Morning Agenda

1. Welcome and overview – Kim Rodrigues, 10 – 10:30

   Background of SNAMP and Integration Team Adaptive management concepts and terms.

2. Update on Implementation of the Last Chance Project – Chris Fischer, 10:30 – 10:50

   Release of draft EA

3. UM Canopy Reduction/Telemetry study and relevance to the SNAMP Owl Study – Dr. Rocky Gutierrez, 10:50 – 12:20

   Telemetry study goals/research questions/study methods/findings;
   Relevance of telemetry findings to SNAMP owl research design;
   Questions about study or others related to spotted owls in general

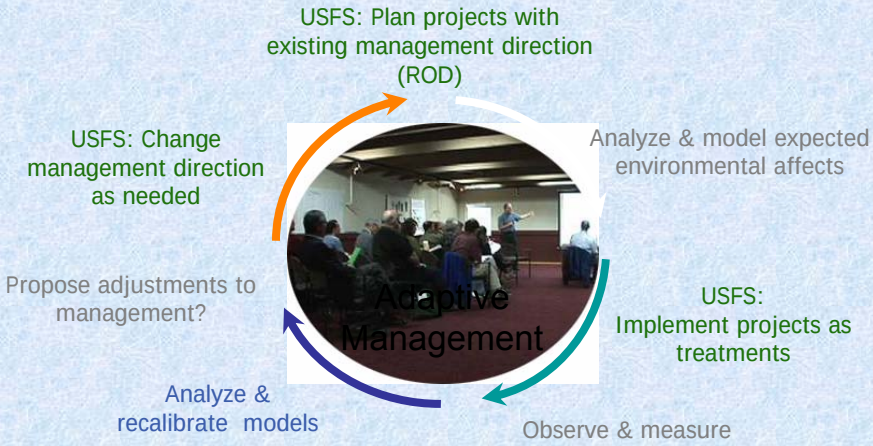
SNAMP Public Participation Team: Our Role

- **Public Participation**: to engage the public as stakeholders in this research project and develop a "community of stakeholders" at local and regional scales.
- **Open and Transparent Processes**: We are committed to them and will adhere to our role as a neutral third-party.
- **Information Tracking**: We will follow how information is gathered and used as it is fed back into the adaptive management process.

Purpose of an Integration Team Meeting

- To close the gap in the adaptive management circle where scientific information is integrated into future management decisions.
- Ensuring that adequate scientific and technical information is shared by all interested participants.

Adaptive Management Framework



Today's Goals

- To understand the current spotted owl study and share results of the spotted owl telemetry study
- To discuss the relevance of the telemetry study for SNAMP research
- To review potential indicators for management of owls

Effects of Canopy Reduction on Spotted Owls: Implications for SNAMP

R. J. Gutiérrez, Sheila Whitmore, Mark Seamans, Guthrie Zimmerman, William Perry, and Peter Stine

Foresthill, California
5 August 2009

Goal of Owl Integration Meeting

- Review Recent SPLAT experiment and relevance for SNAMP
- Discuss current SNAMP approach for owls
- Begin thinking about metrics or "parameters of interest" (how do we assess the effects of SPLATS on owls)

Outline for Morning Session

- History of owl habitat studies and inferring effects of logging on owls
- Canopy Reduction study design: successes and failures
- Treatment Effects
- Analysis of Owl Responses
- Post hoc models
- Inferences: equivocal
- Relevance to SNAMP

REVIEW: ESA LISTING

- **Overuse**
- **Disease or Predation**
- *Inadequacy of regulatory mechanism*
- *Loss of Habitat*
- **Other factors (e.g., *Demographic Rates*)**

SNAMP AND OWLS

- Sierra Framework = one reason CSO not listed at threatened
- SPLATS = key a feature of Sierra Framework
- EFFECTS of SPLATS on CSO unknown
- Effect of SPLATS is key uncertainty that could lead to listing of CSO

