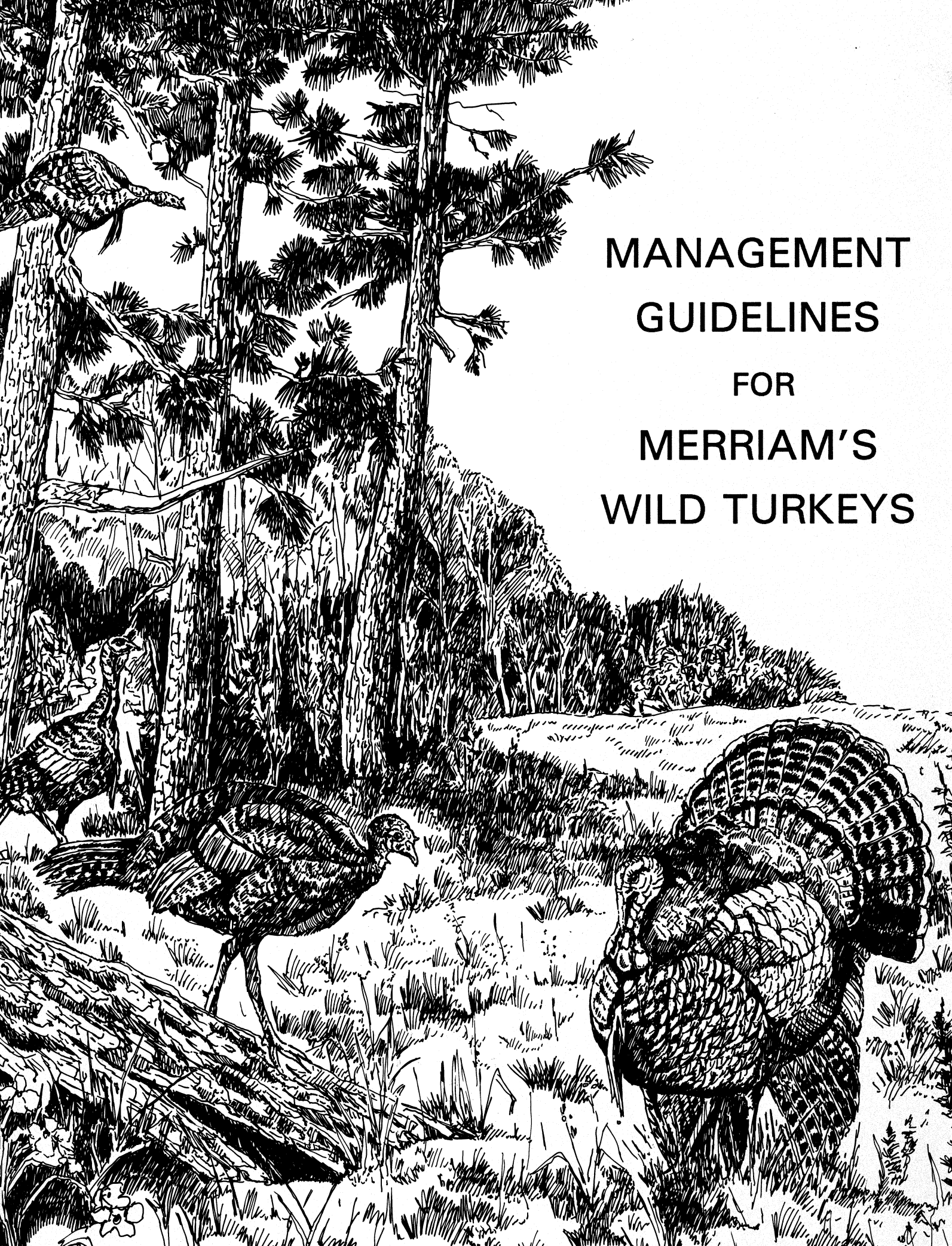

MANAGEMENT GUIDELINES FOR MERRIAM'S WILD TURKEYS

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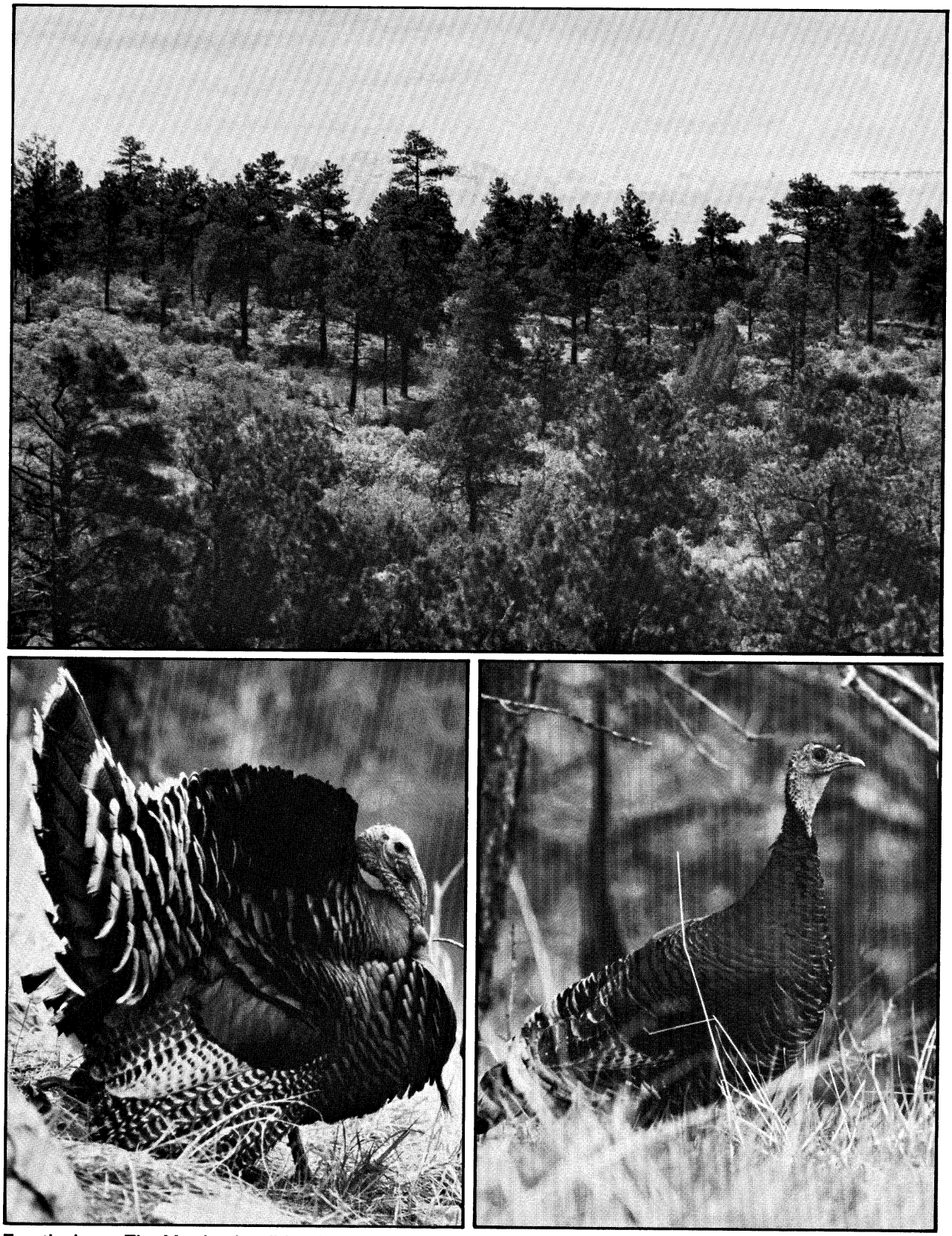
The cover drawing was prepared by Joyce Patterson, U.S. Dep. Agric., Forest Service, Rocky Mountain Forest and Range Experiment Station. Photographs, unless otherwise noted, were provided by the authors or their respective agencies.

FIGURES



Frontispiece. The Merriam's wild turkey is a bird of the western United States where it most commonly ranges in forested habitat characterized by ponderosa pine, pinyon-juniper, or mixed conifers. Males (bottom left, photo by Martin J. Tarby) are larger and have a darker, more iridescent appearance than females (bottom right, photo by Martin J. Tarby).

MANAGEMENT GUIDELINES FOR MERRIAM'S WILD TURKEYS

INTRODUCTION

The Merriam's wild turkey (*Meleagris gallopavo merriami*) is a bird of the western United States. Early naturalists found it here. This is where its range has been expanded through transplants. This is where it has become a valuable sport hunting and aesthetic resource. This is where it must be managed. To understand Merriam's wild turkey management, one must understand the ecology of the West.

Wallace Stegner, in his book Where the Bluebird Sings by the Lemonade Spring", characterizes the West as an arid environment with vast open spaces and low human densities. These characteristics are what set the tone of the guidelines. For turkeys, these characteristics yield highly mobile, widely scattered populations living in fragile habitats. From the wildlife manager's perspective, this translates to little hope for accurate population monitoring, and concern that if these habitats are modified too greatly, they may not recover.

Merriam's wild turkeys are no longer confined to southwestern ponderosa pine-Gambel oak (*Pinus ponderosa-Quercus gambelii*) forests. They now occupy several major vegetation types on lands subject to many uses, hence no single set of guidelines can be provided. We have attempted to blend personal experiences with technical literature to create guidelines specific enough to be useful, yet broad enough to encompass the variety of conditions where Merriam's turkeys exist. This was not an easy task. Members of the committee discussed every sentence because of differences in research findings from extremes of the Merriam's wild turkey range. This reluctance to compromise originated from real concerns for turkeys in specific habitats. The result was a better document that presents separate guidelines for certain habitat parameters that truly differ from one portion of the range to another.

