Pacific and Central Flyways Management Plan for the

Interior Band-tailed Pigeon

Cover photograph: Band-tailed pigeon by Todd A. Sanders ©

This management plan is one of a series of cooperatively developed plans for managing the various species of migratory birds of the Pacific and Central flyways. Inquiries about this plan may be directed to member states of the Pacific Flyway Council, the Central Flyway Council, or to the Pacific Flyway Representative, U.S. Fish and Wildlife Service, 1211 SE Cardinal Court, suite 100, Vancouver, Washington 98683, or to the Central Flyway Representative, U.S. Fish and Wildlife Service, 755 Parfet Street, Suite 235, Lakewood, Colorado 80215.

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MANAGEMENT PLAN

FOR THE

INTERIOR BAND-TAILED PIGEON

Prepared for the

Pacific Flyway Council
Central Flyway Council
U.S. Fish and Wildlife Service
Direccion General de Conservacion Ecologica de Recursos Naturales

by the

Interior Band-tailed Pigeon Subcommittee
of the
Pacific Flyway Study Committee

and the
Band-tailed Pigeon Subcommittee
of the
Central Flyway Webless Migratory Game Bird Technical Committee

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Approved by: _____ _____
Chairperson, Pacific Flyway Council Date

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INTRODUCTION

Band-tailed pigeons (*Patagioenas fasciata*) occupy suitable forest and woodland habitats in western North America, Central America, and northern South America (Goodwin 1983). Eight races of this species are recognized; however, only two exist north of Mexico (Keppie and Braun 2000). The Pacific Coast band-tailed pigeon (*P. f. monilis*, hereafter Pacific Coast pigeons) occurs primarily along the Pacific coast in British Columbia, Washington, Oregon, and California whereas the Interior band-tailed pigeon (*P. f. fasciata*, hereafter Interior pigeons) occurs primarily in the Rocky Mountains south of Wyoming (Keppie and Braun 2000). The two subspecies are geographically separated and managed as two populations with separate management plans, but some interchange occurs between the two populations (Schroeder and Braun 1993, Seamans and Braun 2016). Most of these birds are migratory, but in southern portions of both populations some band-tailed pigeons may be non-migratory (D. P. Collins, unpublished data). There is great disparity in abundance between the two populations. Braun (1994) approximated from harvest reports and band recovery rates that the Interior population north of Mexico was <250,000 birds and the Pacific Coast population was between 2.9 and 7.1 million birds.

Management of Interior pigeons is especially challenging. Reliable estimates of population size, in either absolute or relative numbers, have been unattainable because of the difficulty in locating and observing pigeons. Band-tailed pigeons inhabit forested habitats, much of it in largely inaccessible mountainous terrain. Even in accessible areas, forest canopies prevent adequate visual contact with these birds. Band-tailed pigeons are generally sparsely scattered and they can be highly mobile. Although data indicate that band-tailed pigeons have high survival capacity, their reproductive potential is low within the range exhibited by game birds (Keppie and Braun 2000). Any especially high mortality resulting from disease, hunting, and other factors could have long-lasting effects on the population. Because of the delicate relationship between mortality and reproduction, and the difficulty in assessing population size, special consideration must be given this species by wildlife agencies charged with their management (see Management Concerns section; page 12).

Interior pigeons are managed cooperatively by the U.S. Fish and Wildlife Service (USFWS) and state wildlife agencies through the Pacific and Central Flyway Councils. The purpose of this management plan is to provide guidelines for cooperative management of Interior pigeons in the United States. The plan provides a synopsis of life history and ecological information, and identifies information needs, management actions, and agency responsibilities necessary to effectively manage this subspecies.

GOAL AND OBJECTIVES

The goal is to maintain a sustainable population, meet the needs for consumptive and non-consumptive uses, and minimize depredation and nuisance concerns.

Objectives:

A. Maximize the potential for sustained consumptive and nonconsumptive uses.
    1. Develop abundance monitoring methods.
    2. Update and refine the subspecies range.
    3. Obtain annual age-ratio estimates.
    4. Determine age-specific recruitment rates.
    5. Determine impacts of non-hunting mortality factors.
    6. Develop a formal harvest management strategy.
    7. Obtain annual estimates of hunter participation and harvest.
    8. Evaluate the effect of early-season harvest on population dynamics.
B. Increase habitat quality and quantity.
    1. Identify distribution, types, and use of habitats in the United States.
    2. Identify distribution, types, and use of habitats in Mexico.
    3. Investigate food and nest site availability and the effects of land-use practices.

STATUS

Description

Band-tailed pigeons are about the size of a domestic pigeon and appear bluish gray overall. Inspection of adults reveals brilliant colors including: black wing tips; straw-yellow legs and feet; straw-yellow bill tipped in black; purplish-brown head and breast; coral-red eye ring; a white crescent atop an iridescent, bronze-green nape; and a long square-ended tail with a distinct pale-gray band bordered above by a narrower black band. Males are larger and have more purple or pinkish coloration than the brownish-colored females (Keppie and Braun 2000). Males average 36 cm in length and females average 34 cm (Ridgway 1916). Braun (1994) reported that Interior pigeons are somewhat smaller and have lower adult body mass (rarely >400 g) than Pacific Coast pigeons (adults usually >400 g). Immature band-tailed pigeons are gray with pale-gray feet and bills, no neck crescent, and have buffy-edged wing coverts and primaries (Keppie and Braun 2000).

Distribution

Interior pigeons breed from northern Colorado and east-central Utah south through Arizona, New Mexico, and extreme west Texas into the Sierra Madre Occidental of Mexico; and winter primarily from northern Mexico south to at least Michoacán (Braun et al. 1975, American Ornithologists' Union 1983). However, some pigeons winter in New Mexico (Collins et al. in review), and likely also Arizona and Texas. Interior pigeons migrating in winter to southern portions of the range mingle with resident birds of the same species (Keppie and Braun 2000).

Habitat

Braun (1994) described the habitat of Interior pigeons.

> Band-tailed pigeons inhabit coniferous forests, especially pine-oak (*Pinus-Quercus*) woodlands (Neff 1947, Marshall 1957, Braun 1973, Braun et al. 1975, Pederson and Nish 1975). They nest in mountainous terrain with highest densities occurring at elevations of 1,600 to 2,700 m that are dominated by ponderosa pine (*P. ponderosa*) and varieties of oak, but also occur into lodgepole pine (*P. contorta*) and spruce-fir (*Picea-Pseudotsuga-Abies*) forests at higher elevations. Nesting occurs in all habitat types, and foraging frequently extends to cultivated fields, stream courses, and livestock feeding areas (Braun et al. 1975, Braun 1976, Kautz 1977). During migration stopovers, habitats similar to those used for foraging in summer and fall (especially areas where acorns are abundant) are commonly used. Band-tailed pigeons winter in Mexico, primarily in oak-pine woodlands and montane conifer forests along the Sierra Madre Occidental, but descend at times into the subtropical Sinaloan deciduous forest (Braun et al. 1975).

Coxen et al. (2017) developed distribution models for Interior pigeons in New Mexico using satellite tracking data from marked individuals and occurrence records from eBird. These models indicated selection for riparian habitats (i.e., close to water), elevations between 2,000 and 3,200 m, moderate slopes, and ≥ 60% tree canopy cover, in forested, shrubland, and grassland cover types.

The availability of an ample food supply greatly influences the movements, range, distribution, and initiation and duration of nesting of band-tailed pigeons (Neff 1947, Gutiérrez et al. 1975, Jarvis and Passmore 1992). Diets are highly variable and depend on availability of locally abundant food items (Neff 1947). Most flowering and fruiting shrubs and trees within the range of the birds are used as a food source at some time (Neff 1947). Most important are buds, flowers, and fruits of a variety of deciduous trees and shrubs including oak (*Quercus*), piñon (*Pinus*), madrone (*Arbutus*), manzanita (*Arctostaphylos*), elder (*Sambucus*), cherry (*Prunus*), huckleberry (*Vaccinium)*, and *Rubus* (Neff 1947, Braun 1994). Acorns and pine nuts may be the most important natural food items, and the availability of these nuts determines the distribution of band-tailed pigeons, especially during winter (Neff 1947).

Natural foods are preferred, but band-tailed pigeons readily exploit waste or stored grains and even bird feeders (Braun 1994). Braun (1973) speculated that the abundance of band-tailed pigeons in Colorado was dependent upon distribution of grain fields in mountainous areas. Braun (1994) reported that corn seemed to be the most preferred grain, possibly because of the size of the kernels, but field peas and wheat also are readily consumed. Barley and oats are used but to a lesser extent (Braun 1994). Band-tailed pigeons tend to select and specialize on single food items of local abundance (Jarvis and Passmore 1992, Braun 1994).

Band-tailed pigeons generally nest in conifers within closed-canopy forests (Leonard 1998). The tree or shrub type and age selected for nest placement, however, vary greatly throughout the species range (Neff 1947, Glover 1953, MacGregor and Smith 1955, Peeters 1962, Curtis and Braun 1983a, Leonard 1998). Band-tailed pigeons use free water, especially in conjunction with obtaining minerals (Keppie and Braun 2000, Sanders and Jarvis 2000, Sanders and Koch 2017). The need for water appears to be greatest when feeding on grains and acorns and least when feeding on succulent berries (Braun 1994, Sanders 2012).