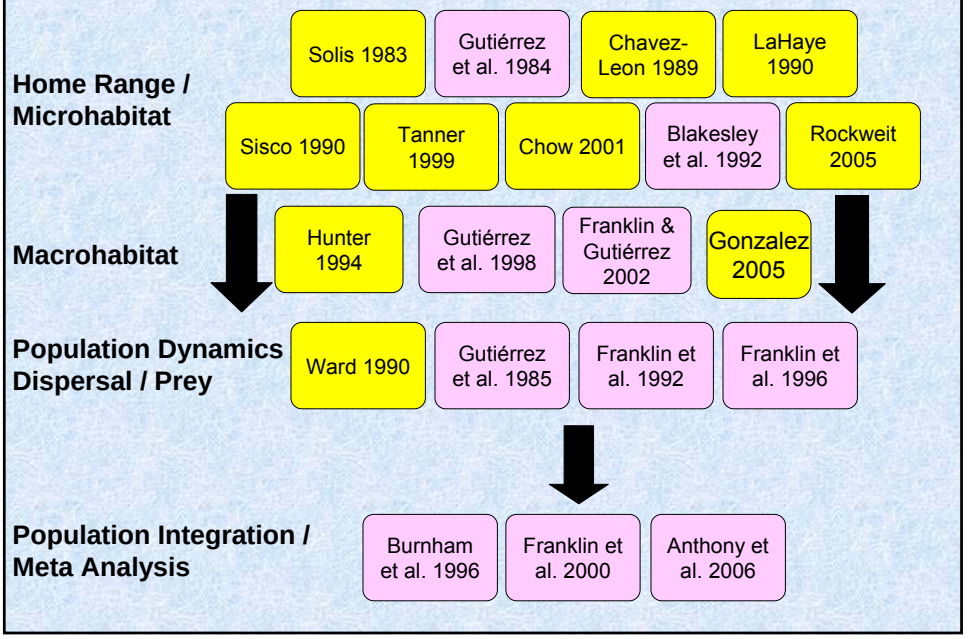
Habitat of the Spotted Owl

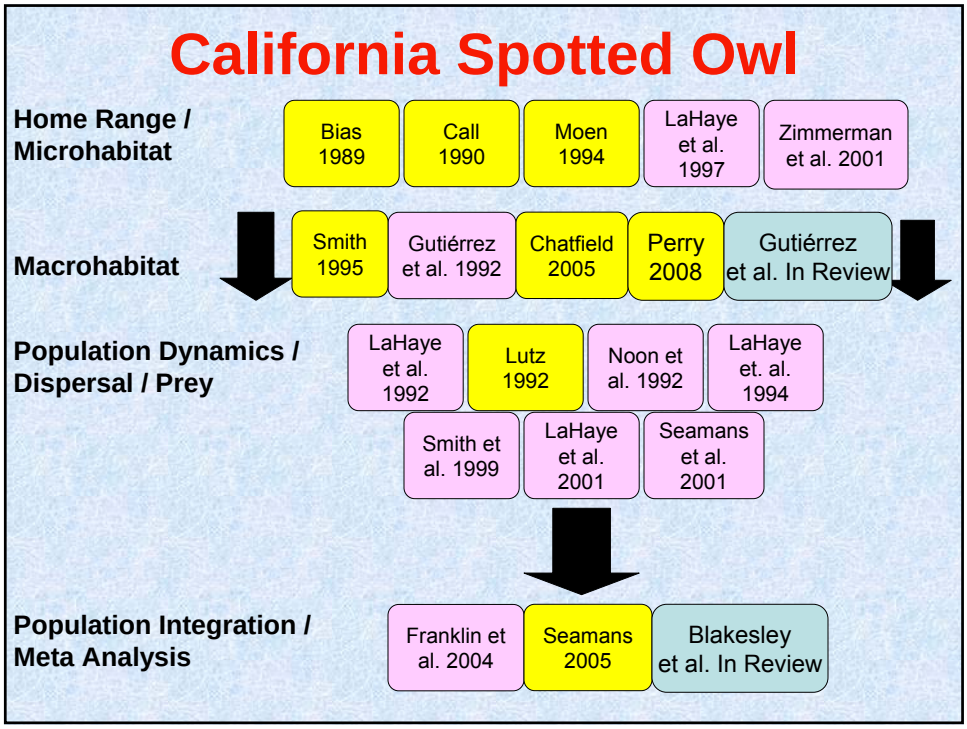
- Habitat is central to the conservation of spotted owls & also an issue of controversy
- Population dynamics are an equally important issue for owls (two can be linked)

