DRAFT

Mountain Quail Status Report:

A Preliminary Document to a Conservation Assessment for Mountain Quail

Prepared for:
Eastside Ecosystem Management Project
112 East Poplar Street
Walla Walla, Washington 99362

Prepared by:
Christine A. Vogel
Research Associate
&
Kerry P. Reese
Associate Professor of Wildlife
Department of Fish & Wildlife Resources
University of Idaho
Moscow, Idaho 83844

January 16, 1995

Table of Contents

Executive Summary

Mountain quail (*Oreortyx pictus*) were historically found throughout the western United States (U. S.) in western Oregon and southern Washington, to *central* Idaho then south through the mountains of California and northern and western Nevada. During the past several decades, mountain quail populations have been declining and their distribution has been shrinking throughout their range except in California. The purpose of this repoa is to present current knowledge on mountain quail natural history within the Columbia River Basin (Idaho, Nevada, Oregon, and Washington). This report addresses the current status. habitat, population parameters, and potential threats to the species. It is a preliminary report designed to meet the immediate needs of the Eastside Ecosystem Strategy Project and will be further developed into a conservation assessment for mountain quail.

Introduction

Although the mountain quail (*Oreortyx pictus*) is the largest quail in North America, its secretive behavior and use of dense, rugged habitat make it a difficult species to study. Over 100 years ago, Henshaw (1874) reported that the mountain quail "is a wild, timid bird. haunting the thick chaparral-thickets, and rarely coming into the opening." When pursued, this quail generally will not flush but will run deeper into thick shrub cover, making observations difficult. Mountain quail exist in low population densities (Gutierrez 1975) and many populations complete an altitudinal migration in the spring and fall of each year, further compounding efforts to study this elusive bird. Although over 350 citations refer to this species, most of these accounts are anecdotal and do not contain significant information about the status, habitat, ecological requirements, or occurrence of mountain quail. As a result, less is known about the mountain quail's basic life history and ecology than any other species of upland game bird in the U. S. (Grinnell et al. 1918, Bent 1963, Gutierrez 1975.1977. Brennan 1989.1990).

The purpose of this report is to meet the immediate needs of the Eastside Ecosystem Strategy Project by compiling information on mountain quail within the Columbia River Basin (CRB). In 1995, a Conservation Assessment and Strategies document will be completed and wiil contain more extensive information on other aspects of the bird's natural history and cover a broader geographic range. This report focuses on the status, habitat, population parameters, and potential threats of mountain quail in Idaho, Nevada, Oregon and Washington.

Status of the Species

General Description of Status

In response to declining populations of mountain quail. the U.S. Department of the Interior (1990) listed the mountain quail as a category 2 candidate species under the Endangered Species Act, emphasizing the need to gain further knowledge about this species as well as to identify remaining populations and suitable habitats. Because little new information has become available in the last few years. the bird was reclassified as a category 3 species by the U. S. Department of the Interior in 1994 (Reference ***). See Appendix X for current and historical range of mountain quail in each state.

Include status in each state whether hunted, sensitive, etc. ***.

Idaho Populations. In Idaho. mountain quail occur at the extreme eastern edge of the species' distribution in the U. S. and have been declining over the past several decades. According to Murray (1938), drought and habitat alterations reduced quail numbers by more than 50% in western Idaho, while suitable food and cover were reduced by more than 50% since 1908. In 1951, mountain quail were not abundant but did occur along riparian draws in central and southwestern areas of Idaho; however, numbers had been declining in Nez Perce and Latah Counties since the 1930's (Idaho Department of Fish & Game Commission 195 1). Brennan (1994:page 44) stated that "surveys and hunter bag returns during the past 50 years indicate that mountain quail populations have experienced a series of local extinctions across broad areas (several thousand km^2) in Idaho and Nevada." By 1990, areas which historically produced coveys had not produced birds since 1985 (Brennan 1990). In 1985, the Idaho Department of Fish & Game (IDFG) nongame management plan classified the mountain quail as a species of special concern, with "restricted ranges, specific habitat requirements, or low numbers which may make them vulnerable to elimination from the state" (Morache et al. 1985:page 22). Currently,

there are only 3 populations of mountain quail remaining in Idaho; 2 separate populations in north-central Idaho and one population in southern Idaho (Brennan 1990). (Brennan may have said this but is it the correct way to think of the birds - What does Robertson 1989 say ?... ***)

Nevada Populations. In the 1920's, this bird was common on both slopes of the Sierra Nevada, migrating to lower elevation areas in the winter (Grinnell and Storer 1924). Linsdale (1936) reported that the mountain quail was a sparse resident in the mountainous areas of western Nevada and present only above 5,000 feet. A study by Gullion and Christenson (1957) showed a scattered, sparse distribution of mountain quail in northern and western Nevada. More here . . . ***

Oregon Populations. Crawford (1980) repotted that mountain quail were distributed statewide but their abundance in western Oregon was highly variable; some areas contain high numbers of birds while other areas contain low numbers. Current populations of mountain quail in western Oregon appear stable and may even be expanding in some areas west of the Cascades (Brennan 1990). Sumner and Dixon (1953:page 55) suggested that the species occupies more extensive areas than earlier in the century, primarily because "they appear to thrive best in the open burns and logged-over areas that have replaced enormous areas of the original dense forest of the Pacific Northwest." Recently logged areas in the Cascades, Coast Range, and Klamath Mountains provide excellent shrub habitat for mountain quail and may have allowed some populations on the west slope of the Cascades to expand their range (Brennan 1990). In contrast, populations in eastern Oregon occupy riparian shrub habitats that have declined drastically from historic levels (Brennan 1990, Murray 1938, Ormiston 1966). Due to this reduction in habitat and in light of declines in similar areas in eastern Washington, eastern Oregon populations haveprobably declined from historic levels.

3

Washington Populations. In Washington. mountain quail were historically present east and west of the Cascades and in the Blue Mountains in the southeastern

portion of the state (Jewett et al. 1953). Due to similarities in habitat and logging practices. populations in western Washington have probably mimicked trends in western Oregon populations. In recent years, the Washington Department of Wildlife (WDW 1993) has confirmed more than 40 mountain quail sightings in the western portion of the state. However, they reported that populations east of the Cascades have "drastically declined in recent years" (WDW 1993:page 4). Prior to 1983, regular sightings were reported for mountain quail in eastern Washington but the number of sightings has decreased and few reports have been confirmed since 1988 (WDW 1993).

