LONG-RANGE PLAN
For The Management of
Lesser Prairie Chickens in New Mexico
2002-2006

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ABOUT THE PLAN

The lesser prairie-chicken (LPC) (*Tympanuchus pallidicintus)* has historically occupied the sandy soils of shin oak-bluestem and sand sage-bluestem communities in the plains of eastern New Mexico. LPC are directly and indirectly dependent on vegetative components available in those native rangelands. As a gallinaceous bird with high reproductive potential and high mortality in a semi-arid climate, populations can fluctuate widely over time.

The abrupt population decline in the early 1990's caused concern among various publics. The five states with LPC began working together to identify causes and find solutions for long-term conservation of LPC. In 1995 the US Fish and Wildlife Service (Service) was petitioned to list the LPC as threatened (Biodiversity Legal Foundation 1975) and their 12 month finding determined that listing was "warranted, but precluded" by other higher priority species. The New Mexico Department of Game and Fish (Department) was also petitioned to investigate the status of the LPC for listing as threatened under New Mexico's Wildlife Conservation Act (WCA). In November 1999 the Director withdrew a recommendation to list LPC as threatened until more information on the status could be obtained.

Several LPC management efforts have been initiated by the Department: lek surveys were initiated to obtain population trend data, public input was accepted at ranch conversations and other meetings, a full-time biologist was hired to gather more information on LPC and to direct conservation efforts and a full-time technician was hired to maintain Prairie Chicken Areas. The Lesser Prairie-Chicken Management Plan will be the foundational document to direct conservation efforts.

The goal of the plan is to satisfy the public's lesser prairie-chicken related recreational and ecological interests and resolve related socio-economic issues. A three-fold approach will be integral in achieving this:

1) We will obtain a better understanding of LPC abundance, distribution and population trends.
2) We will continue to seek public involvement in and support of LPC management efforts.
3) We will work with private landowners and land management agencies to provide habitat necessary to ensure long-term conservation of LPC habitat.

Planning for the management of Lesser Prairie-Chicken in New Mexico is a multi-phase process. Phase I involved researching the biological and historical background, analyzing the current situation, establishing the management goal and objective, identifying issues which might impede goal attainment, and developing strategies to address those issues. Initial public input was obtained at New Mexico State Game Commission (Commission) meetings and ranch conversation meetings in 1999 and 2000. The draft Long-Range Plan was made available for public review in January 2001 to ensure that all issues and strategies were identified. Public comments were considered and many were incorporated into the Long-Range Plan.

The second phase is the Action Plan in which specific tasks to accomplish the long range plan's strategies are developed. The third phase is the Operational Plan in which tasks are scheduled for implementation and related costs are anticipated. The revised Long-Range Plan, the draft Action and Operational Plans were available for public review from July 26 to August 13, 2001. Revisions based on public input to the draft Action/Operational Plans were completed in August 2001. All 3 phases of the plan were presented and approved at the State Game Commission of November.

Acknowledgements.—Bill Graves, NMDGF Planner, gave time, knowledge, wisdom and patience. Bill Dunn, Supervising Biologist for Predator and Gamebird Management went through the numerous edits with much diligence. Kevin Mannie, NMDGF Small Game Biologist created the distribution maps and gave much input and support. Don MacCarter, NMDGF Chief of Public Affairs took all photos.

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Taxonomy.--

The Lesser Prairie-Chicken (LPC) (*Tympanuchus pallidicinctus* Ridgway) belongs to the Order Galliformes, Family Phasianidae and grouse Subfamily Tetraoninae. It is a medium sized grouse weighing 700-800 g (1.5-1.75 lb) (Snyder 1967, Campbell 1970), and is 38-41 cm (15-16 in) long (Johnsgard 1973, Olawsky 1987).

Distribution.--

The historic range of LPC encompassed habitats with sandy soils in the high plains of southeastern Colorado, southwestern Kansas, western Oklahoma, west Texas, the Texas panhandle, and eastern New Mexico (Bailey 1928). In New Mexico, Ligon (1961) reported historic range as being the sandhill-bluestem sage grass plains, an approximately 120 km (75 mi) wide swath in the eastern part of the state from Texas to Colorado and in northern DeBaca County to 48 km (30 mi) west of Ft. Sumner.

Distribution within this historic range appears to have fluctuated widely over time (Fig. 1). In 1926, LPC were reported in only 17% of the range, mainly south and southwest of Portales with smaller areas southwest of Clayton and in southeastern New Mexico (Ligon 1927, Snyder 1967). The drought of the 1930's may have resulted in an even more restricted range; Ligon was able to find few birds throughout their normal range during this period (Lee 1953).

Increasing LPC populations (and presumably increasing distribution) were reported in the late 30's and early 40's (Lee 1953). In the early 50's, the few LPC found were concentrated mostly in the central part of the range near Milnesand (Ligon 1953). The most widespread distribution was reported in the late 1950's and early 1960's when Snyder (1967) noted that LPC had reoccupied “much of their former range”. Most LPC were found in Roosevelt and northern Lea Counties with smaller populations in southern Lea, Eddy, Chaves, DeBaca, Guadalupe and Curry counties. Ligon (1961) gave a somewhat contrasting report stating that LPC were in no more than half of their former range with most birds concentrated in southern Roosevelt and northern Lea counties.

Distribution appeared to be widespread again in the 1980's based on 3 sources of information. High populations were recorded in the Caprock Wildlife Habitat Management Area

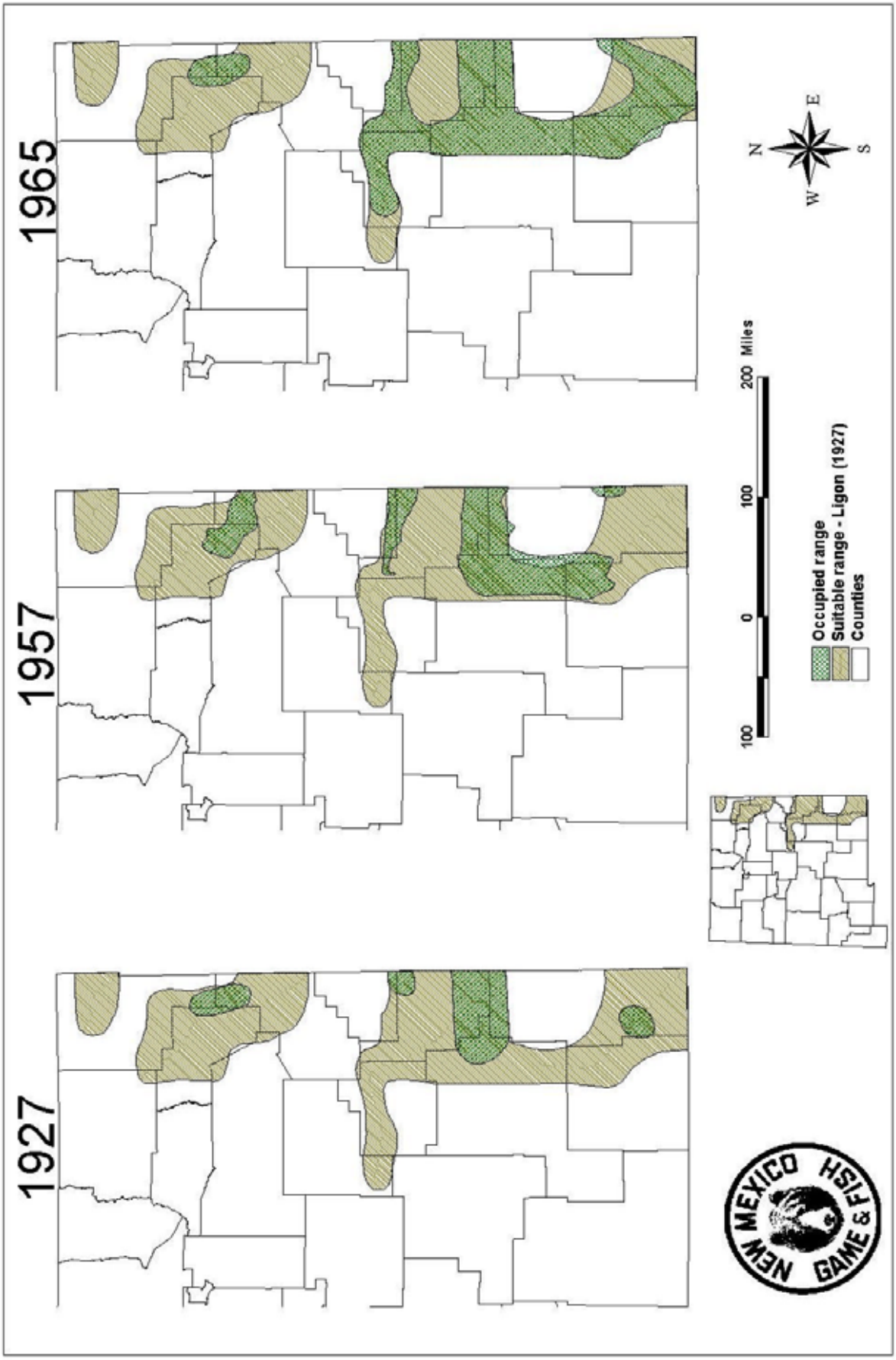


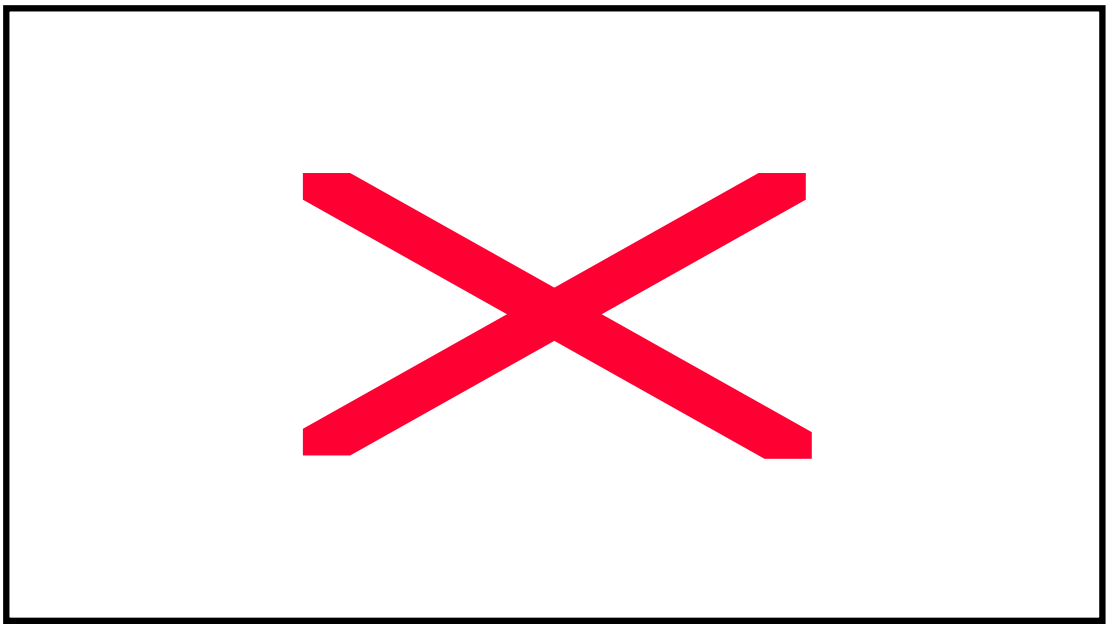
Figure 1. Variation in distribution of Lesser Prairie-Chickens in eastern New Mexico.

(CWMA) east of Roswell (BLM 1996, Johnson and Smith 1999b). Hunter success in 1988 was the highest recorded for the period of 1960-94 (Cowley 1995), suggesting that populations were also high. Most importantly, observations of LPC were widespread. LPC were observed from Crossroads to north of Clovis and from Texas to Ft. Sumner (W. Robertson and R. Hayes, NMDGF, personal communication, C. Dixon, Wildlife Plus, Inc., personal communication.) as well as south and west of Hobbs (J. Sherman, BLM, personal communication.).

Since the decline that began in 1989, LPC distribution appears to again be restricted mostly to the central portion of their range, mainly southern Roosevelt, northern Lea, and east-central Chaves counties (Bailey 1999). No LPC observations have been verified in northeast New Mexico since 1993 and, in 1998, only one of 29 historic leks was found to be active and no leks were detected on 244 mi of surveys in southeastern New Mexico (Smith et al. 1998).

Habitat Requirements.--

LPCs are found in and near habitats dominated by sandy soils with shin-oak (*Quercus havardii*)- bluestem (*Andropogon* sp.) or sand sage (*Artemesia filifolia*)- bluestem vegetative communities (Jackson and DeArment 1963, Jones 1963, Crawford and Bolen 1976, Davis et al. 1979). Specific habitats include breeding grounds (lek sites, booming grounds), nesting, brood rearing, summer foraging, and autumn-winter foraging areas (Applegate and Riley 1998, Davis



Lesser prairie-chicken nesting habitat.

et al. 1979, 1981, Haukos and Smith 1989, Riley et al. 1981, Riley et al. 1993a).

Lek sites are small (<0.4 ha[1ac]), usually slightly elevated, bare or sparsely vegetated areas of tighter soils where males call and perform ritualistic displays. LPC generally remain within a 3.2 km (2 mi) radius of the lek site throughout the year (Campbell 1972, Davis et al. 1979, Taylor and Guthrey 1980*a*,*b,* Riley et al. 1981, Haukos 1988).

Nesting habitat usually consists of taller grasses and shrubs among low-lying sandhills. Generally, nest sites are in shin-oak or sand sage grasslands having high canopy cover and moderate vertical and horizontal cover (Bent 1932, Donaldson 1969, Davis et al. 1979, 1980, Giesen 1994*b*) with residual vegetation from the previous growing season consisting of tall bunch grasses (Riley 1978, Wisdom 1980, Haukos and Smith 1989). Frequently, nests are located on north or northeast dune slopes to provide protection from southwest winds and direct sunlight (Davis et al. 1979). Riley et al. (1992) found that the most successful nests sites are located in clumps of sand bluestem with an average height of 66.6 cm (26.2 in) and neighboring vegetation has an average height of 30.2 cm (11.9 in) within 3 m (9.8 ft).

Brood rearing habitat is usually in the immediate vicinity of nests but is more open at the ground level and has more shrubs and forbs (Riley 1978). Summer foraging areas tend to be the same as brood rearing areas but may include other areas such as cultivated and fallow fields, and fields planted back to grasses where protective cover from predators is less critical for adults than for broods (Riley 1978, Davis et al. 1981).

Autumn-winter foraging areas are dominated by a greater percentage of grasses than shrubs, but still have a substantial shrub component (Riley et al. 1993b). Grain fields are also used for winter foraging (Davis et al. 1981). Crawford and Bolen (1976) found that populations were higher in areas with 5-37% of the land cultivated in small grain crops. It is not known if these grain crops helped increase and maintain populations by supplementing a limited food supply during the winter or merely served to congregate birds for feeding, or both.

Food and Water.--

LPC chicks feed almost exclusively upon insects, primarily grasshoppers and treehoppers, during the first 10 weeks (Davis et al. 1980). Thereafter, their diet will resemble that of an adult. Spring (Mar-Apr) diets of adult LPC are primarily green vegetation (78.7%), and mast and seeds (15.5%) (Davis et al. 1980). Summer (Jun-Aug) diets are insects (55.3 % [of

which 49.3% is grasshoppers and treehoppers]), vegetative material (23.3%), and mast and seeds (21.4%) (Davis et al. 1980). Autumn diets consist of mast and seeds (21-65% shin-oak acorns), insects (7-30% grasshoppers), and vegetative material (28-49% galls, leaves, flowers) (Frary 1959, Riley et al. 1993). Winter diets are mast and seeds (69% shin-oak acorns) green vegetation (26%) and a trace of insects (Riley et al. 1993a). However, shin-oak acorns are not produced every year. LPC will also utilize other food sources including grain during winter where flocks of hundreds up to thousands have congregated in fields to feed (Colvin 1914, Lee 1953, Frary 1957, Snyder 1967, Campbell 1972, Crawford and Bolen 1976, W. Massey, farmer, Dora, NM personal communication, G. Hay, rancher, Pep, NM personal communication J. Williamson, rancher, Pep, NM personal communication).

LPC evidently do not require free water because they metabolize water from their food (Lee 1953, Snyder 1967). However, they have been observed utilizing free water during dry periods (Lee 1953, Frary 1957, Horak 1985, W. Massey, farmer, Dora, NM, personal communication).

Reproduction.--

LPC are polygynous and have a lek mating system where relatively few males perform the majority of copulations (Sharpe 1968, Giesen 1998). The males gather on a relatively small (< 0.4 ha [<1 ac]) area of bare or open ground where they perform ritualistic displays on fiercely guarded territories of less than 3 m^2 to more than 7 m^2 (Ligon 1961,Giesen 1998). Males may attend lek sites from January through June and September through November, although most mating displays are from mid-February through early May. Activity peaks when the females begin to attend the leks from the third week in March through the second week in April (Copelin 1963, Hoffman 1963, Jones 1964, Donaldson 1969, Crawford and Bolen 1975, Suminski 1977, Davis et al. 1979, Haukos and Smith 1999). When displaying, males arrive on the lek sites 30-60 min prior to sunrise, remain for 3-4 h (Frary 1957, Copelin 1963, Sharpe 1968, Crawford and Bolen 1975, Giesen 1998). During peak display periods, they will often return in the evening just before sundown (Lee 1953, Frary 1957, Snyder 1967, Campbell 1970.). During full phases of the moon, they may display at the lek throughout the night (Frary 1954, D. MacCarter, NMDGF personal communication). The average number of males attending lek sites varies

seasonally and annually. Campbell (1968) found a fifteen-year average of 11 males per booming ground from 1954 to 1968.

Giesen (1998) described the males displaying on leks as "exposing and enlarging superciliary eyecombs, elevating tail to highest extent, erecting pinnae feathers and positioning them forward and parallel to the ground, drooping the wings and spreading primaries, extending neck and head forward, stamping the feet on ground, and expanding the esophageal air sacs and producing a booming vocalization.". "Flutter-jumping", jumping 2-3 m off of the ground while flapping wings and "cackling", is stimulated by females approaching lek. Sparring between males sometimes occurs when they confront one another at edges of individual territories. Male auditory booming advertises lek location to females and functions, along with displays, to defend territories from neighboring males, advertise territory location to hens, demonstrates fitness of individual males and facilitates copulation (Sharpe 1968, Haukos 1988).

Displaying Male

Hens typically attend leks from mid March through May with peak attendance on leks and copulation generally the second and third weeks of April; initial attendance will vary with

weather patterns (Davison 1940, Snyder 1967, Campbell 1972, Suminski 1977, Riley 1978, Davis et al. 1979, Haukos 1988, Giesen 1998). The female will move onto the lek and select a male, which will mount the female and successfully copulate in just a few seconds (Sharpe 1968, Giesen 1998). While yearling (0.5-1.5 yr old) males attend leks and are physiologically able to breed, older males do most of the breeding. Females will breed in their second year (Giesen 1998). One to two weeks after copulation (Giesen 1998), females lay a clutch of 10-14 eggs at one egg/day with occasional one-day skips until the clutch is complete (Bent 1932, Copelin 1963, Sutton 1968, Merchant 1982, Haukos 1988, Giesen 1998). Incubation begins after the last egg is laid and lasts 24-26 days (Coats 1955, Sutton 1968). Thus, nests are vulnerable to predation and livestock trampling for a continuous 50-day period during mid-April to mid-July. Chicks are precocial and leave the nest with hens within 24 h of hatching (Giesen 1998). They are able to fly short distances by 2 weeks old and become independent from the hen at 12-15 weeks (Giesen 1998). The females remain reclusive with their broods until their young disperse in the fall. The hen will occasionally renest if unsuccessful in the first attempt but will only produce one successful brood per season (Merchant 1982, Davies 1992, Giesen 1998).

Hen watching displaying male .

Population Dynamics.--

Wide population fluctuations are common among gallinaceous birds (Johnsgard 1973). This is no different for LPC (Ligon 1927, Barker 1949, Lee 1953, Frary 1957, Snyder 1967, Campbell 1968). Species that occur in the semi-arid grasslands are adapted to respond to the climatic conditions of sporadic and varying amounts of precipitation. Campbell (1970, 1972) found first year mortality of 67% among males and 75% among females which translated into a total turnover in the population within 5 years. Prolonged drought prevents adequate recruitment into the reproductive portion of the population and can result in a sharp decrease in the population within a few years (Barker 1949, Lee 1953, Frary 1957, Snyder 1967, BLM 1996, Johnson et al. 1998). Nest failure and poor chick survival during drought periods (Copelin 1963, Merchant 1982) may be more responsible for population declines than annual changes in adult survival (Giesen 1998). However, LPC do have a high reproductive potential (Davies 1992). Bailey (1999) stated, "With their high biotic potential, populations may increase or decrease greatly in one year, depending largely upon annual reproductive success. Great among years variation in abundance is typical, with populations sometimes varying 10-fold or more between dry and wet years". With increased moisture, nest success and recruitment increases substantially and populations may increase rapidly similar to that reported in the 1940s (Barker 1949), late 1950s (Frary 1958), late 1960s (Snyder 1967, Campbell 1970), and the 1980s (Hale 1996a, BLM 1996, Johnson et al.1998).

Sparring males.

Historical Perspective

Habitat Trends.--

(a) Land Settlement: Most LPC range in New Mexico was native shin-oak or sand sage grasslands that was not greatly impacted by humans up until the late 1800s and early 1900s. This included the core of the LPC range on the Llano Estacado of New Mexico, a large plain without permanent surface water. The few Native Americans who occupied the region usually followed the buffalo where and when there was available surface water. During wet periods, the playas would hold water accumulated from runoff, allowing herds to move across the Llano Estacado from the Brazos River in the east to the Pecos River in the west. Buffalo hunters, such as the Causey Brothers, stayed in the area and began ranching after the buffalo disappeared (Greaves 1975). These early ranchers grazed large herds of cattle on the open range. Like the bison that preceded them, distribution of these free roaming cattle was limited by available

surface water (Greaves 1975). Thus, impacts from early cattle herds may not have been any greater than the large herds of bison and antelope that had previously roamed the area.

The invention of the windmill and barbed wire indirectly contributed to the first great human-induced change of native rangeland habitat. Water sources became more widespread and allowed livestock to graze on previously inaccessible range. Barbed wire kept livestock on a single piece of range year-round that may have previously not been grazed or grazed only occasionally. This resulted in removal of residual vegetation that had previously provided food and cover which provided protection from predators, heat and dehydration.

The promise of free land allowed by the Homestead Act of 1862 and arrival of the railroad in 1898 (O'Hare in Burroughs 1975) initiated rapid human settlement in LPC range of eastern New Mexico (Greaves 1975, Williamson in Burroughs 1975). Homesteading occurred in the sandhills of northern Lea County as late as 1939 (Chunn in Burroughs 1975). The new settlers found abundant grass, "…up to the bridle of a horse" (A. Overstreet, homesteader, Portales, NM, personal communication, E. Massey, homesteader, Lingo, NM, personal communication). These original and widely scattered homesteads may have supported unnaturally high populations of LPC by supplementing the LPC winter food supply with grain crops (Ligon 1927, Lee 1953, Jackson and DeArment 1963, Crawford and Bolen 1976, Horak 1985). Large flocks of hundreds and possibly thousands gathered to feed in the grain fields (Colvin 1914, Lee 1953, G. Hay, rancher, Pep, NM, personal communication, W. Massey, farmer, Dora, NM personal communication, J. Williamson, rancher, Pep, NM personal communication). The settlers farmed and raised livestock as they had in the wetter climates of the eastern and southern United States.

(b) Drought and Depression: In the 1930s, the combination of drought and economic depression led to major negative impacts on LPC habitat. The drought resulted in rangeland grasses becoming sparse and few crops being grown, thereby impacting availability of food and cover for LPC. The depression caused prices to drop so that it was not profitable for farmers and ranchers to sell their livestock. Instead, more livestock were kept on the land for a longer period resulting in removal of already sparse residual vegetation needed by LPC for food and cover and increased soil erosion (Barker 1949, Lee 1953, Jackson and DeArment 1963, Barker 1976). Some large ranches were able to ship their stock out of New Mexico where the drought had not

affected the range (Barker 1976). Other ranchers, who had lighter stocking levels and regularly moved their herds, were better able to survive the drought with more residual forage.

Intensive farming practices that had worked in wetter climates left soils exposed to dry out and erode in the high winds of eastern New Mexico. This was exacerbated during the drought of the 1930s. It was during this period that many of the settlers sold out or abandoned their farms and ranches (Burroughs 1975). Much of the land in the sandy soils that had been farmed reverted back to rangeland.

(c) Federal Land Conservation Initiatives: To protect topsoil, federal farm programs and the Soil Conservation Service (SCS) were created to assist and educate farmers and ranchers on retaining quality soils and forage. Range management and cultivation practices changed greatly after World War II. Veterans went to agricultural schools and returned to farm and ranch using scientific knowledge for better management practices. Others went to work for the SCS or university agricultural extension offices to provide assistance to farmers and ranchers in land conservation. However, Jackson and DeArment (1963) believed conditions became worse for LPC in the Texas panhandle during this period because of increased cattle grazing, brush and weed control by herbicides and combine harvesting replacing standing shocks of grain sorghums. Conversely, LPC in New Mexico apparently prospered alongside agriculture (Lee 1953, Frary 1957, Snyder 1967, Campbell 1970). The drier climate in New Mexico may have prevented extensive cultivation that had caused the loss of native rangeland in Texas. In fact, it was not unusual for farmers in New Mexico to complain of LPC eating their shocked feed. Since monetary compensation was not allowed, the Department would move birds out of the area (Lee 1953).

Soil Bank programs of the 1950s and 1960s were aimed at preserving topsoils by converting marginal farmlands to grass. The most available and cheapest grass seed available was non-native love grasses (*Eragrostis spp*) which stabilized topsoil, but provided little benefit to wildlife. The Soil Bank program ended in the late 1960s and early 1970s.

In the mid-1980s, a new SCS program called the Conservation Reserve Program (CRP) was implemented that placed greater emphasis on wildlife than the Soil Bank program. More native grasses were planted, although not exclusively. Implementation of the CRP program, which took some cultivated grain fields out of production, corresponded with the decline in LPC that began in 1989. It has been suggested that the reduction in grain crops contributed to the

LPC decline by reducing an important winter food source. Crawford and Bolen (1976) did find a positive correlation between LPC population size and percent of land cultivated to small grain crops up to 37%. However, this alone would not explain the range-wide decline in LPC throughout their entire 5-state range. In fact, LPC have expanded their occupied range into CRP areas that were planted to native grasses in Kansas (Rodgers 2000).

(e) Range Alterations: From 1980-92, the herbicide tebuthiuron was applied to almost 40,500 ha (100,000 ac) of BLM lands in southeastern New Mexico to reduce shin-oak and increase grass production (BLM 1994, R. French, BLM personal communication , J. Sherman, BLM personal communication). Olawsky and Smith (1991) found no difference in densities of LPC on treated and untreated areas. Johnson (2000) found LPC hens nesting more in untreated than treated areas.

The development of center pivot irrigation provided a way to farm arid sandy soils that were once not conducive to crop production. Major conversion of LPC rangelands to croplands in Texas and Oklahoma has occurred (Leslie and Shackford 1999) but has not been specifically identified as a major factor in New Mexico (Bailey 1999). The Ogalalla aquifer that provides water for irrigated crops is not widely available in eastern New Mexico. There is evidence that this portion of the aquifer in New Mexico has been dropping, which would limit continued conversion of rangeland to cropland (Banks et al. 1982).

(f) Oil and Gas Development: Development of oil and natural gas has expanded into most of the LPC range of southeastern New Mexico. Oil and gas development may impact LPC in 4 ways: (1) habitat fragmentation by roads, well pads and pipelines, (2) disruption of daily activities and movements of LPC by traffic and machinery, (3) interference in communication during mating rituals because of industrial noise, and (4) increased mortality from sludge pits, poisonous gases and powerline collisions (Ligon 1951, Lee 1953, Ramirez 1999, Reeves 1999, Best 2000).

Since the mid 1980s, oil field activity has decreased significantly in southern Roosevelt and northern Lea counties. However, other strata of oil and gas have been found in southern Lea, eastern Eddy and southeastern Chaves counties which may lead to increased activities there (R. Miller, Marbob Energy Corp., Artesia, NM personal communication). This is also the area where LPC have become very difficult to find. Another concern is the possible increase in oil field pollution. With major oil companies pulling out of the area, leases are being sold to smaller

companies that have less funds available for clean up. Two PCAs have oil field pollution problems that are being addressed by the Department and other regulatory agencies. However, they are only a small fraction of LPC habitat affected by oil and gas pollution.

Population Trends.--

LPC populations began an abrupt decline in 1989. LPC counts on leks dropped dramatically in the CWMA (BLM 1996) and in west-central Lea County (Smith et al. 1998). Estimated hunter harvest also declined sharply (Cowley 1995). One explanation is that this decline is simply part of a natural fluctuation in the population. An alternative explanation is that, while LPC populations fluctuate, the decline that began in 1989 was the latest in a long downward trend that began in the early twentieth century (Bailey 1999). In other words, peaks were not as high and troughs were lower with each succeeding fluctuation.

Fluctuating population levels are indicated by several reports. LPC were reportedly abundant in the early 1910s (Colvin 1914), early 1930s (W. Massey, farmer, personal communication), late 1940s (Barker 1949, Lee 1950, 1953, Sands 1968), late 1950s and early 1960s (Snyder 1967, Sands 1968, Campbell 1970, 1972) and 1980s (Hale 1996a, BLM 1996, Johnson 1998). Conversely, LPC populations were reportedly low in the 1920s (Ligon 1927), late 1930s (Lee 1953), 1950s (Frary 1957), late 1960s (Sands 1968), 1970s (BLM 1996, Johnson et al.1998, Johnson and Smith1999) and 1990s (Hale 1996b, BLM 1996, Johnson et al. 1998, 1999, Mote et al. 1998). Lee (1953) surmised that LPC were so few in number that they may have been near extinction in the 1930s.

Some evidence suggests that LPC numbers have begun to increase recently. The mean number of LPC per lek (LPC/lek) increased from 2.8 in 1997 to 11.9 in 2000 on Commission Prairie Chicken Areas (Massey and Dunn 2000). Also, the total number of LPC counted on 15 PCAs since 1996 increased from 31 to 321 (Massey 2001). The number of leks detected on roadside survey routes in 2000 increased slightly over 1999 (Massey and Dunn 2000). On CWMA, LPC/lek and the number of active leks in 2000 were at or near their highest levels since the early 1990s (Johnson 2000).

Use and Demand Trends.--

Market hunting for LPC occurred in the late 1880s and 1890s to feed railroad workers and send to restaurants in the eastern United States. Apparently wagonloads of LPC were killed and shipped to market around 1900 (Lee 1953, Jackson and DeArment 1963). In addition, settlers and pioneers hunted LPC for subsistence. (Ligon 1927, D. Carmichael, Pep, NM personal communication, W. Massey, farmer, Dora, NM, personal communication, J.Williamson, rancher, Pep, NM, personal communication).

All hunting was prohibited in 1934. Sport hunting was allowed in 1948-49, 1958, and from 1960-95 (Campbell 1972, Cowley 1995). LPC hunter/harvest surveys were conducted from 1960-95. Cowley (1995) estimated that hunter effort ranged from 213 in 1991 to 2000 hunters in 1962 with an average of 989 hunters per year. Estimated LPC harvest ranged from 244 in 1993 to 4079 in 1988 (Cowley 1995). Hale (1996b) however, estimated only 96 hunters pursued LPC in 1995.

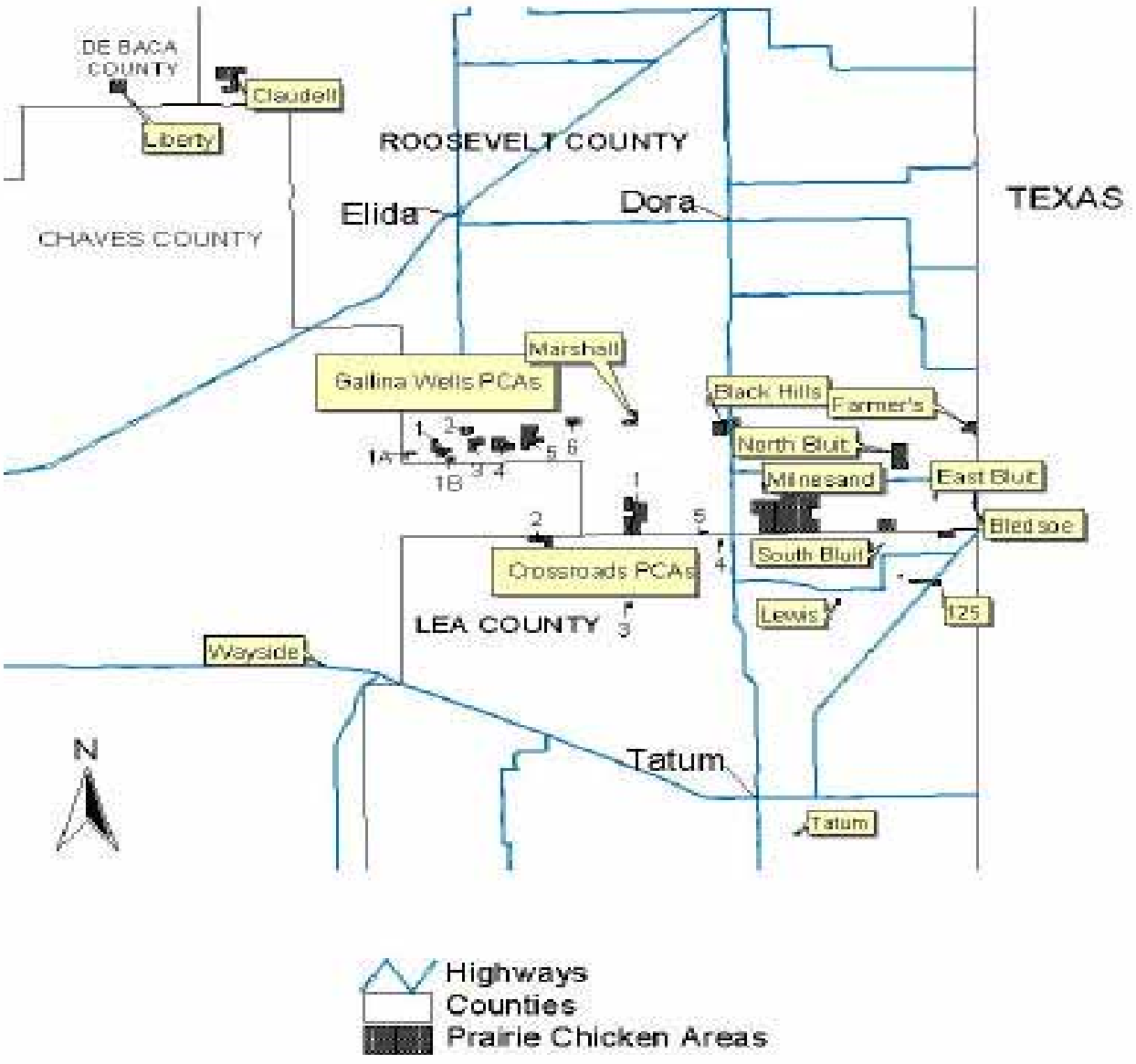
Management to Date.--

(a) Prairie Chicken Areas: The denuded rangeland and few remaining LPC in the 1930s alarmed the state game warden (Director) resulting in prohibition of hunting for the LPC in 1934 (Lee 1953). The Pittman-Robertson Federal Aid in Wildlife Restoration of 1937 enabled the Commission to purchase lands as "Prairie Chicken ranges" (Prairie Chicken Areas [PCAs]), "that would exclude livestock" for conservation of LPC (Barker 1949, 1976, Lee 1953, Snyder 1967). These units, often farms and ranches that had failed during the Dust Bowl and Great Depression, were 1 to 2 mi^2 and scattered throughout the range of LPC in New Mexico (Barker 1949, 1976, Lee 1953). Some were as far north as Rosebud and as far south as several miles south of the Wayside rest area on US Highway 380 (Frary 1956). The basis for this purchase strategy was that wide distribution of protected areas would be more beneficial to LPC conservation than conserving a large area in only one part of LPC range (Barker 1949, 1976). Trick tank water units were installed where there were no wells, food crops were planted, and feeders, shelters, and fences were built on most of these properties. The water units, food plots, feeders and shelters were determined to be non-essential to LPC but water units were kept because they were of benefit to other game species and required little maintenance (Frary 1957). A person was assigned to patrol these areas to prevent poaching, control predators and to maintain the water units and fences. Barker (1949) and Frary (1957) believed that excluding

livestock from these parcels was the single most important factor in assisting the recovery of the LPC. Lee (1953) said the increase may have been "sort of an act of God", meaning that natural occurrences had more to do with population recovery than management efforts. Lee (1953) also noted that the grasses on some units had grown so rank that the LPC were not using them as much as the surrounding lands and speculated that some moderate or light grazing might help improve conditions. Grazing leases were issued on some of the PCAs from the late 1960s until the early 1980s. Grazing was allowed to continue on some PCAs until 1998 when the Director ordered removal of all livestock.

More PCAs were acquired in a trade with the Bureau of Land Management (BLM) in 1967 and 1972 for lands that are now part of the Sevilletta Wildlife Refuge near Socorro. The last property was acquired in 1991 from the Farmers Home Administration (FmHA) under the condition it would be used for wildlife conservation and never returned to agricultural production. To date, none of these areas acquired from BLM or FmHA have been fenced to exclude livestock (Pederson 1998). New fences and old fence repair are needed on other areas as well. PCAs now encompass 9678.3 hectares (23,902 acres) on 29 separate units ranging from 10.5 to 3171 hectares (26 to 7829 acres) (Figure 2).

Figure 2. Location of New Mexico State Game Commission owned Prairie-Chicken Areas.



(b) Transplants: LPC were trapped and transplanted by the Department as early as 1932. These efforts were also made in the 1940s and 1950s but with little or no success (Frary 1958, Snyder 1967). Ligon (1961) reported that transplanted birds tended to return to their home range. Barker (1976) felt that these efforts had not been successful because heavy use by livestock in transplant areas had "removed essential environmental ingredients". A habitat evaluation was completed and a transplant to Kiowa National Grasslands of northeastern New Mexico was planned in the 1980's but never initiated because of a lack of a transplant source (NMDGF 1985).

(c) Public Land Management: The Taylor Grazing Act of 1934 (amended 1976 (90 Stat. 2743)), Federal Land Policy and Management Act of 1976 (90 Stat. 2743),and the National Forest Management Act of 1976 (16 U.S.C. 1600) direct the BLM and the United States Forest Service (USFS) to manage for multiple uses, including the maintenance of biodiversity. The BLM identified the need for special habitat management of LPC habitat on public lands in the 1976 East Chaves Management Framework Plan (BLM 1976). The CWMA plan of 1980 established 93,839 hectares (231,700 acres) of public land along the Caprock on the Mescalero Sands, to be managed with special consideration for the benefit of LPC, Dunes Sagebrush Lizard and white-tailed deer. The BLM has considered the LPC as an "emphasis species" since the early 1990s. Their habitat needs have been taken into consideration in management plans and projects on all BLM lands within LPC range. This has resulted in managing livestock grazing to provide more residual vegetation for LPC. Partly in deference to LPC, brush control has been prohibited in areas having less than 40% cover of shin-oak.

Local and seasonal restrictions upon oil and gas developments also have been placed on BLM lands to protect LPC. Oil and gas leases have not been offered within LPC habitat administered by the Roswell Field Office (RFO) since 1992. The BLM also has regulatory authority to move facilities such as drill pads, rights-of-way, and range improvements 200 meters away from known booming grounds. During the National Environmental Policy Act (NEPA) process, the BLM may extend the off-set distance even farther if it is determined that the 200-meter offset is not sufficient to minimize impacts. Finally, the BLM implements a seasonal oil and gas timing restriction during the booming season. Drilling for oil and gas and 3-D geophysical operations are not allowed within LPC habitat from March 15-June 15. Normal operations such as maintenance, pipelines, roads and well pad construction are not allowed

between the times of 3:00 a.m. and 9:00 a.m except for normal around the clock operations such as venting, flaring, or pumping, which do not require a human presence during that period.

(d) Interagency Coordination: In 1995, a workshop was held in Amarillo, Texas for biologists from the 5 states within the current range of the LPC to address the range-wide decline of LPC (Hale 1996c). This led to formation of the Lesser Prairie-Chicken Interstate Working Group (LPCIWG) comprised of a voting core committee with representatives from the 5 state wildlife agencies within the current range of the LPC and advisory committee from other state, federal and private partners. The working group subsequently published the Assessment and Conservation Strategy for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) (Mote et al. 1998). Six "Primary Concerns Associated With LPC Conservation" were identified: habitat alteration, land ownership issues, climatic factors, predation, disease, and conservation economics.

(e) Federal Listing Investigation: On October 6, 1995, the Service received a petition to list the LPC as threatened within its known historic range. Due to budgetary constraints and a moratorium placed upon federal listing activities, a 90 day finding was not published in the Federal Register until July 8, 1997 (62FR 36482) (USFWS 1997) The Service stated that evidence was sufficient to warrant further investigation. The Service uses 5 criteria by which to evaluate the need for federal protection under the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1532 et seq.): (1) the present or threatened destruction, modification, or curtailment of a species' habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; (5) other natural or manmade factors affecting its continued existence. The Service stated in the 12-Month Finding (Federal Register on June 9, 1998 (63 FR 31400)) that listing of the LPC was warranted but precluded because of other higher priority species. The LPC was then added to the Service candidate species list.

(f) State Listing Investigation: In 1997, the National Audubon Society New Mexico State Office and five local chapters, the Rio Grande Chapter of the Sierra Club, and New Mexico Natural History Institute requested the Department investigate the status of the LPC to determine if listing as a threatened or endangered species was warranted under the New Mexico Wildlife Conservation Act. The final report recommended listing the LPC as threatened based on conclusions made from the analysis of threats to the continued persistence of LPC in New

Mexico. These potential threats include drought, grazing impacts, land conversion, oil and gas development, shrub control, predation, disease, harvest, small population phenomena, and limited conservation efforts (Bailey 1999). A recommendation to list the LPC was proposed to the State Game Commission in October 1999. At the November 1999 meeting, the Director withdrew a recommendation to list LPC as threatened until more information on the status could be obtained.

(g) Federal and State Conservation Efforts: The Service (USFWS 1999) has implemented two programs designed to enlist the help of private landowners to manage habitats on private lands for the benefit of federally listed species or species considered candidates for listing. The "Safe Harbor" program is for landowners with already listed species occurring permanently or seasonally on his lands. The "Candidate Conservation with Assurances" program is for landowners with candidate species occurring permanently or seasonally on his lands. Both programs are designed to allow landowners to voluntarily manage their lands to benefit these species and continue to operate with guidelines that both the landowner and the Service agree upon up front. This gives the landowner certainty that the Service will not come in later with new restrictions upon their private operations if the species becomes listed under the Endangered Species Act (ESA) (USFWS 1999).

In 1999 the Natural Resources Conservation Service (NRCS, formerly SCS) approved a landowner initiated LPC Geographic Priority Area (GPA) under the Environmental Quality Improvement Program (EQIP) to assist landowners with habitat improvement for LPC on private lands in Curry, Roosevelt, northern Lea and eastern Chaves counties. Funding was approved for $192,000 per year for 5 years beginning in 2000. Each landowner may be able to qualify for a maximum of $50,000 for the 5 year period.

The Department has a full-time biologist to develop a management plan, oversee research and work with private landowners and public land managers for improving habitat for LPC. In addition, a technician has been assigned full-time to maintain the PCAs.

Habitat Assessment

Ligon (1927) stated that LPC range formerly included all of sandhill type country in eastern New Mexico. This area encompasses approximately 23,000 km^2 (8650 mi^2) in New Mexico and can be divided into 3 parts: the northeast (3346 km^2 [1292 mi^2]), east-central (11,114 km^2 [4291 mi^2]), and southeast (7931 km^2 [3062 mi^2]) (Bailey 1999). Land ownership status of LPC range is 78% privately owned in the northeast and the east central portion whereas, only 24% is privately owned in southeastern New Mexico. With all three areas combined, private lands make up 59% of all suitable LPC habitat in New Mexico (Bailey 1999).

The east-central area contains the largest contiguous amount of habitat. Within this area is the core of LPC habitat in New Mexico in southern Roosevelt, northern Lea and eastern Chaves counties (Ligon 1927, Frary 1957, Snyder 1967, Mannie 1998, 1999, Massey and Dunn 2000). This core has been continuously occupied throughout the twentieth century. This area is adjacent to Cochran and Yoakum counties, Texas where Crawford and Bolen (1976) had found higher LPC populations associated with small grain crops. The habitat on the CWMA, also in the east-central area, is primarily composed of rangeland with limited oil and gas development.

This southeast area may be marginal habitat that is only occupied during favorable climatic periods (Snyder 1967). The habitat in the BLM lands administered by the Carlsbad Field Office (CFO) is also primarily rangeland but with extensive oil and gas development. This development has been attributed by some to be the cause of the recent decline of the LPC population in this area. However, this area apparently was not widely occupied during some periods before oil and gas development occurred (Ligon 1927, Frary 1957) and there is no conclusive evidence to show that oil and gas activities has caused the recent decline.

Northeastern New Mexico contains the smallest amount of suitable habitat and occupied range (Ligon 1927, Frary 1957, Snyder 1967). However, Ligon (1927), Frary (1957) and Snyder (1967) have all shown at least some range occupied where Harding, Union and Quay counties meet. The last verifiable report of LPC in the area was in 1993 (B. Hays, NMDGF, personal communication). It is unknown what, if any, landscape level change in the habitat has occurred.

Supply and Demand Assessment

In recent years populations have been considered inadequate to provide sufficient recreational hunting opportunities. Hunting has been prohibited since 1996, but apparently there was substantial demand (~1000 hunters/year) for it in the past (Cowley 1995). In addition, over 200,000 persons reported watching birds in New Mexico in 1996 (USDI 1996). Substantial interest in viewing the fairly uncommon LPC exists among these birding enthusiasts because of its unique ritualistic mating dance. One rancher in Roosevelt county reports that prior to the mid 1990s he would have more than 25 visitors per year come visit his ranch to observe LPC (J. Williamson, Pep, NM, personal communication). Another rancher reports over 300 visitors came to his ranch in a one-year period to observe LPC and see habitat projects (J. Weaver, Causey, NM, personal communication). Approximately 200 people per year view LPC on the CWMA and some visitors have come as far away as Germany (R. French, BLM Roswell, personal communication). Finally, for some the demand for conserving adequate numbers of LPC resides in recognition that it is an important ecological component of the Southern Great Plains ecosystem of New Mexico.

Economic Impacts

Hunters contribute to New Mexico's economy through the purchase of guns, ammunition, clothing, food, lodging, and fuel. Small game hunters spent $21.8 million in New Mexico in 1996 and the average expenditure each trip per small game hunter was $245 (USFWS 1996). This would result in $490,000 being contributed to local economies if the estimated demand of 2000 LPC hunters is fulfilled. Outfitters and guides generally have not relied upon LPC or other grouse species as their main income because availability of birds is unpredictable. However, when numbers of birds have been adequate and the season was open, outfitters and local residents have supplemented their income by guiding hunters and charging trespass fees on private lands.

LPC occupy the open rangeland and mixed farming/ranching areas of eastern New Mexico where agriculture is most of the economic base. Cash receipts for all farm commodities in counties with suitable LPC range in 1996 totaled $903.1 million and by county ranged from $18.1 million (DeBaca County) to $287.6 million in Chaves County (USDA 1996). LPC depredation on shocked grains has been reported in the past (Colvin 1914, Lee 1953, G. Hay,

rancher, Pep, NM, personal communication, W. Massey, farmer, Dora, NM personal communication, J. Williamson, rancher, Pep, NM personal communication) but not recently probably because most grain is harvested by combines. LPC have been observed feeding on peanuts that have been turned up for drying but there have not been any depredation complaints reported to the Department (M. Madsen, NMDGF, personal communication).

Farmers and ranchers are concerned about restrictions that may be imposed on them if the LPC becomes listed as a state or federally threatened species (New Mexico LPC Ranch Conversation Meetings 1999, 2000). State listing of the LPC does not extend authority of the Department to restrict farming or ranching operations on any federal or private lands. However, the federal ESA does authorize Service to prohibit activities on private lands that may harm endangered species and some of these activities may be essential for the farmer or rancher to maintain profitability. Activities likely to be affected are grazing on rangeland, brush control to enhance livestock carrying capacity, conversion of native rangeland, and oil and gas developments. Initial costs of implementing grazing management practices to improve LPC habitat could also cause economic hardship. However, Holechek (1996,1998) asserted that conservative grazing will provide higher long-term financial returns as well as providing habitat needs for LPC.

As an endemic species, the LPC is an integral part of the Southern Plains grassland ecosystem. With such a major part of the LPC diet being grasshoppers, other insects and insect galls (Frary 1959, Riley 1978, Davis et al. 1980, Riley et al. 1993a), they may contribute significantly in controlling insects, thereby providing economic benefit to the farmer and rancher. Frary (1959) found 21 grasshoppers in the crop of one bird and an estimated 250 leafhoppers in the crop of another. He also found grasshoppers in 80% of all crops sampled and leafhoppers in 50%. Frary's study sample was taken in October at a time when the diet was switching from insects to vegetative matter.

Oil and gas development occurs throughout much of the LPC range in southeastern New Mexico. Oil and gas production contributed $2.3 billion to the economy of New Mexico in 1996. (Bureau of Business and Economic Research 2000) and production occurs throughout much of LPC range in southeastern New Mexico. Restriction on development and production of oil and gas to protect LPC could adversely affect this industry. For example, the BLM RFO has not issued new leases for oil and gas development in LPC habitat under their jurisdiction

since the early 1990s. In addition, the Roswell and Carlsbad field offices restrict ongoing oil and gas activities during the booming season. Profits may be limited because companies cannot increase production during periods of high market prices.

Special Considerations

The decline in LPC in 1989 caused great concern among wildlife professionals, landowners and environmental groups who valued it as part of the Southern Great Plains ecosystem. Some believe that listing LPC as threatened is essential to recovery efforts. Landowners and sportsmen have expressed concerns that Federal or State listing of the LPC as threatened would result in additional obligations that would restrict activities on both public and private lands. Many are unaware of differences in the effects of Federal and State listing. The New Mexico Wildlife Conservation Act does not authorize Department to prohibit any land-use activities on any public or private lands that it does not own or lease. Under New Mexico statutes the Department may only regulate harvest, control activities on PCAs, and provide recommendations to federal agencies and landowners for conserving LPC.

Current regulatory authority of the LPC rests entirely with the states. If it becomes federally listed, primary management authority would be transferred to the Service. State or federal agencies would have to consult with the Service regarding any actions in which the use of federal resources such as land, permits, or funding might negatively impact LPC. The ESA requires that detrimental impacts of federal programs upon endangered species be eliminated, minimized, or mitigated to the extent that they will not jeopardize the continued existence of the species. The ESA also authorizes the Service to prohibit private activities that result in the take of endangered species on private lands.

LONG RANGE GOAL AND OBJECTIVE

Goal: That the Department's management of LPC satisfies the recreational and ecological interests of the citizens of New Mexico and results in successful resolution of related socio-economic issues.

Objective: That by 2006 most New Mexicans are satisfied with the Department of Game and Fish's efforts to meet LPC-related recreational and ecological interests and to resolve associated socio-economic issues.

ISSUES AND STRATEGIES

Issue 1. Current abundance and distribution of LPC is not fully understood and concern exists that populations may be inadequate to satisfy recreational and ecological interests.

Strategy 1: Determine the abundance and distribution of habitat believed to be suitable for supporting LPC.
Strategy 2: Determine the current distribution and abundance of LPC in New Mexico.
Strategy 3: Identify habitats which, though believed suitable, are apparently unoccupied by LPC.
Strategy 4: Identify probable factors preventing occupation of suitable habitats by LPC.
Strategy 5: Establish baseline targets for population abundance and distribution

Issue 2. Concern exists that federal listing of LPC as a threatened species would abrogate the Department's management authority, and would precipitate critical habitat designations and associated socio-economic issues. This would impede our ability to manage the species to attain recreational and ecological expectations.

Strategy 6: Maintain the current regulatory closure of LPC hunting seasons until data indicate populations are sufficient to sustain hunting.
Strategy 7: Continue to work with federal agencies to implement land use guidelines that will support the LPC populations needed to meet recreational and ecological expectations.

Strategy 8: Continue to work with public land managers and private landowners to implement projects that will maintain or improve the quality and extent of LPC habitat.

Strategy 9: Continue to participate with the Lesser Prairie-Chicken Interstate Working Group (LPC IWG) to gain expertise for LPC management and formulate management strategies to improve LPC populations throughout their entire range.

Issue 3. The diversity of interests, potential for conflicts among them, and skepticism about government motives may obstruct management necessary to realize recreational and ecological expectations and to successfully manage associated socio-economic issues.

Strategy 10: Measure public satisfaction at beginning of and end of life of plan.

Strategy 11: Develop public information and conservation education programs.

Strategy 12: Involve volunteers in management projects and selected research projects.

Issue 4. We suspect that current habitat quality and quantity may limit the abundance and distribution of LPC sufficient to meet recreational and ecological expectation.

Strategy 13: Continue to work with public agencies and private landowners to encourage land use practices that:

- Leave sufficient residual vegetation to maintain food, cover, and moisture requirements,
- Manage chemical use to avoid negative impacts on LPC populations,
- Maintain contiguous areas of habitat with the needed mosaic of components.

Strategy 14: Implement land use practices on Commission-owned PCAs to improve habitat for and may help sustain local populations of LPC.

Issue 5. Most LPC habitat exists on private lands. It is unreasonable to expect private landowners to expend or forego personal income to manage their lands to fulfill the public's ecological and recreational expectations.

Strategy 15: Facilitate the development of partnerships to bear or share the costs of maintaining or improving LPC habitat on private lands.

Issue 6. Some areas within suitable range may not have sufficient numbers of birds or genetic diversity to produce the populations needed to satisfy recreational and ecological interests.

Strategy 16: Evaluate trapping and transplanting of wild birds as a technique to re-establish LPC populations to viable levels.

Strategy 17: Consider the feasibility of using captive-reared birds to supplement or re-establish viable, self-sustaining wild populations.

Strategy 18: Evaluate the potential for inbreeding in small isolated populations to impede population growth.

Issue 7. Though conclusive data are lacking, suspicion exists that oil and gas development may be limiting LPC populations and realization of related recreational and ecological interests. Subsequent restrictions on extractive development may have adverse economic impacts on local oil and gas interests.

Strategy 19: Determine the impacts of oil and gas industry operations on LPC populations.

Strategy 20: Work with involved private, public, and corporate interests to develop and employ economically feasible practices that minimize the adverse impacts of their operations on LPC populations.

Issue 8. Current regulatory protection may be inadequate to satisfy the concerns of those recreational and ecological interests who suspect that the lesser prairie-chicken population may be threatened or endangered.

Strategy 21: Assess findings from our investigations regarding the abundance, distribution, habitat needs and limiting factors for lesser prairie-chicken populations. Provide Director with recommendation to list or not list the species based upon its likelihood to become endangered within the foreseeable future throughout all or a significant portion of its range in New Mexico.

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Appendix A. Summary of public comments on the draft long-range plan for the management of lesser prairie-chickens in New Mexico.

Public Comments on the
Draft Long-Range Plan for the
Management of Lesser Prairie Chickens in New Mexico

1. The draft seems a little vague, but to get something approved, it may need to be that way.

A1. The draft Long-Range Plan for the Management of Lesser Prairie-Chickens in New Mexico was designed to identify the biology, history and management of lesser prairie-chickens (LPC) and identify issues that would impede the management of the species to satisfy the recreational and ecological interests of the citizens of New Mexico. The Action and Operational Plans identify specific actions, set a time line and propose a budget.

2. One thing I do not see is a discussion of the effect of edge or fringe populations on fluctuations in the number of birds found in an area on the edge of habitat. New Mexico and particularly Southeastern New Mexico are the western edge of the larger populations in West Texas and Oklahoma. I would suggest that if an edge population needs to be managed at all, if there is anything that can be done, that management should be different than the core population. That difference does not need to be more stringent.

A2. The concern about the decline in the population of LPC was raised by the region wide decline throughout all five states. Although it may be somewhat on the fringe of the southern plains, it appears that New Mexico has the most remaining native rangeland habitat for LPC. Management for LPC should be as uniform as possible to ensure the viability and sustainability of the population throughout the range.

3. You note on page 7 that wide population fluctuations are common among gallinaceous birds. So Eastern New Mexico must be normal and no management will affect the wide population fluctuations described for Eastern New Mexico. I have not seen any evidence that the population swings in New Mexico are out of the normal ranges.

A3. As noted on page 6 the 15 year average from 1954 to 1968 was 11 males per booming ground. The 1996 average number of all LPC per booming ground was 2.6. Part of the danger of assuming that population fluctuations will always fix themselves is that unknown habitat changes may occur during periods of high populations. When a climatic change occurs causing the population to decline the habitat may no longer be able to support a minimum population..

4. While there are papers that discuss the effects of oil and gas activities on the Prairie Chicken, they are not grounded in good data. They believe, they think, they suspect there may be some affect. There is only one comprehensive study of the relationship between oil and gas and Prairie Chickens and it found a number of positive impacts from oil and gas. We must have more empirical evidence of cause and effect before a decision is made to interfere with the industry on behalf of the Prairie Chicken.

A4. Even though there is not emperical evidence to prove the effects of oil and gas activity on LPC, there is evidence to suggest a correlation between a reduced population and an increase in activity. To err on the side of caution without losing sight of reality will hopefully allow the Department to meet the goal and objective. The research that is proposed is to get the "good data" on the effects of oil and gas activity on the LPC. Some benefits of oil and gas activity may have been realized early on in development. But, just as Crawford and Bolen (1976) found with cultivated small grain crops there may be a point at which benefits of disturbance become negated by too much disturbance.

5. **There is absolutely no evidence, and you cite none, of increased oil field pollution. This myth, created by regulators, of large companies selling out and smaller and smaller companies buying production which results in more pollution has no evidence to substantiate it.**

A5. This section may have been unclear as to the specific areas of concern for oilfield pollution. The second paragraph on p 11 is modified to clarify this. The evidence of increased oil field pollution can be found on the Commission-owned Prairie Chicken Areas (PCAs) between Tatum and Kenna.. The incidence of contamination has increased on the PCAs since production began on and around those areas. It is a fact that smaller companies have bought the mineral leases and are operating on these areas. It is a fact that oil field pollution on these areas has increased. It is a fact that representatives and owners of these smaller companies have claimed that they don't have the money to do all of these cleanups.

6. The economic impact of oil and gas in New Mexico need additional information to describe the impacts from Prairie Chicken habitat protection in the State. There is no discussion of the direct impact on schools, 90% of school funds come from oil and gas. Nearly 40% of the general fund revenues come from oil and gas. The direct impact from oil and gas was 2.3 billion, but the indirect impact was 5.3 billion according to studies by New Mexico Tech and NMSU.

A6. We realize that not every economic impact can be calculated but we do recognize that the oil and gas industry is a major contributor to the economy of New Mexico. This is why the strategies were to determine what impacts the oil and gas industry actually has on LPC and to work with the various interests to come up with economically feasible practices.

7. I applaud your arguments justifying the efforts to preserve this species, but I don't think they should be limited to short-term economic issues (e.g., hunting, bird watching).

A7. The plan is not focused on only "short term economic issues" but also on the ecological interests.
The 1978 New Mexico Statutes Annotated Chapter 17 Article 1 Section 1 (17-2-1 NMSA 1978)states,
It is the purpose of this act and the policy of the state of New Mexico to provide an adequate and flexible system for the protection of the game and fish of New Mexico and for their use and

development for public recreation and food supply, and to provide for their propagation, planting, protection, regulation and conservation to the extent necessary to provide and maintain an adequate supply of game and fish within the state of New Mexico.

This law establishes the legal obligation "to provide and maintain an adequate supply" of LPC, "for public recreation and food supply,…". To accomplish these goals a viable and sustainable population of LPC must be available.

The NMDGF is funded primarily by sportsmens dollars through hunting and fishing license sales and federal aid to sportfish and wildlife restoration dollars that are taken from taxes on hunting and fishing equipment. These monies are targeted to recover game and fish species. Since this is the economic base of the Department it has a major economic impact upon the management of the species.

8. Why hasn't the Department removed livestock from all PCAs?

A8. Livestock owners were ordered to remove their stock from two fenced PCAs in 1998. Seven miles of new fence has been put up and 5 miles of fence has been repaired since 1999 on Gallina Wells 3, 4, 5, and 6. Other fence repairs have been done by NMDGF personnel from the Southeast Area Operations Division and the Conservation Services Division on Liberty, Claudell, Crossroads 1, South Bluit, North Bluit and Milnesand. Currently, 10 PCAs with more than 17,000 acres are fenced to exclude trespass livestock. Storms blow down or wash out sections of fence, renegade livestock tear down sections of fence and gates get left open so that livestock sometimes can be found trespassing on PCAs. As soon as these are discovered owners are contacted, livestock are removed and fences are repaired. There are 131 miles of boundary on all 29 PCAs. The Department is concentrating fencing repair work first on larger PCAs with known LPC leks identified on or near the PCA, second on smaller PCAs with known leks, third on smaller PCAs that leks are unknown. New fencing will be completed in the same order.(see Action and Operational Plan).

9. I think that the LPC population crashed at the end of the 1980s because or the use of tebuthiuron on shin-oak.

A9. LPC population numbers declined throughout the 5 states with LPC and throughout the 5 million acres of range (Snyder map 1967) whereas, tebuthiuron was only used on a limited area (55,000 to 100,000 acres) of far southeastern New Mexico.

10. What would be wrong with federal listing of the LPC as "threatened" or "endangered" since the law would have the US Fish and Wildlife Service protect the species?

A10. The function of the New Mexico Department of Game and Fish is, "…to provide and maintain an adequate supply of game and fish within New Mexico." The Department currently does have the legal authority to manage this as a game species and can utilize game protection funds to implement surveys, research and habitat improvement on PCAs. The Department is also working on gathering resources from various entities to implement on the ground work to manage LPC (See Action/Operational Plans). When a species becomes federally listed the State

of New Mexico no longer has the primary legal authority to manage that species. The planning and management then comes under the authority of the US Fish and Wildlife Service.

11. I don't see much in the way of concrete plans to obtain more or better data on status. The State Game Commission awaits such information [p. 15]; when will they get it? Why not give some specific plans for conducting censuses over the next few years (times and places)?

A11. Recent LPC population surveys have only been conducted on PCAs since 1996 and along roadsides since 1998. Because individual LPC are difficult to locate and impossible to census, surveys are conducted in the spring when leks are active and can be detected audibly for up to one mile. Specifics on the methods of surveys are spelled out in the annual LPC Survey Report. Approaches and plans are also included in the Action and Operation Plans.

12. The Department has taken little action to protect the LPC. In fact, the Department has not even protected its own LPC areas from trespass grazing. As you point out in the Plan, hunting was allowed through 1995, despite widespread evidence of population declines and agreement in 1989 that the LPC was in trouble.

A12. The NMDGF has had several actions already in place to protect LPC. 1. Hunting season was closed in 1996. 2. A NMDGF representative has been active on the Core Committee of the LPCIWG since the beginning to identify problems and develop strategies for species recovery. 3. Surveys for abundance and distribution of LPC began on PCAs in 1996, along roadside routes in 1998, on private lands in 2000. (These surveys require a minimum of 60 man days each year). 4. A fulltime biologist has been hired to address this species alone. (No other state or federal agency has one individual dedicated to just prairie-chickens). 5. Fence work has been done (see A7). 6. A fulltime maintenance person was hired to care for improvements on PCAs. 7. Agreements have been negotiated with landowners and habitat improvements begun on 26,000 acres of private and 12,000 acres of state trust lands. 8. Investigations and enforcement of clean-up of oil field pollution on two PCAs has been taking place in cooperation with the New Mexico Oil Conservation Division. 9.Cattle grazing has been removed from several heavily impacted PCAs. 10. Watering units on 4 PCAs have been repaired with the help of student volunteers from Eastern New MexicoUniversity and other interested sportsmen. 11. The Long Range Strategic Plan has been drafted and public comment taken. 12. The Long Range Plan and draft Action and Operational Plans are now complete. Bailey (1999) stated that harvest was not a primary limiting factor for the species in New Mexico.

13. Much is made of the perception which some ranchers have that listing (either federal or state) would have a negative impact on their operations. In fact, what statements the Plan makes on the subject are at best equivocal as to negative impacts. These perceptions are construed as "socio-economic issues" and the Plan, inasmuch as it plans anything at all, addresses only these perceptions, not the reality of farm operations and economics, the status of the LPC, or the actions of the Department of Game and Fish to protect the species.

A13. Most (60 %) of all LPC habitat in New Mexico is on private land (Bailey 1999). This includes Bailey's Southeast Recovery Area. When looking at Bailey's East-Central Area (1997 in Bailey 1999) 78% of the habitat is on private land. This area that is 78% private is where most LPC are found and have consistently been found during periods of low populations. The most logical place to begin to ensure species survival is by protecting the existing populations and their habitat. If recovery and sustaining of this species is to ever occur, it is imperative that NMDGF obtain the cooperation and support of private landowners. From the landowners themselves at State Game Commission meetings and Ranch Conversation Meetings we have learned that most landowners believe that federal or state listing of a species can and will negatively affect their ability to make a living and develop income from their land. Many have expressed that they will not let us know if LPC occur on their land and are not willing to manage for LPC if they feel its presence may pose some threat to their livelihood. What the landowners perceive as a threat to their operation from the legal requirements of Endangered Species Act becomes the reality of inability of the NMDGF to effectively manage for this species on private lands.

14. Can the Share With Wildlife program provide seed money for research? What about other sources?

A14. The Share With Wildlife program was set up primarily to fund research for non-game species which had no funding. Since LPC are a game species there is some funding available to go ahead with seed monies. The Department has been working with the El Llano Estacado Resource, Conservation and Development Council to compile funds from various sources such as the National Fish and Wildlife Foundation and other private sources.

15. What role does the Lesser Prairie Chicken Interstate Working Group have?

A15. As stated in Strategy 8 we will continue to work with the LPC IWG to gain (and share) the expertise and formulate management strategies to improve LPC populations throughout the range. The group meets once a year to update the population status and ongoing work in each state.

16. Does the Department ever consider that the species may never be able to be hunted again in New Mexico?

A16. Yes. This is a consideration that is taken into account through investigation under the Wildlife Conservation Act. However, recovery to a huntable population is always the goal for our game species.

17. Is the Department confident that transplanting will be successful even though transplants in the past have all failed?

A 17. No. That is why the strategy is to evaluate this technique. The Action/Operational Plan addresses this in more detail.

18. The Plan offers no goal or objective for the abundance and distribution of prairie-chickens in New Mexico in 2005. Instead, the goal is to satisfy the recreational and ecological interests of the citizens of New Mexico and to resolve "related socio-economic issues." There is no discussion of what the recreational and ecological interests on New Mexicans are. There is little discussion of the real, and perceived, socio-economic concerns. If these terms are not defined, there can be no measurement of the success or failure of this plan. "Ecological interests" is a "buzz-word" that sounds nice, but communicates little. I presume this term refers to public concerns for the distribution and viability of prairie-chicken populations? Further, there is no statement of how "citizen interests" and "socio-economic concerns" will be measured, or of how "citizen satisfaction" or "resolution of concerns" will be measured.

(See A1)

A 18. A new strategy to measure public satisfaction will be added in the Operational Plan. A public polling firm will be hired to determine New Mexicans' knowledge and satisfaction with the management of LPC in 2002 and in 2006.

Intermediate objectives to work toward public satisfaction will be set: observation opportunity, hunting opportunity, percentage of occupied suitable habitat, and population numbers.

19. What is NMDGF's goal for the distribution of prairie-chickens in 2006? Will NMDGF attempt to reestablish or maintain any populations in the northeast quadrant of the state? Will NMDGF attempt to reestablish and maintain any populations in southeast New Mexico (southern Lea and east Eddy counties)? Is NMDGF committed to maintaining populations in southeast Chaves County, where data indicate populations are sparse and in decline? Is NMDGF committed to locating and enhancing the security of populations in north Roosevelt, Curry and east De Baca counties, where data indicate that populations are sparse and scattered?

A19. NMDGF is committed "to provide and maintain an adequate supply" of LPC, "for public recreation and food supply,…". To accomplish these goals a viable and sustainable population of LPC must be available. What minimum population that will be is to be determined as a result of the ongoing research. Where this will be is also a result of identifying areas of habitat suitable to sustain the population. Habitats where data indicates that populations are sparse and scattered may not be of adequate size or quality to sustain viable LPC populations and may be in marginal areas where adverse climatic patterns prevent sustaining populations long term. This is possibly indicated by the progression of area occupied by LPC in the 20th century as seen in the maps by Ligon(1927), Frary(1957) and Snyder(1967). "While it is desirable to maintain and/or reestablish LPC in [these] *areas, populations in these areas are not considered necessary for the continued viability of the species in New Mexico." However, since it may be desirable to maintain and/or reestablish LPC in these areas to satisfy the recreational and ecological interests, investigation will continue as to the feasibility of transplants and natural repopulation of these areas with improved habitat.*

20. The Plan lists seven issues. Issue 1 states that, "Current abundance and distribution of LPC is (sic) poorly understood and concern exists that populations may be inadequate." This is not true. Abundance and distribution of prairie-chickens in New Mexico are better understood today than at any time in the past. Recently, there have been many hundreds of miles of roadside surveys and there are large data sets from two BLM areas and the Prairie-chicken Areas. New Mexico seems to be the only state that has used randomly located roadside surveys, allowing valid extrapolation of results to large predefined study areas. Also, it is inconsistent to accept the maps of past distributions of prairie-chickens (Fig. 1 and page 3) while questioning our knowledge of current abundance. I do not believe the authors of these maps described any systematic surveys. Although "recreational and ecological interests" are not defined, given the results from most of the 1998-2000 surveys, it seems ludicrous to state that populations "may be" inadequate to satisfy these needs.

A20. Issue 1 wording changed to "not fully understood". Although NMDGF is making progress with LPC surveys, current abundance and distribution is not fully understood. Maps identifying suitable sandy soils habitat need to be developed to find out where LPC can be expected to occur and proliferate. Even though roadside surveys were randomly selected not all of the survey area is suitable sandy soils habitat and to make an extrapolation of population to areas that cannot sustain populations of LPC would be irresponsible. The maps of past distribution of LPC are all that is available for New Mexico and gives a starting point to from which to look for suitable habitat and for LPC. To utilize these as a resource does not assume that population abundance or even the distribution was fully understood by the authors and creators nor does it imply that the knowledge we have gives full understanding about the current abundance and distribution.

21. An issue not included in the Plan is: In the majority of prairie-chicken range that is almost all privately controlled land, short-term commitments of landowners to maintain habitat will provide no long-term security for the species. Conservation agreements are often only 5-10 year commitments. Landowner interest may change drastically due to drought, new economic opportunities, and change of ownership. NMDGF must look beyond a 5-year plan to provide for the long-term conservation of lesser prairie-chickens.

A21. This pertains to Issue 5 which has been changed to "Most LPC habitat exists on private lands. It is unreasonable to expect private landowners to expend or forego personal income to manage their lands to fulfill the public's ecological and recreational expectations."
The approach to improve habitat on private lands is to identify range management practices that not only improve habitat for LPC but have long term economic benefits to the landowner/operator. Plans for habitat improvement will be developed by combining accepted habitat needs from the scientific literature, the best available scientific knowledge of range management, and the rancher's knowledge of ranch economics. With this approach specific ranch plans can be developed that will be economically beneficial for not just 5 or 10 years but, for the next 30 years. Some landowners may drop out and change management after 5 or 10 years. However, as more landowners are willing to participate and others see the economic benefits obtained by their neighbors management then there should always be some private lands that are managed to benefit LPC.

22. The Plan lists 17 strategies for the management of prairie-chickens. Two strategies (7 and 10) are redundant, so there are only 16 different strategies.

A22. Strategy 7 addresses developing specific projects whereas Strategy 10 addresses developing guidelines.

23. Eight strategies (1, 2, 3, 4, 13, 14, 15 and 16) commit to more studies and research. More studies will not translate to management within 5 years.

A23. All of these research needs are ongoing and "look beyond a 5-year plan to provide for the long-term conservation of lesser prairie-chickens." *Strategies 1-4 will provide the information necessary to make management decisions. Strategy 1 will be completed by the end of year 1. Strategies 2 and 3 are ongoing but provide information annually. Strategy 4 will be ongoing for five years but will hopefully provide information needed to effectively manage LPC throughout its range. Strategies 13-15 must be accomplished before any actions are taken and countless dollars wasted not knowing what will or won't work. Part of Strategy 16 is already under way and will give good scientific information on what really does impact LPC.*

24. The 3-fold management approach on page 2 neglects management of the NMDGF Prairie-chicken Areas.

A24. NMDGF is included in 2 and 3(See also A1, A7, Action and Operational Plan)

25. Page 3:paragraph 4. Referring to Snyder's map, "smaller populations" are not shown in Fig. 1 in Guadalupe County. However, they are shown in parts of Union, Harding and Quay counties.

A25. This is taken from Snyder's (1967) text, not from the map.

26. P.4:2. The use of "again" in the first sentence is inappropriate. Previous references, illustrated in Fig. 1, always showed populations of prairie-chickens in northeast and southeast New Mexico. Referring to southeast New Mexico, personal communication from John Sherman, BLM biologist, indicates that only 1 of 29 historic leks was active in 2000, with only 2 males present.

A26. The use of "again" is appropriate when referring to the LPC distribution being restricted to the central portion of their range. When looking at Ligon's (1927), Frary's(1957) and Snyder's(1967) maps we only see that these areas are occupied but, I do not believe the authors of these maps described any systematic surveys to indicate how many or where LPC were found. They may have surveyed hundreds of miles but just did not describe it. The fact that LPC were found at all in the southeast in the same general vicinity as the southern polygon in Ligon's map and the southern tip of the main polygon in Snyder's map, indicates it is still occupied. Although some roadside surveys were conducted in the northeast in 1998 and 1999, extensive systematic surveys within suitable LPC habitat have not yet been established. Roadside surveys were also conducted in the east central area in 1997 but were not systematically established by the

protocols. We do have the report of an official sighting in the northeast in 1993 and several un-verified reports as recently as Spring 2001.

27. **P.7:2. The citation of Bailey (1999) is not quite correct. On page 4 of the 1999 report it said that populations have varied 10-fold or more between wet and dry years. It did not say that these were adjacent years.**

A27. The text of the report does not indicate what you state here. "With their high biotic potential, populations may increase or decrease greatly in one year, depending largely upon annual reproductive success. Great among years variation in abundance is typical, with populations sometimes varying 10-fold or more between dry and wet years" (J. Bailey 1999). *Since the discussion was on high biotic potential* "(maximum possible rate of population increase)" *and since weather patterns in the eastern plains of New Mexico can have a dry year followed by a wet year, this lends to the interpretation that the population can increase, as well as decrease, 10-fold in one year.*

28. P.10:last line. I suggest that "habitat fragmentation" be "habitat loss and fragmentation."

A28. Not all of these create a significant loss of habitat.

29. P.12:1. This is a superficial summary of the recent surveys. It emphasizes the limited "positive" information. The first sentence should end with "in some areas." A more realistic summary of these data is needed.

A29. The statements in this paragraph are by no means absolute. They are prefaced with, "Some evidence suggests…". *The latest survey information shows numbers of LPC on the 15 PCAs surveyed since 1997 have increased by 10-fold from 31 to 321 and numbers of leks along roadsides have remained fairly stable(see LPC Survey Report 2001). Numbers of LPC on Mescalero Sands have maintained somewhat stable. Since 1997 LPC numbers have not declined and in some areas have increased.*

30. P.12:4. The PCAs are not "scattered throughout the range" of prairie-chickens in New Mexico. Most are in the core area. Two, Liberty and Claudell, are in the area of sparse and scattered populations. Most of the ancestral range of prairie-chickens in New Mexico has no PCAs. This is important because the future of prairie-chickens in much of the state may depend upon establishing new PCAs, or similar protected areas, to assure there will always be refugia of quality habitat.

A30. This section is a historical account of Management to Date and is talking about where PCAs were when they were acquired. There were PCAs also located in the northeast near the community of Rosebud and south of Highway 380 in the Mescalero Sands. According to Barker (1976) those PCAs were located across the known range of LPC. Those other properties were either leased and turned back or disposed of because no LPC were found or used those areas.

31. P13:1-2. This section is incomplete without a summary of fence conditions, fence and survey needs, trespass grazing, excessive roads and other problems on the PCAs. The NMDGF 1998 report of conditions and needs on the PCAs should be cited. There should be a compilation of fencing needs, so that we may know how much of this problem is to be addressed during the tenure of the Plan.

(See A1, A8, A12, draft Action/Operation Plans)

32. P,13-14. It seems appropriate to point out that the habitat needs and habitat commitments in the 1976 BLM East Chaves Management Framework Plan were never addressed.

A32. This references an account of recorded Management to Date, not the evaluation of the completion, quality or benefit of that particular management.

33. P.17:4. The calculation of $490,000 benefit to local economies assumes there will be only one trip per prairie-chicken hunter. Further, there is a local "multiplier effect" from these expenses. (Money spent at a gas station is spent again by the station operator, perhaps to buy groceries or furniture.) Economists generally use multipliers ≥2. You may not want to get in to this, but the economic impact would exceed $490,000.

(See A6)

34. P.19:3. I suggest adding "and landowners" to the last line of this paragraph ("provide recommendations to federal agencies and landowners for conserving LPC").

A34. Done.