These guidelines are not the final word in Merriam's wild turkey management. They will be refined through more research, use, documentation of results, and feedback into the general information base. Therefore, we recommend the Western Wild Turkey Committee not be disbanded simply because the initial task is completed. The most important work lies ahead in the form of continued exchange of information and improvement of management skills. Without a process for periodic updating, the guidelines will become just another obsolete document on the bureaucratic shelf, and another committee will have to battle through a morass of new data 10, 20, or 30 years from now.

GENERAL BIOLOGY

RANGE

Merriam's wild turkeys originally occupied portions of Arizona, Colorado, and New Mexico where they were found in association with mixed conifer, ponderosa pine-Gambel oak, and pinyon-juniper (*Pinus edulis-Juniperus* spp.) vegetation types. Small populations extended across the Colorado and New Mexico borders into extreme northwest Oklahoma and west-central Texas. Archaeological evidence suggests that Merriam's wild turkeys may be descendants of birds brought to the Southwest by early Pueblo Native Americans. Such an origin could explain why Merriam's turkeys have flourished outside their presumed historic range, especially in areas with greater annual precipitation. Presently, an estimated 207,000 Merriam's wild turkeys live in 15 states and 2 Canadian Provinces (Fig. 1). Trapping and transplanting has extended the distribution north to Wyoming, Idaho, Montana, and Alberta; west to Utah, Nevada, and California; northwest to Oregon and Washington; and northeast to Nebraska, South Dakota, North Dakota, and Manitoba.

PHYSICAL CHARACTERISTICS

The most striking difference between Merriam's wild turkeys and the other subspecies is color. In general, Merriam's wild turkeys have more white or cream coloration on the tips of the rectrices, secondary tail coverts, and flank feathers. The wings also

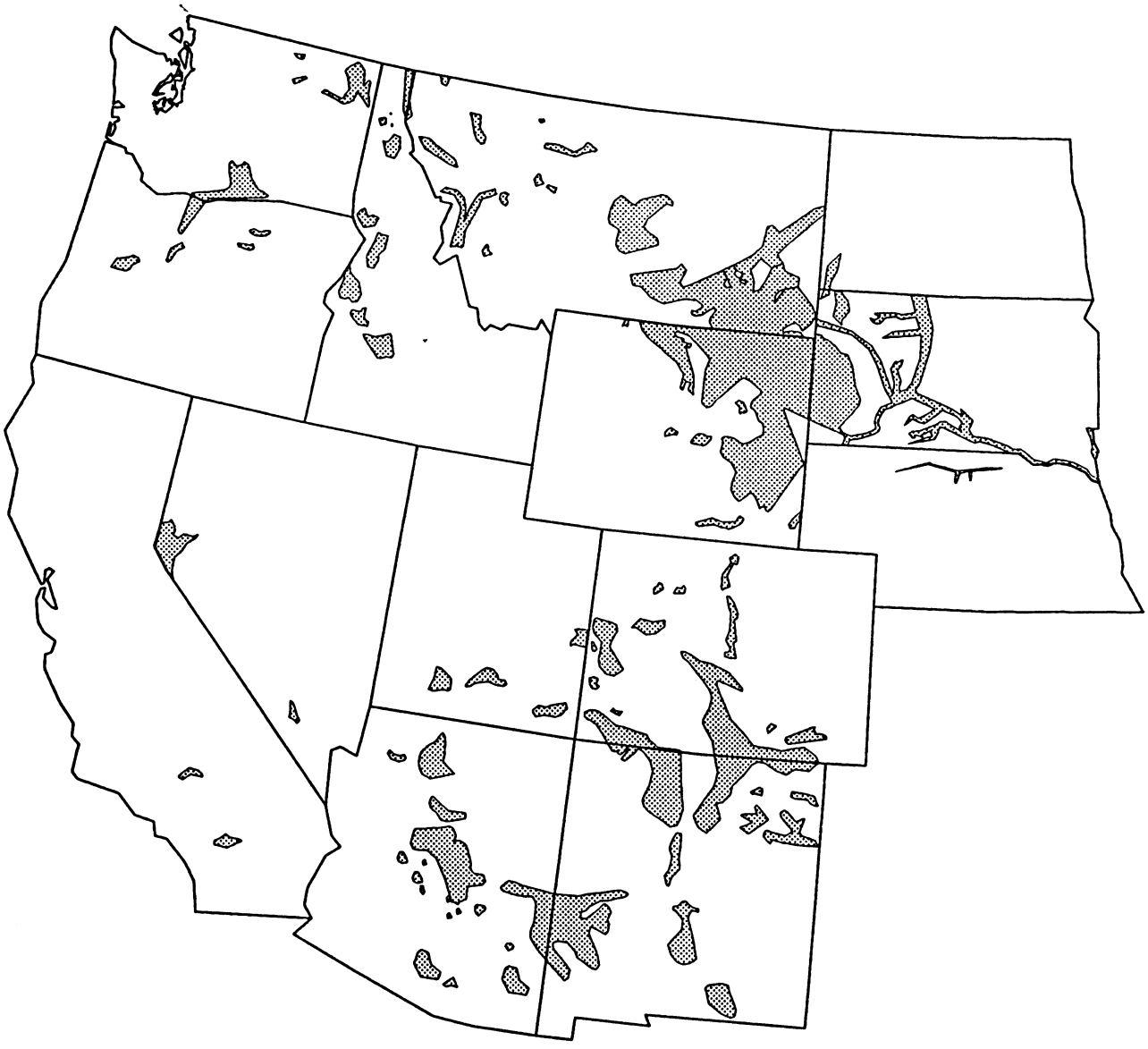


Fig. 1. Distribution of Merriam's wild turkeys in the western United States.

appear whiter because the white bars on the primaries tend to be broader than the black bars.

Merriam's wild turkeys are sexually dimorphic. Males are larger, slimmer, and have longer legs than females. Males have a metallic black, blue, purple, and bronze reflection to their overall body plumage. This gives them a darker, more iridescent appearance in comparison to the mottled brown plumage of females. The best indicator of sex is coloration of the breast feathers, which are black-tipped in males and buffy-tipped in females (Fig. 2). Males lack feathering on the head and the caruncles (fleshy protuberances of skin) on the head are more pronounced than on females. Beards and spurs are generally considered secondary sex characteristics of males, but may be present on females. When present on hens, the spurs are usually rounded and poorly developed, and the beards are thinner and shorter than those of males, except possibly yearling males.

Wing characteristics can be used to identify age (Fig. 3). For yearlings (4-15 mo), primaries IX, X and sometimes XIII [numbered proximal (I) to distal (X)] are pointed and the white barring stops approximately 3 inches from the feather tip. These primaries are rounded on adults (>15 mo) and the white barring extends to the end of the feather. Another more

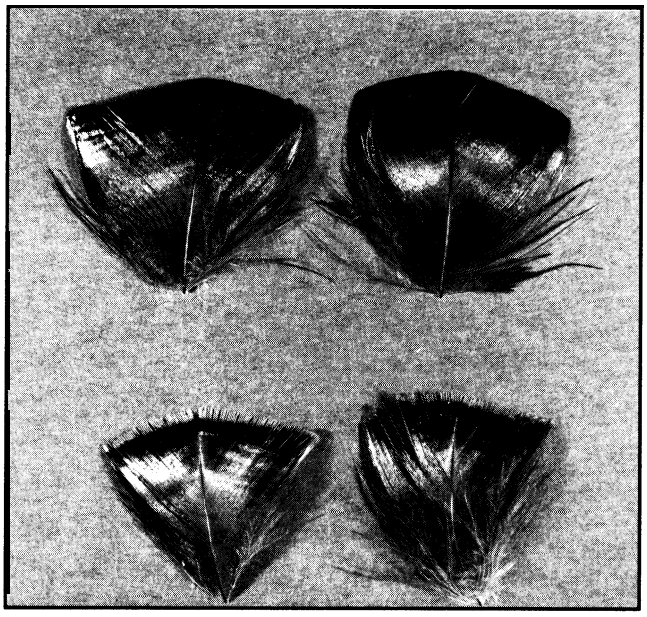


Fig. **2.** Breast feathers are black-tipped on males (top) and buffy-tipped on females (bottom).

subjective technique involves examination of the secondary wing coverts. The coverts of yearlings project an irregular, triangular silhouette over the secondaries when viewed from the side. Those of adults project a uniform, rectangular silhouette. This technique, unlike examining the primaries, does not require capturing the birds. However, counting turkeys to obtain age data under field conditions is difficult because it requires a good lateral view of the bird and an experienced observer.

LIFE HISTORY

Merriam's wild turkeys are migratory in parts of their range, gradually moving between low elevation wintering areas and higher elevation breeding areas. Distances involved vary from less than 1 **to** greater than 40 miles. Within the same population, some birds may move long distances, others short distances, and still others may reside in the same general area year-round. Timing of movements can differ annually and geographically, depending on snow conditions.

Movements from wintering areas commence anytime between mid-March and mid-April. Males begin strutting and gobbling in February while still in winter flocks, and continue these behaviors into June. Males may or may not associate with hens at onset of gobbling. Gobbling intensity increases in late April and again in mid-May in conjunction with peak mating and incubation, respectively. By mid- to late April, males spend much of the day courting hens, but often roost separately from hens at night. Older, dominant males do most of the breeding and are capable of mating with many females.

