

REGIONAL, LOCAL AND ANNUAL VARIATION IN DIETS OF SPOTTED OWLS IN OREGON, 1970-2001

ERIC FORSMAN

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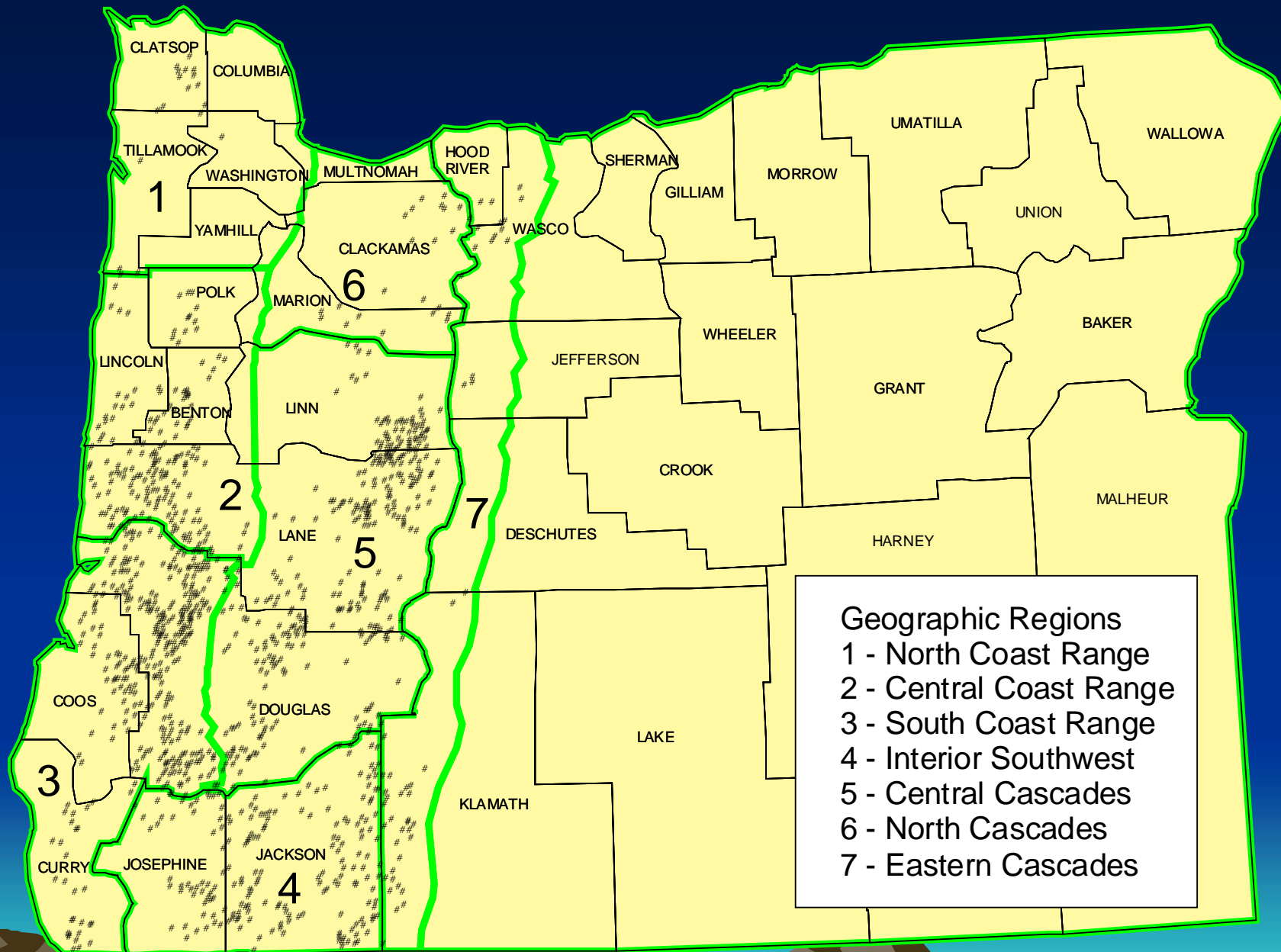
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Oregon Study Area 1970-2001

Objectives:

- **ESTIMATE MEAN PREY MASS**
- **EXAMINE LOCAL, REGIONAL AND SEASONAL VARIATION IN DIET**
- **ESTIMATE NUMBER OF PREY CAPTURED PER YEAR BY INDIVIDUAL OWLS**



Why do we care what they eat?



