

Indicator 1.04:

Number of native forest-associated species

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What is this indicator and why is it important?

Indicator 1.04 reports the number of native forest-associated species. Species counts are used not only to monitor individual species, but also to assess ecosystem well-being because one of the more general signs of ecosystem stress is a reduction in the variety of organisms inhabiting a given locale. The count of forest-associated species will change when species become completely extinct or regionally extirpated; species colonize new areas; or our knowledge base is improved. Extinction/extirpation and colonization can alter ecological processes in ways that affect the kinds and quality of ecosystem services provided by forest ecosystems. Therefore, the loss or addition of species in an ecosystem can provide valuable insights into the overall health and productivity of that system.

What does the indicator show?

A total of 17,464 native species are associated with forest habitats in the United States: 15,256 vascular plants, 1,014 invertebrates (an incompletely assessed group—the actual number of these species is considerably higher), and 1,194 vertebrate species, which include amphibians (216), birds (459), freshwater fish (60), mammals (233), and reptiles (226). The number of forest-associated species per ecoregion ranges from a low of 126 to a high of 3,881 across the United States (fig. 4-1a). Species-area relationships confound direct comparison of species richness between ecoregions, which vary in size. Nevertheless, ecoregion delineations of similar ecological conditions over relatively large areas provide useful information on spatial patterns of species diversity. Species-area relationships have less impact on within-

ecoregion comparisons of forest-associated species across time (fig. 4-1b).

What has changed?

Compared to the 2010 Sustainability Report, an additional 2,650 native forest-associated species are now being counted, primarily due to better data and a revised accounting of species that inhabit forest systems. Much of this change is attributed to a substantial increase in the count of vascular plant species. Increasing numbers of invertebrates and decreasing numbers of vertebrate species were mostly offsetting, resulting in little net change for those combined taxa. Vertebrate losses are mostly attributable to changes in assignment of forest-association. Thus, not all changes in counted species reflect increases or decreases in numbers of species actually present.

Our knowledge of which bird species are associated with forest habitats has been well established, and we had sufficient data to compare historical with recent trends in the numbers of native forest-associated bird species. Comparing historical (1975–1999) with recent short-term (1999–2018) trends shows 51 ecoregions throughout the conterminous United States with increases in the number of forest bird species: 19 previously decreasing but now increasing, 32 previously increasing and continuing to increase (fig. 4-2a). In contrast, trends reveal 30 ecoregions where the number of forest-associated bird species have shown declines: 21 previously increasing but now decreasing, 9 previously decreasing and continuing to decrease (Fig. 4-2b). Twenty-five of 106 ecoregions remained stable, with no significant change in numbers of forest-associated bird species numbers across time. Trends in forest-associated bird species counts reported here differ from rates of population change (Indicator 1.08 and Rosenberg et al. 2019) due to uneven distributions of populations among species.