Band-tailed pigeons use "mineral sites" of natural and artificial sources, which are mineralized deposits or, more typically, mineralized water (Sanders and Jarvis 2000, Sanders and Koch 2017). Used mineral sites are characterized by an abundance of adjacent perching sites. Sanders and Jarvis (2000) hypothesized that band-tailed pigeons in western Oregon seek a sodium source to supplement their diet during the nesting season because of insufficient sodium intake and inefficient sodium retention associated with a berry diet. Use of mineral sites by Interior pigeons is known to occur, but much less than in the Pacific Coast Population (Braun 1994, Keppie and Braun 2000). Interior pigeons may use mineral sites to a lesser extent because their mineral requirements are met by the availability of mineral-laden grit (Braun 1994) or through their diet, but data do not support either of these hypotheses (T. A. Sanders, unpublished data).

Life History

Band-tailed pigeons migrate north from winter-use areas beginning in March-early April, and are assumed to complete spring migration by early June (Keppie and Braun 2000). Early arrivals are observed primarily where non-natural food sources are abundant (e.g., livestock feeding areas, grain fields, suburban bird feeders). Fall migration begins in mid-August and continues through October, but may vary with breeding activities and food availability (Keppie and Braun 2000, Sanders and Koch 2017, D. P. Collins, unpublished data).

Band-tailed pigeons make coo vocalizations throughout the year, but cooing is most frequent during the breeding season and especially from June to early August (Sisson 1968, Keppie et al. 1970, Sanders 1999). Cooing peaks 10 minutes after sunrise during the breeding season, but is common from about –10 to 240 minutes after sunrise and from 210 to 45 minutes before sunset (Keppie et al. 1970, Sanders 1999). Coo vocalizations are usually restricted to adult males; however, adult females are capable of cooing (Sisson 1968). Sanders (1999) reported that band-tailed pigeon coo-calls lasted about 8–9 seconds and had a maximum intensity frequency range of 200–500 Hz. Coo-call audibility ranged from 150 m in dense forest to >1,100 m in open forest, but was judged to average 300–400 m in most forest environments of the Oregon Coast Range. The acoustic characteristics of the coo-call appear well suited for long-range communication and correspond to the well-dispersed distribution of band-tailed pigeons during the nesting season (Sanders 1999).

Band-tailed pigeons are monogamous, but the length of pair bonds is unknown. Band-tailed pigeons are well-dispersed, solitary nesters (Leonard 1998, Sanders 1999). Nests are loosely constructed twig platforms. North of Mexico, nests are initiated from early May through August (Braun 1994, Sanders and Braun 2013). Nests almost invariably contain 1 egg, but clutches of 2 have been reported, and 2 to 3 nestings may be attempted annually depending on food availability (Neff 1947, Braun 1994, Leonard 1998). The incubation period is 19 to 20 days and is shared by both pair members. Females attend nests until mid-morning and males attend nests from mid-morning until mid-afternoon (Braun 1994). Both sexes feed the nestling for 20 to 28 days until the young fledges. Both adults regurgitate crop milk, a curd-like substance, to feed their young for about 1 week after hatching and then in decreasing amounts mixed with other food items until fledging (March and Sadleir 1975, Griminger 1983). Females are able to initiate a second clutch about 1 week before the initial young has fledged (Leonard 1998).

Use

Sport hunting

The Migratory Bird Treaty of 1916 and subsequent passage of the Migratory Bird Treaty Act in 1918 ended market hunting of migratory birds, provided the basis for Federal government-regulated sport hunting, and prohibited hunting of some birds including the band-tailed pigeon (Neff 1947). Because of the growing number of crop depredation complaints, the Secretary of Agriculture issued an order in 1924 that allowed permits to be granted for the taking of band-tailed pigeons depredating agricultural crops in California (Neff 1947). The order was amended in 1930 to include Arizona and Washington. Complaints of crop depredation continued to increase and the demand for permits grew until it was apparent that an open hunting season would be preferred (Neff 1947). Federal regulations have permitted regulated hunting of Interior pigeons throughout their range in the United States, in whole or in part, from 1932 to 1950, following a 20-year moratorium, and since 1968 (Appendix A, Fig. 2).

Arizona and New Mexico had a hunting season from 1932 through 1950 that allowed a daily bag of 10 birds, with the exception of an 8-bird bag in 1950. The seasons were 15 days before increasing to 30 days in 1943. Through 1950, there was no hunting season in Colorado except in 12 southwestern counties in 1944 and 1945 (Neff 1947, 1951). The hunting seasons were 30 days and allowed a daily bag of 10 birds. Utah did not have a hunting season until 1970 because band-tailed pigeons are so sparsely distributed within the state. Hunting seasons for Interior

pigeons were closed in all states beginning in 1951 based on the suspected decline in pigeon abundance (Neff 1952) and life history information published by Neff (1947). Hunting seasons for Interior pigeons remained closed from 1951 through 1967.

An experimental hunting season for band-tailed pigeons was initiated in Arizona and New Mexico in 1968, and Colorado and Utah in 1970. Hunting seasons have continued without the experimental label since 1973. The daily bag limit remained at 5 birds until 2015 with the exception of Arizona, which reduced the bag to 3 and 4 birds in 1998 and 1999, respectively. Season lengths were 9 days before increasing to 23 in 1971 and 30 in 1973, except that New Mexico went to a 20-day hunting season in each of 2 zones in 1974. Arizona decreased hunting season lengths to 10 days in 1992 and 8 days in 1998 due to a suspected decline in the population size. Beginning in 2015, a 9-day season and 2-bird daily limit was implemented in all states with seasons for this subspecies.

State wildlife agencies in Arizona, Colorado, New Mexico, and Utah, in whole or in part, have obtained annual estimates of band-tailed pigeon hunter participation and harvest during 1968–1999 (32 years) using standardized surveys allowing evaluation of relative change over the time series (Appendices B–G). Between 1970 and 1996, total band-tailed pigeon harvest in the four states decreased 86.7% from a peak of 5,995 in 1975 to a low of 789 in 1996 (where estimates are reported for all 4 states; Appendix C). Results from regression analyses indicated long-term (1968–1999) decreases in total harvest ranging from 3.3 to 83.2 birds per year ($P \leq 0.032$) in the four states (excluding Utah's abnormally high estimate in 1977) (Appendix H). In the short-term (1988–1999), total harvest decreased in Arizona by 86.4 birds per year ($P = 0.033$), but there was no trend in harvest indicated for Colorado, New Mexico, or Utah ($P \geq 0.216$) (Appendix I).

Decreasing harvest between 1970 and 1996 has resulted, in part, from the decreasing number of hunters afield and the total number of days that sportsmen hunted (Appendices C–G). The total number of hunters in the four states decreased 72.1% from a peak of 1,953 in 1975 to a low of 551 in 1993 (where estimates are reported for all 4 states). The total number of days that sportsmen hunted band-tailed pigeons between 1970 and 1996 in Arizona, Colorado, and Utah decreased 65.7% from a peak of 2,957 in 1974 to a low of 1,015 in 1993.

Between 1970 and 1996, the mean number of band-tailed pigeons harvested per hunter day in Arizona, Colorado, and Utah decreased 80.0% from a peak of 5.5 in 1970 to a low of 1.1 in 1993. Results from regression analyses indicated long-term (1968–1999) decreases in the mean number of band-tailed pigeons harvested per hunter day by 0.02 to 0.04 birds per year ($P \leq 0.091$) in Arizona, Colorado, and Utah (excluding Colorado's abnormally high estimate in 1995) (Appendix H). The mean number of band-tailed pigeons harvested annually per hunting day in New Mexico is unknown. In the short-term (1988–1999), Arizona, Colorado, and Utah failed to demonstrate a trend in either direction ($P \geq 0.113$) (Appendix I). The reason that fewer sportsmen hunted band-tailed pigeons annually between 1968 and 1999, and that those that hunted had less success is unknown, but may be related to population size.

All states were required to register band-tailed pigeon hunters with the U.S. Fish and Wildlife Service's Migratory Bird Harvest Information Program (HIP) starting in 1998 (Appendix B).

There was a gap in data collection in transition to the HIP survey and HIP results are not comparable to early State survey methods

Other uses

Band-tailed pigeons readily use backyard feeders and water sources making them popular with bird watchers and photographers. They are valued by society for a multitude of reasons including; esthetic, ecological, educational, scientific as well as adding to the biological diversity of the landscape.

