Conservation Lecture Series

Hosted by the

Habitat Conservation Planning Branch

Upcoming Lectures

Topic	Date
California's endemic fishes in an era of rapid decline, Dr. Peter Moyle	2/11
Yellow starthistle, Dr. Joseph DiTomaso	3/17
Shasta crayfish, Dr. Maria Ellis	4/29
Alameda whipsnake/San Francisco gartersnake, Karen Swaim	TBD
Mountain yellow-legged frog, Dr. Vance Vredenburg	TBD
California tiger salamander, Dr. Chris Searcy	TBD

Videos and presentation slides available for past lectures:
California tiger salamander*, giant gartersnake, Pacific fisher
*no video available
http://dfgintranet/portal/ExploreCDFW/Divisions/ECD/HCPB/PermitAcademy/ConservationLectureSeries/tabid/2223/Default.aspx

Credit for Attendance from OTD

- In person: sign in sheet
- WebEx: full name
- E-mail margaret.mantor@wildlife.ca.gov

Northern Spotted Owl

Dr. Lowell Diller

December 17, 2013

Review of Northern Spotted Owl Ecology with an Emphasis on California

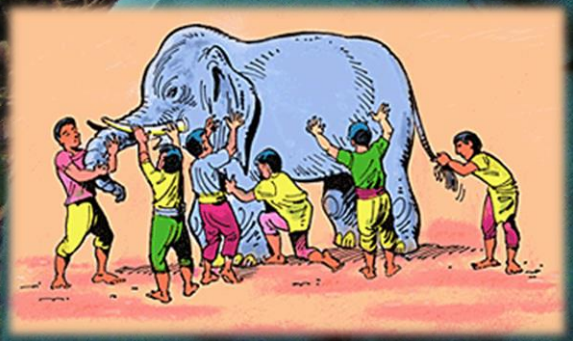
Lowell Diller

Green Diamond Resource Company

Courtesy Nick Nichols, NGM

Where you "touch the owl" really matters:

Ecology strongly influenced by prey base and barred owl



Life History and Behavior

Long lived (max 20+ yrs) with high pair and site fidelity, low fecundity but high adult survival

Courtesy Paul Bannick


Vocalizations, courtship feeding and allopreening maintain pair bond – peak during pre- and early nesting season

Forage under/within forest canopy as a perch and dive predator

Flight feathers with special adaptations, slotting, and low wing loading


Not fast but masters of precise,
highly agile and silent flight
Courtesy Paul Bannick

Reproduction – nesting

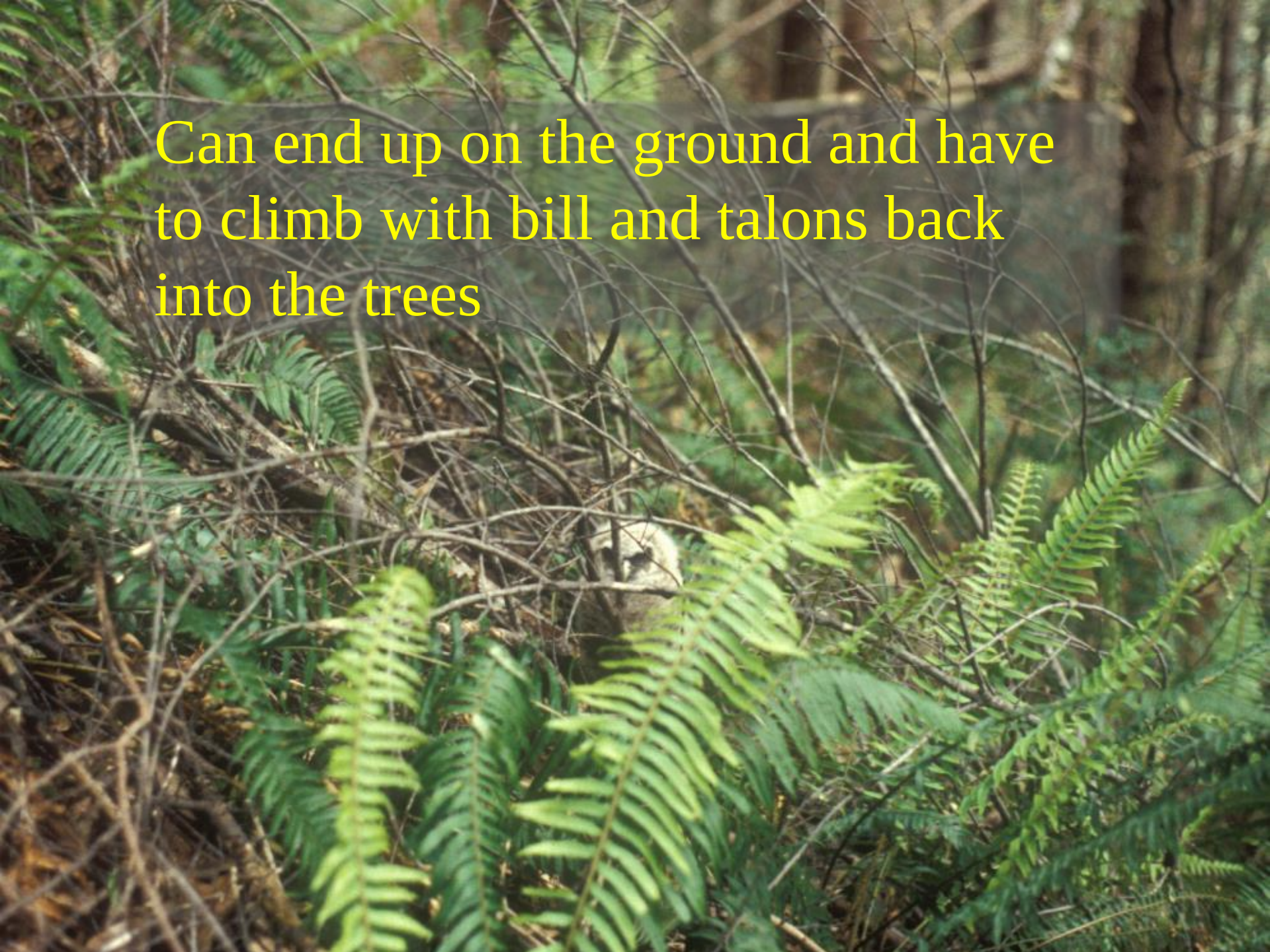
Do not build nests – create a shallow depression in an existing structure. Most commonly an open platform created by a structural tree deformity, debris platform or animal nest