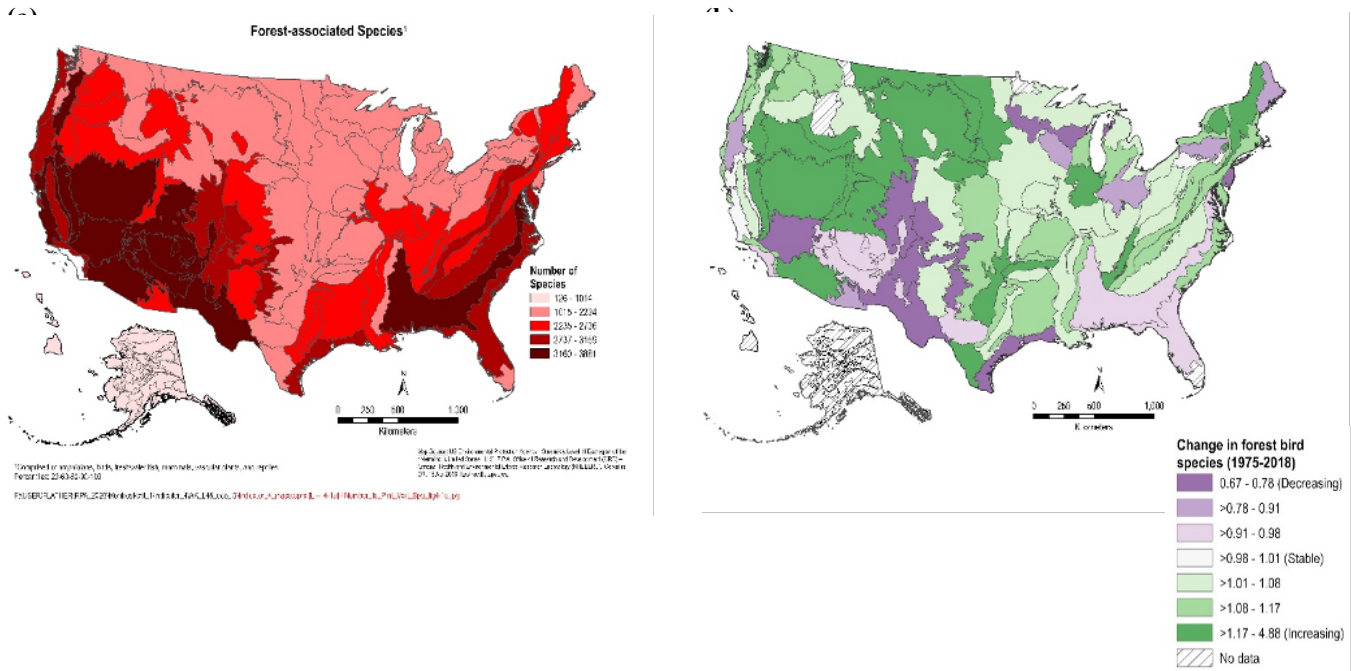


Figure 4-1—**(a)** The number of species (amphibians, birds, freshwater fish, invertebrates, mammals, reptiles, and vascular plants) associated with forest habitats. Class thresholds represent 20, 60, 80, 90, and 100th percentiles. **(b)** The estimated long-term change in the number of forest-associated bird species from 1975 to 2018. Change is measured as (2018 species number estimate/1975 species number estimate), excluding exotic species. Values >1.0 indicate increasing species numbers (green shades); values <1.0 indicate declining species numbers (purple shades).

Sources: NatureServe; USGS Breeding Bird Survey. See Technical Data Supporting Indicator 1.04.

Are there important regional differences?

Distribution data reveal notable differences in the number of species that occur in major ecoregions of the United States. The number of forest-associated species is highest in the Southeastern Plains; in the arid ecoregions of the Southwest; in California’s Sierra Nevada Range, Central Foothills, and Coastal Mountains; and in the Cascades of Oregon and Washington (fig. 4-1a). Long-term (1975–2018) trends in the number of forest bird species also vary among ecoregions of the conterminous United States (fig. 4-1b). The greatest increases in numbers of forest bird species were clustered in ecoregions of the northern Great Plains and Intermountain West, with additional gains scattered among the Cross Timbers and Arkansas Valley, Southern Texas Plains, Central Corn Belt Plains, Southwestern Appalachians, and Northeastern Highlands. The greatest declines were distributed among the Southern Rockies, Southwestern Tablelands, and Chihuahuan Deserts, and scattered among disjunct ecoregions of the

Mojave Basin and Range, Western Gulf Coastal Plain, North Central Hardwood Forests, and Atlantic Coastal Pine Barrens. Additional regional variations are described in the section above.

Why can’t the entire indicator be reported at this time?