Hens normally start laying eggs in late April and initiate incubation in early to mid-May. It takes about 2 weeks to lay an average clutch of 9 to 11 eggs, incubation requires 28 days, and peak of hatch occurs in late May - early June. Only 30-40% of the hens are successful in hatching their clutches; however, greater than 90% of the eggs in successful nests hatch. Some hens renest if the first nest is lost. The propensity of yearling hens to nest varies among years and between areas. Data from Arizona, New Mexico, Oregon, and southern Colorado suggest that yearling hens rarely attempt to nest. In the Black Hills of South Dakota, yearlings nest at rates nearly equal to adults, whereas yearling females occupying prairie/riparian habitats in South Dakota seldom nest. In

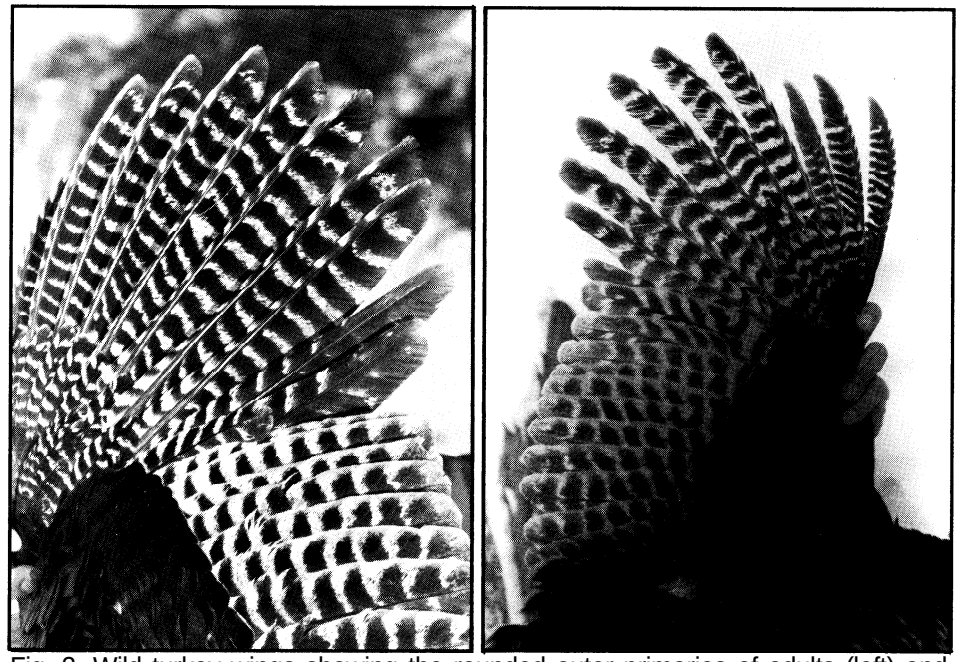


Fig. 3. Wild turkey wings showing the rounded outer primaries of adults (left) and pointed outer primaries of juveniles (right). For adults, the white barring extends to the end of the feather.

Wyoming and northwestern Colorado, yearlings nest but experience lower success than adults.

Newly hatched poults are precocial but require brooding during the first 3-4 weeks of life.They can fly at about 10 days of age and start roosting in trees at about 2 weeks of age (Fig. 4); until then, they roost with the hen on the ground. Hens with broods frequent openings where insects are most available. Several broods may coalesce into a single flock. Interchange between flocks is common. These "gang' broods represent the initial formation of winter flocks. Hens without poults and males normally segregate and use different habitats from those selected by brood hens.

Turkeys gradually move toward winter ranges in early fall. Where seasonal ranges overlap, no distinct movement patterns are apparent. Juvenile hens remain with mature hens during winter. Juvenile males may stay with hen flocks or form their own flocks, but rarely do they join adult males in winter flocks.

Merriam's wild turkeys winter in low elevation ponderosa pine habitats and pinyon-juniper woodlands. Snow depth and duration, food availability, and presence of suitable roost trees are key factors determining where turkeys winter. Snow conditions may force turkeys into riparian habitats below the conifer zone. Here turkeys use deciduous tree species such as cottonwoods (*Populus* spp.) for roosting and may become dependent upon human-related sources of food such as barnyards, grainfields, silage pits, or feedlots.

Fig. 4. Wild turkey poults start roosting in trees at about 10 days of age.

Merriam's wild turkeys are highly selective feeders, but may feed on many different food items depending on availability. Their diet varies annually, seasonally, and regionally in accordance with precipitation patterns and the resulting food and cover availability. Grass leaves and seeds, forbs, ponderosa pine and pinyon pine seeds, acorns, invertebrates, and cultivated crops are all common foods of Merriam's wild turkeys (Fig. 5). Other foods of regional importance include juniper berries, clover (*Trifolium* spp.), kinnikinnick (*Arctostaphylos uva-ursi*), hawthorne (*Crataegus* spp.), snowberry (*Symphoricarpos* spp), watercress (*Nasturtium* spp.), and rose hips (*Rosa* spp.). Acorns and pine seeds, although less dependable food sources, may comprise 80-90% of the diet when available. There are exceptions. For instance, in the Black Hills, ponderosa pine seeds are a staple food item.

Grasses are the most dependable and consistently used food source, but grazing and winter snow depths can markedly influence their availability. Green grass

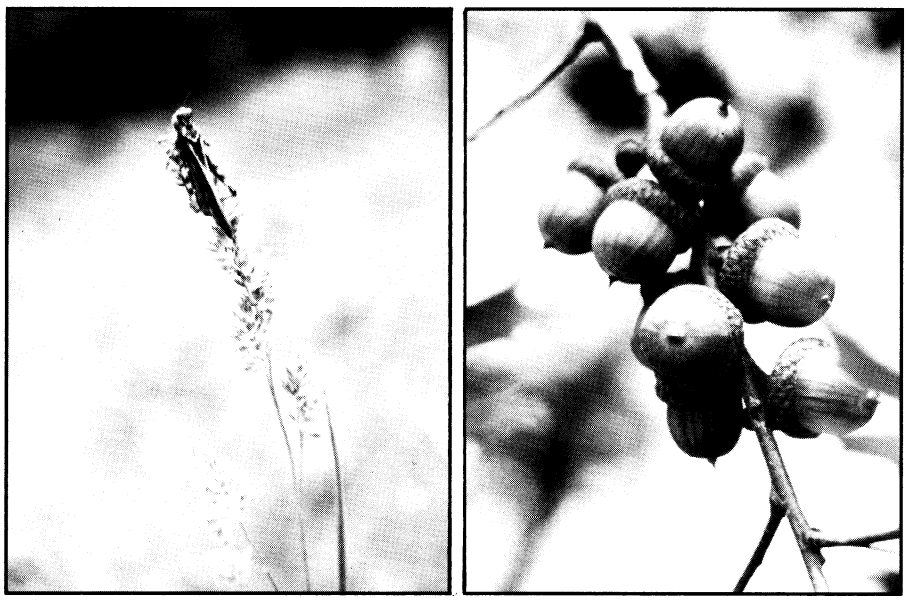


Fig. 5. Grasses and invertebrates along with acorns and ponderosa pine seeds (when available) are seasonally important foods of Merriam's wild turkeys.

and forbs become increasingly important foods as winter progresses into spring. Grasses and forbs along with insects continue to be consumed throughout summer. Soft and hard mast are added to the diet as they become available. Young poults require and eat large quantities of insects. Herbaceous material increases in the diet as they become older.

How long a turkey lives is dependent upon habitat quality, and to some extent, hunting pressure. Survival estimates based on long-term data sets with adequate sample sizes are lacking for Merriam's wild turkeys. Short-term estimates suggest 4 years is probably the average life expectancy. Merriam's wild turkeys, like other gallinaceous birds, experience high mortality rates their first year. Mortality declines in their second year to a rate that is usually maintained in the older age classes.

POPULATION MANAGEMENT

Population management is the responsibility of state wildlife agencies, but cooperation with land management agencies and landowners is imperative. Three essential elements of population management are inventorying numbers, ascertaining sex and age structure, and monitoring harvest. Additional activities include conducting transplants, monitoring diseases and use of pesticides, evaluating predator control programs, and regulating supplemental feeding and release of game farm birds.

SURVEYS

Managers gather survey data to estimate sex ratios, production, and population trends. Currently, no techniques are available to reliably estimate density or total population size of Merriam's wild turkeys, nor has a single method emerged as a standard for surveying populations. It can be laborious to count Merriam's wild turkeys because they are wary, highly mobile, and occur in low densities over large and often inaccessible areas. Consequently, indirect counts, such as questionnaires mailed to hunters, landowners, or land management personnel, are difficult to apply and unreliable. Direct counts offer the best alternative provided there is adherence to sampling procedures. Depending upon the management objective, a combination of spring gobbling counts, summer roadside classification counts, and winter flock counts are recommended. None of these counts is without bias. Counts must be conducted with equal, repeatable effort each year, and long-term data are necessary for meaningful interpretation of results.

Spring Gobbling Surveys. – Sporadic gobbling patterns related to weather and variation among individual males make gobbling counts unsuitable for estimating population trends. Gobbling counts can be used to document population expansion and to confirm presence of turkeys in new transplant areas (Fig. 6). These counts are best conducted on wind- and moisture-free mornings during the primary peak of gobbling (mid- to late April). Counts should start about **45** minutes before sunrise, while the birds are still on the roost, and last for approximately **1** hour. No specific sampling strategy is necessary since the objective is to ascertain presence or absence of turkeys. Surveyors should cover as much turkey habitat as possible during the l-hour period. Tape-recorded or manually produced calls can be used to stimulate gobbling. A more intensive survey involving preestablished routes and listening stations can be used if desired.

Summer Roadside Classification Counts. -- Summer classification counts can be used to estimate population trends and production. Counts should be conducted during the same time period each year, preferably within a 2-week period or less. Extended sampling periods create biases due to changes in mortality, behavior, and distribution of birds. The same routes should be surveyed annually with each route stratified by habitat type to account for differential habitat selection by age and sex classes of turkeys.

The following procedures have worked well in Arizona and are presented as an example of how to conduct a summer survey:

1. Conduct surveys in early to mid-August when poults can be distinguished from adults.
2. Establish survey routes along roads that traverse suitable brood habitat and carry low vehicular traffic.
3. Each route should be about 15 miles long.
4. Begin driving the route at sunrise; speed should not exceed 15 mph.
5. Routes should be driven out and back on 3 consecutive mornings.

