What does the literature say? Riparian restoration with birds in mind

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Audubon VERMONT

Sea Grant Lake Champlain

“Riparian” Birds

Warbling Vireo

Swamp Sparrow

Belted Kingfisher

Pileated Woodpecker

Yellow Warbler

Green Heron

Sedge Wren

Veery

Willow Flycatcher

Am. Woodcock

Spotted Sandpiper

Importance of Buffers

Food:

Early season—nectar, pollen; *Late season*—berries, seeds

insects—1.2 to 2 X more abundant flying insects in buffers than undisturbed shorelines (Whitaker et al. 1999)

Terrestrial-aquatic energy link – diet, fitness, and reproductive success (Manning et al. 2021).

Movement:

Migration, wide-ranging species

Corridors—habitat connectivity of larger blocks

Breeding: Structure for riparian-preferring nesters

Importance of Birds

Seed dispersal, pest control (Ortega-Álvarez et al. 2012)

Bio-indicators of healthy functioning ecosystems (Bryce and Hughes 2002; Omerod and Tyler 1993)

Monitoring/assessments of post-implementation outcomes (Gardali and Holmes 2011; Berges et al. 2010).

Restoring with Birds in Mind: What to Consider

- What site preparation is needed and why is it important to birds?
- Which native plants are best for birds?
- How large does a buffer need to be to benefit birds?
- How long after a planting can you expect to see some species colonizing?
- What other factors affect birds in riparian areas?

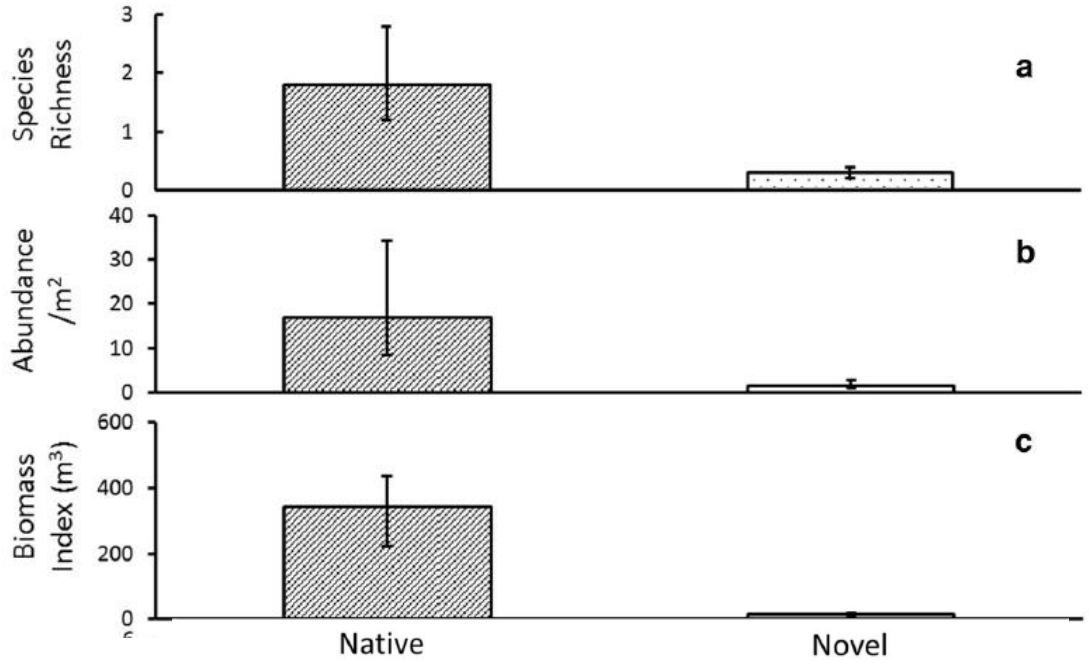
Site Preparation – invasive vegetation removal

Nelson et al. 2017 review of 128 studies in North America on impacts of invasive vegetation on birds

- negatively affected avian ***abundance*** in ~25% of cases, but ***species richness decreased*** in 41.3% of cases
- impact ***quality and quantity of food*** much more that nest site selection and nest survival (45% cases nest in invasives, neutral effect on survival in 57.9% cases)

Richard et al. 2019. caterpillar communities in invaded (novel) hedgerows vs. native hedgerows in ag setting

