Recovery Plan for Masked Bobwhite (*Colinus virginianus ridgway*)
https://ecos.fws.gov/docs/recovery_plan/950421.pdf

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DRAFT AMENDMENT 1

We have identified best available information that indicates the need to amend (add) recovery criteria for the masked bobwhite (*Colinus virginianus ridgwayi*) subsequent to completion of the 1995 revision of the Masked Bobwhite Recovery Plan (Recovery Plan). In this proposed modification, we consider the adequacy of the existing recovery criteria, show amended recovery criteria by adding delisting criteria, and provide the rationale supporting the proposed recovery plan modification. The proposed modification is shown as an addendum that supplements the Recovery Plan, specifically the recovery criteria (p.37) of the existing Recovery Plan.

For
U.S. Fish and Wildlife Service
Southwest Region
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BACKGROUND INFORMATION

Recovery plans should be consulted frequently, used to initiate recovery activities, and updated as needed. A review of a recovery plan and its implementation may show that the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures that the species benefits through timely, partner-coordinated implementation based on the best available information. The need for, and extent of, plan modifications will vary considerably among plans. Maintaining a useful and current recovery plan depends on the scope and complexity of the initial plan, the structure of the document, and the involvement of stakeholders.

An amendment involves a substantial rewrite of a portion of a recovery plan that changes any of the statutory elements. The need for an amendment may be triggered when, among other possibilities: (1) the current recovery plan is out of compliance with regard to statutory requirements; (2) new information has been identified, such as population-level threats to the species or previously unknown life history traits, that necessitates new or refined recovery actions and/or criteria; or (3) the current recovery plan is not achieving its objectives. The amendment replaces only that specific portion of the recovery plan, supplementing the existing recovery plan, but not completely replacing it. An amendment may be most appropriate if significant plan improvements are needed, but resources are too scarce to accomplish a full recovery plan revision in a short time.

Although it would be inappropriate for an amendment to include changes in the recovery program that contradict the approved recovery plan, it could incorporate study findings that enhance the scientific basis of the plan, or that reduce uncertainties as to the life history, threats, or species' response to management. An amendment could serve a critical function while awaiting a revised recovery plan by: (1) refining and/or prioritizing recovery actions that need to be emphasized, (2) refining recovery criteria, or (3) adding a species to a multispecies or ecosystem plan. An amendment can, therefore, efficiently balance resources spent on modifying a plan against those spent on managing implementation of ongoing recovery actions.

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

U.S. Fish and Wildlife Service (USFWS) personnel associated with Buenos Aires National Wildlife Refuge (BANWR), in conjunction with the Masked Bobwhite Recovery Team (Recovery Team), reviewed the best available information on the status and needs of the masked bobwhite. We reviewed and considered information found in the current Recovery Plan (USFWS 1995), the Masked Bobwhite 5-Year Review (USFWS 2014), pertinent published literature, USFWS files, and personal experiences of BANWR staff and Recovery Team members. The Recovery Team consists of representatives from United States Federal and State agencies, Mexican agencies, academia, quail experts and practitioners, and accredited facilities participating in masked bobwhite quail recovery activities.

Following a review of the best available information, BANWR personnel summarized the state of our knowledge and the need to develop delisting criteria for the Recovery Team. They then led a discussion with the Recovery Team to assess the current status of information, possible metrics and information needed to develop criteria, and then what those potential delisting criteria might look like. Recovery team members provided insights and direction to what conditions and population status were needed to determine when the species would be recovered. Following this discussion and input, BANWR and Ecological Services personnel collaboratively utilized that information to develop the proposed delisting criteria presented in this document. We intend to allow the Recovery Team to provide peer review of the delisting criteria we have developed prior to finalizing the criteria.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (ESA) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995)) and a Government Accountability Audit (GAO 2006) have also affirmed the need to frame recovery criteria in terms of threats assessed under the five threat factors (ESA 4(a)(1)).