Fig. 6. Gobbling counts are unsuitable for estimating population trends, but are useful in documenting population expansion and to confirm presence of **turkeys in new transplant areas.**

6. Observers should be rotated among routes to reduce bias
7. Only one observer/driver is needed in each vehicle.
8. Observers may stop and examine openings with binoculars.
9. Tabulate each sighting separately and classify each bird observed as male, female, poult, or unclassified. Record date, time, and location (distance from starting point).

Data are used to calculate male:female ratios, hen:poult ratios, percent hens without poults, and total individuals observed. Locations are plotted on a map of the survey route to determine possible repeat observations. Repeat observations are excluded from the analyses. Major habitat types along the survey route should be delineated on this map. Observations can be categorized by habitat types and adjustments can be made for biases introduced by differential habitat use by hens with poults, hens without poults, and males.

Winter Flock Counts. **--** Of the survey methods discussed, winter flock counts offer the most potential for monitoring population trends (Fig. 7). Merriam's wild turkeys concentrate around limited food resources during winter and traditionally use the same winter range and winter roost sites each year. This provides an opportunity to count and classify many birds. Standardized routes, similar to roadside classification counts, will provide the most useful information. Routes should be surveyed in late February or early March to account for winter mortality and, thus, to more closely approximate the pre-breeding population. Snow conditions, mast production, and human activity influence the distribution of birds and can introduce biases into the counts. Winter counts tend to underestimate the adult male segment of the population because males move more on winter ranges. Winter counts should reflect total number of flocks observed, flock size, sex and age composition of each flock, date, location, habitat type, and time of observation.

Identifying age of turkeys in the field can be difficult. The technique, which involves examining the formation of the secondary wing coverts, has not been thoroughly tested on Merriam's wild turkeys. If after further testing this technique proves to be reliable, late winter juvenile: hen ratios could be compared to summer hen:poult ratios to assess recruitment into the population.

We do not recommend counting turkeys at winter bait stations as a means of estimating population size. Counts may vary depending on snow conditions, location of bait stations, availability of natural foods, differences in visitation patterns among flocks, and flock interchange. This procedure requires feeding birds on a regular and continued basis, which is contradictory to recommendations in these guidelines.

REGULATING AND MONITORING HARVEST

Season Structure **--** Most states with Merriam's wild turkeys hold spring and fall hunting seasons. Spring hunting directed at harvesting males is a highly specialized, traditional form of hunting and should be designed to encourage the sport of calling turkeys. Fall hunts usually allow for harvest of both sexes. Hunters harvest mostly juvenile birds during fall. Since fall turkey seasons may be concurrent with other hunting seasons, incidental harvest may occur.

Fig. 7. Merriam's wild turkeys concentrate around limited food resources during winter and tend to use the same winter range each year, which provides an opportunity to count and classify many birds.

Fall hunts are an excellent way of expanding hunting opportunities, but should be carefully monitored to protect future breeding stock.

Timing of Seasons. -- Spring hunts (Fig. 8) should be timed to bracket the peak of incubation, which in turn should include the second peak of gobbling. This minimizes disturbance during peak breeding, reduces chances of accidentally shooting a hen, and maximizes the hunter's opportunity to call in a male. Spring hunts should close before the onset of hatching.

Fall hunts should not start before early September. Whenever possible, time fall hunts so they do not overlap with big game seasons. Late seasons (Nov-Dec) should be carefully evaluated to avoid excessive disturbance and overharvest of turkeys on winter concentration areas.

Shooting Hours. -- Shooting hours should begin at official sunrise or later and end one-half hour before sunset to discourage shooting birds on roosts.

License System. -- Whatever license system is used, it must ensure that turkey hunters can be readily identified for sampling purposes. Permit systems allow quick access to hunter names and addresses for follow-up surveys, and the most control of hunter densities, hunter distribution, and harvest. Permit systems are useful in controlling hunting of newly established or restricted populations and in providing quality hunting opportunities. Permits can be issued on a lottery or "first come-first serve" basis. If permits are not necessary, a specific turkey license should be issued.

Bag Limits. -- Most states allow the harvest of 1 bird per season. Multiple bird bag limits, where biologically justified, should be promoted as a unique hunting opportunity. Regulations pertaining to multiple bird bag limits should specify that only one bird can be taken on any given day. This will discourage hunters from shooting into flocks and decrease wounding loss.

Method of Take. -- Although fewer turkey hunting accidents involve rifles (mainly because fewer hunters use rifles), the fatality rate for rifle-related accidents is nearly 16 times greater than with shotguns. Having rifle and shotgun hunters afield simultaneously, using different tactics to hunt the same species, raises concerns about hunter safety. These concerns also extend to other hunters that may be in the field hunting other species at the same time. Specialized methods used in turkey hunting, such as calling and wearing camouflage clothing, increase risks of hunter accidents.

It is the responsibility of state wildlife agencies to establish regulations that maximize the safety of anyone afield during a hunting season. For this reason, spring and fall turkey hunting should be restricted to shotguns and hand-held bows only. Shot size restrictions are needed to further reduce the risks of fatality. Shotguns using number 4, 5, or 6 size lead shot have been shown to be the most efficient method of harvesting turkeys at ranges up to 40 yards.

Special Regulations -- Special weapons seasons should be discouraged. Baiting, use of electronic calls, and use of decoys made with real turkey feathers should be illegal. Turkey hunting seminars for all ages promoting safe, ethical, and responsible hunting practices should be encouraged.

Law Enforcement. -- Fines for illegally killing turkeys should reflect the true value of the resource.

Fig. 8. Spring hunting seasons that coincide with the peak period of incubation will minimize disturbance during the breeding season, reduce chances of accidentally shooting a hen, and maximize the hunter's opportunity to harvest a male.

Studies have shown this value is somewhere between $250 and $400 per bird. Wildlife agencies should maintain 24-hour toll-free telephone services for reporting violations.

***Harvest* Surveys. --** Harvest estimates are fundamental to managing hunted species. Some states use only harvest surveys as indices of population status. Harvest surveys also serve as a measure of how well wildlife agencies are meeting their obligations to the hunting public, and how well they are meeting their planning objectives. It is critical that harvest data be collected systematically and with statistically valid sample sizes.

A 100% survey is preferred. For most states, this is cost prohibitive, and instead they must obtain information from a sample of license holders. Sample sizes are often inadequate due to budget constraints. In addition, surveys are usually conducted by mail, which characteristically have low return rates, and high non-response (successful hunters are more likely to return surveys) and false-response biases (successful hunters inflating their bag and unsuccessful hunters claiming success). All these factors lead to a general lack of confidence among managers in the resulting estimates.

Telephone surveys may have advantages over mail surveys. The primary advantage is that non-response bias can be reduced to negligible levels. Furthermore, telephone surveys can be designed so that hunters are interviewed in a timely fashion to minimize false-response biases. Telephone surveys generally cost less than mail surveys; therefore, more hunters can be sampled with the same budget. Telephone surveys also are advantageous from an administrative perspective. They can be contracted to public opinion firms and, thus, require less time from permanent personnel. A few simple questions of a yes/no nature generate the highest return rates for mail surveys. More complex questions can be asked in telephone surveys without reducing the response rate.

Check Stations and Wing Collections. -- Check stations can be used to estimate harvest and hunter activities over short intervals (e.g., opening weekend) from defined areas. Wing collection stations also can be used to gather wings from local areas and this information can be used to provide an index to harvest as well. Both methods provide data on age and sex composition of the harvest. However, they have limited application and are seldom cost effective for monitoring harvest over broad geographic areas. The validity of any population index calculated from harvest samples depends on the assumption that different age and sex classes are harvested in proportion to their occurrence in the population. Long-term population and harvest data are necessary to test this assumption. Such data are not available for Merriam's wild turkeys. Biologists must be aware of these limitations and use caution in interpreting the data.

TRANSPLANTING

Transplants using wild-trapped stock have been the primary management tool in restoring wild turkeys to historic ranges and in establishing populations in previously unoccupied habitats (Fig. 9). Traditionally, transplant programs have been poorly documented. The general approach has been "dump and hope" with little attention given to the genetic, disease, or evolutionary implications or to recording protocols and conducting pre- and post-release evaluations. This has led to repeated mistakes in planning future

Fig. 9. Transplant programs using wild-trapped stock have been instrumental in the restoration and expansion of Merriam's wild turkey populations.

programs. Although there are few examples of introduced turkeys competing with other species, damaging agricultural crops, transferring diseases or parasites, hybridizing with related forms, or spreading beyond the preferred area, the possibility of these problems occurring cannot be overlooked.

Planning and coordination among wildlife agencies, land management agencies, landowners, and state agriculture departments are critical to the success of transplant programs. Transplant stock should originate from habitats and latitudes similar to release sites. Evaluation of habitat suitability at release sites should include on-ground inspection by experienced turkey biologists familiar with the habitats involved.

Late winter (late Feb - Mar) is the best time to release birds. Initial releases should be made into prime habitats. Supplemental releases can be made into marginal habitats to enhance expansion, but are not necessary to ensure success. Only wild birds of pure genetic stock should be used. Merriam's wild turkeys should not be transplanted into habitats contiguous to areas with other subspecies, especially when the other subspecies is native to the area and Merriam's wild turkeys are not. Similarly, no transplants of other subspecies should be made into native ranges of Merriam's wild turkeys. Before releasing turkeys into previously occupied habitats, the cause of the initial decline should be determined and appropriate steps taken to correct the problem.