Similar plant species richness and more plant biomass in novel hedgerows, but ***68% fewer caterpillar species, 91% fewer caterpillars and 96% less caterpillar biomass!***



***Common buckthorn fruits have a laxative property

***Japanese honeysuckle berries are not nutritious

No insects + poor fruit = few birds

Earthkeep Farmcommon



Philo Ridge Farm

Riparian Restoration Site for Wildlife Habitat


KILL BUCKTHORN
and stop regrowth
BUCKTHORN
BLASTER™
Herbicide applicator for
cut-stump treatment

Native Plants for Birds

- Higher insect biomass on native plants → coevolved together with specializations (structural mouthparts or chemical resistance)
- >90% of moth and butterfly caterpillars eat only certain species or groups of plants → diversity
- **>95% of terrestrial birds rear their young on insects (even if fruit of seed eaters as adults)**
- Chickadees need 6,000 to 9,000+ caterpillars over 16-18 days to raise an average clutch to maturity!
- "Superstar Native Plants"

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SHRUBS

WILLOWS—(common pussy, silky, sandbar, wooly headed, black). Host to **370+ species of caterpillars.** Blooms March-May.

SPECKLED ALDER-- provides early food and cover for goldfinches and grouse. Thrives in wet soils. Host to **222 species of caterpillars**. Blooms March.

DOGWOODS- Silky, red osier. Berries ripen throughout the summer. Blooms April-May.

BERRY SHRUBS; VIBURNUMS, highbush cranberry, chokecherry, nannyberry, high bush blueberry, bridalwreath spirea, winterberry holly.

TREES

OAKS– swamp white. Host **caterpillar species 460+.**

CHERRY– black. **390 species caterpillars**. Blooms April-May.

MAPLES—Red, Silver. Host to **276 species of caterpillars.** Early bloom March-April.

Others: Yellow Birch (354) , Hackberry, Sycamore, American Elm, Witchhazel, Red Cedar, Cottonwood

How “wide” should a buffer be to support birds?

Spackman and Hughes (1995) surveyed bird, mammal, and vascular plant species along 6 mid-order streams in VT to determine “minimum width for biological richness conservation.”