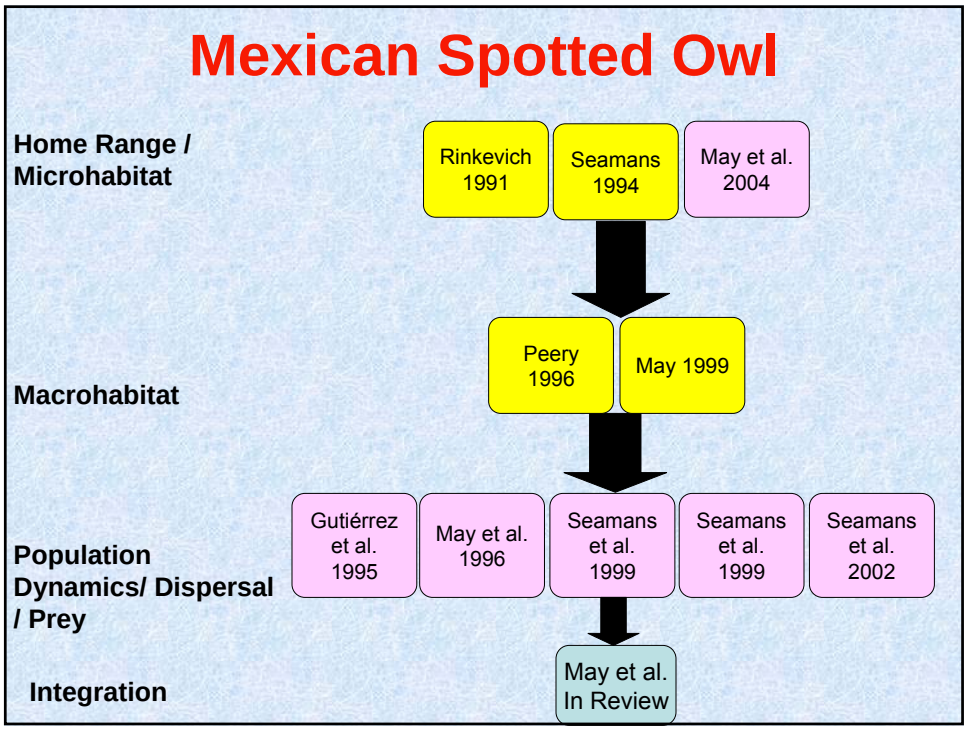
Historic Approach of UMN Owl Team

- Hierarchical (in scale and question)
- Replicated (space, time, subspecies)
- Geographical
- Integrative (linking habitat, weather, and population dynamics)
- All of these are still correlative assessments of patterns

Northern Spotted Owl




California Spotted Owl
Home Range / Microhabitat
Bias 1989
Call 1990
Moen 1994
LaHaye et al. 1997
Zimmerman et al. 2001
Macrohabitat
Smith 1995
Gutiérrez et al. 1992
Chatfield 2005
Perry 2008
Gutiérrez et al. In Review
Population Dynamics / Dispersal / Prey
LaHaye et al. 1992
Lutz 1992
Noon et al. 1992
LaHaye et. al. 1994
Smith et al. 1999
LaHaye et al. 2001
Seamans et al. 2001
Population Integration / Meta Analysis
Franklin et al. 2004
Seamans 2005
Blakesley et al. In Review


Mexican Spotted Owl
Home Range / Microhabitat
Rinkevich 1991
Seamans 1994
May et al. 2004
Macrohabitat
Peery 1996
May 1999
Population Dynamics/ Dispersal / Prey
Gutiérrez et al. 1995
May et al. 1996
Seamans et al. 1999
Seamans et al. 1999
Seamans et al. 2002
Integration
May et al. In Review

A Quarter Century of Results: Habitat

- Most studied raptor habitat in the world (Lõhmus 2004)
- Variable habitat selection and space use across its ranges
- Habitat Specialist
- Habitat correlated with survival and occupancy but less so with reproduction

Spotted Owls are Structure Dependent

- Owls use younger forest if they resemble older forest (large trees, uneven tree diameter distribution, high canopy cover, coarse woody debris)

HOW DOES LOGGING AFFECT OWLS?

- Most inferences are oblique (absence; low density): patterns not cause and effect
- Experiments needed (Gutiérrez 1985)
- No habitat experiments for the next 20 years (Noon and Franklin 2002)

Underlying Issues

- Is the owl sufficiently plastic to adapt to perturbations of its habitat?
- Yes, they have persisted in a dynamic environment (fire etc.)
- Also “persist” when habitat logged
- But, this adaptation is not unlimited or we would find them everywhere
- So what are the thresholds of tolerance?

Experiment: Effect of Canopy Reduction on Spotted Owls

- Historical Context - CASPO (1992)
- Multiple subsequent plans failed
- 2004 Sierra Framework
- SPLATS and others land “treatments”
- SPLATS controversial – USFS desired an understanding of the effects of SPLATS on owls

