

# Wildlife Habitat Patterns & Processes: Examples from Northern Spotted Owls & Goshawks



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# NFS role in wildlife management:

- NFMA 1976: “provide for **diversity of plant and animal communities** based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.”
- 2012 Planning Rule: provide **ecological conditions** necessary to maintain “A population of a species that continues to persist over the long term with sufficient distribution to be resilient and adaptable to stressors and likely future environments.”

# NFS manages habitat, not individual animals.

- Habitat: “The **resources** and **conditions** present in an area that produce occupancy – including survival and reproduction – by a given organism.”<sup>1</sup>
  - **Resources:**
    - Food, Water, Shelter
  - **Conditions:**
    - Spatial arrangement / configuration / connectivity
    - Temporal patterns
    - Security from predators, competitors, & humans
    - Spatial scale – habitat selection is hierarchical & depends on suitability at the next larger scale

<sup>1</sup>From: Hall et al 1997. Wildlife Society Bulletin 25:173-182.

# Vegetation is not habitat...



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Vegetation structure and configuration are often correlated with important resources and conditions, but vegetation conditions alone are insufficient to provide for occupancy by an organism.



# Things I am working on to understand habitat:

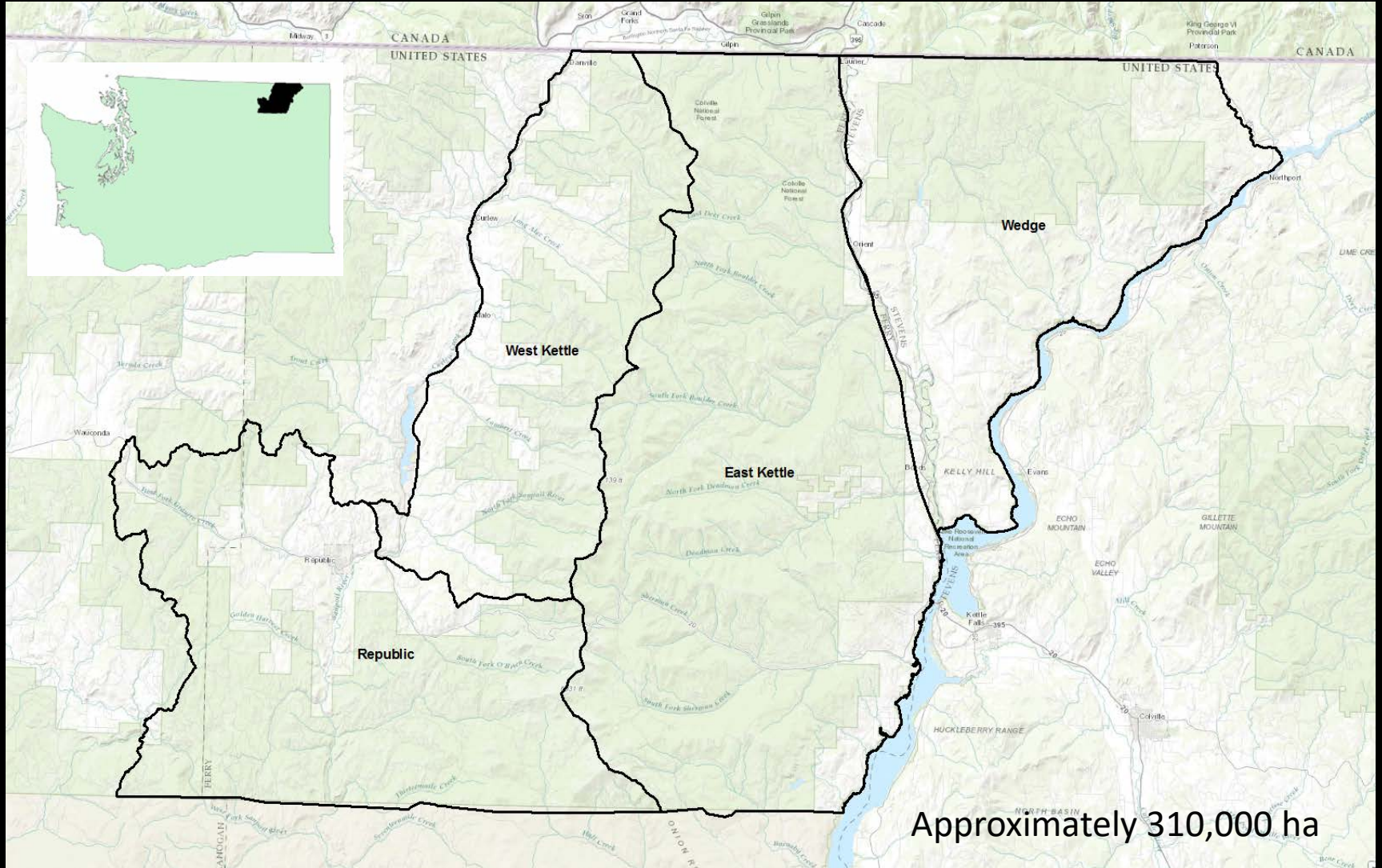
- Colville CFLRP Goshawk Study
- Effects of forest restoration on northern spotted owl prey
- Interactions between barred owls and spotted owls



# Colville Goshawk Study

- Three study components & questions:
  - Surveys:
    - How many reproducing goshawks are there and where are they located?
    - What are the landscape patterns at those locations?
  - Genetics:
    - How are individuals at different territories related?
    - Are there parent-offspring pairs that reflect fine-scale source/sink dynamics?
  - GPS Telemetry:
    - How do goshawks move through the landscape to access resources?
    - How do movement patterns change when landscape conditions change?