Availability of Suitable Habitat

Throughout western Oregon and Washington, mountain quail often inhabit early successional stages which follow burning or logging activity (Brennan 1990, Crawford 1980, Johnsgard 1973, and others). Due to recent and widespread logging in both the Coast and Cascade ranges, this available habitat has increased from historic levels (Brennan 1990, Sumner and Dixon 1953). In contrast, along the eastern portion of its range (western Idaho, southeastern Washington, eastern Oregon, northern Nevada), mountain quail distribution is closely associated with riparian shrub habitats (Ormiston 1966, Brennan 1989). Due to a combination of overgrazing, water impoundments, residential developments, agricultural practices and other human activities, available riparian habitat has drastically declined (Murray 1938, Brennan 1990). Although available mountain quail habitat has been contracting in the eastern portion of its range, quantitative surveys using a habitat model developed in California indicate that the remaining suitable habitat in western Idaho, eastern Oregon, and southeastern Washington is of above average quality (Brennan 1989).

Available Habitat in Idaho. In western Idaho, mountain quail are generally restricted to riparian corridors along waterways and secondary drainages within a few hundred meters of water (Breman 1989). In 1978, the IDFG reported a total of 3 1,455

acres (12,735 hectares) of this riparian habitat available for mountain quail in Idaho: land holdings included 4.7 11 acres (1,907 hectares) by the Bureau of Land Management, 26.520 acres (10,737 hectares) by the US. Forest Service, 4 acres (I .6 hectares) by the State of Idaho, and 220 acres (89 hectares) by private entities (IDFG 1978). To escape from harsh winter. weather and snow, mountain quail require shrub habitat at lower elevations. At present, adequate winter habitat is restricted to the Salmon River drainage near the confluence of the Salmon and Little Salmon Rivers in northwestern Idaho (Brennan 1990). This drainage is free of impoundments, agricultural activity is limited. and the area experiences the mildest winters in the state (Brennan 1990).

Available Habitat in Nevada. ***

Available Habitat in Oregon and Washington. As mentioned above, early successional stages that result from burning or logging provide excellent habitat for mountain quail in western Oregon and Washington. Recent logging activities throughout the Coast and Cascade Ranges as well as the Klamath Mountains, have resulted in an increase in available habitat for mountain quail in these areas (Brennan 1990). Estimates for remaining habitat in eastern Oregon and Washington are lacking; however, the habitat

in this region is similar to that found in western Idaho and is probably experiencing similar declines.

Apparent Indicators of Health

A healthy population is one that can reproduce viable offspring; experiences adequate survival rates to ensure future reproduction; is not grossly decimated by disease. parasites, or predators; is not experiencing a long-term decline in numbers; is not highly fragmented; and is present in the numbers expected for the quality/quantity of habitat available. Little information is available on offspring viability, survival or mortality rates. or specific population estimates for mountain quail populations within the CRB. However, some studies have been conducted in California that produced density estimates for healthy mountain quail populations; please see "Population Size & Density" below for further information about these studies.

Habitat

Description of habitat

At the ecosystem level, mountain quail inhabit the Canadian and Transition Life Zones composed of coniferous and deciduous forests with a mixed shrub understory. The Canadian Zone is the forested zone of higher elevations dominated by lodgepole pine (*Pinus contorta*), whitebark pine (*Pinus albicaulis*), foxtail pine (*Pinus balfouriana*), Douglas *fir* (*Pseudotsuga menziesii*), mountain hemlock *(Tsuga mcrtensiana),* and aspen (*Populus tremuloides*) *(Sumner* and Dixon 1953). The Transition Zone is composed of the lower-elevation foothills and upper-elevation valleys where average annual temperatures and winter snows are moderate. Characteristic species include ponderosa pine (*Pinus ponderosa*), Douglas fir, incense cedar (*Calocedrus decurrens*), and sugar

pine (*Pinus lambertiana*), while drier south-facing slopes are covered with sagebrush (*Artemisia* spp.) or black *oak (Quercus kelloggii*) (Sumner and Dixon 1953). Appendix A contains a list of common trees and shrubs found in mountain quail habitats throughout their range.

At the macrohabitat level, mountain quail inhabit different types of plant communities in the western and eastern segments of their range. In western portions of their range, this quail can be found in the continuous hardwood, hardwood-coniferous. and coniferous-chaparral vegetation communities with a shrub understory (Johnsgard 1973, Leopold et al. 198 1). In this area a "mixed ever-en forest is clearly the primary habitat of the mountain quail with the chaparral the second most important" (Gutierrez 1980:page 75). In the eastern portion of their range, mountain quail are found in narrow corridors of riparian shrub communities which may or may not have an open coniferous forest overstory (Ormiston 1966, Brennan 1989). As a result, the habitats frequented by this quail in eastern portions of its range differ greatly from those inhabited in western portions (Ormiston 1966).

At the microhabitat level, Edminster (1954) found that mountain quail use shrub cover that shades 1/4 - 1/2 of the ground for nesting and brood rearing. An open forest with a shrub understory may be the most desirable composition because the resuiting shrub layer is more open and allows the quail to move through the habitat more easily (Johnsgard 1973). Brennan et al. (1987:page 72) concluded that "mountain quail were consistently associated with a microhabitat configuration that consists of tall and dense shrubs which are in close proximity to drinking water and escape cover." In their study, habitat plots centered at quail use sites had an average distance to free water and to escape cover of 13 1 meters and 0.8 meters respectively, an average maximum shrub height of 3 meters, and a percent shrub canopy cover (perennial shrubs) of 46% (Brennan et al. 1987). In a California study, Gutierrez (1977:page 39) found that this quail uses "areas of high tree crown coverage, abundant shrubs, steep slopes, and are found inside the forest

canopy." The average values for four habitat characteristics measured in this study are as follows: 64% crown cover, 36% ground cover, 28° slope, and 58% herbaceous cover.

Open habitats such as annual grasslands. lava reefs, and talus slopes are infrequently used by this species (Gutierrez 1977, Brennan et al. 1987). Gutierrez (1977:page 41) stated that "'mountain quail have a strong behavioral avoidance of open ground' such as annual grassland. and will avoid crossing such habitat types. In a California study, Gutierrez (1980) classified 1,049 mountain quail sightings; of this total, 0 sightings were associated with grassland plant communities.