The Experiment

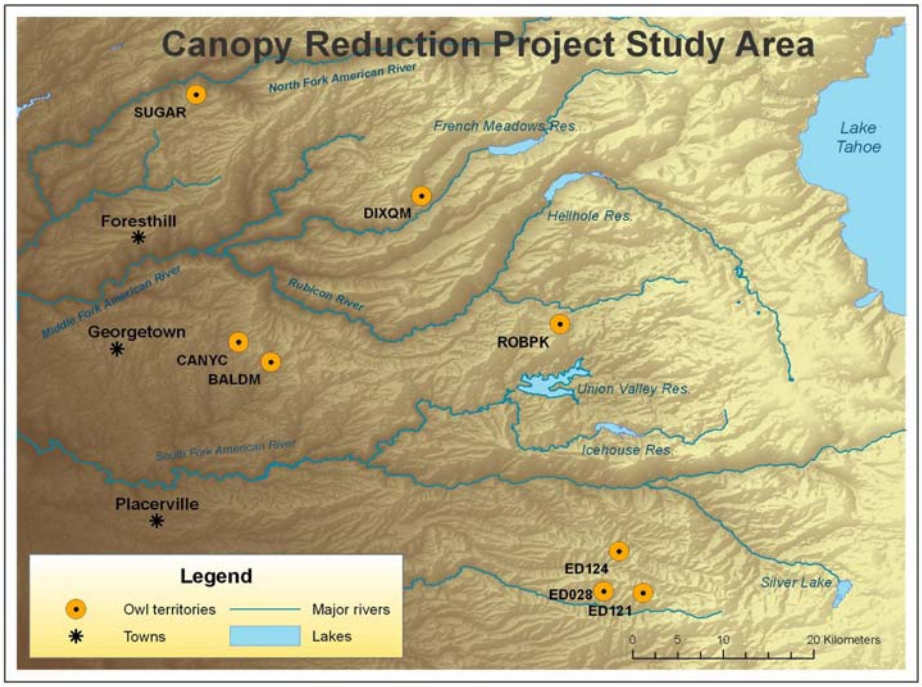
- Inference Population – Central Sierra Nevada
  - All known owls
- *Random* selection of owls
- *Replication* (RFP=20 owls; our design=24)
- *Local Control*
  - Remove territories with confounding effects
  - Model other effects

Measure Acute Responses: Estimated by Telemetry

- Death
- Change home range size
- Shift home range
- Shift home range relative to treatment

Design: Time Sequence

- Spring 2005 – randomly select owl sites
- Summer 2005 – survey sites
- Spring 2006 – Capture owls
- May-Jul 2006 – pre-treatment monitoring
- Jul-Aug 2006 – treatment [actual Sep-Nov]
- Sep-Oct 2006 – post-treatment monitoring [May-Aug 2007 - Actual post-treatment monitoring]
- Aug 2007 – Jul 2008 – removal of transmitters



Results: Design Successes

- Selected 12 sites (6 treatment and 6 control; target was 10 sites [=20 owls])
- Detected 23 owls in 2005 and 16 in 2006
- Radio-marked 14 birds of 16 birds
- 9 owls with sufficient data for analysis (5 control and 4 treatment)

Results: Design "Failures"

- "Failure" to implement initial selection criteria (2 sites could not be treated)
- "Failure" to sell timber (time delays)
- *Birds "disappeared" prior to capture (decrease sample size)*
- Treatments not conducted on schedule (time delay)

Results: Summary of survey effort, status, and fate of spotted owls and probable consequences for design

Original Site[1]	Sex	Experimental Unit	# Surveys 2005[2]	2005 Status[3]	Fate 2006/7[4]
Bald Mountain	F	Control	13	Pair	K
Bald Mountain	M	Control	13	Pair	S (n = 3, 23)
Canyon Creek	M	Treatment	18	Pair	S (n = 6, 4)
Canyon Creek	F	Treatment	18	Pair	ND
Dixie Queen Mine	F	Control	8	Pair	S (n = 2, *)
Dixie Queen Mine	M	Control	8	Pair	ND
Dolly	F	Treatment	10	Pair	FM
Dolly	M	Treatment	10	Pair	F
ED028	F	Control	9	Pair	S (n = 2, 1)
ED028	M	Control	9	Pair	S (n = 2, 4)
ED059	F	Control	11	Pair	NA
ED059	M	Control	11	Pair	NA
ED121	F	Treatment (replacement site)	4	Pair	S (n = 5, 2)
ED121	M	Treatment (replacement site)	4	Pair	F
ED124	F	Treatment (originally control, replaced as treatment site)	7	Pair	S (n = 3, 1)