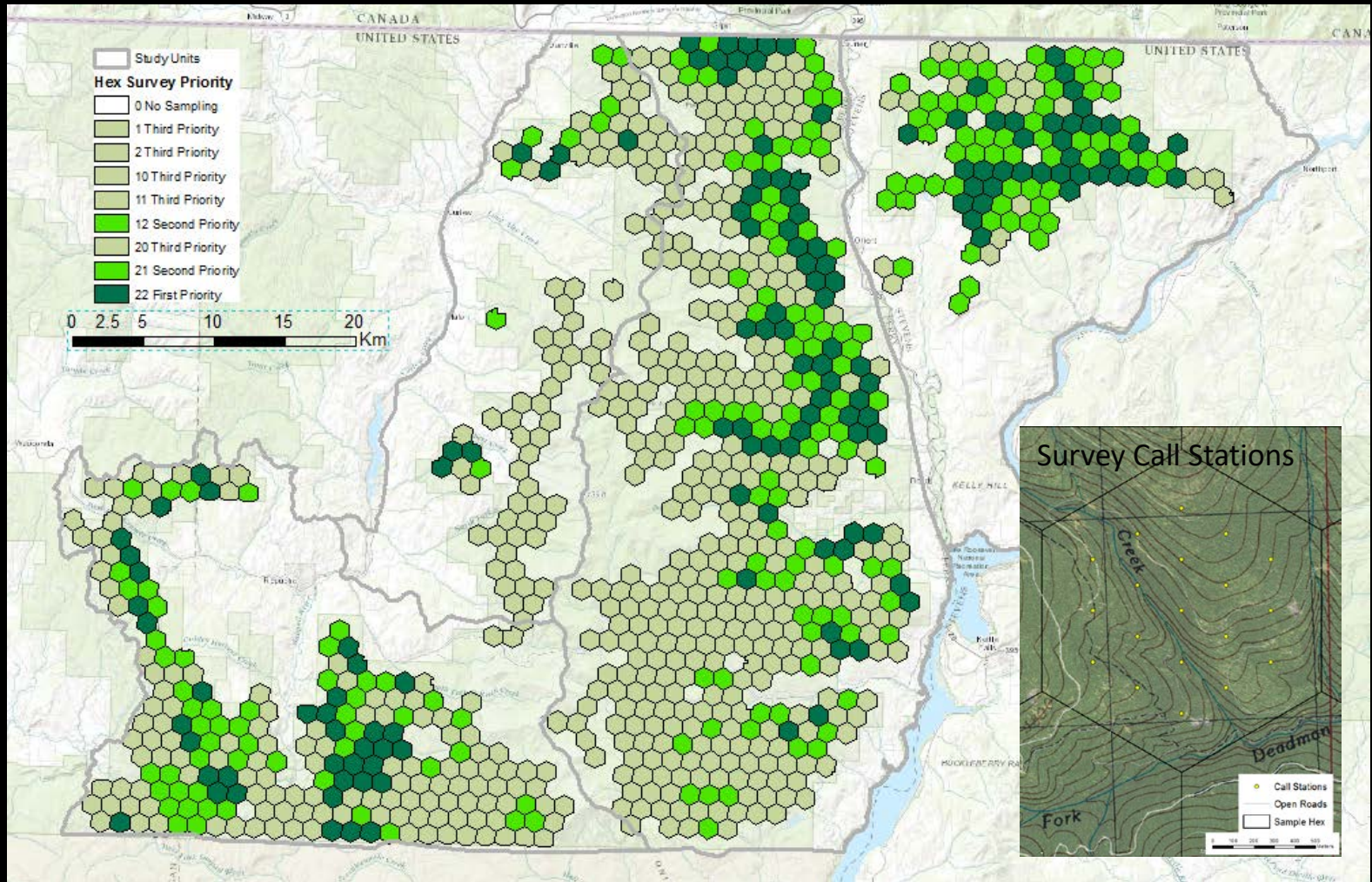
# Colville CFLRP Goshawk Study





# Colville Goshawk Study

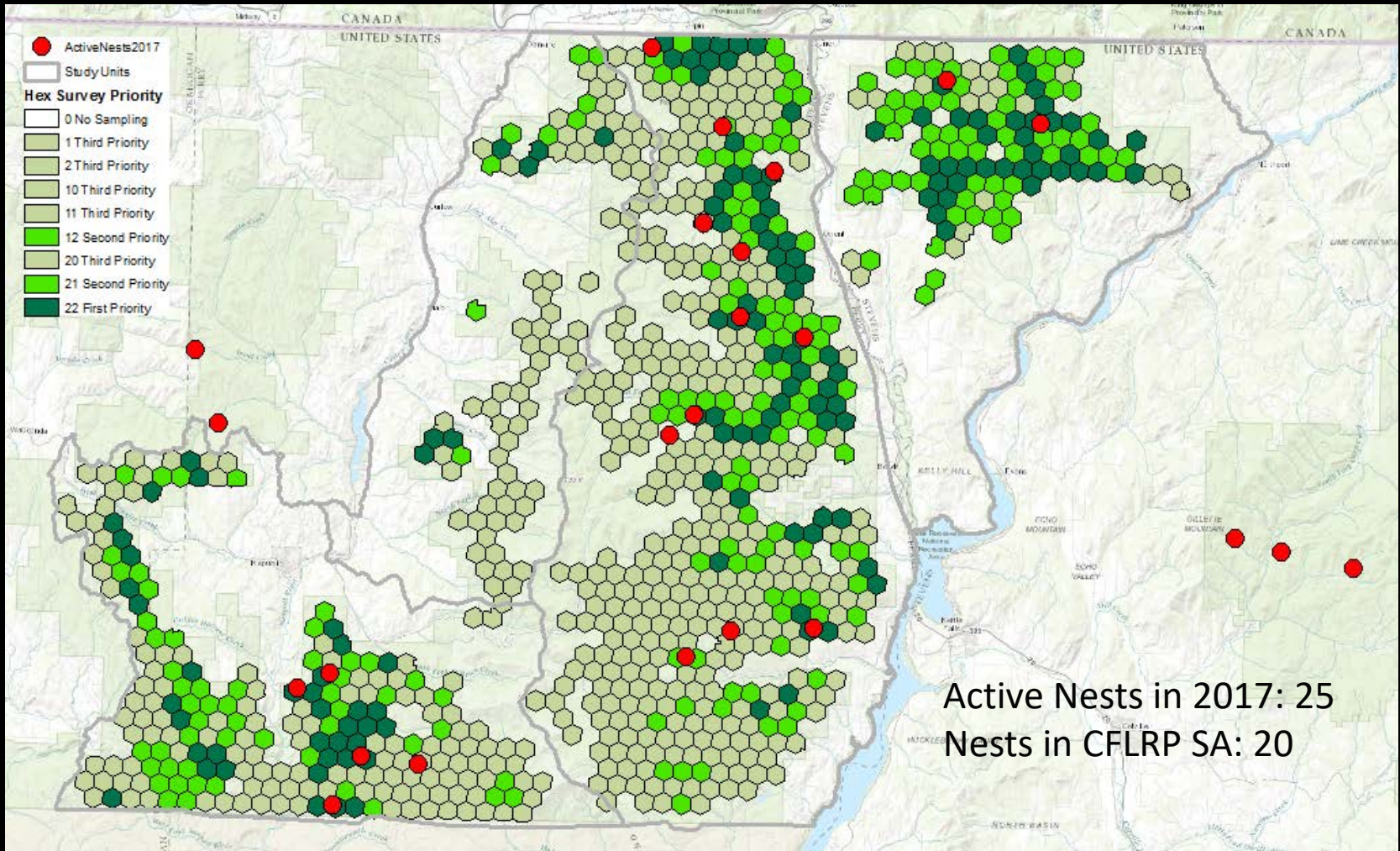
- Survey Methods:





# Colville Goshawk Study

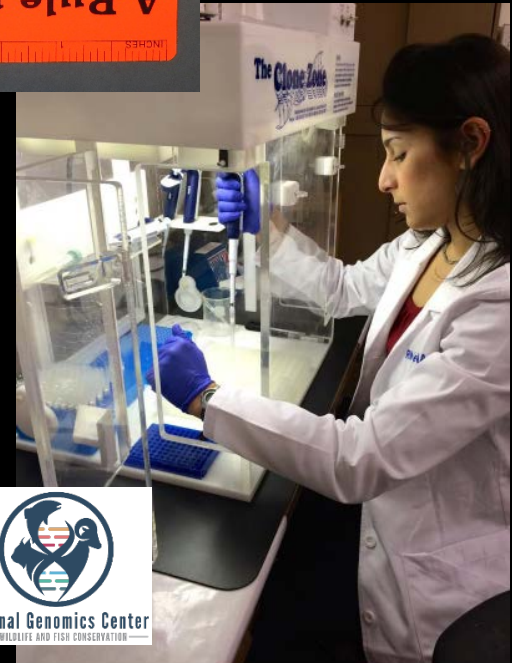
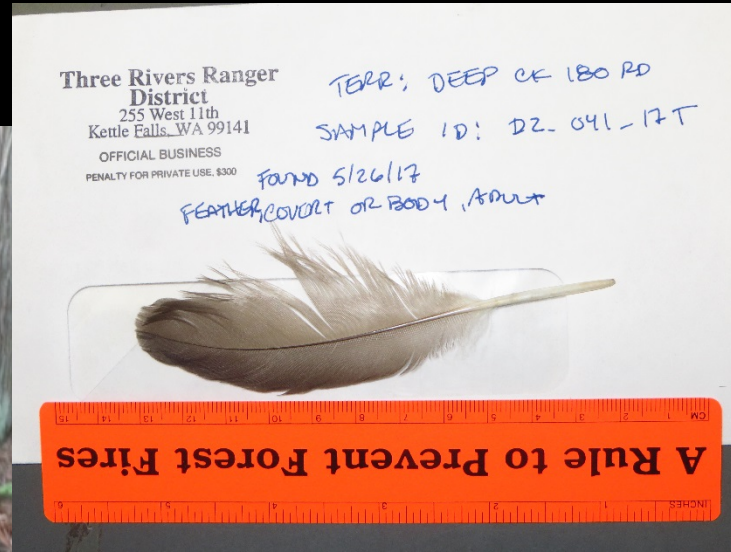
- Survey Results:





# Colville Goshawk Study

- Genetics Methods:



# Colville Goshawk Study

- Genetics Results, 2016 Samples:

Sample Type	# Samples	# DNA Extracted	# Successful
Feather	74	74	49
Pellet	32	32	13
Whitewash	22	11	0
Tissue	4	4	4
Eggshell	3	3	2
<b>Total</b>	<b>135</b>	<b>124</b>	<b>68</b>

Rodent/Bat Feces	1	1	1
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49 Unique individuals genotyped,  
Including 32 females and 17 males





# Colville Goshawk Study

- GPS Telemetry Methods:



# Colville Goshawk Study

- GPS Telemetry Results:

13 individuals tagged from 12 sites.

Over 12,000 locations recorded.

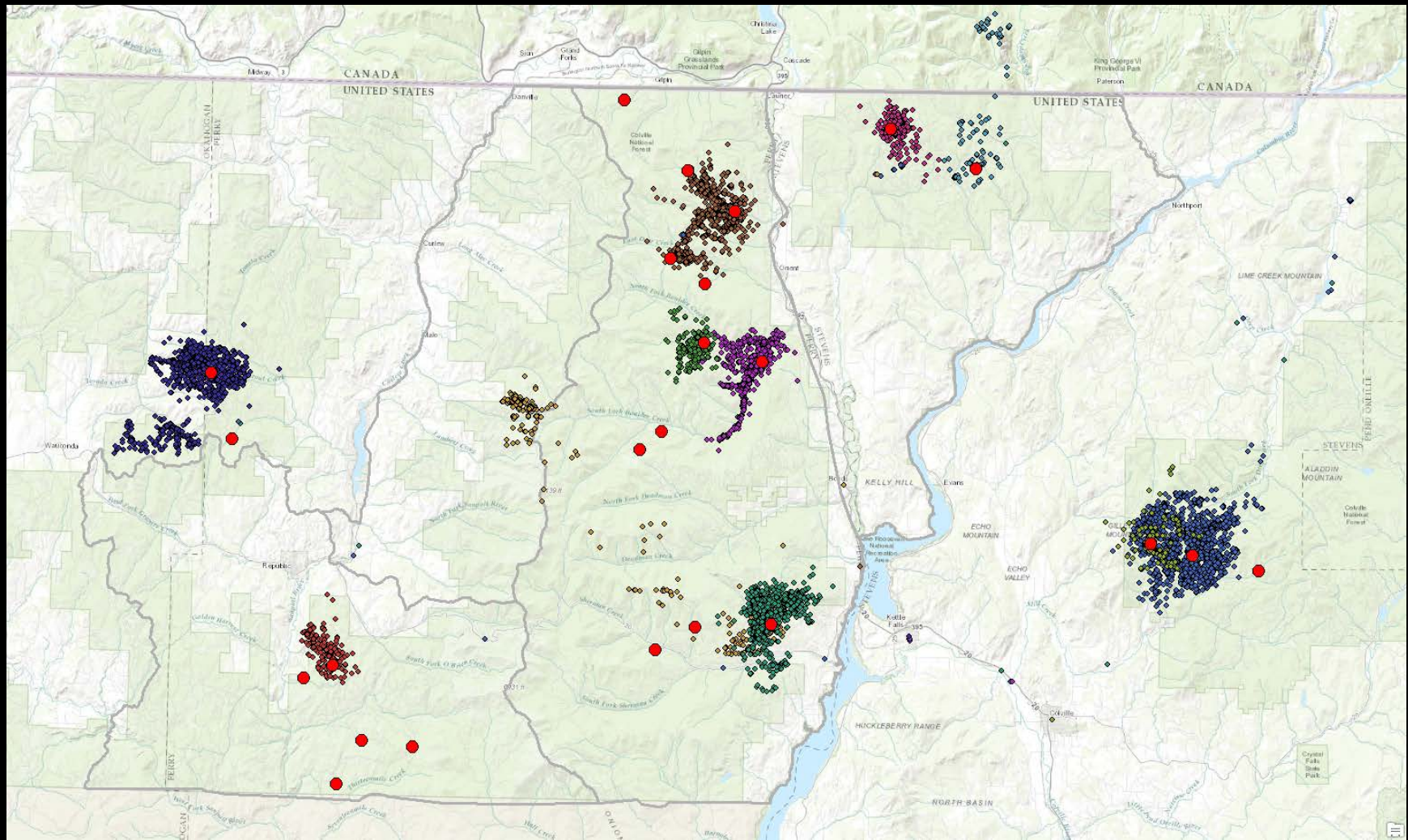
Typical daily movement rates of 20 to 50 km during breeding season.