Transplant stock should be captured from established populations capable of recovering from the loss. A minimum of 15 birds should be released at any given site. If possible, the stock should consist primarily of adults and come from 2 or more populations to maximize reproductive potential and genetic diversity. A 1:1 sex ratio is preferred as an unbalanced ratio favoring one sex may reduce the genetic contribution from individuals of the other sex. This may be difficult to achieve for turkeys because males are typically more difficult to trap than females. A reasonable objective is to transplant 1 male for every 2 females. Birds should not be held in captivity any longer than necessary. However, it is probably better to hold birds overnight if they cannot be released before noon. State importation regulations should be followed before releasing any birds into the wild.

State agencies should keep accurate records of wild turkey transplants. No transplant program should be approved without written documentation that includes (1) biological and/or social demand, (2) objectives (i.e., supplement existing population, reestablish population in historic range, establish new population in previously unoccupied habitats), (3) prerelease evaluation of habitat conditions, (4) projected costs, (5) source of release stock, (6) location of release, and (7) protocol for disease monitoring and post-release evaluation. Detailed trapping records should be kept pertaining to dates of capture and release, age and sex composition of released stock, condition of birds when released, band numbers, and radio frequencies (if birds are radio-marked).

STOCKING

Stocking is the intentional release of captive-reared animals for immediate harvest or personal viewing enjoyment. Stocking is done by commercial shooting preserve operators that offer "put and take" hunting and by private landowners. Most states have regulations restricting the species that can be stocked. Game birds commonly included on this list are ring-necked pheasants (*Phasianus colchicus*), northern bobwhites (*Colinus virginianus*), chukars (*Alectoris chukar*), and gray partridge *(Perdix perdix).* Numer-

ous requests have been made to include turkeys on this list. Those making this request believe releasing game farm turkeys will benefit existing populations or establish new populations. This is a fallacy. Game farm turkeys are of genetically inferior stock and may carry diseases that are potentially harmful to wild turkeys. State wildlife agencies are strongly encouraged to enact regulations excluding turkeys from the list of species that can be lawfully released by private individuals. No wild birds should be released in areas where game farm turkeys are known to occur.

MONITORING DISEASES

No disease outbreaks in domestic poultry have been linked to wild turkey restoration efforts. This does not negate the importance of testing for specific diseases, particularly if birds are to be released near domestic poultry operations. State testing requirements differ; therefore, the state veterinarian should be consulted before proceeding with any transplant program.

PREDATOR CONTROL

Predator control has not been shown to enhance numbers of turkeys. It is not a cost effective practice, cannot be maintained over large areas, and cannot be sustained over long time periods. Any benefits are short-term. Healthy turkey populations are a function of the quantity and quality of habitats available to them. Funds for predator control would be more wisely spent on habitat improvement and land acquisition. In suitable habitats, predation is a normal mortality risk which should be exceeded by the inherent reproductive potential of the population. This does not imply that predators will not be a problem, but that predator problems are rare and of a local nature.

PESTICIDES

There are virtually no data to evaluate the direct or indirect effects of pesticide applications on turkey populations. Insecticides and herbicides are routinely applied to rangelands and forests to control insects and weeds, but the magnitude of these applications has not been quantified specifically in relation to acres of turkey habitat treated. This in itself is reason for concern. Intuitively, the indirect effects should be elimination or reduction of insects and forbs required for food, and reduction of cover for both insects and turkeys. Direct toxic effects, such as predisposing birds to predation, reducing reproductive output, and even direct mortality may occur, but are likely to go unnoticed.

Pesticide spraying should be discouraged except under emergency situations, and then only in accordance with labeled instructions. Wildlife biologists must take an assertive role in pest control programs to ensure compliance and to offer recommendations for minimizing impacts to turkeys and their habitats. Efforts should be made to protect brood rearing areas. If brood areas must be treated, application should be delayed until after 31 July. Critical periods of growth and development will have passed for most broods by this date. Target-specific pesticides applied at the minimum rate only in problem areas are preferred to broadcast applications of broad spectrum pesticides over large areas. Use of pesticides with documented low toxicity to wildlife should be required.

SUPPLEMENTAL FEEDING

Supplemental feeding is the intentional and artificial spreading of food, usually grain, to attract wildlife. This is not to be confused with planting food plots or leaving unharvested crops standing in fields; these practices should be encouraged. Supplemental feeding is primarily directed at helping turkeys through winter and should be used only in emergency situations (Fig. 10).

Problems arise with supplemental feeding because (1) few state wildlife agencies have feeding policies that define what constitutes an emergency, (2) they do not have guidelines on how to implement a supplemental feeding program when conditions warrant, and (3) they have no regulations to control routine feeding by private landowners. Wildlife agencies must carefully consider the precedent they are setting when becoming involved in any feeding program and take the necessary steps to fully inform the public of their intentions. Likewise, they need to develop strategies to respond to public pressures for supplemental feeding when it is not warranted.

The general consensus among wild turkey biologists is that supplemental feeding does not enhance survival nor reproductive performance of wild turkeys under normal winter conditions. Turkeys that become dependent upon supplemental foods may not receive a nutritionally balanced diet. Furthermore, supplemental feeding artificially concentrates birds, predisposing them to predation, diseases, and poaching. Also, association with humans fosters a protectionist attitude and may result in the birds loosing their wildness.

These negative consequences do not diminish the value of supplemental feeding during severe winters, particularly where weather conditions have previously contributed to significant losses. If only a few birds survived as a result of winter feeding, this alone

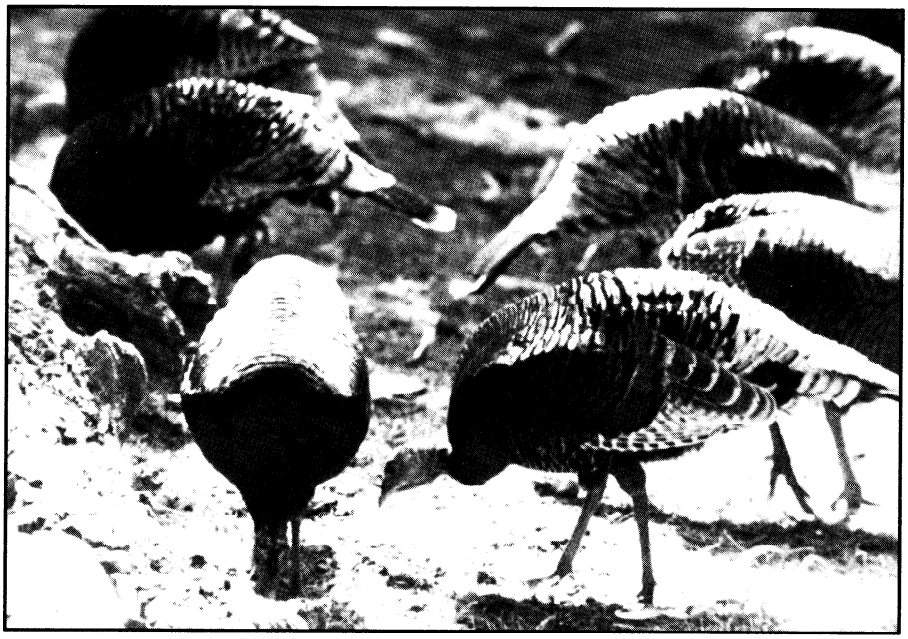


Fig. 10. Supplemental feeding often creates more problems than it solves and should be done only in emergency situations.

would avoid the high costs of transplants to repopulate the area. When winter feeding is considered necessary, it should be done in remote areas away from human residences. Birds should be scattered as much as possible by providing several small bait stations rather than feeding at a single site. Feeding sites should be selected with adequate roosting and escape cover nearby. Commercially prepared poultry feeds, although more expensive, may provide a better diet than corn or other grains. Turkeys should be weaned from supplemental foods as soon as conditions permit.

Unintentional feeding may occur where turkeys visit barnyards or feed lots. Operators of these facilities should be encouraged not to provide additional food for turkeys. They should be informed that feeding wild turkeys could lead to unnaturally high concentrations, disease, and game damage. If they insist on feeding, suggest planting food plots as an alternative.

HABITAT MANAGEMENT

Merriam's wild turkeys require a diversified landscape to meet their basic needs. Habitat management for Merriam's wild turkeys must involve (1) preservation of existing habitats, including maintaining diversity and protecting corridors and buffer zones to prevent habitat isolation, and (2) careful manipulation of habitats to enhance carrying capacity.

Integrating turkey habitat management with other land uses begins with standard resource inventories. Basal area (BA), tree diameter at breast height ground cover density, and forest canopy cover, measurements originally developed for administration of logging and grazing, can be used to evaluate some aspects of turkey habitat. However, these measurements do not provide all of the necessary information. Horizontal cover, for example, is important in evaluating nesting and brood rearing habitat. Methods used to measure this characteristic include cover boards, height-density poles, wildlife silhouettes, distance at which a human is screened from view, and distance to the "solid forest wall". Some of these techniques are still developmental, and none is considered standard in range allotment or timber stand analysis.

The habitat guidelines that follow are presented foremost as broad prescriptions designed to meet the basic needs of Merriam's wild turkeys in Western forests. The habitat components are listed as separate entities, but must occur in proper juxtaposition to each other to provide the annual requirements of turkeys. Guidelines oriented towards improving nesting, brood-rearing, roosting, and wintering habitats are given for resource managers that have the opportunity to improve specific components of turkey habitat. Because studies have yielded some disparities in descriptions of certain habitats, managers must be aware of regional differences when applying the guidelines to their locality.

BREEDING

Males will strut almost anywhere if sexually aroused, but prefer to display in small openings, edges of large openings, or beneath forested habitats with

an open understory. Merriam's turkeys breed in habitats used during summer and winter (Fig. 11). Providing feeding areas and escape cover throughout summer and winter ranges should assure suitable habitat for breeding.