Recovery Criteria

The recovery objectives, downlisting criteria, and recovery actions can be found on pages 34-59 in the existing 1995 Recovery Plan. Neither the original, nor any subsequent revisions to the Masked Bobwhite Recovery Plan contained quantifiable or measureable delisting criteria that would help us understand when recovery has been accomplished. It was determined at the time those recovery plans were developed or revised, that there was inadequate information to know what delisting criteria would be appropriate.

Synthesis

The most complete and recent description of the status of the masked bobwhite is found in the 2014 5-Year Review of the Status of the Masked Bobwhite (USFWS 2014). Considerable information is presented in that document that comes from additional research, monitoring, investigations, and implementation of recovery actions that have occurred subsequent to the completion of the Recovery Plan. Threats to the masked bobwhite continue to be those outlined in the 5-Year Status Review and include disease in the captive population, lack of genetic variability, predation, improper livestock grazing systems, habitat fragmentation, exotic grasses and changed fire regimes, and effects of climate change. Below, we summarize new information that has become available since the 5-Year Status Review of the Masked Bobwhite.

Reproduction

Casual observations by BANWR staff of mortalities of captive masked bobwhites held in outdoor pens with varying degrees of cover seem to indicate that there may be a lowered tolerance for extreme cold temperatures. When night-time temperatures drop into the 10 to 20 degree Fahrenheit (F) range (-12 to -7 degree Celsius (C)), or when cold and rainy conditions occur together, birds are sometimes found dead in roost rings. It is not known how this might affect truly wild birds, since the captive birds had limited choices for seeking cover, and wild birds may be able to move out of colder areas into better roost sites.

Wild Populations

Portions of central and eastern Sonora, Mexico, have recently been surveyed from the air to try to detect potential masked bobwhite habitat, with intensive ground surveys taking place in those areas that appear to be suitable habitat to document potential additional areas in which to conduct masked bobwhite surveys. Researchers are asking landowners and ranch personnel for information related to historical and current presence of the masked bobwhite on their lands. Thus far, these efforts have been unproductive.

Captive Breeding

With recent survey results, in both the United States (BANWR) and Mexico, indicating that occurrence of wild masked bobwhite in the wild is essentially non-existent, conservation and recovery of the masked bobwhite is nearly completely restricted to the captive flocks at various facilities. An active captive breeding program in the United States includes BANWR in Sasabe, Arizona, George Sutton Avian Research Center (Sutton) in Bartlesville, Oklahoma, and a third captive breeding program exists at Africam Safari (Africam), in Puebla Mexico.

Approximately 600-1000 birds are held at any one time on BANWR, with approximately 50-70 individuals kept at Northern Illinois University. Additional individuals (1-12 birds each) are at various zoological institutions around the country. Numbers of captive birds vary widely from year to year, as well as within single years, due to annual variability in hatching of chicks and mortality rates in both juvenile and adult birds.

The Sutton masked bobwhite captive facility was established in 2017 when 178 masked bobwhite eggs were provided from BANWR to initiate this second captive facility, supported by Cooperative Recovery Initiative funds. Sutton became active in supplying masked bobwhite chicks and adults in 2018 to aid in the release program. The establishment of this facility

secured the masked bobwhite captive population reducing population risks and reinvigorating the captive program. In addition, the recovery goal action (1.2) to establish and maintain a second captive population in the United States was accomplished.

Africam Safari was successful in acquiring dollars through a "State of the Birds" grant to assist in the development of a captive rearing facility and flight conditioning pens, also in alignment of recovery action (1.4). In June of 2015, and April of 2016, a total of 140 masked bobwhite quail were transferred from BANWR to Africam ultimately securing a third captive flock population. To date they have 60 males, 52 females, and one undetermined individual bringing the total captive population in Mexico to 113 quail.