Methods

Diet Composition

Estimate composition of diet of each pair based on the % of prey numbers and % of prey biomass (use territories with $n \geq 10$ prey).

Average across territories to estimate the average diet in each region (sample is the territory, not the number of prey).



Most prey were identified by dissecting owl pellets and keying skeletal remains



Small numbers of prey were identified from fur or feathers



- If they catch more than they can eat, spotted owls store their food and retrieve it later



Mean Prey Mass

Estimate mass of each prey item and calculate mean prey mass at each owl territory.

Average across territories to get mean prey mass in each region. Use only territories where $n \geq 10$ prey items.



Dietary Diversity

Used the reciprocal of Simpson's Index ($1/q$) to estimate dietary diversity at each territory:

$$1/q = 1 / \sum(\text{proportions})^2$$

For our samples this index could vary from 1 (only 1 species in diet) to 18 (all 18 prey types equally abundant in diet).




Number of Prey Captured

Assume that an average adult spotted owl (619 grams) consumes approximately 11% of its body mass per day (73 grams) or 26,718 g per year

- Multiply 26,718 g by the proportion of biomass of each species in the diet to estimate the total biomass of each species captured per year per owl.
- Divide the total biomass of each species by the mean mass of each species to get the estimated number captured per year.

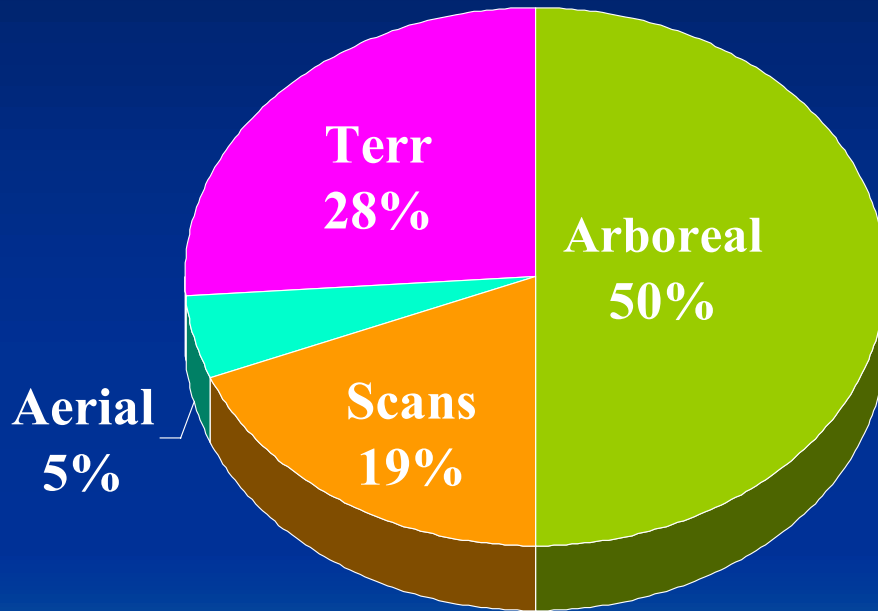


Results

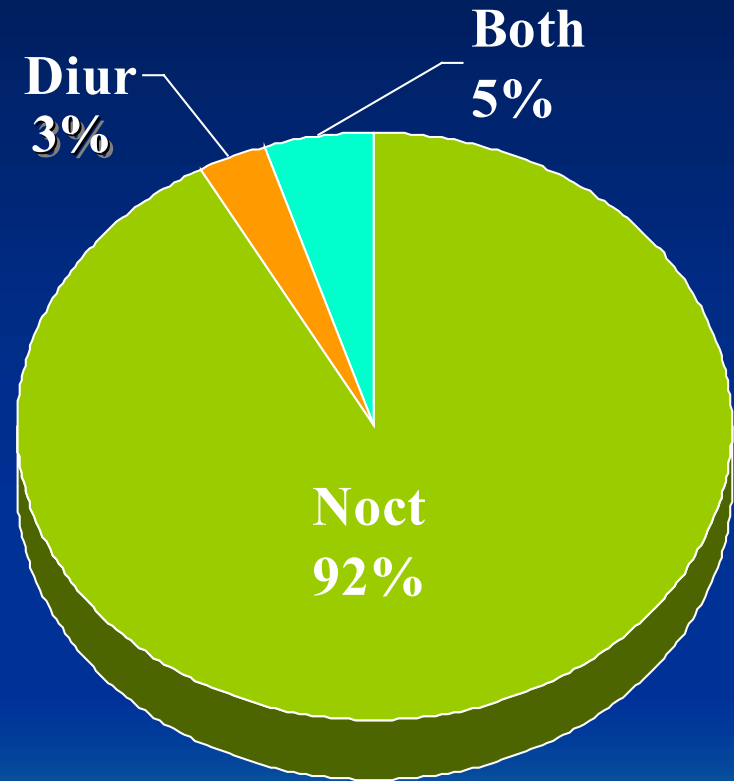
- Collected pellets at 1,102 owl territories, including 532 territories where sample size was ≥ 10 prey.
 - Total number of prey was 23,999.
 - Sample included 91% mammals, 4% birds, 4% insects, and 1% miscellaneous.
 - Sample included at least 131 species, including 48 mammals, 41 birds, 3 reptiles, 1 frog, 1 crayfish, 1 scorpion, 2 snails, and 33 insects.
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Prey composition in diets of Spotted Owls

Life Zones



Activity Periods



Estimated mean mass of prey captured by spotted owls in Oregon, 1970-2001

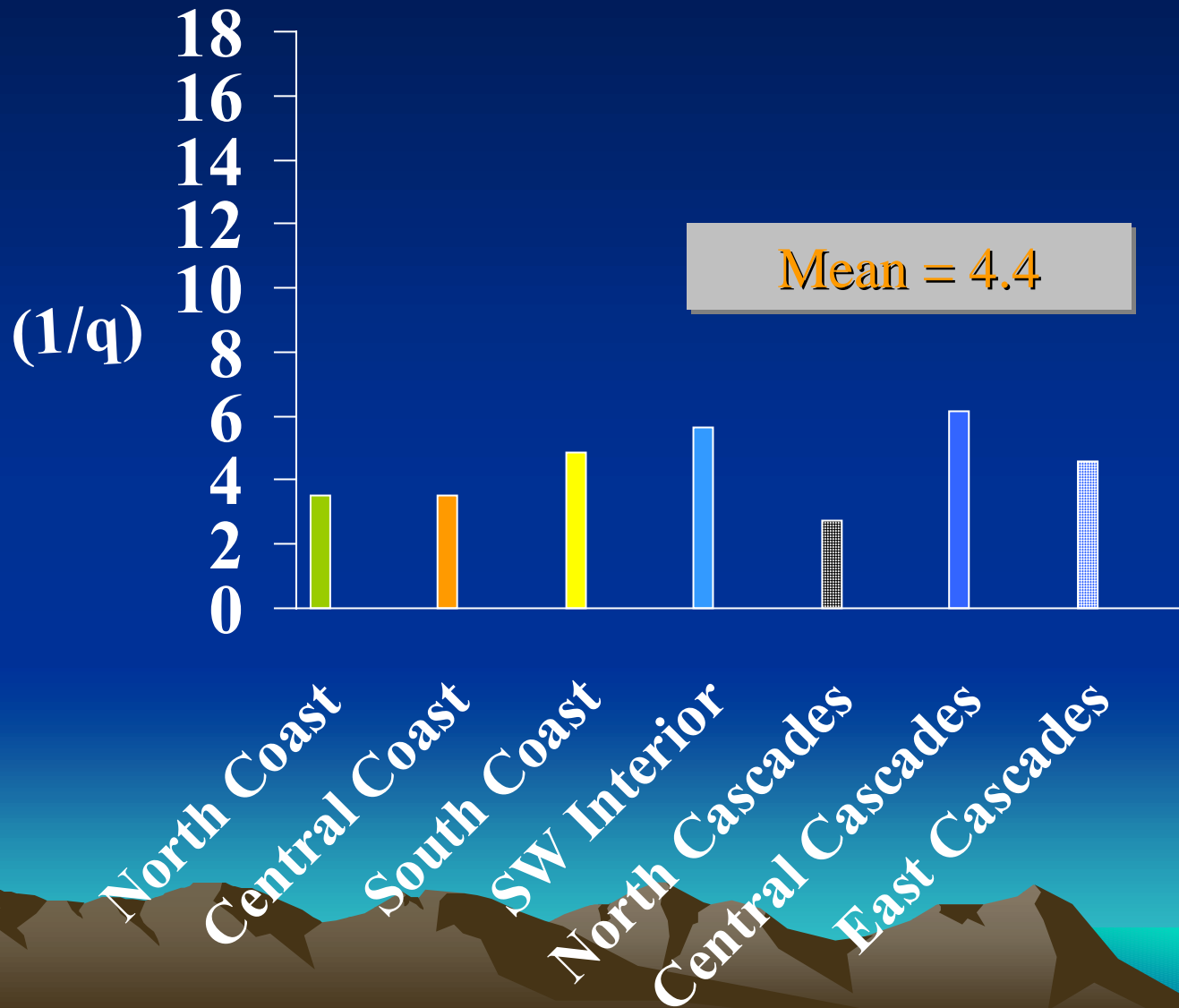
Region	<i>N</i>	Mean \pm SE
North Coast	9	123.6 \pm 10.3
Central Coast	90	112.8 \pm 3.3
South Coast	180	131.4 \pm 2.7
SW Interior	75	142.4 \pm 5.0
North Cascades	4	90.7 \pm 14.1
Central Cascades	150	108.5 \pm 2.8
East Cascades	26	98.9 \pm 8.4
Overall Average	7	115.5 \pm 6.9