Site	Sex	BR16	NB16	BR17	NB17	TotDays
Deep Ck	Unk	0	0	466	0	32
Trout Lake WDFW	Female	0	0	757	0	50
Trout Lake WDFW	Male	1062	177	0	0	86
Irish Mt	Male	982	628	700	0	339
SF Boulder 130	Female	0	0	1296	9	95
Little Boulder	Unk	0	0	1273	41	107
Elbow Lake	Male	0	0	123	0	11
McMann Ck	Female					
Boulder 090	Female	0	0	433	0	36
W Fork Trout	Female					
Turner Horseshoe	Male	0	0	3723	57	93
Quartz Mt	Female	0	0	341	0	30
Strauss Ck	Female	0	0	320	0	36
		2044	805	9432	107	915



# Colville Goshawk Study

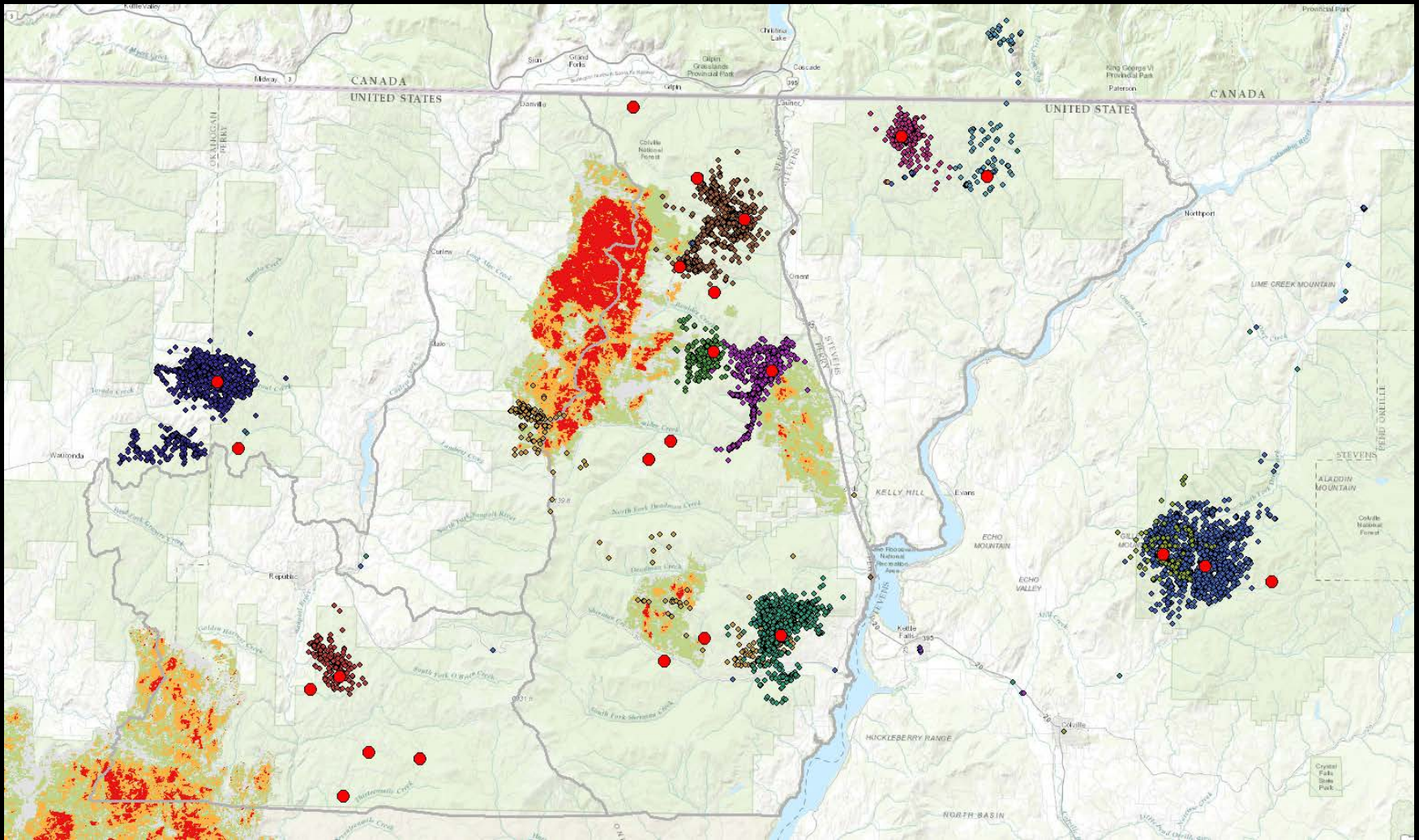
- GPS Telemetry Results:





# Colville Goshawk Study

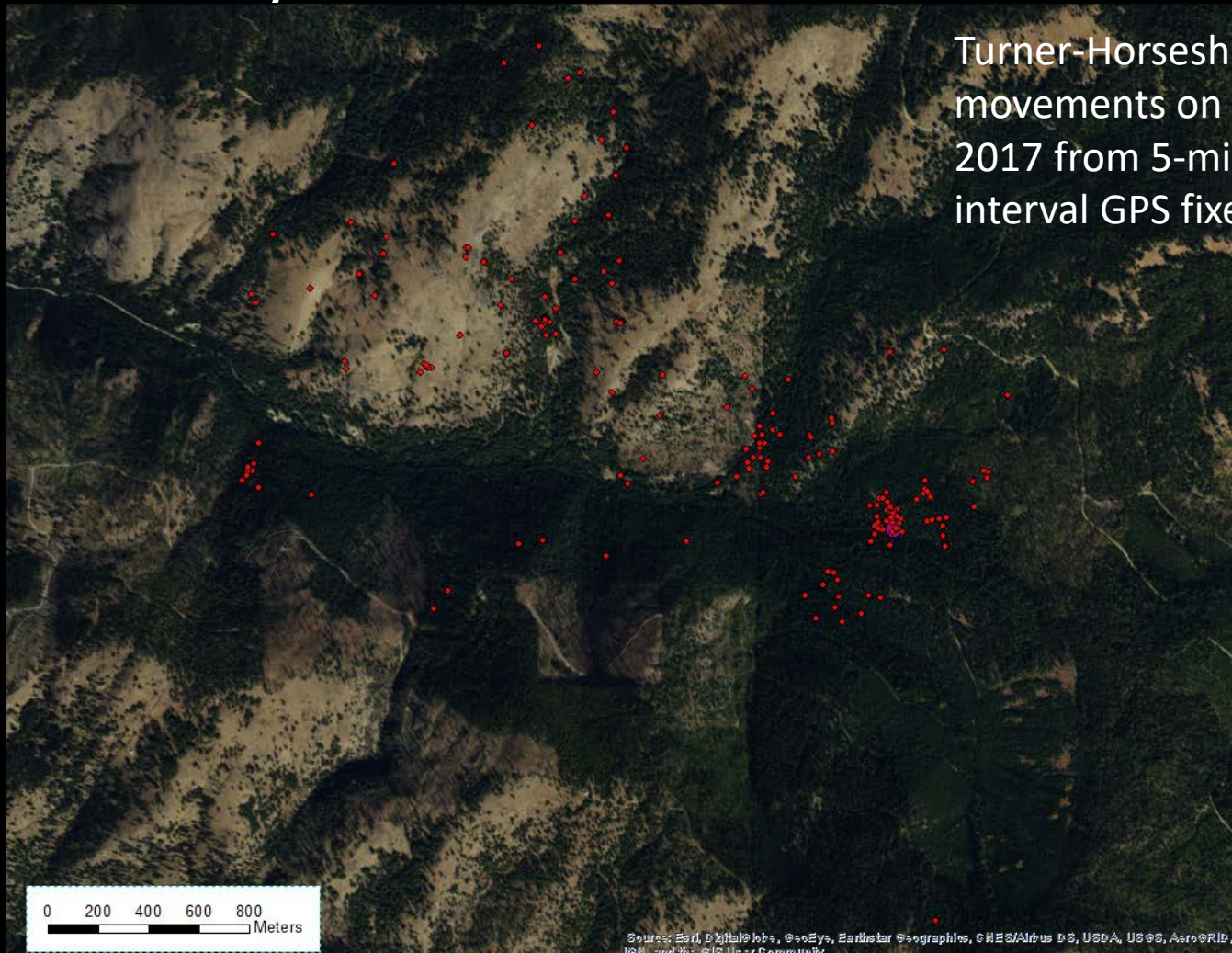
- GPS Telemetry Results:





# Colville Goshawk Study

- GPS Telemetry Results:



# Colville Goshawk Study

- Study Timeline:
  - 2016: Pilot study – hexagon surveys, genetic sample collection, 2 GPS-tagged individuals
  - 2017: First year – hexagon surveys, genetic sample collection, 12 GPS-tagged individuals
  - 2018: Second year – hexagon surveys, genetic sample collection, continue trapping & tagging efforts
  - 2019 and later: Follow-up work – ongoing nest site monitoring, genetic sample collection, data downloads from GPS-tags
- Other potential work:
  - Movement responses to restoration treatments
  - Prey studies



# Northern Spotted Owl Studies

- Spotted owl prey responses to forest restoration:
  - How are forest structure characteristics correlated with northern flying squirrel and bushy-tailed woodrat density?
  - How do prey densities respond to forest restoration treatments?



# Spotted Owl Prey Study Target Species:

**Northern Flying Squirrel**

**(*Glaucomys sabrinus*)**



Length: 25-30 cm

Weight: 100-300 g

**Bushy-tailed Woodrat**

**(*Neotoma cinerea*)**



Length: 30-40 cm

Weight: 200-500 g

These two species compose about 70% of spotted owl prey biomass in the Eastern Cascades



# Spotted Owl Prey Study - Three Sites:

## Swauk Pine Project, Okanogan-Wenatchee N.F., WA

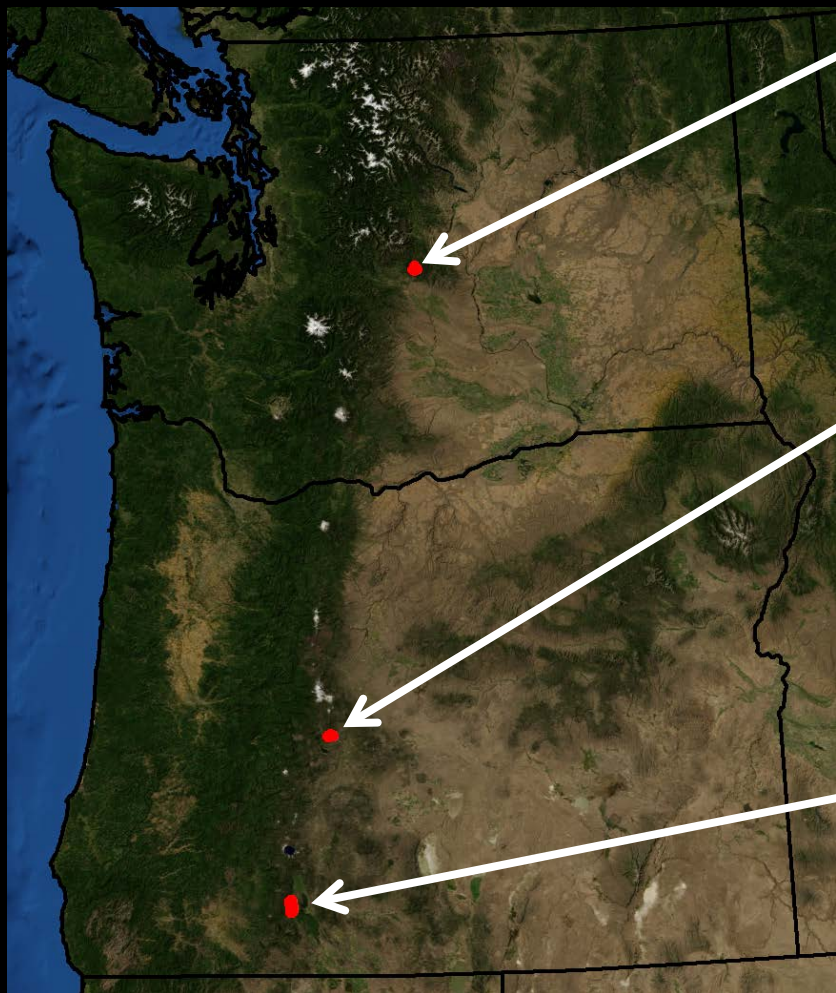
- Pre-treatment sampling Sept 2013 & 2014
- Treatment implementation 2016
- Post-treatment sampling 2019