Idaho Habitat. In Idaho, mountain quail distribution is closely tied to riparian shrub communities which may or may not have a forest canopy (Ormiston 1966, Brennan 1989). Because these plant communities are dependent upon water, habitat is confined to corridors of vegetation along breaks and secondary drainages of the Snake. Salmon and Cleatwater Rivers (Ormiston 1966), often within a few hundred meters of water (Brennan 1989). Remaining habitat covers steep, dissected slopes with ridges, gulches, and outcrops of basalt. South-facing slopes are arid and dominated by perennial grasses such as bluebunch wheatgrass *(Agropyron spicatum)* and Idaho fescue *(Festuca idahoensis)*, together with several forb species. In draws and on north-facing slopes, serviceberry (*Amelanchier alnifolia*), hawthorn *(Crataegus douglasii)*, ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpos albus*), and wild rose *(Rosa* spp.) are common. Moist sites support species such as elderberry (*Sambucus* spp.). alder *(Alms* spp.), red-osier dogwood (*Cornus stolonifera*), *and* cottonwood (*Populus* spp.) *while* higher elevation sites contain ponderosa pine and Douglas-fir.

Nevada Habitat. Remaining populations of mountain quail in the Sierra Nevada range breed in the mixed conifer forest and winter at lower elevations in the montane chaparral (Leopold et al. 1981). Forest habitats in this region are dominated by ponderosa pine. Douglas fir, sugar pine. and incense cedar subdominant trees include black oak. Oregon white oak (*Quercus garryana*), and canyon live oak (Q. *chrysolepis*) (Barbour et

al. 1987). A mixed shrub understory is composed of snowberry, oceanspray (*Holodiscus discolor*), mountain misery (*Chamaebatia* spp.), wild rose, and others. During the fall, mountain quail migrate to the lower elevations and winter in the montane chaparral habitat (Grinnell and Storer 1924. Johnsgard 1973) (which is composed of what species? ***) .

Western Oregon & Washington Habitat. West of the Cascade Range, mountain quail frequent upper elevation coniferous forests and forested draws to breed. and lower elevation valleys and sagebrush habitats during winter months (Crawford 1980). This quail inhabits "regenerating clear-cut areas, ranging from shrub stages through the time when the young coniferous trees are 5 to 10 meters in height" (Crawford 1980:page 5). It also frequents clearing edges, brushy foothills, and burns (Gabrieison and Jewett 1940, Jewett et al. 1953, Masson and Mace 1970). Eiiarsen (1955) found that the species does well in these recently burned or logged areas and then declines to only a remnant species as succession occurs. Dominant tree species common to this region include Douglas fir. western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), and western red cedar (*Thuja plicata*); subdominant species include ponderosa pine, lodgepole pine, and western larch (*Larix occidentalis*) (Barbour *et* al. 1987). Common shrub species include ***. . .

Eastern Oregon & Washington Habitat. *East* of the Cascade range, mountain quaii inhabit shrub steppe plant communities composed of bunchgrasses and cold desert shrubs. Kessler (1990) stated that aspen stands in steep draws provided good habitat, and Masson and Mace (1970:page 14) write that "brushy draws and creek bottoms along foothills are favorite haunts east of the Cascades." In this region. shrub steppe dominants include several species of sagebrush with subdominant shrubs of shadscale (*Atriplex confertifolia*), winterfat (*Ceratoides lanata*), spiny hopsage (*Grayia spinosa*), and Mormon tea (*Ephedra* spp.) (Barbour et al. 1987). Perennial bunchgrasses and a variety of seasonal forbs are scattered among the shrub species.

trails (Dawson 1923, Bent 1963, Leopold et al. 1981, Erlich et al. 1988, and others). Belding (1903:page 18) observed that when mountain quail migrate "they do not seek cover for protection, but follow a wagon road. railroad, travel in snow sheds. pass near dwellings, and seem to care but little for self-preservation."

Specialization

Within the basic habitat and ecological requirements included in other sections of this report, mountain quail do not appear to have rigid biotic or abiotic requirements. They do not need cavities, burrows, snags, or specialized food sources and nothing in the literature suggests that they require interspecific associations with any plant or animal. This species can inhabit a variety of dense habitats, consume a variety of foods, and exist in a range of conditions that do not indicate specialization.

Ecological Requirements

Foods habit studies show that mountain quail eat primarily vegetal matter while a small part of their diet is composed of animal matter. Judd (1905) analyzed the crop contents from 23 mountain quail collected in California and found 97% vegetable matter and 3% animal matter. Of the vegetable *matter,* 18% was grain, 46% seeds, 8% fruit, and 24% miscellaneous vegetation: animal matter included grasshoppers. beetles, centipedes, harvest spiders, and miscellaneous insects. Edminster (1954) found that mountain quail consume an average of 3 - 5% animal matter, but their diet can contain up to 10% insects in early fall. In his study, succulent greens made up 25 - 40% of the diet during winter and spring, while pine seeds and acorns were important foods in the fall; remaining foods included seeds, fruits, flowers, buds, and tubers. Ormiston (1966) studied the diet of birds collected from 2 study sites in Idaho and found that animal matter occurred in crops of most young birds and composed 6 - 8% of their diet; for all birds. animal food made up an average of 3 - 5%. Green foods composed 25 - 40% of the

winter and spring diet while the yearly average for leaves, flowers, and buds was 25% (Ormiston 1966). Yocum and Harris (1953) analyzed crops and gizzards from 33 mountain quail collected in southeastern Washington and identified 95 different food items. The majority of these items were plant foods with smooth sumac (*Rhus glabra*) forming 23% of the diet. Other studies have shown that in addition to seeds, fruits and other foods, pine seeds and acorns are an important food item during the fall (Belding 1892, Miller and Stebbins 1964, Ormiston 1966). Mountain quail also scratch for small tubers and roots which can make up 10% of the fall diet (Ormiston 1966). For a complete listing of mountain quail food plants, see Appendix B.