Diets of Spotted Owls in Washington (% of prey numbers), 1983-96

Prey	Olympic Peninsula (n = 151)	Western Cascades n = 57)	Eastern Cascades (n = 34)
Lagomorphs	6.3	4.9	3.9
Diurnal squirrels	2.8	2.5	2.7
Flying squirrels	54.3	29.3	40.7
Gophers	Tr	6.9	4.3
Deer mice	11.3	15.2	6.5
Woodrats	5.3	1.3	8.7
Red-backed vole	5.8	10.3	6.4
Microtus	1.7	5.7	1.9
Other mammals	5.7	15.4	9.9
Birds	6.4	6.0	4.4
Amphibians	0.1	0.0	0.0
Insects	0.4	2.5	10.6

Index of Dietary Diversity ($1/q$)



Major prey of Northern Spotted Owls



Northern flying squirrel



Bushy-tailed woodrat



Dusky footed woodrat



Red Tree Vole



Snowshoe hare



Deer mouse



Brush rabbit

Other prey species in the Oregon



Western red-backed vole



Trowbridge's shrew



Creeping vole



Silver-haired bat

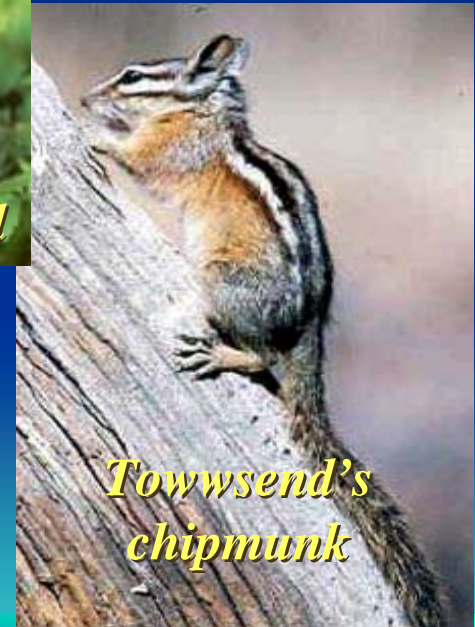


Varied Thrush

Donald Walte/CLO



Douglas squirrel



Towwsend's chipmunk



Saw-whet Owl



Ponderous woodborer



Burt Gildart


Annual Variation
Diet of spotted owls at Oak Creek site, 1970-74

Species	Percent of prey by year			
	1970	1972	1973	1974
Flying Squirrel	5	37	29	6
Red tree vole	66	10	44	11
Red-backed vole	0	3	0	0
Deer Mouse	8	15	0	79
Woodrat	2	8	3	0
Brush rabbit	1	2	0	2
Other prey	18	25	24	2

