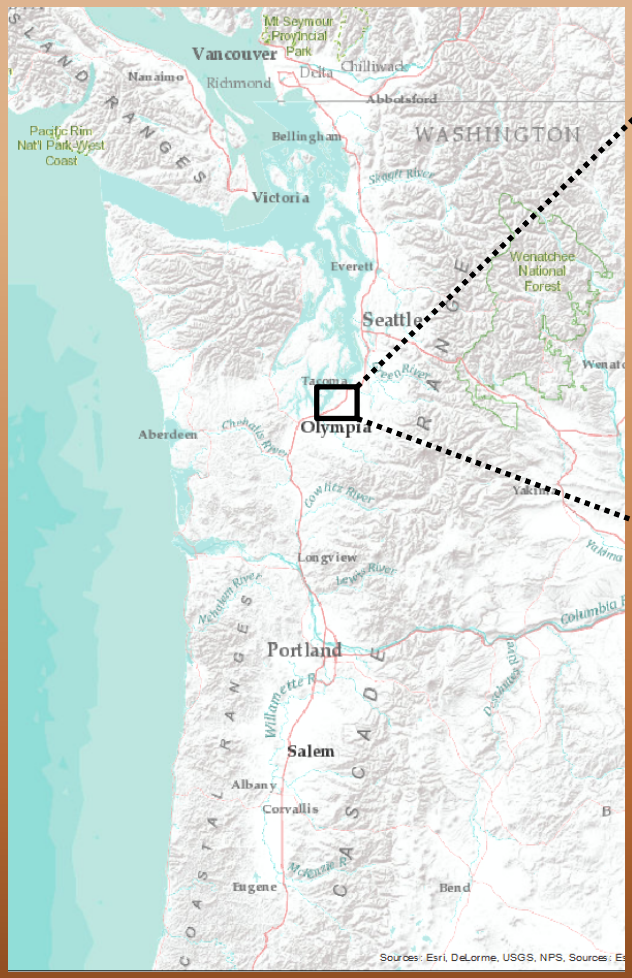
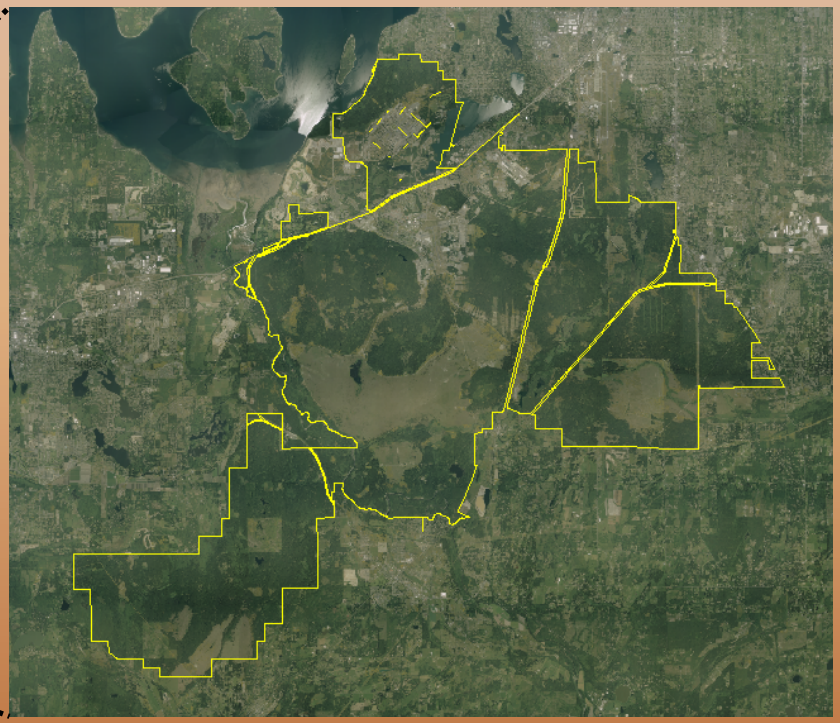
Pocket Gopher Response to Prescribed Fire on JBLM