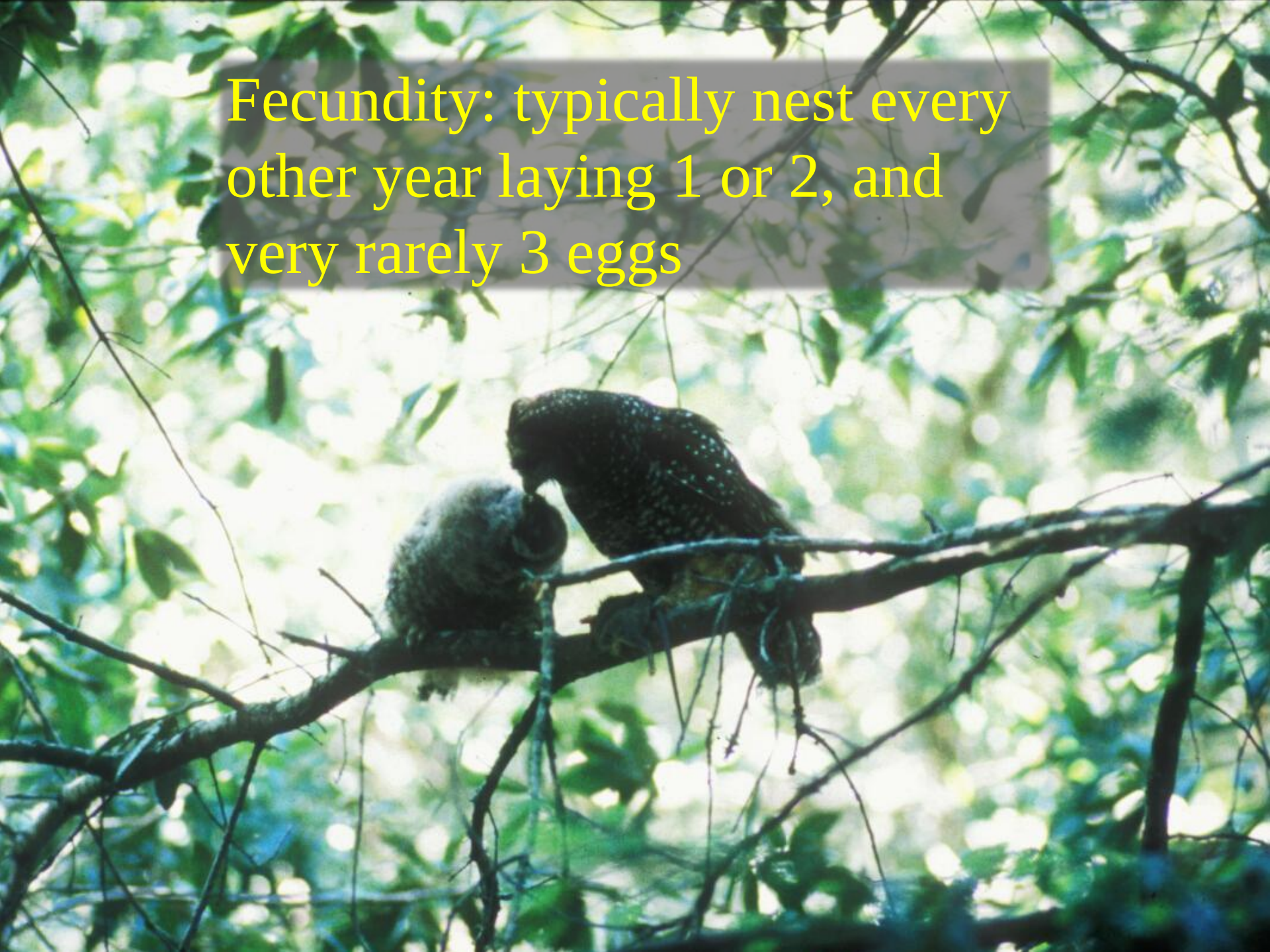
Nesting chronology:

- Egg laying late March – early April
- Hatching late April – early May
- Fledging early June but fed by adults until dispersing
- Fledglings usually disperse in September

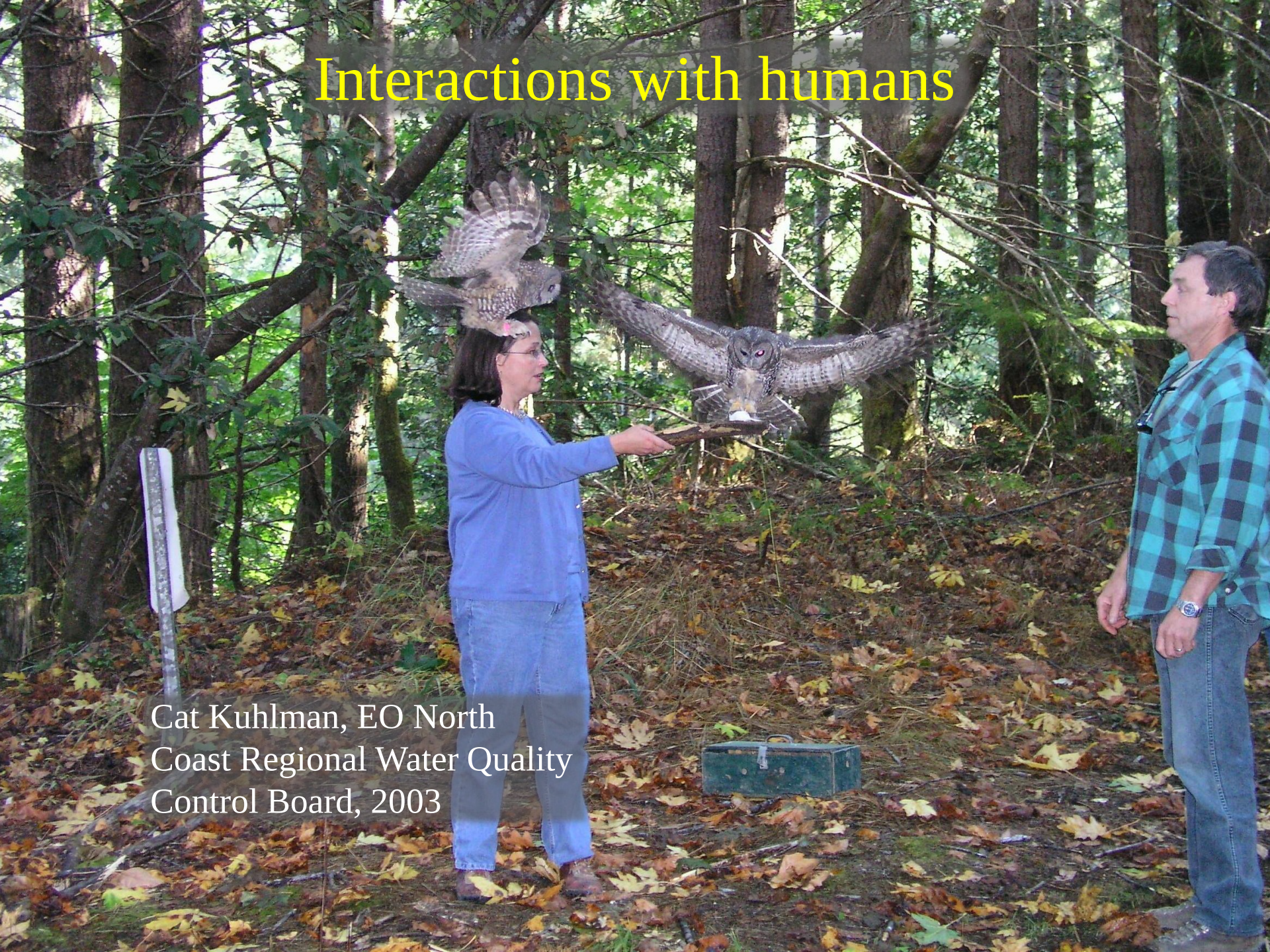

Tend to “fledge” (leave the nest)
when quite immature


Poorly flighted and totally dependent
on adults for protection and food


Can end up on the ground and have to climb with bill and talons back into the trees


Fecundity: typically nest every other year laying 1 or 2, and very rarely 3 eggs

Interactions with humans



Cat Kuhlman, EO North Coast Regional Water Quality Control Board, 2003

Response to human presence:
remarkably rapid habituation and transference of behaviors if interactions are positive


Response to human presence:
never forget if interaction is negative

Response to human presence:
attempt to climb the nest tree and they will aggressively attack

