

Impact of Inclement Weather on Overwinter Mortality of Montezuma quail in southeast Arizona

Pedro Mazier Chavarria (Texas A&M University)

Angel Montoya (U.S. Fish and Wildlife)

Nova Silvy & Roel Lopez (Texas A&M University)

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Overview

- ❖ **Background on Montezuma quail life history gaps**
- ❖ **What do we know of mortality rates in Montezuma quail?**
- ❖ **Montezuma quail research in SE Arizona; background**
- ❖ **Unusual weather in Winter 2010**
- ❖ **Observed mortality / behavior**
- ❖ **Research and management applications from these findings**



Introduction

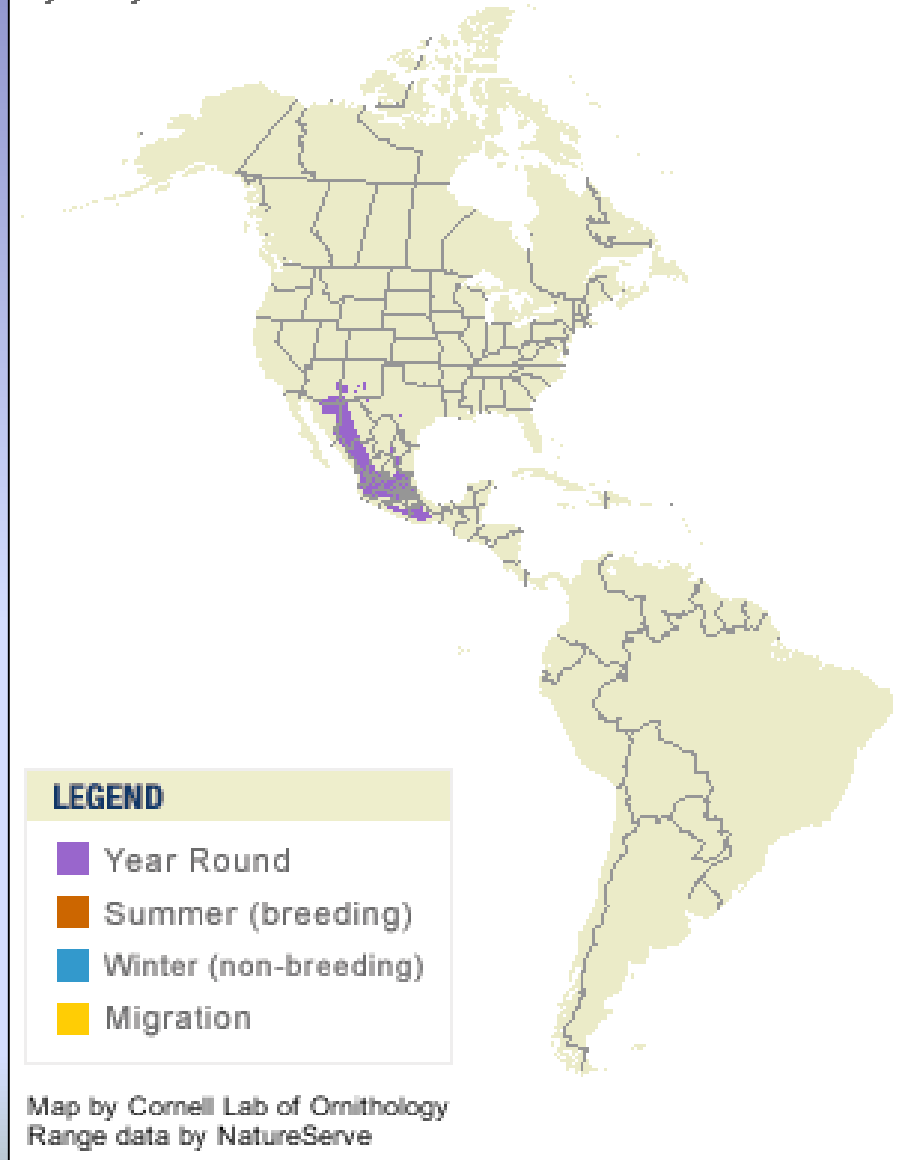
- ❖ Montezuma quail, considered mostly a neotropical species, ranges northmost in parts of Arizona, New Mexico, Texas
- ❖ Like most quail, population status reflects available precipitation before breeding season. (summer monsoons)
- ❖ Actual mortality rates of wild populations mostly unknown:

Leopold and McCabe (1957)

Yeager (1966)

Stromberg (1990)

Montezuma Quail
Cyrtonyx montezumae





Montezuma Quail (*Cyrtonix montezumae mearnsi*)



Adult male



Adult female



Juvenile





Photo by Steve Hopkins

- ❖ **Field research: Population Dynamics, Habitat Use, Range, etc.**
- ❖ **Southeast Arizona: 2008 – 2010**
 - ❖ **Coronado National Forest (Sonoita, Patagonia, San Rafael Valley)**
 - ❖ **Appleton-Whittell Research Ranch (Elgin)**
- ❖ **Unusual winter weather observed from January – March 2010**



Montezuma quail overwinter mortality, an overview:

- ❖ Leopold and McCabe (1957) → study in Mexico. “...one case of sudden decline in Montezuma quail is periodic winter mortality resulting from abnormally deep snow.”
- ❖ Ligon (1927) → similar observations in New Mexico
- ❖ O'Connor (1936) → similar observations in Texas
- ❖ Yeager (1966) → population decline reported to be as high as 86.7% following inclement weather especially during periods of heavy and persistent snowfall
 - ❖ thought to be directly related to exposure
 - ❖ unmarked population, estimated abundance from flush counts
- ❖ Stromberg (1990) → first successful attempt at monitoring a marked population through radio-telemetry
 - ❖ no estimates of overwinter mortality





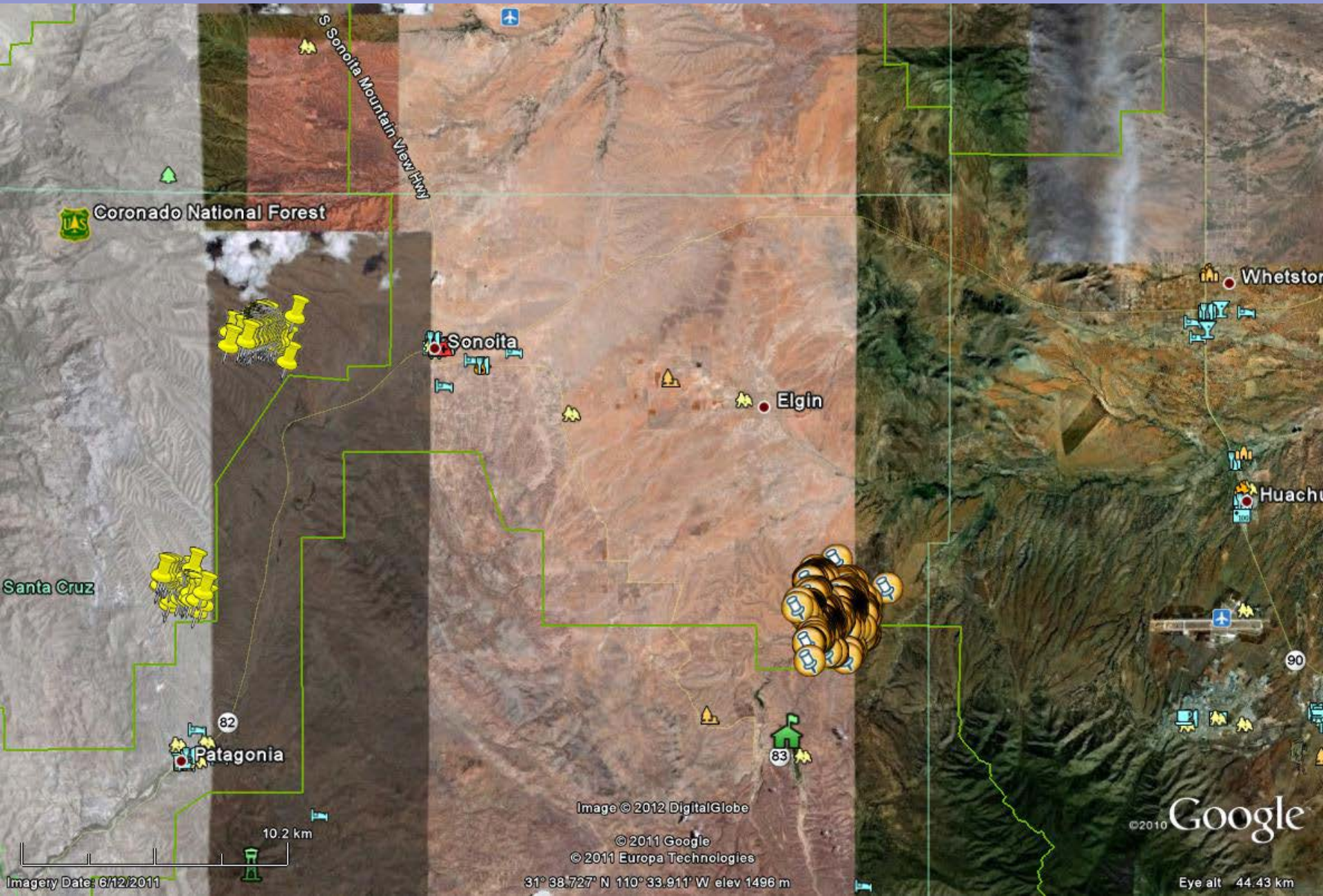
Objectives:

- ❖ **Evaluate abundances of Montezuma quail from 2008 – 2010**
 - ❖ **Flush counts with dogs**
 - ❖ **Hunted vs. Non-hunted sites**
- ❖ **Evaluate actual mortality rates of radio-tagged Montezuma quail (2010)**
- ❖ **Investigate how weather may have impacted mortality rates**
 - ❖ **Amount of winter precipitation**
 - ❖ **Amount of snowfall**
 - ❖ **Temperature (lows)**
- ❖ **Radio-track quail**
 - ❖ **Analyze habitat utilization range and movements**
 - ❖ **Analyze sources of mortality**
 - ❖ **Analyze behavior (covey dynamics)**
- ❖ **Provide input that may assist in management**

Methods:

- ❖ **Trap Montezuma quail with assistance from trained dogs**
- ❖ **Appleton-Whittell Research Ranch (National Audubon Society)**
 - ❖ **3,247 ha “Sanctuary” → no hunting or grazing**
- ❖ **Radio-tag Montezuma quail (5 – 8 g transmitters; Wildlife Materials)**
- ❖ **Track quail movements, habitat use, survival, sources of mortality**
- ❖ **Conduct flush-counts with dogs for estimates of abundance**
 - ❖ **Hunted vs. Non-hunted**
 - ❖ **October 2008 – February 2010**
- ❖ **Evaluate mortality using the Kaplan-Meier staggered entry estimator (Pollock et al. 1989) → finite survival probability rates**
 - ❖ **Research Ranch only: no tagged birds in hunted areas in 2010**
- ❖ **Compare historical climate records of precipitation from 2008 – 2010**

