A Tale of Two Owls:

New Challenges in Spotted Owl Conservation

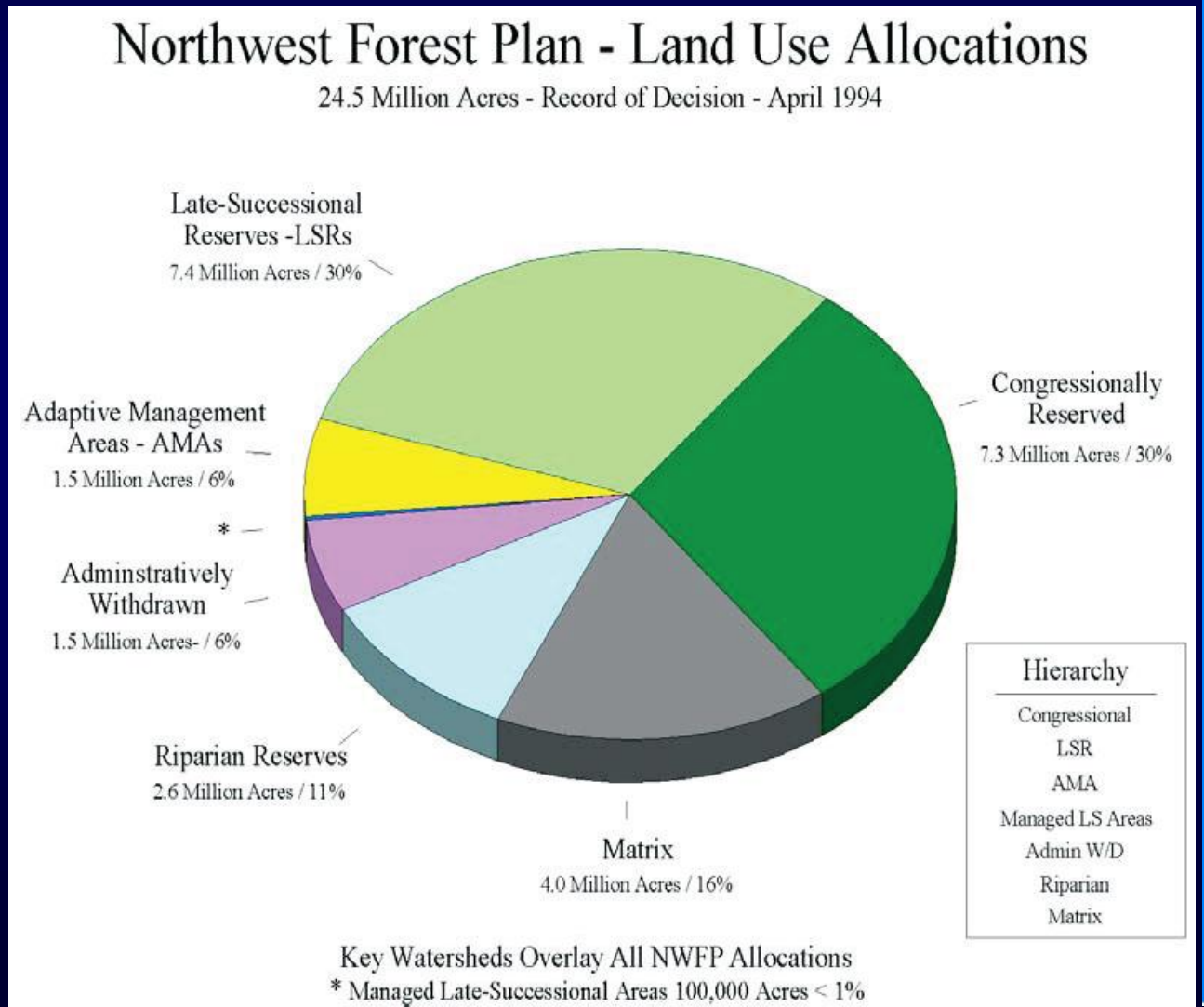
Lowell Diller

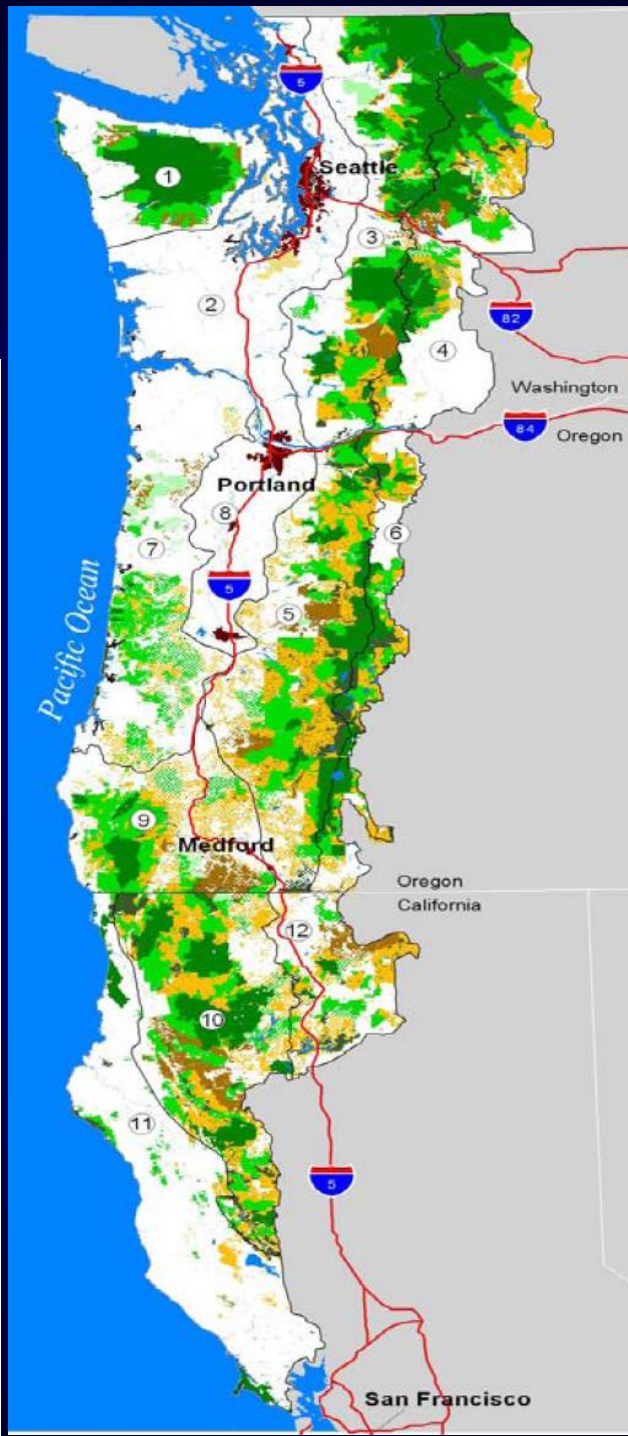
Green Diamond Resource Company, Korbel, CA

At listing (1990), primary threat
to Northern Spotted Owl was
loss and fragmentation of habitat

Northwest Forest Plan – 1994

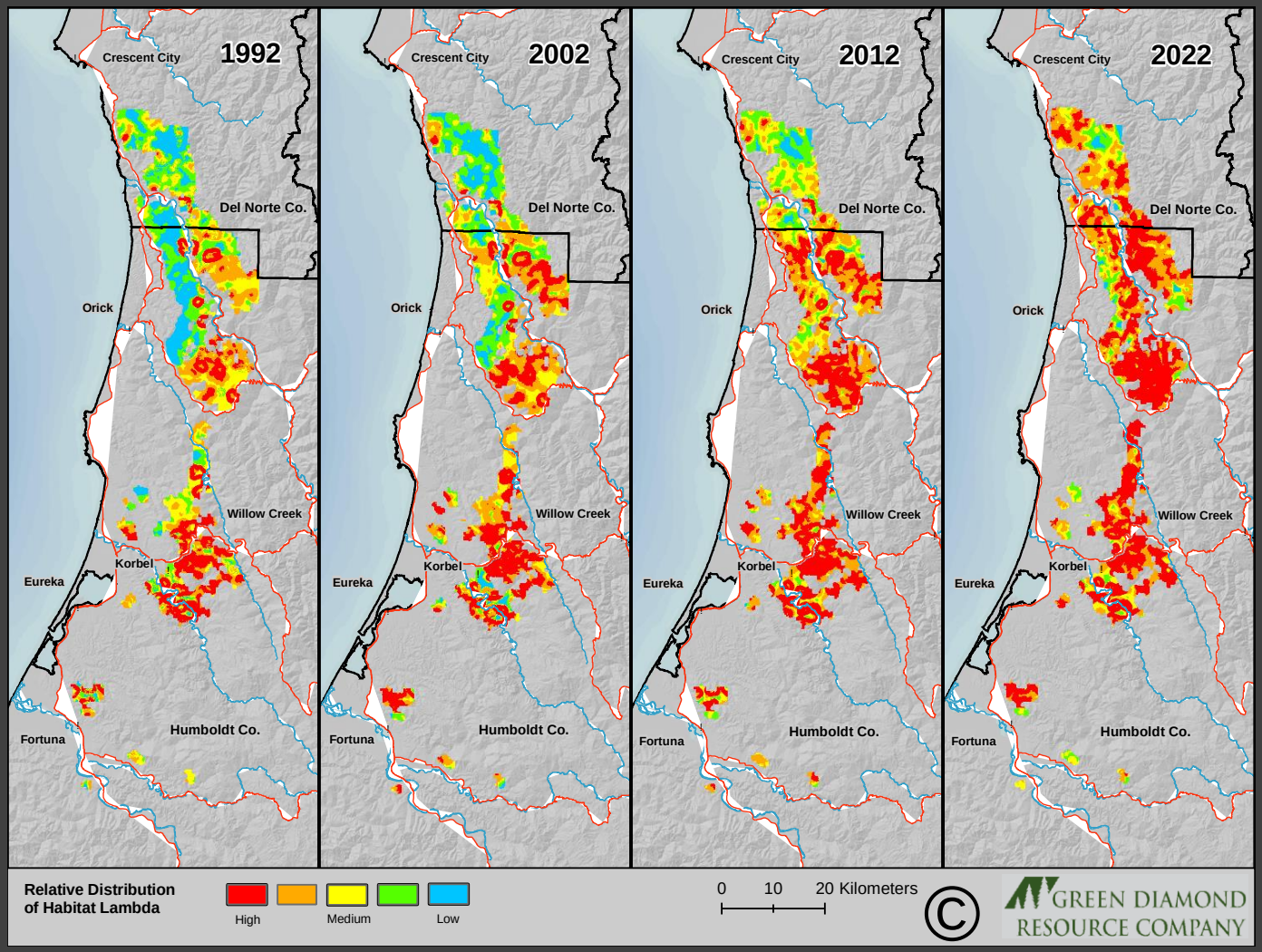
18.5 million acres in various reserves





Range-wide threat of habitat loss still exists, but it has been stabilized in the last two decades.