Danielle Folliard with talon puncher wounds following a spotted owl attack

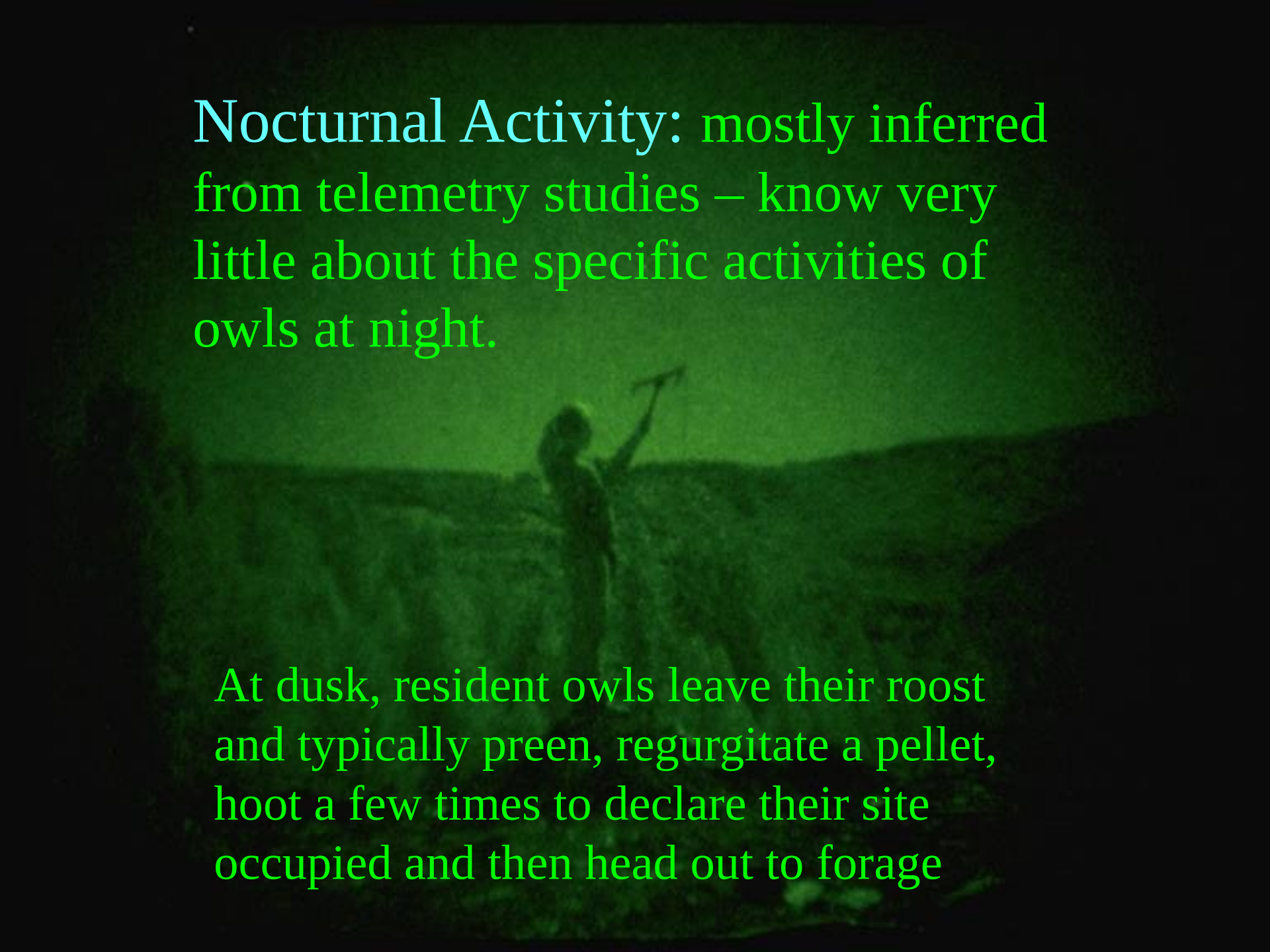
Studies facilitated by positive human interactions and opportunistic daytime foraging behavior


“Hand grab”


Mark-recapture studies facilitated by unique color bands on one leg and USFWS numbered band on the other
>12,000 banded in NW and
>1,800 on Green Diamond
(single largest banding dataset)

Food Habits:

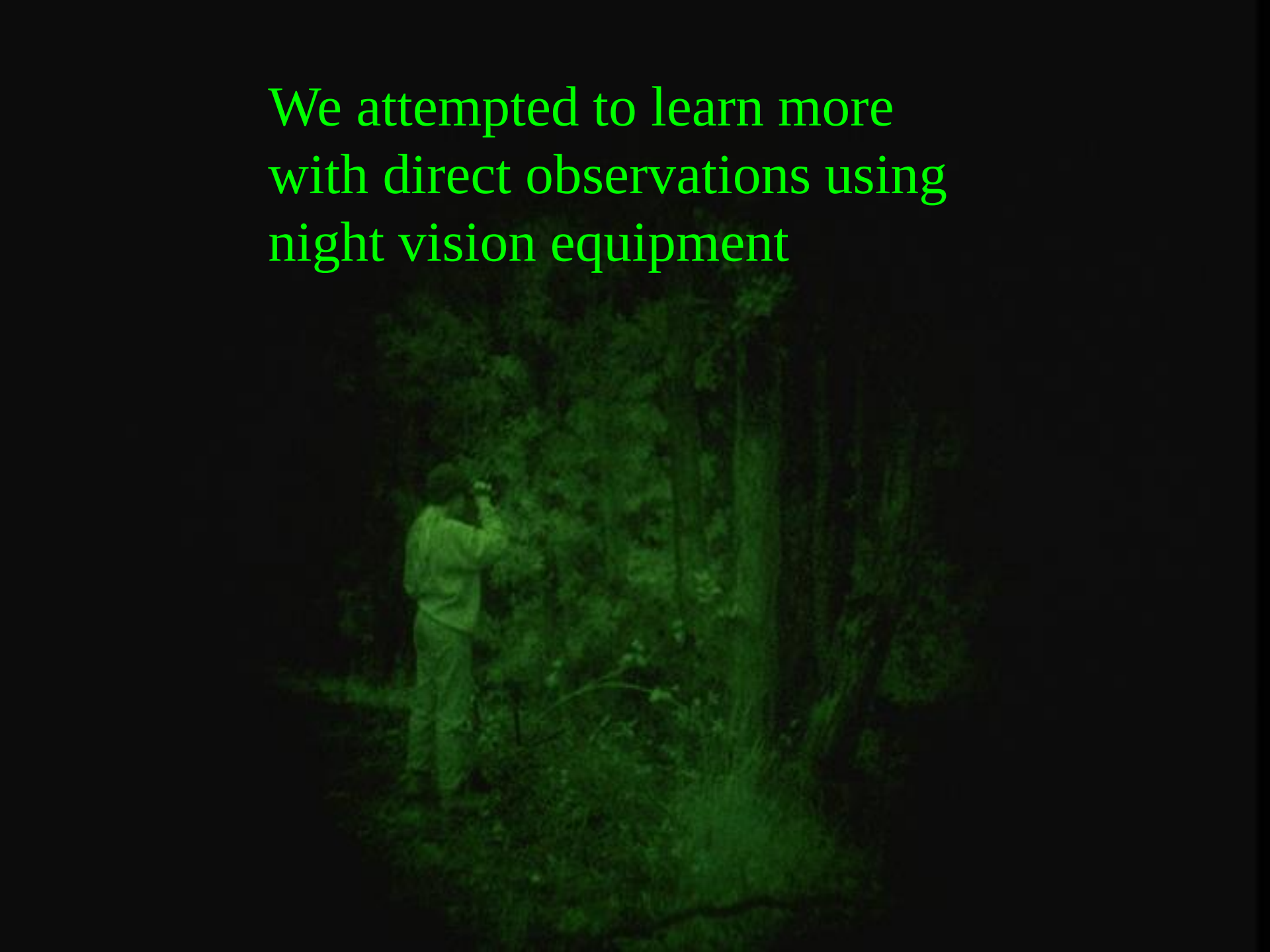
Mostly take small mammals with either northern flying squirrel or dusky-footed woodrat being the single most important prey species depending on the location. Primary prey has a profound influence on the ecology of the NSO.