Center for Natural Lands Management

Joint Base Lewis-McChord

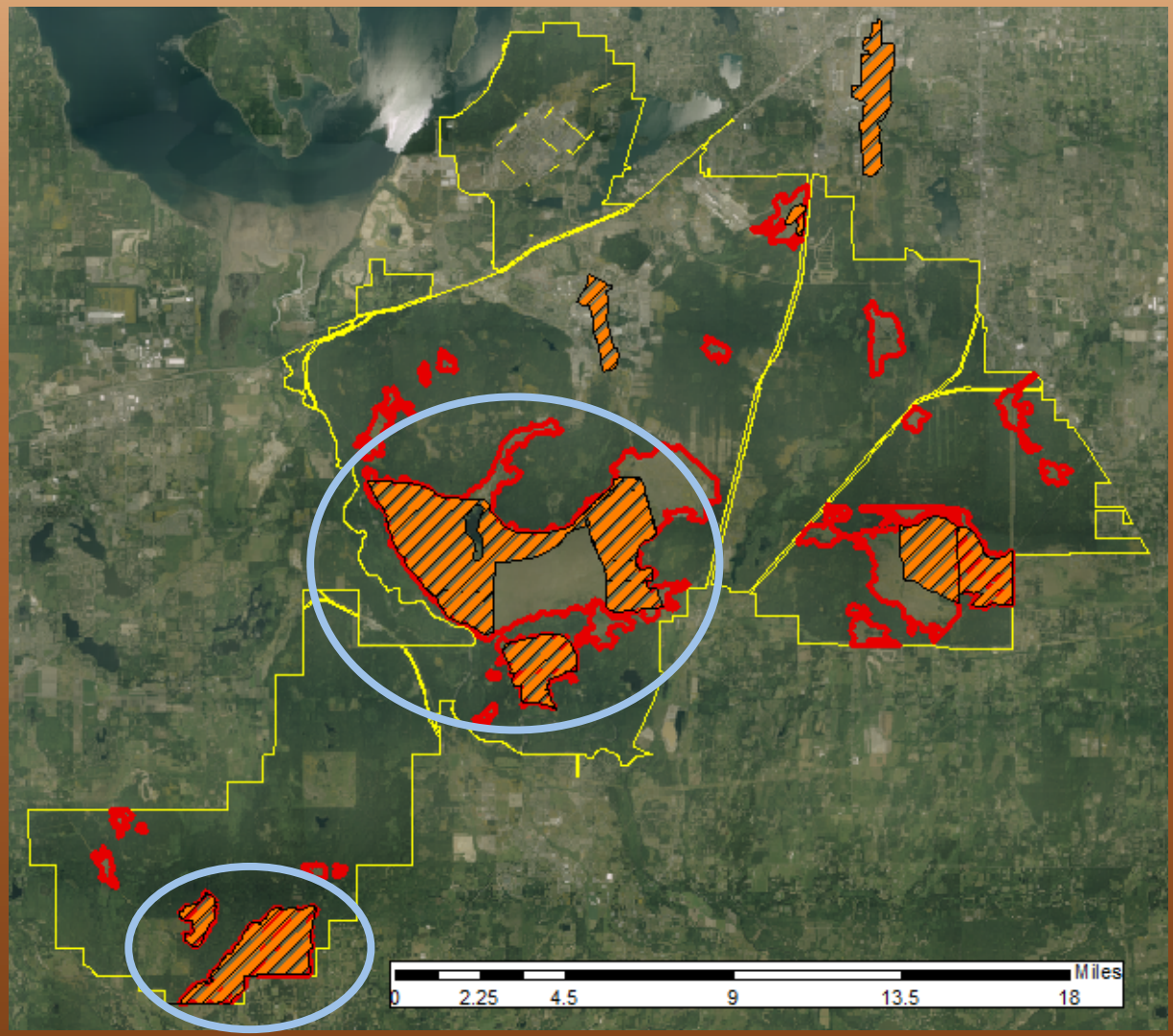




- ~86,000-acre Installation
- >14,000 acres of Prairie
- ~ 37 Prairie Units

Priority Habitat Areas

- > 11,000 acres
- 3 Federal-listed species
- High-quality Prairie
- Other Rare Species
- Multi-use Landscape



Fire – Management Tool

-Cost Effective Tool

-Prepares Sites for Restoration

-Maintains Prairie Structure

- •Consumes thatch & moss
- •Controls woody-plant invasion

Gopher Response to Fire

Long-term Response - **Positive**

- Abundant where frequent fire
- Populations persist where frequent fire
- Suitable structure maintained by fire

Short-term Response - **Unknown**

- Information vital to burn-management planning – *fire intervals*

If positive….*how long until effect diminishes?*

If negative….*when do populations rebound, to what extent?*

What is driving short-term response?

