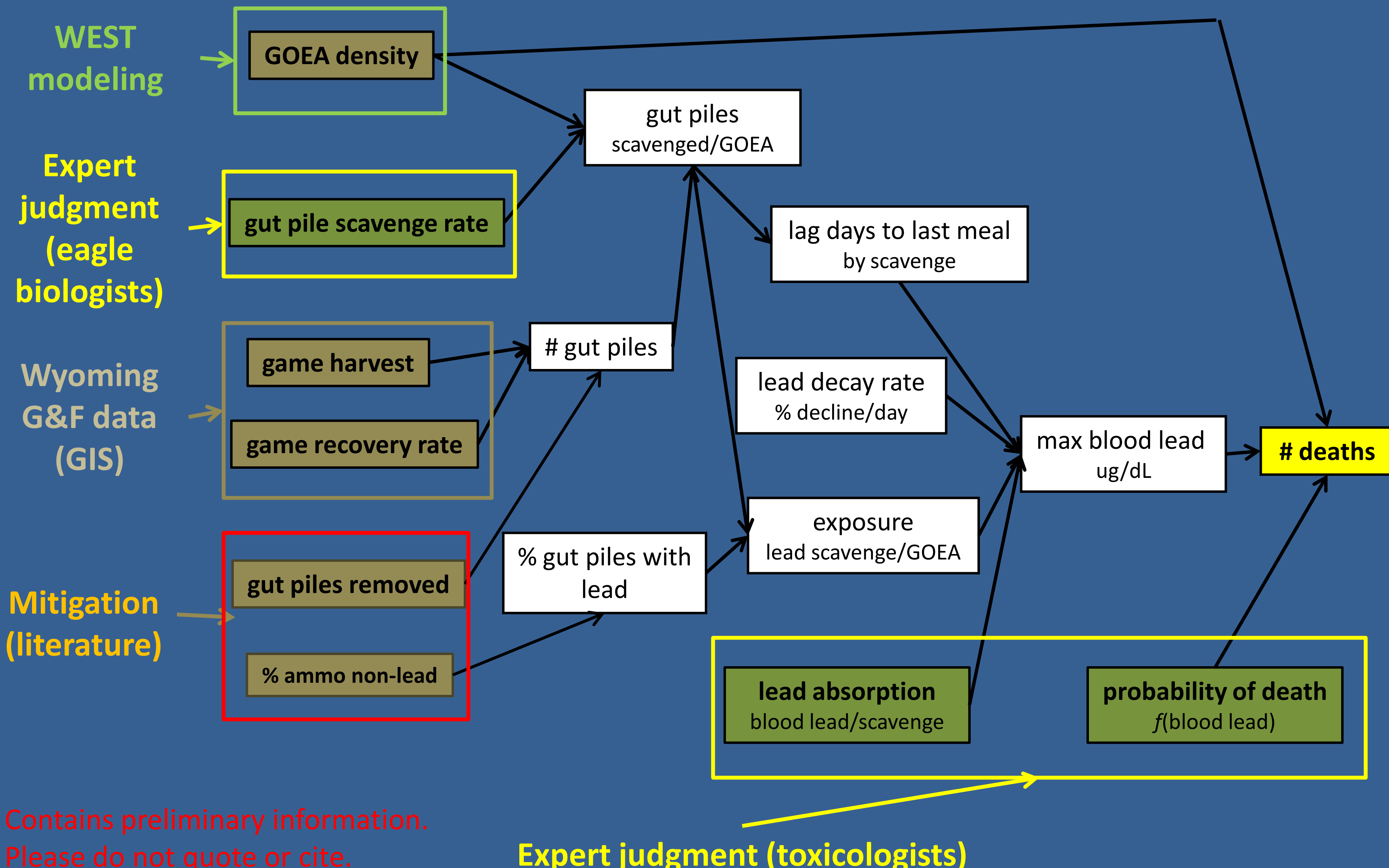
Lead mortality model "sources of data"