Past Management and Research

Although band-tailed pigeons became legal game in 1932, little was known about numbers, distribution, and population biology of this species. The USFWS conducted the first investigation of band-tailed pigeon abundance in Colorado in 1944 (Merovka 1944), which was little more than a tally of counts made by a corps of observers. In August 1945, Neff initiated a basic study of the habits of this species where the first 2 reported nests in Colorado were found (Neff and Culbreath 1947). Neff (1947) published the life history and naturalistic observations of band-tailed pigeons north of Mexico. A more comprehensive inventory of band-tailed pigeon abundance was conducted in Colorado in 1946 and 1947 (Neff and Culbreath 1947, Kinghorn and Neff 1948). These surveys were the first attempt at inventorying an area as large as a state. An inventory similar to Colorado's in 1946 and 1947 was conducted in Arizona, Colorado, and New Mexico annually from 1951 to 1956 forming the first cooperative study of Interior band-tailed pigeons (Neff 1951, 1952; Branch of Game Management 1954, 1955, 1956, 1957).

In 1967, the Four Corners Cooperative Band-tailed Pigeon Technical Committee (FCPC) was formed to coordinate research and management activities on Interior pigeons (Braun et al. 1975). The committee consisted of one person responsible for directing pigeon research activities from each of the 4 primary states in the range of the subspecies. Research was initiated in Arizona in 1967, New Mexico in 1968, and Colorado and Utah in 1969 (Braun et al. 1975). Experimental hunting seasons, necessary to facilitate research efforts, were requested and approved in Arizona and New Mexico in 1968 and Colorado and Utah in 1970 (Braun et al. 1975). During the experimental seasons, each band-tailed pigeon hunter was required by the USFWS to have a band-tailed pigeon hunting permit issued by the respective state. This requirement enabled a mailing list to be compiled of all hunters for the distribution of questionnaires pertaining to hunter activity and harvest. The FCPC collected information on the distribution, habitats, migration chronology and patterns, survival, hunting pressure, harvest, hunter success, crippling loss, and age composition of the harvest during experimental seasons from 1968 to 1972, and recommended continuation of hunting seasons without the experimental label beginning in 1973 (Braun et al. 1975).

The FCPC reported research results from June 1967 through October 1972 in Braun et al. (1975). A total of 25,730 band-tailed pigeons was banded, 2,878 of which were young-of-the-year (juvenile). Two major southward migration routes in the United States were identified: one from south-central Colorado southwest across New Mexico to extreme southwestern New Mexico and southeastern Arizona; the other southwest from central and western Colorado to east-central Arizona, where a route from Utah converged, then south along the New Mexico and Arizona boundary. The direct recovery rate was 1.5% for adults and 2.2% for juveniles. Thus,

depending on actual reporting rates, hunting mortality appears to be low. Mean annual harvest rates were lowest in New Mexico (1.3%) and Colorado (1.6%) and highest in Utah (2.9%) and Arizona (2.4%). Mean annual survival rate was 63.9% for adults and 58.3% for juveniles. An estimated 29% of the harvest occurred in Mexico.

Interior pigeon research has been conducted on parasites and diseases (, Olsen and Braun 1980, Stabler and Stromberg 1981, Justice-Allen and Knox 2014), contaminants (Braun et al. 1977), counting methods (Curtis and Braun 1983b), description of nest sites (Curtis and Braun 1983a, Hughes 2007, Blackman et al. 2013), reproductive biology (Gutiérrez et al. 1975), age and sex characteristics (White and Braun 1978), movement and philopatry (Schroeder and Braun 1993), distribution (Coxen et al. 2017), and survival rates (Kautz and Braun 1981, Seamans and Braun 2016). Little information exists on population status, except that four state wildlife agencies have collected information on band-tailed pigeon hunter participation and harvest (see Sport Hunting section; Appendix B).

In 1992, biologists and other field personnel from state agencies and the USFWS voiced concern over the unknown status of Interior pigeons. This concern prompted the formation of the Four Corners Band-tailed Pigeon Subcommittee within the Pacific Flyway Council's Western Migratory Upland Game Bird Technical Committee. The subcommittee's purpose was to evaluate population status, to prepare a management plan, and to collaborate and cooperatively manage Interior pigeons.

By directive of the USFWS, each band-tailed pigeon hunter in Arizona, Colorado, New Mexico, and Utah was required to have a band-tailed pigeon hunting permit issued by the respective state beginning in 1993. A sample of permit holders were mailed 10 postage-paid envelopes for collecting wings as part of the USFWS's Cooperative Migratory Bird Parts Collection Survey. Wings were used to annually estimate age composition of the harvest (Appendix J and K). The hunter was instructed to remove one wing from each band-tailed pigeon harvested for each day successful, enclose all wings from those harvested that day in one of the envelopes provided, and mail the pre-addressed envelope. Beginning in 1998, the USFWS required band-tailed pigeon hunters to register with the Migratory Game Bird Harvest Information Program (HIP) in place of the permit.

Population Demographics

Population size

Little is known about the demographics and status of Interior pigeons, and especially the fundamental parameter of population size. Size of the population is unknown because pigeon habits, visibility, and inaccessibility are such that comprehensive counts of individual birds are impractical. The difficulty in locating and observing individuals has also resulted in unreliable estimates of absolute and relative abundance (Casazza et al. 2000). Information on abundance has, however, been obtained by 3 methods: 1) an extensive corps of observers who watched for and recorded counts of band-tailed pigeons when they were found (typically in late summer when the birds concentrated at favored feeding areas), 2) mark-recapture studies, and 3) The North American Breeding Bird Survey (BBS), which provides the only current data on abundance.

The USFWS investigated the abundance of band-tailed pigeons in Colorado in 1944 in response to the Colorado Game and Fish Commission's request for a hunting season on this species (Merovka 1944). Investigators relied on observations of band-tailed pigeons made by personnel from state and federal natural resource agencies and other qualified individuals. Reviewing records as far back as 1928, Merovka (1944) concluded that: (1) the population in Colorado was similar to that in Arizona and New Mexico, (2) the population has shown no substantial increase or decrease in recent years, and (3) he was unable to obtain any evidence that these birds were ever numerous in these states.

A more comprehensive inventory of band-tailed pigeons was conducted in Colorado in 1946 and 1947 (Neff and Culbreath 1947, Kinghorn and Neff 1948). Personnel from state and federal natural resource agencies and other qualified individuals documented the location and number of band-tailed pigeons inhabiting Colorado. A similar inventory was conducted cooperatively in Arizona, Colorado, and New Mexico annually from 1951 to 1956 (Neff 1951, 1952; Branch of Game Management 1954, 1955, 1956, 1957). Utah was included in the inventory in 1953. Counts of band-tailed pigeons from these inventories indicated that the population size probably decreased between 1946 and 1956 (Appendix L), with pigeons being widely distributed and occurring at low densities except when gathered at preferred feeding areas.

The fall population size in Colorado was estimated at 70,000 band-tailed pigeons in 1972 based on recapture rates of banded birds (Braun 1994). Seamans and Braun (2016) used harvest rate and total harvest data to estimate a mean annual (September 1) abundance of band-tailed pigeons in Colorado during 1970–1974 of 59,911–88,290 pigeons. Braun (1994) speculated that population size of Interior pigeons north of Mexico was <250,000 birds.

An index to breeding population size is obtained annually from BBS surveys (Peterjohn and Sauer 1993, 1994). Since 1968, a total of 7 to 36 BBS routes have been surveyed annually in Arizona, Colorado, New Mexico, and Utah where band-tailed pigeons were detected. The BBS provides evidence that abundance of Interior pigeons decreased 4.5% per year (95% Credible Interval = –8.5 to –1.4) over the long term (1968–2016). The BBS provides no evidence of trends in abundance during the most recent 10- and 5-year periods, but sample sizes are low, variances are high, few pigeons are currently detected along routes, and coverage of pigeon habitat by BBS routes is poor. Assuming a total population size of 250,000 pigeons in 1970 and given the 1968 to 2016 trend (–4.5% annually, 95% Credible Interval –8.5 to –1.4) from the BBS data, the 2017 projected population size is 27,422 pigeons (95% Credible Interval of 3,706 to 127,067). The Partners in Flight Landbird Population Estimates Database provides an annual population estimate for Interior pigeons of 102,000 birds during 1998–2007 (AZ = 30,000, CO = 11,000, NM = 60,000, UT = 1,100). However, the Partners in Flight approach to abundance estimation is questionable in that BBS data was designed to estimate relative abundance (trends) and not absolute abundance. Consequently, use of the BBS trend data to derive a population estimate from some reference point as presented above is a preferred approach and more consistent with the intended uses of BBS data (John Sauer, USGS, personal communication).

Assessments of hunter participation and harvest data indicate Interior pigeons may have declined since initiation of the experimental hunting seasons in 1968. Results from regression analyses indicated long-term (1968–1999) decreases in the total number of hunters afield annually and the

mean number of band-tailed pigeons harvested per hunter day (see "Sport hunting" section). These phenomena may be a result of hunters encountering fewer birds or hunters being denied access to areas of high pigeon density. Since most band-tailed pigeon hunting occurs on public lands, except in Colorado, access likely has not changed over this time period. Thus, declining success per hunter day and declining interest in band-tailed pigeon hunting may indicate that fewer birds are available for harvest. Harvest estimates were found to be significantly and positively correlated with relative abundance of Pacific coast pigeons (Western Migratory Upland Game Bird Technical Committee 1994).