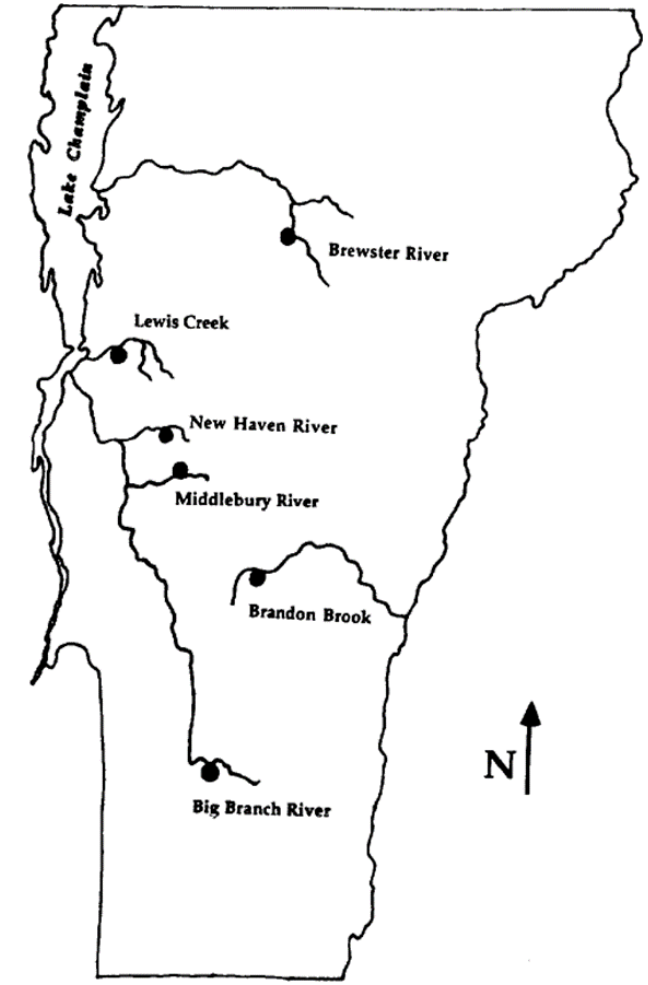
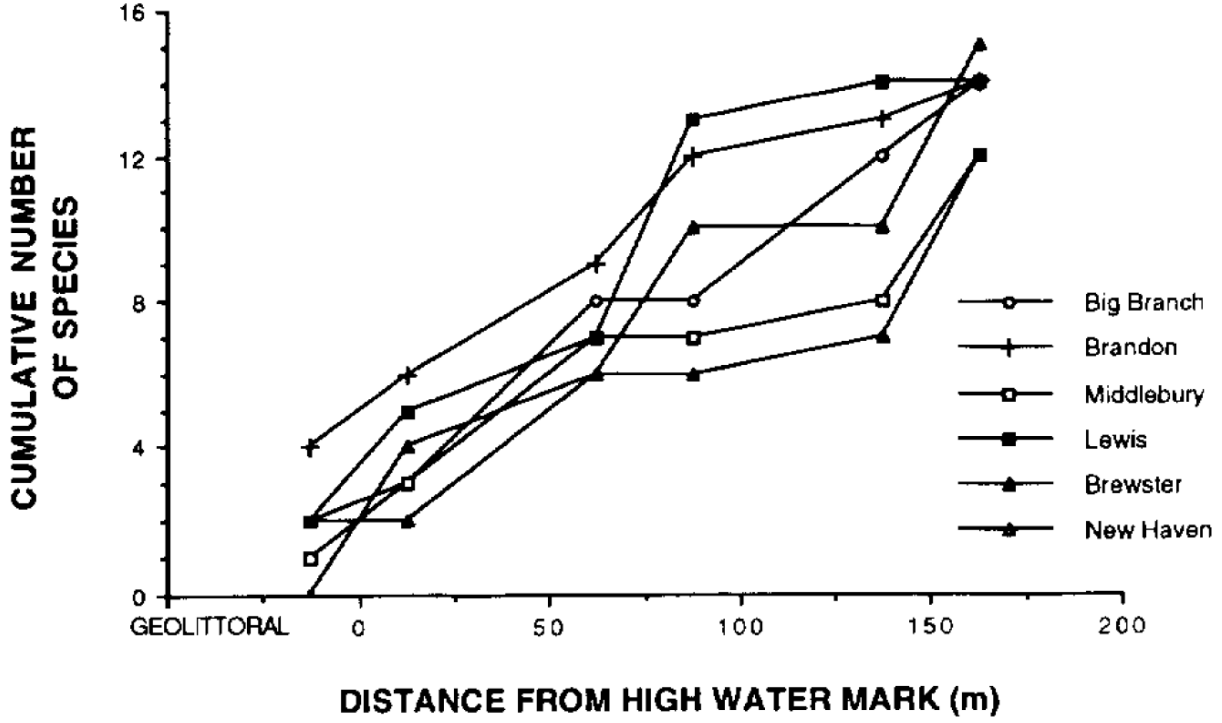


Fig. 1. Map of Vermont, USA, indicating location of stream corridor study sites.



150 m buffer needed to include 90% of bird species.

Extreme variation between streams species differed by site

IT DEPENDS

‘Buffer width’ a poor standard for design alone

Buffer Scale → Structure, Density, Surroundings

Table 1. Recommended Minimum Widths of Riparian Buffer Strips and Corridors for Birds

