

flgaCBC

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## SPECIES TO INCLUDE
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# You can count hummingbird sp, Archilochus sp., waterthrush sp., Empidonax sp. as Neotropical migrants
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Introduction

CBC and BBS have become powerful tools for understanding large-scale patterns of population changes in North American birds, having been applied to guilds, and individual species.

Restrictions and major biases, however, do apply to these citizen science data (Dunn et al. 2005). How well do trends in local CBCs mirror larger trends? Can we use insights from long-term local participants to identify possible causes of some of these trends? What have local birders observed that might help explain declines and increases. Habitat loss, succession, climate, dog fennel, prairie regrowth, drought, cyclic changes of drying, Are there processes other than actual population changes creating apparent population changes (superior birding skills (Sauer et al. 1994; Dunn et al. 2005), more knowledge of where birds might be hiding? More competition among groups? More bird feeder watchers (Dunn et al. 2005)? Better techniques such as playbacks of mobbing or screech owls? Stable populations but decreases caused by an increasing count effort that can only count a fixed number of individuals? Declining birding skills as we get older?) Changes in effort over time (Butcher and McCulloch 1990)

On the CBC data

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The count format (broken up into 11 teams and all day counts) was instituted in 1972, so i think that would be a good time to begin. Therefore, we analyze data from 1972 to 2018.

Group the species

In some portions, we present results in groups of species according to various hypotheses. Species groupings are as follows: Declining, Ag vics, Endemic, DDT vics, Feeder, Non-native, Urban adapters, North Florida winter center, Neotropical migrants, Short distance migrants, Sweetwater (see Table @ref(sppGroupTab)).

Table 1: Species groups for analysis

sppGroup	family	species
Declining	Columbidae	Common Ground-Dove
	Icteridae	Eastern Meadowlark
	Laniidae	Loggerhead Shrike
	Mimidae	Brown Thrasher
	Odontophoridae	Northern Bobwhite
		Field Sparrow
	Passerellidae	Grasshopper Sparrow
		Henslow's Sparrow
	Picidae	Northern Flicker
		Red-Headed Woodpecker

Ag vics	Accipitridae	Northern Harrier Red-Tailed Hawk
	Charadriidae	Killdeer
	Columbidae	Common Ground-Dove Mourning Dove
	Falconidae	American Kestrel Boat-Tailed Grackle
	Icteridae	Common Grackle Eastern Meadowlark Red-Winged Blackbird
	Laniidae	Loggerhead Shrike
	Mimidae	Brown Thrasher
	Motacillidae	Northern Mockingbird American Pipit
	Passerellidae	Field Sparrow Savannah Sparrow Vesper Sparrow
	Passeridae	House Sparrow
	Turdidae	Eastern Bluebird
	Tyrannidae	Eastern Phoebe
	Tytonidae	Barn Owl
Endemic	Passerellidae	Bachman's Sparrow
	Picidae	Red-Cockaded Woodpecker
	Sittidae	Brown-Headed Nuthatch
DDT vics	Accipitridae	Bald Eagle Cooper's Hawk Red-Shouldered Hawk Sharp-Shinned Hawk
	Falconidae	Merlin Peregrine Falcon
	Pandionidae	Osprey
	Phalacrocoracidae	Double-Crested Cormorant
Feeder	Accipitridae	Cooper's Hawk Sharp-Shinned Hawk
	Cardinalidae	Indigo Bunting Northern Cardinal Painted Bunting
	Columbidae	Mourning Dove
	Corvidae	American Crow Blue Jay
	Fringillidae	American Goldfinch House Finch Pine Siskin
	Icteridae	Baltimore Oriole Brown-Headed Cowbird
	Laridae	Ring-Billed Gull
	Paridae	Carolina Chickadee Tufted Titmouse
	Parulidae	Yellow-Throated Warbler
	Passerellidae	Chipping Sparrow
	Passeridae	House Sparrow
	Picidae	Red-Bellied Woodpecker
	Sittidae	Red-Breasted Nuthatch
	Troglodytidae	Carolina Wren
	Anatidae	Black-Bellied Whistling-Duck Egyptian Goose Mallard