On Green the amount of high quality habitat is projected to be increasing.



Do NSO numbers reflect habitat trends? - Washington

Realized rate of population change - WA

Forsman et al. 2011

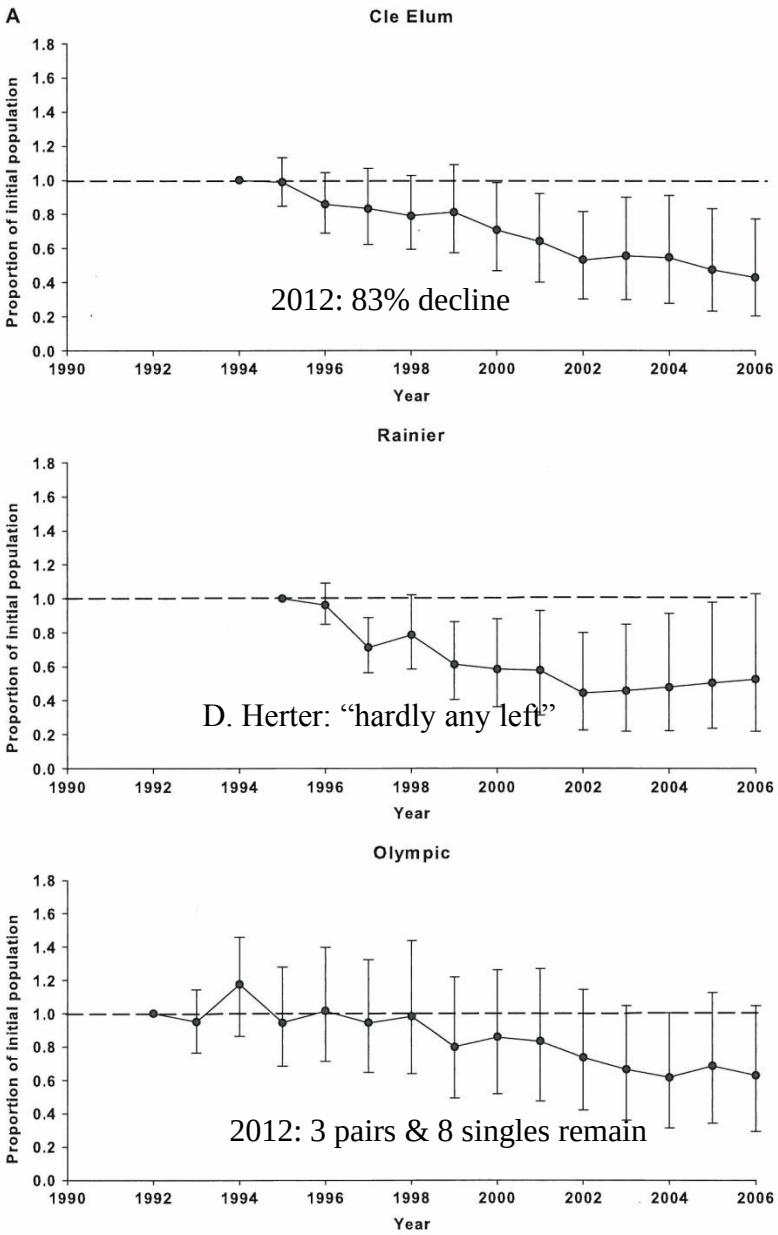
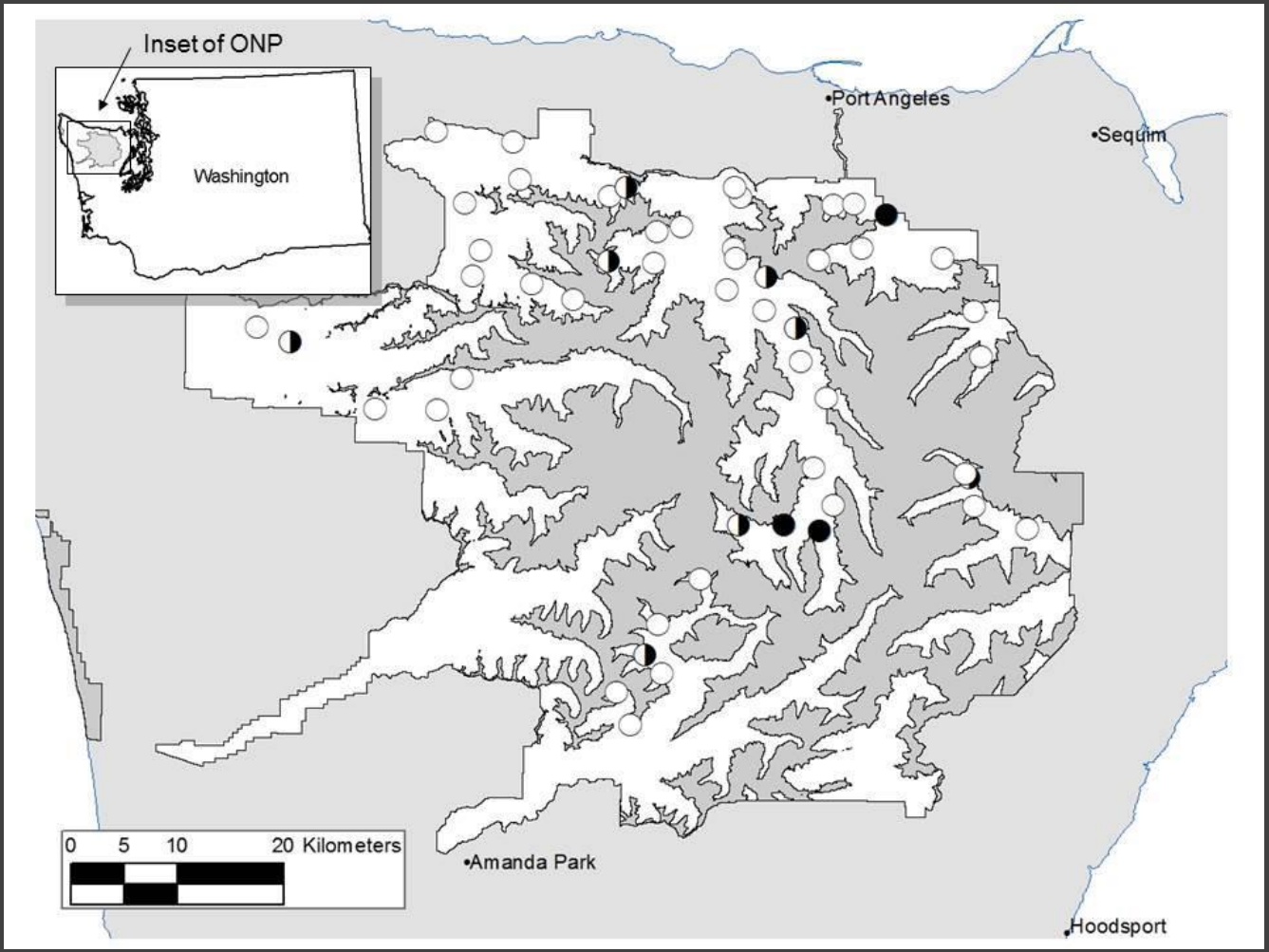


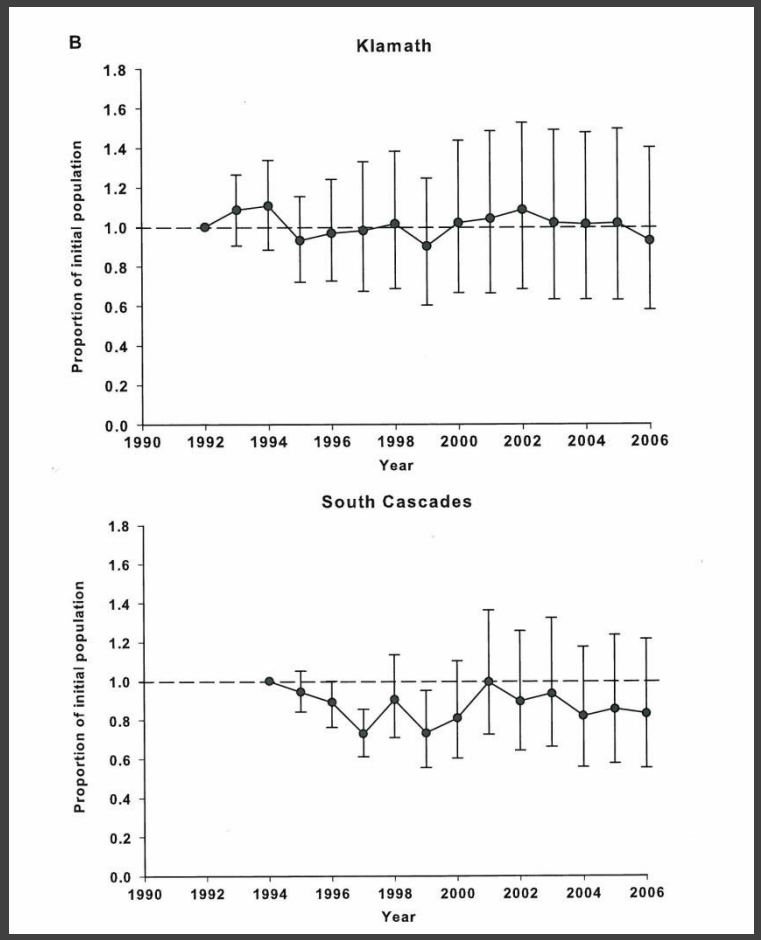
Figure 10. Estimates of realized population change, Δ_t, with 95% confidence intervals for Northern Spotted Owls at three study areas in Washington (A), five study areas in Oregon (B), and three study areas in California (C).