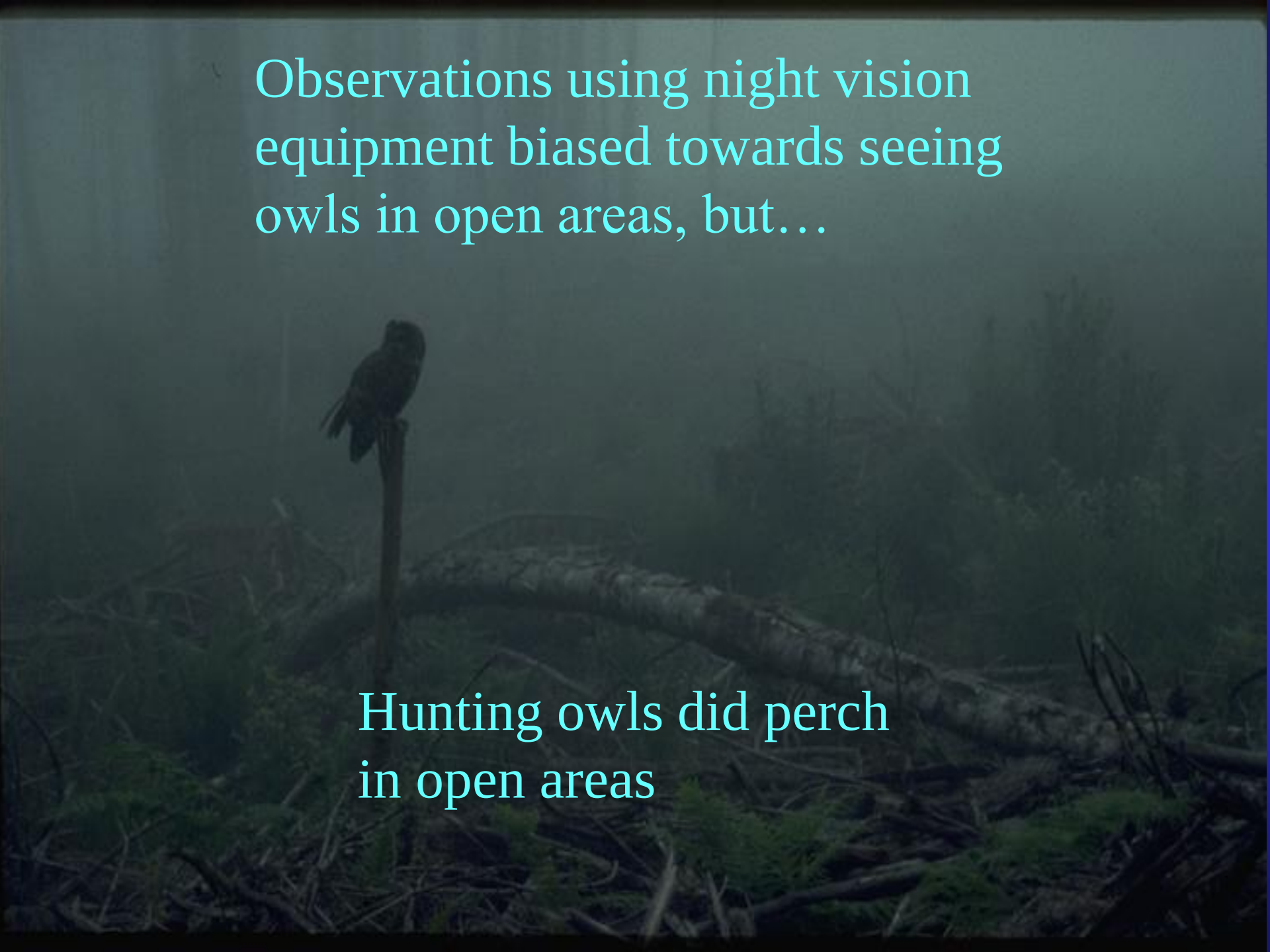


Nocturnal Activity: mostly inferred from telemetry studies – know very little about the specific activities of owls at night.

At dusk, resident owls leave their roost and typically preen, regurgitate a pellet, hoot a few times to declare their site occupied and then head out to forage

We attempted to learn more with direct observations using night vision equipment

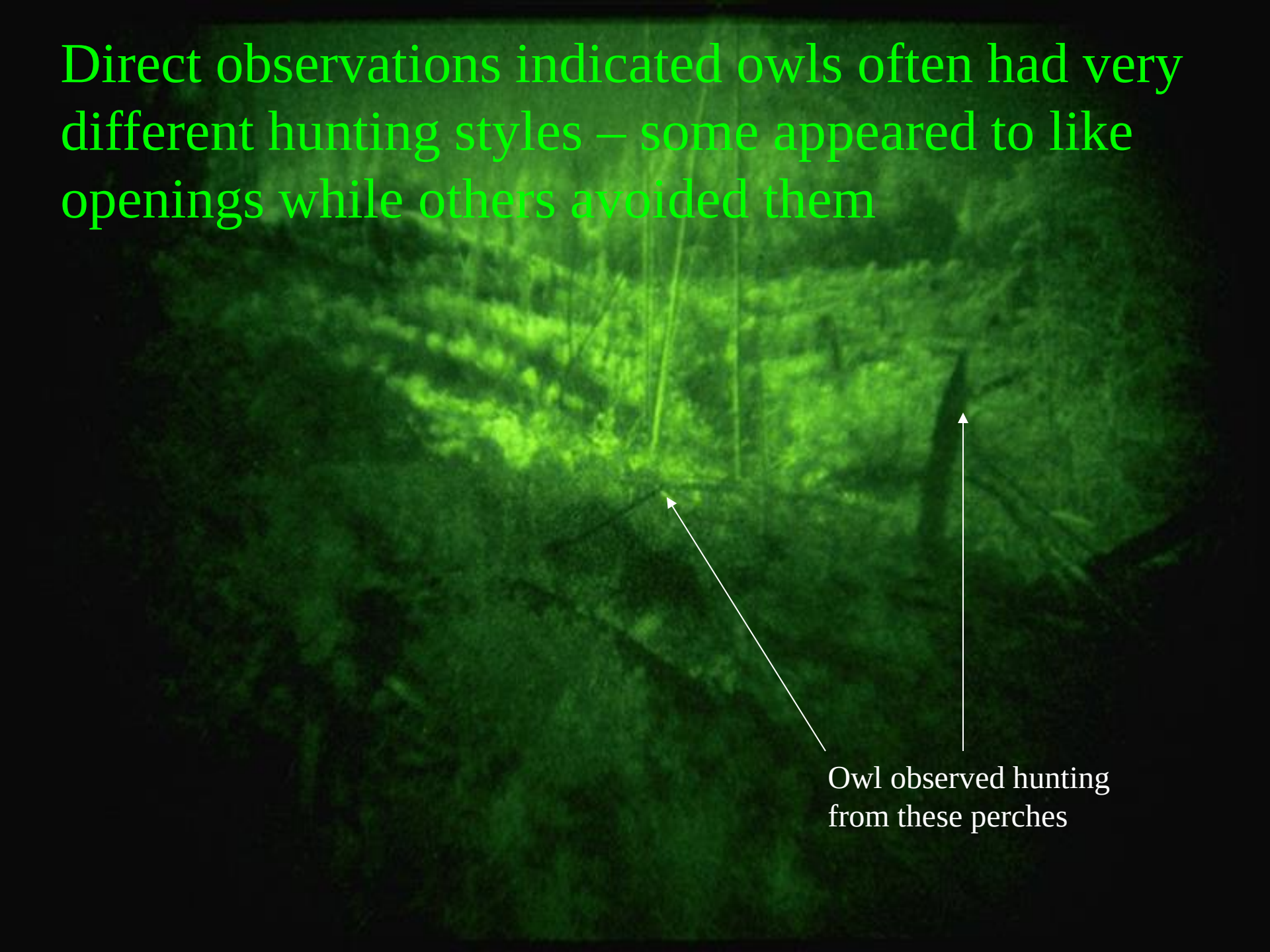




Observations using night vision equipment biased towards seeing owls in open areas, but…