NESTING

Nest site characteristics are fairly consistent across the range of Merriam's wild turkeys. Studies have shown an affinity for slopes greater than 30%. Aspect is not important if suitable cover is present. Overstory canopy cover within 4 feet above the nest usually exceeds 80%. This cover may be vegetation, rock ledges, or slash. Nests located in forested habitats tend to be within stands with greater than 60% overstory canopy cover. One side of the nest will be relatively open to provide access and escape. Another side will be positioned against a "guard object" such as a tree trunk, rock, log, shrub clump, or thicket of young trees (Fig. 12). The remaining sides will be concealed by herbaceous vegetation, rocks, branches, or slash to a height of about 18 inches. Horizontal cover is likely to be dense within a 5-7 foot radius of the nest. Later in the nesting season, hens may renest in tall (> 18 in.) herbaceous cover, if available.

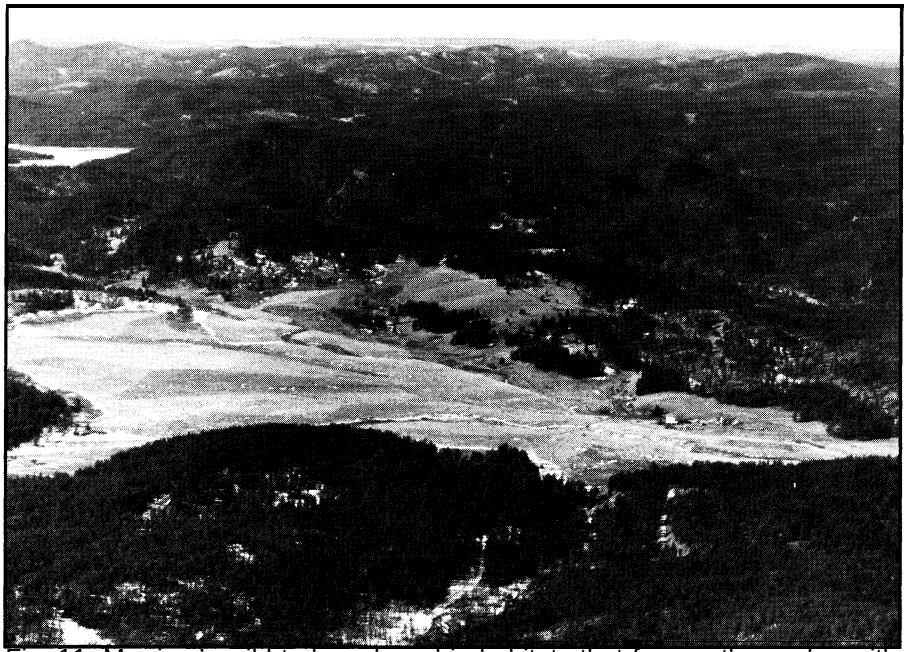


Fig. 11. Merriam's wild turkeys breed in habitats that frequently overlap with summer and winter ranges.

BROOD REARING

Areas frequented by broods include openings (natural or created), riparian areas, springs and seeps, burns, aspen stands, and flood plains. Natural openings with abundant herbaceous vegetation adjacent to forested cover provide the best habitat for broods. Mid-day loafing sites and roosting areas must be located nearby. The value of the opening as brood habitat is related to invertebrate abundance, which in turn is related to herbaceous productivity. Furthermore, the size and amount of opening used is related to the height of the vegetation within the opening and juxtaposition of other habitat types that serve as escape cover. For small poults, forested overhead cover or shrub thickets are essential within 35 feet of openings for protection from raptors. Turkeys can use more of large openings if shrub thickets or small patches of trees are interspersed through the open area or if herbaceous vegetation exceeds 15 inches in height (Fig. 13). Without this cover, use may be restricted to the edges.

Loafing sites usually occur in the adjacent forest within 50-60 feet of openings. Loafing sites are characterized by a dense overstory, an open understory with good visibility, and the presence of fallen snags, logs, large diameter slash, and/or low rock outcrops that are used as perches. Management to provide slash and downed logs for loafing is considered important in drier habitats where ground cover within the forest canopy is limited.

ROOSTING

Winter roost sites are used traditionally and often communally by several flocks. Concentrations of 100 or more birds of both sexes may jointly use the same winter roosting site. Summer roosts are used by smaller flocks comprised of hens with poults, broodless hens, or males. As a result, summer roost sites have fewer trees and encompass a smaller area than winter roost sites. Summer roosts may be used for several days in succession by the same flock or used repeatedly by different flocks. Traditional use is rare unless suitable roost sites are limited.

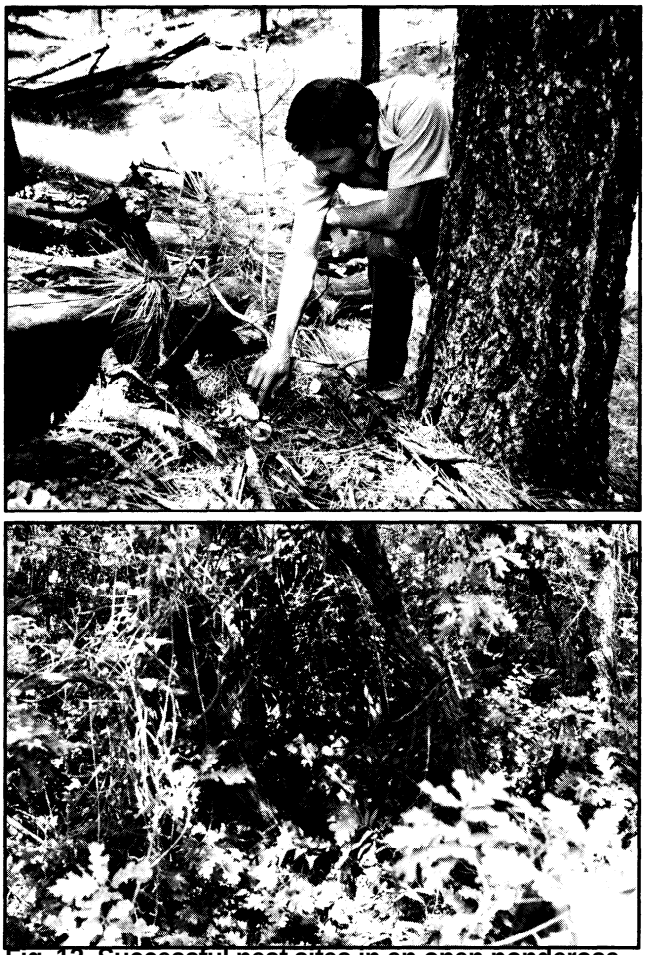


Fig. 12. Successful nest sites in an open ponderosa pine type (top) and oak thicket (bottom).

Ponderosa pine is the most common tree species used for roosting. Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), limber pine (*Pinus* flexilis), western white pine (*Pinus monticola*), cottonwoods, large oaks, and pinyon pine also may be used. Roost sites are frequently on ridges or near the top of slopes and include an average of 5-13 roost trees/site. Multistory stands containing dominant trees with layered, open, horizontal branches spaced at least 24 inches apart are preferred (Fig. 14). The range of acceptable tree sizes (DBH) varies and may be a function of growth rates; i.e., faster growing trees presumably have adequate limb spacing at a younger age. Otherwise, trees must go through natural pruning processes before the proper limb configurations are available. Winter roost trees in Arizona averaged 25 inches DBH, with 85% greater than 20 inches DBH. Summer roosts averaged over 16 inches DBH. In South Dakota, where precipitation patterns are conducive to faster growth rates, trees as small as 9 inches DBH ($\bar{x}$ = 14 in.) were used during both seasons.

WINTER

Because winter food availability varies both within and between years, turkeys must have a diversity of habitat types across several stocking densities from which to search for food (Fig. 15). Habitat use patterns change in accordance with food availability. Dense stands of ponderosa pine and oak on southerly exposures are used in years of good seed or acorn production. Use shifts to openings or forested stands with open canopies in years of poor mast production. Pinyon-juniper stands bordering or mixed with ponderosa pine provide a consistent source of grasses, seeds, and berries, and are used by turkeys in the Southwest during most winters. Pinyon-juniper habitats below the ponderosa pine zone become increasingly important to turkeys in years of deep, persistent snow cover. Use of this habitat depends upon the presence of ponderosa pine

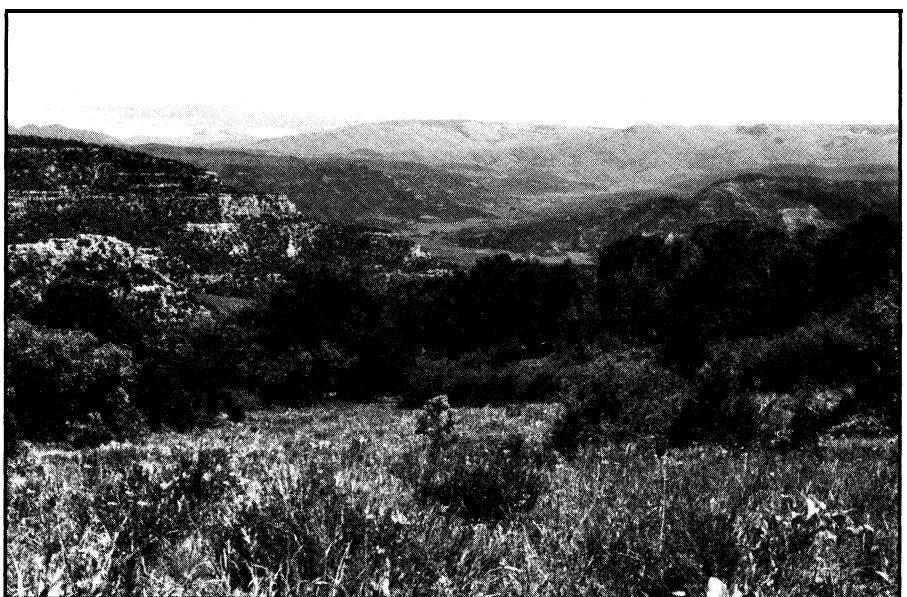


Fig. 13. Shrub thickets extending into openings provide escape cover and allow turkeys to use more of the opening.