Results Continued: Summary of survey effort, status, and fate of spotted owls

Original Site[1]	Sex	Experimental Unit	# Surveys 2005[2]	2005 Status[3]	Fate 2006/7[4]
ED124	M	Treatment (originally control, replaced as treatment site)	7	Pair	FM
ED164	F	Treatment	14	Pair	NA
ED164	M	Treatment	14	Pair	NA
ED200	F	Control (replacement site)	6	None	FM
ED200	M	Control (replacement site)	6	Single	ND
Long Meadow	F	Treatment	7	Pair	ND
Long Meadow	M	Treatment	7	Pair	ND
Rob's Peak	F	Control	21	Pair	ND
Rob's Peak	M	Control	21	Pair	S (n = 7, 14**)
Sugar	F	Treatment (originally control)	7	Pair	D
Sugar	M	Treatment (originally control)	7	Pair	S (n = 3, 1)
Whiskey	F	Treatment	15	Pair	ND
Whiskey	M	Treatment	15	Pair	ND

Canopy Reduction Treatments

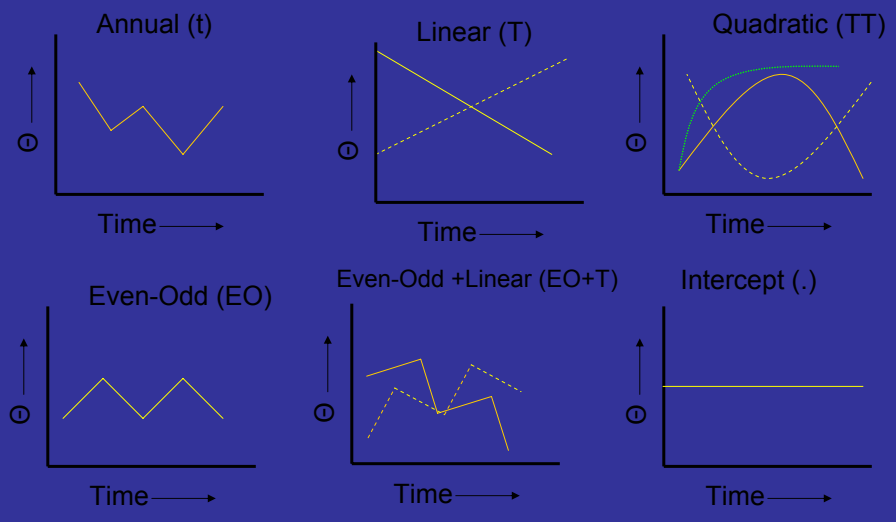
pre-treatment
(at territory ED121)

post-treatment
(at territory Canyon Creek)

Bayesian Model Selection

- Likelihood vs. Bayesian
- MCMC simulation of parameter estimation deciding factor because of small “n”
- *a priori* model development – key to this afternoon’s discussion
- Parsimonious selection of best model
- Conceptual Examples