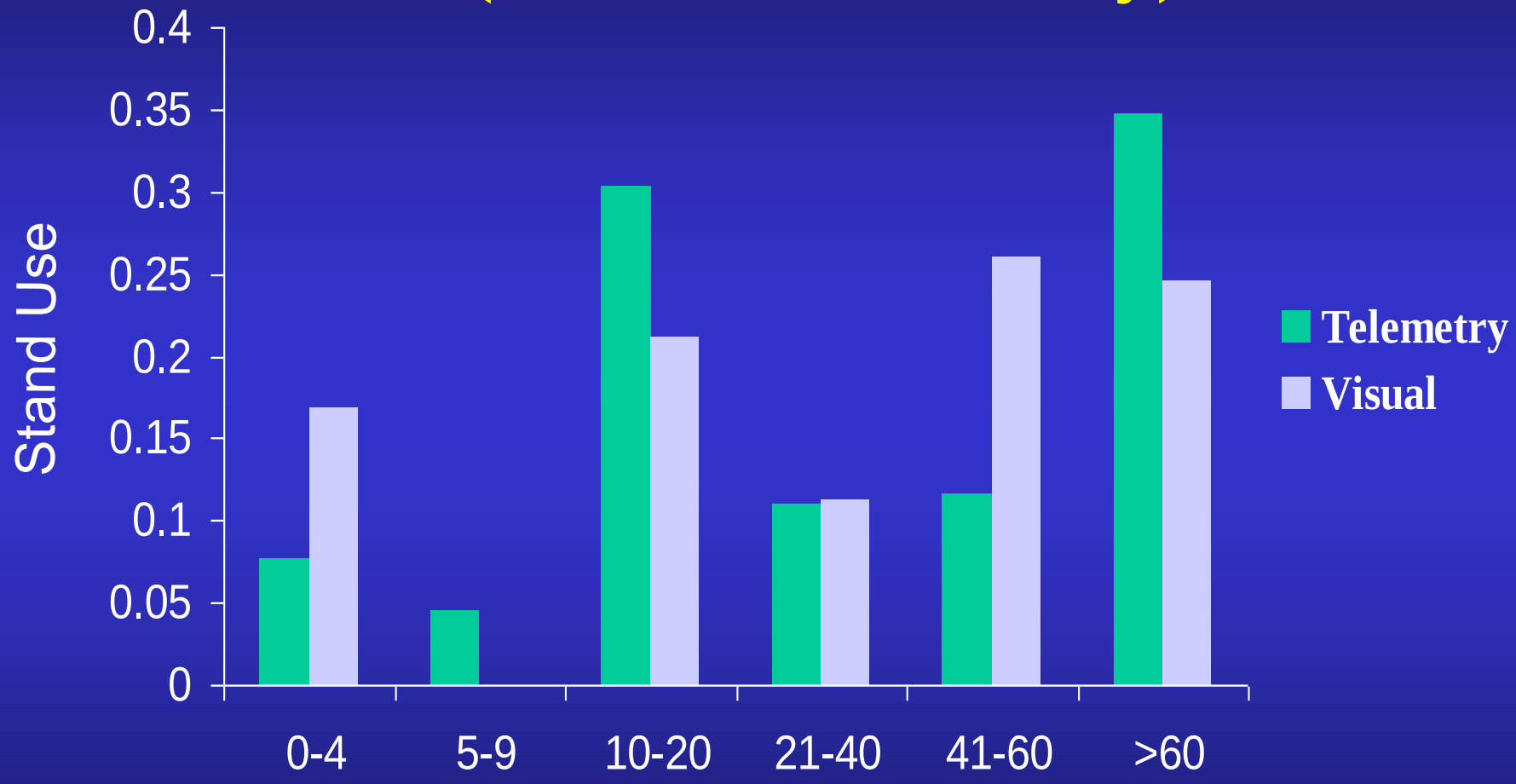
Hunting owls did perch in open areas

Direct observations indicated owls often had very different hunting styles – some appeared to like openings while others avoided them




One owl specialized in hunting old logging roads
hunting perch
Prey captured

Foraging Use Relative to Stand Age (visual and telemetry)



Diller et al. 2011

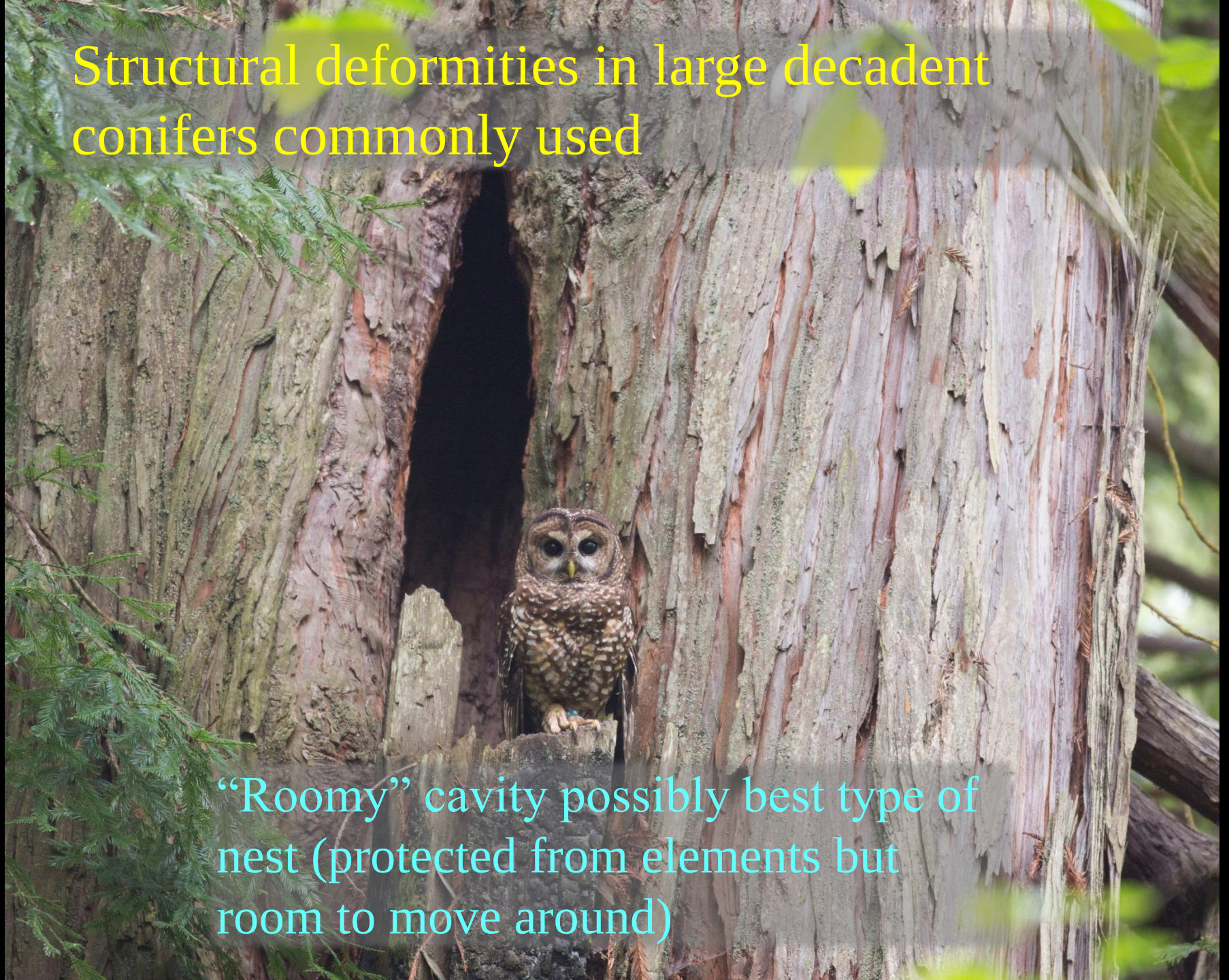
Juvenile Dispersal

Dispersal occurs in stages with movements between temporary locations until settling into a “permanent” location. The median distance from fledging to settlement is about 10 miles for males and 15.5 miles for females.
(Forsman et al. 2002)

Green Diamond dispersal distances based on recaptures of banded fledglings					
Males			Females		
N	Range (miles)	Mean (miles)	N	Range (miles)	Mean (miles)
172	0.5-93	7.7	171	0.8-87	10.5

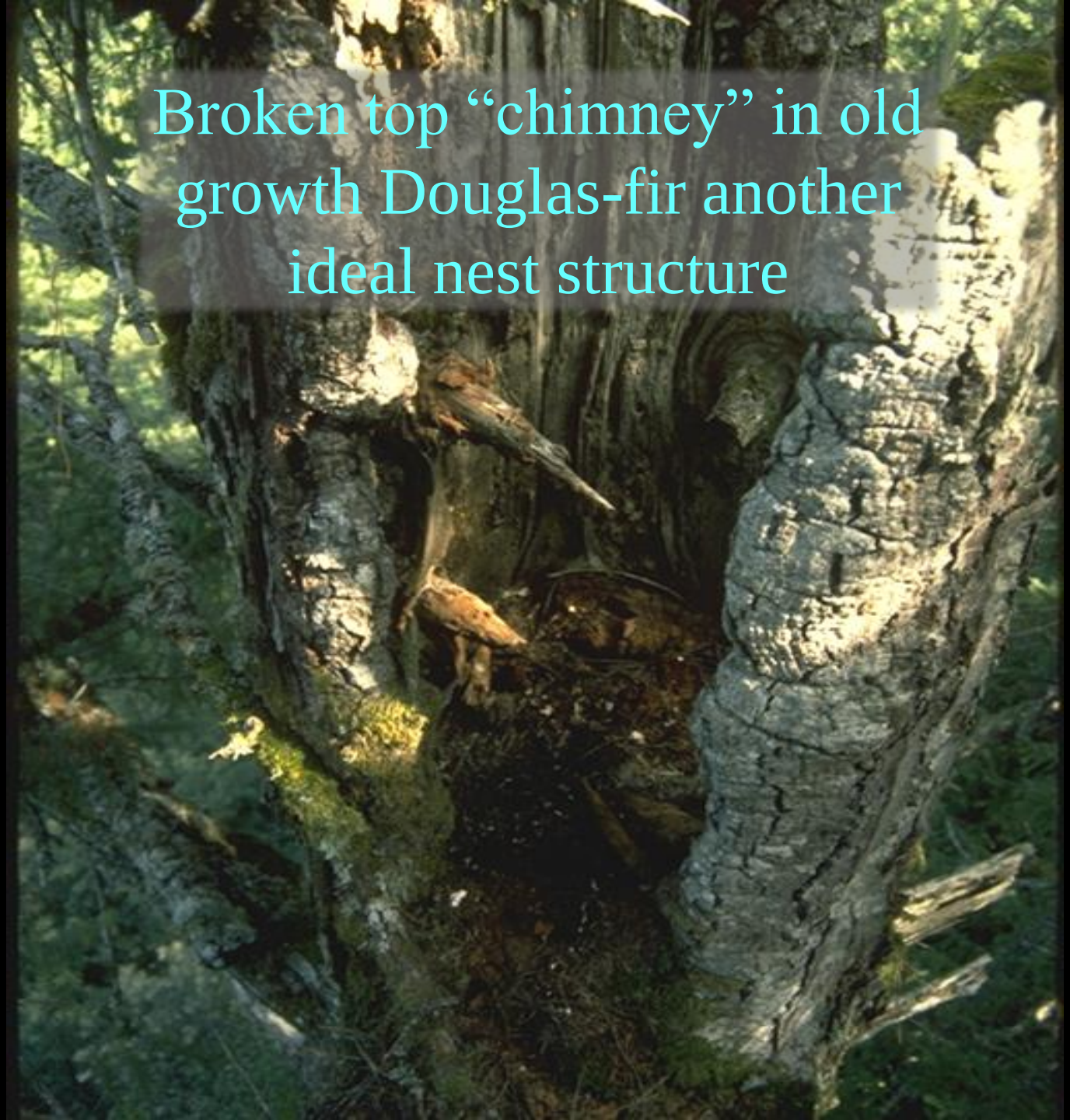
Habitat Associations at Different Spatial Scales:

- Nest structure and tree
- Nest and roost stand/grove – core of activity center
- Home range or landscape



Structural deformities in large decadent conifers commonly used

"Roomy" cavity possibly best type of nest (protected from elements but room to move around)


Broken top “chimney” in old growth Douglas-fir another ideal nest structure

Tight cavities such as those created by pileated woodpeckers are less frequently used – tend to cause premature fledging


Open platform nests created by other animal nests or debris accumulations – potentially in smaller trees
Proportion of nests in open platforms varies dramatically by area (Courtney et al. 2004) – about 50% in redwood region

“Bed and Breakfast” – spotted owl eats the tree vole and creates its nest on the vacated nest

Experimented with artificial nest structures: intermittently used if placed within an activity center but no evidence they increase fledging success

Nest/roost stand:

- Tends to be similar throughout the species range
- Characterized by stands with high canopy closure (60-90%); multilayered with large decadent overstory trees (USFWS 2011)
- Core area that includes alternate nest and roost sites estimated to be from about 80-90 acres (Thomas et al. 1990 and Green Diamond data)


Residual structure
in owl site core
Dry Creek, Mad River
drainage near Korbel, CA

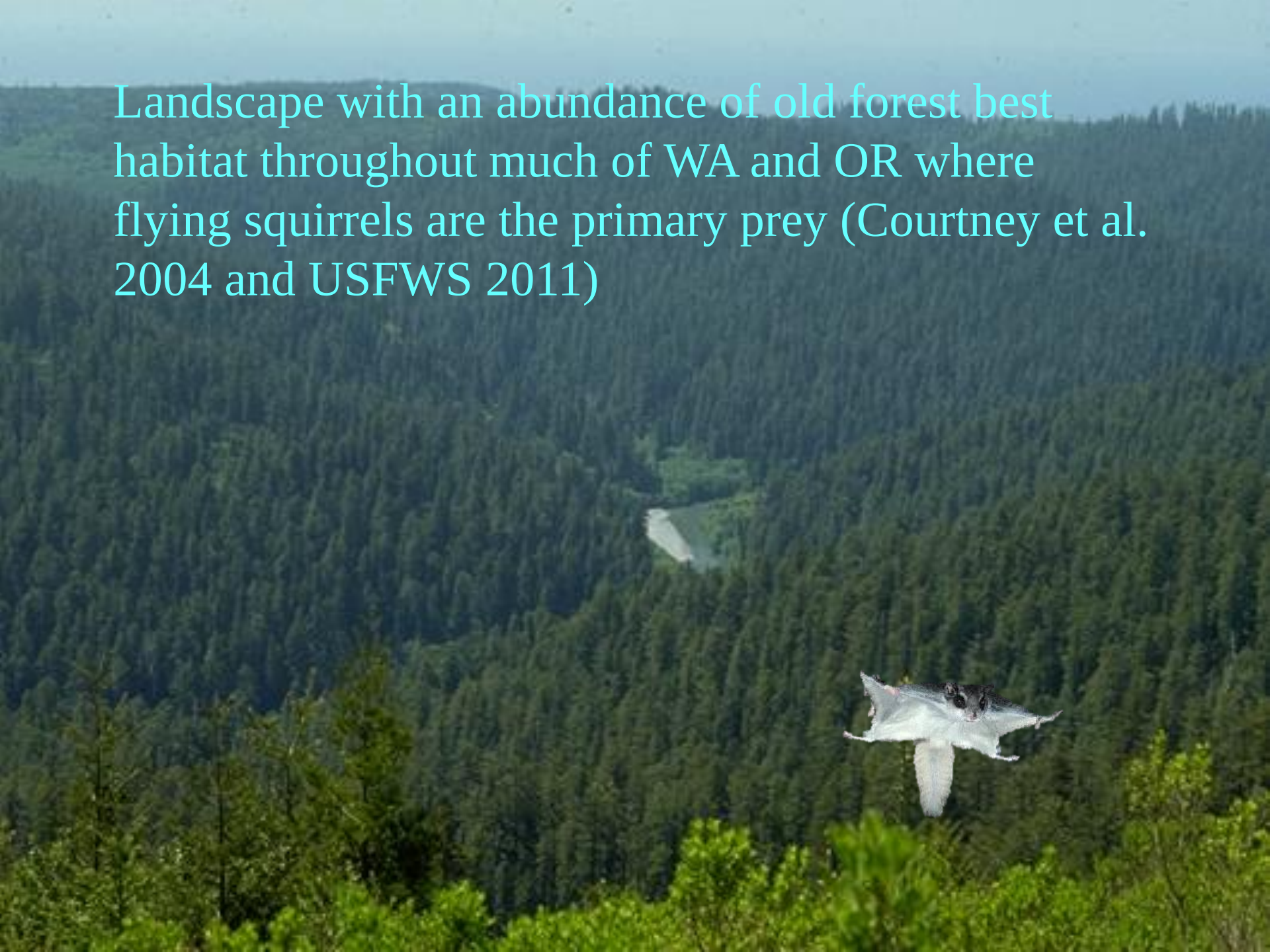

Residual structure
in owl site core
Bald Mountain Cr, NF Mad River
drainage near Korbel, CA

Landscape or home range characteristics

Which landscape is better habitat for NSO?

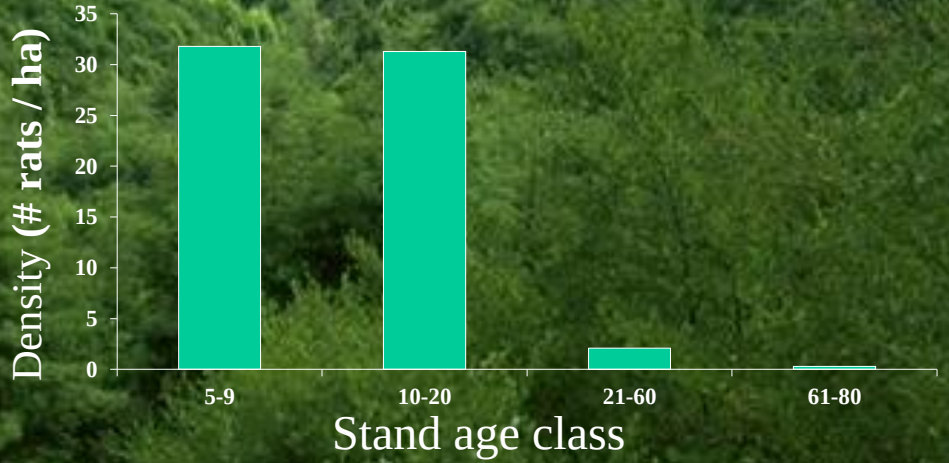
All depends on where you are and what the primary prey is.