Goals & Objectives

Goal:

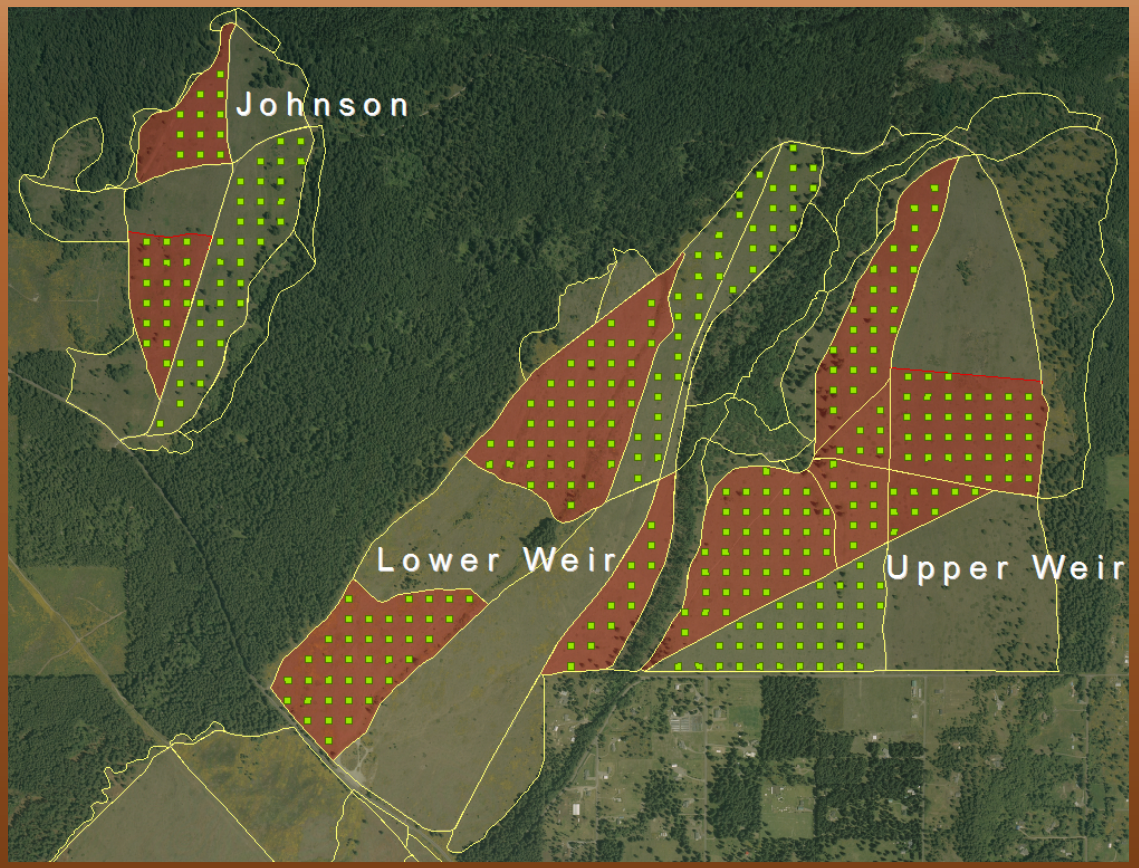
Quantify impact of prescribed fire on distribution of Mazama pocket gopher through time

Objectives:

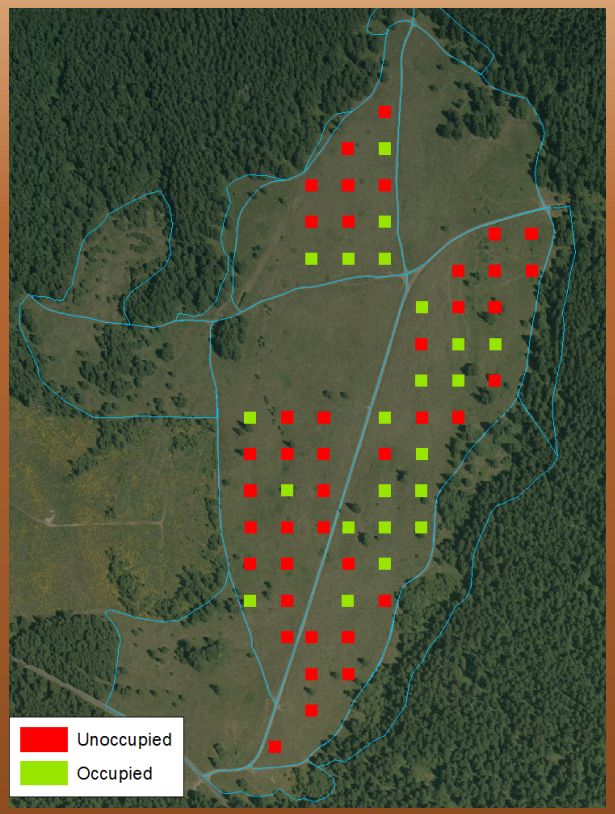
- Estimate patch-occupancy on 'Burned' and 'Unburned' management units
- Conduct surveys across 3 seasons
  - Summer (time of burn)
  - Fall
  - Spring
- Model detectability
- Investigate impact of burn severity, day-of-burn conditions, and burn history on patch occupancy

Gopher Mound Surveys

- **25 m X 25 m plots**
  - multiple home ranges per plot
  - 50-m spacing
- **Multi-season Design**
  - Summer (time of burn)
  - Fall
  - Spring
- **Repeat-visit Surveys**
  - 3 visits per season
  - 3-5 days between visits
- **Field Procedure**
  - Mound presence/absence
  - 2-minute maximum searches
  - Fresh mounds recorded



Occupancy Design – Confirming ‘0’



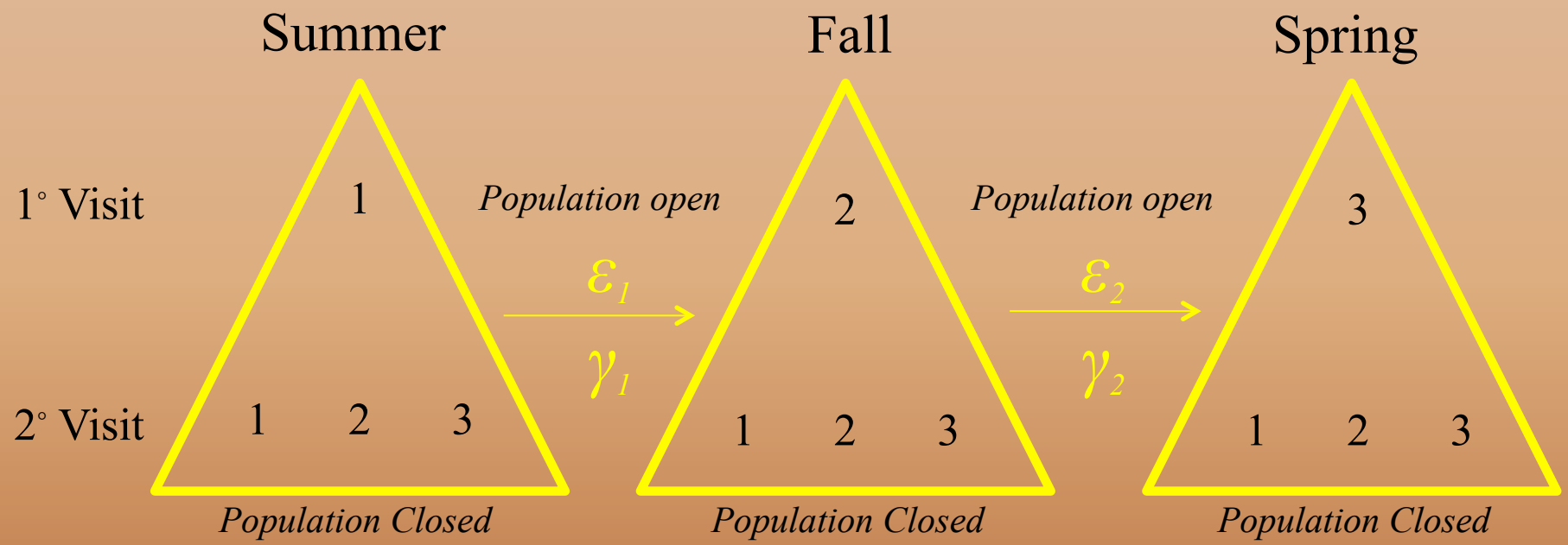
- Accounts for Animals Present But Not Detected

