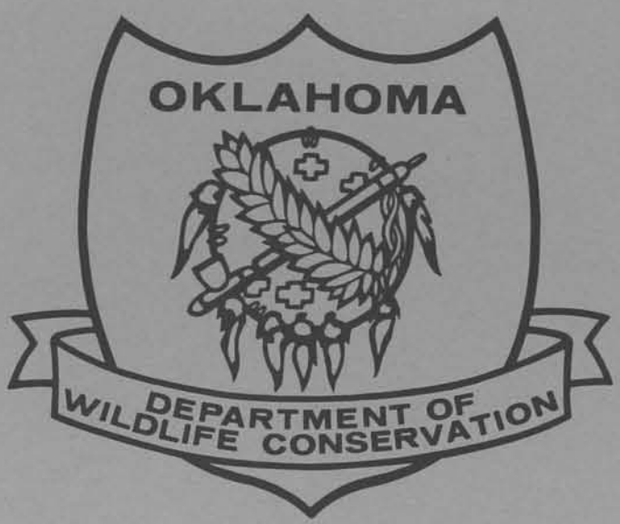
FINAL REPORT

SECTION 6

ENDANGERED SPECIES ACT



FEDERAL AID PROJECT E-51

Status of the Mountain Plover on
Cultivated Landscapes in Western Oklahoma

JUNE 1, 1999 - DECEMBER 31, 1999

FINAL REPORT

STATE: Oklahoma Project Number E-51

PROJECT TITLE: Status of the Mountain Plover on Cultivated Landscapes in Western Oklahoma

SEGMENT DATES: 1 June1999-31 December 1999

I. Objective

Revisit cultivated fields in northwestern Oklahoma that have previously supported nesting mountain plovers, as documented by Shackford et al. (1999), and document current breeding activities of plovers on those fields.

II. Abstract

Currently, the mountain plover (Charadrius montanus) is a candidate species under consideration for Threatened Species status (U. S. Fish and Wildlife Service 1999). We studied this species on cultivated fields of the western end (primarily Cimarron County) of the Oklahoma Panhandle during the breeding season of 1999. We inspected 98 fields where Shackford had observed mountain plovers in Oklahoma from 1986 through 1998. Of these, nine (9%) had been (re)converted to pasture land or were overgrown with thick vegetation, 38 (39%) had crops or other vegetation deemed too high to effectively survey (≥ 60 cm), while 51 (52%) had crops or other vegetation < 60 cm (24 in) and were searched for mountain plovers. Of those 51, we found mountain plovers on 16 (31%) fields, but no mountain

plovers on the remaining 35 (69%) fields. Of the 38 fields with vegetation deemed too tall to effectively survey, mountain plovers fortuitously were located on two (5%) fields. Thus, of the 98 fields with mountain plovers in the past, we found mountain plovers on 18 (18%) fields. We also located mountain plovers on 22 "new" fields, those fields where plovers were located for the first time in the 1999 breeding season. Thus, in the 1999 breeding season, we located mountain plovers on a total of 40 cultivated fields, 18 (45%) of which were "old" fields, and 22 (55%) were "new" fields. On the 40 fields where we found plovers during the breeding season, we located 86 mountain plovers, 27 (31%) of them on "old" fields and 59(69%) on "new" fields. Total acreage of fields with plovers (n = 40) was 6,886 acres (2,787 ha), and average field size was 172 acres (70 ha). The best evidence of breeding activity (n = 40) was: nesting, one field; flightless young, six fields; fledged young, one field; courtship calls and/or flights, 12 fields; "pair" of plovers of unknown sex, four fields; and single adult plovers in cultivated fields in breeding season, 16 fields. Four years of field research on mountain plover use of cultivated fields during the breeding season were compared: the 40 fields with plovers in 1999 was 8% higher than our previous high of 37 fields in 1994, while the 86 plovers in 1999 was only 4% less than the previous high of 90 plovers, also in 1994.

III. Procedures

The study area was cultivated fields in Cimarron and the west 10 miles of Texas counties, Oklahoma. Study periods were 1 June-14 July for breeding birds, and from 15 July-14 August for premigratory birds.

We compiled a list of all cultivated fields (n = 99) where we had located mountain plovers between 1986-1998 ("old" fields) in Cimarron County at the western end of the Oklahoma Panhandle. All of these fields were within a 20-mi. (32 km) radius of Boise City. Ninety-eight of those fields were inspected to determine suitability for surveying for mountain plovers (one field was inadvertently omitted during the reinspection). Fields were deemed unsuitable for surveying if (a) they had been (re)converted to grasslands (Conservation Reserve Program grasslands, etc.) or thick weeds, or (b) crop or other vegetation was $\geq$ 60 cm (24 in). The remaining fields (i.e., those with crops or other vegetation < 60 cm) were searched until at least one mountain plover was located or for $\leq$ 30 minutes, whichever came first. We defined a cultivated field as that area in one location that a land manager or farmer attempted to plant and/or manage as a single unit.

In the study area, we inspected many additional cultivated fields that appeared suitable for breeding mountain plovers, but where we had never recorded mountain plovers before; we found mountain plovers on many of these "new" fields. In the final tally of "old" and "new" fields surveyed, we counted as surveyed only those fields where we either (a) found one or more plovers or (b) surveyed $\geq$ 30 minutes without finding a plover. Because we did not survey any "new" fields without plovers as long as 30 minutes, only those "new" fields where we found plovers appear in our tally of total fields surveyed.

At each cultivated field where mountain plovers were located, we recorded extensive data on a field data sheet and a map sheet developed by Shackford over the past several years (Appendix I). Data from these sheets were then entered into a database file previously designed by Shackford (Appendix II),

and specific data were extracted and condensed from this database. For comparative purposes, we also compiled the number of townships and fields with mountain plovers and the number of mountain plovers during the breeding seasons in 1992, 1993, 1994, and 1999; we expended similar amounts of effort in field research in each of these four years.

IV. Results

We inspected 98 of 99 fields where Shackford had observed mountain plovers in Oklahoma from 1986 through 1998. Of these (n = 98), nine fields (9%) had been (re)converted to pasture land (Conservation Reserve Program grasslands, etc.) or were overgrown with thick vegetation; an additional 38 fields (39%) had crops or vegetation deemed too high to effectively survey ($\geq$ 60 cm); 51 fields (52%) had crops or vegetation < 60 cm. Those latter 51 fields were searched for mountain plovers; we found mountain plovers on 16 fields (31%), but not on the remaining 35 (69%) fields. Of the 38 fields with vegetation deemed too tall to effectively survey, mountain plovers fortuitously were located on two (5%). Thus, we found mountain plovers on 18 (18%) of the fields with mountain plovers in the past (n = 98).