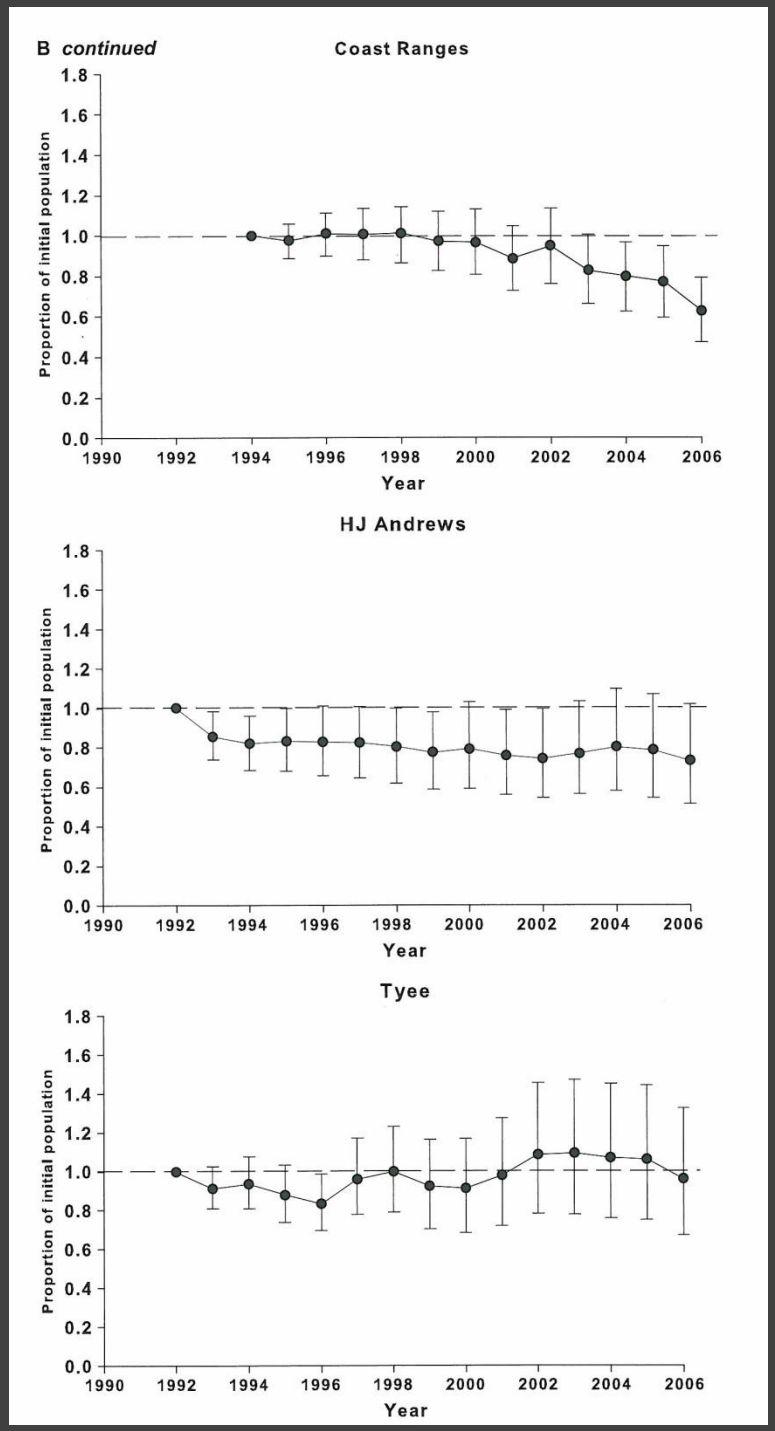
Trends in NSO, Olympic National Park



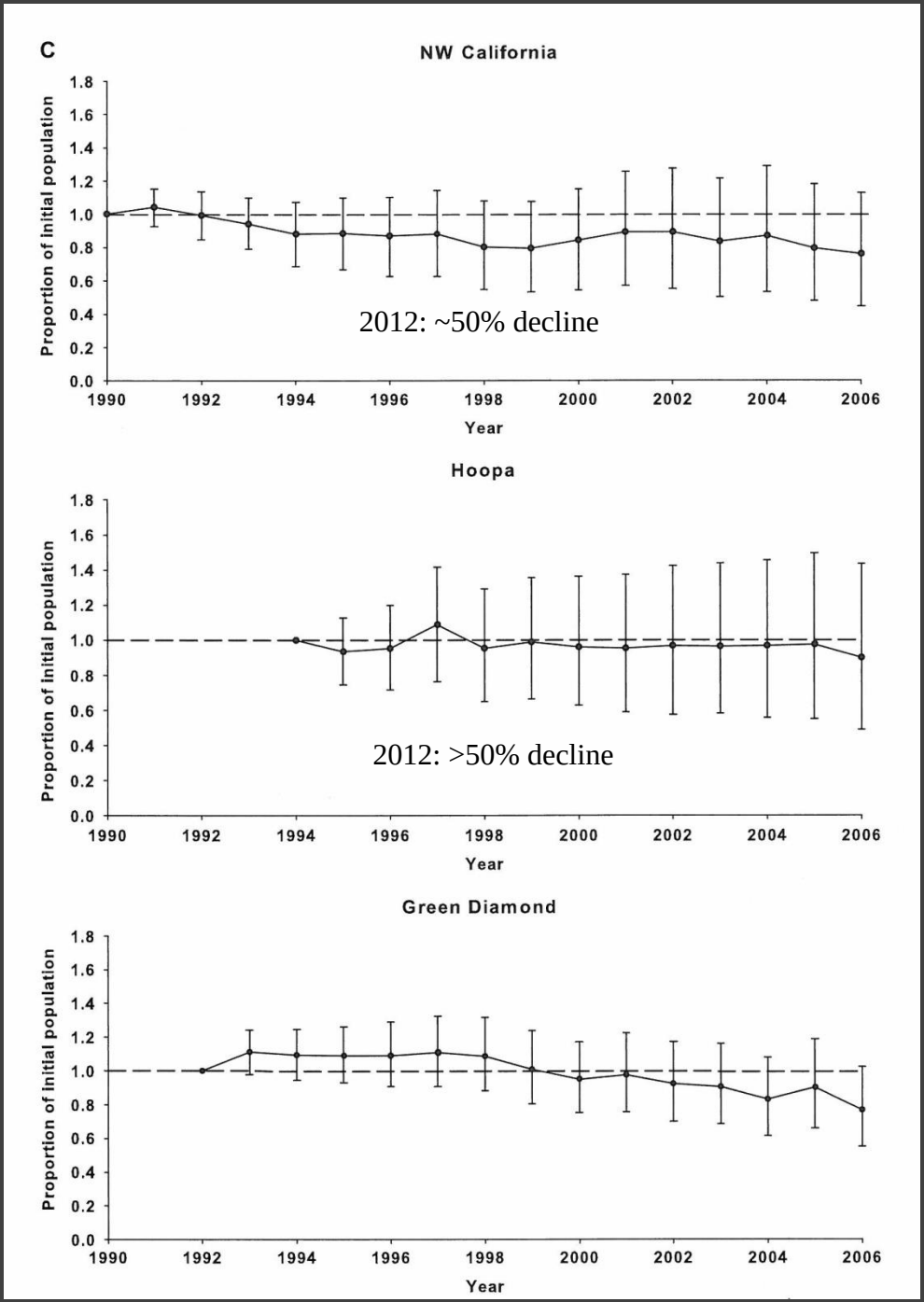
Location and occupancy status of 52 monitored spotted owl territories in Olympic National Park, 2013. Black circles are spotted owl pairs, half-filled circles are single owls and white circles are monitored sites with no response. Shaded area within the park boundary is high elevation non-habitat. (Gremel 2013)

Oregon trends in NSO numbers – all areas with major declines since last meta-analysis





California trends in NSO numbers based on demographic study areas



A new threat in the form of a distant cousin from the east

- BO separated from NSO for millions for years
- Closest relative to the BO are the Neotropical "Ciccaba" (now *Strix*) owls (G. Barrowclough, Amer. Mus. Nat. History, pers. comm.)

NSO and BO Life History Comparisons

- Both species are strongly territorial, maintain lengthy pair bonds and vocalizations are essential in all their behaviors, but BO 10-25% larger

Wing: 333mm (male); 338mm (female)

Weight: 632 g (male); 801 g (female)

Wing: 320mm (male); 328mm (female)

Weight: 582 g (male); 637 g (female)

Johnsgard 1988

Vocalizations and Behavior

Courtesy of
Liz Kelly

Reproductive Comparisons

- Similar reproductive strategies except BOs initiate nesting earlier in the season and have higher fecundity

NSO: typically nest biennially and fledge 1-2

BO : nest every year and fledge 3-4

Interaction study in coastal OR (Wiens 2012)

- Over 3 breeding seasons combined (2007–2009) with radio transmittered owls:
- NSO produced a total of 13 fledglings during 21 nesting attempts at 15 occupied territories.
- No NSO successfully fledged any young if they were within 1.5 km of a BO site
- BO produced a total of 80 fledglings during 45 breeding attempts at 20 occupied territories.

Food Habits – Northern Spotted Owl

Typically >90% small mammals composed of 2-3 species

Seldom feed on aquatic species

Northern flying squirrel

Red or Sonoma tree voles

Dusky-footed woodrat

Food Habits – Barred Owl

Many of the same small mammals (flying squirrel greatest biomass) and more, ~75% total overlap