Genetics

Genetic variability of the captive flock may play an important role in the success of the reintroduction of masked bobwhite in Arizona and Mexico. In 2007 a partial pedigree was created for captive masked bobwhite quail located at BANWR by using feather DNA. Due to cost of analysis, only 218 birds of the larger flock size of approximately 600 quail were used to develop the pedigree used for all future breeding pairing. A die off that summer removed 41 individuals from the pedigree list, further reducing genetic variability. Signs of inbreeding have already appeared within the captive population. Results of the flock's recent pedigree showed what appeared to be higher variability than expected (USFWS 2014). A more recent evaluation of the flock's pedigree is underway and results should be available by the fall of 2019. The addition of captive breeding facilities at Sutton and Africam should improve the overall genetics of the population.

Habitat characteristics

Recently published research has found that impacts from historical prescribed fire and habitat management have impacted masked bobwhite quail. Beginning in the 1980s, prescribed fire management was employed to improve vegetative conditions for masked bobwhite. Although native grasses and forbs would respond positively in the short term, particularly during years with adequate precipitation, the leguminous shrubs and subshrubs, important to masked bobwhite for shelter and food resources, were diminished throughout areas where burns were conducted (Sesnie and Dickson 2018). Moreover, the frequency of prescribed fire (specifically in areas with more than 4 burns over a 30-year period) had a negative impact to the availability of woody plants (trees and shrubs) and overall plant diversity, and burned areas were more likely to be subsequently dominated by Lehmann lovegrass (*Eragrostis lehmanniana*) (Sesnie and Dickson 2018). Given that masked bobwhite use habitat with higher canopy coverage of woody plants than available to them, a decrease in these features could correlate to the reduced populations of masked bobwhite. Future fire management will incorporate time intervals of 15 to 20 years between fires to provide recovery of the native and woody plant community (Sesnie and Dickson 2018).

Habitat restoration

Since 2014, BANWR has applied new GIS and remote sensing techniques for mapping habitat conditions, targeting restoration sites, and prioritizing release sites. This work reveals multiple sites suitable for masked bobwhite releases. These locations must be connected and replicated to build a self-sustaining population. Over the last few years, a masked bobwhite habitat

restoration implementation plan has been developed and will guide management actions. This plan calls for an increase in native bunchgrasses, forbs, and shrubs while reducing invasive mesquite and minimizing cover of Lehmann lovegrass. To build these conditions, planting of native seed for grasses, forbs, and shrubs is necessary as is the conversion of mesquite trees into a useful, shrubby structure by half-cutting (bending partially cut branches to the ground). Buenos Aires NWR will also restore the natural sheet flow of water by installing multiple small rock dam structures, thereby forcing channelized washes to spread. This action will regenerate a richer native plant community, especially shrubs that are instrumental in providing winter food. In aggregate, restoring the diverse components of masked bobwhite habitat on 1,000 acres initially will provide the necessary habitat characteristics for supporting a self-sustaining masked bobwhite population, thereby making significant progress towards recovery.

Predation

Raptor numbers are significantly lower in Sonora than on the refuge, therefore, it is believed that raptor predation in Sonora is less common. For unknown reasons, hawks are not common in the central Sonoran habitat utilized by the bobwhites. Many predators, especially mammalian, are dispatched by ranchers in the area, but high numbers of reptilian predators are present in the vicinity.

Climate Change

Downscaled climate information from the U.S. Geological Survey's National Climate Change Viewer, using the average of 30 international climate models, projects warmer and drier conditions for the State of Arizona (https://www2.usgs.gov/climate_landuse/clu_rd/nccv.asp). For Arizona, from data spanning 1981-2010 predicted to 2025-2049, the mean model prediction for annual maximum temperature shows an average increase of 3.4°F from 1981-2010 to 2025-2048 under the 8.5 RCP emissions scenario. Although we lack the ability to predict which emissions scenario will be the most accurate into the future, data on global temperatures at this time appear to be most aligned with the 8.5 RCP scenario. Further time frames, from 1981-2010 to 2050-2074, and then from 1981-2010 to 2075-2099, predict an increase in annual mean maximum temperatures of 6.1°F and 9.2°F, respectively. Precipitation projections are more challenging to estimate; however, Arizona is predicted to receive similar amounts of precipitation, with a slight decrease up to ½ inch per month from the 1981-2010 data through the 2025-2049, 2050-2074, and 2075-2099 time frames. Due primarily to the increase in temperature, the evaporative deficit for Arizona is expected to increase from 1981-2010 to 2025-2049 by 0.3 inches/month; to 2050-2075 by 0.5 inches/month, and to 2075-2099 by 0.8 inches/month.