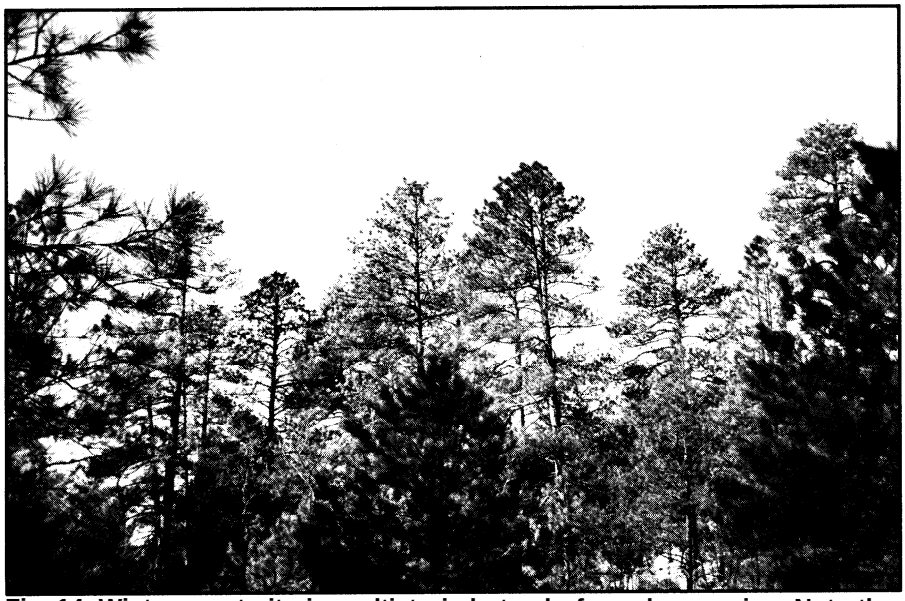


Fig. 14. Winter roost site in multistoried stand of ponderosa pine. Note the widely-spaced horizontal branches of the mature trees.

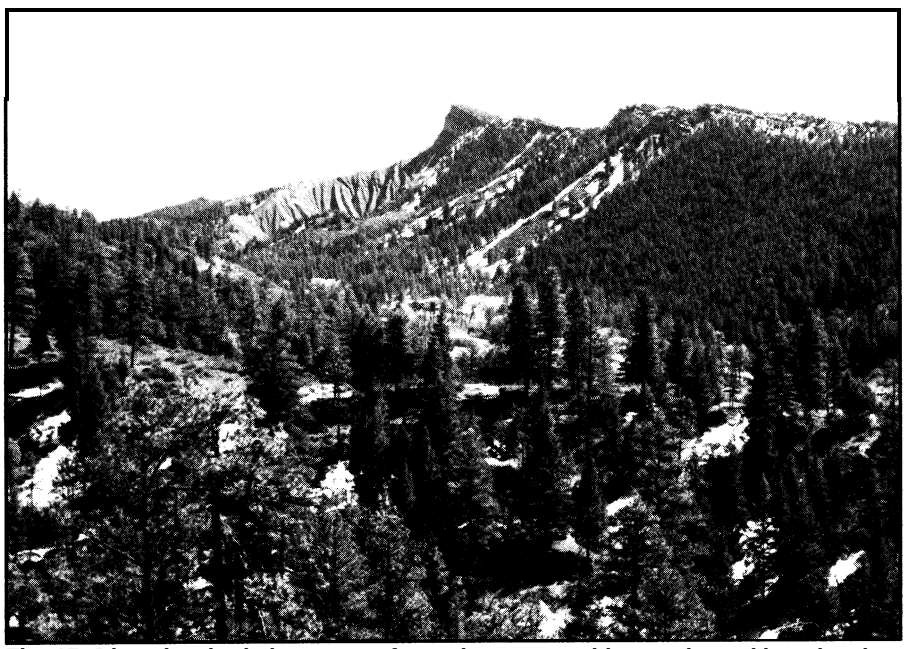


Fig. 15. Diversity, both in terms of species composition and stocking density, is a critical component of winter habitat.

stringers that serve as roosting habitat. Deep snow or lack of diversity on winter ranges may force turkeys into riparian habitats below the coniferous zone where they frequently become dependent on humans for food.

HABITAT MANAGEMENT GUIDELINES

Openings. **--** This habitat component is an important source of invertebrates, which are critical to the proper growth and development of poults. Adult turkeys also will use this habitat for feeding year-round and for breeding during spring. Openings are especially important if adequate forage does not exist under the forest canopy or in the absence of good mast production. The value of openings to turkeys is directly related to the herbaceous biomass within the opening.

1. Forested areas should be managed so that 10-25% of the area is in natural or created openings (Fig. 16). Several small openings (2-5 a.) scattered within the forest will provide more usable habitat than one large opening. However, all openings should be considered important turkey habitat, regardless of size or origin.

2. Created openings should be located in mesic or alluvial sites because these sites are more productive. Long, narrow openings with an irregular edge and not exceeding 240 feet in width are recommended. Shrub thickets or tree clumps should be maintained within openings larger than 10 acres if these configuration requirements cannot be achieved. Trees encroaching into small openings and natural meadows should be removed. Likewise, slash should be removed from created openings to promote growth of herbaceous vegetation. Seed mixtures for created openings should consist of native grasses (50%) and forbs with emphasis toward large seeded grasses and legumes. Disturbance-tillage can be used in portions 20%) of the opening to promote annual forbs.

3. Herbaceous vegetative cover within the opening should exceed 70%. Management should ensure at least 800 pounds/acre of standing herbaceous biomass at an absolute minimum height of 10 inches (15 in. should be the goal) to provide suitable cover and food for poults (Fig. 17, also Fig. 13). If the biomass goal cannot be achieved due to site potential, the height goal should take priority.

4. Escape cover adjoining openings should consist of shrub thickets and tree stands exceeding 100 feet^2/acre BA for at least 300 feet from the edge. Logs and large, downed woody material beneath the forest canopy within 50-60 feet of openings should be retained for potential loafing sites.

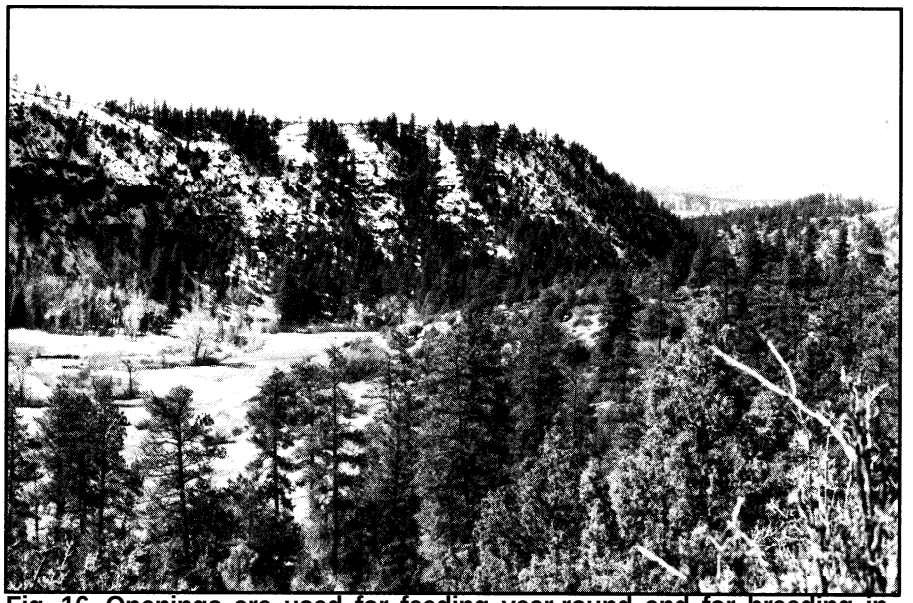


Fig. 16. Openings are used for feeding year-round and for breeding in spring, and should comprise 10-25% of the available habitat.

Fig. 17. At least 800 pounds/acre of standing herbaceous biomass of an absolute minimum height of 10 inches should be maintained within openings to provide suitable cover and food for poults. The dense oak-thicket adjacent to the opening is ideal escape cover.

Forested Stands. -- These habitats are divided into slopes greater than 30% and those less than 30% because turkeys show a preference for nesting and roosting on slopes greater than 30%. However, turkeys will roost and nest on more gentle slopes, so these areas should not be ignored in developing management plans. The distinction is made to help managers decide where to direct projects to best benefit turkeys and where to avoid projects with negative consequences. Guidelines that cross forest types are presented first followed by guidelines specific to certain forest types. The same basic guidelines apply for both slope categories, with additional recommendations given for managing slopes greater than 30%. These guidelines also are applicable to forest stands surrounding openings unless otherwise stated.

1. Slopes

   a. Forest management activities such as logging, thinning, and prescribed fire should

be restricted during the nesting season (1 Apr to 1 Jul). Overstory canopy cover should be maintained at > 60%. Limit timber harvest to no more than 10% of the area at one time. Reentry should not occur until the treated stand has an average DBH of 12 inches and BA of 100 feet^2/acre.

b. Leave 5-6 tons/acre of logging slash (2-3 tons/acre >3 in. in diameter) in patchy distributions with occasional patches 10-12 feet in diameter that approach 10 tons/acre. Do not pile the slash. Smaller slash should be loosely scattered. Large (> 12 in.) culls should be left in place with branches intact (Fig. 18).