In addition, we located mountain plovers on 22 "new" fields, where mountain plovers were located for the first time in the 1999 breeding season. Thus, of all cultivated fields surveyed in the 1999 breeding season (n = 120), we located mountain plovers on 40 (33%) fields; 18 (45%) of those were "old" fields, while 22 (55%) were "new" fields (see "Separate Report: Sensitive Data"). On the 40 fields where we found plovers during the breeding season, we located 86 ($\bar{x}$ = 2.2 plovers/field) mountain plovers,

59 (69%) on "new" fields, 25 (29%) on the 16 "old" surveyable fields, and two (2%) on the "old" unsurveyable fields (vegetation ≥ 60 cm). Total acreage of the 40 cultivated fields with mountain plovers was 6,886 acres (2787 ha) and average field size was 172 acres (70 ha). The best evidence of breeding activity (n = 40) was: nesting, one field; flightless young, six fields; fledged young, one field; courtship calls and/or flights, 12 fields; "pair" of plovers of unknown sex, four fields; and a single adult plover during the breeding season, 16 fields.

During the 1992 breeding season we found mountain plovers on 35 cultivated fields in eight townships and a total of 45 plovers; in 1993, 25 fields, 10 townships, and 39 plovers; in 1994, 37 fields, seven townships, and 90 plovers; and in 1999, 40 fields, seven townships, and 86 plovers (Figs. 1-4).

Dan Robinson, a farmer who is very familiar with mountain plovers, reported seeing the species while farming a specific field in Texas County, Oklahoma, within the last year, but he did not have an exact date. We suspected his sighting was during the breeding season but were not certain. That field and the surrounding area in Texas County were checked extensively on two occasions. No plovers were found, but based on such characteristics as the good habitat and other species found there (long-billed curlew, Numenius americanus), we have no reason to doubt his report. We are still, however, trying to verify the first record of a mountain plover during the breeding season in Texas County.

During the premigratory flocking period in 1999 (July 15-August 14), we found an additional 27 mountain plovers on the 40 "old" and "new"

breeding season fields, and 46 more plovers on four additional fields during the premigratory season only. Thus, during the entire nesting and premigratory flocking seasons, we found a total of 150 mountain plovers on 44 cultivated fields ($\bar{x}$ = 3.4 plovers/field)

V. Discussion

In Cimarron County, we spent similar amounts of effort looking for mountain plovers on cultivated fields during the breeding seasons in 1992, 1993, 1994, and 1999, and therefore we believe our counts in those years have some comparative value (Figs. 1-4). Even though the 40 fields with mountain plovers in 1999 was 8% higher than the 37 fields in 1994, the next highest year, and the 86 mountain plovers in 1999 was only 4% lower than the 90 plovers found during the highest year, also in 1994, our 1999 numbers may still have been adversely affected by two "negative" biases. In the earlier years, we tried to determine all plovers present on a field, particularly our study fields, while in 1999 we were primarily interested in presence/absence; after the first bird was found on a field, we normally moved on to permit adequate time to survey the remaining fields. The study in 1999 began later (1 June) than in the earlier years (early April); thus, plovers had to be searched for (on average) in older, and therefore taller, crops or other vegetation, making the search more difficult in 1999. Presumably, skill in finding plovers on cultivated fields in 1999 increased over earlier years, and this was likely a "positive" bias.

The average size of fields with mountain plovers in Oklahoma in 1999 was 172 acres. This was 12% larger than the average field size of 153 acres found in Oklahoma, Kansas, and Colorado in a 1993 and 1994 study

(Shackford and Leslie 1995a) and supports the contention that, on average, fields are being farmed in larger blocks in recent years.

A historical review of past research on mountain plover breeding on cultivated fields is useful to understand the significance of the present research. During research on five rare bird species of the Oklahoma Panhandle in spring 1986, Shackford located mountain plovers on 21 sites, nine of which were cultivated fields, a habitat previously unknown to be used by the species (Shackford 1987). That year Shackford (1987, 1991) also verified the first mountain plover nest on a cultivated field, in 30 cm (12in.) high, growing milo. In 1988, in southeastern Alberta, Canada, at the northern limits of the mountain plover's range, Werschler (1989) found a nest in a field planted to (exotic) Russian wild rye in the 1960's. The total number of nests that we have found on cultivated fields, all of them in southern latitudes (from southeastern Wyoming southward), now stands at 53 (Shackford et al.1999, reported herein).

In spring 1992, we looked for, and found, new populations of mountain plovers on cultivated fields in southwestern Kansas, eastern Colorado, southeastern Wyoming (Laramie County), and southwestern Nebraska (Kimball County) (Shackford and Leslie 1995b, Shackford et al.1999). In spring 1995, we then undertook a much more extensive survey of mountain plovers on cultivated fields, from the Texas Panhandle and eastcentral New Mexico north to within a few miles of the Canadian border in Montana; this survey added several counties in eastern Colorado, one county in southwestern Nebraska (Cheyenne), and one county (Judith Basin, one plover only) in central Montana to the counties already known to have mountain plovers on cultivated fields (Shackford and Leslie 1995b,

Shackford et al. 1999). We noted that the general absence of mountain plovers on cultivated fields north of southeastern Wyoming (Laramie County) was likely an indication of much more frequent plowing regimens in northern latitudes, where spring wheat is the dominant crop, than in southern latitudes (southeastern Wyoming southward), where winter wheat is the dominant crop, as well as climatological differences in the two areas (Shackford and Leslie 1995b, Shackford et al. 1999).