Landscape with an abundance of old forest best habitat throughout much of WA and OR where flying squirrels are the primary prey (Courtney et al. 2004 and USFWS 2011)



However, a landscape with an abundance of dense early-seral habitat with pockets of mature forest for roosting/nesting could support high densities of NSO where dusky-footed woodrats are the primary prey (Diller and Thome 1999)

Dusky-footed woodrat density



Hamm 1993

Home range size: influenced by habitat, prey base and latitude

Province	Home range (acres)	Factors
WA Olympic Peninsula	14,211	Mixed OG/managed
WA E. Cascades	9,066	Managed forests
OR W. Cascades	7,576	Managed forests
OR Coast Range	7,186	Doug fir fragmented
OR Coast Range	3,877	Doug fir old growth
OR Klamath	4,437	Mixed con fragmented
OR Klamath	1,317* (only 3 pairs)	Mixed con old growth
CA Coastal (Mendocino)	1,942	Managed forests
CA Coastal (Humboldt)	1,447	Managed forests

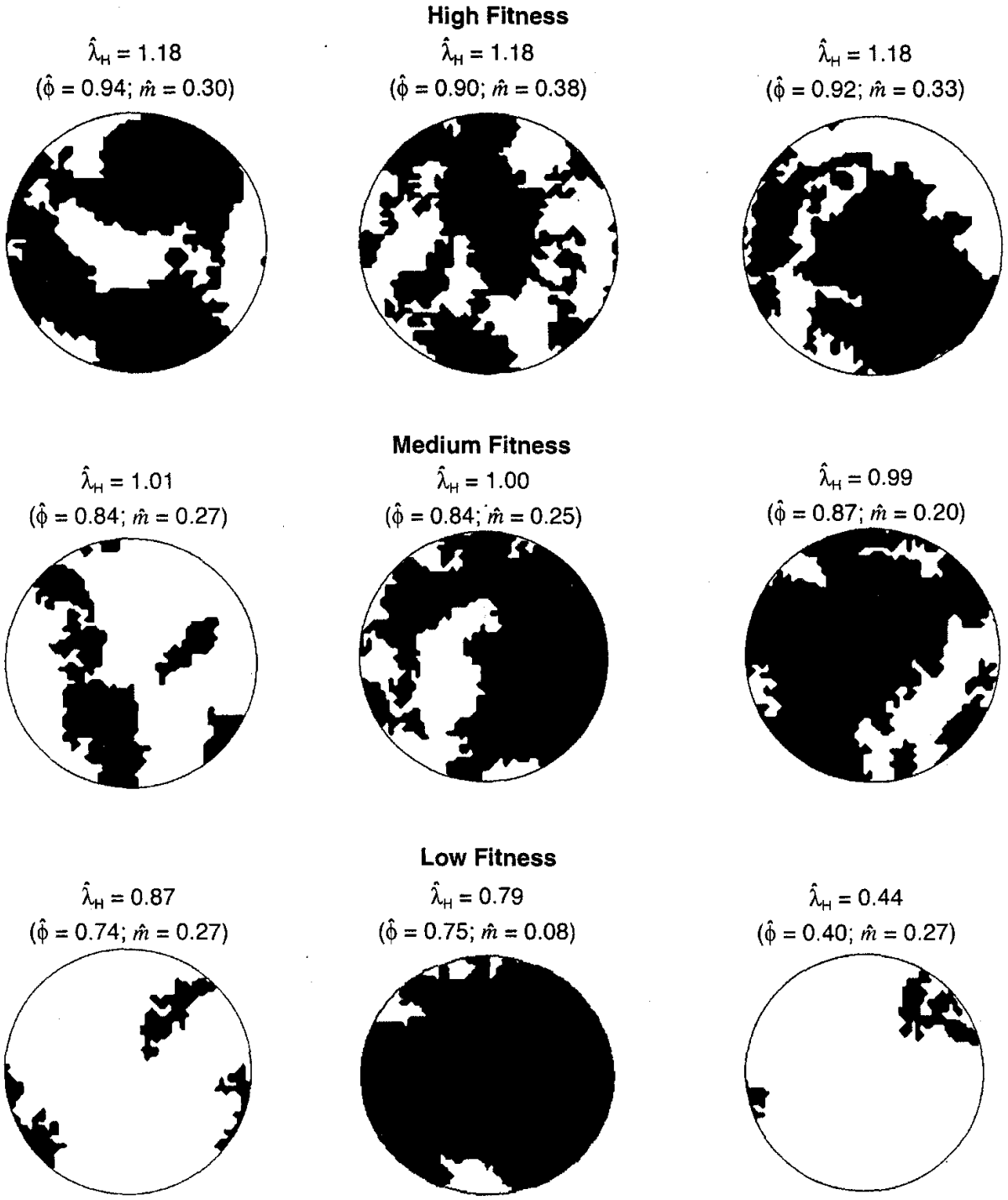
Core high use area ranges from 230-500 acres

Courtney et al. 2004 and USFWS 2011

"Habitat Fitness" – quality of habitat relative to its impact on the fitness (survival and reproduction) of individuals occupying it (Franklin et al. 2000)

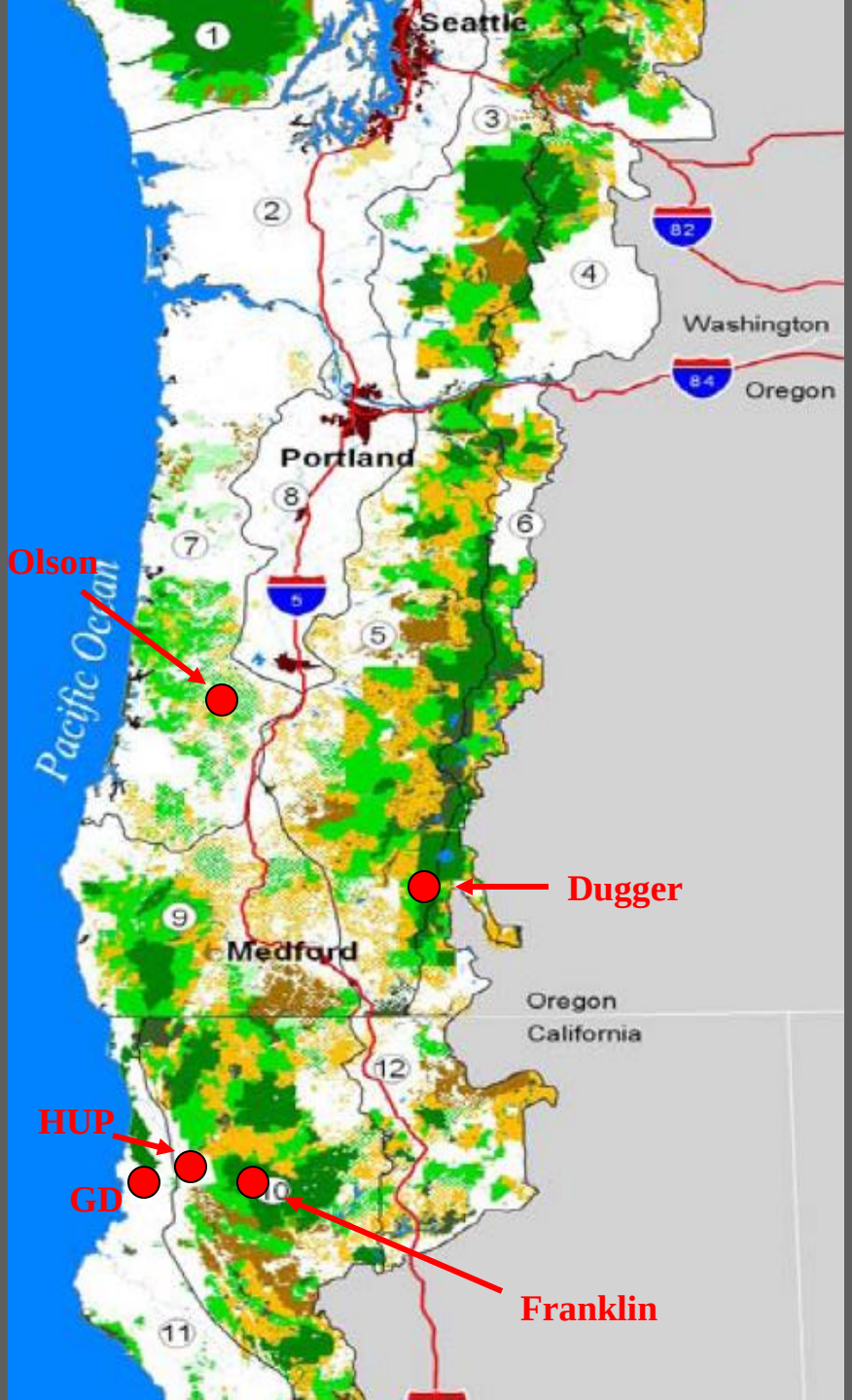
- Landscape with high habitat fitness ($\lambda_H > 1.0$) capable of supporting a stable or increasing source population
- Low habitat fitness ($\lambda_H < 1.0$) = decline or "sink" habitat

Habitat heterogeneity (mosaic of young and old forest) is key to high habitat fitness in portions of the NSO range.