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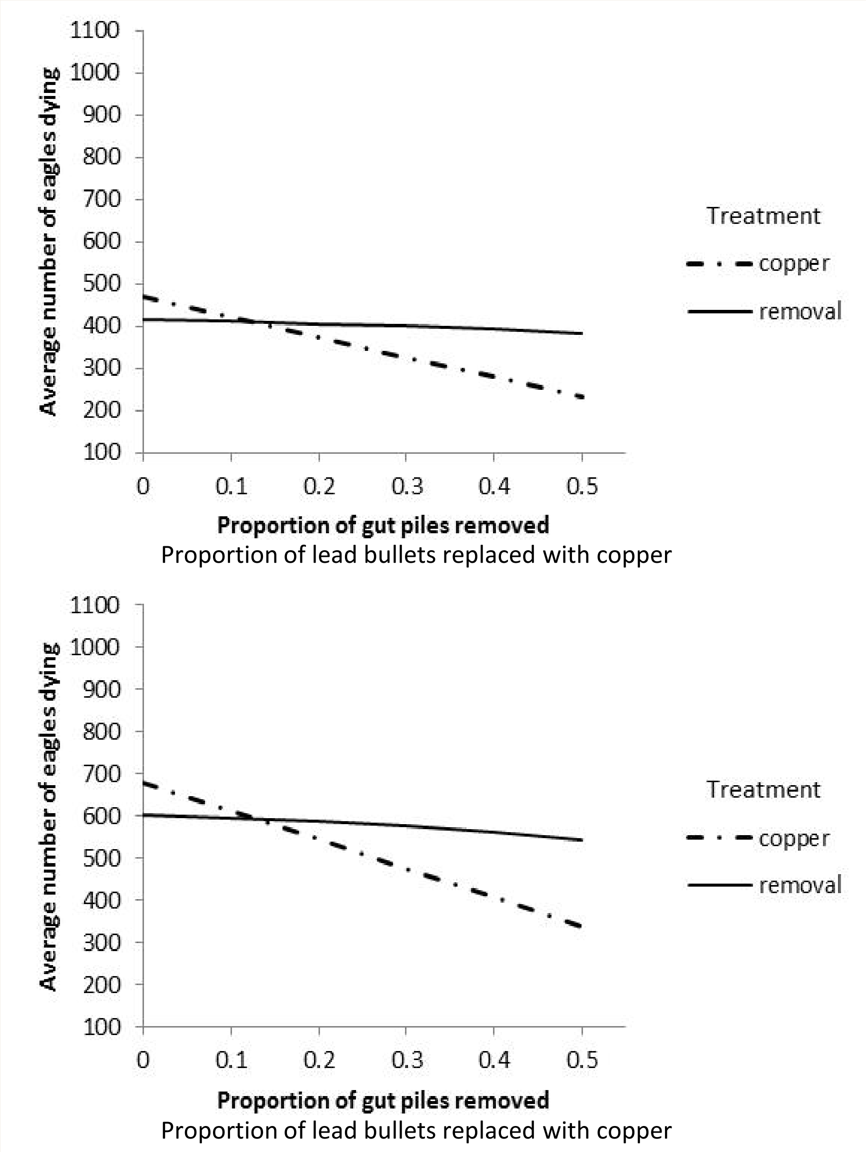
Comparing effectiveness of use of copper bullets versus removing gut piles for reducing number of eagle deaths*

1.0 eagles per 100 km^2

1.5 eagles per 100 km^2



* Lines represent averages of 100 iterations

Additional Steps to Implement

- Refine the model to reflect regional details and mitigation methods
- Use the model to evaluate specific mitigation strategies (& uncertainties)
- Design adaptive management approach and monitoring priorities and protocols
- Continue conversations with agencies and industry partners to test/implement model

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Next Steps

- Consider additional sources of lead inputs, e.g., varmint hunting
- Create vehicle collisions model (April-October 2014)
- Scope prey habitat management (May 2014)

Questions?

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