Estimated number of prey captured per year by spotted owls in Oregon

Species	South coast	SW Interior	East Cascades	Per owl	Pair + 2 Yng
Shrews	3	8	6	7	17
Moles	0	7	4	2	5
Rabbits	10	5	11	7	18
Flying Sqrl	79	62	113	104	277
Gophers	0	12	20	8	21
Deer Mice	15	12	11	19	50
Woodrats	35	46	12	22	59
R-B Vole	7	15	39	28	73
Tree Vole	43	5	0	17	46
Othr Mamm	17	14	18	17	46
Birds	9	11	7	14	36
Insect/Misc	5	21	143	27	74
Total	222	217	384	271	722

Summary:

- **Most prey are nocturnal and either arboreal or scansorial.**
 - **Mean prey mass is large for such a small owl.**
 - **Diet varies regionally but is generally dominated by flying squirrels, woodrats, lagomorphs, red tree voles, red-backed voles and deer mice.**
 - **Red tree voles are important prey in mesic forests, especially in coastal regions of southwest Oregon.**
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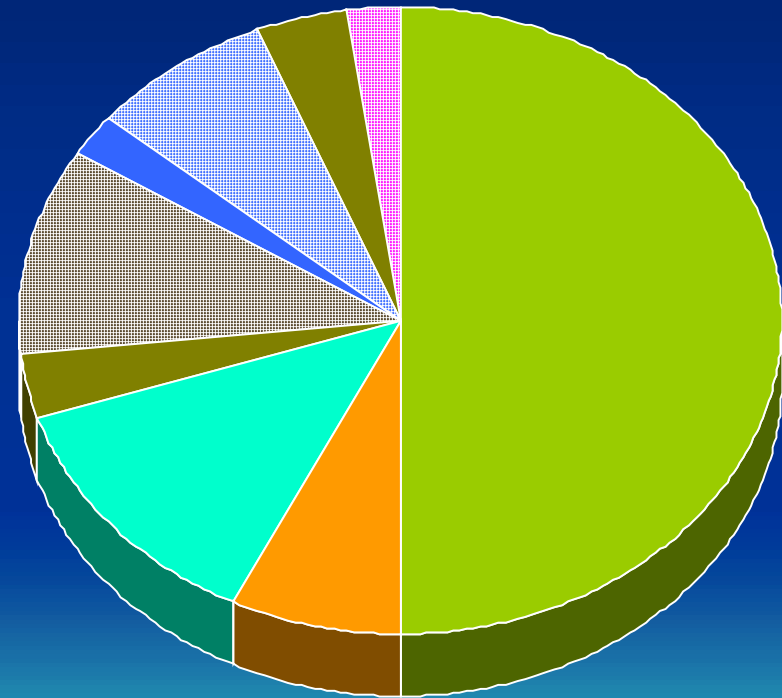
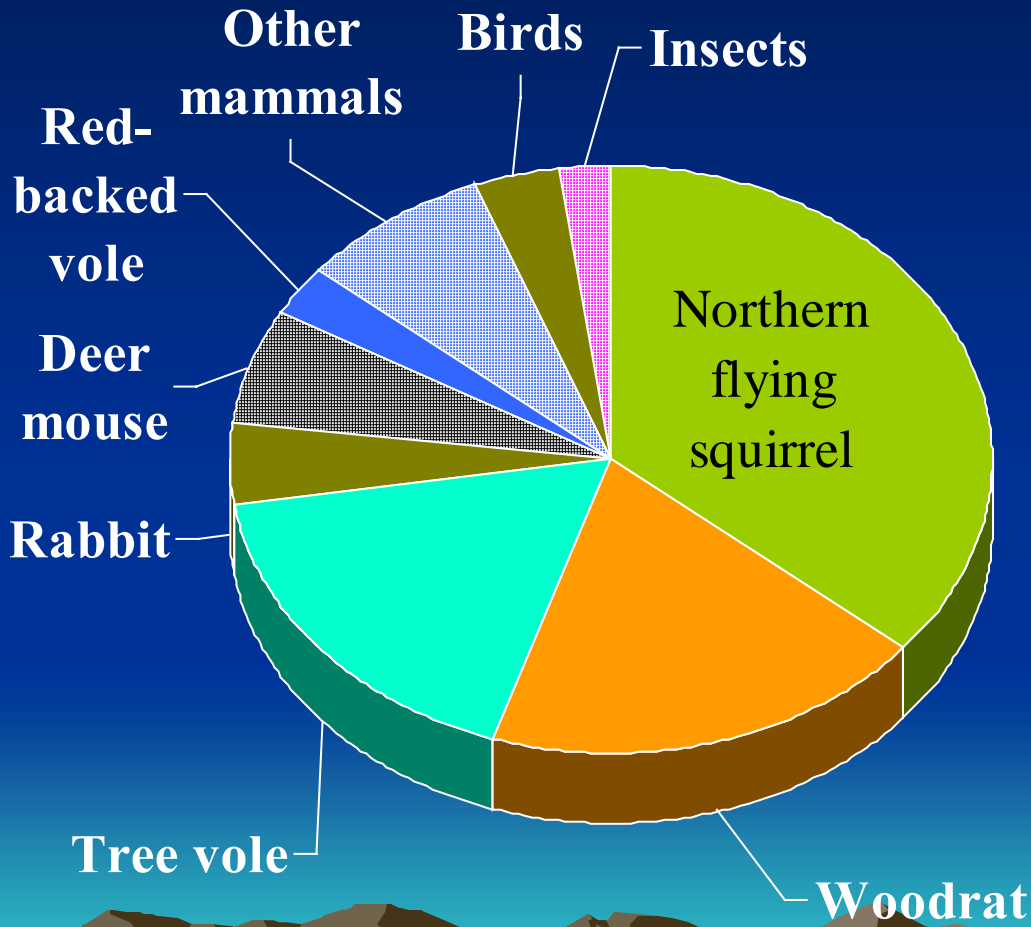
Management Implications