	Visit		
Sample	**V1**	**V2**	**V3**
1	1	1	0
2	0	0	1
3	0	1	0
.	0	1	0
.	0	0	0
j	1	1	1

Assumes:

- Population closure
- Likelihood of occupancy constant across samples…or modeled
- Likelihood of detection constant across samples…or modeled
- Capture histories are independent

Robust Design - Occupancy



ε = *Rate at which samples become* ***unoccupied***

γ = *Rate at which samples become* ***occupied***

Robust Occupancy Models*

Model Parameters			Model Performance				
Occupancy	Rate of Change	Detection (Summer) (Fall)	AICc	Δ AICc	w_i	Parameters	Deviance
Prairie * Treatment * Season	* Treatment	(Day) (Day)	1203.65	0	0.5042	16	222.8972
Treatment * Season	* Treatment	(Day) (Day)	1206.34	2.6896	0.13139	12	234.2143
Prairie * Treatment * Season	* Treatment	(Treatment*Day) (Treatment*Day)	1206.495	2.8455	0.12154	20	216.9292
Prairie * * Season	Prairie * Treatment	(Treatment*Day) (Treatment*Day)	1207.757	4.107	0.06468	20	218.1907
Treatment * Season	Prairie * Treatment	(Day) (Day)	1208.293	4.6434	0.04947	14	231.8772
Prairie * * Season	* Treatment	(Day) (Day)	1209.327	5.677	0.0295	12	237.2017
Prairie * Treatment * Season	* Treatment	(Day) (Treatment*Day)	1209.691	6.0412	0.02459	17	226.7527
Prairie * Treatment * Season	* Treatment	(Day) (Treatment*Day)	1209.691	6.0412	0.02459	17	226.7527
Prairie * Treatment * Season	Prairie * Treatment	(Treatment*Day) (Treatment*Day)	1210.729	7.0789	0.01464	24	212.1569
Prairie * * Season	Prairie * Treatment	(Day) (Treatment*Day)	1211.196	7.5464	0.01159	17	228.2579
Prairie * * Season	Prairie	(Day) (Day)	1211.403	7.7531	0.01045	11	241.4062
Prairie * * Season	Prairie * Treatment	(Day) (Day)	1211.603	7.9534	0.00945	14	235.1872
Prairie * Treatment * Season	Prairie	(Day) (Day)	1213.777	10.1273	0.00319	15	235.1986
* Treatment * Season	Prairie	(Day) (Day)	1216.726	13.0761	0.00073	12	244.6007
* Treatment *	* Treatment	(Day) (Day)	1228.266	24.6158	0	10	260.3863
Prairie * Treatment * Season	* Treatment	(Constant) (Day)	1229.5	25.8499	0	14	253.0837