The band-tailed pigeon population, at least in Colorado, may have been especially large during the late 1960s to early 1970s because of increased availability of food associated with grain crops. Szymczak and Funk (1993) reported the distribution, and perhaps the abundance, of band-tailed pigeons in Colorado has changed considerably since the early 1970's. Many of the band-tailed pigeon feeding and trapping sites described by Braun (1976) during 1969 to 1975 were associated with grain crops of spring and winter wheat, barley, oats, corn, and sorghum. In 1993, Szymczak and Funk (1993) revisited those sites used by Braun (1976) and reported that band-tailed pigeons were found at only 40.5% (17 of 42) of the sites. They also reported that substantial acreage of grain was planted to winter wheat, oats, and corn in 1970, but by 1987 had declined to about one-half of 1970 levels. No grain was reported planted from 1989 to 1991 in Huerfano County where 2,204 band-tailed pigeons were banded in or near grain fields from 1969 to 1975 (Braun 1976).

Survival, age structure, age ratio, and recruitment

Kautz and Braun (1981) reported mean annual survival rates of 73% (95% Confidence Interval = 65–80%) for adult and 66% (95% Confidence Interval = 45–88%) for juvenile band-tailed pigeons in Colorado. The percentage of males and females in the Interior pigeon population was 53.3 and 46.7 (male:female, 1:0.88) determined from 21,292 band-tailed pigeons trapped and sexed from 1967 to 1972 in the southern Rocky Mountain region (Braun et al. 1975). Analysis of Colorado bandings using updated statistical methods resulted in survival estimates of 63.3% (SE = 3.1%) for juveniles and 71.9% (SE =1.6%) for adults (Seamans and Braun 2016).

Of 25,730 pigeons trapped and aged in the southern Rocky Mountain region, 88.8% (22,852) were classified as adults and 11.2% (2,878) were classified as young-of-the-year (juveniles; Braun et al. 1975). The average proportion of juveniles in the harvest was 23% per year (range 18–32%) from 1968 to 1972 based on 11,723 individual wings collected from hunters (55.7% of the retrieved harvest) in four states. The greater proportion of juveniles in the harvest than in trap samples was most likely a result of juveniles being more vulnerable than adults to hunter harvest (Braun et al. 1975, Kautz and Braun 1981). The USFWS's Migratory Bird Parts Collection Survey indicates a mean of 27.6% juveniles in the annual harvest from 1994 to 2016 (Appendix J).

Annual recruitment into the population is unknown. Jarvis and Passmore (1992) estimated that second year band-tailed pigeons were about one-third as productive as adults. Leonard (1998) reported a nest survival probability of 0.689 (95% CI = 0.613–0.775) for band-tailed pigeons in western Oregon.

Potential Take Level Assessment

In 2015, the USFWS and a work group of state biologists and band-tailed pigeon experts conducted an assessment of the harvest potential of Interior Population band-tailed pigeons using the Potential Take Level (PTL) approach of Runge et al. (2009), and compared the harvest potential estimate with observed harvest levels. The estimated intrinsic growth rate at low population density (i.e., relatively high demographic rates) under current environmental conditions indicated there is no harvestable surplus for this population. Therefore, current harvest levels exceed estimated allowable harvest given our current best estimates of population size and observed harvest. The assessment assumed a management objective of maximum sustained yield (i.e., F =1). The band-tailed working group agreed to a management objective of 75% of MSY (i.e., F=0.75), which would make the assessment of allowable harvest more conservative. Therefore, if the flyways and USFWS agree to use this approach to develop a formal harvest strategy for interior pigeons, this objective should be explicitly incorporated into the assessment. We caution that these estimates are based on limited demographic information that may not adequately represent current conditions. Also, current population size is largely unknown, and estimated current hunter harvest is highly imprecise and may be biased high relative to the true value. Nonetheless, this assessment is based on the best available information and suggests that a conservative approach to harvest management for this population may be warranted. Jarvis and Passmore (1992) similarly reported low harvest potential for this species. They developed population models for Pacific Coast pigeons and concluded that given data available for reproductive parameters, survival rates were not adequate to maintain current population size (restrictive 9-day season and 2-bird daily bag regulations have been in place since that time). Further, they suggested that survival rates would have to be 0.679 for juvenile and 0.829 for adults to attain a stable population, which are higher than the best estimates used in our assessment (0.6 and 0.75, respectively).

The goal of the Interior pigeon harvest assessment was to incorporate uncertainty in our understanding of demographic parameters (i.e., survival and reproduction) into an estimate of harvest potential. The results of this process provided an estimate of harvest potential and its associated uncertainty, but also strength of evidence whether current harvest is over or under the harvest potential associated with the management objective. The end result is not a recommendation for harvest levels or regulations, but information (considering uncertainty) to help inform the regulatory decision-making process for this population. One of the key lessons from this exercise was confirmation of the low harvest potential of Interior pigeons and the lack of reliable data on which to base assessment and management decisions, particularly with regard to current harvest levels. Contemporary estimates for demographic parameters also would help inform reliability of the results.

The USFWS Branch of Harvest Surveys conducted an analysis to estimate the expected proportional decrease in harvest associated with reductions in the daily bag limit. This assessment did not include the effect of season length on harvest, but adjustment to season length also could be a consideration for reducing harvest. The average estimated proportional decrease in harvest going from a daily bag limit of 5 to 4 was 0.072, from 5 to 3 was 0.172, from 5 to 2 was 0.323, and from 5 to 1 was 0.584.

The Pacific and Central flyway councils reviewed the results from the PTL assessment and bag reduction analysis and subsequently recommended reductions in the federal frameworks for season length (from 30 to 14 days) and daily bag limit (from 5 to 2). The USFWS approved these recommendations and implemented the changes in federal frameworks beginning with the 2015 hunting season.

MANAGEMENT CONCERNS

Challenges associated with the effective management of Interior pigeons result from the lack of information on demographics, population status, effects of harvest and habitat alteration on population dynamics, habitats necessary to support stable populations, and inadequate funding for research and management (Braun 1994, Case and Associates 2011).

A. Population Status

1. The single greatest problem is the lack of information on absolute or relative abundance of Interior pigeons. Presently, there is no inventory technique demonstrated to be effective in estimating population size or monitoring population trends.

   Counts of band-tailed pigeons at mineral sites have proven effective in assessing short-term changes in breeding population size of Pacific Coast pigeons (Casazza et al. 2000). This same technique cannot effectively be applied to Interior pigeons, however, because these birds do not use or depend on mineral sites to the extent of coastal band-tailed pigeons (Braun 1994, Keppie and Braun 2000, Sanders and Jarvis 2000, Sanders and Koch 2017). Other techniques developed to monitor abundance of Pacific Coast pigeons, such as coo counts at points (Sanders 1999, Sanders and Jarvis 2003) and along transects (McCaughran and Jeffrey 1989), are likely of limited value in monitoring abundance of Interior pigeons because of low population densities and the probable low number of birds per sample. The BBS survey is unreliable in detecting changes in band-tailed pigeon abundance over time because sample sizes are low, variances are high, pigeon detections per route are low, and coverage of pigeon habitat by BBS routes is poor.

   The point count technique developed by Sanders (1999) for indexing abundance of Pacific coast band-tailed pigeons in combination with distance sampling techniques (Buckland et al. 1993) may have the best chance of success and should be tested experimentally (D. Anderson, Colorado State University, personal communication). Band-tailed pigeons are easily attracted to bait sites (Braun 1976). Counts at permanent bait sites were tested experimentally by Curtis (1981) and recommended for large-scale application by Curtis and Braun (1983). There is no evidence, however, that the number of pigeons at these sites is an accurate index of abundance, especially given confounding variables such as local availability of other native and exotic foods and the direct relationship between the amount of food at bait sites and visiting pigeons (Curtis 1981). Capture-recapture techniques at bait sites may also be effective in generating estimates of relative abundance (Kautz and Braun 2000), but the availability of native foods must be quantified to account for its influence on counts.

2. Information on survival rates, age and sex ratios, and recruitment are insufficient. Interior pigeons were banded during 1968 to 1972 (Braun et al. 1975, Seamans and Braun 2016). These data provided useful information on survival rates, age and sex ratios, distribution, and migration routes, but these estimates are now about 30 years old and parameters likely have changed. Age ratio information is obtained from the USFWSs Migratory Bird Parts Collection Survey, but estimates from the harvest may not represent the population because sample sizes and regional representation are inadequate.

3. Information is lacking on relative importance of non-hunting mortality factors. Band-tailed pigeons are susceptible to trichomoniasis caused by a protozoan parasite (*Trichomonas gallinae*) of the upper digestive tract (Justice-Allen and Knox 2014). In at least two instances in California, hundreds of band-tailed pigeons have perished from trichomoniasis outbreaks (Stromberg et al. 2008, Rodgers et al. 2016). Mortality due to trichomoniasis could occur at low levels in the population and go unnoticed due to the dispersed distribution of pigeons. The use of pesticides in the United States and Mexico could cause direct pigeon mortality or indirect loss through decreased production.