In spring 1993 and 1994, Shackford and Leslie (1995a) intensively studied 71 fields in Cimarron County, Oklahoma, southwestern Kansas, and eastcentral Colorado, primarily Kiowa County. We found that mountain plover fidelity to a single field during one breeding season appeared to be high within a particular year; stay on a particular cultivated field averaged 41 days--49% of the time--during an average of 83 days of observation (Shackford and Leslie 1995a). In spring 1999, we studied reuse of a particular field among years in the western 35% of the Oklahoma Panhandle. Our data, given herein, suggested somewhat more fluidity of mountain plovers in the selection of fields among years than within a particular year; of 51 "old" fields surveyed, plovers could be located on only 16 (31%). Furthermore, only 18 (45%) of the fields found with plovers in 1999 were "old" fields, while 22 (55%) were "new" fields. Also, of the 86 mountain plovers found in the breeding season of 1999, only 27 (31%) were on "old" fields, but 59 (69%) were on "new" fields. Our data suggest that the first field selected for nesting by a pair (or small group) of plovers in a given year usually relates more to the bareness of a field, or cluster of fields, at the beginning of the nesting season when mountain plovers first arrive than it does to the precise nesting area of the previous year (pers. obs.). For

overwhelmingly preferred plowed ground: of 82 observations of adult or fledged plovers, 71 (87%) were on four plowed fields, plus a total of nine unfledged young there, but only 11 (13%) were on two native prairie pastures, with no unfledged young (Shackford and Leslie, unpub. data). Comparing prairie habitats in northeastern Colorado to those in southeastern Colorado, we suspect one important difference is the relative abundance of cacti and other forbs on native prairies of northeastern Colorado only, especially on the Pawnee National Grassland (pers. obs.). These forbs may provide valuable shade for the plovers there. The general absence, however, of such forbs on native prairies in southeastern Colorado results in much shadeless habitat; rather than selecting native prairies there, where exposure to the sun might be excessive, the plovers in southeastern Colorado may select the best alternative, cultivated fields with shade. Shade is an important habitat component for both young (Graul 1975) and adult mountain plovers (Shackford 1996).

VI. Recommendations

Recently, much of the debate surrounding the petition to list the mountain plover as threatened appears to center on (a) whether the species has been adequately surveyed, particularly in southeastern Colorado, and (b) what effect nesting on cultivated fields has had on populations of mountain plovers. In a two-year study during 1993 and 1994, Shackford and Leslie (1995a) determined that during the breeding season in southern latitudes, mountain plovers on cultivated fields (n = 71) averaged at least one period without mechanical farming operations that was sufficiently long for the plovers to proceed uninterrupted from courtship through the hatching of young: courtship through the hatching of young requires 46-50 days, while

all years of research on cultivated fields, however, plovers usually have been found in the same geographical areas as in previous years, suggesting that fidelity may be quite strong (Figs. 1-4). Graul (1973, 1975), studying banded birds on native prairie in northeastern Colorado, found that site fidelity among years for at least some adult mountain plovers was strong; certain adults built nests within 100 m (109 yd) of their nest site of the previous year.

We have found mountain plovers most often on bare or nearly bare fields and least often in fields with standing crops ≥ 30 cm (12 in). However, we urge caution in dismissing cultivated fields that have standing crops. There is a natural bias toward finding mountain plovers on bare fields because their cryptic coloration makes it much easier for researchers to locate them there. We have, however, found one mountain plover at an active nest in growing wheat 45 cm (18 in.) high and have seen or heard other mountain plovers in vegetation that was ≥ 60 cm (24 in) on at least three occasions. As noted above, our data on study fields in 1993 and 1994 suggested considerable site fidelity to a specific field within a given year (Shackford and Leslie 1995a). This was true even if the growing crop became quite tall, to at least 30 cm (12 in) (pers. obs.). Furthermore, it should be noted that for such crops as milo and corn, and to a lesser extent wheat, the ground surrounding a 30 cm (12 in) tall crop is still mostly bare; milo, for example, is usually planted on 75 cm (30 in) centers.

Knopf and Rupert (in press) found that mountain plovers in northeastern Colorado that had the opportunity to use either plowed or prairie surfaces, used both equally. In southeastern Colorado, however, we found that where both habitats were adjacent and both appeared suitable, the mountain plover

the longest period without mechanical farming operations averaged 55.8 days (range = 29-91 days). Furthermore, the production of young, on average, was theoretically possible during the longest period without mechanical farming operations for every crop or field type surveyed (n = 7): bare fields (n = 43 fields), average of 53.5 days, range = 29-91 days without mechanical operations; milo crop (n = 15 fields), 52.5 days, 31-71 days; wheat crop (n = 4 fields), 89.8 days, 86-91 days; corn crop (n = 3 fields), 51.3 days, 35-61 days; wheat turned under for mulch (n = 3 fields), 55.0 days, 36-72 days; milo stubble (n = 2 fields), 72 days, 53-91 days; wheat stubble (n = 1 field), 48 days, 48 days (Shackford and Leslie 1995a).

Although the sample was too small for normal statistical analyses for every field type except bare fields (n = 43), farmers are bound by certain necessities, so that their methods are usually quite standardized. For example, farmers usually plant milo on or about 15 June, a necessity if the milo is to make a crop before the first frost. Likewise, winter wheat is usually planted in September or October and usually not disturbed until the following June when it is harvested. Thus, even small samples can be quite useful, when they relate to standardized farming practices, such as the planting, cultivating, and harvesting of specific crops. We believe that many mountain plovers are ultimately successful at producing young during the longer intervals when no mechanical farming operations occur, for the plovers, even after nests have been destroyed by cultivation, almost always appear to once again begin courtship and renesting, often on the same field where nests have just been plowed up (pers. obs.).

We believe it is an open question as to whether populations of mountain plovers on cultivated fields in southern latitudes are helped or hurt by

farming, when averaged over several years and several locations. In at least one local area, near Eads, Kiowa County, southeastern Colorado, we suspect plover populations have been helped, on average, by farming, because of the relatively large numbers of mountain plovers we found on cultivated fields there in 1993 and 1994 (Shackford and Leslie 1995a) compared with the apparent absence of mountain plovers on cultivated fields in this same area in the late 1960s (Graul 1973, pers. comm.). Thus, we believe cultivated fields near Eads, Colorado, would be a logical area for future mountain plover research to try to assess effects, particularly positive effects, of farming on the plover. One major benefit to the mountain plover on cultivated fields, for example, may be a very low nest predation rate; using methods somewhat less rigid than normal, we found a 2.3% nest predation rate on cultivated fields (Shackford and Leslie 1995a), far below the 62.5% rate Knopf and Rupert (1996a) found on native prairie on the Pawnee National Grassland.

In a 1997 exchange of letters and information among U. S. Fish and Wildlife Service, Colorado Department of Wildlife, and us, we discussed seven reasons (such as the apparently low predation rate mentioned above) as to why we believe mountain plover fledging success on cultivated fields needs a closer look, before assuming such areas are "sinks"; we believe much of that dialogue remains relevant (see Appendix III). Furthermore, based on our finding in southeastern Colorado that mountain plovers overwhelmingly preferred cultivated fields to native prairie (Shackford and Leslie, unpubl. data, see "Discussion"), the only realistic management options, if needed, may be on plowed ground. Again, a closer look at whether mountain plover populations on cultivated fields are "sources" or

"sinks" will be necessary to determine if population management actions on such fields are actually justified.