Commonly take insects, snails, amphibians, fish, crayfish, earthworms and more

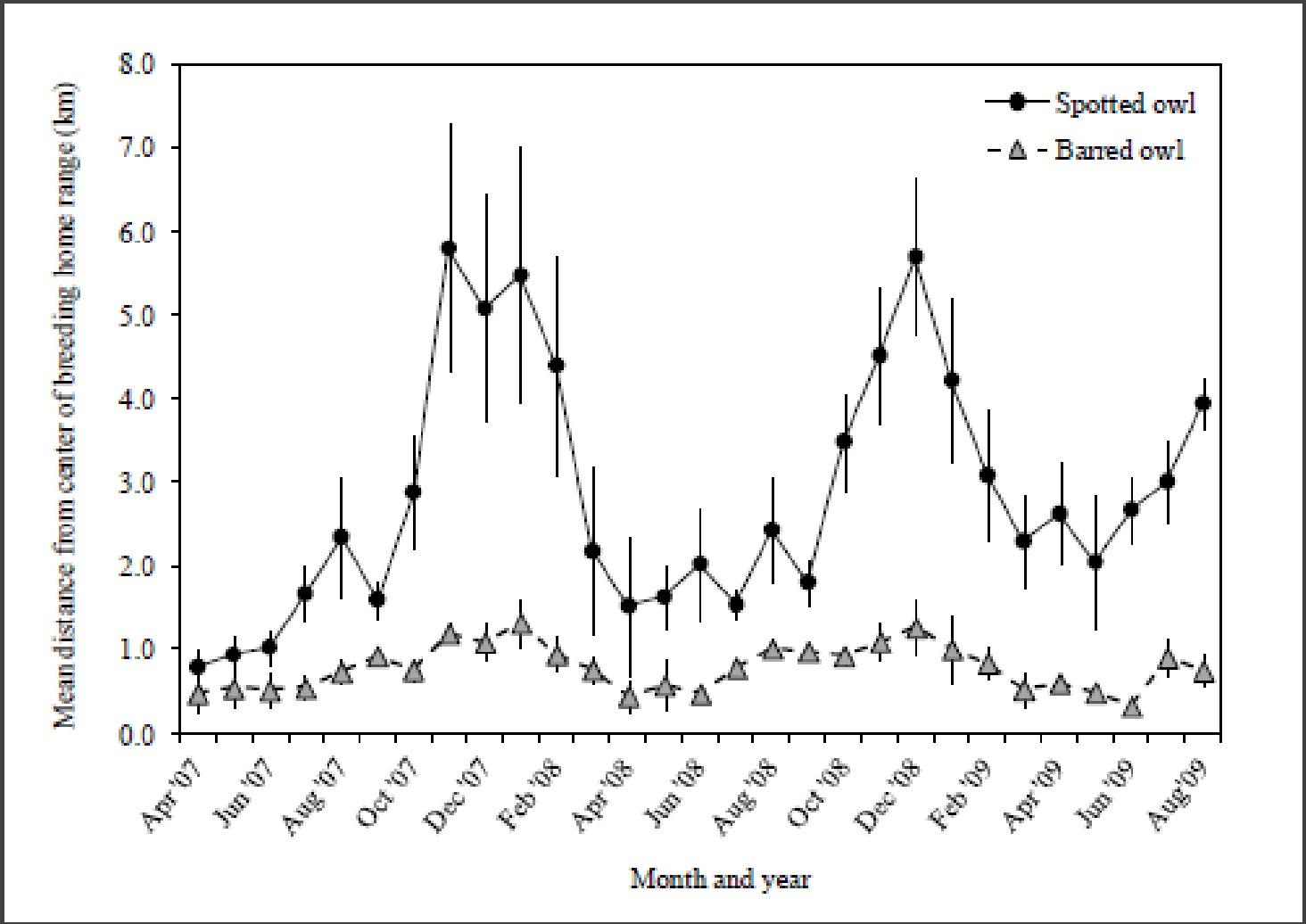
Courtesy David Wiens

BO perch
Courtesy David Wiens

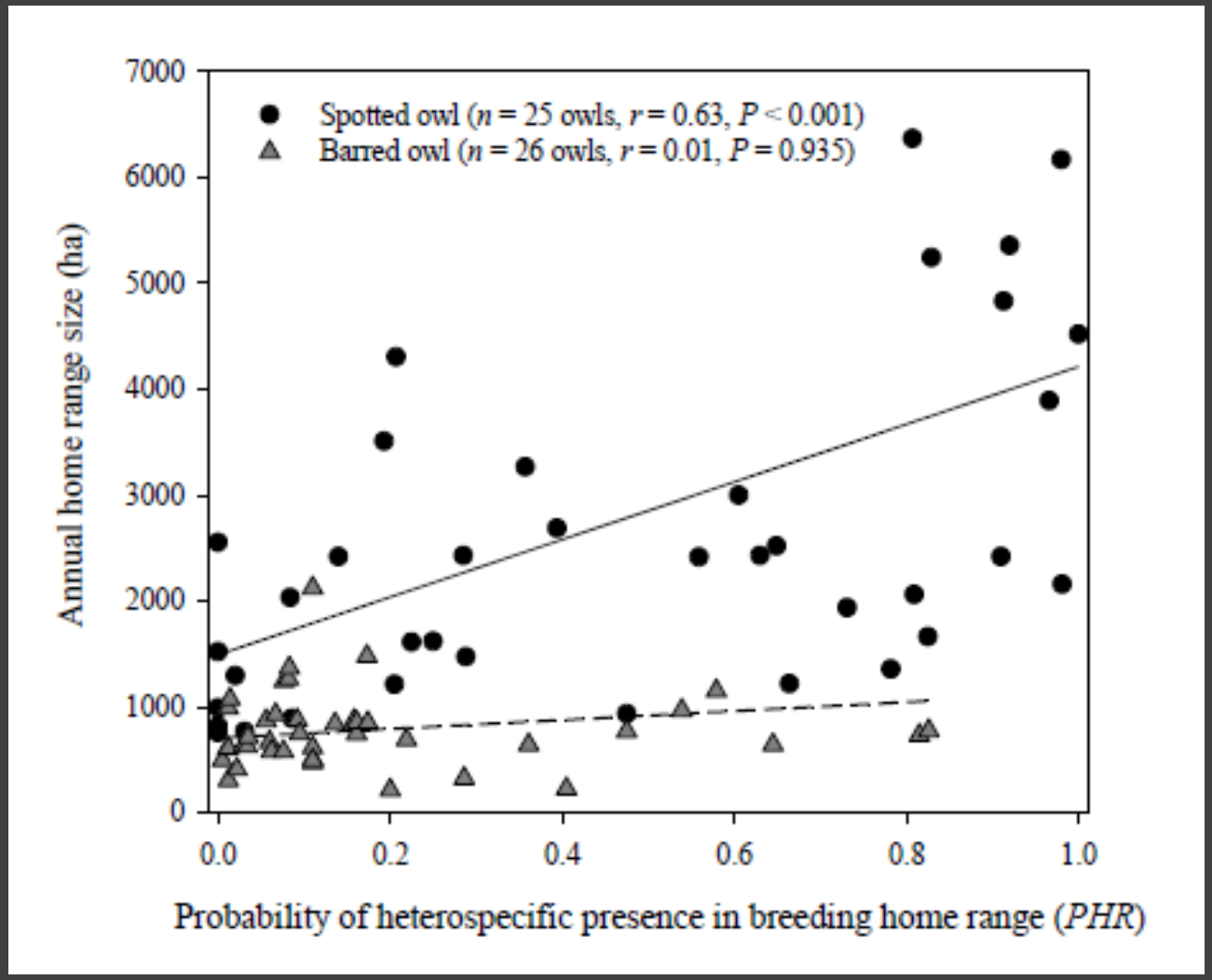
Courtesy David Wiens

Courtesy David Wiens

Food habits differences result in NSO having home ranges 2-5 times larger than BO (Wiens 2012)



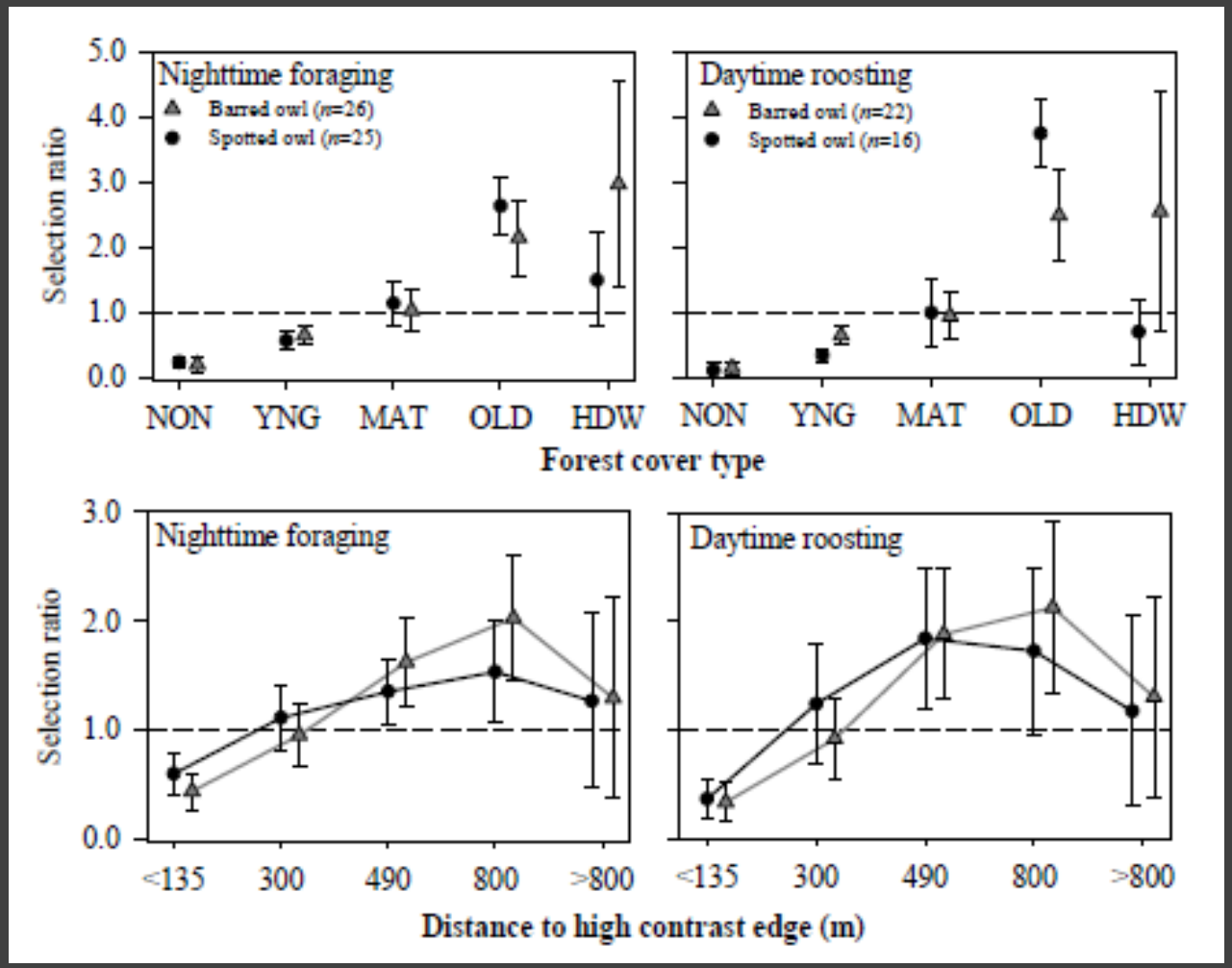
Presence of a BO increased home range for NSO but not the reverse (Wiens 2012)