Slope. Mountain quail often use habitat on steep slopes and seem to prefer slopes that are 20% or steeper (Edminster 1954). Gutierrez (1980) identified steep slopes as an important characteristic that distinguishes mountain quail habitat from California quail (*Lophortyx californicus*) habitat. However, Brennan et al. (1987:page 72) stated that "topography alone probably has little value as a component of mountain quail habitat" in California. Their results suggest that other aspects of the habitat were more predictive of habitat use by this quail. Although slope may not be a requirement for mountain quail, these birds may use steep slopes to avoid or escape from predators by running uphill when pursued.

Altitude. Authors studying different populations of mountain quail give different elevation ranges for mountain quail habitat. In general, this species can be found from 2,000 - 10,000 feet (606 - 3,030 meters) elevation throughout its range, depending on local habitat and weather conditions (Anthony 1893, Dawson 1923, Grinnell and Miller 1944, Rue 1973, and others). Along the coast of Oregon and Washington, this quail may range down to sea level and up to 5,600 feet (1,697 meters) (Grinnell and Miller 1944). Edminster (1954) insisted that the best populations were found from 2,000 - 4,000 feet (606 - 1,212 meters) with only a few quail occupying habitat from 4,000 - 6,000 feet (1,212 - 1,818 meters). In northern regions and mountainous country, snow conditions

may impose an upper limit on the altitudinal range of this species (Johnsgard 1973). At the lower limit, Rue (1973) stated that mountain quail will not migrate any lower than forced to by winter snows, although it may be found as low as 500 feet (152 meters).

Climate & Weather. Drought and harsh winters can have a severe impact on mountain quail populations. In arid regions within their range, shortage of water during summer drought may be a primary limiting factor for mountain quail populations (Gutierrez 1975). Edminster (1954:pages 347-348) said that all species of desert quail "are affected more by weather conditions than by any other factor, drouth is the great threat." Without early spring rains. succulent green foods do not flourish; without these food sources, the quail subsist on an inadequate diet and enter the breeding season in poor condition (Leopold 1972). The impact on mountain quaii populations depends on the intensity and extent of the drought; with severe drought, coveys may remain together in the spring rather than form pairs, and none of the birds will breed (Edminster 1954, Leopold 1972).

Severe winters can have an equally negative impact on this species and mountain quail range may be limited along the northern edge and in mountainous areas by the severity of winter weather (Edminster 1954). Heavy snows and extreme winter temperatures can severely deplete populations and are often accompanied by swift declines in mountain quail numbers (Jewett et al. 1953, Edminster 1954, Gutierrez 1975). During winter, mountain quail inhabit dense shrub thickets along creek bottoms; these thickets hold the snow off the ground and provide protection from harsh weather and predators (IDFG Commission 195 1). Water impoundments, overgrazing, and other activities that reduce low elevation riparian habitats expose this species to increased risk during severe winters. One of the last remaining Idaho populations can be found along the Salmon River drainage in an area that is free of water impoundments and experiences the mildest winters in the state (Brennan 1989).

Habitat Relationships

A habitat suitability index (HSI) model was developed and tested by Brennan et al. (1986) in northern California and tested again by Brennan (1991) in Washington. Oregon, Idaho, and Nevada.. This model focuses on structural components of the habitat, not specific floristic components. so that it could be used in a variety of habitats throughout the quail's range. Five structural components of the habitat are required to run the model: distance to water, distance to escape cover. tallest shrub, shortest shrub, and percent shrub cover. Using these variables as input, a computer program runs the model and resulting HSI values range from 0 (unsuitable habitat) to 1 (suitable habitat). During development and testing of the HSI model, Brennan et al. (1987) noted that habitat plots centered at quail use sites had a higher percent cover of food shrubs than randomly selected sites. They also observed that as the population density increased, mountain quail utilized a broader range of microhabitat structures than at lower densities (Brennan et al. 1987). (give some quantitative/qualitative indication of accuracy for the model ***)

Population Parameters

Production & Survival

(Indicate mean clutch size, reproductive years, % hens laying, mean survival rates by seasons, % increase from spring to fall. etc. if available)

Population Size & Density

Because they inhabit such dense vegetation in rugged terrain, population surveys are difficult to conduct and few scientifically-based estimates have been made (WDW 1993). In California Edminster (1954) studied a mountain quail population in the spring of 1949, following an unusually mild winter. He estimated densities of 82 birds/100 hectares, with the highest density of 123 birds/100 hectares near a water source. Brennan and Block (1986) studied 4 mountain quaii populations in northern California during May-June 1983 and calculated density estimates ranged from 9 - 30 birds/100 hectares. The Coast Range study site, a mixed coniferousdeciduous'forest with mixed shrub understory, produced a density estimate of 21 birds/100 hectares. The Klamath Mountains and Sierra Nevada sites, containing mixed conifers and mixed shrub, produced estimates of 30 birds/100 hectares and 28 birds/100 hectares respectively. A Modoc Plateau site, dominated by Jeffrey pine (***) /western juniper (***) forest, shrub-steppe, and extensive basalt lava reefs. produced an estimate of 9 birds/100 hectares. Brennan and Block (1986) concluded that their line transect method produced "reasonable" estimates of density for mountain quaii if data is collected during the breeding season. Population size or density studies for mountain quail in the CRB have not been conducted and estimates of numbers and density are unavailable for this portion of their range.

Occurrence & Abundance

(Can I reference the distribution maps and just make brief comments about their abundance in these areas?)

In recent years. many mountain quail sightings have been confirmed in western Washington. however, sightings in eastern Washington have declined drastically and few sightings have been reported since 1988 (WDW 1993). Kessler (1990) stated that this quail had a scattered distribution in the Puget Sound area. was uncommon in Kitsap and Mason Counties. and was an irregular resident of western Washington and Idaho, being more numerous in Oregon and Nevada. Masson and Mace (1970) reported that this species could be found throughout Oregon with highest numbers existing in the Coast and Cascade Ranges and in Malheur, Baker, and Wallowa Counties of eastern Oregon: in other areas of the state, only scattered coveys exist. Crawford (1980) added that populations in western Oregon were abundant in some areas and existed at low densities in others. Populations may be locally abundant throughout the Sierra Nevadas and Coast Range (Leopold et al. 1981) with scattered populations present in western Nevada (Linsdale 1936).

Trend & Locations of Key Populations

California as a whole, western Oregon and Washington: anything known about. last 20 years for population trend?

Riggins, Idaho, trend from 1960's to now - decline, closed seasons, etc.?

Nevada:

Eastern Oregon?