4. Information is lacking on the present distribution of band-tailed pigeons.

B. Harvest Statistics

1. The USFWS Migratory Bird Harvest Information Program (HIP) produces annual estimates of migratory bird hunter participation and harvest, and was fully implemented in 1998. However, HIP estimates of band-tailed pigeon hunter participation and harvest lack precision, and there is no evidence that more precise estimates will be available in the near future. Wildlife agencies in Arizona, Colorado, and Utah discontinued surveys of hunter participation and harvest in 1998 with implementation of HIP, and Arizona and Colorado discontinued band-tailed pigeon hunting permit requirements. Braun (1994) recommended that efforts be made to carefully transition from the permit survey to HIP methods of obtaining hunter participation and harvest information so these annual estimates are comparable over time to provide long-term trends.

2. Information on the relationship between hunting regulations and Interior pigeon demographics is lacking. Especially needed are data on the effect of early season harvest (before 20 September) on annual production and survival of breeding adults (Braun 1994). Sport harvest in early September may coincide with nesting (Leonard 1998), and losses of productivity may occur (Zeigler 1971, Gutiérrez et al. 1975).

C. Habitat Suitability

1. Detailed knowledge of habitats essential for increasing or maintaining abundance of Interior pigeons is largely unknown. Ensuring that adequate, high-quality habitat for band-tailed pigeons is maintained will undoubtedly have the most significant effect on maintaining and increasing population levels. Widespread destruction of foraging areas and nesting cover could lead to long-term population declines (Sanders 1999, Sanders and Jarvis 2003). Major habitat components include forested areas for nesting; suitable foraging sites, possibly mineral sites, roosting cover, and escape cover.

2. Information is lacking on the relationship of food availability to band-tailed pigeon density and productivity. There are possibilities for increasing population size of this species by planting or enhancing the production and availability of wild fruit and mast and agricultural crops for this species. The provisioning of natural and cultivated foods to band-tailed pigeons could be used to increase population size and change distribution, which may subsequently enhance opportunities for consumptive and non-consumptive uses.

   Land-use practices may reduce natural food availability and adversely affect band-tailed pigeon abundance and distribution (Sanders 1999, Sanders and Jarvis 2003). The practice of removing natural food producing trees and shrubs or use of herbicides and thinning to promote growth of conifers may reduce availability of natural foods. Livestock grazing may, over the long-term, reduce abundance of berry-producing plants in the understory.

D. Funding

1. Funding from federal, state, and private agencies and individuals is inadequate to address most research and management needs outlined in this plan. The likely reasons are that band-tailed pigeons are sparsely distributed, declines in hunter participation and success have not been brought to the attention of administrators, hunting band-tailed pigeons is not popular in comparison with other game birds such as waterfowl and doves, and options for enhancing monitoring and management programs for band-tailed pigeons are limited and costly.

MANAGEMENT STRATEGIES

The following management strategies provide a synthesis of management actions, assessment methods, and information needs that should be considered when developing a management program for Interior pigeons. These procedures should be implemented cooperatively in Arizona, Colorado, New Mexico, and Utah. Cooperative partnerships ensure that data are meaningful and comparable among states, and maximize effectiveness when making management decisions.

Objective: Maximize the potential for sustained consumptive and nonconsumptive uses.

A. Population Status

1. Population Inventory: Develop and test techniques with the greatest likelihood of success in an effort to cost effectively and reliably monitor range-wide population size.

   Priority: 1

   Responsibility: USFWS and Pacific and Central flyway councils.

   Schedule: Ongoing.

2. Population Range: Determine present population range, maintain current distribution maps, and evaluate the present range relative to the historic range.

   Priority: 1

   Responsibility: USFWS and Pacific and Central flyway councils.

   Schedule: Ongoing.

3. Age ratio: Obtain annual age-ratio estimates to assess annual production. Currently available techniques include:

   1. Trapping, and
   2. Field bag checks, strategic placement of wing barrels on public land, and USFWS Migratory Bird Parts Collection Survey.

   Every effort should be made to ensure adequate sample size (>30) and representation from each state.

   Priority: 1

   Responsibility: State wildlife agencies in Arizona, Colorado, New Mexico, and Utah in conjunction with the USFWS.

   Schedule: Ongoing.

4. Survival: Estimate survival rates through a long-term (at least 5 years) banding program or radio telemetry. A banding program will also provide age and sex ratio data.

   Priority: 1

Responsibility: USFWS and state wildlife agencies in Arizona, Colorado, New Mexico and Utah.

Schedule: Ongoing.

5. Recruitment: Determine age-specific recruitment rates.

   Priority: 1

   Responsibility: Pacific and Central flyway councils to solicit funding and research proposals.

   Schedule: No current activity.

6. Non-hunting Mortality: Determine impacts of non-hunting mortality factors including disease, predation, and pesticides on demographics.

   Priority: 2

   Responsibility: Pacific and Central flyway councils to solicit funding and research proposals.

   Schedule: No current activity.

B. Hunting

1. Regulations: Develop an adaptive harvest management strategy for establishing annual sport hunting regulations.

   Priority: 1.

   Responsibility: Pacific and Central flyway councils in conjunction with USFWS.

   Schedule: Bag limits and seasons reduced and standardized in all states

2. Hunter Participation and Harvest: Obtain annual estimates of hunter participation (hunters afield, hunter days) and harvest.

   Priority: 1

   Responsibility: Arizona, Colorado, New Mexico, and Utah in conjunction with the USFWS.

   Schedule: Ongoing.

3. Early Season Harvest: Evaluate the effect of early-season harvest (before 20 September) on harvest, population recruitment and survival of breeding adults.

   Priority: 2

   Responsibility: Pacific and Central flyway councils to solicit funding and research proposals.

   Schedule: No current activity.

Objective: Increase habitat quality and quantity.

C. Habitat Suitability

1. Habitat in the United States: Identify the distribution, types, and use of habitats used by Interior pigeons throughout their range in the United States to facilitate habitat acquisition, protection, and enhancement. Identify causes of habitat loss and degradation from all factors including, but not limited to urban and industrial development, changing agricultural and forestry land-use practices, pesticides, grazing, loss of mineral sites, and others. After identifying causes for habitat loss and degradation, develop strategies for curtailing losses and degradation in cooperation with the U.S. Forest Service, Bureau of Land Management, Indian Reservations, and other land owners or managers.

   Priority: 2

   Responsibility: USFWS and Pacific and Central flyway councils to solicit funding and research proposals.

   Schedule: Ongoing.

2. Habitat in Mexico: Identify distribution, types, and use of habitats used by Interior pigeons throughout their range in Mexico.

   Priority: 2

   Responsibility: USFWS to encourage Mexican officials to implement projects individually and cooperatively.

   Schedule: Ongoing.

3. Food and Nest-site Availability: Investigate the relationship of food and nest site availability to band-tailed pigeon distribution, density, and productivity; and the effects of land-use practices (e.g. forestry management practices) on nest densities, nest success, and recruitment.

   Priority: 2

   Responsibility: Pacific and Central flyway councils to solicit funding and research proposals.

   Schedule: No activity.

ANNUAL REVIEW

The Interior Band-tailed Pigeon Subcommittee of the Pacific Flyway Council's technical committee and the Interior Band-tailed Pigeon Subcommittee of the Central Flyway Council's technical committee shall meet annually, or as needed, to review progress in meeting the goal and objectives of this plan, and to recommend revisions. The subcommittees shall report on progress to the Pacific Flyway Council (through the Study Committee) and Central Flyway Council (through the Webless Migratory Game Bird Technical Committee), state and federal agencies, and organizations interested in cooperating in management of Interior pigeons.

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APPENDICES

APPENDIX A. Hunting seasons (S = September, O = October, N = November, D = December) and daily bag and possession limits (B/P) for Interior band-tailed pigeons.