Authors	Location	Minimum Width	Benefit
Darveau et al. 1995	Canada	>60 m	There was evidence that 50-m-wide forested buffer strips were required for forest-dwelling birds. Bird populations may decline in strips before regeneration of adjacent clearcuts provide suitable habitat for forest birds.
Hodges and Krementz 1996	Georgia	>100 m	Riparian strips >100 m were sufficient to maintain functional assemblages of the six most common species of breeding neotropical migratory birds.
Mitchell 1996	New Hampshire	>100 m	Need >100-m-wide buffers to provide sufficient breeding habitat for area-sensitive forest birds and nesting sites for red-shouldered hawks.
Tassone 1981	Virginia	>50 m	Many neotropical migrants will not inhabit strips narrower than 50 m
Triquet, McPeek, and McComb 1990	Kentucky	>100 m	Neotropical migrants were more abundant in riparian corridors wider than 100 m; riparian areas <100 m wide were inhabited mainly by resident or short-distance migrants.
Spackman and Hughes (1995)	Vermont	>150 m	Riparian buffer widths of at least 150 m were necessary to include 90 percent of bird species along mid-order streams.
Kilgo et al. (1998)	South Carolina	>500 m	Although narrow bottomland hardwood strips can support an abundant and diverse avifauna, buffer zones at least 500 m wide are necessary to maintain the complete avian community.
Keller, Robbins, and Hatfield 1993	Maryland; Delaware	>100 m	Riparian forests should be at least 100 m wide to provide some nesting habitat for area-sensitive species.
Gaines 1974	California	>100 m	Provide riparian breeding habitat for California yellow-billed cuckoo populations.
Vander Haegen and DeGraaf 1996	Maine	>150 m	Managers should leave wide (>150 m) buffer strips along riparian zones to reduce edge-related nest predation, especially in landscapes where buffer strips are important components of the existing mature forest.
Whitaker and Montevecchi 1999	Canada	>50 m	50-m-wide riparian buffers only supported densities <50 percent of those observed in interior forest habitats.
Hagar 1999	Oregon	>40 m	Although riparian buffers along headwater streams are not expected to support all bird species found in unlogged riparian areas, they are likely to provide the most benefit for forest-associated birds species if they are >40 m wide.

Fischer, R.A. (2000) Width of Riparian Zones for Birds.

Lots of variation in the literature

No magic number

Buffer Scale → Structure, Density, Surroundings

Each stream needs a specialized plan

10 - 30m can help protect physical, chemical, and aquatic biological integrity of small streams– subsurface nutrient removal, sediment trapping, erosion, temperature, and macro-invert and fish communities (Sweeny and Newbold, 2014).

Much wider buffers for terrestrial habitat ecological integrity (>10ha; Broadmeadow and Nisbet 2004).

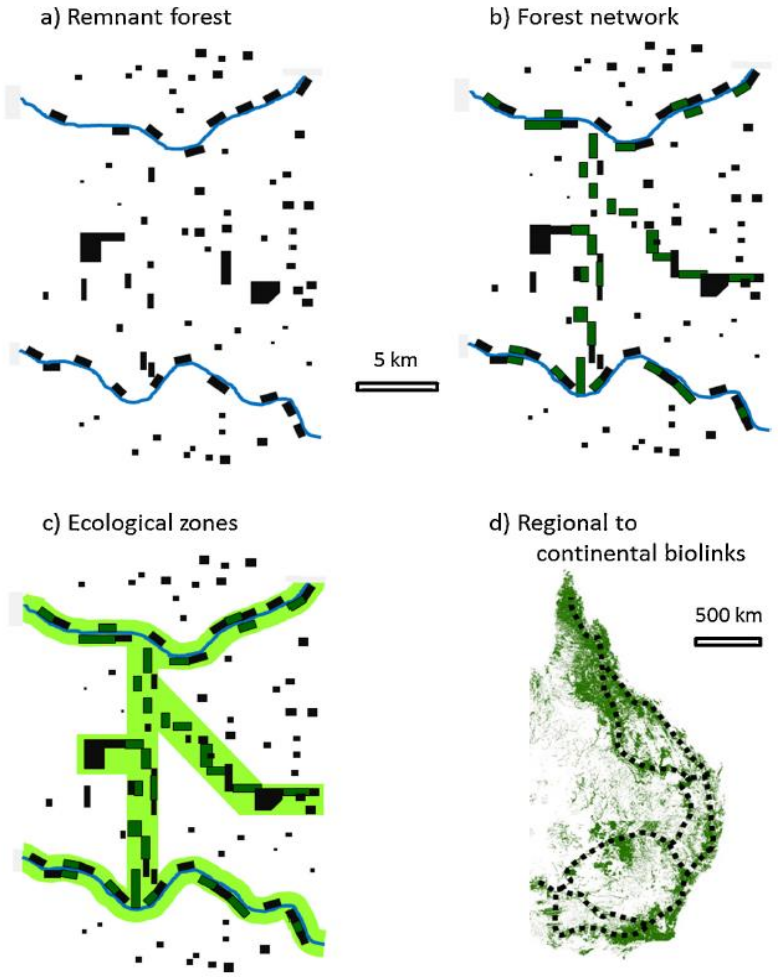
Structure of vegetation

Design: shrub patches within trees

Surrounding landscape type and proximity

(Cunningham et al. 2015)

Surrounding Landscape– site selection, habitat connectivity



(Cunningham et al. 2015)

Gardali and Holmes (2011): rate of bird abundance increases after restoration as a function of

tree species planted (diversity)

stems planted per ha (density)

% riparian forest w/in 500m (proximity, connection)

Sullivan et al. (2007) habitats in entire stream system a single, integrated ecological unit across spatial scales.