- Management practices that favor arboreal or scansorial forest mammals such as flying squirrels, woodrats, and tree voles are beneficial to spotted owls.
- Although many of the primary prey species are forest species, some edge habitats may benefit spotted owls because woodrats, rabbits, snowshoe hares, and pikas are common in non-forest types adjacent to forests.

Prey composition in diets of Spotted Owls

South Coast

Central Coast



% of prey numbers in diets of barred owls and spotted owls

Prey	Barred Owl (n = 265)	Spotted Owl (n = 296)
Shrews / shrew moles / moles	23.8	4.0
Hares	8.3	6.0
Douglas squirrels / chipmunks	9.0	1.7
Flying squirrel	20.0	50.7
Deer mice	6.8	20.6
Woodrats	0.0	4.4
Red-backed vole	1.1	6.8
Microtus	6.7	0.7
Other mammals	0.4	1.3
Birds	11.0	2.8
Fish / Amphibians	8.3	0.0
Molluscs	0.8	0.0
Insects	3.8	1.0

Home Range and Habitat Use of Spotted Owls on the Olympic Peninsula, Washington

- ❖ Conducted April 1987-August 1989
- ❖ 20 adult owls (9 pairs and 2 paired males)
- ❖ Average tracking period = 438 ± 34 days
- ❖ Sampling schedule = 1 location per day or night
- ❖ Average relocations per owl = 366 ± 35
- ❖ Total foraging locations = 3,931
- ❖ Total roosting locations = 3,262 (902 visual)
- ❖ Median telemetry accuracy = 100 m (mean = 140 ± 17 m)
- ❖ 1 mortality (choking?)



Estimates (in hectares) of median ranges of Spotted Owls on the Olympic Peninsula, Washington, 1987-89

Estimator	Males	Females
Annual 75% FK	1,186	967
Annual 95% FK	2,533	2,235
Annual MCP	3,288	1,915
Cumulative 75% FK	1,152	1,173
Cumulative 95% FK	2,404	3,384
Cumulative MCP	2,870	2,912

Conversion: 2.5 acres per hectare



Selection of forest cover types by spotted owls on the Olympic Peninsula, 1987-89. Preference ranks from compositional analysis.

Cover type	Preference rank	
	Foraging	Roosting
Old-forest	6	6
Mature forest	4	5
Young + remnant forest	5	4
Young forest	2	3
Pole-sapling forest	1	1
Hardwood forest	3	2
Clear-cut/non-forest	0	0



Size of home ranges was negatively correlated with the % cover of older forest types (Old + mature) regardless of which home range estimator was used.



Difference between spotted owl foraging locations and random locations relative to elevation, distance to the nearest edge, or distance to the nearest stream, Olympic Peninsula, 1987-89. All measurements in meters.

Variable	Observed	Random	Signif.
Forest edge	233 ± 24	304 ± 34	0.001
Nearest stream	98 ± 14	94 ± 10	0.475
Elevation	315 ± 31	354 ± 36	0.002