We believe the wisest approach is to work with farmers in southern latitudes, first to learn both the benefits and the costs to the mountain plover of nesting on cultivated fields. Afterwards, and to an extent feasible for farmers, we suggest working with them to maximize benefits and minimize detriments of farming to the plover. Already, low-till (infrequent tilling) and no-till farming are gaining popularity among farmers as prudent anti-wind and anti-water erosion measures and a cost-saving measure. Such practices likely benefit the mountain plover. To do away with all tillage, however, may be missing a golden opportunity to help the plover: as the adult birds arrive on the breeding grounds each spring, they usually appear to select nesting fields that are bare at the time of arrival, and this bareness is nearly always the result of tillage. Thus, tilling in late March-early April, just as mountain plovers return to the breeding grounds and begin searching for nesting sites, combined with low- or no-till farming thereafter, to reduce the plowing up of nests, may prove to be particularly effective in creating "source" populations of mountain plovers on cultivated fields, assuming such a strategy works for a particular farmer and field type. When such strategies do not work for a particular farmer and field type, we need to work with the farmer to develop the best alternate strategies. Finally, we believe farmers should be encouraged to farm so that on "resting" or "fallow" (bare, unplanted) fields, a small amount of growing vegetation survives. Shackford (1996) found that during midday in hot weather, adult mountain plovers on cultivated fields actively sought out, and competed for, shade beneath green vegetation when it was sparse, while Graul (1975)

found that temperatures of 27° C (81° F) were lethal within 15 minutes when ≤ five-day-old mountain plover chicks were exposed to direct sunlight.

VII. Acknowledgments

We especially thank Mark Howery at the Oklahoma Department of Wildlife Conservation for his constructive suggestions for improving this report.

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Date: 27 March 2000

Approved: Oklahoma Department of Wildlife Conservation

By: _____

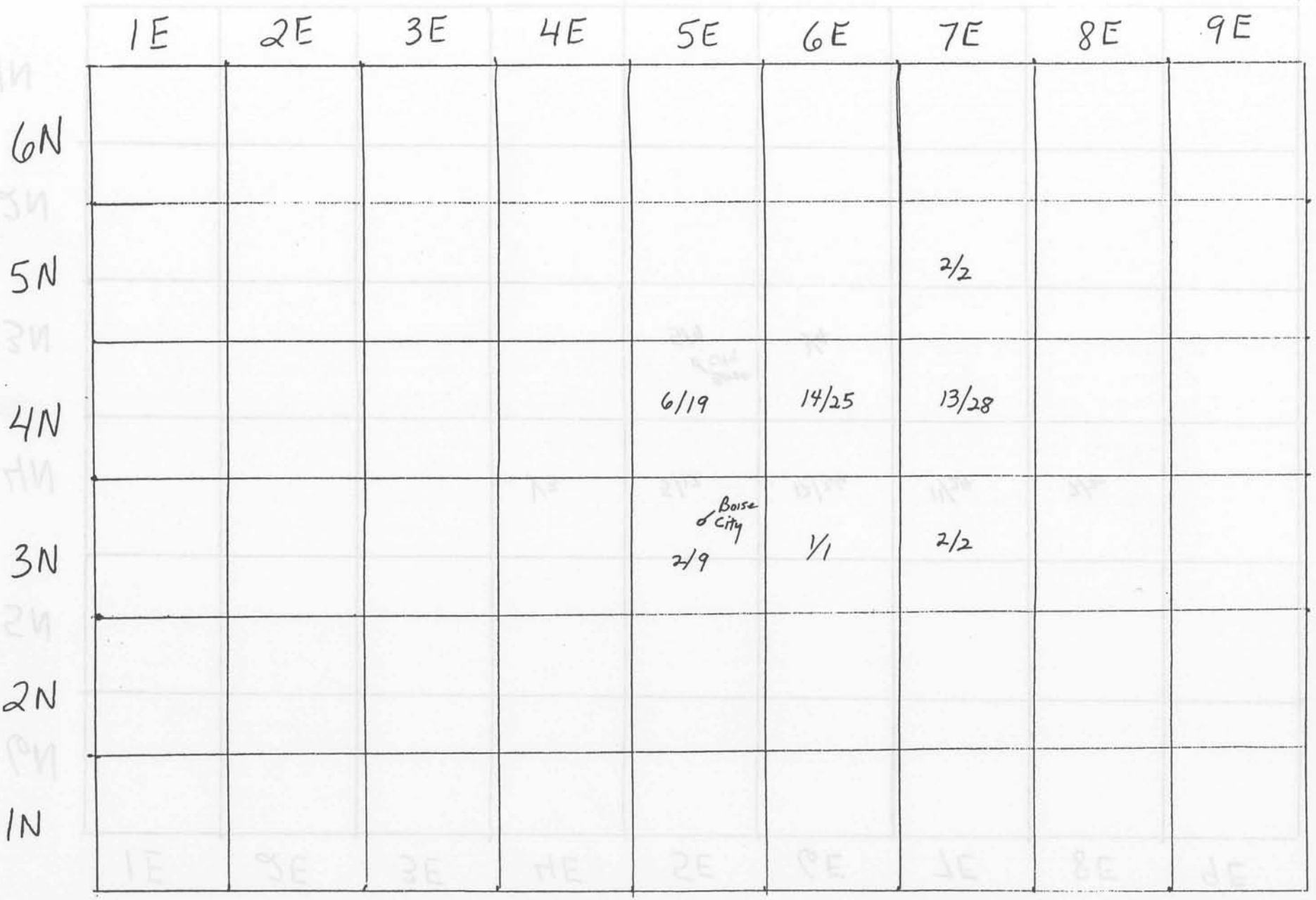
Harold Namminga, Federal Aid Coordinator
Oklahoma Department of Wildlife Conservation

Date: 28 March 2000

Figure 4

MOUNTAIN PLOVER BREEDING UNTA — 1999

Cimarron County Townships



— number of fields/ with plovers / total # plovers

TOTALS — Townships — 7
Fields — 40
Mountain Plovers — 86

Figure 3

MOUNTAIN PLOVER BREEDING DATA — 1994

Cimarron County Townships

	1E	2E	3E	4E	5E	6E	7E	8E	9E
6N									
5N									
4N				1/3	5/12	12/36	11/24	2/2	
3N					5/9 (Boise City)	1/4			
2N									
1N									

