UPDATE OF BALD EAGLE TAKE LIMITS FOR THE ATLANTIC, CENTRAL, MISSISSIPPI, AND NORTERN PACIFIC EAGLE MANAGEMENT UNITS

INTRODUCTION

As in 2016, the U.S. Fish and Wildlife Service ("we", "us") used the Prescribed Take Level (PTL) framework to estimate sustainable take limits for bald eagles (Runge et al. 2009, USFWS 2016a). The PTL framework enabled us to distinguish between important policy and scientific components of bald eagle take management, which makes the decision process for setting allowable take limits transparent. The PTL framework incorporates a management objective, risk tolerance for not achieving the management objective, an estimate of the maximum growth rate, and an estimate of population size to derive an allowable take limit. The management objective and risk tolerance are the policy components of PTL and are subjective decisions made by the U.S. Fish and Wildlife Service. The policy decisions regarding bald eagle management were specified in the 2016 Programmatic Environmental Impact Statement (PEIS) for the eagle take permit regulations (USFWS 2016b).

The PTL framework is derived from harvest and logistic growth theory. The form of density dependence (linear vs non-linear) has been shown to influence allowable take levels (Johnson et al. 2012). Bald eagles have life history characteristics (e.g., high survival, delayed maturation) of a species for which density dependence would be expected to be non-linear and stronger near carrying capacity (Johnson et al. 2012, Williams 2013). Thus, we estimated allowable take using a non-linear version of the PTL model, and we estimated the degree and direction of nonlinearity as part of the PTL modeling process following the approach in Johnson et al. (2012). We used simulation to incorporate uncertainty in the estimates of growth rate and population size.

This update is for the Atlantic, Central, Mississippi, and Northern Pacific bald eagle management units (EMU) (USFWS 2016b). The Service has no new data with which to update the Southern Pacific or Alaskan EMU take limits, but available biological data (e.g., USGS breeding bird survey data [https://www.mbr-pwrc.usgs.gov/], Southwestern Bald Eagle Management Committee reports [http://www.swbemc.org/Productivity.html]) do not indicate those populations have declined in status substantially since take limits were set in 2016 (USFWS 2016b). For the time being the take limits for these two EMU remain as established in 2016.

METHODS

In our PTL analysis, we adhered to the management objective specified in the PEIS (USFWS 2016a) and structured our PTL model to limit permitted take to be consistent with maintaining bald eagle population size in the U.S. at or above the 2009 estimate of 142,977 individuals. We estimated the sustainable take rate and take limits, and calculated allowable take limits at the median and at the 20th quantiles of the probability distribution following what was presented in USFWS (2016b). The Service uses the 20th quantile of the sustainable take limits as the take limits for permitting (USFWS 2016a), which represents a risk averse approach for managing bald eagle take. For that reason, those are the values we report here.

To obtain updated estimates of bald eagle demographic rates for the PTL model, we developed an integrated population model (IPM) that combined leg band and dead recovery data,

recruitment estimates from USFWS (2016b; Appendix A2), and breeding bird survey data to estimate growth rates and to help inform population size. The output from the IPM provided estimates of age-specific survival and recruitment. We used this information to populate an age-structured projection matrix to calculate the population growth rate. The growth rate used to inform the PTL should be that which is expected when population density is low, in the absence of anthropogenic take, and under average contemporary environmental conditions – essentially the maximum growth rate that could be expected under average environmental conditions. These conditions were likely not met when data for the IPM were being collected because bald eagle density was not low, so we sampled values from the upper half of the uncertainty distributions of the IPM parameter estimates to approximate the maximum growth rate, as we did in 2016 (USFWS 2016a). We use additional output from the IPM, data from an aerial nest occupancy survey, and eBird (https://ebird.org/home) data to estimate a total population size for 2018-2019 throughout the conterminous US excluding the southwest (USFWS 2021). The aerial nest occupancy survey and eBird data were integrated to provide an estimate of the total number of occupied bald eagle nesting territories. We multiplied this estimate by 2 to get total number of breeding birds, and then adjusted that for our estimate of the proportion of adults breeding (to account for non-breeding adults) and non-breeding aged birds from the IPM (see USFWS 2021 for details on the population estimation process and results). For more details on the approach and methods see Zimmerman et al. (2022).

RESULTS

The maximum growth rate from the PTL was 0.13, and the allowable take rate assuming a non-linear relationship between density and population growth was 0.09. The 20th quantiles of the distribution of population size (see USFWS 2021) multiplied by the allowable take rate provided the following updated take limits: Atlantic EMU = 4,223; Central EMU = 1,521; Mississippi EMU = 7,986; and North Pacific EMU = 2,102.

DISCUSSION

We attribute much of the increase in the bald eagle take limits to the rapid increase in population size. The continued population growth is an encouraging sign that the bald eagle population recovery is durable and ongoing. To a lesser degree, the increased take limits reflect that the IPM allowed us to account for nonbreeding adult bald eagles in our population estimates. Although the updated allowable take estimates are higher than previous levels, the Service's policy to use the 20th quantiles of the allowable take limits manages risk to emphasize bald eagle conservation at the expense of more liberal permitting options. We do not believe this will constrain the availability of permits, because even under the current national take limit of 7,522 the number of permits issued in 2020 was only 490. As described in the PEIS, the Service will continue to monitor bald eagles and revisit allowable take limits no less than once every six years to ensure that changes in demographic rates and population size can be detected and accounted for in future updates like this one.

LITERATURE CITED

Johnson, F.A., M. A. Walters, and G. S. Boomer. 2012. Allowable levels of take for the trade in Nearctic songbirds. Ecological Applications 22: 1114–1130.

Runge, M.C., J. R. Sauer, M. L. Avery, B. F. Blackwell, and M. D. Koneff. 2009. Assessing allowable take of migratory birds. Journal of Wildlife Management 73: 556–565. https://doi.org/10.2193/2008-090

USFWS. 2016a. Bald and golden eagles: population demographics and estimation of sustainable take in the United States, 2016 update. Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington, D.C. USA.

USFWS. 2016b. Programmatic Environmental Impact Statement for the Eagle Rule Revision. Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington, D.C. USA.

USFWS. 2021. U.S. Fish and Wildlife Service Final Report: Bald Eagle Population Size: 2020 Update. Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Washington, D.C. USA.

Williams, C. K. 2013. Accounting for wildlife life-history strategies when modeling stochastic density-dependent populations: A review. Journal of Wildlife Management 77: 4–11.

Zimmerman, G. S., B. A. Millsap, F. Abadi, J. V. Gedir, W. L. Kendall, and J. R. Sauer. 2022. Estimating allowable take for an increasing bald eagle population in the United States. The Journal of Wildlife Management DOI: 10.1002/jwmg.22158. https://wildlife.onlinelibrary.wiley.com/doi/full/10.1002/jwmg.22158