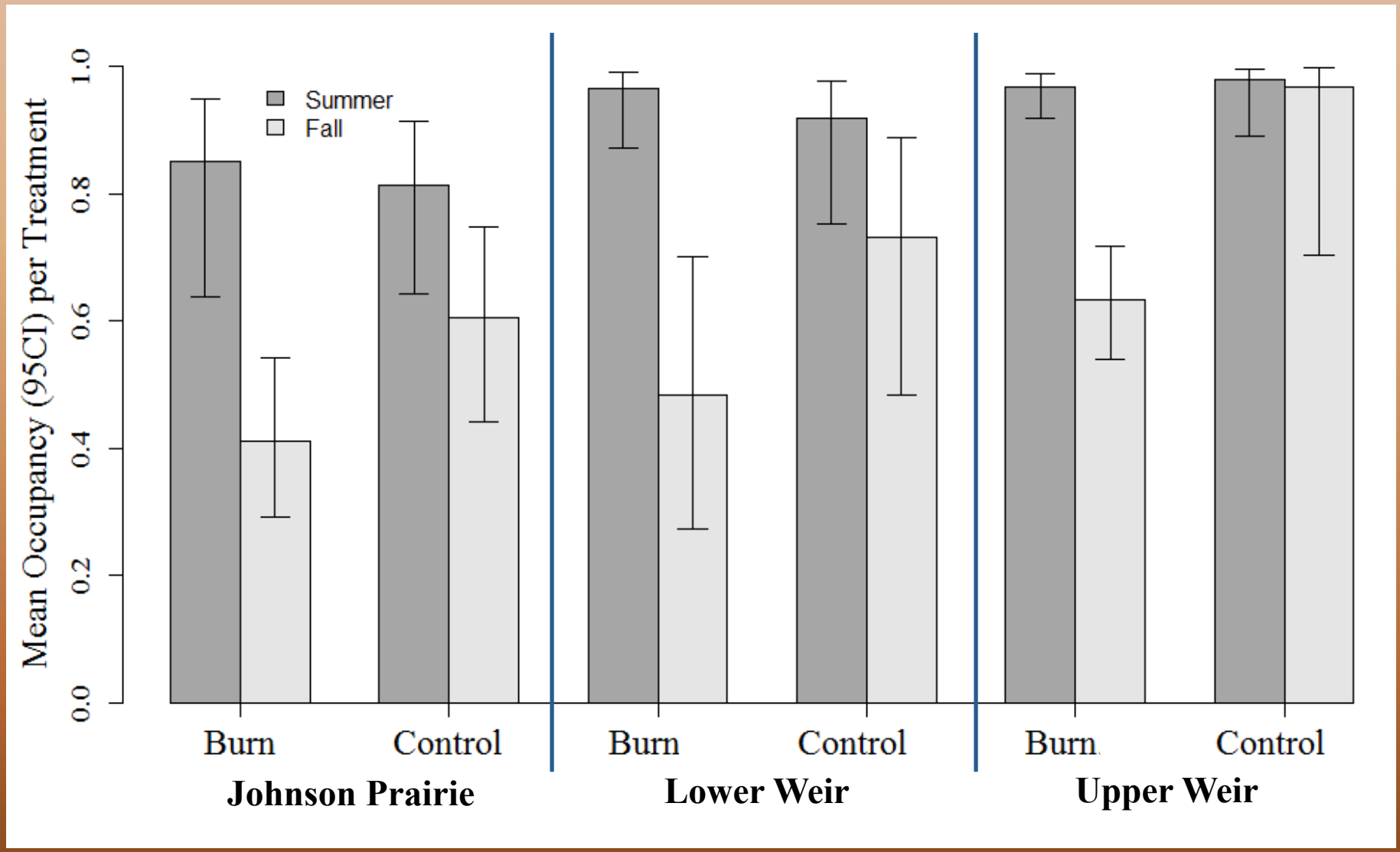
*Upper Weir excluded –
inappropriate distribution of data

Occupancy Models*

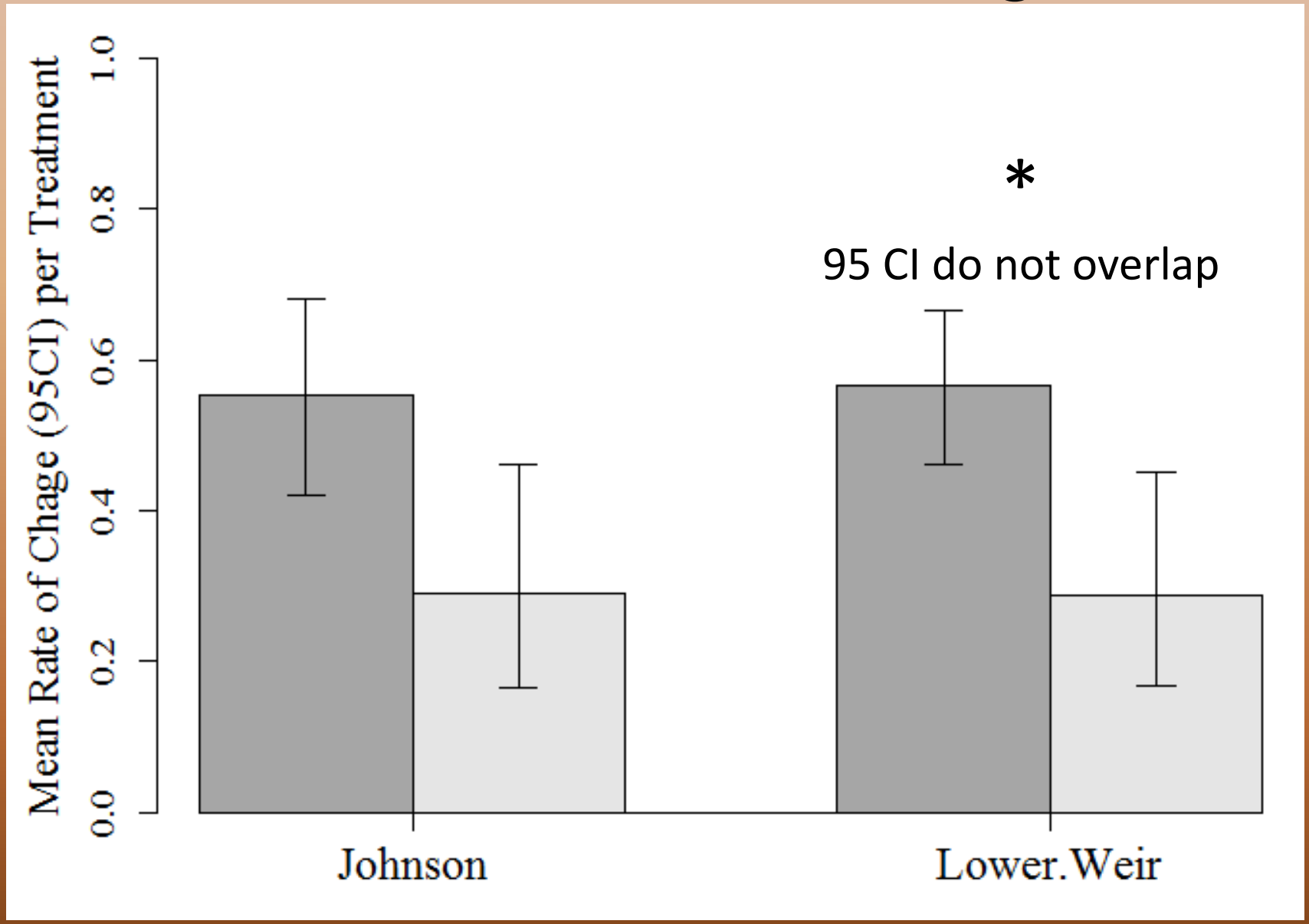
	Model Parameters		Model Performance				
Season	Occupancy	Detection	AICc	Δ AICc	w_i	Parameters	Deviance
Summer	Prairie	Treatment*Day	920.6111	0	0.42618	9	156.2119
	Prairie	Day	921.748	1.1369	0.24139	6	163.6284
	Prairie * Treatment	Day	922.072	1.4609	0.20529	8	159.7781
	Prairie * Treatment	Treatment*Day	923.1088	2.4977	0.12224	12	152.3203
	Constant	Treatment*Day	932.2325	11.6214	0.00128	7	172.0318
	* Treatment	Treatment*Day	932.3563	11.7452	0.0012	8	170.0624
	* Treatment	Day	933.5218	12.9107	0.00067	5	177.4715
	Prairie	Constant	933.8643	13.2532	0.00056	4	179.8714
	Prairie * Treatment	Constant	934.1654	13.5543	0.00049	6	176.0458
	Prairie	Treatment	934.6678	14.0567	0.00038	5	178.6175
	Prairie * Treatment	Treatment	934.9425	14.3314	0.00033	7	174.7417
Fall	Prairie * Treatment	Day	1157.5824	0	0.71281	9	113.998
	Prairie * Treatment	Treatment*Day	1159.4011	1.8187	0.28711	12	109.4273
	* Treatment	Day	1177.298	19.7156	0.00004	5	142.0624
	* Treatment	Treatment*Day	1178.9709	21.3885	0.00002	8	137.4918
	Prairie	Treatment*Day	1179.0286	21.4462	0.00002	9	135.4442
	Prairie	Day	1179.9949	22.4125	0.00001	6	142.69