	Arizona		Colorado		New Mexico Season			Utah	
Year	Season	B/P	Season	B/P	North[a]	South[a]	B/P	Season	B/P
1913–31	closed		closed		closed			closed	
1932	D 1–15	10/10	closed		N 1–15		10/10	closed	
1933	D 1–15	10/10	closed		N 1–15		10/10	closed	
1934	D 1–15	10/10	closed		N 1–15		10/10	closed	
1935	D 1–15	10/10	closed		N 1–15		10/10	closed	
1936	O 16–30	10/10	closed		O 1–15		10/10	closed	
1937	O 16–30	10/10	closed		O 1–15		10/10	closed	
1938	O 16–30	10/10	closed		O 1–15		10/10	closed	
1939	O 16–30	10/10	closed		O 1–15		10/10	closed	
1940	S 16–30	10/10	closed		S 16–30		10/10	closed	
1941	S 16–30	10/10	closed		S 16–30		10/10	closed	
1942	S 16–30	10/10	closed		S 16–30		10/10	closed	
1943	S 16–O 15	10/10	closed		S 16–O 15		10/10	closed	
1944	S 16–O 15	10/10	S 16–O 15[a]	10/10	S 16–O 15		10/10	closed	
1945	S 16–O 15	10/10	S 16–O 15[a]	10/10	S 16–O 15		10/10	closed	
1946	S 16–O 15	10/10	closed		S 16–O 15		10/10	closed	
1947	S 16–O 15	10/10	closed		S 16–O 15		10/10	closed	
1948	S 16–O 15	10/10	closed		S 16–O 15[b]		10/10	closed	
1949	S 16–O 15	10/10	closed		S 16–O 15[b]		10/10	closed	
1950	S 16–O 15	8/8	closed		S 16–O 15[b]		8/8	closed	
1951–67	closed		closed		closed			closed	
1968	S 28–O 6[a]	5/10	closed		S 28–O 6[c]		5/10	closed	
1969	O 11–19[a]	5/10	closed		O 11–19[c]		5/10	closed	
1970	O 17–25[a]	5/10	S 12–20[b,c]	5/10	O 17–25[c]		5/10	S 12–20[a]	5/10
1971	O 16–24[a]	5/10	S 4–26[b,c]	5/10	S 11–O 3[c]		5/10	S 4–26[a]	5/10
1972	O 14–23[a]	5/10	S 9–O 1[b,c]	5/10	S 2–24[c]		5/10	S 1–23[a]	5/10
1973	O 12–31[a]	5/10	S 8–O 7[b,d]	5/10	S 1–30[c]		5/10	S 15–30[a]	5/10
1974	O 12–31[a]	5/10	S 7–O 6[b,d]	5/10	S 1–20[c]	O 12–31[c]	5/10	S 2–30[a,b]	5/10
1975	O 11–N 9[a]	5/10	S 6–O 15[b,e]	5/10	S 6–25[c]	O 11–20[c]	5/10	S 1–30[a]	5/10
1976	O 9–N 7[a]	5/10	S 4–O 3[b,e]	5/10	S 1–20[c]	O 2–21[c]	5/10	S 1–30[a]	5/10
1977	O 12–N 10[a]	5/10	S 3–O 2[b,e]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1978	O 12–N 10[a]	5/10	S 2–O 1[b,f]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1979	O 12–N 10[a]	5/10	S 1–30[b,g]	5/10	S 1–20[c]	O 5–24[c]	5/10	S 1–30[a]	5/10
1980	O 10–N 8[a]	5/10	S 1–30[b,h]	5/10	S 6–25[c]	O 4–23[c]	5/10	S 1–30[a]	5/10
1981	O 9–N 7[a]	5/10	S 1–30[b,h]	5/10	S 1–20[c]	O 3–22[c]	5/10	S 1–30[a]	5/10
1982	O 8–N 6[a]	5/10	S 1–30[b,i]	5/10	S 1–20[c]	O 2–21[c]	5/10	S 1–30[a]	5/10
1983	O 7–N 5[b]	5/10	S 1–30[e,i]	5/10	S 1–20	O 1–20	5/10	S 1–30	5/10
1984	O 11–N 10[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 1–30	5/10
1985	O 11–N 9[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 2–30[b]	5/10
1986	O 10–N 8[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 1–30	5/10
1987	O 9–N 7[b]	5/10	S 1–30[j]	5/10	S 1–20	O 1–20	5/10	S 1–30	5/10
1988	O 7–N 5[b]	5/10	S 1–30[j]	5/10	S 1–20	O 1–20	5/10	S 1–30[a]	5/10
1989	O 13–N 11[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 1–30[a]	5/10
1990	O 12–N 10[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 1–30[a]	5/10
1991	O 11–N 9[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 2–30[a,b]	5/10
1992	O 13–22[b]	5/10	S 1–30	5/10	S 1–20	O 1–20	5/10	S 1–30[a]	5/10
1993	O 13–22[b]	5/10	S 1–30[k]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1994	O 12–21[b]	5/10	S 1–30[k]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1995	O 18–27[b]	5/10	S 1–30[k]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1996	O 16–25[b]	5/10	S 1–30[k]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 2–30[a,b]	5/10
1997	O 15–24[b]	5/10	S 1–30[k]	5/10	S 1–20[c]	O 1–20[c]	5/10	S 1–30[a]	5/10
1998	O 2–9[c]	3/6	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
1999	O 1–8[c]	4/8	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2001	S 28–O 8	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2002	S 27–O 7	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 2–30[a,b,c]	5/10

2003	S 26–O 6	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2004	S 24–O 4	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2005	S 9–O 3	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2006	S 15–O 8	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2007	S 14–O 7	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2008	S 12–O 5	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2009	S 11–O 4	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2010	S 10–O 3	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2011	S 9–O 2	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2012	S 7–30	5/10	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	5/10
2013	S 6–29	2/4	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 2–30[a,b,c]	2/6
2014	S 5–28	2/4	S 1–30[l]	5/10	S 1–20[c,d]	O 1–20[c,d]	5/10	S 1–30[a,b,c]	2/4
2015	S 1–14	2/6	S 1–14[l]	2/6	S 1–14[c,d]	O 1–14[c,d]	2/6	S 1–14[a,b,c]	2/6
2016	S 1–14	2/6	S 1–14[l,m]	2/6	S 1–14[c,d]	O 1–14[c,d]	2/6	S 1–14[a,b,c]	2/6
2017	S 1–14	2/6	S 1–14[l,m]	2/6	S 1–14[c,d]	O 1–14[c,d]	2/6	S 1–14[a,b,c]	2/6

Arizona

[a] Each band-tailed pigeon hunter must have a band-tailed pigeon hunting permit issued by the state.

[b] Each band-tailed pigeon hunter must have a properly validated special bird permit stamp issued by the state.

[c] Each band-tailed pigeon hunter must have properly registered with the Migratory Bird Harvest Information Program.

Colorado

[a] In the drainage of the North Fork of the Gunnison River in Gunnison and Delta Counties and in La Plata, Montezuma, Dolores, San Miguel, Montrose, Ouray, San Juan, Archuleta, Huerfano, and Las Animas Counties.

[b] Each band-tailed pigeon hunter must have a band-tailed pigeon hunting permit issued by the state.

[c] In all lands west of U.S. Interstate 25 from the New Mexico state line to its intersection with U.S. Highway 24 at Colorado Springs; south and west of U.S. Highway 24 to its intersection with U.S. Interstate 70 to the Utah state line.

[d] In all lands west of U.S. Interstate 25.

[e] In all lands west of U.S. Interstate 25 and Small Game Management Unit 80.

[f] In all lands west of U.S. Interstate 25 and Small Game Management Unit 80 and 82.

[g] In all lands west of U.S. Interstate 25 and lands east of U.S. Interstate 25 bounded by U.S. Highway 50, State Highway 109, U.S. Highway 160, State Highway 389 and the New Mexico state line.

[h] In all lands west of U.S. Interstate 25 and lands east of U.S. Interstate 25 south of U.S. Highway 50 and State Highway 96; west of Bent County Road 14, U.S. Highway 50, State Highway 109, U.S. Highway 160 and State Highway 389; north of Colorado-New Mexico state line.

[i] In all lands west of U.S. Interstate 25 and small game management units 80–83.

[j] In all lands west of U.S. Interstate 25 and small game management units 128, 129, 133–136, and 140–142.

[k] Each band-tailed pigeon hunter must have a band-tailed pigeon hunting permit.

[l] Each band-tailed pigeon hunter must have properly registered with the Migratory Bird Harvest Information Program.

[m] Each band-tailed pigeon hunter must purchase a hunting permit issued by the state.

New Mexico

[a] New Mexico used a zoned season beginning in 1974. The northern zone is defined as that area lying north of U.S. Highway 60 and the southern zone in that area lying south of U.S. Highway 60. The zones were redefined in 1975. The northern zone is that area lying north and east of a line following U.S. Highway 60 from the Arizona state line east to Interstate Highway 25 at Socorro and thence south along Interstate Highway 25 to the Texas state line. The southern zone is that area lying south and west of a line following U.S. Highway 60 from the Arizona state line east to Interstate Highway 25 at Socorro and thence south along Interstate Highway 25 to the Texas state line.

[b] South of U.S. Highway 60.

[c] Each band-tailed pigeon hunter must have a band-tailed pigeon hunting permit issued by the state.

[d] Each band-tailed pigeon hunter must have properly registered with the Migratory Bird Harvest Information Program.

Utah

[a] Each band-tailed pigeon hunter must have a band-tailed pigeon hunting permit issued by the state.

[b] Utah law prohibits the opening day of a hunting season to be on Sunday.

[c] Each band-tailed pigeon hunter must have properly registered with the Migratory Bird Harvest Information Program.

APPENDIX B. Methods used by state wildlife agencies to obtain estimates of Interior band-tailed pigeon hunter participation and harvest.

Permit Survey

Hunters were required to have a state-issued permit prior to hunting band-tailed pigeons in Arizona (1968–1997), Colorado (1970–1982, 1993–1997), New Mexico (1968–1982, 1992–1999), and Utah (1970–1982, 1988–1999). Permits were obtained from designated state agency offices or license vendors. This requirement enabled a mailing list to be compiled of all potential band-tailed pigeon hunters within each state. Questionnaires pertaining to hunter participation and harvest were mailed to all registered hunters following the hunting season in each state where permits were required, except for Colorado in 1981–1982 and New Mexico in 1979–1982. Permit holders were mailed a second questionnaire if they did not respond to the first questionnaire. Hunters were questioned about the number of days they hunted and pigeons harvested, both retrieved and un-retrieved. Estimates of hunter participation and harvest by permit holders that did not respond to either questionnaire were calculated from the responses of permit holders that completed and returned the questionnaire. Statewide hunter participation and harvest was calculated by combining numbers from hunter responses with projected estimates. In 1992, questionnaires were expanded to include the number and location of band-tailed pigeons seen.