Information for annual mean maximum temperature at the county level for Pima and Santa Cruz counties in southern Arizona reveals similar trends. For example, in Pima County, the annual mean maximum temperature from the time period 1981-2010 will increase by 3.2°F as measured during the 2025-2049 time period; by 2050-2074, there will be an increase of 5.8°F average annual maximum temperature. Between the 1981-2010 and 2075-2099 time periods, the average annual maximum temperature is predicted to rise by 8.6°F at the RCP emissions scenario of 8.5. For Santa Cruz County, over the same data periods, the change is similar, with a shift of 3.2°F by the 2025-2049 time period; by 2050-2074, there will be a change by 5.9°F average annual maximum temperature; and by 2075-2099 the mean maximum average temperature will increase

8.8°F. Precipitation projections for Pima and Santa Cruz counties follow the rest of Arizona, although chances of diminished precipitation slightly increase in southern portions of Arizona, yet remain in the 0-1/2 inch decrease range through 2099. The projected evaporative deficit for Pima and Santa Cruz counties is the same as that for the state of Arizona through 2099.

Given the warming trend over the past several decades (Sheppard et al. 2002) and the 20-30 year drying trend the Southwest is experiencing (https://www.ncdc.noaa.gov/temp-and-precip/us-trends/), much of the masked bobwhite quail ancestral range has transformed into drier habitat. On BANWR specifically, climate data for the wettest quarter combined with average temperature depict warmer and drier conditions in the norther portion, than the slightly wetter and cooler southern range of the refuge (Sesnie and Dickson 2018). As new habitat suitability models are continuously created to best identify the current quality habitat throughout BANWR, our best success may occur in the southern regions of BANWR.

Reproduction, survival, and population dynamics of masked bobwhite, like those of other bobwhite species, are strongly influenced by precipitation and temperature. Climate trends and extremes will continue to impact masked bobwhite recovery, and effects of the threat of climate change will need to be mitigated by conservation management.

AMENDED RECOVERY CRITERIA

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the species in no longer at risk of extinction and may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, sub-species, or DPS) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the USFWS, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When

changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

We establish recovery criteria for the masked bobwhite, which will supplement the existing criteria in the Recovery Plan, as follows:

Downlisting Recovery Criteria
Downlisting criteria will remain the same as in the Masked Bobwhite Recovery Plan (USFWS 1995, p. 37).

Delisting Recovery Criteria
In addition to meeting the downlisting criteria provided in the 1995 Recovery Plan, the masked bobwhite may be considered for delisting when the following criteria have been met:

1. Four populations are maintained at an average of 1,000 individual masked bobwhite per population over an additional 10-year period following downlisting. This criterion can be met by any combination of four wild populations in the United States or Mexico.

Justification: We estimated that 1,000 individual masked bobwhites must be established in each population to provide adequate resiliency, redundancy, and representation such that overall population viability can be maintained in perpetuity. We selected the number masked bobwhites needed in each population by using northern bobwhite quail research as a surrogate for masked bobwhite quail because no population viability analysis or determination of minimum viable population number has been developed specifically for masked bobwhite quail. The numbers of masked bobwhite in a population can be determined through proven methods established for masked bobwhite specifically and for bobwhite across their range more generally. Guthery et al. (2000b) indicated that 800 individual bobwhites allow bobwhite populations to remain viable even when experiencing both winter and summer catastrophic events. Such events are common within the range of the masked bobwhite. In addition, masked bobwhite quail productivity is strongly tied to monsoonal moisture and humidity, as is habitat quality. Current predictions indicate that climate change will affect both winter and summer precipitation. Effects to both masked bobwhite productivity and habitat resulting from ongoing drought and anticipated climate change effects, therefore, it is prudent for Criterion 1 to have a population target of greater than the 800 individuals indicted in Guthery et al. (2000b).