Survey Area Range: Abundance Surveys



Appleton-Whittell Research Ranch

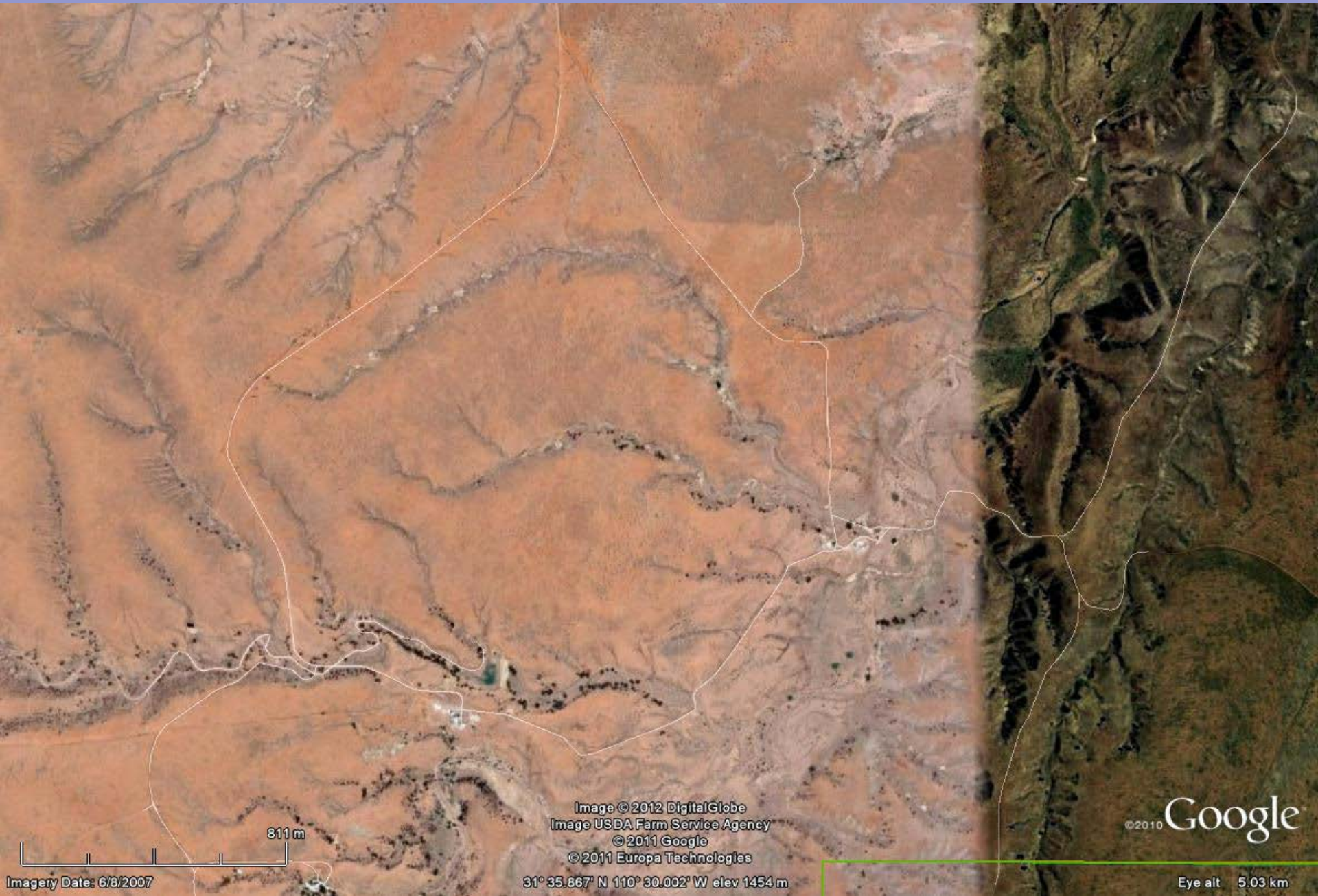


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31° 35.867' N 110° 30.002' W elev 1454 m

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Eye alt 5.03 km

811 m

Imagery Date: 6/8/2007

Climate data: Precipitation and Temperatures

Table 1. Average temperatures, total precipitation, and departures from normal at the Canelo 1 NW and Appleton-Whittell Research Ranch (AWRR) weather stations in southeast Arizona, for the months January–March from 2008–2010.