Small Game Harvest Survey

Estimates of band-tailed pigeon hunter participation and harvest were obtained from state-conducted small game harvest surveys in Colorado in 1970–1977 and New Mexico in 1975–1999. Data pertaining to hunter participation and harvest were collected by mail questionnaire or telephone survey of a sample of small game license buyers. The small game surveys were designed to monitor state-wide harvest trends from year-to-year for extensively hunted species. Estimates of band-tailed pigeon hunter participation and harvest are highly imprecise, and are typically so for less popular game species. Because of the lack of precision, estimates from small game harvest surveys are not presented in this management plan.

Migratory Bird Harvest Information Program

Beginning in 1998, all states were required to register band-tailed pigeon hunters with the U.S. Fish and Wildlife Service's Migratory Bird Harvest Information Program (HIP). Hunter addresses and telephone numbers were collected for the HIP in Arizona, Colorado, and Utah via a state-operated automated telephone system and the permit system in New Mexico. Hunters in Arizona, Colorado, and Utah were required to have proof of proper registration with the HIP prior to hunting band-tailed pigeons. State-collected information on potential band-tailed pigeon hunters was forwarded to the U.S. Fish and Wildlife Service where an annual telephone survey was conducted on a sample of hunters in each state to estimate hunter participation and harvest. Arizona, Colorado, and Utah have relied on the HIP to provide estimates of hunter participation and harvest since 1998.

Current Status

Arizona: Currently Arizona is only using federal HIP.

Colorado: In 2016, Colorado instituted a new $5 permit required for band-tailed pigeon hunters. Contact information for all permit purchasers is provided to the USFWS as the sampling frame for the federal harvest survey in Colorado. Counties in eastern Colorado where band-tailed pigeons do not occur were identified, so that hunter activity and harvest (likely rock pigeon or Eurasian collared-dove) from these counties could be excluded from the band-tailed pigeon harvest survey.

New Mexico: In 2016, New Mexico began requiring band-tailed pigeon hunters to acquire a Free Band-tailed Pigeon Permit."

Utah: Currently Utah requires band-tailed pigeon hunters to obtain a free federal HIP permit and conducts a state survey of a subset of hunters.

APPENDIX C. Harvest estimates for Interior band-tailed pigeons in the U.S. Confidence intervals (CI) are expressed as the interval half-width in percent, based on USFWS surveys using state Harvest Information Program data for the sampling frame.

	Arizona		Colorado		New Mexico		Utah		Total	
Year	Harvest	CI	Harvest	CI	Harvest	CI	Harvest	CI	Harvest	CI
1968	2,085		0		500		0		2,585	
1969	2,820		0		719		0		3,539	
1970	3,545		541		859		109		4,971	
1971	782		1,723		2,027		156		4,502	
1972	453		820		2,981		211		4,374	
1973	2,419		363		1,548		18		4,353	
1974	3,063		792		1,501		95		5,451	
1975	3,469		809		1,601		116		5,995	
1976	2,800		995		1,496		119		5,410	
1977	1,473		988		2,455		435		5,351	
1978	1,439		938		1,800		264		4,378	
1979	1,102		1,096				117			
1980	2,408		1,273				182			
1981	2,082						101			
1982	2,378						113			
1983	1,931									
1984	1,139									
1985	1,534									
1986	532									
1987	1,180									
1988	1,137						101			
1989	286						24			
1990	917						7			
1991	847						31			
1992	522		195		261		73		856	
1993	543		138		189		0		825	
1994	523		134		247		51		892	
1995	237		155		274		121		1,669	
1996	151		183		326		92		789	
1997			144		317		98		762	
1998			158		128		67			
1999	500	154	700	129	283		100	69	1,300	94
2000	2,300	110	1,700	147	400	122	300	192	4,600	78
2001	400	118	600	94	600	126	300	169	2,000	62
2002	1,000	153	100	117	600	158	400	149	2,100	89
2003	1,400	126	900	97	400	65	100	132	2,900	70
2004	1,400	120	500	57	700	115	200	136	2,800	68
2005	2,200	105	100	113	300	106	100	193	2,700	86
2006	500	56	600	76	100	109	400	95	1,600	42
2007	1,000	101	900	102	2,800	113	200	195	4,800	71

2008	1,600	122	2,500	83	600	95			4,700	62
2009	2,300	76	1,400	100	1,300	79			5,000	49
2010	700	110	1,500	90	2,700	100	200	195	5,000	62
2011	1,000	93	300	101	500	125	100	142	1,800	61
2012	1,300	75	1,100	61	300	38	100	143	2,800	43
2013	900	125	<50	140	200	30	500	196	1,600	92
2014	700	83	400	96	200	67	100	172	1,500	52
2015	500	57	200	98	100	87	<50	190	800	43
2016	500	69	200	174	200	81	200	191	800	54
2017	100	72	100	64	200	68	0	0	300	46

APPENDIX D. Hunter estimates for Interior band-tailed pigeons in the U.S. Confidence intervals (CI) are expressed as the interval half-width in percent, based on USFWS surveys using state Harvest Information Program data for the sampling frame.

	Arizona		Colorado		New Mexico		Utah		Total	
	Hunters	CI	Hunters	CI	Hunters	CI	Hunters	CI	Hunters	CI
1968	851		0		278		0		1,129	
1969	968		0		218		0		1,186	
1970	1,069		182		440		34		1,725	
1971	622		344		559		54		1,579	
1972	576		298		692		61		1,627	
1973	858		212		828		25		1,880	
1974	860		288		690		74		1,910	
1975	817		213		826		54		1,953	
1976	704		219		449		54		1,539	
1977	594		243		515		70		1,532	
1978	472		192		563		78		1,427	
1979	788		220				62		754	
1980	911		265				62		1,115	
1981	865						67		978	
1982	645						51		916	
1983	736								645	
1984	736								736	
1985	505								736	
1986	528								505	
1987	486								528	
1988	519						11		497	
1989	432						23		542	
1990	476						9		441	
1991	276						15		491	
1992	315				195		18		489	
1993	321		90		138		8		551	
1994	233		86		134		13		554	
1995	228		129		155		59		576	
1996			114		183		37		562	
1997			101		144		58		303	
1998					158		68		226	
1999	700	105	100	113	100	121	<50	46	900	
2000	600	79	400	95	300	67	<50	192	1,300	
2001	500	65	500	61	500	53	200	97	1,800	
2002	400	85	200	101	300	81	200	98	1,000	
2003	1,500	61	400	71	400	87	300	81		
2004	900	56	300	29	100	103	50	92		
2005	800	69	200	46	100	109	100	134		
2006	600	73	900	52	100	172	200	92		
2007	2,100	43	1,400	45	800	47	300	86	4,600	

2008	1,300	55	2,300	40	600	52	300	143	4,500
2009	1,300	52	2,400	51	500	54	200	138	4,400
2010	1,800	47	1,100	61	900	46	300	112	4,100
2011	500	101	200	38	300	37	200	82	1,200
2012	1,100	57	300	39	100	18	100	93	1,600
2013	400	137	200	39	100	16	300	196	1,000
2014	1,000	43	300	35	100	32	100	75	1,500
2015	600	24	200	44	100	39	100	93	1,000
2016	100	56	100	108	100	69	100	191	300
2017	100	47	<100	29	100	24	<100	66	200

APPENDIX E. Estimates of total hunter days afield for Interior band-tailed pigeons in the U.S. Confidence intervals (CI) are expressed as the interval half-width in percent, based on USFWS surveys using state Harvest Information Program data for the sampling frame.

	Arizona		Colorado		New Mexico		Utah		Total	
	Days	CI	Days	CI	Days	CI	Days	CI	Days	CI
1968	1,498		0				0			
1969	1,719		0				0			
1970	1,815		374				53			
1971	1,076		851				110			
1972	968		763				122			
1973	1,688		642				42			
1974	2,039		777				141			
1975	1,968		653				119			
1976	1,902		629				162			
1977	1,666		872				225			
1978	1,323		675				238			
1979	1,107		804				133			
1980	1,794		848				175			
1981	2,269						142			
1982	2,291						125			
1983	1,781									
1984	2,128									
1985	2,027									
1986	1,611									
1987	1,562									
1988	1,383						109			
1989	1,345						159			
1990	1,354						28			
1991	1,321						20			
1992	724						70			
1993	789		213				13			
1994	778		296				27			
1995	571		373				171			
1996	644		336				125			
1997			354				209			
1998										
1999	2,000	97	300	122	300	158	100	50	2,700	76
2000	1,600	83	2,800	107	900	75	300	192	5,600	60
2001	1,000	71	800	54	1,800	64	700	133	4,300	39
2002	1,000	110	400	105	900	109	500	104	2,800	58
2003	3,700	77	2,100	89	1,400	75	600	136	7,900	47
2004	2,300	80	700	35	300	92	100	72	3,400	55
2005	1,600	74	300	51	400	140	200	142	2,500	54
2006	1,100	70	1,700	63	300	163	200	87	3,300	43
2007	5,000	57	3,800	56	3,600	62	400	73	12,800	33

2008	3,300	66	6,100	45	2,100	76	700	139	12,200	33
2009	4,100	68	6,100	70	2,300	72	600	166	13,200	42
2010	5,800	57	3,900	77	3,200	55	700	121	13,600	36
2011	900	71	700	55	900	62	300	94	2,800	35
2012	4,800	79	1,300	66	500	27	200	99	6,800	57
2013	800	126	500	48	400	26	300	196	2,000	60
2014	1,900	49	800	45	300	36	400	104	3,300	32
2015	1,700	31	600	57	500	51	100	110	3,000	23
2016	400	71	100	140	100	81	100	191	800	54
2017	100	52	100	33	300	41	<100	78	500	28

APPENDIX H. Estimates from regression analysis of long-term (1968–1999) linear trends in hunter participation and harvest of Interior band-tailed pigeons.