2. All slopes

a. The management goal should be to maximize within and between stand diversity. Toward this goal, maintain an equitable distribution of habitats across basal areas and DBH categories from openings to > 130 feet^2/acre BA and sapling to mature size timber. Adjacent stands should differ by at least 30 feet^2/acre BA and/or 4 inches DBH.

b. Uneven-aged management is recommended. For stands under even-aged management, the maximum stand size should be < 20 acres.

c. Protect all deciduous tree regeneration and shrub thickets occurring in the understory and retain 7-10 patches (≤ 1/10 a.) of coniferous tree regeneration per square mile.

d. Maintain 2-6 roost sites per square mile (see roost site guidelines).

Fig. 18. Created opening in a mixed conifer habitat with scattered slash and large culls left in place to serve as possible nesting sites.

3. Ponderosa pine habitats. -- Manage for 20% of the area in openings, 25% in stands > 100 feet^2/acre BA of which 15% should be > 130 feet^2/acre, 20% at 80-100 feet^2/acre BA, and 35% at 50-80 feet^2/acre BA. Forested stands < 100 feet^2/acre should be located at least 300 feet from any openings (see guidelines for forested stands adjacent to openings). These are goals; do not discount the habitat for turkeys if environmental conditions preclude high basal areas.

4. Oak habitats. -- Oaks growing in the arborescent form should be maintained in a patchy distribution at > 35 feet^2/acre BA. Conifer stands adjacent to oak stands should be > 80 feet^2/acre BA. Protect all mature oaks because of their potential to produce acorns. In addition, oak thickets growing in the shrub form beneath the forest canopy and adjacent to openings should be protected because of their value as nesting and escape cover, and as potential sources of mast (Fig. 17). Penalties for damage to oak trees during timber harvest activities should be implemented.

5. Mixed conifer habitats. -- Emphasis should be placed on uneven-aged management strategies that increase habitat diversity and patchiness. Basal area distributions of 10-25% in scattered, small openings (< 2 a.), 20% > 120 feet^2/acre BA, 35% 90-120 feet^2/acre BA, and 20% 65-90 feet^2/acre BA are recommended.

6. Pinyon-juniper habitats. -- Management should be directed at maintaining mature stands with varying degrees of canopy closure. Mature stands with canopy closures

40% furnish seeds and berries and provide cover. Stands with < 40% canopy closure contain more understory vegetation that adds to the forage base. Grasses, forbs, and shrubs are virtually absent in stands with > 70% canopy closure because of competition for soil moisture and sunlight, and accumulation of litter containing growth inhibiting compounds. Efforts to control juniper should be restricted to widths c 200 yards. Pinyon and junipers are slow growing trees with closely spaced branches. They rarely attain heights over 30 feet or diameters greater than 20 inches. These growth characteristics limit their use as roost trees. Thus, the best pinyon-juniper stands for turkeys are those adjacent to or mixed with ponderosa pine or cottonwood riparian communities (Fig. 19)

Ponderosa pine stringers extending into pinyon-juniper habitats allow more of this habitat to be used by turkeys. This is extremely important during severe winters. Isolation of the pine stringer from surrounding pinyon-juniper habitats will make it unsuitable for turkeys. Under no circumstances should these pine stringers be harvested. If advanced regeneration of ponderosa pine (10-in. trees at 80 Growing Stock Levels) cannot be demonstrated, it may be necessary to plant ponderosa pine to ensure these habitats are available in the future.

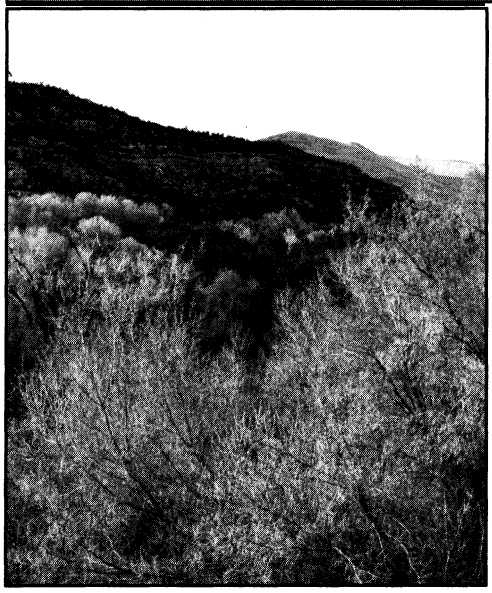


Fig. 19. Pinyon-juniper habitats are used by Merriam's wild turkeys during winter and occasionally year-round. These habitats provide critical feeding areas during severe winters. Turkeys have been observed roosting in large pinyon pines, but consistent use of the pinyon-juniper type is dependent upon the proximity of taller trees, such as ponderosa pine or cottonwoods.

Roosting Habitats. -- This habitat component is important year-round. Lack of roost sites will render otherwise suitable habitats useless. The focus of roost site management is recognition of the structural characteristics of roost trees and roost sites (Fig. 20).

1. Manage for roost sites rather than individual roost trees. Ideally, roost sites should be located on easterly aspects on the upper

Fig. 20. Manage for roost sites, not individual roost trees, and avoid isolating roost sites from other habitat components.

of slopes, encompass at least 1/4 acre, exceed 80 feet^2/acre BA, and include at least 5 mature trees with a minimum DBH of 20 inches in the southwest and 12 inches in northern ranges.

2. Trees with layered horizontal branches spaced at 2-3 feet intervals will allow turkeys easy access into the tree. There should be an unobstructed flight path into and out of the tree from the uphill side.

3. Known roost sites should be protected from timber harvest by a buffer zone of 2 chains (132 ft) surrounding the outer most trees. Travel corridors must be maintained to roost sites. Corridors should be no less than 100 yards wide and 80 feet^2/acre BA, and no more than 150 yards long.

4. Management should stress protection of current roost sites and establishment of 2-6 potential roost sites per square mile, preferably within 1/4-1/2 mile of existing roosts. All trees within the roost site should be protected regardless of size.

5. Although site characteristics are lacking for roosts dominated by tree species other than conifers, the above guidelines should apply.

Water Developments. -- Turkeys obtain water directly from natural and artificial sources such as streams, ponds, springs, seeps, puddles, and impoundments, and indirectly from succulent vegetation and insects they consume. Dew on vegetation, and snow serve as additional sources of water. Free standing water is probably essential during warm and dry periods. The source of this water is not as important as its availability. Good turkey management involves development and protection of water sources and associated plant communities.

1. Free-standing water should be available on every square mile to ensure utilization of all suitable habitats.

2. Developed water sources should be fenced to limit use by livestock, and include ground level access, escape cover within 100 feet, and travel corridors to the water source with features similar to those described for roost sites.

3. Water impoundments for livestock should be fenced and the water piped to tanks 50-100 yards away. Escape cover should be available within 100 feet of the impoundment.

Grazing Management. -- Moderate grazing may stimulate new herbaceous growth. However, continuous, intensive grazing depletes food supplies and reduces the cover component provided by herbaceous vegetation (Fig. 21). Proper grazing management is imperative to maintaining turkey habitat.

Rest-rotation grazing systems are recommended. Entry into the previously rested pasture should be delayed until 15 July. Stocking rates should be adjusted to reflect the percent of allotment being rested. Modifications to allow use of rested pastures during drought years should be prohibited. Considering the attractiveness of openings and riparian areas to livestock, it may be difficult if not impossible to adequately protect these sites without fencing. Utilization of herbaceous vegetation should not exceed 50%. Guidelines for management of openings should be considered.

Fig. 21. When use of herbaceous vegetation by herbivores exceeds 50% or when intensively grazed habitats are not periodically rested, their value as turkey habitat greatly diminishes.

Roads.--Roads are vectors for people to access forested lands. Some roads are necessary, but high road densities and frequent use by people can cause turkeys to abandon some habitats (Fig. 22). Roads should be eliminated from meadows where possible, If a closure is not possible, divert the road 200-300 feet into the adjacent forest. Avoid placing roads along the edge of openings. Restrict off-road vehicle use to specific areas, preferably away from openings. Unnecessary existing roads, skid trails, and log landings should be closed to vehicle use. They can be disturbance-tilled and seeded with native species comprised of 50% large seeded grasses and 50% forbs of which 20% should be legumes. New road construction should avoid slopes steeper than 30% particularly in regions where nesting habitat might be limited. Divert new roads away from known roost sites and areas that have been identified as potential roost sites. If possible, close existing roads that bisect traditional roost sites. This may require winter closure only.

Recreational Development.--Placement of recreational developments near openings, an areas, roosting sites, or other key habitats should be avoided. This creates situations where harassment and eventual loss of habitat capability may occur.

Fig. 22. Road closures may be permanent where access is no longer needed or seasonal, such as only during winter to avoid disturbance in critical roosting or feeding areas.

RESEARCH NEEDS

Research should be coordinated among states and between state and federal agencies to avoid duplication of efforts. Cooperative studies are needed to assess factors affecting populations across the variety of habitats and climatic regimes inhabited by Merriam's wild turkeys. To date, research has focused on conspicuous behaviors, such as roosting, nesting, and brood rearing, and the habitats associated with these behaviors. Fall, winter, and transitional ranges have received less attention, and year-round needs of adult males and summer habitat use by broodless hens have been virtually ignored.

Past studies have taught us much about the basic life history of Merriam's wild turkeys, which in turn has generated additional questions. We lack sufficient knowledge about seasonal food habits, including availability of supplemental foods in relation to energy balance, productivity ofyearling hens, and over-winter mortality. Minimum viable population size and genetic diversity as they relate to habitat fragmentation and introductions are poorly understood. Census and classification techniques, along with certain measurements of habitat characteristics (e.g., horizontal cover), require further testing, refinement, and standardization. Questions remain about the implications of mycoplasmosis in wild, free-ranging turkeys. The issue of fall hunting and its effect on females and subsequent loss of reproductive potential still needs to be addressed. These and many other information gaps indicate the need for continued research to improve upon and add to the guidelines set forth in this document.

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