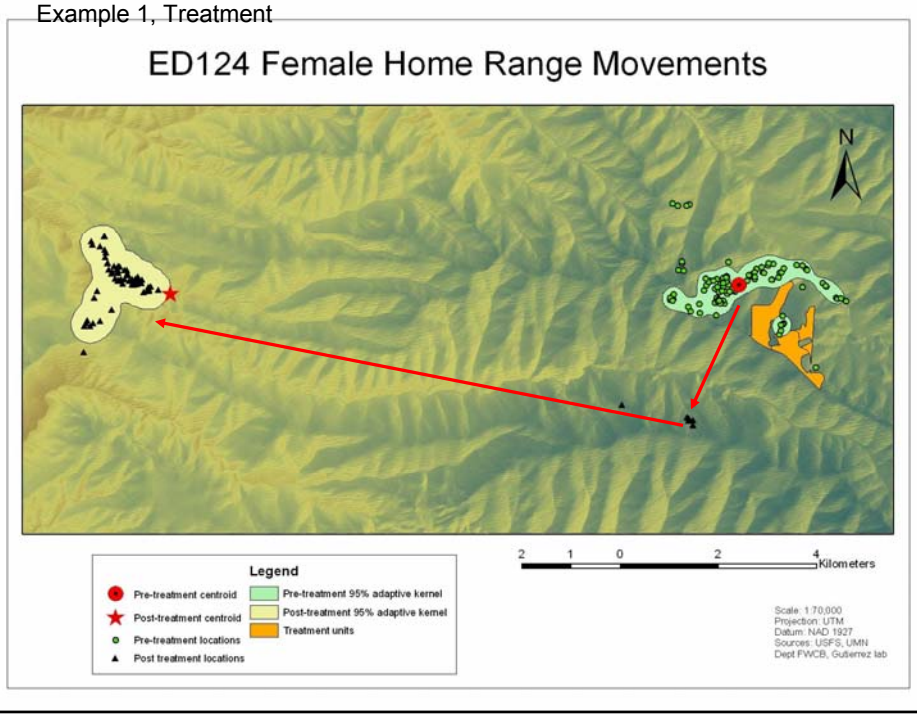
a priori Model Examples



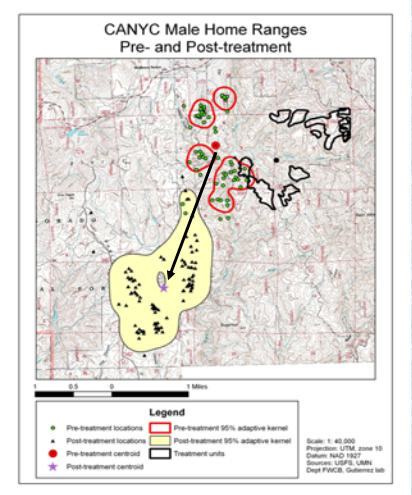
Results: Response Variables

- Home Range Size
- General Shift in home range
- Shift in home range with respect to treatment

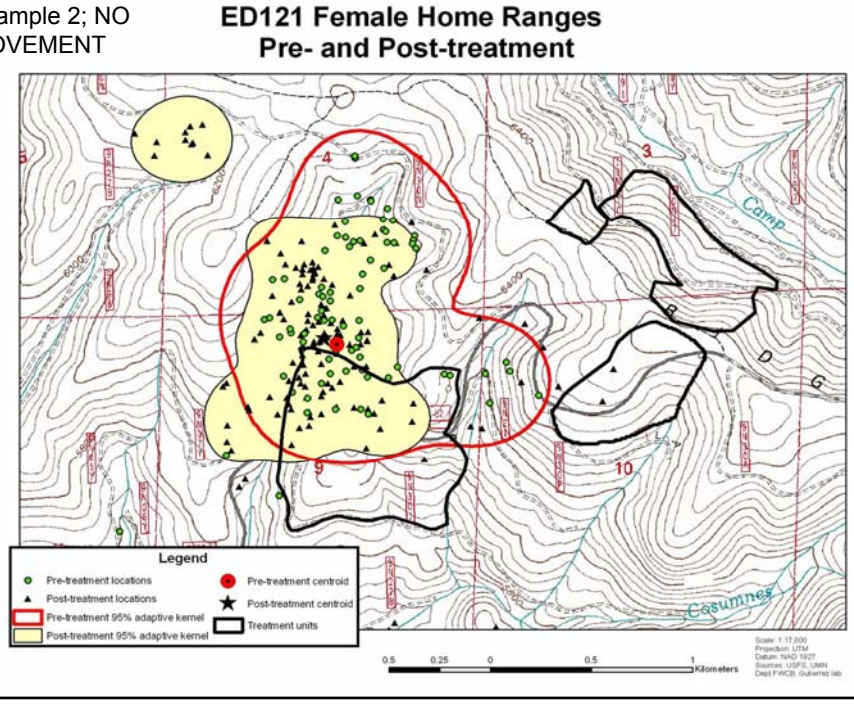
Example 1, Treatment



EXAMPLE 2. MOVEMENT BY TREAMENT BIRD



Example 2; NO MOVEMENT



Results

- Home Range: both T&C Owls increased HR, but C more so (T=46 ha; C=77 ha)
- HR Shift: T Owls moved more than C Owls (T=4143 m; C=3959 m)
- HR Shift Relative to Treatments: T Owls moved further from treatments than C Owls (T=3661 m; C=3217 m)

Results: a priori models: ΔR = Response variable of interest

Model No.	Model Description	Model Variables
1	Treatment/Control (T: Treatment =1 control = 0)	$\Delta R = B_0 + B_1*T$
2	Treatment area	$\Delta R = B_0 + B_1*TA$
3	Treatment/Control + pre-treatment spotted owl habitat	$\Delta R = B_0 + B_1*T + B_2*SOH$
4	Treatment area + pre-treatment spotted owl habitat	$\Delta R = B_0 + B_1*TA + B_2*SOH$
5	Pre-treatment canopy closure and treatment area effect	$\Delta R = B_0 + B_1*CC + B_2*TA$
6	Pre-treatment large tree density and treatment area effect	$\Delta R = B_0 + B_1*LTD + B_2*TA$
7	Means (Null or No Effect Model)	$\Delta R = B_0$