— number of fields with plovers / total # plovers

TOTALS — Townships — 7
Fields — 37
Mountain Plovers — 90

Figure 2

MOUNTAIN PLOVER BREEDING DATA — 1993

Cimarron County Townships

	1E	2E	3E	4E	5E	6E	7E	8E	9E
6N									
5N							2/1*	1/1	
4N				1/2	3/3	4/13	3/6	2/3	
3N					5/4* (Boise City)	1/4	3/2*		
2N									
1N									

— number of fields with plovers / total # plovers

— * movement between fields accounts for more fields with plovers than plovers

TOTALS — Townships — 10
Fields — 25
Mountain Plovers — 39

Figure 1

MOUNTAIN PLOVER BREEDING DATA — 1992

Cimarron County Townships

	1E	2E	3E	4E	5E	6E	7E	8E	9E
6N									
5N									
4N				9/11	7/8	7/11	1/1	2/2	
3N				2/1*	5/9 (Boise City)	2/2			
2N									
1N									

— number of fields with plovers / total # plovers

— * movement between fields accounts for more fields with plovers than plovers

TOTALS — Townships — 8
Fields — 35
Mountain Plovers — 45

Mountain Plover Field Data Sheet--1994

1p.__

2Site#:____3Field:__4SF?:___5Legal1/4sec:_____Sec:____Tws:____Rng:____6St-Co:_____
7Size of Field:_____8PhysOfField Flat:___Contour:___9CultOfField Fla:___Contou:___
10Type of Field Cultivated:___NativePasture:___WithPDT:___11Soil Type Loamy:__Sandy:__SCS Type:_____
12Owner:_____
13Address:_____14Cty,St,zip:_____

	15 Date Visit	16 Time	17 MP Act	18 Ad	19 M	20 F	21 FY	22 UA	23 TTL	24 Py	25 Eg	26 Nst	27 Crp	28 % Bare	29 HtG Cvr	30 HtS Cvr	31 SC	32 Pl 2wk	33 Date Pl	34 Type Pl
a:																				
b:																				
c:																				
d:																				
e:																				
f:																				
g:																				
h:																				
i:																				

APPENDIX I

BEarBrEvFi BLateBrEvFi BEarBrEvSi BLateBrEvSi
#VisitsToFi: #VisitsPlPres: TtlDateSp: //: Ttl#Days:
MaxBrBirds: DatSpanPl: /: Ttl#DaysPl:
Legal LBCAct

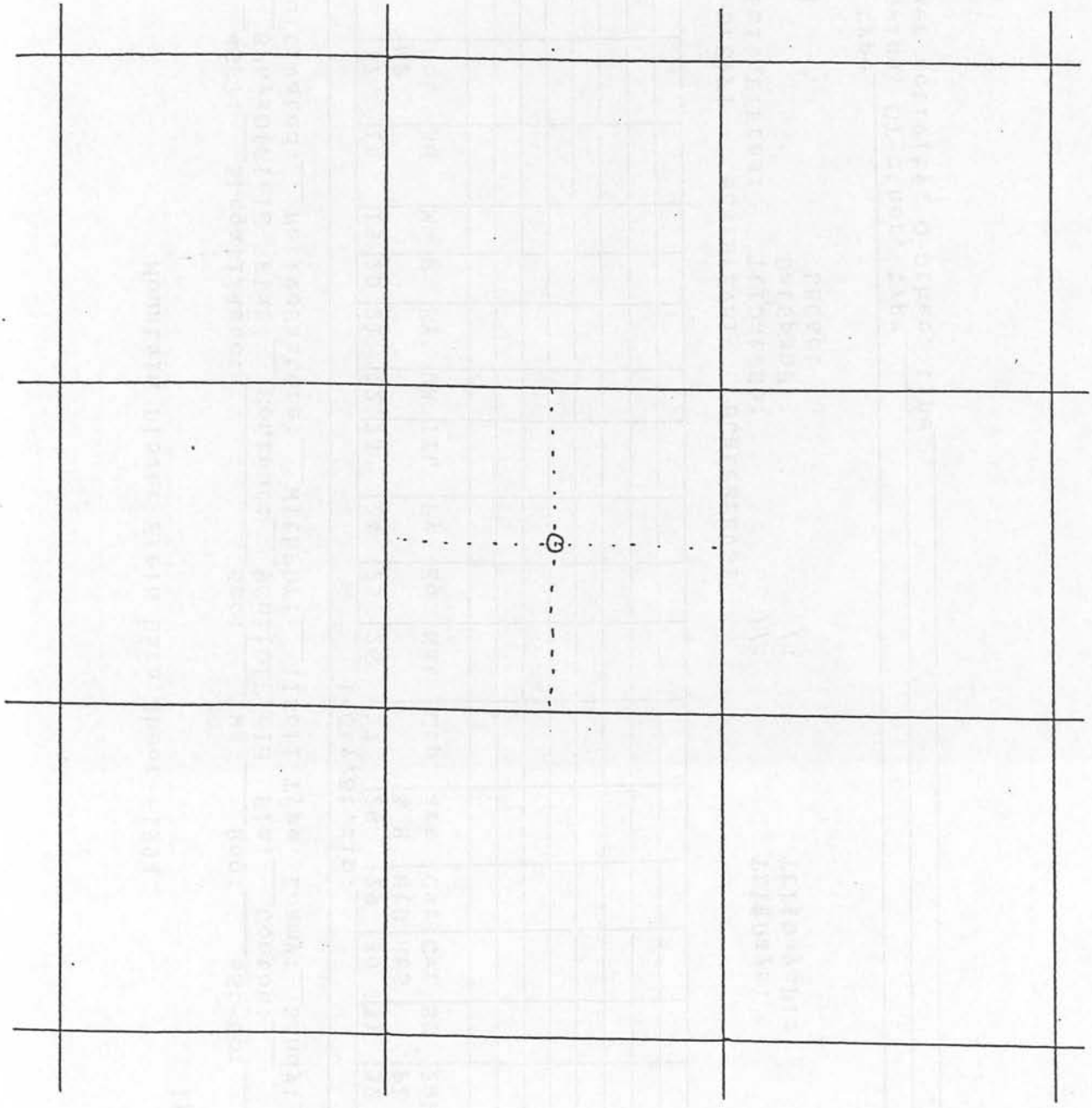
Crop, O-Other, type_____
Type Pl=type of plowing, OT-other, type_____
MPAct=Mountain Plover activity, O-Other, type_____