Eastern Washington:

Other Modeling Efforts

An HSI model was developed by Brennan et al. (1986) to assess structural components of habitat and produce a suitability index value that would indicate whether available habitat was suitable or unsuitable for mountain quail. Other modeling efforts which address habitat relationships or populations dynamics of mountain quail do not exist in available literature.

Population Viability Assessments

Studies which estimate historic and current populations of mountain quail and extrapolate trends to identify future survival (viability assessments) have not been conducted for populations of this species. Prior to the deveiopment of viability assessments, methods must be established to accurately census mountain quail populations and develop unbiased population estimates., Population viability assessments have not been completed for any population of mountain quail throughout their range.

Potential threats

Interspecific competition

Current literature indicates that interspecific competition does not exist between mountain quail and California quail. Because mountain quail move upslope to breed, mountain quail and California quail are geographically separated most of the year throughout most of their range. They are sympatric when mountain quail descend to low elevation winter habitat or when sedentary populations do not undergo altitudinal migrations. Gutierrez (1977) acknowledged that although the mountain quail and California quail are sympatric in some areas, they effectively partition resources so that a state of non-competitive coexistence occurs. In areas where they are sympatric year-round, interspecific competition is minimal because mountain and California quails use different habitats and different foraging techniques (Gutierrez 1977).

No studies have been conducted on possible interactions between mountain quail and chukars (*Alectoris chukar*), an introduced upland game bird that is present throughout much of the mountain quail's range. Although the IDFG (1978) stated that competition may exist between chukars and mountain quail, further information is needed on the habitat requirements of both species before interspecific competition can be assessed.

Island Populations

In the eastern portion of their range, mountain quail occupy non-continuous habitat such as bands of riparian vegetation. Because this habitat is patchy and fragmented, eastern populations often exist in islands of habitat that may only be connected by narrow corridors of vegetation. These same corridors also serve as migration routes between breeding and wintering habitats, and must provide continuous cover, food, and water (Brennan 1989). Over the years. agriculture, grazing, residential development, and other human activities have reduced and fragmented remaining quail habitat. Brennan (1989:page 11) stated that destruction and fragmentation of habitat corridors "could result in widespread population declines and a contraction in geographic distribution. since these birds are so closely tied to these habitats." Because remaining

populations are isolated, random catastrophic events, such as fire or disease, can cause local extinctions without chance of repopulation by dispersal. In addition, small populations isolated in islands of suitable habitat do not intermingle and may be threatened with reduced fitness due to inbreeding and genetic drift (Brennan 1990).

Parasites & Disease

Few studies have been conducted to examine the importance of parasites and diseases in mountain quail. Belding (1900) reported that 10% of the young quail he collected in the Sierra Nevadas were infested with a tapeworm that he did not identify. Gutierrez (1975) included the following parasites found in wild mountain quail: 1 species of roundworm (*Capillaria contorta*), 2 species of external parasites (*Goiodes pictus* and *Lagopoecus californicus*), and 2 species of mites (*Euschongastia radforidi* and *Neoschongastia americana*). In addition, several species of protozoan parasites have been found in captive mountain quail. but only 1 species (*Haemoproteus lophortyx*) was noted in wild birds. Mountain quail are also vulnerable to'a bacterial disease commonly known as quail disease (Ulcerative *enteritis*). Available literature does not include information on the extent of parasitic infestations or diseases, or their effects at the individual or population level.

Predation

McLean (1930:page 6) stated that "the Cooper [sic] hawk, sharp-shinned hawk, goshawk, house cat and great homed owl are the worst offenders in the destruction of adult birds." *Of* the avian species, the *Cooper's* hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*) and northern goshawk (*A. gentifis*) arc the most common predators of adult and juvenile birds alike (Edminster 1954, Miller and Stebbins 1964, Rue 1973, Gutierrez 1977). Some authors suggest that these accipitrine hawks "learn" to hunt quail near feeding stations or water sources and can have a significant impact on local

populations (Gutierrez 1977, Miller and Stebbins 1964). Owls, such as the great homed owl (*Bubo virginianus*), are cited by a few authors as predators of this quail (McLean 1930, Rue 1973). Significant mammalian predators include the domestic cat. gray fox (*Urocyon cineraoargenteus*), and possibly bobcats (*Felis rufus*) (McLean 1930. Jewett et al. 1953, Edminster 1954, Miller and Stebbins 1964, Rue 1973). Primary nest predators include ground squirrels (*Spermophilus* spp.), striped skunk (*Mephitis mephitis*), snakes (*Coluber* spp. and *Lampropeltis* spp.), and jays, ravens, and crows (Corvidae family) (Edminster 1954, Miller and Stebbins 1964, Rue 1973). No studies have been conducted on predation rates or on the impact of predator complexes or specific predators on mountain quail populations. Occasional predators of birds and eggs include bobcats. coyotes (*Canis latrans*), weasels (*Mustela frenata*), and others but their impact on quail numbers is probably slight (Kellogg 1916, Edminster 1954).

Habitat Destruction

In the eastern portion of mountain quail range, corridors of riparian habitat are being reduced and fragmented by clean farming. alterations to existing watercourses. herbicide applications, and road construction (IDFG 1978). In the western portion of its range, forestry practices can create or destroy habitat, depending on the methods used. Throughout this species' range, activities such as agriculture, cattle grazing, residential development, water impoundments. and forestry practices can alter the extent, composition, and structure of mountain quail habitat. Habitat destruction relegates remaining populations to islands of suitable habitat separated by tracts of unusable land that can act as barriers to dispersal and migration (Brennan 1989).

Agriculture. Because mountain quail require dense, shrub habitat, they generally do not inhabit lands altered by agriculture (Masson and Mace 1970. Brennan 1990). Throughout their eastern range, much of the riparian habitat has been converted to cropland (Brennan 1990). In Idaho, thousands of acres of riparian habitat have been lost

along the middle reach of the Snake River (Brennan 1990), and lands in southeastern Washington are being converted to agricultural lands at an alarming rate (Kessler 1990). This reduction, and subsequent fragmentation, of habitat has contributed to local extinctions of mountain quail in Idaho and Nevada (Brennan 1994) and is a factor in their overall decline in numbers.