Habitat Comparisons

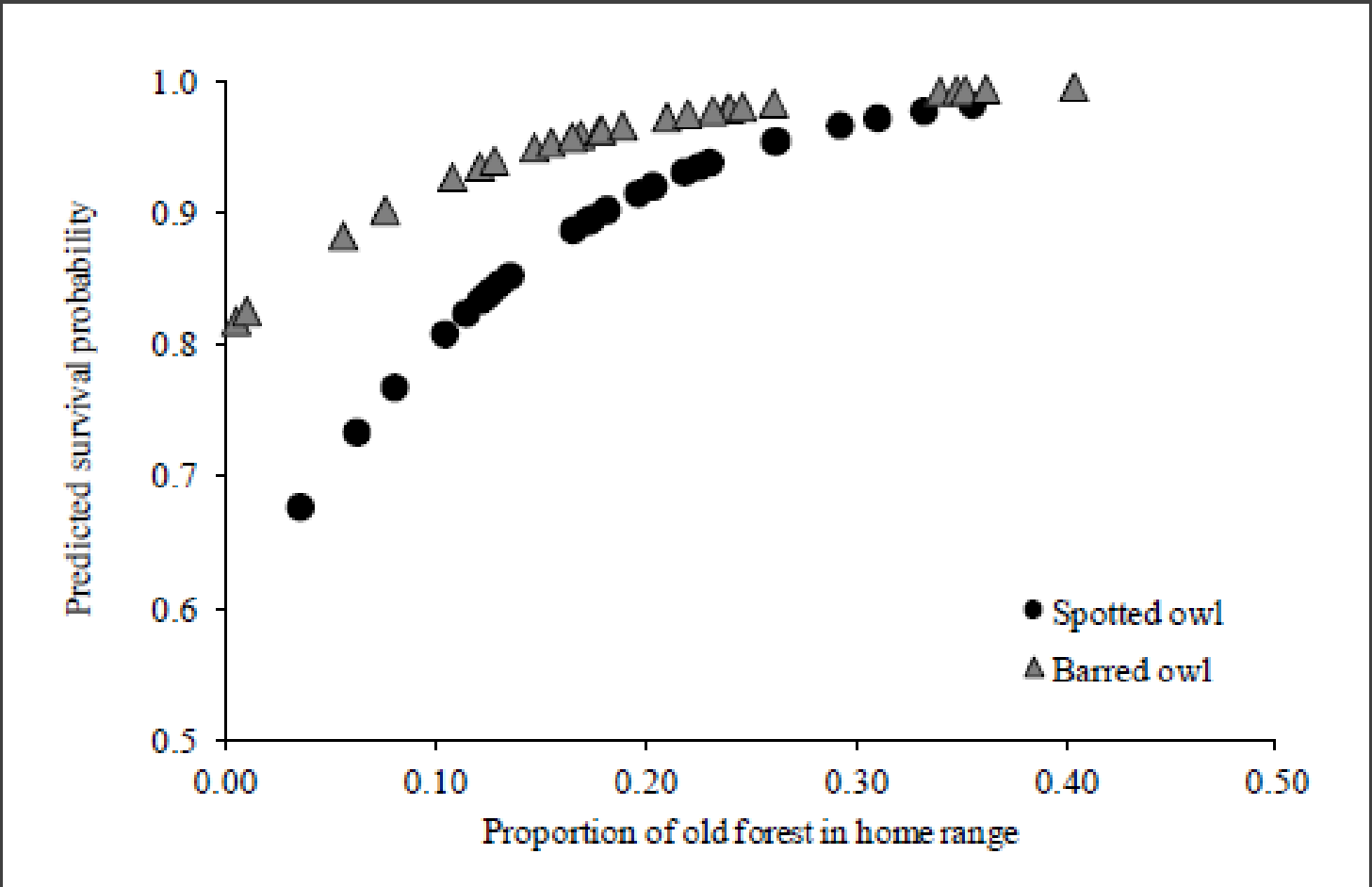
Commonly assumed that BO prefer or benefit from young and fragmented landscapes

No differences in habitat selection except for use of hardwood (riparian) areas



Wiens 2012

Amount of old forest was important to survival in both species: BO survival 0.92, NSO survival 0.81



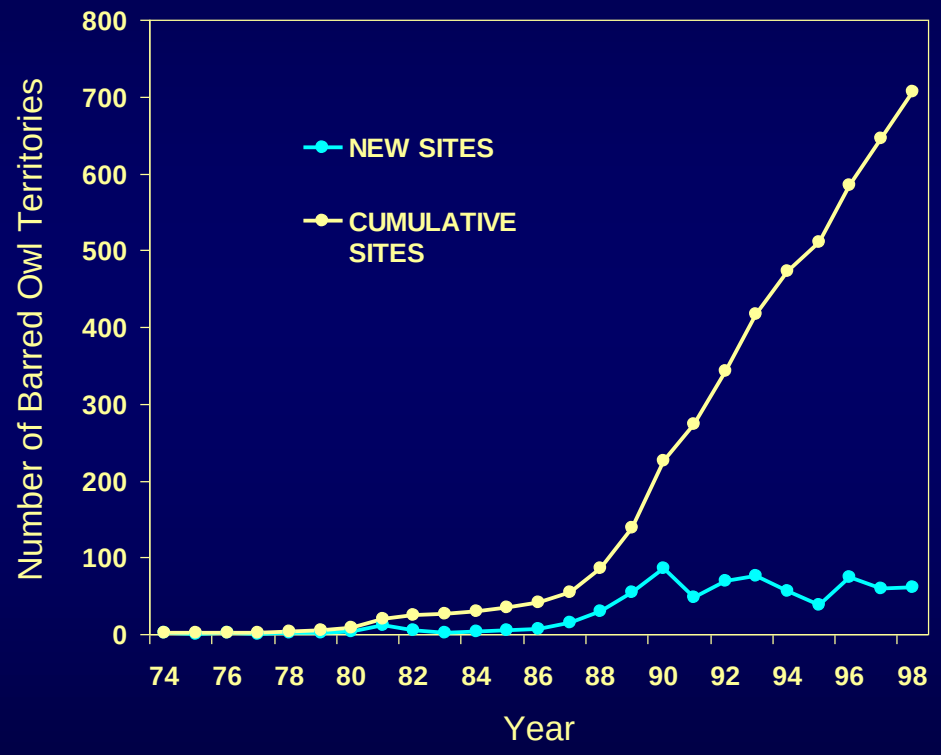
Wiens 2012

Summary of habitat comparisons

- Both species select mature and old growth stands for roosting and nesting, but barred owls tend to differ in selecting:
  - flatter slopes,
  - lower more mesic locations,
  - and have greater overall habitat flexibility
  - No evidence of any habitat that is exclusive to NSO (Dugger et al. 2011) – i.e., There is no known habitat solution!

Trend in BO Numbers

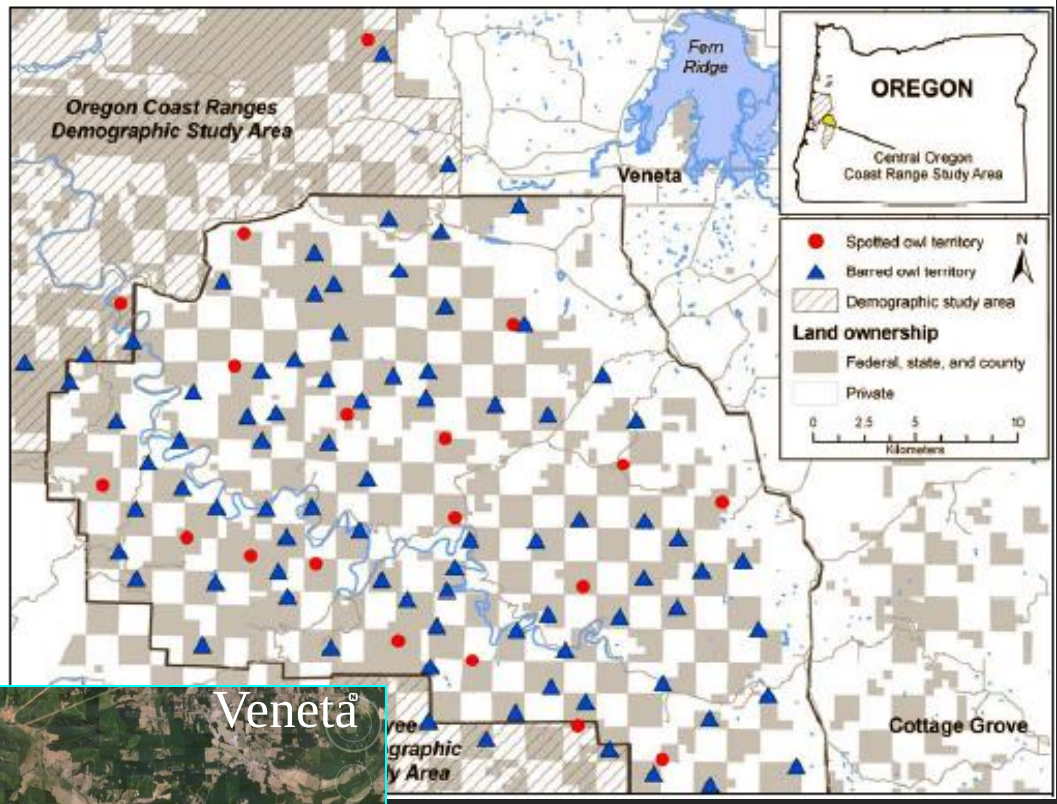
New and Cumulative Barred Owl Territories in Oregon (1974 - 98) (Kelly et al. 2003)

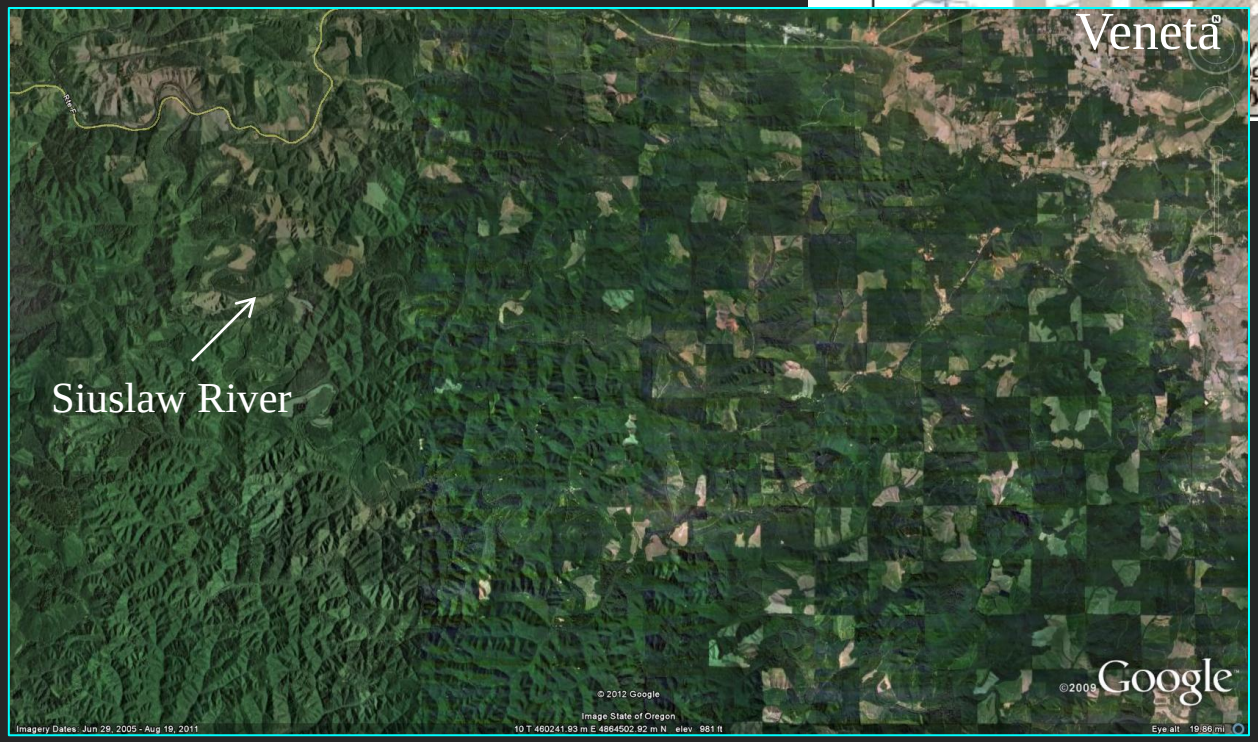


With delays in “taking off”, this same pattern has been repeated north to south from WA to coastal northern CA

Trends in BO/NSO

Wiens Veneta NSO/B0 Study Area





1990's – 30 pairs NSO and a few BO
2009 – 18 NSO territories (15 with pairs) and 82 BO territories (Wiens 2012)

Potential impacts of BO on NSO Hybridization

male NSO +
female BO =
Sparred Owl

Hybridization

Physical Attacks

Not commonly observed but ultimately shapes interactions between the two species (Van Lanen et al. 2011)

Summary of Species Comparisons

- BO have much greater potential for population increase – higher fecundity and survival
- BO have more diverse prey base and smaller home ranges resulting in population densities that can be >5 times greater than NSO
- BO select the same habitat required by NSO for roosting and nesting
- Both species are strongly territorial, but BO are bigger and likely win most of the aggressive interactions

Conclusions

- NSO has been declining throughout its range with precipitous declines where BOs are most abundant
- Strong evidence from radio telemetry and correlational studies and extensive anecdotal observations that it is primarily due to interference competition with BOs
- If BOs are primarily the cause, what can/should be done about it?

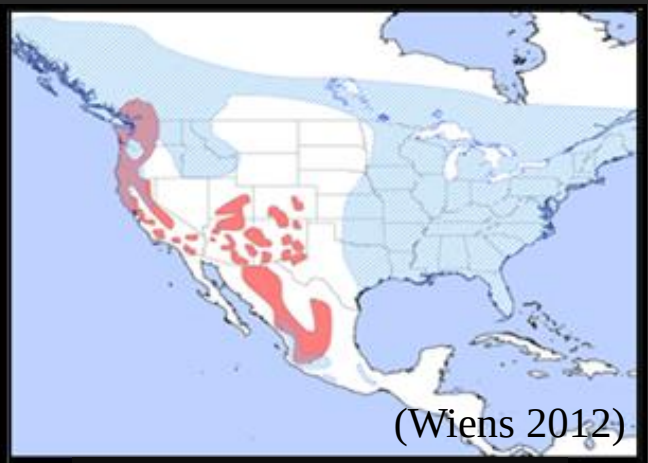
Does it matter how BO got to the NW?

Was the range expansion human caused?

Two potential routes: boreal forest route is supported by their current distribution

Barred owl range (pre-1900)

Barred owl range (current)



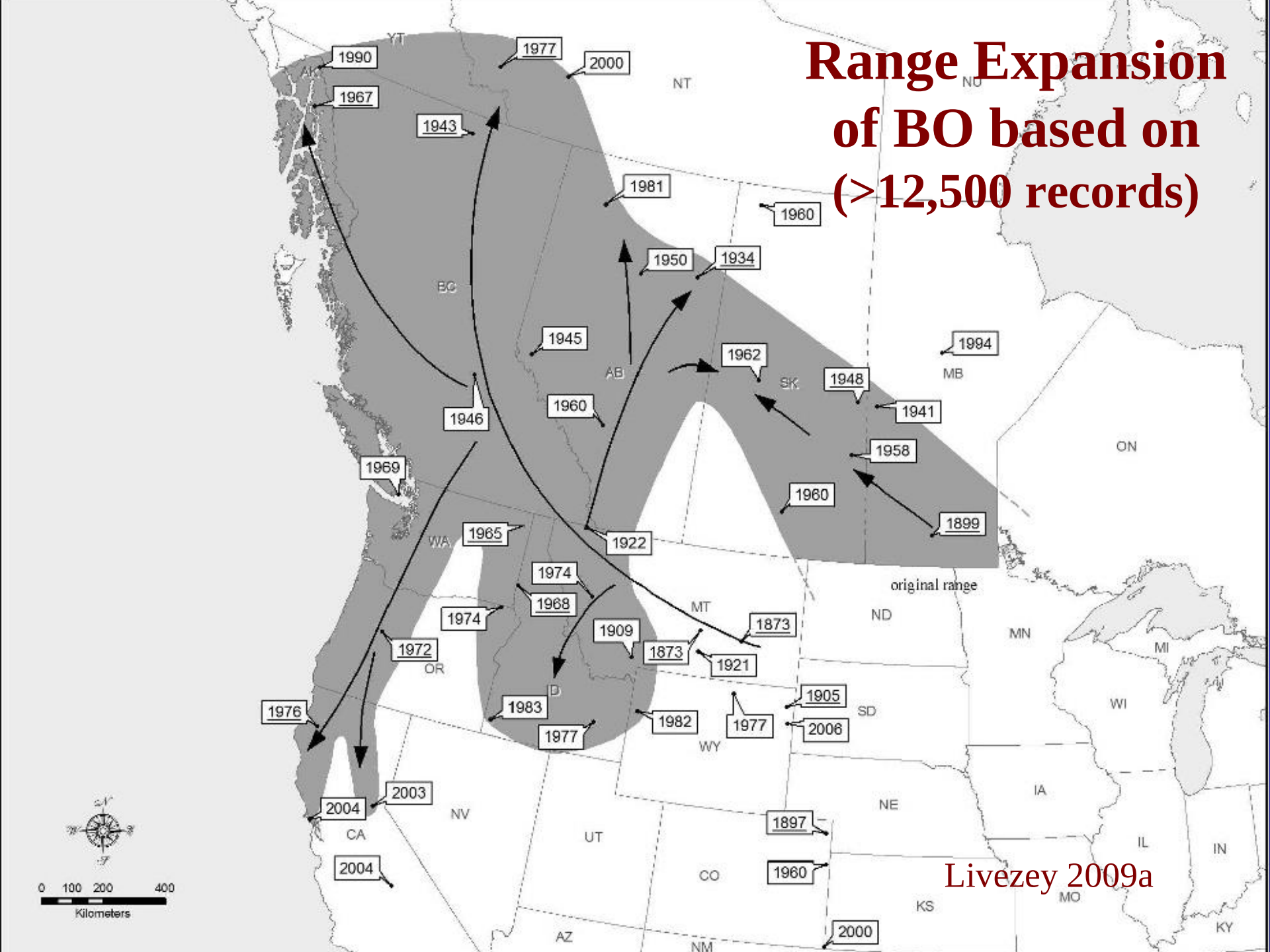
Barred owl/spotted owl range overlap (current)

Possibly a “natural” expansion mediated by global climate change

Stepping stone hypothesis of BO range expansion

- Great Plains route facilitated by European settlement – “stepping stones” created by alteration of the native flora and fauna – native Americans prevented from burning prairies, suppression of large ungulate populations, planting trees and more (Livezey 2009b)
- This hypothesis supported by historical BO records
- Records indicate BO were in Montana before 1900, CA in the 1970’s, but rapid expansion did not occur until the 1990’s (Livezey 2009a)

Range Expansion of BO based on (>12,500 records)



Livezey 2009a

Actions to Address the Threat

- Regardless of how it got here, BO is not native to the NW and is acting as an invasive species in potentially displacing a native threatened species
- Several federal actions have been taken to address the threat

U.S. Fish & Wildlife Service

Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*)

June 28, 2011

Region 1
US Fish and Wildlife Service
Portland, Oregon

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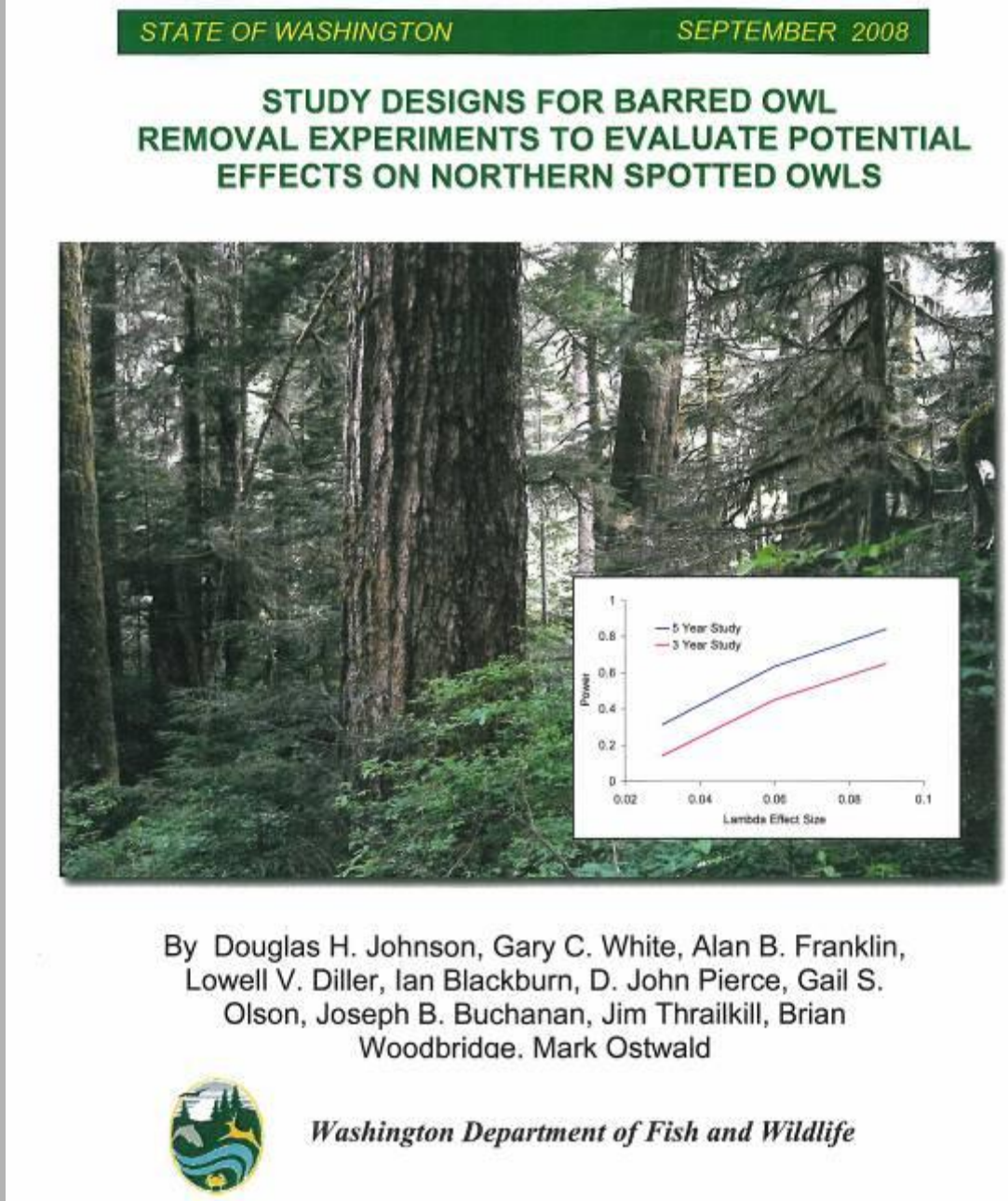
Revised NSO Recovery Plan Continued

- “Recovery Action 29: Design and implement large-scale control [removal] experiments to assess the effects of barred owl removal on spotted owl site occupancy, reproduction, and survival.
- “Given the rapidity and severity of the increasing threat from barred owls, barred owl removal should be initiated as soon as possible in the form of well-designed removal experiments.” (USFWS 2011)

Panel of scientist convened in 2007 to evaluate the best experimental design to assess the impact of barred owls on spotted owls (Johnson et al. 2008)



Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls

Final
Environmental Impact Statement

Prepared by

Oregon Fish and Wildlife Office
U.S. Fish and Wildlife Service
Portland, Oregon
July, 2013

www.fws.gov/oregonfwo

Federal Removal Experiments

- ROD was signed September 2013, which established four study areas – 1 in WA (Cle Elum), 2 in OR (Oregon Coast Range/Veneta and Union/Myrtle) and 1 in CA (Hoopa/Willow Cr.)
- Removal has already started in Hoopa, but the other study areas will require surveys in 2014 before removals can begin in the fall of 2014

How do you remove the barred owls? Non-lethal removal

- Capture Techniques
- What do you do with the captured birds?

Lethal Removal

Logistics

20 ga. shotgun with illuminated aimpoint

Remote controlled digital caller (Wildlife Technologies MA-15)

John James Audubon 1826

Collected birds are all specimens for the CAS museum

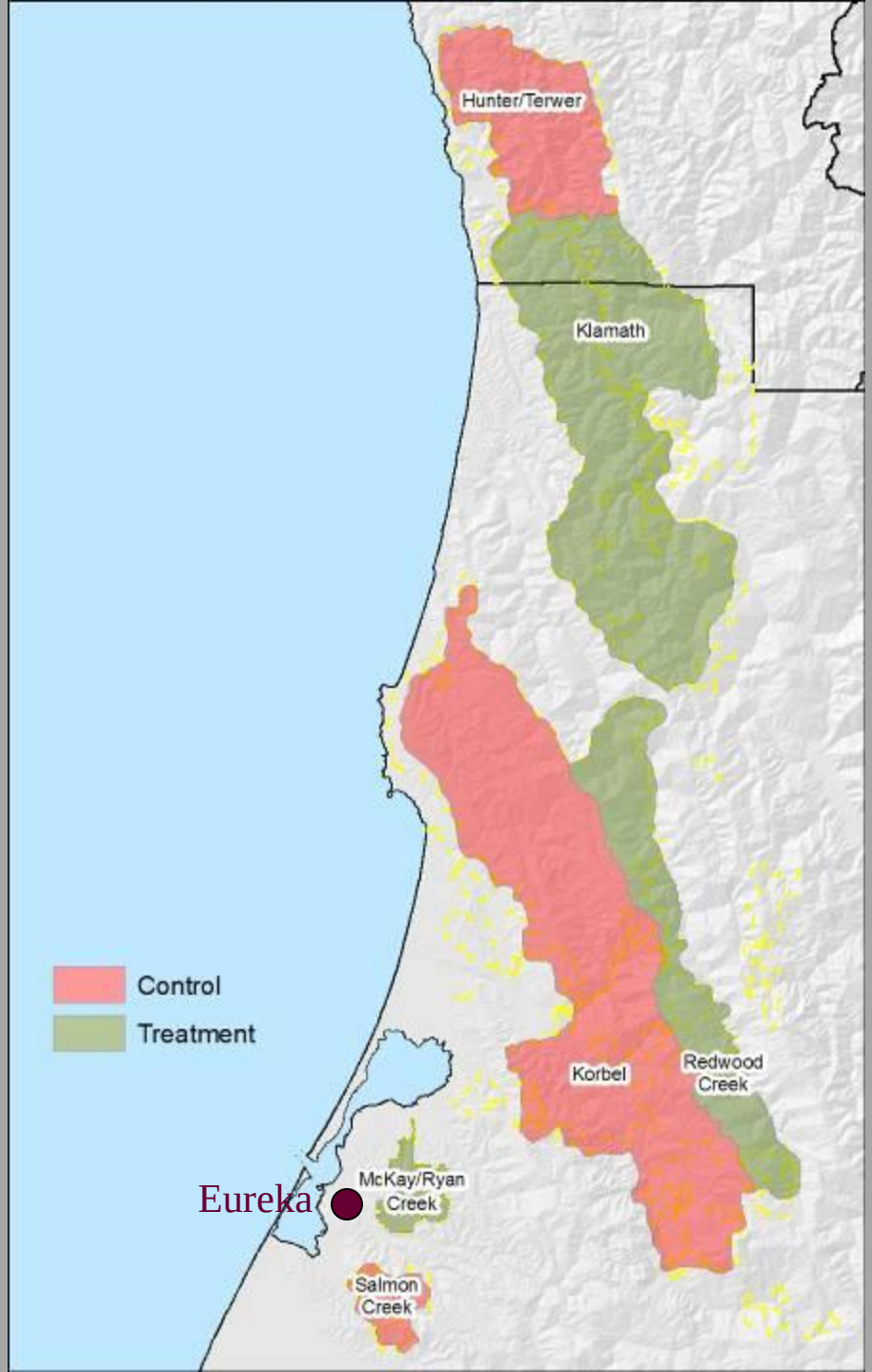
Supplemental Data Collection

Rodenticides: Novel New Threat

- Fisher (published in Gabriel et al. 2012 PloS One):
  - 46 of 58 (79%) fishers tested exposed
  - Distribution of exposure suggests threat is widespread throughout the fisher's range in CA
- Preliminary data using BO livers as a surrogate suggests similar threat for spotted owls

Green Diamond Pilot BO Removal Experiment Study Design

- Initial BO collections in 2006 under California Academy of Sciences
- Pilot removal experiment initiated in 2009 on GD study area – permitted through 2013



Effort/cost and efficiency

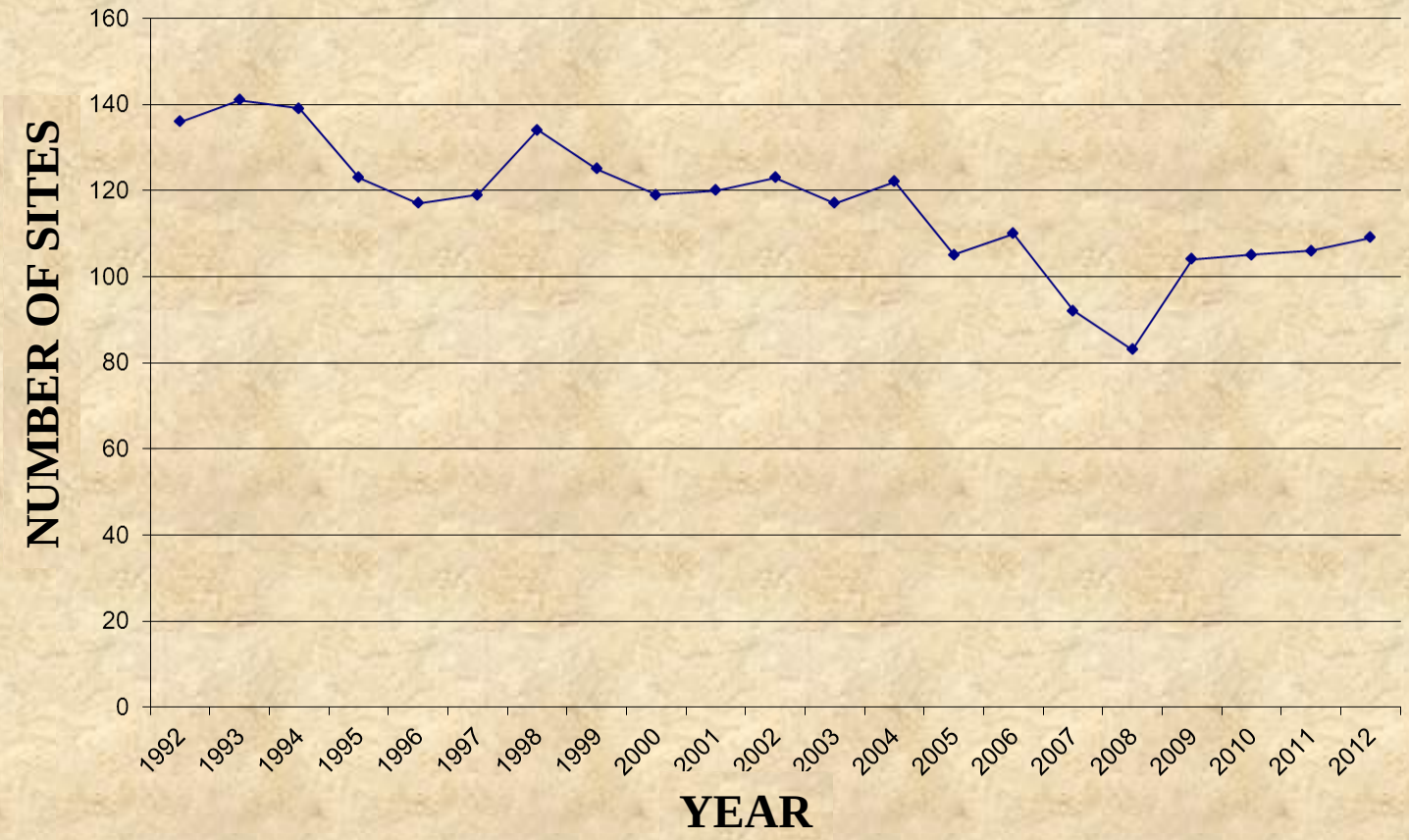
Cost: average of 2 hours 23 minutes per owl collected but this included processing time and supplemental calling – most females shot <30 minutes but males took longer (most <90 minutes)