Non-native	Columbidae	Eurasian Collared-Dove Mourning Dove Rock Dove
	Passeridae	House Sparrow
	Sturnidae	European Starling
	Accipitridae	Red-Shouldered Hawk Black-Bellied Whistling-Duck Egyptian Goose Mallard
Urban adapters	Anatidae	Canada Goose Hooded Merganser Wood Duck
	Cardinalidae	Northern Cardinal
	Cathartidae	Black Vulture Turkey Vulture
	Columbidae	Eurasian Collared-Dove Mourning Dove Rock Dove American Crow
	Corvidae	Blue Jay Fish Crow
	Fringillidae	House Finch Boat-Tailed Grackle
	Icteridae	Brown-Headed Cowbird Common Grackle
	Laridae	Ring-Billed Gull
	Mimidae	Brown Thrasher Northern Mockingbird
	Paridae	Carolina Chickadee Tufted Titmouse
	Passeridae	House Sparrow
	Picidae	Pileated Woodpecker
	Rallidae	Common Gallinule
	Strigidae	Eastern Screech-Owl Great Horned Owl
	Sturnidae	European Starling
	Threskiornithidae	White Ibis
	Troglodytidae	Carolina Wren House Wren
	Tytonidae	Barn Owl
	Alcedinidae	Belted Kingfisher
	Cardinalidae	Northern Cardinal
	Charadriidae	Killdeer
	Columbidae	Mourning Dove American Crow
	Corvidae	Blue Jay Fish Crow
	Fringillidae	American Goldfinch
	Icteridae	Brown-Headed Cowbird Brown Thrasher
	Mimidae	Gray Catbird Northern Mockingbird
	Paridae	Carolina Chickadee Tufted Titmouse Black-And-White Warbler Common Yellowthroat Orange-Crowned Warbler Palm Warbler

North Florida winter center	Parulidae	Pine Warbler Yellow-Rumped Warbler Yellow-Throated Warbler
	Passerellidae	Chipping Sparrow Swamp Sparrow
		Downy Woodpecker
	Picidae	Red-Bellied Woodpecker Yellow-Bellied Sapsucker
	Poliophtilidae	Blue-Gray Gnatcatcher
	Regulidae	Ruby-Crowned Kinglet
	Scolopacidae	Wilson's Snipe
	Troglodytidae	Carolina Wren House Wren
		Sedge Wren
	Turdidae	American Robin Eastern Bluebird
	Tyrannidae	Eastern Phoebe
	Vireonidae	Blue-Headed Vireo White-Eyed Vireo
	Apodidae	Vaux's Swift
	Caprimulgidae	Eastern Whip-Poor-Will Dickcissel
Neotropical migrants	Cardinalidae	Indigo Bunting Painted Bunting Rose-Breasted Grosbeak Summer Tanager Western Tanager
		Baltimore Oriole
	Icteridae	Bullock's Oriole Orchard Oriole
	Icteriidae	Yellow-Breasted Chat American Redstart Black-And-White Warbler Black-Throated Blue Warbler Black-Throated Green Warbler Blackburnian Warbler Blue-Winged Warbler Louisiana Waterthrush Magnolia Warbler Nashville Warbler Northern Parula Northern Waterthrush Ovenbird Prairie Warbler Tennessee Warbler Yellow Warbler Wilson's Warbler
		Black-Chinned Hummingbird
		Ruby-Throated Hummingbird
		Rufous Hummingbird
		Wood Thrush
		Ash-Throated Flycatcher
		Brown-Crested Flycatcher
		Eastern Kingbird
		Least Flycatcher
		Western Kingbird
		Vermilion Flycatcher
		Yellow-Throated Vireo

Short distance migrants	Accipitridae	Northern Harrier
		Sharp-Shinned Hawk
	Certhiidae	Brown Creeper
	Fringillidae	Pine Siskin
		Purple Finch
	Gruidae	Sandhill Crane
		Common Grackle
	Icteridae	Red-Winged Blackbird
		Rusty Blackbird
		Dark-Eyed Junco
		Eastern Towhee
		Fox Sparrow
	Passerellidae	Song Sparrow
		Vesper Sparrow
		White-Throated Sparrow
Sweetwater		White-Crowned Sparrow
	Regulidae	Golden-Crowned Kinglet
	Scolopacidae	American Woodcock
	Sittidae	Red-Breasted Nuthatch
	Troglodytidae	Winter Wren
	Turdidae	Hermit Thrush
	Accipitridae	Snail Kite
	Anatidae	Blue-Winged Teal
	Anhingidae	Anhinga
	Aramidae	Limpkin
		American Bittern
		Least Bittern
		Great Blue Heron
	Ardeidae	Little Blue Heron
		Tricolored Heron
Sweetwater		Green Heron
		Black-Crowned Night-Heron
		Yellow-Crowned Night-Heron
	Ciconiidae	Wood Stork
	Phalacrocoracidae	Double-Crested Cormorant
		King Rail
		Purple Gallinule
	Rallidae	Sora
		Virginia Rail
		White Ibis
	Threskiornithidae	Glossy Ibis
		White-Faced Ibis
	Troglodytidae	Marsh Wren

