BOBWHITE QUAIL HARVEST MANAGEMENT: RANCH PERSPECTIVE

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Introduction

Of all the species of game animals in North America, the bobwhite quail may be the most difficult for hunters and managers to understand. Since I started managing San Tomas Hunting Camp (Brooks County, Texas) in 1979, I have heard the same sad story about quail hunting and quail management from people all over the bobwhites native range. The story generally goes like this. "When I was a kid we used to jump 15-20 coveys a day. Now we can hunt all day long and only find 2-3 coveys. We've done everything we can do for quail and just can't seem to keep a huntable population." The list of reasons and explanations for this phenomenon are long and varied. Some of the most popular are:

1) Fireants got all my quail.
2) Agricultural practices have changed.
3) The neighbors trapped and shot all the birds.
4) We had that real cold winter back in '06 that killed all the birds.
5) The hawks (e.g.,coyotes, bobcats, housecats, etc...) are so bad now that they never get to hatch.
6) Farmland is so expensive we had to plow up the fencerows.
7) We used to keep feeders out for the birds but there is no one to keep them full anymore.

Some of these explanations may have merit but are seldom the single culprit in the decline of a quail population. For years, researchers and managers have studied quail populations under hunting conditions. The only conclusive answers from their research are that quail populations fluctuate from year to year and that the populations are going to cycle to peaks and valleys. People have argued that hunting adds mortality to the population and that it is compensatory for natural mortality. There are other people here that are more qualified than I am to argue these points. I personally think that hunting is definitely additive to natural mortality, when populations are low. When populations are high, I feel hunting is more compensatory, or at least has little effect on the population the ensuing year.

Table 1-5 show how the number of quail harvested and hunting success at San Tomas has varied from 1983-1995. The harvest figures in Table 1-5 do not reflect a maximum harvest situation. Since each of our corporate hosts are equally important, it

is essential that our hunts in January and February reflect the same quality of hunting as in early season hunts. In order to insure this season long quality, we have adopted harvest strategies to keep from overshooting the population. Some of these strategies include:

1) Rotating hunting areas.
2) Limiting hunters to three birds per covey.
3) Mapping hunts (coveys).
4) Lease enough land to allow a sizable harvest on both good and bad production years.
5) Use alternative hunting measures to reduce hunting pressure.
6) Setting a half day limit of birds.
7) Using feed to make a quality hunt from a marginal area.
8) Manipulate plant succession to favor quail and hunting.

It is easy to calculate numbers of birds, coveys pointed, numbers of birds per outing, but these are just numbers? **WHAT REALLY CONSTITUTES A QUALITY QUAIL HUNT?** The answer to this question is **HUNTER SATISFACTION.** When hunters have good accommodations, a friendly atmosphere, good equipment (trucks that are clean and don't break down), see good dog work in the field, see large coveys and plenty of coveys (relative to the production year), and achieve the goals of the hunt (3 birds per covey, 10 birds per hunter); **THEY WILL BE SATISFIED.**

San Tomas Harvest History

During the last 13 years (Table 1-5) we have harvested at a maximum rate of 4.4 acres/bird (1983/84) to a minimum of 27.7 acres/bird (1989/90). Hunting pressure varied from 340 outings a year (1 outing = 1 quail truck running for ½ day) to 156 outings (approximately 460-210 hunter days). Hunting success over the 13 year period, measured by C/O (the average # of coveys found per outing) or B/O (the average number of birds harvested per outing) has ranged from 13.5 coveys per outing to 5.6 coveys per outing. Quail populations at San Tomas were generally high from 1981-83 and slowly declined from 1984 to their lowest point in 15 years in 1989 and 1990 when our total harvest was down to 1229 and 1429 birds. During this time, we adjusted our hunting pressure to reflect the population, primarily by offering alternative hunts (liberated quail, pheasants, chukars, and flighted mallards). Since 1991, favorable rainfall and conservative harvests have allowed the population to rebound. During 1992, 1993, and 1995 we **averaged** 10.5 - 13 coveys per outing (21-26 coveys a day) over the entire lease. This average includes hunting in the good areas as well as the not so good. Each group that comes in hunts a variety of habitats and pastures.