Maintaining 1,000 individuals in four populations will provide adequate resiliency, redundancy, and representation such that overall population viability can be maintained in perpetuity. The number of individual masked bobwhites will be determined using standard survey protocols, including call counts and/or covey flush surveys with dogs (Sisson and Terhune 2017; Wellendorf et al. 2004; Burger et al. 2006; Rollins et al 2005; USFWS 1996). Population surveys will be conducted at least every three years. As defined by the existing downlisting criteria, these four populations would be geographically distributed throughout the masked bobwhite's range in both the United States and Mexico. However, the areas where key habitat can be maintained or establish will be affected over time by resources to implement habitat management, as well as by climate change. Therefore, we accept that there needs to be flexibility in where these four populations can be established or maintained, which supports our

flexibility in the locations of the four populations in the United States or Mexico. These population levels must be maintained at an average of 1,000 individual masked bobwhite per population over an additional 10-year period following downlisting in order to delist the masked bobwhite. We acknowledge that this species may be a conservation reliant species dependent on additional captive releases and/or ongoing habitat management in order to maintain these populations at a level of 1,000 individual masked bobwhites.

2. Each of the four populations described in the downlisting criteria and in Criterion 1 above has approximately 2,000 acres of habitat to support the 1,000 masked bobwhite needed to satisfy Criterion 1 above. The habitat in all four populations should be protected through such actions as acquisition, easements, management agreements, or similar types of land protection instruments. Management and protection of these habitats must be assured in perpetuity.

Justification: Adequate habitat must be provided to support the number of masked bobwhite needed to satisfy Criterion 1 above. Masked bobwhite habitat quality models have been developed, and measuring masked bobwhite habitat is relatively straight forward and repeatable (USFWS 1996; Brown et al. 2012, Guthery et al. 2001, LaRoche and Conway 2013). We determined the criterion of 2,000 acres based on the use of northern bobwhites as a surrogate and as described in Guthery et al. (2000b), Hernandez and Guthery (2012), and Stephens (2008), as well as the need to provide an addition habitat buffer due to the effects of climate change as discussed above. Habitat quality requirements are discussed in the **Synthesis** section above under the Habitat Characteristics and Non-Native Vegetation paragraphs.

Rationale for Amended Recovery Criteria

These delisting criteria now provide the general public with a way to understand when recovery has been achieved. These delisting criteria follow the concept in the existing Recovery Plan by expanding upon the downlisting criteria and recovery actions included in that Recovery Plan. These actions are focused on establishing and maintaining masked bobwhite populations within its historical range, as well as on understanding and determining how masked bobwhite habitat is best defined, created, and maintained. The delisting criteria simply take these concepts and actions and expand them so that viability is enhanced and persistence is ensured through adequate resiliency, redundancy, and representation. Therefore, these delisting criteria reflect the recovery strategy for this species outlined in the Recovery Plan, as well as those developed and being implemented by the existing Recovery Team. Recovery criteria linked to threat abatement are necessary. Determining whether a species is an endangered species or a threatened species evaluates not only the absolute numbers of individuals, size of their habitats, or other demographic and habitat measures, but also the stressors and threats attributed to five threat factors (ESA 4(a)(1)) that cause a species to be at risk of extinction. The ESA 4(a)(1) factors that cause a species to be an endangered species or a threatened species must be reduced, eliminated, or mitigated in order to recover such species, and "threats-based" criteria are required to reflect when threats have been ameliorated to a level and extent that allows for the ecological requirements of the species to be met. Populations can increase to respectable sizes and even be growing because of recovery efforts that reduce or eliminate the threats acting on the species, to sufficient levels. However, if the threats continue unabated, return once protections are removed or once conservation measures are terminated, the species' condition is likely to degrade again.