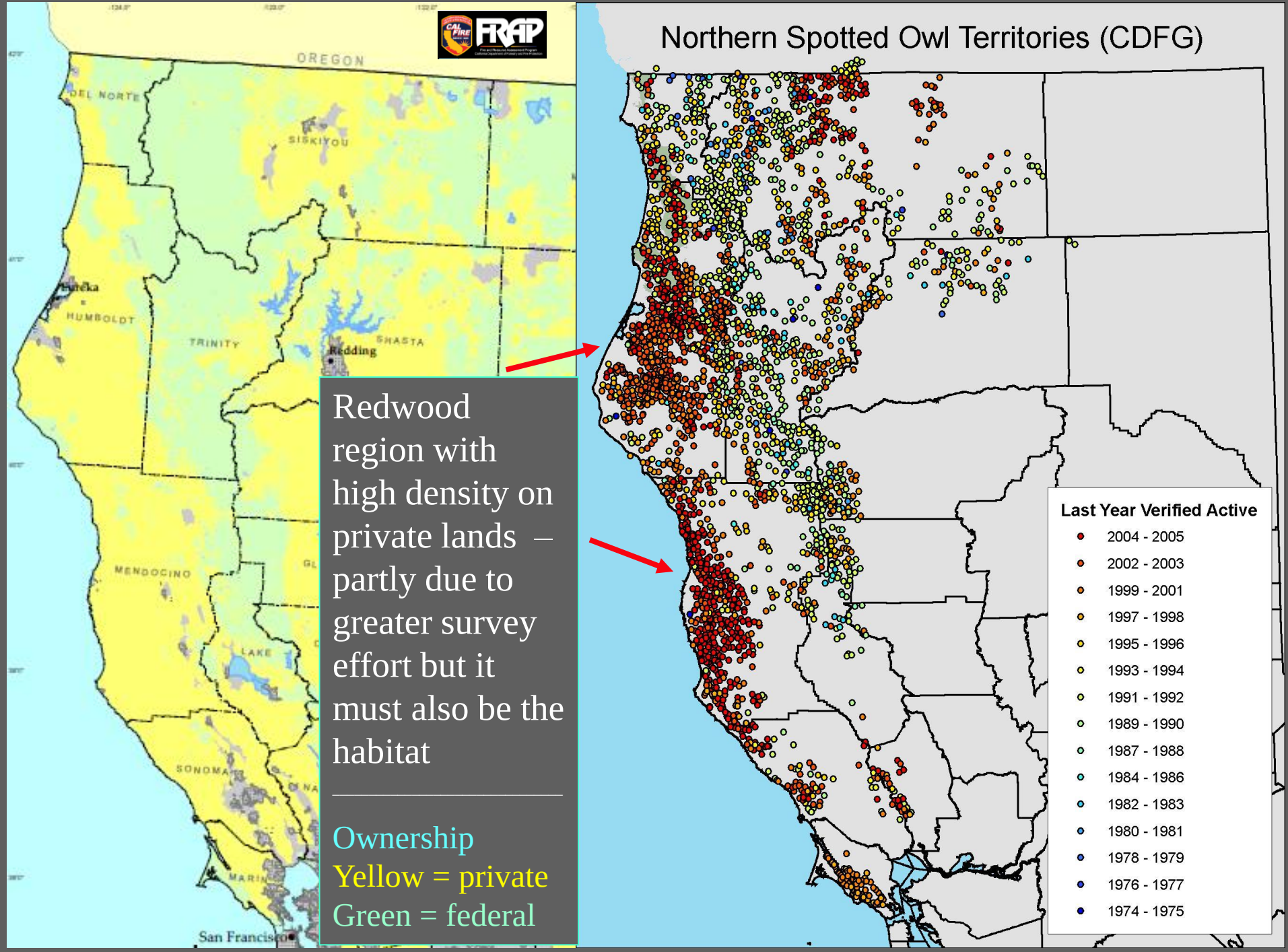
Landscape habitat characteristics within 0.71 km radius circles. Dark areas are NSO habitat; white areas are other vegetation types.

(Franklin et al., 2000)



Location of habitat fitness studies

- Olson et al 2004 – habitat heterogeneity (HH) positive relationship with habitat fitness (HF)
- Dugger et al. 2005 – HH not positive, survival + with more mature forest in core
- Franklin et al. 2000 – HH critical to HF
- Hoopa study (M. Higley and P. Carlson pers comm) – HH critical to HF
- Green Diamond (Diller et al. 2010) – HH key element in high HF


Northern Spotted Owl Territories (CDFG)
OREGON
DEL NORTE
SISKIYOU
HUMBOLDT
TRINITY
SHASTA
Redding
MENDOCINO
LAKE
SONOMA
San Francisco
Redwood region with high density on private lands – partly due to greater survey effort but it must also be the habitat
Ownership
Yellow = private
Green = federal
Last Year Verified Active
2004 - 2005
2002 - 2003
1999 - 2001
1997 - 1998
1995 - 1996
1993 - 1994
1991 - 1992
1989 - 1990
1987 - 1988
1984 - 1986
1982 - 1983
1980 - 1981
1978 - 1979
1976 - 1977
1974 - 1975

How could managed stands in coastal CA have the highest densities of NSO?

Diller and Thome 1999

Coppice growth of redwoods

Lower Mad River 1990

Rapid regeneration of stands loaded with woodrats in a mosaic of mature stands

Lower Mad River 2004


Tenacious and ubiquitous evergreen hardwoods
CA bay
Madrone
Tanoak


Tendency to create managed stand with high species and structural diversity

High levels of residual old trees in many areas – retaining old and recruiting new is critical to maintaining high quality habitat


Since we know so much about their habitat, can we insure positive trends in NSO population?
Courtesy Paul Bannick

Literature cited

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff and L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute, Portland, Oregon.

Diller, L.V., and D.M. Thome. 1999. Population density of northern spotted owls in managed young-growth forests in coastal northern California. Journal of Raptor Research 33:275–286.

Diller, L., K. Hamm, D. Lamphear and T. McDonald. 2010. Green Diamond Resource Company, Northern Spotted Owl Habitat Conservation Plan, Ten-Year Review Report. Report available from U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, California. 232 + viii pp.

Dugger, K.M., F. Wagner, R.G. Anthony and G.S. Olson. 2005. The relationship between habitat characteristics and demographic performance of northern spotted owls in southern Oregon. Condor 107:863–878.

Hamm, K.A. 1995. Abundance of dusky-footed woodrats in managed forests of north coastal California. Arcata, CA: Humboldt State University. MS thesis. 46 p.

Forsman, E.D., R.G. Anthony, J.A. Reid, P.J. Loschl, S.G. Sovern, M. Taylor, B.L Biswell, A. Ellingson, E.C. Meslow, G.S. Miller, K.A. Swindle, J.A. Thrailkill,F.F. Wagner and D.E. Seaman. 2002. Natal and breeding dispersal of northern spotted owls. Wildlife Monographs 149:1–35.

Franklin, A.B., D.R. Anderson, R.J. Gutiérrez and K.P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs 70:539–590.

Literature Continued

Olson, G.S., E.M. Glenn, R.G. Anthony, E.D. Forsman, J.A. Reid, P.J. Loschl and W.J. Ripple. 2004. Modeling demographic performance of northern spotted owls relative to forest habitat in Oregon. Journal of Wildlife Management 68:1039–1053.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon and J. Verner. 1990. A conservation strategy for the northern spotted owl. Interagency Scientific Committee to Address the Conservation of the Northern Spotted Owl. U.S. Forest Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. National Park Service, Portland, Oregon.

USFWS (U.S. Fish and Wildlife Service). 2011. Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp.