Birds and biological control of pests

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UC CE | UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources | UC Cooperative Extension

Attracting raptors to nest and hunt on farms can boost boost biological control of rodent pests.

Photos: Ryan Bourbour, Sara Kross, Jessica Schlarbaum

Photos: Ryan Bourbour

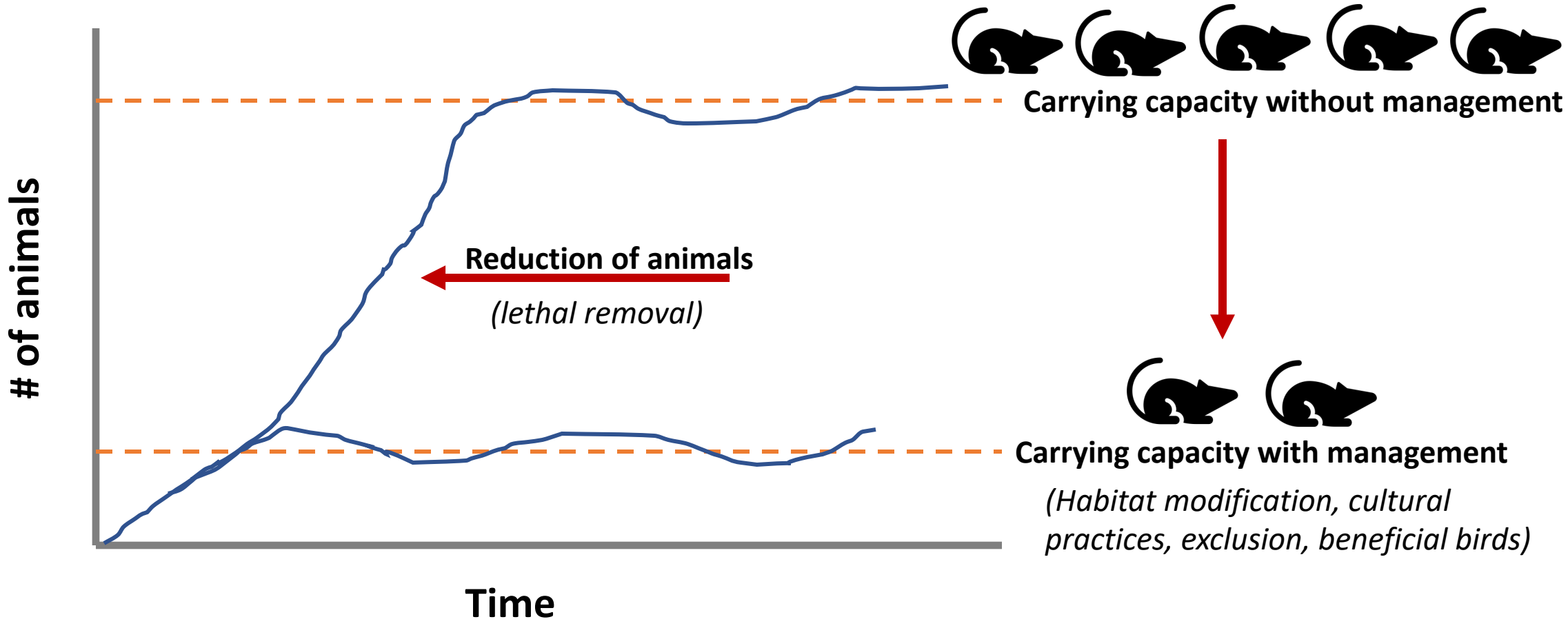
Attracting raptors is a long-term ecological strategy that is one part of an Integrated Pest Management program.

Well maintained nest box networks

Habitat modification, cultural practices**, biological control,** exclusion, lethal removal, etc...

Image: University of Wyoming

Management through prevention and control



Management through prevention and control

	Habitat Modification	Cultural Practices	Biological Control	Exclusion	Trapping	Shooting
Gophers	X	X	X	?	X	–
Voles	X	X	X	X	?	–
Ground squirrels	X	X	X	–	X	X

Barn Owl

Red-tailed Hawk

American Kestrel

Three of the most common local raptor species

Photos: Ryan Bourbour

	 Raptor Species	Diet 
Hawks	**Red-tailed Hawk**, Swainson's Hawk, Red-shouldered Hawk, Cooper's Hawk	Small rodents (voles, gophers, mice, rats) rabbits, ground squirrels, some reptiles & insects *Cooper's Hawks are bird specialists*
Owls	**Barn Owl**, Great Horned Owl, Western Screech-Owl	Small rodents, rabbits, some insects
Falcons	**American Kestrel**	Small rodents, birds, reptiles, & insects
Eagles	Golden Eagle	Ground squirrels & rabbits
Harriers & Kites	Northern Harrier & White-tailed Kite	Small rodents

How many rodents do they kill?

In CA agricultural regions, Barn Owl diet consists of > 99% rodent pests. Diet changes depending on the common pest species (Kross et al. 2016)

A nesting pair and their young estimated to consume over 220 lbs of prey in a single year (Kross and Baldwin 2016)

Studies monitoring nests with cameras documented nests consuming 3,000 to 4,000 rodents (St. George & Johnson 2021)

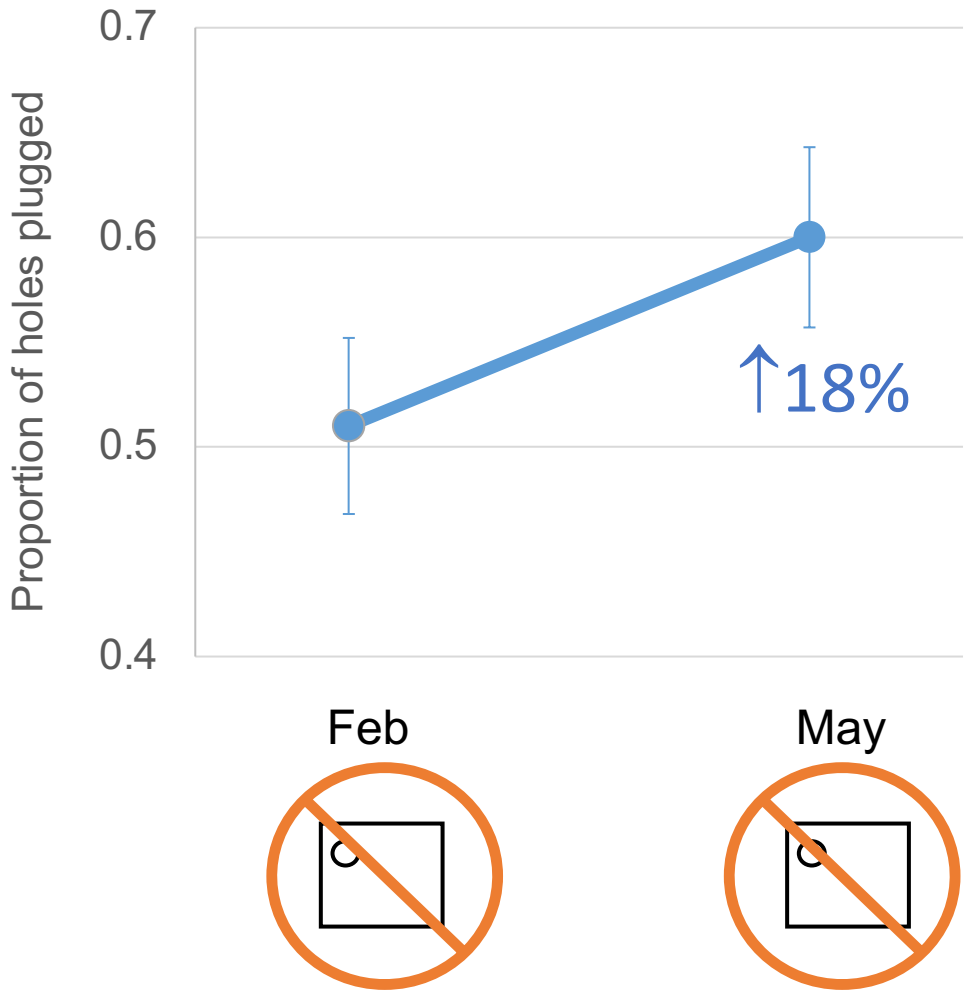
Photo: Ryan Bourbour

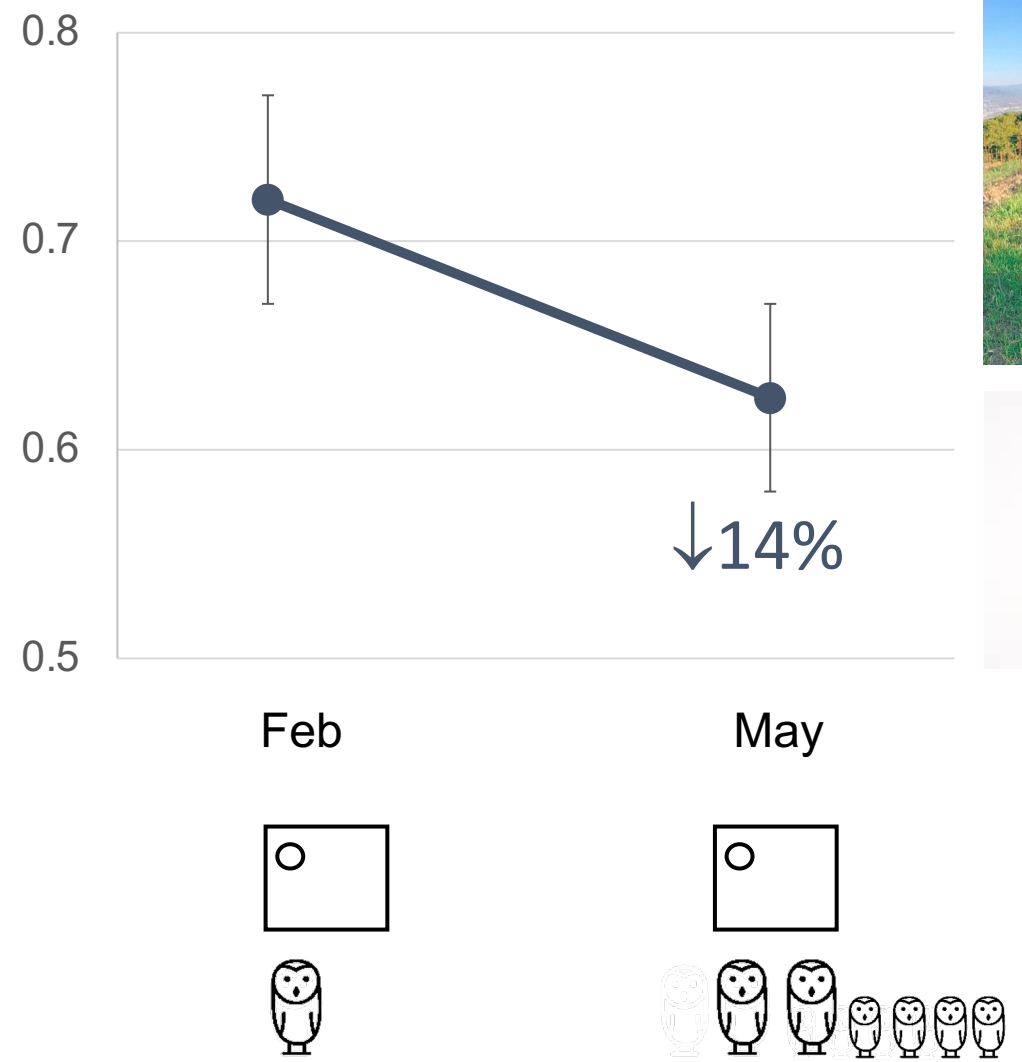
Landscape of fear

The benefit of raptors is not limited to what they directly consume.

The presence of a predator can shift prey behavior and reduce pest activity.

In Napa vineyards, gopher activity decreased when breeding owls were nearby (Hansen MS thesis)



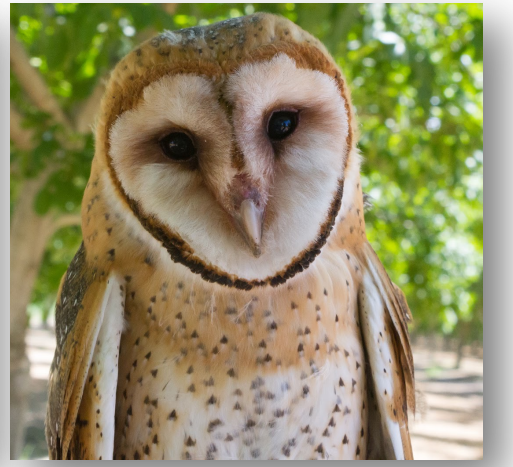


Barn Owl nest box networks

Barn Owls have a long breeding season!

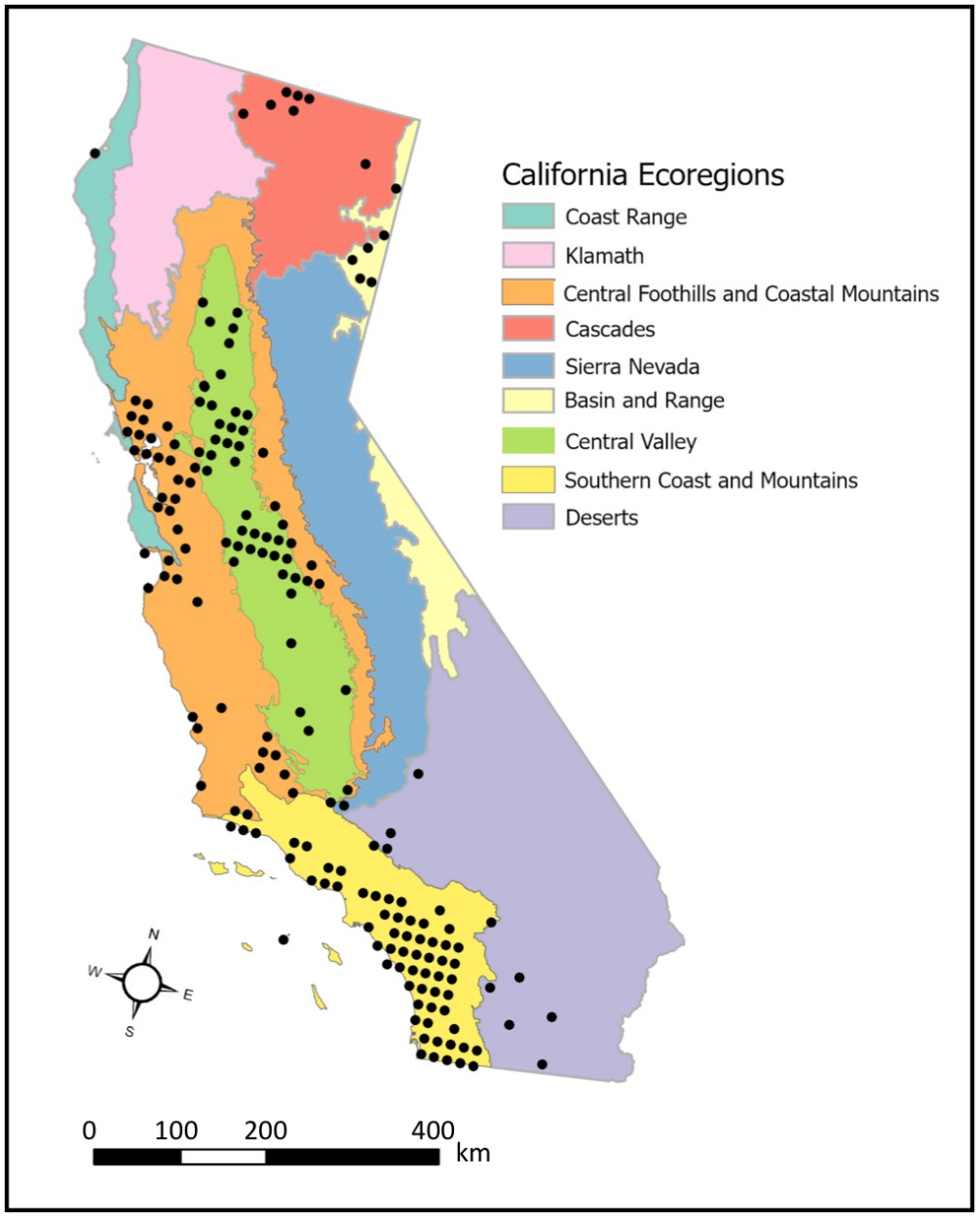
Egg laying can begin as early as January

Nestlings may use nest boxes until late summer



Eggs (~4 weeks) → Nestling development (~8 weeks)

Many experienced pairs will fit in two nesting cycles in one year!



Timing of Barn Owl nesting

Mean egg laying begins in mid to late February but prospecting nest boxes can happen much earlier

Coast Range (orange) egg laying is later, typically late February to early March

Bourbour et al. 2022

Barn Owl nest box installation

Timing:

Install new boxes by late summer/fall, may take 2-3 years for colonization, depending on location

Placement:

Open areas with natural habitat nearby such as grasslands or oak savannahs, nest boxes can be as close as 100-300 feet apart, ~9-10 feet high

Avoid:

Dense forests, busy roads, fast speed limits, houses, loud pumps and generators, lights

Barn Owl nest box installation

There is no set density for optimal number of nest boxes per acre – the goal is to create a network of nest boxes that supports a breeding population of owls

We recommend starting with a reasonable number, monitoring, and adding more nest boxes once you see 60-80% occupancy

Barn Owl nest box design

Prevent predators:

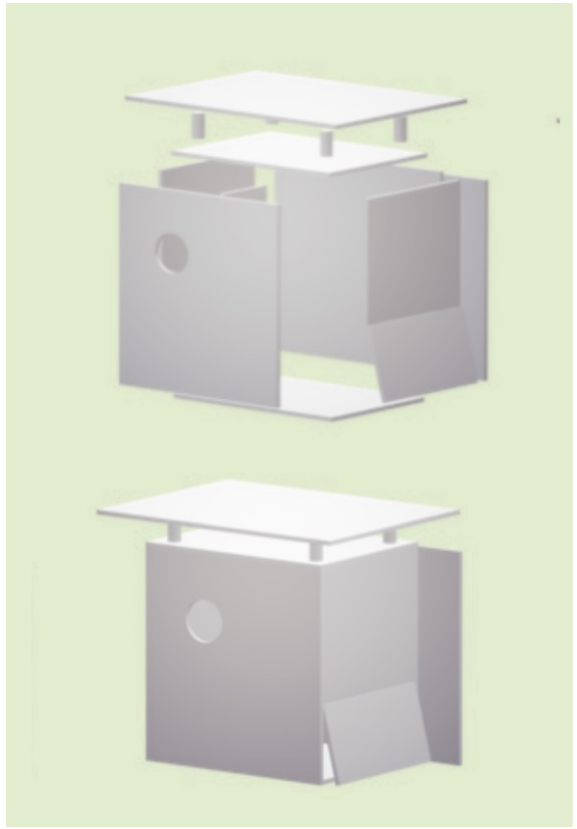
Installed on a (metal) pole, grooves, with appropriately sized opening, partition near entrance

Nestling safety:

Hole closer to the top of the box, larger boxes allow more room, mitigate heat in hot climates

Heat:

Opening facing north or east, holes drilled for ventilation, recommend sun shields in hottest areas



Nest box maintenance most effective *before* winter

Breeding activity is lowest in fall months-- Less likely to disturb pairs close to nest initiation

Prevents owls from initiating nests in overfilled or unsafe nest boxes

Annual inventory for cleaning and maintenance

Commitment of time and money to ensure proper construction, installation, and maintenance

Inspect boxes yearly in late summer-fall, fix normal deterioration, check hardware

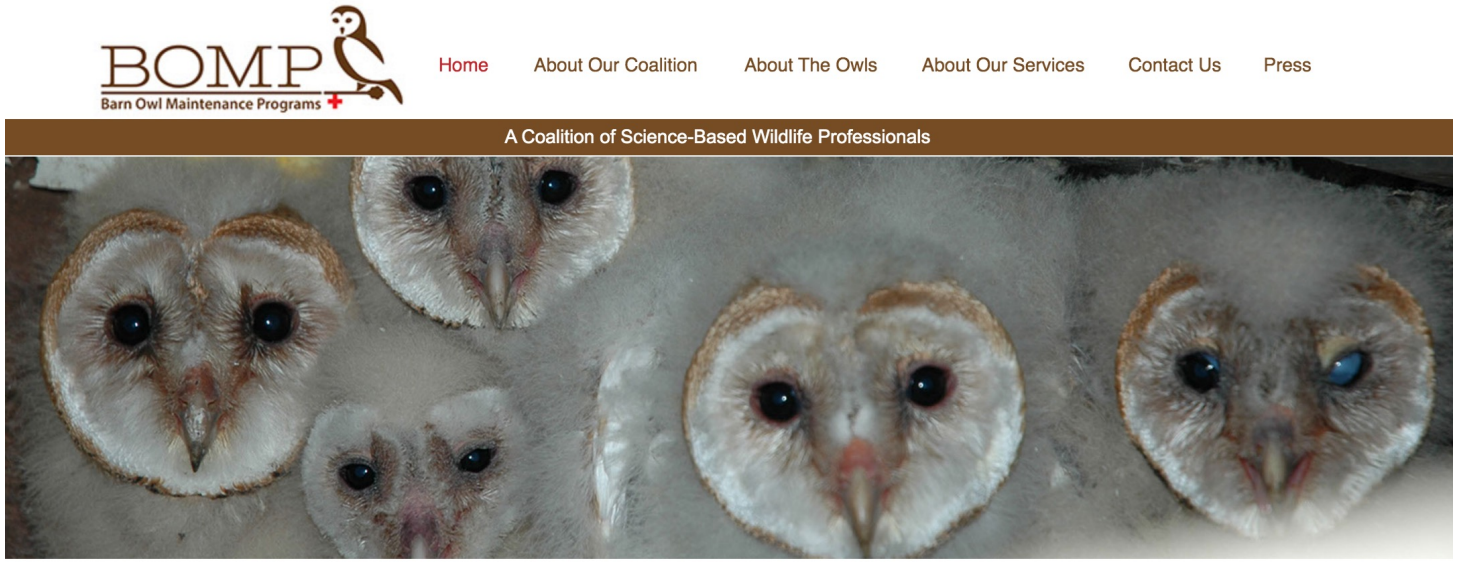
Songbird: Clean out old nests and leave empty (you can identify the types of species by the nest!)

Barn Owl/kestrel: Clean out built up pellet debris so box does not become over filled, replace with non-treated wood chips (Wear an n95 mask)

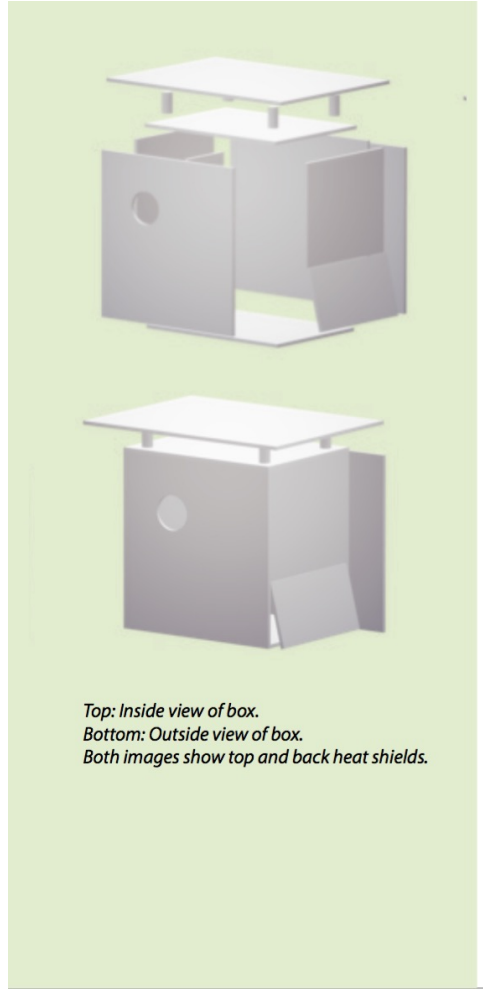
Don’t disturb boxes with birds

Keep a log!

Barn Owl nest box services and plans



Bompco.org
Napa Wildlife Rescue
Sonoma County Wildlife Rescue



Top: Inside view of box.
Bottom: Outside view of box.
Both images show top and back heat shields.

https://cenapa.ucanr.edu/Napa_County_Programs/Wildlife/

Evaluate efficacy of actions; modify as needed; keep records for future to communicate to your group and to the community.

Habitat modification, cultural practices**, biological control,** exclusion, lethal removal, etc...

Considerations such as:
Cost, effort, consumer demand, ecological sustainability.

Image: University of Wyoming

Raptor habitat and perches

Large trees & edge habitat provide perching and nesting substrate for many raptor species

Can provide multiple benefits, but should seek regional specific advice

Different habitats attract different raptor species

Great Horned Owl nest

Red-shouldered Hawk

Swainson's Hawk

Photos: Ryan Bourbour

Increased habitat complexity

Woody field margins and can attract beneficial species that increase pest control without increasing pest damage.
(Heath & Long 2019; Kross et al. 2020, Garcia et al. 2023)

Photo credit: UC ANR Capital Corridor Pest Mgmt

Attracting raptors with perches

A variety of diurnal and nocturnal raptor species will be attracted to perch on and hunt from artificial perches in and around fields

Raptor perch construction

Variety of constructions will work, they do not need to be as sturdy as nest boxes

- → Galvanized steel poles, as small as 3/4 inch
- → Wooden crossbeam ~18 inches – double cross beam not necessary (Kross et al. 2018)
- → 15 feet high is optimal (Kross et al. 2018)
- → Typically seat in concrete ~3 feet deep or attach to existing secure fence posts

Photo: Ryan Bourbour

Raptor perch placement

- → Install in open tree-less areas
- → In and around crop fields (ie, younger orchards or vineyards)
- → Place in highest areas, such as hill tops and ridgelines

Can focus on problem areas, such as areas with ground squirrel colonies

Create a network of perches:

~2 per acre (Machar et al. 2017)

Video: Ryan Bourbour

Kross et al. 2018

Photos: Ryan Bourbour, Sara Kross

Many native songbirds use nest boxes

Ash-throated Flycatcher

Western Bluebird

Tree Swallow

House Wren

Songbirds feed young a protein-rich insects, active nest boxes will increase foraging in a given area.

Photos: Ryan Bourbour, WFCB Museum

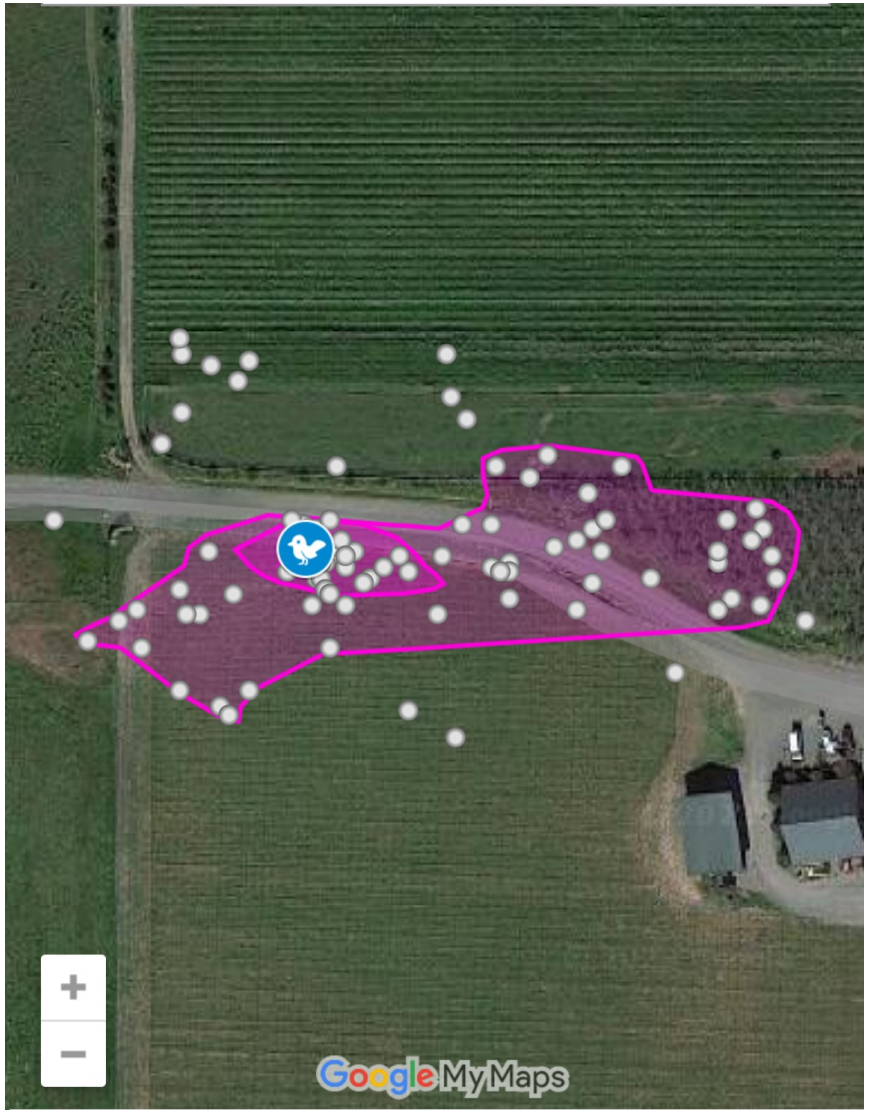
Many native songbirds use nest boxes

Many native songbirds use nest boxes

Bluebirds foraged in vineyards 86% of the time and in natural habitats 12% of the time

They mostly stayed within 200 feet of their nest boxes

Photo: Ryan Bourbour



Cody Pham, UC Davis Ecology; unpublished data

Do songbirds help with insect pests?

Songbirds have a varied diet and consume abundant prey species-- allowing them to respond and assist with pest outbreaks (Garfinkel et al. 2022)

Bluebird diet in CA vineyards consist of greater than 50% herbivorous insects, such as aphids, leafhoppers, and moths and other pests such as mosquitos (Jedlicka et al. 2017)

Bird foraging reduced the abundance of the most significant insect pests of alfalfa by over 33% (Kross et al. 2016)

Photo: Ryan Bourbour

Songbird nest box installation

Timing:

Install new boxes by late summer/fall

Location:

Grasslands, riparian areas, open farmland, parks, natural areas, backyards in proximity to natural areas or parks, suburban yards/areas with cavity nesting songbirds

Avoid:

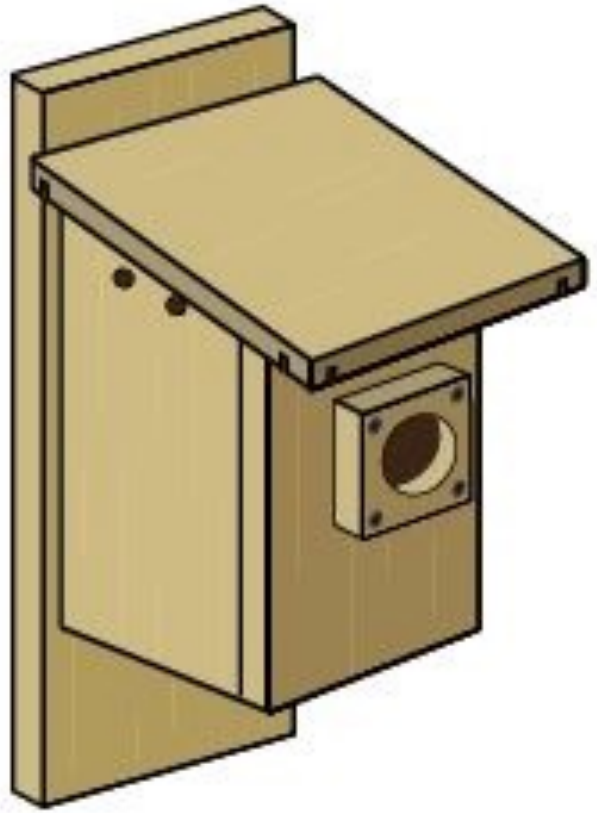
Sprinklers, roads, parking lots/driveways, areas with moderate to high human activity, outdoor cats, backyards with dogs, constant noise or bright lights at night

Photo: Wild Farm Alliance

Songbird nest box design

Prevent predators:
Installed on a pole, fence, or hanging in tree (not directly on tree trunk), appropriately sized opening, predator guard

Reduce temperatures:
Choose areas with afternoon shade, box oriented north or east. Recommend sun shields and ventilation holes in hottest areas



Songbird nest box design - purchase

Audubon 12 in. H X 6.4 in. W X 6.4 in. L Red Cedar Bird House

Item # 8914855 | Mfr # NABB4N

★★★★★ (24) Write Review

$20.99

ACE REWARDS See Details >

Estimated Points Earned: 209

1 ADD TO CART

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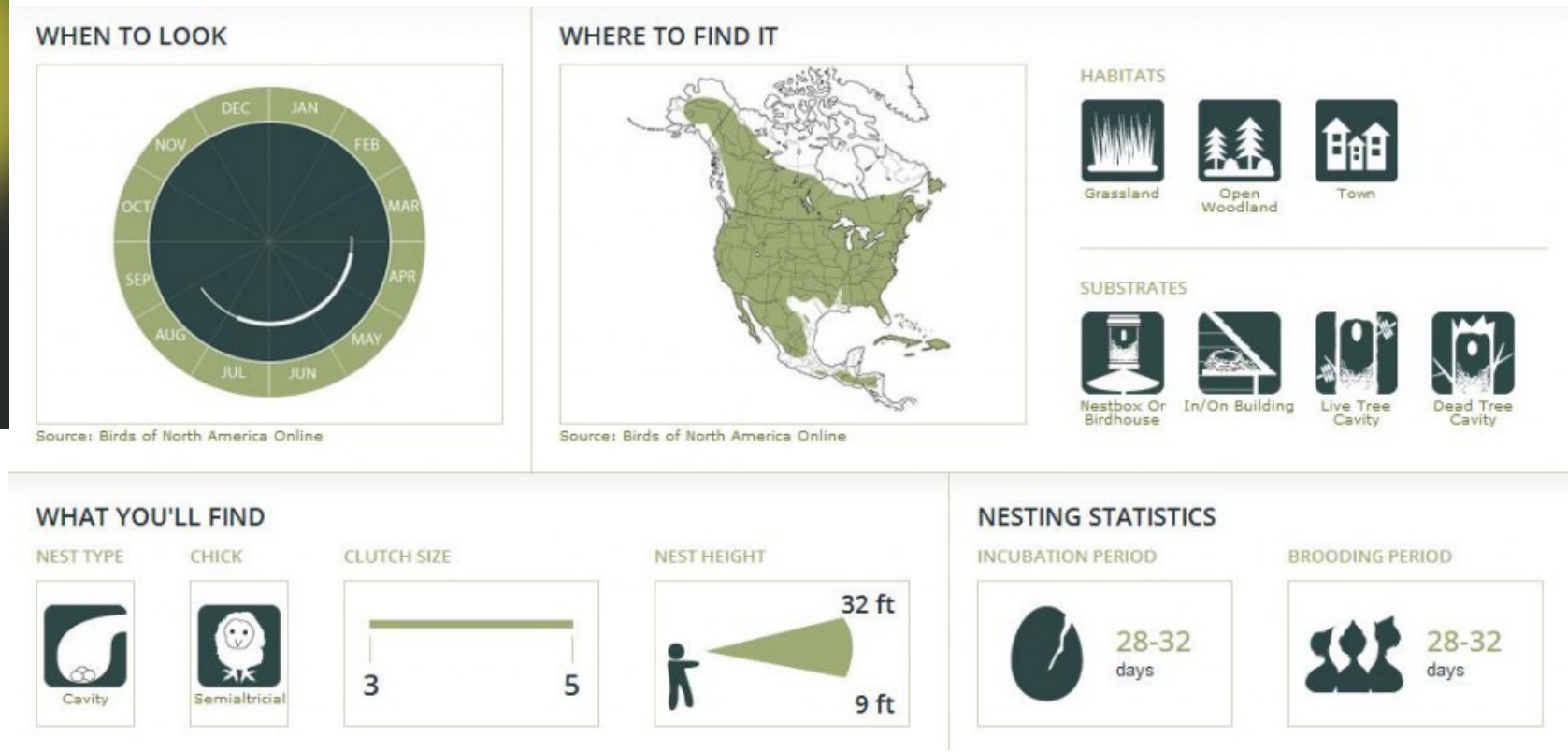
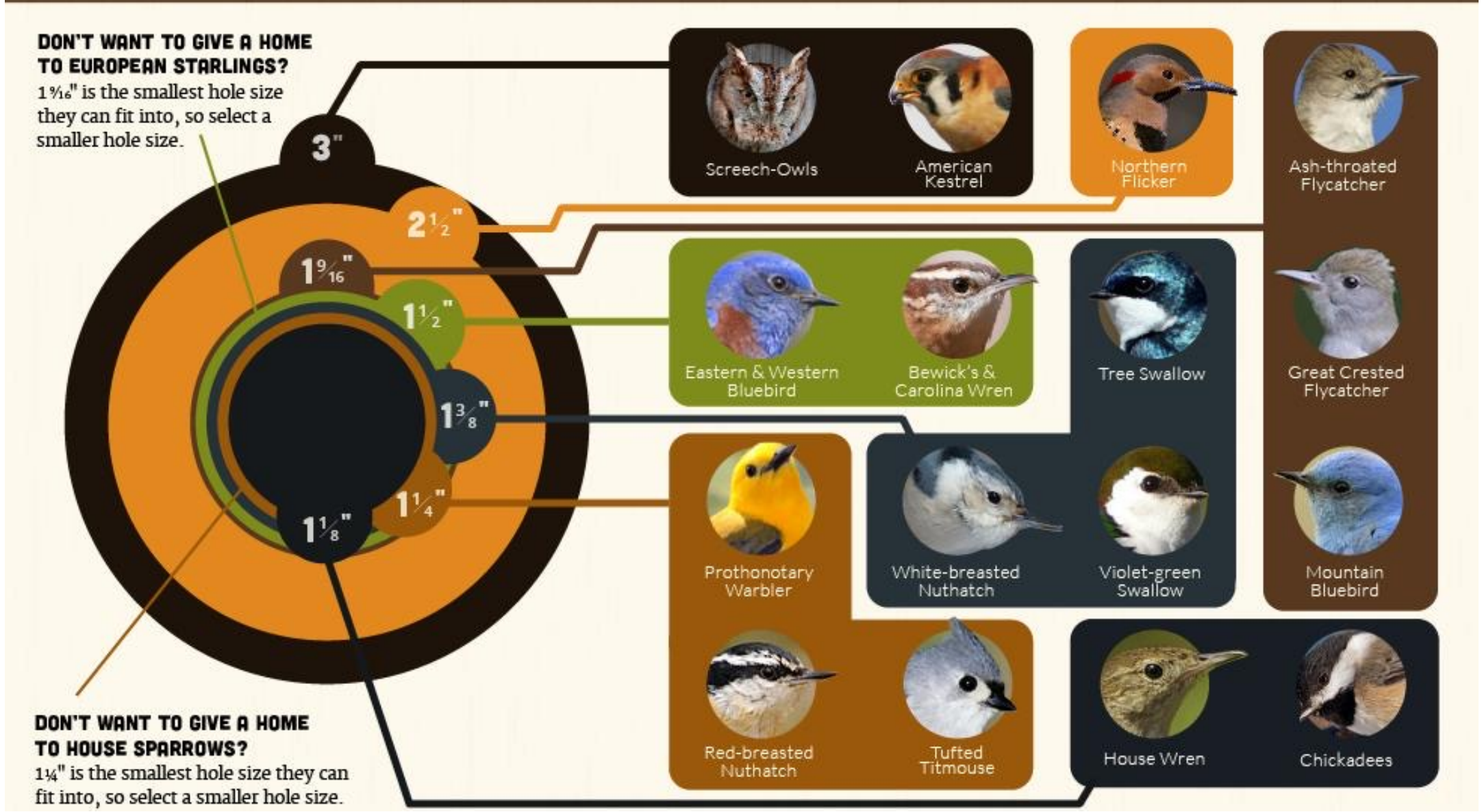
Songbird nest box resources

Nestwatch.org



By providing a properly-sized entrance hole, you can attract desirable species to your birdhouses while excluding predators and unwanted occupants. Below are the requirements for some common species that nest in boxes.



Nestwatch.org

Thank you!

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