For this reason, recovery criteria are necessary to assess threat abatement as well as population condition.

Threats to the viability of masked bobwhite populations fall within three of the five threat factors outlined in section 4 of the ESA. These factors are 1) present or threatened destruction, modification, or curtailment of its habitat or range (non-native species invasion, habitat loss and fragmentation); 2) disease or predation (disease in the captive flock, predation primarily in the United States); and 3) other natural or manmade factors affecting its continued existence (climate change).

The delisting criteria address these threats in the following manner:

Criterion 1 – Increased numbers of masked bobwhite quail will reduce the effects of disease and predation by providing enough individuals that the effects of such threats are reduced at the population level. In addition, by having more masked bobwhite distributed across the four population groups, metapopulation rescue can occur following local effects from predation or climate change.

Criterion 2 – Increasing the amount and distribution of available masked bobwhite habitat and protecting habitat areas in perpetuity will reduce the effects of habitat loss and fragmentation. It will also increase our ability to manage these lands to reduce and prevent the invasion of invasive species. Masked bobwhite habitat distributed across a diversity of topography and vegetation communities will provide a buffer against local impacts of climate change and provide areas for populations to adapt to ongoing climate change. Increasing available habitat will also provide additional areas for releasing captive-bred masked bobwhites in order to increase metapopulation development and support.

The USFWS uses a recovery concept based on the conservation biology principles of resiliency, redundancy, and representation ("3Rs") to identify the conditions needed for species recovery. Briefly, the USFWS defines the 3 Rs as follows: resiliency describes the ability of the species to withstand stochasticity; redundancy describes the ability of the species to withstand catastrophic events; and representation describes the ability of the species to adapt over time to long-term changes in the environment. Shaffer and Stein (2000) defines the 3Rs as follows: Resiliency encompasses population-specific attributes that increase long-term persistence in the fact of disturbance and can also address related issues regarding threats abatement and recovery of ecologically effective populations. Redundancy requires establishing multiple populations in each ecological setting to spread extinction risk and to increase species viability. Representation requires the protection of populations across the full range of ecological settings of a species range, meeting the ESA's geographic representation mandate. (Shaffer and Stein 2000). Below we justify the masked bobwhite delisting criteria in the context of the 3Rs and threats, which when combined with the explanations above, provide support for the delisting criteria.

Resiliency is met by increasing the number of masked bobwhite associate with each of the four populations such that masked bobwhite population numbers and productivity throughout its historical range are able to withstand effects associated with disturbances such as variations in rainfall, extreme temperature gradients, (environmental stochasticity), and random fluctuations in

population (demographic stochasticity). The increase in numbers above those needed to downlist the masked bobwhite will provide greater resiliency within the overall masked bobwhite population.

Redundancy is met by increasing the number of masked bobwhites in each of the four populations established under the downlisting criteria. These four population are anticipated to be distributed across the masked bobwhite's historical range in both the United States and Mexico. Because these populations are geographically independent, populations are less likely to be simultaneously affected by catastrophic events (e.g., a wildfire, hurricane, etc.). Increased size of each of these four populations enhances the redundancy of the overall masked bobwhite population. Therefore, the species is more likely to withstand these types of events.

Representation is met by maintaining diversity within the populations of masked bobwhite that occur within the historical range. Such a distribution allows for increased genetic diversity, but perhaps even more importantly, allows for masked bobwhite to exist across a diverse range of environmental conditions. This allows the overall population of masked bobwhite to adapt to changing conditions and provide for diverse metapopulation support that enhances the viability of the overall masked bobwhite population.

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