Overgrazing. Cattle grazing can have a significant impact on the riparian habitat that mountain quail inhabit, especially in the eastern portion of their range. In annual grassland habitats, riparian areas are often the only source of water or shade. As a result, cattle concentrate in these areas to graze. eating herbaceous ground cover, trampling shrubs, and compacting the soil (Brennan 1990). With overgrazing, the habitat is changed from a varied plant community with a diversity of woody shrubs, to a simplified plant community composed largely of willow (*Salix* spp.) (Brennan 1990). As a result, the woody shrub species which provide cover and food are replaced with a monotypic willow habitat that provides some cover but does not produce food. In Idaho, Nevada, and eastern Oregon and Washington, these riparian habitats may be the only habitat available to mountain quail and alteration of these plant communities can contribute to declining populations (Brennan 1990).

Residential Development. Preparing land for residential development often includes the removal of trees and shrubs, replacing them with open expanses of lawns and gardens. Housing developments are often placed along waterways, and destroy large tracts of riparian habitat. Kessler (1990) stated that removal of trees and shrub fields for housing development is a serious problem for mountain quail on the Kitsap Peninsula of Washington. In addition, the introduction of human residents to an area also introduces domestic cats, which can be effective predators of mountain quail (McLean 1930; Jewett et al. 1953, Edminster 1954). Bird enthusiasts with bird feeding stations in residential areas may help mountain quail obtain adequate feed in the winter months: however. if stations are placed in open areas. feeding may increase exposure to domestic cats and

avian predators. Crawford (1980) warned that extensive feeding efforts only act to concentrate quail, increase the influence of predators, and may promote the spread of disease.

Water Impoundments. Water diversions and impoundments can destroy riparian habitat. alter microclimate conditions, and may increase mortality during migration. Throughout the CRB, hydro-electric impoundments along the Columbia River and its tributaries have flooded vital quail wintering habitat. As an example, since the 1950's over 100 miles (160 kilometers) of the Snake River has been altered by water impoundments, eliminating thousands of acres of habitat along its shores (Brennan 1990). Flooding of low-elevation wintering habitat is thought to be a primary cause of habitat destruction and subsequent population declines in eastern populations (Brennan 1990, 1994). In addition to destroying habitat, water impoundments can alter the microclimate of surrounding areas. Still water in a reservoir freezes during winter months and then acts as a cold sink. Surrounding temperatures are lower and snow remains along the shorelines longer, making food acquisition and predator avoidance more difficult for quail (Brennan 1990). Finally, the establishment of reservoirs and water diversions may be a source of mortality. When mountain quail encounter a new water impoundment during their migration to winter habitat, they become confused and may attempt to fly across the reservoir (Edminster 1954, Brennan 1989). When they have exhausted their flight reserves, they fall into the water and die from hypothermia or drown (Edminster 1954, Gutierrez 1975, Brennan 1989). Leopold (1972) suggested that populations maintain traditional migration routes and when these route are interrupted with new reservoirs, mountain quail attempt to fly across rather than alter their migration route. Edminster (1954) observed that if a covey of birds is approached at the shoreline, some of the juvenile birds fly out over the water and drown.

Forestry Practices. Mountain quail can be positively or negatively affected by forestry practices, depending on the habitat conditions produced. Negative impacts result

when spring logging activities destroy nests and nesting habitats during the breeding season. In the Sierra Nevadas, nest losses due to logging may be substantial; however, these losses may be balanced by the increase in shrub habitat that follows the removal of trees (Gutierrez 1975). If forestry practices result in impenetrable patches of shrubs or open grassland, the birds may be excluded from these areas (Edminster 1954). Positive impacts can result when logging produces a varied mosaic of woody shrubs that are not too dense. Openings formed by roads and trails can provide areas for dusting and thermoregulation as well as travel routes for migrating birds (Dawson 1923, Edminster 1954, Bent 1963, Erlich et al. 1988, and others).

Fires

Several authors suggest that forest and rangeland fires may be a locally important source of mortality for mountain quail throughout their range. McLean (1930) observed 9 - 10 mountain quail flying into the flames of a forest fire, and Spaulding (1949) reported mountain quail retreating into thick brush in the path of oncoming forest fires and being killed. Clark (1935) received reports from California firefighters that the birds would become confused by the oncoming fins and flush into the flames where they were consumed. The mountain quail's habit of seeking dense cover and their reluctance to cross open habitats may contribute to the number of mortalities by fire.

Appendix A: Common trees and shrubs frequently found in mountain quail habitats.

Species Name	Common Name
Abies grandis	grand fir
Acer glabrum	Rocky Mountain maple
Alnus spp.	aider
Amelanchier alnifolia	serviceberry
Arctostaphyios	bearberry
Artemisia spp.	sagebrush
Atriplex confertifolia	shadscale
Calocedrus decurrens	incense cedar
Ceanothus spp.	ceanothus
Celtis spp.	hackberry
Ceratoides lanata	winterfat
Chantaebatia spp.	mountain misery
Cornus stolonifera	red-osier dogwood
Crataegus spp.	black hawthorn
Ephedra spp.	Mormon tea
Grayia spinosa	spiny hopsage
Holodiscus discolor	ocean spray
Larix occidentalis	western larch
Philadelphus lewisii	syringa
Physocarpus malvaceus	ninebark
Pinus albicaulis	whitebark pine
Pinus baifouriana	foxtail pine
Pinus contorta	lodgepoie pine
Pinus lambertiana	sugar pine
Pinus ponderosa	ponderosa pine
Populus spp.	cottonwood
Populus tremuloides	aspen
Prunus spp.	chokecherry/plum
Pseudotsuga menziesii	Douglas fir
Quercus chrysolepis	canyon live oak
Quercus garryana	Oregon white oak
Quercus kelloggii	black oak
Rhamnus purshiana	cascara

Common trees and shrubs continued

Species Name	Common Name
Rhus glabra	smooth sumac
Rhus radicans	poison ivy
Ribes spp.	currant
Robinia pseudo-acacia	black locust
Rosa spp.	wild rose
Rubus spp.	blackberry/brambles
Salix spp.	willow
Sambucus spp.	elderberry
Symphoricarpos spp.	snowberry
Thuja plicata	western red cedar
Tsuga heterophylla	western hemlock
Tsuga mertensiana	mountain hemlock