Effects of logging on owl home range size: Bayesian model selection results

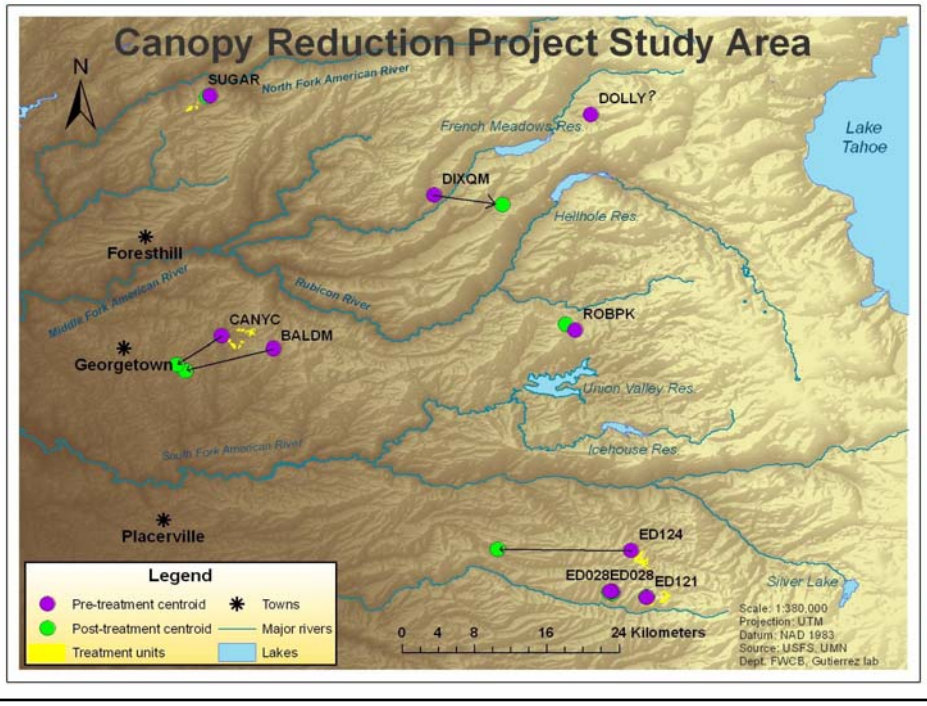
Model	Model Variables and Predictions	Dbar	PD	DIC	Delta DIC
Pretreatment canopy cover and treatment area effect	$\Delta HR = B_0 - B_1*CC + B_2*TA$	127.090	4.118	131.207	0.000
Means Model	$\Delta HR = B_0$	130.424	2.129	132.553	1.346
Treatment area	$\Delta HR = B_0 + B_1*TA$	131.143	3.323	134.466	3.259
Treatment/Control + pretreatment spotted owl habitat	$\Delta HR = B_0 + B_1*T - B_2*SOH$	130.303	4.348	134.651	3.444
Treatment area + pretreatment spotted owl habitat	$\Delta HR = B_0 + B_1*TA - B_2*SOH$	130.297	4.413	134.710	3.503
Treatment/Control (T: Treatment =1 control = 0)	$\Delta HR = B_0 + B_1*T$	131.549	3.228	134.777	3.570
Pretreatment large tree density and treatment area effect	$\Delta HR = B_0 - B_1*LTD + B_2*TA$	130.432	4.385	134.817	3.610

Effect of logging on general home range shifts of owls: Bayesian model selection results

Model	Model Variables and Predictions	Dbar	PD	DIC	Delta DIC
Treatment/Control + Spotted owl Habitat (area of habitat pretreat or post)	$\Delta CENT = B_0 + B_1*T - B_2*SOH$	200.034	2.160	202.193	0.000
Treatment area + Spotted owl Habitat pretreatment	$\Delta CENT = B_0 + B_1*TA - B_2*SOH$	200.826	3.313	204.139	1.946
Pretreatment canopy cover and treatment effect	$\Delta CENT = B_0 - B_1*CC + B_2*TA$	201.991	3.333	205.324	3.131
Means model	$\Delta CENT = B_0$	204.487	1.024	205.510	3.317
Treatment/Control (T: Treatment =1 control = 0)	$\Delta CENT = B_0 + B_1*T$	204.474	1.042	205.516	3.323
Treatment area	$\Delta CENT = B_0 + B_1*TA$	203.379	2.181	205.560	3.367
Pretreatment large tree density and treatment effect	$\Delta CENT = B_0 - B_1*LTD + B_2*TA$	203.420	2.897	206.316	4.123

Effect of logging on home range shifts relative to treatments: Bayesian model selection results