Additional Comments:

APPENDIX I

Site Map:

Site#_____



APPENDIX II

S:te#: Fi#: Legal1/4sec: Sec: Tws: Rng:
Study Area?: Date: Time: to: St-Co:
Nest: Eggs: FllessYng: Hdgelngs:
Bird seen-hear: Male1 Male2 Fem1 Other

ScrpeBld: PikTos: M1: M2: F1: Ot:
Scrape bldg/dis: a: k: u: ee:
Scrape display: b: l: v: ff:
Pair: MleChasFem: c: m: w: gg:
Calls: Flights: d: n: x: hh:
Agonistic: e: o: y: ii:
Other: Type: f: p: z: jj:

OtherBehavior
FeedingHurriedl: g: q: aa: ll:
WingFlopHop: h: r: bb: mm:
SingleInBr.Seas: i: s: cc: nn:
oth: Typ: j: t: dd: oo:

SizeOfField:
PhysiogOfField Flat: Contoured:
CultivOfField Fla: Cont:
TypeOfField
NativePasture: WithPDT:
Cultivated UnplowedW/I2wk: Plowed: PlowUnk:
Growing(short): Stubble: Clean:
Wheat: Milo: Corn: Othe: Typpe:
PrevCropUnknown:
SoilCondition Wet: Pan: Loose: VeryLoose:
Soil Type Loamy: Sandy: SCS Type:
Owner: Addr:
Cty,St,zip:

				No.birds						
Dates visited	MPAct	Ad	M	F	UA	TTL	PY	FY	Eg	Nst
1:	pp:	zz:	ak:	cg:	ub:	cq:	ap:	az:	da:	dl:
2:	qq:	ab:	al:	ch:	uc:	cr:	aq:	ba:	db:	dm:
3:	rr:	ac:	am:	ci:	ud:	cs:	ar:	bc:	dc:	dn:
4:	ss:	ad:	an:	cj:	ue:	ct:	as:	bd:	de:	do:
5:	tt:	ae:	ao:	ck:	uf:	cu:	at:	be:	df:	dp:
6:	uu:	af:	ca:	cl:	ug:	cv:	au:	bf:	dg:	dq:
7:	vv:	ag:	cb:	cm:	uh:	cw:	av:	bg:	dh:	dr:
8:	ww:	ah:	cd:	cn:	ui:	cx:	aw:	bh:	di:	ds:
9:	xx:	ai:	ce:	co:	uj:	cy:	ax:	bi:	dj:	dt:
10:	yy:	aj:	cf:	cp:	uk:	cz:	ay:	bj:	dk:	du:
Tot:	ta:	tb:	tc:	td:	te:	tf:	tg:	th:	ti:	tj:

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Outcomes No.visits to fi: No.VisPlPres:
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DatSpanPl: /: No.Days:
BBrEvSi: BestBrEvid: MaxNo.BrBirds: #NstBrds:

OKLAHOMA COOPERATIVE
FISH AND WILDLIFE RESEARCH UNIT

Cooperating Agencies
U.S. Department of Interior • Oklahoma Department of Wildlife Conservation
Oklahoma State University • Wildlife Management Institute

404 Life Sciences West
Oklahoma State University
Stillwater, Oklahoma 74078-3051
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(405) 744-5006 FAX

APPENDIX III

8 April 1997

Mr. Bob Leachman
U. S. Fish and Wildlife Service
764 Horizon Dr.
South Annex A
Grand Junction, CO 81506

RE: Mountain Plover Fledging Success on Cultivated Fields

Dear Bob:

The enclosed discusses the question, "How good is Mountain Plover (MP) fledging success on cultivated fields?" Due to the potential plowing up of nests and plowing over of unfledged young, one might intuitively suspect it is poor. Our data and observations, however, indicate a very real need for a closer look.

Partly based on our data, we suspect that many, if not most, populations of MPs on cultivated fields are "source" populations, when averaged over several years. If such "source" populations do occur, should regulations of unknown consequences be imposed on farmers anyway? As management decisions are made for the MP, we are somewhat apprehensive that farmers might be saddled with inappropriate restrictions which could be detrimental both to MP populations and to public support of the Endangered Species Act.

Some of the information enclosed herein is presently under consideration for publication, while other parts (from Final Research Reports to the Oklahoma Department of Wildlife Conservation, field data sheets, personal observations) we may seek to publish in the future. However, because we feel the subject is of immediate concern and importance as the MP is considered for endangered species status, we are conveying the information now for your consideration.

We hope the above will contribute to a positive dialogue regarding the status of the MP and perhaps help decision makers avoid some not-so-obvious pitfalls. We would very much welcome contrary or supplementary data or ideas, or additional comments, suggestions, questions, etc. that anyone may have on fledging success, as we all seek the best possible future for this most intriguing species.

With best regards,

John Shackford

John Shackford, Research Associate
429 Oak Cliff Dr.
Edmond, OK 73034-8626
phone: (405) 340-5057
e-mail: JShackford@aol.com

D. M. Leslie Jr.

Dr. David M. Leslie, Jr., Unit Leader
Oklahoma Cooperative Fish & Wildlife
Research Unit
404 Life Sciences West
Oklahoma State University
Stillwater, Oklahoma 74078
phone: (405) 744-6342

xc and 1 encl.:

Fritz Knopf
Walt Graul
Jennie Slater
Craig Knowles
Mary Jennings
Mark Stotts
Noreen Walsh
Harold Namminga
Ed Butterfield
Gretchen and Bill Cutts
Warren Harden

RE: Mountain Plover Fledging Success on Cultivated Fields

Most populations of Mountain Plovers (MPs) (Charadrius montanus), including most of those on cultivated fields, are located in southern latitudes, primarily Colorado, Kansas, Oklahoma and southeastern Wyoming. Thus, the species' fate in these southern latitudes is of paramount importance. We suspect that populations of MPs on cultivated fields in northern latitudes (Montana and Wyoming, except for the southeast), if they exist at all, may indeed be "sink" populations, for we were able to find only one MP on cultivated fields during many hours of searching there. Southern populations of MPs, however, likely fare much better than northern populations. Below are 7 factors that tend to support, we believe, the contention that many, if not most, populations of MPs on cultivated fields (southern by default) could be "source" populations.

1. Long breeding/growing season in southern latitudes. Length of the growing season is 157 days for Denver, Colorado, 122 days for Helena, Montana. The actual breeding season, through egg hatching, is about 91 days long in southern latitudes, from 15 April through 14 July. In northern latitudes the nesting season appears to be ca. 2-3 weeks shorter.