Appendix B: Mountain quail food plants

Trees and shrubs

Species Name	Common Name	Reference
Alnus spp.	alder	Yocum & Harris 1953
Ameianchier alnifolia	serviceberry	Ormiston 1966
Celtis spp.	hackberry	Yocum & Harris 1953
Crataegus spp.	black hawthorn	Ormiston 1966; Yocum & Harris 1953
Rhus glabra	smooth sumac	*Yocum & Harris* 1953
Rhus radicans	poison ivy	Yocum & Harris 1953
Ribes spp.	currant	Ormiston 1966
Robinia pseudo-acacia	black locust	Yocum & Harris 1953
Sambucus spp.	elderberry	Ormiston 1966; Yocum & Harris 1953
Symphoricarpos spp.	snowberry	Ormiston 1966; Yocum & Harris 1953

Forbs, grasses and others

Species Name	Common Name	Reference
Agropyron spicatum	bluebunch wheatgrass	Yocum & Harris 1953
Allium spp.	onion	Ormiston 1966
Alyssum alyssoides	yellow alyssum	Ormiston 1966
Amaranthus spp.	pigweed	Ormiston; Yocum & Harris 1953
Amsinckia retrorsa	fiddleneck	Ormiston 1966
Astragalus spp.	locoweed	*Ormiston 1966*
Balsamorhiza spp.	balsamroot	P.E. Heekin (pers. corn.)
Brassica spp.	mustard	P.E. Heekin (pers. corn)
Bromus spp.	brome	Ormiston 1966; Yocum & Harris 1953
Capsella bursa-pastoris	shepherd's purse	Ormiston 1966
Carex spp.	sedge	Ormiston 1966
Cerastium spp.	chickweed	Ormiston 1966
Chenopodium album	lamb's quarter	Ormiston 1966

Forbs, grasses and others continued

Species Name	Common Name	Reference
Cirsium spp.	thistle	Ormiston 1966
Coilinsia parviflora	blue-eyed Mary	Ormiston 1966
Dipsacus sylvestris	teasel	Ormiston 1966
Draba vema	spring whitlow grass	Ormiston 1966
Epilobium spp.	fireweed	P.E. Heekin (pers. corn.)
Eriogonum spp.	buckwheat	Ormiston 1966
Erodium circutarium	stork's bill	Otmiston 1966: Yocum & Harris 1953
Euphorbia spp.	spurge	Otmiston 1966
Geranium bicknellii	Bickneil's geranium	Ormiston 1966
Helianthella uniflora	sunflower	P.E. Heekin (pers. corn.)
Helianthus annuus	common sunflower	Otmiston 1966; Yocum & Harris 1953
Holosteum umbellatum	jagged chickweed	Ormiston 1966
Hordeum spp.	barley	Ormiston 1966
Lactuca spp.	lettuce	Otmiston 1966; Yocum & Harris 1953
Lemna minor	duckweed	Ormiston 1966
Lithophragma bulbifera	bulbiferous prairiestar	Ormiston 1966
Lomatium spp.	lomatium	Ormiston 1966
Lupinus spp.	lupine	Ormiston 1966
Madia spp.	tarweed	Ormiston 1966
Medicago lupulina	black medic	Yocum & Harris 1953
Melilotus spp.	sweet clover	Ormiston 1966; Yocum & Harris 1953
Microsteris gracilis	microsteris	Otmiston 1966
Montia arenicola	sand montia	Ormiston 1966
Montia perfoliata	miner's lettuce	Ormiston 1966
Nepeta cataria	catnip	Ormiston 1966
Panicum spp.	witchgrass	Ormiston 1966
Parietaria pensylvania	pellitory	Ormiston 1966
Poa spp.	bluegrass	Ormiston 1966
Polygonum spp.	knotweed	Ormiston 1966
Rumex spp.	dock	Ormiston 1966; Yocum & Harris 1953
Scleranthus annuus	scleranthus	Otmiston 1966
Solanum spp.	nightshade	Otmiston 1966; Yocum & Harris 1953
Stellatia spp.	chickweed	Ormiston 1966; Yocum & Harris 1953
Trifolium spp.	sweet clover	Yocum & Harris 1953
Triticum aestivum	wheat	Yocum & Harris 1953
Vicia spp.	vetch	Ormiston 1966; Yocum & Harris 1953

Literature Cited

Anthony, A. W. 1893. Birds of San Pedro Matir, Lower California Zoe 4:228-247.

Barbour, M. G., J. H. Burk, and W. D. Pitts. 1987. Terrestrial plant ecology. 2nd Edition. Benjamin/Cummings Publishing Co., Inc. Menlo Park, California. 634 pp.

Belding, L. 1892. Food of the grouse and mountain quail of central California. Zoe 3:232-234.

Belding, L. 1900. Tape worm in young mountain quail. Condor 2:9 1.

Belding, L. 1903. *The* fall migration of *Oreortyx pictus plumiferus.* Condor 5: 18.

Bent, A. C. 1963. Life histories of North American gallinaceous birds. U. S. Natl. Mus. Bull. 162. Dover Publications, Inc., New York. 490 pp.

Brennan, L.A. 1989. Report on a survey of mountain quail habitat in eastern Oregon, southeastern Washington, western Idaho. and northern Nevada. Unpublished Report. Prepared for The Chukar Foundation. Boise, Idaho. 58 pp.

Brennan, L.A. 1990. What happened to the mountain quail in Idaho? Quail Unlimited 9:42-43, 69.

Brennan. L.A. 1991. Regional tests of a mountain quail habitat model. Northwest Naturalist 72: 100-108.

Brennan, L.A. 1994. Broad-scale population declines in four species of North American quail: an examination of possible causes. Pages 44-50 in Sustainable Ecological Systems: implementing an ecological approach to land management. Flagstaff. Arizona, July 12-15, 1993. General Technical Report RM-247. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Brennan, L. A., and W. M. Block. 1986. Line transect estimates of mountain quail density. J. Wildl. Manage. 50:373-377.

Brennan, L.A., W.M. Block, and R.J. Gutierrez. 1986. The use of multivariate statistics for developing habitat suitability index models. Pages 177-182. in: J. Verner, M. C. Morrison, and C. J. Ralph, eds., Wildlife 2000: modeling habitat relationships of terrestrial vertebrates. Univ. Wisconsin Press, Madison.

Brennan, L.A., W.M. Block. and R.J. Gutierrez. 1987. Habitat use by mountain quail in northern California. Condor 89:66-74.

Clark, H. W. 1935. Fire and bird populations. Condor 37:16-18.

Crawford, J. A. 1980. The quail of Oregon. Oregon Wildl. 35(6):3-7.

Dawson, W. L. 1923. The birds of California. Vol. 3. South Moulton Co., San Francisco. ____ pp. ***

Edminster, F. C. 1954. American game bird of field and forest. Their habits, ecology and management. Charles Scribners Sons, New York. 490 pp.

Einarsen, A. S. 1955. Observations on quail behavior. Murreiet 36: 18-21.

Erlich, P. R., D. S. Dobkin, and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, New York. 785 pp.

Gabrielson. I. N., and S. G. Jewett. 1940. Birds of Oregon. Oregon State Univ. Press, Corvallis. ____ pp. ***

Grinnell, J., H. C. Bryant. and T. I. Storer. 1918. The game birds of California. Univ. California Press, Berkeley. 642 pp.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27. Berkeley, California. 608 pp.

Grinnell, J., and T. I. Storer. 1924. Animal life in the Yosemite. Univ. California Press. Berkeley. 752 pp.

Gullion, G. W., and G. C. Christensen. 1957. A review of the distribution of gallinaceous game birds in Nevada. Condor 59: 128-138.

Gutierrez, RJ. 1975. A literature review and bibliography of the mountain quail *Oreortyx pictus*, (Douglas). USDA Forest Service Special Report. California Regional Office, San Francisco. 33 pp.

Gutierrez, R. J. 1977. Comparative ecology of the mountain and California quails in the Carmel Valley, California Ph.D. Diss. Univ. California, Berkeley. 103 pp.

Gutierrez, R. J. 1980. Comparative ecology of the mountain quail and California quail in Carmel Valley, California Living Bird 18:71-93.

Harrison, C. 1978. A field guide to the nests, eggs and nestlings of North American birds. Collins Press. 416 pp.

Henshaw, H. W. 1874. Report on the ornithological collections made in portions of Nevada. Utah. California, Colorado, New Mexico, and Arizona, during the years 187 1, 1872.1873. and 1874. Pages 133-507 in Wheeler's Report Geogr. and Geol. Expl. and Surv. West 100th Meridian. Vol. 5, Zoology

Idaho Department of Fish and Game. 1978. A plan for the future management of Idaho's fish and wildlife resources. Vol. 1: goals. objectives and policies 1975-1990. Idaho Dept. Fish and Game, Boise. ____ pp. ***

Idaho Department of Fish and Game. 1985. Upland Game Species Management Plan: 1986- 1990. Idaho Dept. Fish and Game, Boise. ____ pp. ***

Idaho Department of Fish and Game Commission. 195 1. Upland game birds of Idaho. ____ pp. ***

Jewett, S. G., W. P. Tayior. W. T. Shaw, and J. W. Aldrich. 1953. Birds of Washington State. Univ. Washington Press, Seattle. ____ pp. ***

Johnsgard, P. A. 1973. Grouse and quails of North America. Univ. of Nebraska Press, Lincoln. *553* pp.

Johnsgard, P. A. 1975. North American game birds of upland and shoreline. Univ. Nebraska Press, Lincoln. 183 pp.

Judd, S. C. 1905. The bobwhite and other quail of the U. S. in their economic relations. U. S. Dept. Agric. Bur. Bioi. Survey, Bull. 21. 66 pp.

Kellogg, L. 19 16. Report upon mammals and birds found in portions of Trinity, Siskiyou. and *Shasta Counties.* California, with descriptions of a new *Dipodomys*. Univ. California Publ. Zool. Vol. 12, No. 13, Jan. 27. Pp. 335-398, pits. 15-18.

Kessler, R. 1990. The status of mountain quail *Oreortyx pictus in* Washington state. Unpublished Report, February 18.1990. Washington Dept. Wildl., Olympia. ____ pp. ***

Leopold, A. S. 1972. Wildlife of Mexico: the game birds and mammals. Univ. California Press, Berkeley. 568 pp.

Leopold, A. S.. R. J. Gutierrez, and M. T. Bronson. 1981. North American game birds and mammals. Charles Scribners Sons. New York. 198 pp.

Linsdale, J. M. 1936. The birds of Nevada. Pacific Coast Avifauna, No. 23: 1- 145.

Masson, W. V., and R. U. Mace. 1970. Upland game birds. Bull. No. 5, Oregon State Game Comm., Portland. ____ pp. ***

McLean, D. D. 1930. The quail of California. California Div. Fish and Game. Game Bull. 2: l-47.

Miller, A. H., and R. C. Stebbins. 1964. The lives of desert animals in Joshua Tree National Monument. Univ. California Press, Berkeley. 452 pp.

Morache, M., C. Chaffin, J. Naderman. and W. Melquist. 1985. Nongame management plan: 1986 to 1990. Species Management Plan. Idaho Dept. Fish and Game, Boise. 26 pp.

Murray, T.B. 1938. Upland game birds in Idaho and their future. Univ. Idaho Bull. 33:55-60.

Ormiston, J.H. 1966. The food habits, habitat. and movements of mountain quail in Idaho. M. S. Thesis, Univ. Idaho, Moscow. 39 pp.

Robertson. M.D. 1989. Statewide survey of mountain quail, 1989: a report on the status of mountain quail in Idaho. Unpublished Report. Prepared for Idaho Dep. Fish and Game. 27 pp.

Rue, L. L., III. 1973. Game birds of North America. Harper and Row, New York. 490 pp.

Spaulding, E. S. 1949. The Quails. The MacMillan Co., New York. ____ pp. ***

Sumner, L., and J. S. Dixon. 1953. Birds and mammals of the Sierra Nevada. Univ. California Press, Berkeley. 484 pp.

U.S. Department of the Interior, U.S. Fish and Wildlife Service. 1990. Federal Register (VIII). 50 CFR Part 17: Endangered and threatened wildlife and plants: animal candidate review for listing as endangered or threatened species, proposed rule. 56(225).

Washington Department of Wildlife. 1993. Distribution status of the mountain quail (*Oreortyx pictus*) in Washington. Unpublished Report. Washington Dept. of Wildl., Olympia. 22 pp.

Yocum. C.F., and S.W. Harris. 1953. Food habits of mountain quail (*Oreortyx picta*) in eastern Washington. Journal Wildl. Manage. 17:204-207.