Model	Model Variables and Predictions	Dbar	PD	DIC	Delta DIC
Treatment/Control + Spotted owl Habitat (area of habitat pretreat or post)	$\Delta CENT = B_0 + B_1*T - B_2*SOH$	199.913	2.160	202.073	0.000
Treatment area + Spotted owl Habitat pretreatment	$\Delta CENT = B_0 + B_1*TA - B_2*SOH$	200.739	3.313	204.052	1.979
Means model	$\Delta CENT = B_0$	203.466	1.029	204.495	2.422
Treatment/Control (T: Treatment =1 control = 0)	$\Delta CENT = B_0 + B_1*T$	203.456	1.048	204.504	2.431
Treatment area	$\Delta CENT = B_0 + B_1*TA$	202.551	2.185	204.736	2.663
Pretreatment canopy cover and treatment effect	$\Delta CENT = B_0 - B_1*CC + B_2*TA$	202.136	3.333	205.469	3.396
Pretreatment large tree density and treatment effect	$\Delta CENT = B_0 - B_1*LTD + B_2*TA$	202.987	2.911	205.899	3.826



Post hoc Modeling

- Mate loss could be confounding factor ~ owls who lose mates are more likely to move (recall T&C movement distances)
- Pos hoc modeling
  - All Competing Models in original analysis
  - Plus mate loss model, mate loss+Tc, and mate loss+Ta [plus means if not in original]
- Results – did not improve inferences (no post hoc models were competing)

DISCUSSION

- **Results equivocal, but not uninformative**
- **Experiments of this scale are difficult!**
- **Bad luck in timing (natural and unnatural)**
- **Greater movement by owls who have more habitat seems counter intuitive**
- **Owls probably (treatment owls moved farther than control owls in both cases) affected by logging but *may* adjust in the short term**
- **Home range size confounded by time and sampling duration for HR estimation**

Implications for SNAMP

- Logistics and money dictate that radio telemetry not the ideal choice for spotted owls
- Constraints
  - Need annual change of transmitters
  - Need good monitoring locations
  - Need close access to birds
  - Need pre-treatment use data, selection of sites should be based on use, need post-treatment monitoring (= 4 year minimum study/radios)
  - Need huge sample size (30 treatments/30 controls)

Is There additional silk in this sow's ear?

- **Results inform Adaptive Management**
- **Telemetry and Acute Effects are not best for experiments on owls**
- **Chronic Effects estimated by survival, occupancy are alternative approaches**
- **Hence, this is the approach taken by SNAMP Owl Team**

Adaptive Management: more observations

- **Adaptive management more complicated than experiments**
- **Results inform future experiments**
- **Structure of process important (interaction among parties)**
- **Adaptation comes from all information even failures**
- **Communication is key – ergo integration meetings**

ACKNOWLEDGMENTS

- U. S. Forest Service biologists and rangers in the central Sierra Nevada
- Funding (**USFS**)

Lunch Break

We will resume the meeting at 1:00 pm

Thank You

Afternoon Agenda

1. Parameters of Importance – Dr. Rocky Gutierrez, 1:00 – 2:30
   - Modeling approach to identifying treatments effects;
   - Role of parameters in modeling:
     - Occupancy and population parameters
     - Habitat parameters
   - Nomination of parameters by group
2. Wrap up/Next Steps/Evaluation – Kim Rodrigues, 2:30 – 3:00

Spotted Owl: Parameters of Interest

SNAMP INTEGRATION TEAM MEETING

5 August 2009

Types of Modeling

- *Verbal* – stated relationship between response and predictor variables
- *Mathematical* – may or may not use data
  - Evaluate scenarios given assumptions
- *Statistical* – use of empirical data
  - Test hypotheses
  - Evaluate alternatives

Purpose of Discussion Today

- Begin process of model construction
- Articulate and discuss response variables (pros and cons of each)
- Discuss (retain, reject, or unsure) possible predictor variables (i.e., other parameters of interest that might explain response parameters of interest)

Response Variables (Primary Parameters of Interest)

- Survival (apparent survival)
- Reproduction
- Occupancy
- Others?
- Which is likely not to give us a strong result? Why?

Occupancy Modeling

- Presence-absence data corrected for detectability
- Components of Interest
  - Occupancy rate
  - Extinction rate
  - Colonization rate

“A Priori” Hypothesis (model)

- What does this mean?
- “a priori” means that the hypothesis is stated before the analysis to avoid spurious conclusions [“over fitting”]
- Why is it important (why verbalize model)?

A Priori Verbal Model

- Number of a priori models is infinite, so must constrain number of models to those that are plausible, those for which we have data, and for which the amount of data is sufficient to support
- Plausibility = do we think a predictor variable truly might affect a response variable?

DISCUSSION

Plausible Hypothesis

- What is most obvious one that is likely to be missed? .
- Others?

Thank You

Please take a moment to fill out our online survey/evaluation at:

https://ucce.ucdavis.edu/survey/surveyadmin/surveyformat.cfm?surveynumber=2916

The public participation team uses these evaluations to help better our outreach efforts and to ensure your input is taken into consideration.