2. Relatively few mechanical operations per unit of time in southern latitudes. Winter wheat is grown in southern latitudes and spring wheat in northern latitudes. Winter wheat as a crop, is grown from autumn to the following summer, while spring wheat only grows from spring to summer. Because the same number of mechanical operations are spread over much more time for winter wheat than for spring wheat, winter wheat has fewer mechanical operations per unit time, giving the plovers a longer window to nest, on average, between mechanical operations. From our data, the average longest interval between mechanical operations during MP breeding season, for all cultivated field types, was 55.8 days. This gives the MPs more than sufficient time for courtship, scrape building, nesting and incubation, which take ca. 46-50 days.

On our 71 study fields, the average longest interval between mechanical manipulations on bare ("summer fallow") fields selected by MPs for breeding activity was 53.5 days. This was the most commonly selected field type and accounted for 61% (43 of 71) of all study fields. Fields of milo, the second most prevalent field type selected (15 of 71), were usually low-tilled, which leaves those fields undisturbed until about 15 June, 61 days after the MP breeding season

had begun. Of our 71 study fields, MPs utilized only 4 wheat fields that progressed to harvest, even though wheat is the principle crop of the entire region. Such sites, however, had an especially long window of nesting opportunity between mechanical manipulations (avg. 89.8 days).

3. Extremely low predation rates. Our study had an apparent predation rate of 2.3%, compared to about 62.5% on the Pawnee National Grassland reported by Knopf and Rupert in 1996. Low predation rates may be a characteristic benefit on cultivated fields, for the interiors of these fields (where most MP nests are located) appear to be largely ignored by avian and (especially) terrestrial predators. When compared to the high predation rates (about 62.5 %) reported by Knopf and Rupert (1996) on native prairie, the extremely low predation rates on cultivated fields may more than offset direct losses of nests (47.7% for our data; n=44) and young due to mechanical manipulations. More research needs to be done on this important topic.

4. Adult/fledgling ratios. Our minimum fledging rate on 47 study nests was 14 fledglings (0.30 fledglings/nest). If each adult pair averages 2 nests/year (because of plowing up, weather), this would produce a minimum of 0.60 fledglings/adult pair.

Our premigratory flocking counts for all years yielded 289 adult and 94 fledglings, a ratio of 0.33 fledgling/adult, or 0.66 fledgling/adult pair. This is sufficiently good to replace the population in about 3.1 years. These are our figures for all areas. Some of these areas are no doubt above average and some below average. For example, from 13-16 July 1996, near Eads, Kiowa County, Colorado, we counted 23 fledglings (this excludes 4 that were within 2 days, + or -, of fledging) and 16 adults. This is a ratio of 1.4 fledgling/adult (!), sufficient to replace the adult population in ca. 0.7 years! Thus, if MP life expectancy is >0.7 years, the MPs populations in the Eads area, at least in 1996, appeared to be "source" populations. [Even if our contention (that most populations of MPs are "source" populations) is wrong, it could be very useful to study what is "right" with the Eads populations, before taking actions elsewhere.]

5. Efficient synchronization of nesting due to mechanical manipulations. Our observations indicate there is a real, though counter-intuitive, benefit to mechanical manipulations--the efficient synchronization of courtship and nesting of all plovers on a field. This synchronization

appears to occur throughout the breeding season, both early and late. When MPs arrive from the wintering ground early in the breeding season, small colonies of this semi-colonial, semi-nomadic species generally choose, we believe, those cultivated fields with no more than moderate vegetation (bare ground to about 4 inch wheat). Plant height on these fields has been regulated by previous mechanical manipulations.

Any subsequent mechanical manipulation disrupts all incubating MPs on that field simultaneously, thus creating a new pool of available mates, which includes previously-incubating males (and usually an apparently appealing "new" bare field for nesting). This pool of available MPs then tend to recycle and renest synchronously. On native prairie, by contrast, many nest losses (such as to predation) are non-synchronous events. This wastes more time in renesting because of unavailability of mates, out of sync hormones, etc., thereby lowering recycling efficiency.

This synchronization of breeding cycles on cultivated fields almost surely results in a higher average number of nests/adult/year than on non-synchronous native prairie sites. This then would result in a higher number of fledged young/adult/year on cultivated fields than on native prairie, if one assumes equal fledging success rates per nest on both habitats.

[Historically, vast herds of bison (Bison bison) once grazed and macerated the prairie sod. MPs likely moved into such bison "plowed" areas to nest. Modern mechanical manipulations may be sufficiently similar to "plowing" by bison to explain some of the MPs attraction for cultivated fields. The relationship of MPs to bison "plowing" may offer insight into why the MP became a semi-colonial, sem-nomadic species. This relationship also may offer insight as to why colonies of MPs tend to (re)nest synchronously after modern mechanical manipulations.]

6. Little abandonment of nests due to tall vegetation. Most nests are located on fields $\geq$ 95% bare and we know of only one nest which may have been abandoned due to tall vegetation, while we know of two nests which were still active when crop vegetation was 30-38 cm (12-15 in.) high. Because most nest sites are selected when vegetation is short and incubation is 21 days, plant height seldom becomes a problem during the 21 days incubation period, although some of the crops are relatively fast growing. Even when MPs choose fields of fast-growing wheat for nesting sites, our observations lead us to suspect the MPs normally select bare to thinly sprouted areas in such fields, not the more thickly vegetated parts.

Should be 29 days—98.

7. Present high numbers of MPs upon cultivated fields of an area may be indicative of good fledging success on these same cultivated field areas in previous years, thereby suggesting (on average) a "source" population. Its corollary--low numbers of MPs during a recent year on the cultivated fields of an area being a reflection of poor nesting success in previous years in that same area of cultivated fields--may well be illustrated in northern latitudes, where we do suspect "sink" populations. (It is in northern latitudes where we suspect management intervention might be most easily justified and most helpful, but MP populations on cultivated land there appear to be almost nonexistent--thus, there is little to manage.)

In passing, we also mention that a close relative of the MP, the Killdeer (C. vociferus) appears to have benefited greatly because of agricultural and other human activities. The MP and Killdeer have similar needs and requirements for nesting, although the MP usually selects the drier parts of a field, while the Killdeer often (but not always) selects a slightly wetter spot (where the number of mechanical manipulations likely averages somewhat lower than in the drier parts of a field). Nonetheless, if the Killdeer, overall, is very positively affected by modern agricultural practices, then could the MP not also be positively affected in southern latitudes, at least moderately? We suspect so, given the above 7 reasons.

John S. Shackford

David M. Leslie, Jr.

8 April 1997

APPENDIX III

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Western Colorado Office
764 Horizon Drive, South Annex A
Grand Junction, Colorado 81506-3946

IN REPLY REFER TO:

ES/CO:ES-Mountain Plover
MS 65412 GJ

May 9, 1997

Dr. David M. Leslie, Jr., Unit Leader
Oklahoma Cooperative Fish and Wildlife Research Unit
404 Life Sciences West
Oklahoma State University
Stillwater, Oklahoma 74078-3051

Dear Dr. Leslie:

This responds to the April 8, 1997, letter from John Shackford and yourself to Bob Leachman regarding mountain plover reproductive success on cultivated fields. The Service appreciates you providing us this information, and has the following comments.

The Service is not aware of any published literature documenting cultivated lands as either mountain plover "sources" or "sinks." Because of the significant implications that cultivated lands may have to the conservation of this declining species (including the potential regulatory requirements you refer to) we believe the hypothesis that cultivated lands may in some circumstances be "sources" of mountain plovers, needs substantiation by further study, followed by publication in a professional journal. The Service generally adheres to a policy to error on the side of a resource in the absence of substantial information. Consequently, until additional research is completed to support the advocated position that cultivated fields may serve as "sources" (and therefore a benefit to mountain plovers), the Service will likely continue to suspect that cultivated lands in most circumstances are "sinks". As you are probably aware, [1]Knopf (1996) speculates that farming practices on cultivated lands may at least partially contribute to the 3.7 percent annual decline documented by Breeding Bird Survey trends. Given that cultivated lands are ubiquitous in the areas John has investigated, and have probably been subject to conventional farming practices for decades, it seems that mountain plover "sources" would begin to have a positive influence on BBS trend data. To our knowledge, BBS trends continue to indicate a chronic decline in mountain plovers.

We agree that mountain plover conservation efforts on private lands has significant social implications. We appreciate the effort John has dedicated

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[1]Knopf, F.L. 1996. Mountain Plover (*Charadrius montanus*). In: the Birds of North America No. 211 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, D.C.

to inventory cultivated lands, but are not convinced that their designation as suitable alternate breeding sites is justified by the data currently available. We are anxious to learn the contribution cultivated lands make to the conservation of the mountain plover, and therefore encourage the Oklahoma Coop Unit to continue its research and seek publication of its findings in professional journals.

We appreciate you providing us this information and hope you will keep us informed. Please contact me or Bob Leachman at the letterhead address or (970) 243-2778, if there are any questions.

Sincerely,

Richard P. Krueger
Acting Assistant Field Supervisor, Colorado

cc: USGS/BRD, Fort Collins (Attn: Dr. Fritz Knopf)
FWS/ES, Lakewood

BLeachman:MPOKCoop.ltr:050997

APPENDIX III

25 November 1997

Jerry Craig
Colorado Division of Wildlife
317 West Prospect
Fort Collins, CO 80526

Dear Jerry:

I am very sorry to miss the Mountain Plover Meeting in Denver! My wife and I have four-month-old twins, and I just can't work everything out to come at this time.

Dr. Leslie and I wish to make the information in the enclosed five documents available for the meeting. These include recent research and correspondence which may be particularly relevant. For the enclosed document, Shackford and Leslie 1995, I was unable quickly to lay my hands on a final copy, but as I recall, the only changes were the "h" in Charadrius on the cover page, and, on page 8, "than" substituted for "that" in the last paragraph, and, of course, it would not have the "draft" stamp. If you need me to chase a final copy down, let me know.

Prefacing this information is a one page summary of what we believe are some of the most pertinent points of these five documents, and a short discussion recommending future directions. This summary may be used and edited as you see fit to conform with what others are submitting.

We hope the meeting is a great success at helping to preserve this fascinating species!

With best wishes,

John

John S. Shackford
429 Oak Cliff Dr.
Edmond, OK 73034
405-340-5057

Mountain Plovers and Cultivated Land

Colorado has the largest populations of Mountain Plovers (MPs) on cultivated fields; the most successful of these populations appears to be in southeastern Colorado, near Eads, Kiowa County (see Shackford and Leslie, 1995, enclosed). During one survey there from 13-16 July 1996, several volunteers helped Shackford count 23 fledglings and 16 adults, a 1.4 fledgling/adult ratio, plus an additional 153 MPs we could not age (see letter to Leachman, 1996, enclosed).

During the heat of the day, shade, such as that provided by low vegetation, is very important to MPs on cultivated fields (see Shackford, 1996, enclosed).

Although MP nests on cultivated fields are plowed up, Shackford and Leslie believe that cultivated land in and around Colorado may have some largely unrecognized benefits for the MP, and they noted the following: (1) long breeding/growing season in southern latitudes (southeastern Wyoming southward), (2) relatively few mechanical operations per unit of time in southern latitudes, (3) apparently low predation rates, (4) good fledgling/adult ratios, at least some years, in the Eads, Colorado, area, (5) efficient synchronization of nesting due to mechanical manipulations, (6) little abandonment of nests due to tall vegetation, and (7) present high numbers of MPs on cultivated fields of an area may be indicative of good fledging success in past years (see letter to Leachman, 1997, enclosed).

In response to our letter outlining the seven points above, the USFWS cited a 3.7% annual decline of MPs on Colorado Breeding Bird Surveys (BBSs) as part of the basis for their conservative approach to the MP (see letter from Krueger, 1997, enclosed). We agree that this apparent decline is alarming, and that much caution should be exercised in dealing with the MP. To help clarify the specific issue of MP success on cultivated lands, however, we suggest that habitat along current BBS routes in Colorado be divided on the basis of farmland and native rangeland, to see how extensively farmland is represented, and, especially, if any of these BBSs adequately cover farmland in the Eads, Colorado, area. If farmland is not adequately covered on Colorado BBSs, we are concerned that this omission could be somewhat analogous to declaring that southwestern Kansas has no shorebirds because Cheyenne Bottoms is not included in the survey: the MPs on cultivated fields may be quite localized, but numbers can be surprisingly large in the best agricultural hot spots.

We believe there may be some very important lessons to be learned by examining what is "right" about the Eads populations before taking arbitrary actions on farmlands elsewhere. We strongly urge further research there.

John S. Shackford
David M. Leslie, Jr.

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