San Tomas hunters represent, in my opinion, average South Texas quail hunters. Most of the guests are businessmen whose main exposure to hunting has been through

hunting invitations rather than active pursuit of the sport. Less than 1/3 of the guests are what I would consider "good" quail hunters; about a third are complete newcomers to the sport. We generally have 2 to 3 guests per truck and allow either 2 or 3 shooters on the ground at a time. The number of shooters is determined by my dog handlers and the expertise of the hunters.

Hunting success has always been highest during January and February when birds become more active, food becomes more scarce, and hunting conditions (for bird dogs) are more favorable. In 1995, C/O increased from 8.1/outing in November to 11.8/outing in February. From year to year, we see a similar trend (increased covey finds from November through February), even during the years when populations are low. Much of South Texas quail habitat, especially the western part, experiences considerable reduction of the population on most years by mid-season, when food becomes scarce. The area around Falfurrias is blessed with a sandy soil that produces an abundance of quail foods on even the driest of years. Since I have been at San Tomas, the only year I have seen food as a limiting factor was in 1989. During that year (11 inches of rainfall), bird weights in some pastures actually dropped as much as 15-20% during the course of the season. All other years, our birds have gained weight through January.

During the last 13 seasons, our average harvest has been 3,973 birds a year from 2,167 coveys pointed. This results in an average of 18 coveys pointed/day and 32 birds harvested per day, per truck. These numbers could have been greater had we not stopped hunters short of their daily bag limit on a great number of hunts by **implementing a half day limit**. It is important to create an atmosphere of accomplishment (the camp limit) rather than allow hunters to play a numbers game (which truck shoots the most birds). These averages are also held down by the fact that we **limit the number of birds harvested per covey**. Since 1987, we have stopped our hunters at **three birds per covey**. From 1983-1986 we generally allowed hunters to harvest as many birds from a covey as that covey could stand. During this time we shot 22,285 quail from 9,484 coveys pointed (2.3 birds/covey); since 1982, we have harvested 29,364 birds from 18,684 coveys (1.6 B/C). Although this seems like a small change, had we retained our unlimited average of 2.3 B/C from 1987-95 we could have harvested an additional 18,684 birds. This number is somewhat exaggerated by the fact that daily bag limits would have reduced this number and we now spend more time searching for new coveys rather than continuing the chase for the 4th, 5th, or 6th bird from a covey (this allows us to actually point more coveys during an outing). One manager I talked to has hunters that average 0.5 birds per covey. In this situation, I doubt that limiting the number of birds harvested per covey would have any effect on the population.

From a statewide perspective, the only real factors that may control quail harvest may be the general rainfall patterns of the state. On a very large scale, low population numbers discourage hunters from making return trips to the field. Thus low populations receive little hunting pressure. From an individual ranch perspective, harvest management

can have a real influence on the population. At San Tomas, we can expect to have from 210-460 hunter days per season (31-35 hunts per season) with the potential to have over 600, regardless of whether we are at a peak or valley in the quail population. The open terrain at San Tomas allows us to shoot a considerable number of singles. Our best bird country does not have thickets where coveys can completely avoid shooting pressure. If we attempted to get a maximum harvest each year from this number of hunters, we would be shooting coveys down to the last few birds by February. Hunt quality would be so low during the second half of the season that hosts would cancel their hunts. By implementing harvest controls, we were able to continue to harvest an average of 15-18 birds per day throughout the season, during the drought years of 1989 and 1990. During February of 1990 (at the end of a 4 year drought) we averaged 17 coveys and 25 birds a day. This is a quality quail hunt for anywhere in the nation. In 1990, we maintained quality by reducing the number of outings to 156, by **offering alternative hunts that took up an entire evening or a portion of the day** (guests still hunted wild birds three of the four half days they were at the camp).

In 1994, which was considered a bust year for quail in most of Texas, our February hunts averaged 16 coveys and 19 birds a day. Last season, we were able to maintain this level of hunting success with more than an average number of outings (13 year average=247 outings; 1994=251 outings). Our best pastures were averaging 19 coveys a day and 26 birds per day.

During 1995, a good year over most of South Texas, we had 265 outings, averaged 22 coveys a day and 36 birds a day harvested. February harvest averaged 42 birds a day on 24 coveys. The overall number of birds harvested during 1995 (4703) does not really reflect how good the season actually was. We had about 12 inches of rain during late October and mid November this year. The entire month of November and the majority of December we were restricted to hunting from caleche roads and in our toughest quail pastures. Harvest during the second half of the season was 1,000 more birds than the first half, despite the fact that we did not hunt for an entire week in February due to unavoidable hunt cancellations.

How Much Land Is Enough ?

As I stated earlier, San Tomas is not an example to look to determine how many quail can be harvested from a piece of property. It is an excellent example of how to maintain a **quality hunting property** over a long period of time. Several leases on the Santa Gertrudis Division of the King Ranch that strive for season long quality hunts report harvests of a bird per 5.7 acres on boom years, and a bird to 14-15 on normal years (in many cases they felt they could have doubled this harvest with little effect on year-end quality). The San Chicago lease on the Norias Division of the King Ranch reports a harvest of 2.5 acres per bird on their best year and 1/11 acres on their worst. Their 1995

harvest ran about a bird to 4 acres. The Pineland Plantation in Georgia reports an overall harvest of about a bird to 10 acres and averages 25 coveys on a 5 hour hunting day. Again, their goal is to provide a high quality hunt rather than apply maximum hunting pressure.

Dr. Fred Guthery is aware of a harvest of a bird per acre on the San Vacinte Ranch, and in 1987 the Chaparral WMA documented a harvest of a quail per acre. I feel these are extreme cases, and should not be used as an example of a "normal sustainable harvest" . I have heard of other people that harvested quail in these quantities from small (500-1,000 acre) areas, but have not seen long term information about these areas. I have no doubt that on certain years, on certain parts of San Tomas, we could have harvested a quail per acre. I feel the quality of the hunt in these areas would have deteriorated below the standards that we are accustomed to, had we done so.

Using our harvest records as an example, a quality hunt (13 year average of 17 coveys and 32 birds a day) could be maintained throughout the season in quail habitat similar to San Tomas, by harvesting an average of 1 bird per 7.8 acres, pointing 18 coveys, and harvesting 16 birds a day from an average of 252 acres (Table 1-5). If you take the 2 worst years out (1989 and 1990), those figures come to 6.9 acres per bird harvested on an average of 243 acres per day to point 18 coveys and harvest 34 birds. If you consider the best years we have had at San Tomas (1983 & 84, 1992, 93, & 95), you could harvest a bird to 5.1 acres, point 22 coveys and harvest 43 birds per day off an average of 220 acres.

At San Tomas we have a large variety of pasture and habitat conditions. Approximately 2,500 acres (7%) of the lease is liveoak country with very limited bird hunting opportunity, regrowth chained mesquite/grenheno (chained in about 1969) makes up approximately 15,500 acres (46%) , and 16000 acres (47%) is open mesquite/grenheno country that was rootplowed in 1968 and 1969. Over the last 13 years the open rootplowed areas have provided the best quail hunting on the lease.

If all your quail country was as good as these rootplowed areas you could expect a thirteen year average of 5.5 acres per bird harvested (on 182 acres per day) to point 18 coveys and harvest 33 birds a day. Dropping the two lowest years from this scenario (1989 & 90) moves the harvest to 4.9 acres per bird on 170 acres per day to point 19 coveys and harvest 35 birds per day. On the five best years we have had, you could harvest a bird to 3.6 acres on 157 acres per day and point 23 coveys while harvesting 43 birds per day.

The areas that were chained in the late 60's that currently have regrowth mesquite/grenheno have had a 9 year average harvest of a bird to 14.3 acres on 354 acres a day to point 16 coveys and harvest 25 birds a day. If you exclude the two worst years harvest is still 12.4 acres per bird on 340 acres per day to point 16.5 coveys and 27 birds

a day. Two boom years in this area produced a harvest of 1 bird to 7.2 acres on 228 acres while pointing 19 coveys and shooting 32 birds a day.

Using this information, if you planned to have 100 hunter days, you would need to lease 9,333 acres of habitat similar to San Tomas (a composite of rootplowed, chained, and liveoak) to average 18 coveys pointed and 32 birds harvested a day over an extended period of time. If you leased only country as good as our open rootplowed country you would need to lease 6740 acres to average 18 coveys and 33 birds a day. If you only leased country similar to our regrowth chained mesquite areas you would have to lease 13,111 acres to average 16 coveys and 25 birds a day.

Table 6 shows the acreages calculated (for 100 hunter days) if you are willing to disregard "bust" years like 1989 and 1990 and if you are willing to settle for season long quality hunting only on the best of years (5 of 13). Under these scenarios in the chained mesquite areas (or areas with average bird densities) you would need to lease 12,593 acres and 8,444 acres for 100 hunter days. In rootplowed areas (or areas with excellent bird densities) you would need to lease 6,296 or 5,815 acres for 100 hunter days.

Harvest Strategies

I have already mentioned some of the harvest strategies such as limiting harvest to three birds per covey and implementing a half day limit. On 'bust" quail years these strategies will help but will not necessarily keep you from overshooting birds when there are not many. During those years we introduce "**alternative hunts**" such as a pheasant/chuckar shoot that lasts 1.5-2 hours in the morning and then we hunt wild birds for ½ a morning. We shoot released bobwhites for an entire evening on the second day and shoot wild quail all of the first evening and the last morning. This year, we added a flighted mallard shoot that lasts about 1.5 hours from start to finish. This shoot was done for fun this year but could be important during the next "bust" year.

On each quail hunt we map the route we took and mark the coveys we found. This map helps us locate concentrations of birds, keeps us from shooting the same coveys to often, and helps my dog handlers and I plan future hunts. On Monday of each week, I get with the dog handlers and we plan our hunts for that week and sometimes the next week. If there are areas that need to be fed before they are hunted we will make those plans. We try to **never hit the same coveys more often than once every two weeks.**

Over the years I have seen two major influences on quail harvest that are within our control, **THE MANAGEMENT OF PLANT SUCCESSION and feeding.** At San Tomas, management of plant succession is accomplished one of three ways, either by grazing pressure, burning, or brush control. All three of these tools, when properly applied, can enhance harvest by creating the diversity of grass and forb species necessary

for quail to flourish or by allowing physical entry into areas that were previously unhuntable. These techniques actually help you produce more quail which is THE harvest strategy we are all looking for. Each one of these techniques can be detrimental to harvest when they are improperly applied. Table 7 shows how heavy grazing pressure can negatively effect quail harvest. From 1990 to 1992 (a drought year, followed by two good rainfall years) the harvest in these 6 pastures was nearly 3 times higher where grazing pressure was moderate as opposed to heavy. In this case, the heavily grazed pastures were grazed so low that birds were not plentiful and were so spooky that they were difficult to harvest.

Table 8 shows the effect of grazing pressure on the Maestro pasture (3,296 acres) during a period when it was very heavily grazed and as it came back from the drought conditions. At the same time we were harvesting a bird per 30-32 acres in the Maestro pasture, we were harvesting a bird to 10.8 acres in the Lagunitas pasture. During the four year period, harvest in the Maestro pasture was 11 acres per bird while harvest in the Lagunitas was a bird to 6.8 acres. Throughout the drought and into the recovery period the Lagunitas was never overgrazed. Another prime example of negative effects of overgrazing on quail harvest can be seen in the North and South Viboras pastures. In 1988, an average bird year, the entire Viboras pasture was either deferred or lightly grazed. We harvested 478 birds from the South Viboras pasture that year and 553 from the North Viboras. In 1989, the South Viboras was deferred all year and we harvested 281 birds on a droughty, poor reproduction year. That same year the North Viboras was grazed heavily and we harvested 94 birds from it. Both pastures were heavily grazed the next year and we able to harvest 79 birds from the South Viboras pasture and only 1 from the North Viboras (in 6 outings).

Without grazing pressure, all of these pastures would eventually get so grassy that quail production would fall off dramatically. **Proper grazing is an essential tool to quail management. Improper grazing management can override all other proper management techniques.** During 1995, all 34,000 acres of San Tomas was in good to excellent condition for quail harvest.

On good rainfall years, we will burn from 20-40 fires a year that total from 4,000-10,000 acres. In most cases burns are done in long (1-2 mile) strips that are between 200 and 600 yards wide. Strips are alternated from year to year to create a mosaic pattern of varying plant succession in the pasture. Burning also sets back the succession of the woody plants in the pasture and causes them to basal sprout, creating low brush cover for the birds to loaf under.

We use two forms of brush control at San Tomas to control woody plant succession, chaining for larger mesquite areas and Vel-Par herbicide for smaller regrowth mesquite. Two-way chaining proved to be a very effective tool in 1993 when we chained 100 yard strips out of some of our heavier regrowth mesquite that had last been chained

in 1969. In 1992, a very good rainfall year, we harvested 323 birds from two chained pastures. Brush had restricted harvest to the point that we were only harvesting a bird to 15 acres on and average of 474 acres per day. Following the chaining, we were able to harvest 1271 birds or a bird to 3.9 acres on an average of 146 acres per day. Chaining is much more affordable than rootplowing, which is the reason we chose this method.

Spot treatment of brush with Vel-Par is generally used in the more open rootplowed areas to keep regrowth mesquite from thicketizing to the point that we cannot hunt through it. We have also been successful in controlling brush in chained pastures following a burn, or in just keeping our hunting roads open.

Feeding quail is strictly a harvest management tool. In my experience, it will not make you any more birds, only improve the quality of a hunt by increasing the number of coveys we find. This is particularly useful when we hunt our heavier brush areas (old chained areas). Without feed, we may only find 6-8 coveys in an outing. With feed, these same areas will produce 10-12 covey hunts. Although, I seldom hunt these areas as often as I hunt the open rootplowed areas, being able to draw an acceptable hunt from a marginal area allows me to utilize the entire lease and still maintain a quality hunt. I very seldom feed before hunts in the rootplowed areas. During the first half of the 1995 season, when wet pasture conditions forced us to stay on caleche roads, feeding allowed us to maintain a quality hunt despite our inability to go to the bird.

Conclusions

The harvest strategies we employ at San Tomas to insure quality quail hunts are as follows:

1) Lease sufficient acreage. In our best quail pastures about 6,800 acres/100 hunter days is necessary. In more marginal quail country 13,000 acres would provide 100 quality hunter days.

2) Map each hunt and use it as a reference to determine how to hunt the area in the future and to keep coveys from being shot too often.

3) Rotate hunting areas so that the same covey gets shot no more often than 1 time in two weeks (about 7 times a year).

4) Limit hunters to harvesting 3 birds per covey to maintain covey size throughout the season (our hunters average 1.6 birds per covey).

5) Set morning limits for hunters that are hunting a full day (10/hunter at San Tomas). This allows satisfaction with "limiting out".

6) On years of low production, use alternative hunts to reduce the shooting pressure on wild coveys (we have used 1-2 hour pheasant and chukar hunts; full evening released bobwhite hunts; a 1 and ½ hour flighted mallard shoot; clay bird shoots; and large game hunts to reduce quail hunting pressure).

7) Use grazing management, fire, and brush control to manipulate plant succession or you will have no birds to harvest.

8) Avoid overgrazing a pasture to the point of reducing quail survival and huntability.

9) Use feed to bring the hunting standard of marginal areas up or they will go underutilized.

Table 1. Long-term quail harvest among all pastures on San Tomas, 1983-1995.

Pasture	Year	#Acres	#Out[a]	#Bird[b]	#Cov[c]	#Hunt[d]	C/O[e]	B/O[f]	B/C[g]	B/H[h]	Ac/Bird[i]	Ac/Out[j]
SAN TOMAS	1995/96	34000	265	4703	2800	681	10.57	17.75	1.68	6.91	7.2	128.3
SAN TOMAS	1994/95	34000	251	2631	1915	629	7.63	10.48	1.37	4.18	12.9	135.5
SAN TOMAS	1993/94	34000	294	6194	3589	739	12.21	21.07	1.73	8.38	5.5	115.6
SAN TOMAS	1992/93	34000	211	3981	2718	511	12.88	18.87	1.46	7.79	8.5	161.1
SAN TOMAS	1991/92	34000	179	2483	1551	520	8.66	13.87	1.60	4.78	13.7	189.9
SAN TOMAS	1990/91	34000	156	1429	965	473	6.19	9.16	1.48	3.02	23.8	217.9
SAN TOMAS	1989/90	34000	172	1229	960	457	5.58	7.15	1.28	2.69	27.7	197.7
SAN TOMAS	1988/99	34000	306	3817	2425	790	7.92	12.47	1.57	4.83	8.9	111.1
SAN TOMAS	1987/88[k]	24000	229	2897	1761	601	7.69	12.65	1.65	4.82	11.7	148.5
SAN TOMAS	1986/87	36000	260	3937	1763	510	6.78	15.14	2.23	7.72	8.6	130.8
SAN TOMAS	1985/86	24000	291	3643	1807	760	6.21	12.52	2.02	4.79	9.3	116.8
SAN TOMAS	1984/85	24000	340	6993	2409	850	7.09	20.57	2.90	8.23	4.9	100.0
SAN TOMAS	1983/84	24000	259	7712	3505	509	13.53	29.78	2.20	15.15	4.4	131.3
SAN TOMAS	TOTAL		3213	51649	28168	8030						
	AVERAGE		247	3973	2167	618	8.77	16.08	1.83	6.43	7.8	125.7

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Bird = Number of quail harvested all season
[c] #Cov = Number coveys found all season
[d] #Hunt = Number of hunters making a ½ day hunt
[e] C/O = Number coveys/outing
[f] B/O = Number quail/outing
[g] B/C = Number quail shot/covey
[h] B/H = Number quail/hunter
[i] AC/Bird = Number acres/bird harvested
[j] AC/OUT = Acres/Outing
[k] Hunters were limited to 3 coveys after 1987

Table 2. Long-term quail harvest in quiteria pasture (11,467 ac.) on San Tomas, 1983-1995. Pasture was rootplowed in 1969 and is now very open, mesquite/grenheno.

Pasture	Year	Duration	#Out[a]	#Bird[b]	#Cov[c]	#Hunt[d]	C/O[e]	B/O[f]	B/C[g]	B/H[h]	Ac/Bird[i]	Ac/Out[j]
QUITERIA	1995/96	SEASON	106	2205	1231	264	11.61	20.80	1.79	8.35	5.2	108.2
QUITERIA	1994/95	SEASON	130	1630	1124	322	8.65	12.54	1.45	5.06	7.0	88.2
QUITERIA	1993/94	SEASON	97	1890	1121	237	11.56	19.48	1.69	7.97	6.1	118.2
QUITERIA	1992/93	SEASON	83	1369	1005	197	12.11	16.49	1.36	6.95	8.4	138.2
QUITERIA	1991/92	SEASON	73	993	597	201	8.18	13.60	1.66	4.94	11.5	157.1
QUITERIA	1990/91	SEASON	80	796	545	229	6.81	9.95	1.46	3.48	14.4	143.3
QUITERIA	1989/90	SEASON	50	417	279	135	5.58	8.34	1.49	3.09	27.5	229.3
QUITERIA	1988/99	SEASON	96	1324	799	257	8.32	13.79	1.66	5.15	8.7	119.4
QUITERIA	1987/88[k]	SEASON	115	1536	911	315	7.92	13.36	1.69	4.88	7.5	99.7
QUITERIA	1986/87	SEASON	92	1692	799	269	8.68	18.39	2.12	6.29	6.8	124.6
QUITERIA	1985/86	SEASON	135	1478	761	343	5.64	10.95	1.94	4.31	7.8	84.9
QUITERIA	1984/85	SEASON	215	4401	1901	581	8.84	20.47	2.32	7.57	2.6	53.3
QUITERIA	1983/84	SEASON	129	3617	1575	407	12.21	28.04	2.30	8.89	3.2	88.9
QUITERIA	13 YEAR	TOTAL	1401	23348	12648	3757	9.03	16.67	1.85	5.92	6.4	106.4

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Bird = Number of quail harvested all season
[c] #Cov = Number coveys found all season
[d] #Hunt = Number of hunters making a ½ day hunt
[e] C/O = Number coveys/outing
[f] B/O = Number quail/outing
[g] B/C= Number quail shot/covey
[h] B/H = Number quail/hunter
[i] AC/Bird = Number acres/bird harvested
[j] AC/OUT = Acres/Outing
[k] Hunters were limited to 3 coveys after 1987

Table 3. Long-term quail harvest in La Loba, Maestro, and Pinole pastures (7,762 ac) on San Tomas,1983-1995. Pasture was rootplowed in 1969 and is now very open, mesquite/grenheno.

Pasture	Year	Duration	#Out[a]	#Bird[b]	#Cov[c]	#Hunt[d]	C/O[e]	B/O[f]	B/C[g]	B/H[h]	Ac/Bird[i]	Ac/Out[j]
LL/MST/PIN	1995/96	SEASON	69				11.52	19.26	1.67		5.8	112.5
LL/MST/PIN	1994/95	SEASON	63				6.78	8.59	1.27		14.3	123.2
LL/MST/PIN	1993/94	SEASON	86				12.69	22.40	1.77		4.0	90.3
LL/MST/PIN	1992/93	SEASON	79				13.48	22.86	1.70		4.3	98.3
LL/MST/PIN	1991/92	SEASON	49				8.90	14.47	1.63		10.9	158.4
LL/MST/PIN	1990/91	SEASON	43				6.28	8.98	1.43		20.1	180.5
LL/MST/PIN	1989/90	SEASON	36				5.42	7.67	1.42		28.1	215.6
LL/MST/PIN	1987/88[k]	SEASON	81				8.11	13.31	1.64		7.2	95.8
LL/MST/PIN	1986/87	SEASON	56				6.09	12.57	2.06		11.0	138.6
LL/MST/PIN	1985/86	SEASON	84				7.33	13.19	1.80		7.0	92.4
LL/MST/PIN	1984/85	SEASON	56				8.11	15.59	1.92		8.9	138.6
LL/MST/PIN	1983/84	SEASON	98				11.81	25.97	2.20		3.0	79.2
SAN TOMAS	13 YEAR TOTAL		875	14309	8144	2344	9.31	16.35	1.76	6.10	7.1	115.3

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Bird = Number of quail harvested all season
[c] #Cov = Number coveys found all season
[d] #Hunt = Number of hunters making a ½ day hunt
[e] C/O = Number coveys/outing
[f] B/O = Number quail/outing
[g] B/C= Number quail shot/covey
[h] B/H = Number quail/hunter
[i] AC/Bird = Number acres/bird harvested
[j] AC/OUT = Acres/Outing
[k] Hunters were limited to 3 coveys after 1987

Table 4. Long-term quail harvest in north and south Viboras pastures (10,010 ac) on San Tomas, 1983-1995. Pasture is regrowth mesquite/live oak that was chained into strips in 1994.

Pasture	Year	Duration	#Out[a]	#Bird[b]	#Cov[c]	#Hunt[d]	C/O[e]	B/O[f]	B/C[g]	B/H[h]	Ac/Bird[i]	Ac/Out[j]
VIBORAS	1995/96	SEASON	54	588	423	136	7.83	10.89	1.39	4.32	17.0	185.4
VIBORAS	1994/95	SEASON	16	66	69	38	4.31	4.13	0.96	1.74	151.7	625.6
VIBORAS	1993/94	SEASON	41	862	508	107	12.39	21.02	1.70	8.06	11.6	244.1
VIBORAS	1992/93	SEASON	23	388	327	57	14.22	16.87	1.19	6.81	25.8	435.2
VIBORAS	1991/92	SEASON	30	322	250	79	8.33	10.73	1.29	4.08	31.1	333.7
VIBORAS	1990/91	SEASON	20	80	76	59	3.80	4.00	1.05	1.36	125.1	500.5
VIBORAS	1989/90	SEASON	72	375	321	144	4.46	5.21	1.17	2.60	26.7	139.0
VIBORAS	1988/89[k]	SEASON	93	1031	670	236	7.20	11.09	1.54	4.37	9.7	107.6
VIBORAS	9YEAR	TOTAL	418	4535	3040	1049	7.27	10.85	1.49	4.32	19.9	215.5

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Bird = Number of quail harvested all season
[c] #Cov = Number coveys found all season
[d] #Hunt = Number of hunters making a ½ day hunt
[e] C/O = Number coveys/outing
[f] B/O = Number quail/outing
[g] B/C= Number quail shot/covey
[h] B/H = Number quail/hunter
[i] AC/Bird = Number acres/bird harvested
[j] AC/OUT = Acres/Outing
[k] Hunters were limited to 3 coveys after 1987

Table 5. Long-term quail harvest in Las Flores, Posita, and Gueritas pastures (5,508 ac) on San Tomas, 1983-1995. Pasture is regrowth mesquite/live oak that was chained into strips in 1993.

Pasture	Year	#Acres	#Out[a]	#Bird[b]	#Cov[c]	#Hunt[d]	C/O[e]	B/O[f]	B/C[g]	B/H[h]	Ac/Bird[i]	Ac/Out[j]
LF/POS/GR	1995/96	SEASON	36	475	294	90	8.17	13.19	1.62	5.28	11.6	153.0
LF/POS/GR	1994/95	SEASON	40	369	276	107	6.90	9.23	1.34	3.45	14.9	137.7
LF/POS/GR	1993/94	SEASON	64	1361	801	161	12.52	21.27	1.70	8.45	4.0	86.1
LF/POS/GR	1992/93	SEASON	26	400	311	58	11.96	15.38	1.29	6.90	13.8	211.8
LF/POS/GR	1991/92	SEASON	29	363	264	91	9.10	12.52	1.38	3.99	15.2	189.9
LF/POS/GR	1990/91	SEASON	15	78	65	44	4.33	5.20	1.20	1.77	70.6	367.2
LF/POS/GR	1989/90	SEASON	31	199	165	87	5.32	6.42	1.21	2.29	27.7	177.7
LF/POS/GR	1988/99	SEASON	40	404	297	104	7.43	10.10	1.36	3.88	13.6	137.7
LF/POS/GR	1987/88[k]	SEASON	33	239	187	88	5.67	7.24	1.28	2.72	23.0	166.9
LF/POS/GR	1986/87	SEASON	35	414	223	90	6.37	11.83	1.86	4.60	13.3	157.4
LF/POS/GR	1985/86	SEASON	58	631	393	152	6.78	10.88	1.61	4.15	8.7	95.0
LF/POS/GR	1984/85	SEASON	53	1022	610	143	11.51	19.28	1.68	7.15	5.4	103.9
LF/POS/GR	1983/84	SEASON	32	781	455	86	14.22	24.41	1.72	9.08	7.1	172.1
SAN TOMAS 13 YEAR TOTAL			492	6736	4341	1301	8.82	13.69	1.55	5.18	10.6	145.5

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Bird = Number of quail harvested all season
[c] #Cov = Number coveys found all season
[d] #Hunt = Number of hunters making a ½ day hunt
[e] C/O = Number coveys/outing
[f] B/O = Number quail/outing
[g] B/C = Number quail shot/covey
[h] B/H = Number quail/hunter
[i] AC/Bird = Number acres/bird harvested
[j] AC/OUT = Acres/Outing
[k] Hunters were limited to 3 coveys after 1987

Table 6. Long-term quail harvest at San Tomas by habitat type, 1983-1995.

Item	Overall Average	Average without bust years	Average for boom years
San Tomas (34,000 ac)			
# Quail/Day	32	34	43
#Cov/Day	18	18	22
Ac/Bird	7.8	6.9	5.1
Ac/Day	252	234	220
Ac/100 HD[a]	9333	8667	8148
Chained regrowth mesquite/grenheno(15,500 ac)			
Quail/Day	25	27	32
# Cov/Day	16	16.5	19
Ac/Bird	14.3	12.4	7.2
Ac/Day	354	340	228
Ac/100 HD[a]	13111	12593	8444
Rootplow mesquite/grenheno (16,000 ac)			
# Quail/Day	33	35	43
# Cov/Day	18	19	23
Ac/Bird	5.5	4.9	3.6
Ac/Day	182	170	157
Ac/100 HD[a]	6740	6296	5815

[a] The number of acres needed for 100 hunter days. Data from 13 years of harvest

Table 7. Hunting success as affected by grazing on San Tomas,1990-92.

Grazing	# Out[a]	# Quail	# Cov[b]	C/O[c]	B/O[d]	B/C[e]	Ac/B[f]	Ac/Out[g]
Moderate[h]	222	3374	2178	9.8	15.2	1.5	8.3	127
Heavy[i]	123	1450	958	7.8	11.8	1.5	320	27.2

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Cov = Number coveys found all season
[c] C/O = Number coveys/outing
[d] B/O = Number quail/outing
[e] B/C = Number of quail shot/covey
[f] Ac/Bird = Number of acres/bird harvested
[g] Ac/Out = Acres/Outing
[h] La loba, lagunitas and cuates pastures
[i] Quiteria, north viboras and south viboras pastures

Table 8. Hunting success in the maestro pasture (3296 Acres) on the San Tomas, 1989-1992.

Year	Graze	# Out[a]	# Quail	# Cov[b]	C/O[c]	B/O[d]	Ac/B[e]	Ac/Out[f]	$/Quail[g]
1989	Heavy	13	109	62	4.7	8.4	30.2	254	151
1990	Heavy	16	103	87	5.4	6.4	32	206	160
1991	Moderate	17	236	149	8.8	13.9	14	194	70
1992	Light	32	756	424	13.3	23.6	4.4	103	22
1989-92	Average	19.5	301	181	9.3	15.4	11.0	169	55

[a] #Out = Number of outings = 1 truck hunting for ½ day
[b] #Cov = Number coveys found all season
[c] C/O = Number coveys/outing
[d] B/O = Number quail/outing
[e] Ac/Bird = Number of acres/bird harvested
[f] Ac/Out = Acres/Outing
[g] Based on $5.00/acre for quail hunting alone