Birds respond to so many variables (**channel slope, drainage area, percent conifers, and in stream conditions, etc.**), that a *holistic approach* to restoration is ideal.

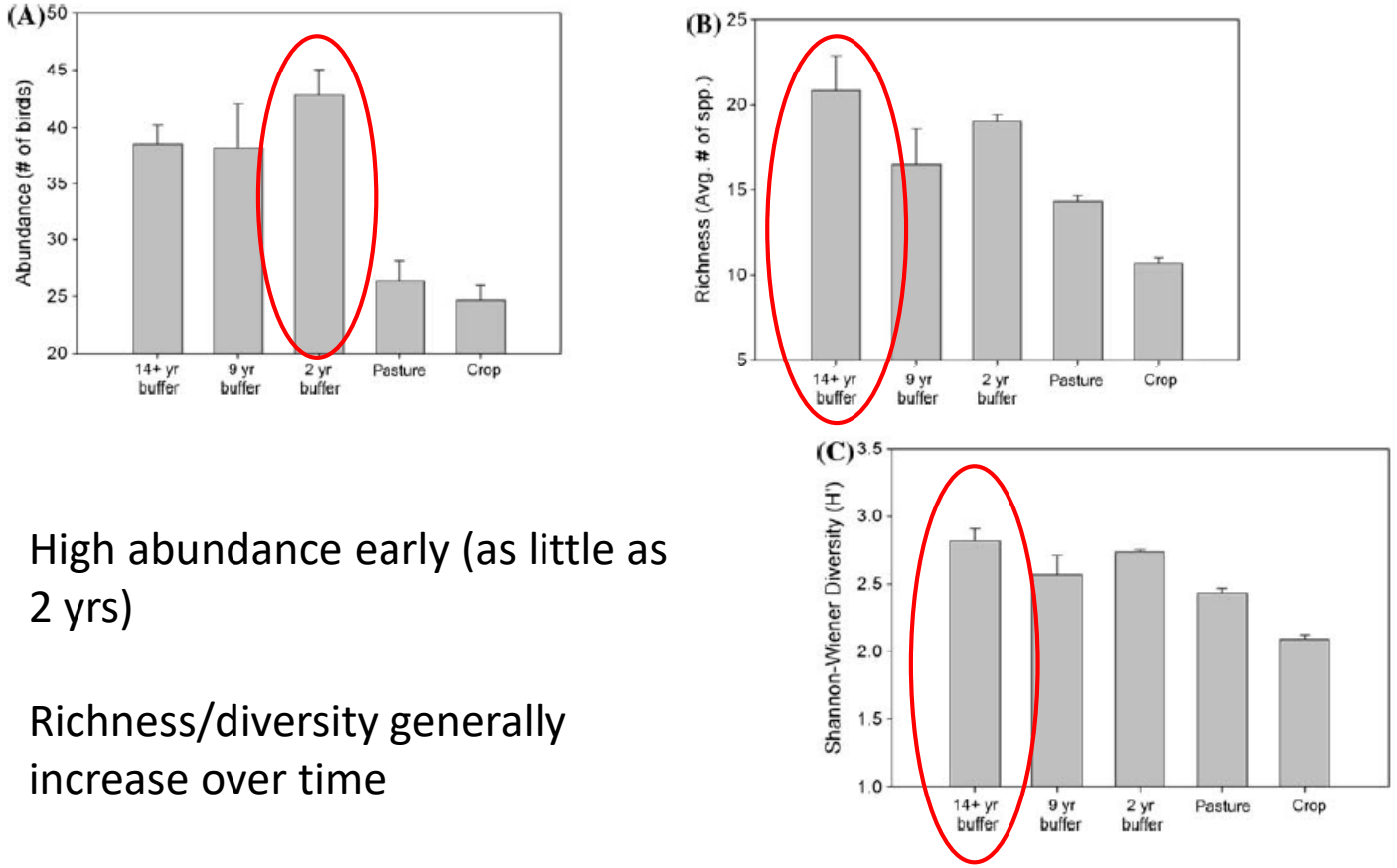
How long after a planting will birds show up?