Statistical analysis of population trends

We estimated species population trends in the Gainesville, Florida Christmas Bird Count (CBC; National Audubon Society REF) circle (FLGA) for the period of 1972 to 2015 using generalized additive models (GAMs, Hastie and Tibshirani 1990; Wood 2006). GAMs are a flexible implementation of generalized linear models in cases where species' populations exhibit non-linear trends. GAMs optimize the predictability of the relationship between the response and predictor variable(s) while accounting for the noise associated with. We analyzed individual species' trends using the a generalized additive model:

$$y = \alpha + s(year) + s(hours)\gamma = 1(\#eq : var - beta) \quad (1)$$

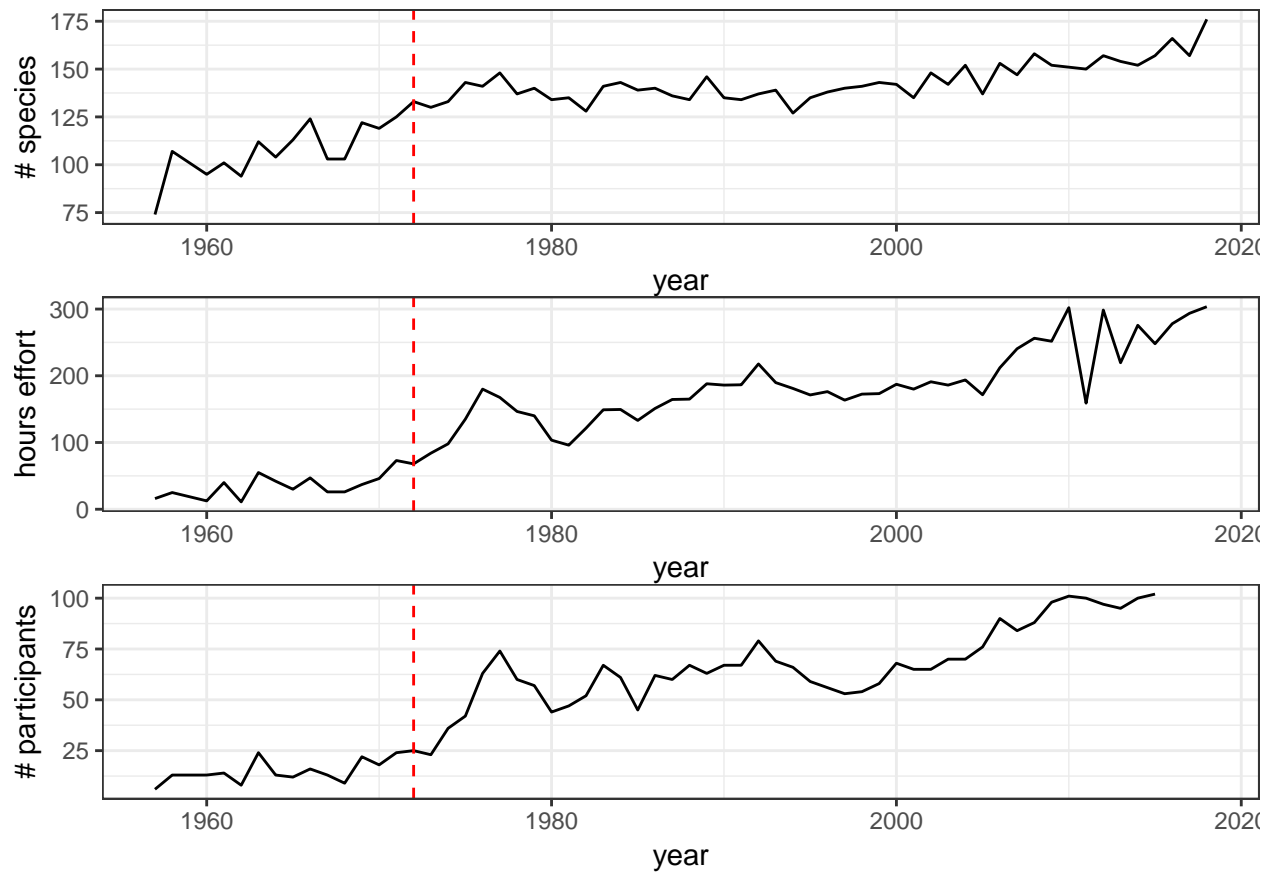


Figure 1: Annual effort and species richness for the FLGA CBC circle. Dashed line indicates year we begin analyses.

$$I = \frac{1}{T} \int_0^T dt \left[\frac{s''^2}{s'^4} \right]^2 \text{ (\#eq : } fiDerivs) \quad (2)$$

References not yet defined in .bib

Fewster, Rachel M., et al. "Analysis of population trends for farmland birds using generalized additive models." *Ecology* 81.7 (2000): 1970-1984. Hastie, Trevor J., and Robert J. Tibshirani. *Generalized additive models*. Vol. 43. CRC Press, 1990. R Core Team (2015). *R: A language and environment for statistical computing*. R Founding for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>. Wood, S.N. (2006) *Generalized Additive Models: An Introduction with R*. Chapman and Hall/CRC.