Year	Visits	Mean time/visit (min)	BO collected	Mean time/BO removed (min)
2009	33	77.2	20	127.4
2010	26	85.7	13	171.5
2011	23	104.5	18	133.5
2012	40	81.2	22	147.7
Total	122	85.5	73	142.9

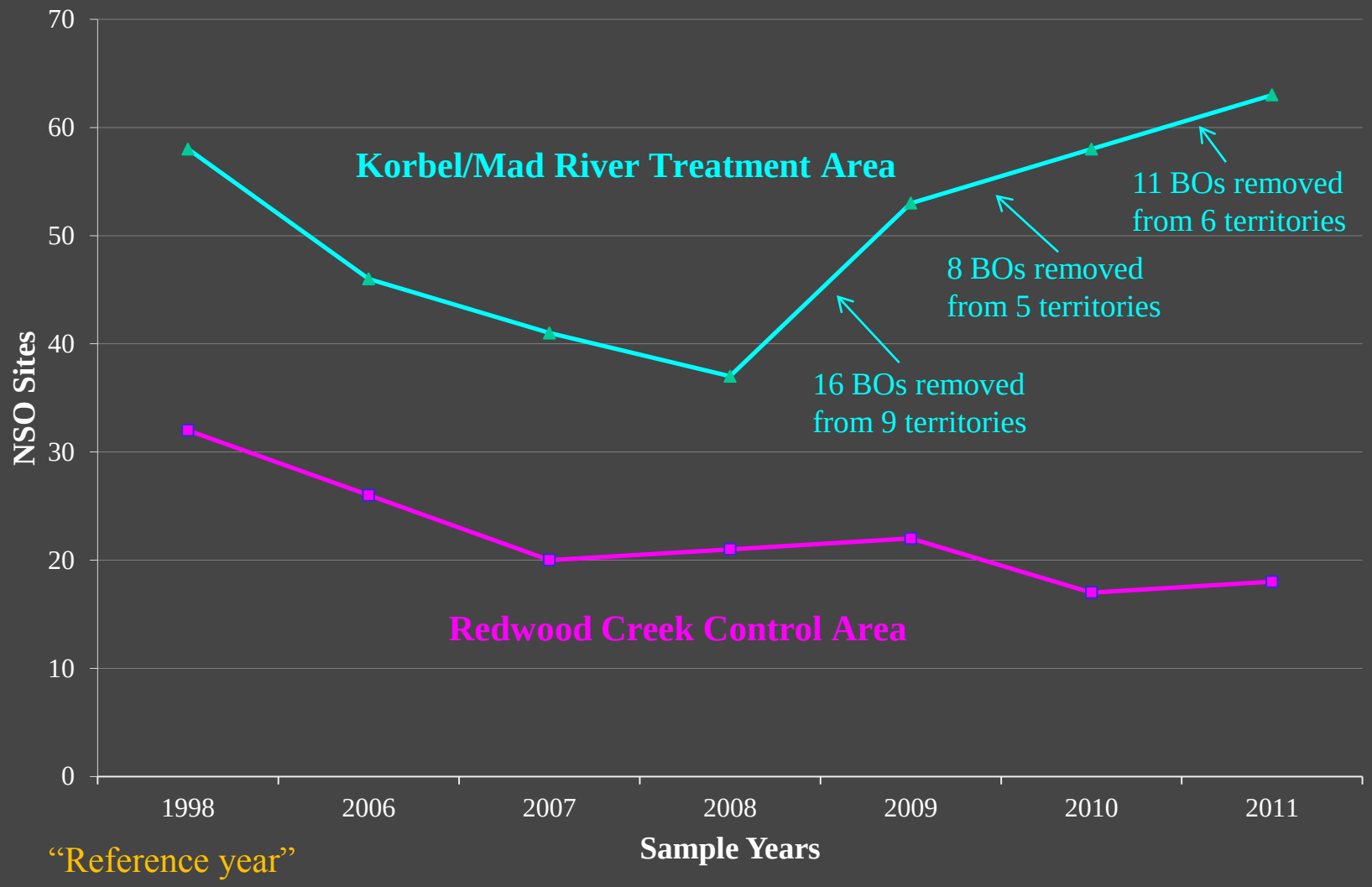
Diller et al. *In Press*

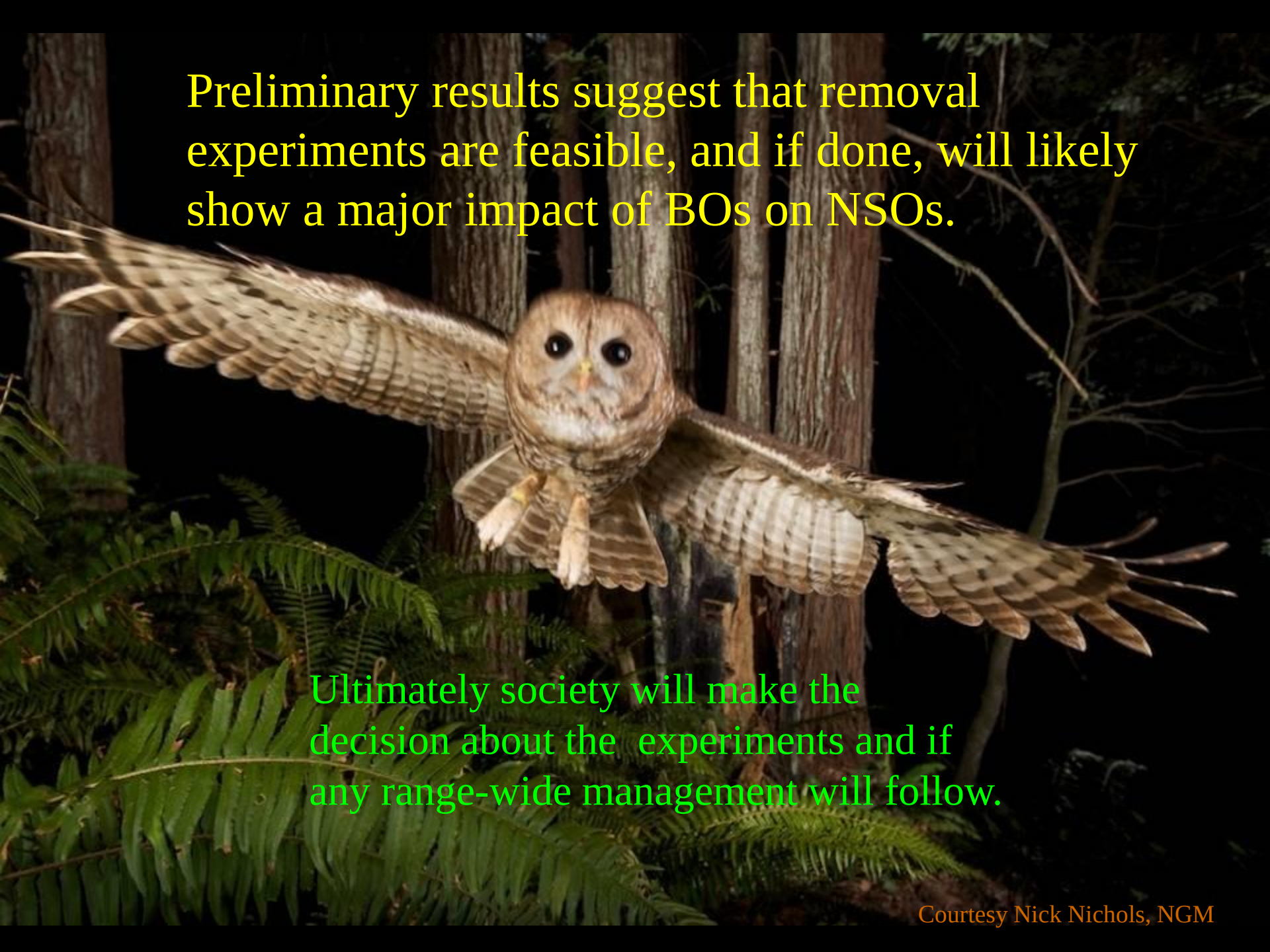
Efficiency: all (73) of the known territorial BOs collected except 8 ‘colonizers’ seen only once

Trend in Occupied NSO Sites on Green Diamond's Density Study Area, 1992-2012



Trend in occupied NSO sites on adjacent treatment and control areas




Preliminary results suggest that removal experiments are feasible, and if done, will likely show a major impact of BOs on NSOs.
Ultimately society will make the decision about the experiments and if any range-wide management will follow.
Courtesy Nick Nichols, NGM

Questions generated by this conservation dilemma

- Is it ethical to kill some individuals of one species to save another species?
- Is this a choice of one owl over another or a choice to have both species?
- If human actions have put one species in jeopardy, is it ethical to do nothing to help save that species?
- Is “let nature take its course” (i.e., don’t attempt to alter the course of natural events) a viable option?
- Is it possible to protect more habitat for the NSO?
- How would range-wide BO management be implemented?

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