(Burges et al. 2010)

Bird response to riparian buffers of varying ages (2, 9, 14 yrs)

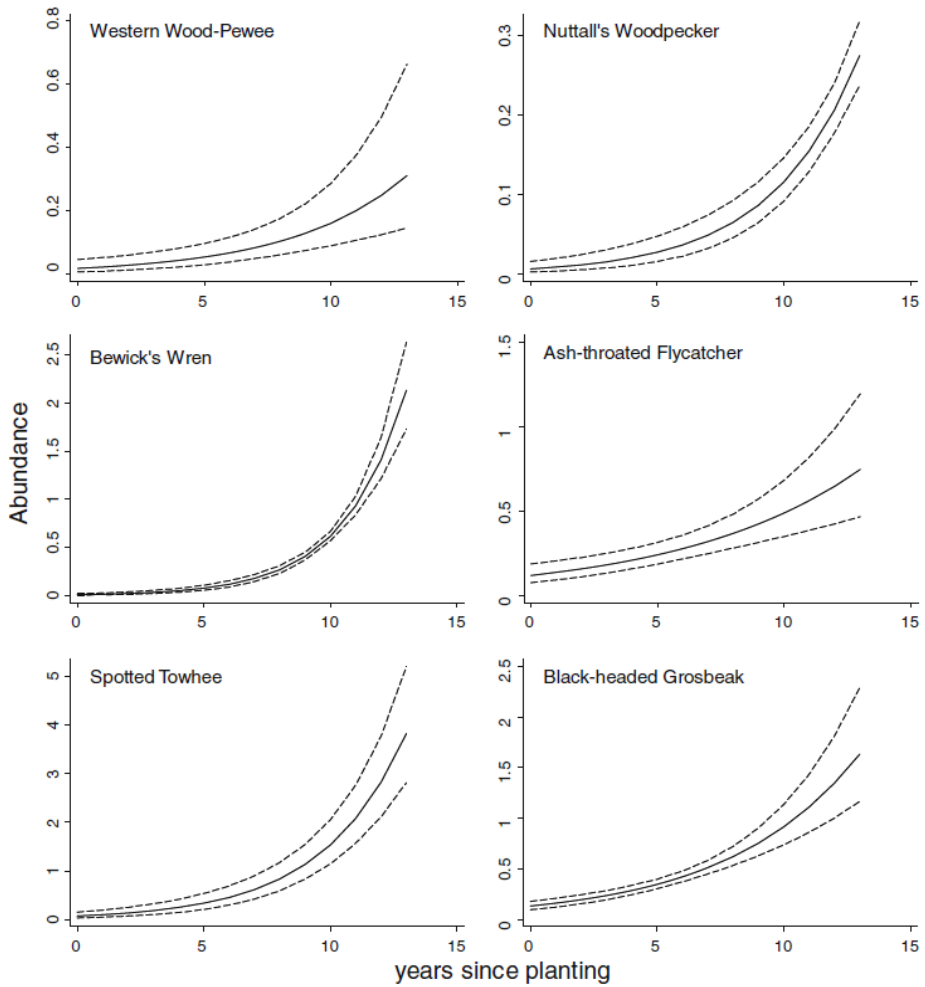
Abundance higher in buffers vs. control group (crop/pasture)

Restored areas all provide habitat but ***specific species might reflect successional stage***



High abundance early (as little as 2 yrs)

Richness/diversity generally increase over time



Gardali and Holmes (2011) Different responses for different species. Expect significant population increase approx 10, 15+ yrs post planting?

Takeaways for bird-friendly riparian restoration

Location: favor sites close to existing habitat for connectivity

Prep: Control/remove invasives as much as possible

Scale: wider, larger buffers are better

Design: Vertical structure, stem density, interspersed shrub and tree patches

Native plants: Be strategic about superstar species. If you need a shrub, why not make it a berry-producing, high caterpillar hosting, bird-preferred species?

Time: Often takes many years to see the impacts of habitat restoration on birds.

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