## Lookout Mountain Project, Deschutes N.F., OR

- Pre-treatment sampling Sept 2011
- Treatment implementation 2014-15
- Post-treatment sampling 2017

## Pelican Butte (Westside) Project, Fremont-Winema N.F., OR

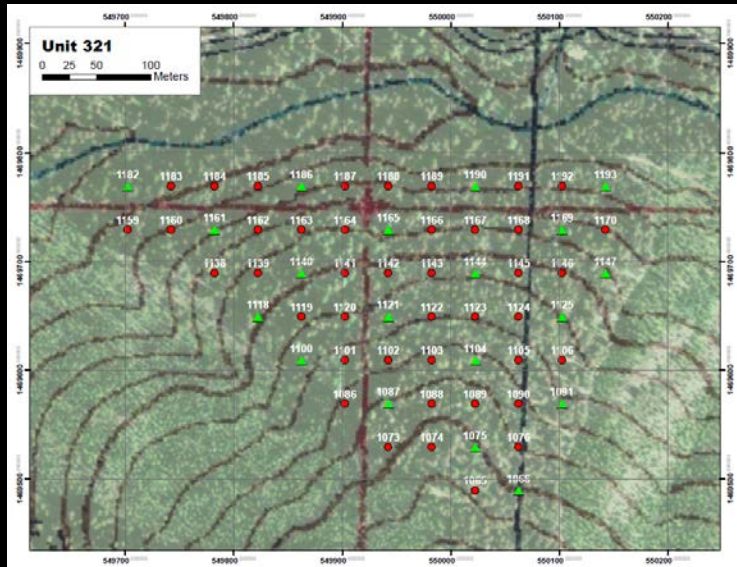
- Pre-treatment sampling Sept 2011
- Treatment implementation 2014-15
- Post-treatment sampling 2018



# Spotted Owl Prey Trapping:



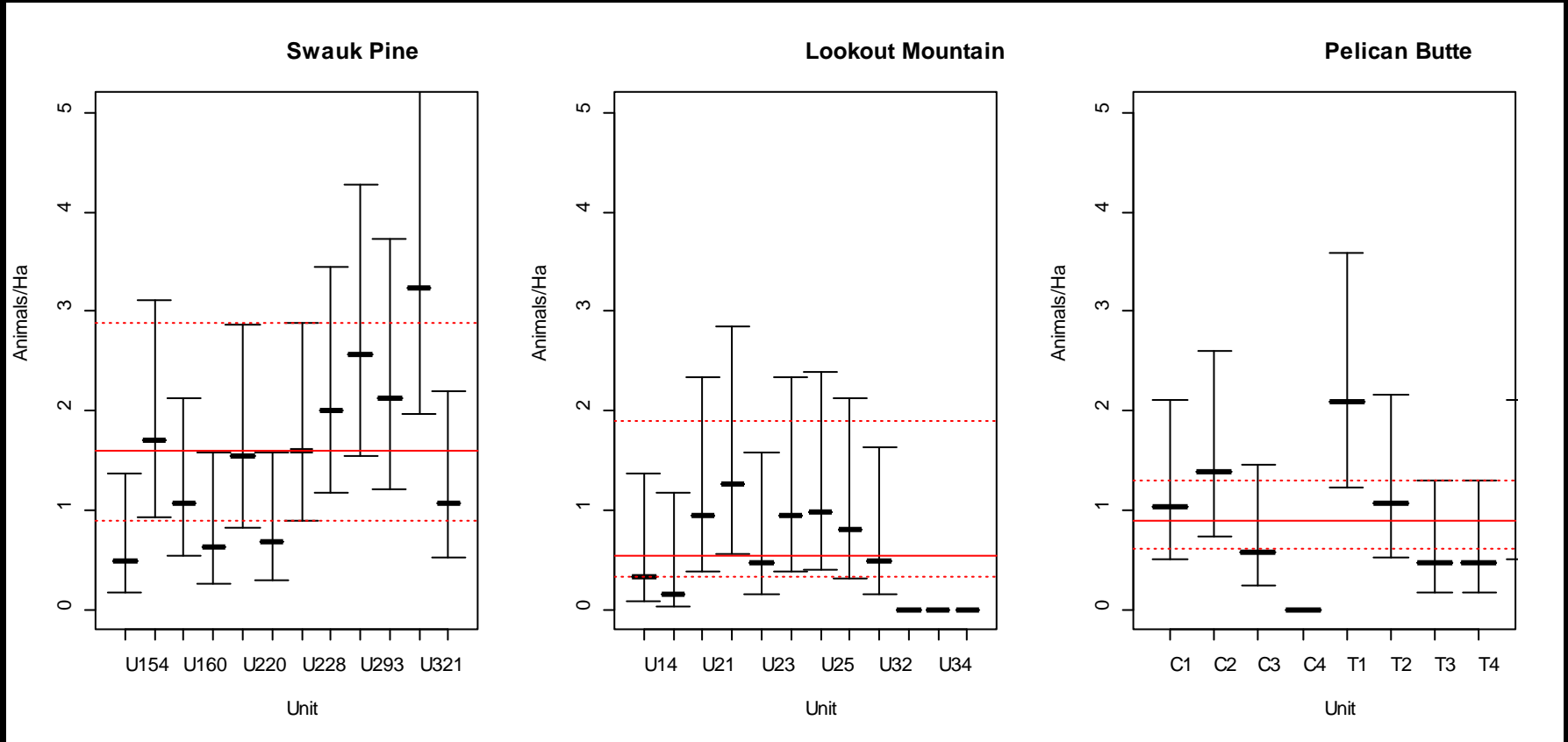
- Traps run for ~8 nights in September (12 nights for Swauk Pine in 2014)
- 8 x 8 trap grid, traps at 40m intervals
- Target animals were ear tagged, sexed, weighed, measured, and released





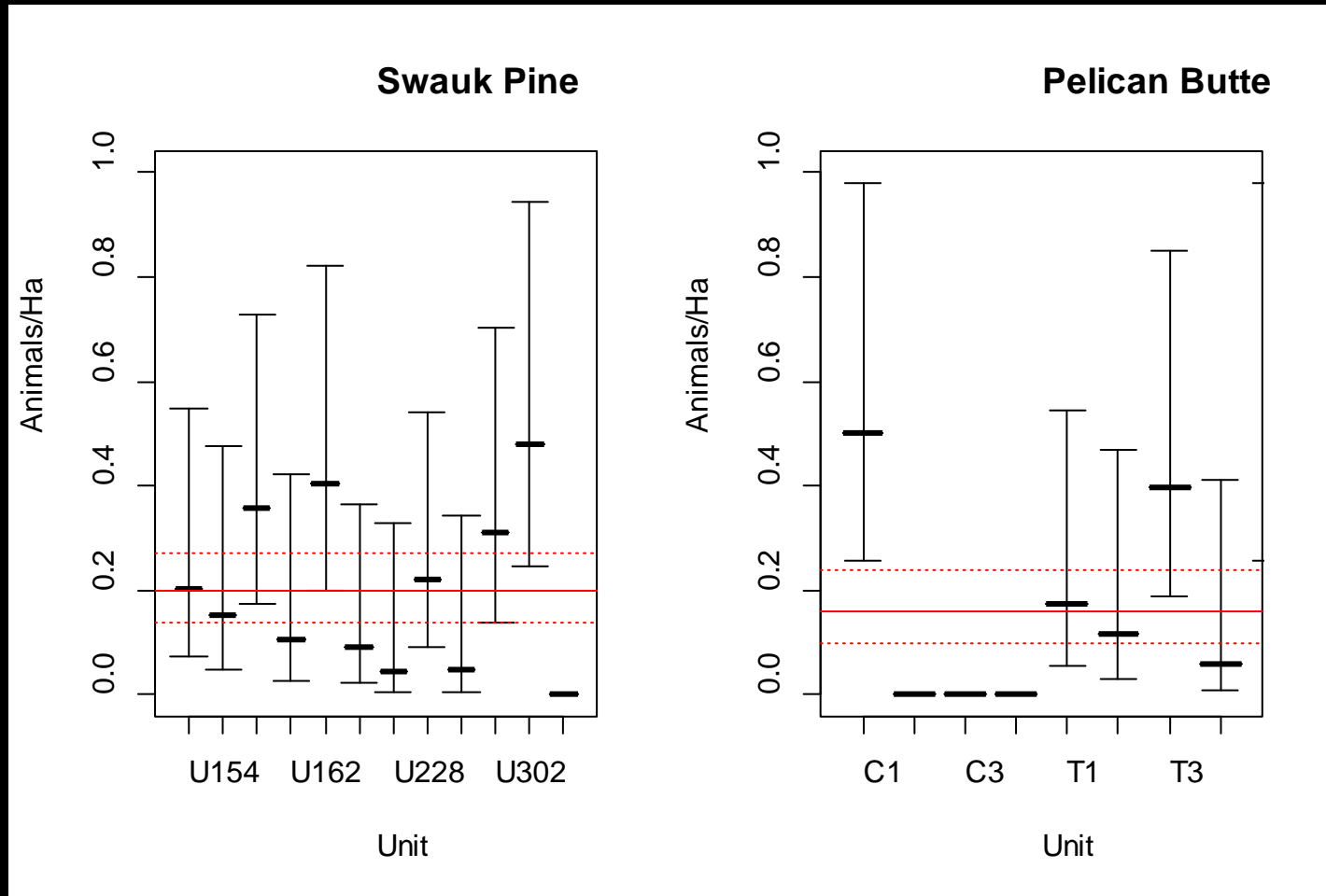
# Results: Flying Squirrel Density by Unit

Density estimates (animals / ha) from SECR, with 95% confidence intervals:



Density estimates (animals / ha) from spatially explicit capture-recapture modeling (SECR), with 95% confidence intervals

# Results: Woodrat Density by Unit



Density estimates (animals / ha) from SECR, with 95% confidence intervals

I did not estimate woodrat density for Lookout Mtn units because captures were too sparse



# Spotted Owl Prey Study Take-homes:

- Prey were least abundant in the ponderosa pine dominated sites
- Number of trees, snags and logs >30cm diameter are important correlates of prey density...
- But there's lots of variability within & between units & sites

# Northern Spotted Owl Studies

- Interactions between spotted owls and barred owls:
  - Are there differences in habitat selection between the two species?
  - Do habitat differences influence spotted owl site occupancy?





# Introduction: Barred Owl and Spotted Owl Ecology

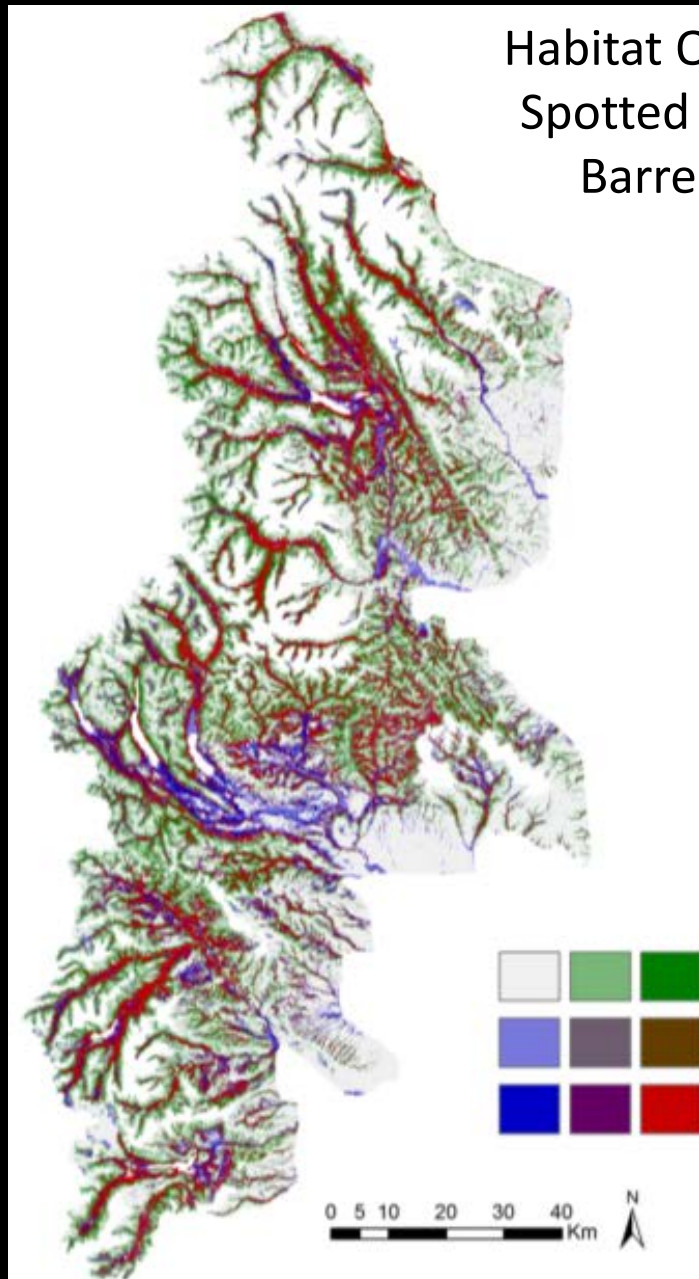


	Barred Owl	Spotted Owl
Body Size	Slightly Larger (Females ~872g)	Slightly Smaller (Females ~663g)
Annual Home Range Size	~450 ha	~2500 ha
Prey Preference	Ground Dwelling Vertebrates and Invertebrates	Medium-sized Arboreal Mammals (i.e. Flying Squirrels and Woodrats)
Behavior	Very Aggressive, Little Conspecific Home Range Overlap	Less Aggressive, More Conspecific Home Range Overlap
Within Home Range Habitat Characteristics	Closed Canopy, Structurally Diverse Mixed Conifer Forest	Closed Canopy, Structurally Diverse Mixed Conifer & Deciduous Forest
Landscape Scale Habitat Associations	Generally Use Flat Ground in Valley Bottoms	Less Strongly Associated with Topographic Characteristics

# Spotted – Barred Owl landscape-scale habitat selection and overlap



# Spotted – Barred Owl landscape-scale habitat selection and overlap

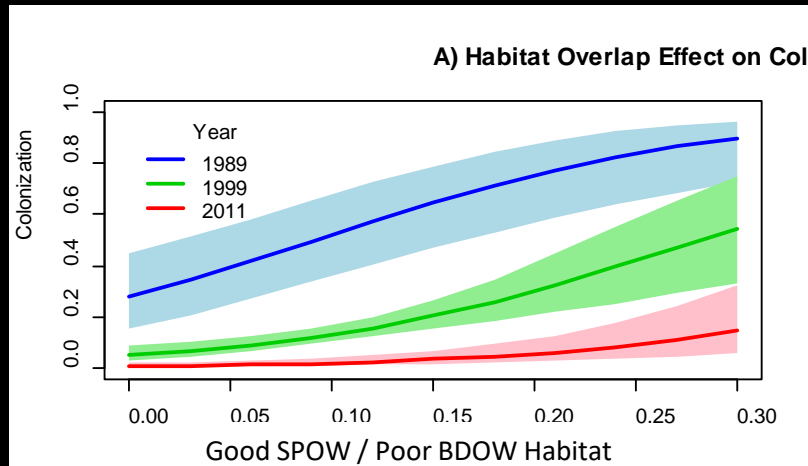


Barred Owl	Spotted Owl			Total
	Poor	Mod	Good	
Poor	0.41	0.22	0.05	0.68
Mod	0.04	0.06	0.07	0.17
Good	0.02	0.05	0.09	0.16
Total	0.47	0.33	0.20	1.00

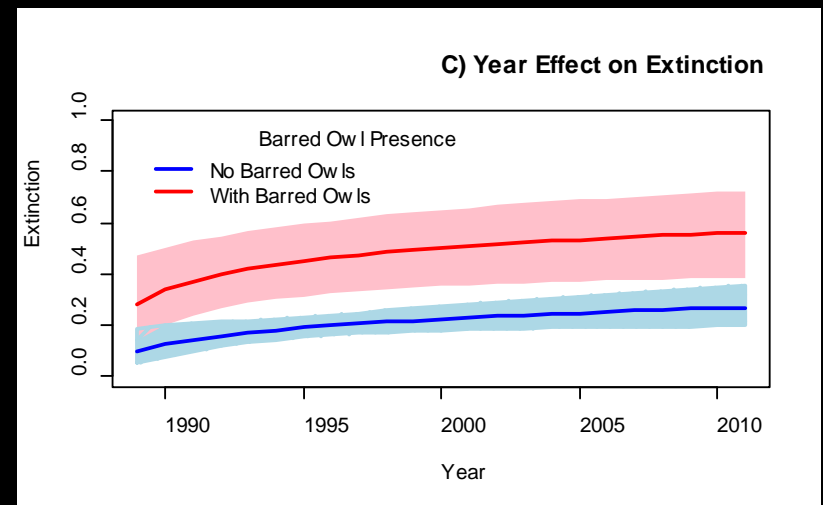
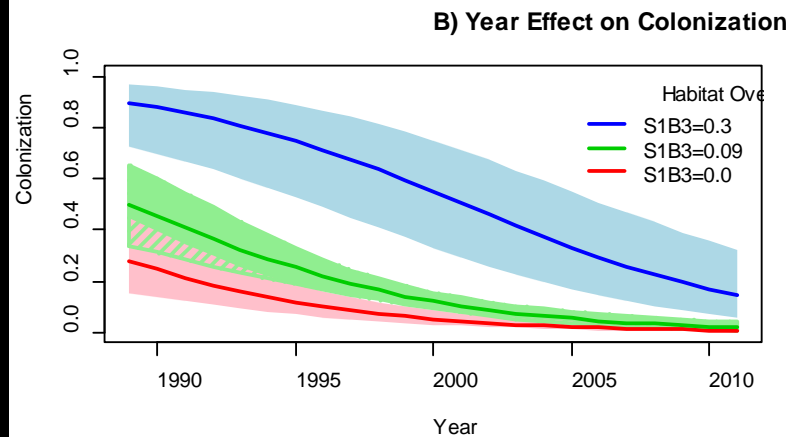


# Does habitat overlap with barred owls influence spotted owl pair site occupancy dynamics?

Site colonization rates were much higher at sites where good spotted owl habitat overlapped poor barred owl habitat, but declined through time for all sites:



Site extinction rates were higher at sites where barred owls were detected in the previous season, and exceeded colonization rates at all sites by the end of the study:



# Spotted – Barred Owl Interactions

## Habitat Selection and Overlap Results:

- **Spotted owls used steeper (>16 degrees) mid-slope areas more than barred owls.**
- **Spotted owls were more closely associated with closed canopy, large tree forests than barred owls.**

## Effects of Habitat Overlap on Multi-Year Spotted Owl Site Occupancy:

- **Areas of least habitat overlap between spotted owls and barred owls appear to contribute to short-term persistence of spotted owl pairs in the eastern Cascade Mountains of Washington, but these areas do not appear to provide long-term refugia from competitive interactions with barred owls.**

# Wildlife Habitat Patterns & Processes: Examples from Northern Spotted Owls & Goshawks

Wildlife Habitat Components:

**Water**



**Food**



**Shelter**



**Security**



**Space**