Monitoring species counts over large geographic areas is difficult. We lack systematic inventories that permit consistent estimates of species numbers for many groups (e.g., non-vascular plants, insects, fungi). Presently, the U.S. Geological Survey Breeding Bird Survey is the only data set that can support consistent, long-term comparisons of species counts at the national level. Aside from birds, much of the increase in the number of forest-associated species reported here reflects improved datasets for some taxa and a change in our understanding of which species are thought to be associated with forest habitats, rather than a true increase or loss of species in the forest

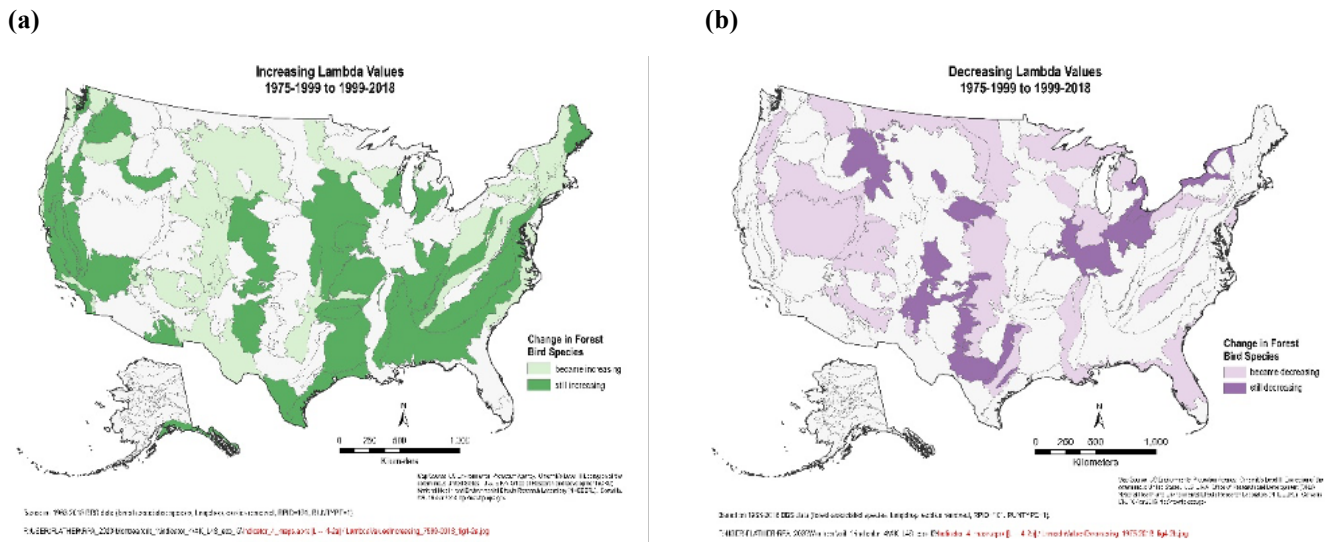


Figure 4-2—A comparison of historical trends (1975–1999) to recent short-term trends (1999–2018) in forest-associated bird species counts in the continental United States. **(a)** Those strata that have continued to see increases in bird species numbers or were declining historically but have become increasing. **(b)** Those strata that have continued to see decreases in bird species numbers or were increasing historically but have become decreasing.

Source: Data provided by U.S. Geological Survey. See Technical Data Supporting Indicator 1.04.

biota. Improved knowledge of taxonomy, distribution, or habitat affiliation can lead to change in species counts and improved biodiversity conservation. Until comprehensive biodiversity inventories are implemented, trends in the number of native forest species will have to be interpreted cautiously. The most fundamental need is to develop monitoring programs that are economically feasible and applicable across the diverse groups of species that inhabit forest ecosystems..

References

Rosenberg, K.V.; Dokter, A.M.; Blancher, P.J.; Sauer, J.R.; Smith, A.C.; Smith, P.A.; Stanton, J.C.; Panjabi, A.; Helft, L.; Parr, M.; Marra, P.P. 2019. Decline of the North American avifauna. *Science*. 366(6461): 120–124.

Supporting Data for Indicator 1.04

Ecoregion maps from: Omernik’s Level III Ecoregions of the conterminous United States. Corvallis, OR: U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory. Accessed: 16 April 2013. <ftp://newftp.epa.gov>.

Species data from: NatureServe. October 2020. Anne Frances and Jason McNees. 2020 Biodiversity Datasets for the National Report on Sustainable Forests.

Breeding Bird Survey data, 1966–2018, from: U.S. Department of the Interior, U.S. Geological Survey, Patuxent Wildlife Research Center, North American Breeding Bird Survey.