Attribute State	Estimate	SE	95% confidence interval		df	*t*	*P*	r^2
Total harvest								
AZ	-83.21	16.40	-116.80	-49.62	28	5.1	<0.001	0.49
CO	-24.54	10.28	-46.46	-2.62	15	2.4	0.032	0.29
NM	-50.55	13.15	-78.18	-22.92	18	3.8	<0.001	0.46
UT	-4.40	2.07	-8.69	-0.11	22	2.1	0.045	0.18
UT (–1977)	-3.33	1.41	-6.26	-0.39	21	2.4	0.029	0.22
Total hunters								
AZ	-22.30	3.01	-28.48	-16.13	28	7.4	<0.001	0.67
CO	-6.64	1.14	-9.06	-4.22	15	5.9	<0.001	0.71
NM	-15.12	3.59	-22.65	-7.58	18	4.2	<0.001	0.51
UT	-1.29	0.49	-2.30	-0.28	22	2.7	0.015	0.25
Total hunter days								
AZ	-28.38	9.81	-48.51	-8.24	28	2.9	0.008	0.24
CO	-16.81	4.15	-25.71	-7.91	15	4.1	0.001	0.54
UT	-1.16	1.56	-4.41	2.09	22	0.7	0.466	0.03
Mean days per hunter								
AZ	0.04	0.01	0.02	0.05	28	6.0	<0.001	0.57
CO	0.01	0.01	-0.01	0.04	15	1.0	0.332	0.07
UT	0.06	0.04	-0.03	0.16	22	1.5	0.151	0.10
Mean harvest per hunter day								
AZ	-0.04	0.01	-0.05	-0.02	28	5.4	<0.001	0.52
CO	-0.01	0.02	-0.05	0.02	15	0.7	0.504	0.03
CO (–1995)	-0.03	0.01	-0.05	-0.01	14	2.9	0.013	0.39
UT	-0.02	0.01	-0.05	0.00	22	1.8	0.091	0.13
Mean harvest per hunter season								
AZ	-0.06	0.02	-0.09	-0.02	28	3.4	0.002	0.29
CO	-0.02	0.05	-0.12	0.08	15	0.4	0.690	0.01
NM	-0.05	0.02	-0.09	-0.01	18	2.8	0.013	0.31
UT	-0.01	0.05	-0.11	0.09	22	0.2	0.848	0.00

APPENDIX I. Estimates from regression analysis of short-term (1988–1999) linear trends in hunter participation and harvest of Interior band-tailed pigeons.

Attribute State	Estimate	SE	95% confidence interval		df	*t*	*P*	r^2
Total harvest								
AZ	-86.38	32.48	-161.29	-11.48	8	2.7	0.033	0.50
CO	65.70	140.18	-323.51	454.91	4	0.5	0.671	0.07
NM	1.32	11.00	-24.70	27.34	7	0.1	0.908	0.00
UT	6.10	4.54	-4.17	16.37	9	1.3	0.216	0.18
Total hunters								
AZ	-37.88	6.47	-52.81	-22.95	8	5.9	0.001	0.83
CO	5.00	5.79	-11.06	21.06	4	0.9	0.451	0.20
NM	-0.95	3.53	-9.30	7.40	7	0.3	0.797	0.01
UT	4.58	1.60	0.95	8.21	9	2.9	0.021	0.50
Total hunter days								
AZ	-116.03	19.89	-163.06	-69.01	8	5.8	0.006	0.83
CO	32.20	13.81	-11.75	76.15	4	2.3	0.102	0.64
UT	8.13	7.84	-9.95	26.21	9	1.0	0.330	0.12
Mean days per hunter								
AZ	-0.03	0.03	-0.10	0.03	8	1.2	0.259	0.18
CO	0.17	0.13	-0.19	0.53	4	1.3	0.279	0.37
UT	-0.50	0.25	-1.07	0.07	9	2.0	0.084	0.33
Mean harvest per hunter day								
AZ	-0.03	0.03	-0.10	0.04	8	1.0	0.374	0.11
CO	0.17	0.37	-0.85	1.19	4	0.5	0.675	0.01
CO (–1995)	0.17	0.06	-0.03	0.37	3	2.7	0.113	0.79
UT	0.01	0.07	-0.15	0.17	9	0.2	0.880	0.00
Mean harvest per hunter season								
AZ	-0.11	0.07	-0.28	0.07	8	1.4	0.202	0.22
CO	0.59	1.03	-2.27	3.45	4	0.6	0.606	0.09
NM	0.02	0.07	-0.15	0.19	7	0.3	0.785	0.01
UT	-0.30	0.29	-0.94	0.35	9	1.0	0.327	0.12

APPENDIX G. Estimated age structure in the U.S. harvest of Interior band-tailed pigeons, based on the Parts Collection Survey (PCS) data. Values are percentage of Hatch Year (HY) birds in the harvest (%), number of HY wings in the PCS (HY), and number of both HY and After Hatch Year wings in the PCS (N).

	Arizona			Colorado			New Mexico			Utah			Total		
Year	%	HY	N	%	HY	N	%	HY	N	%	HY	N	%	HY	N
1994	24.2	16	66	66.7	4	6	28.6	14	49	-	0	0	28.1	34	121
1995	60.0	6	10	29.3	53	181	19.0	12	63	54.5	6	11	29.1	77	265
1996	0.0	0	1	38.5	5	13	34.1	15	44	-	0	0	34.5	20	58
1997	33.3	7	21	31.5	17	54	15.5	13	84	-	0	0	23.3	37	159
1998	48.4	15	31	20.0	2	10	10.0	2	20	16.7	1	6	29.9	20	67
1999	13.0	3	23	33.3	6	18	24.1	7	29	-	0	0	22.9	16	70
2000	41.7	30	72	11.8	2	17	26.9	18	67	0.0	0	3	31.4	50	159
2001	52.9	9	17	-	0	0	23.5	4	17	33.3	1	3	37.8	14	37
2002	55.9	57	102	27.3	3	11	54.0	34	63	8.3	1	12	50.5	95	188
2003	-	0	0	-	0	0	33.3	1	3	-	0	0	33.3	1	3
2004	34.8	8	23	-	0	0	40.0	4	10	-	0	0	36.4	12	33
2005	15.4	2	13	66.7	8	12	0.0	0	3	-	0	0	35.7	10	28
2006	13.5	7	52	20.0	4	20	29.9	20	67	-	0	0	22.3	31	139
2007	25.0	11	44	-	0	0	-	0	0	-	0	0	25.0	11	44
2008	18.2	2	11	-	0	0	-	0	0	-	0	0	18.2	2	11
2009	0.0	0	5	-	0	0	14.3	1	07	-	0	0	8.3	1	12
2010	18.2	2	11	-	0	0	14.3	2	14	-	0	0	16.0	4	25
2011	13.3	2	15	-	0	0	0.0	0	1	-	0	0	12.5	2	16
2012	24.2	16	66	-	0	0	0.0	0	3	-	0	0	23.3	16	69
2013	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0
2014	-	0	0	-	0	0	28.0	7	25	-	0	0	28.0	7	25
2015	-	0	0	-	0	0	33.3	2	6	-	0	0	33.3	2	6
2016	-	0	0	-	0	0	-	0	0	-	0	0	-	0	0

APPENDIX L. Annual counts of Interior band-tailed pigeons during inventories from 1946 to 1947 and from 1951 to 1956. A corps of observers totaling 150 to 200 people annually, including personnel from state and federal natural resource agencies, and other qualified individuals, were instructed to watch for and record counts of band-tailed pigeons when they were found from May through October. Beginning in 1953, surveys were of short duration lasting 5 days in mid-September. Consequently, indices of abundance from 1946 to 1953 and 1954 to 1956 are not comparable between the 2 periods.

Year	Arizona	Colorado	New Mexico	Utah
1946		9,000		
1947		4,473		
1951	4,588	4,256	13,233	
1952	3,332	2,221	6,062	
1953	3,431	2,877	8,560	572
1954	929	1,255	2,174	359
1955	526	557	2,634	223
1956	482	139	1,303	798