*Pooled all sites –
estimates reported for Upper Weir Only

Estimated Occupancy



Estimated Rate of Change



Summary of Results

Occupancy – (differs by prairie*treatment)

- ↓ on all but one site from summer to fall
- Decrease was significant on burned sites

Rate of Change – (strong effect of fire)

- Though, estimated ε differed between treatments only on Lower Weir

Detection – (varies by survey day)

- Differed across survey days w/in seasons
- Did not model constant seasonal effect (no hypothetical justification)

Moving Forward

If positive….*how long until effect diminishes?*

If negative….*when do populations rebound, to what extent?*

What is driving short-term response?

Spring Surveys

- Repeat summer & fall?

Model Covariates

- Fire severity
- Burn temperatures (below and above ground)
- Fire history

Theoretical Approach

Hypotheses

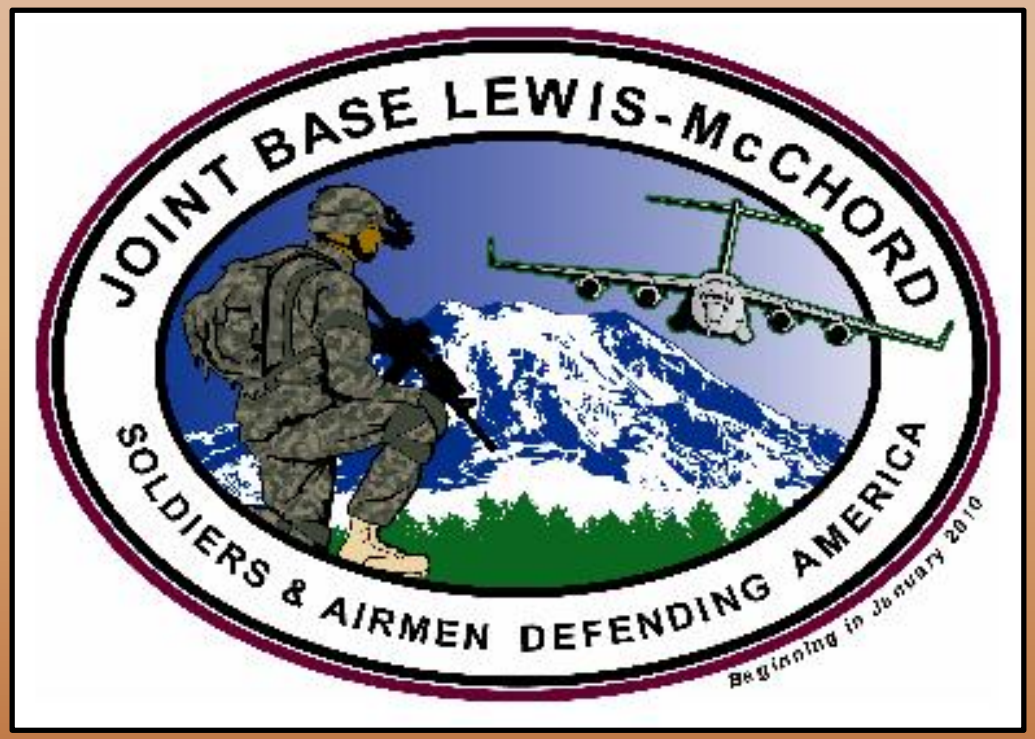
Future Surveys

- Increased occupancy relative to control units.
- *Higher quality forage*

Model Covariates

- Fire severity significant driver
- *Impact to structure resulting in decreased cover*

THANK YOU!



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