		2008			2009			2010		
		JAN	FEB	MAR	JAN	FEB	MAR	JAN	FEB	MAR
Canelo 1 NW	Mean temperature (°F)	–	–	–	–	47.7	–	41.8	41.9	46.0
	Departure from normal	–	–	–	–	1.7	–	-1.5	-4.1	-3.7
	Total precipitation (in)	–	–	–	–	0.0	–	7.55	2.25	1.04
	Departure from normal	–	–	–	–	-1.18	–	6.15	1.07	-0.06
AWRR	Mean temperature (°F)	43.11	47.14	50.32	45.83	47.86	52.80	–	–	–
	Total precipitation (in)	0.51	0.61	0.04	0.19	0.30	0.24	–	–	–

Table 2. Mean maximum and minimum temperatures, coldest recorded dates with data in parentheses measured in °F, and dates of precipitation with data in parenthesis measured in inches. Data was obtained from the Canelo 1 NW weather station in southeast Arizona, from January–March 2010

	January	February	March
Mean maximum temperature (°F)	56.9	55.4	62.9
Mean minimum temperature (°F)	26.6	28.4	29.1
Coldest days: Date (followed by temperature °F in parentheses)	1 (17), 2 (17), 24 (19), 25 (21), 26 (21), 30 (21)	8 (22), 9 (22), 24 (19)	11 (22), 12 (22), 15 (24), 21 (24), 22 (24)
Precipitation days: Date (followed by amount in inches in parentheses)	19 (1.38), 20 (0.61), 21 (2.08), 23 (1.68), 28 (1.80)	3 (0.81), 7 (0.13), 10 (0.8), 20 (0.28), 22 (0.33) 28 (0.62)	8 (0.18), 9 (0.60), 10 (0.10), 11 (0.16)

Quail abundances: Dog survey flush counts

Table 3. Abundance data of Montezuma quail at 4 study areas from pre-hunt (Oct–Nov) and post-hunt (Feb–Mar) surveys for the 2007–2010 seasons in southeast Arizona. Flush-counts note the total number of coveys and quail. Missing data is indicated where surveys were not conducted. Note: The Research Ranch (AWRR) does not permit hunting—the pre- and post-hunt designations are used only as frame of reference for when the surveys were conducted. SR Valley = San Rafael Valley.

Season	2007–2008		2008–2009		2009–2010	
	Pre-hunt	Post-hunt	Pre-hunt	Post-hunt	Pre-hunt	Post-hunt
	Oct-Nov (2007)	Feb-Mar	Oct-Nov (2008)	Feb-Mar	Oct-Nov (2009)	Feb-Mar
Stevens Canyon	–	3 coveys: 11-20	2 coveys: 12	0 coveys: 0	–	0 coveys: 0
Hog Canyon	–	4 coveys: 15-30	3 coveys: 15	2 coveys: 8	2 coveys: 11	0 coveys: 0
AWRR	–	–	–	8 coveys: 64	8 coveys: 60	3 coveys: 10
SR Valley	23 coveys: 182	10 coveys: 38	20 coveys: 175	11 coveys: 47	10 coveys: 65	2 coveys: 8

- ❖ **Abundances stable from 2007 - 2009**
- ❖ **Declines occurring, as expected, following “population boom” of 2007**
- ❖ **Large reduction in abundance pre-hunt in 2009**
- ❖ **Severe reduction in abundance post-hunt in 2010**
 - ❖ **reduction independent of hunting vs. non-hunting**
 - ❖ **density-independent event**

Results [Flush counts] :

- ❖ **Greatest reduction in abundance was in post-hunt season 2010 with 87.69% reduction within season**
- ❖ **Change in abundance 2007 – 2008 → 79.12%**
- ❖ **Change in abundance 2008 – 2009 → 73.14%**
- ❖ **3-year average flushed (2007 – 2009) post-hunt $41.67\% \pm 4.73$**
 - ❖ **was 80% higher than number of birds flushed ($n = 8$) in 2010**
- ❖ **Reductions in quail calls and sign (scratchings) also observed**
- ❖ **Research Ranch estimated population between 38 – 75 individuals in early January 2010 → possibly 4 – 10 individuals by May 2010**
- ❖ **Research Ranch reduction in abundance post-hunt 2010 → 83.33%**

Results [Radiotracking] :

- ❖ 22 individual tagged in 2010, monitored through April 2010
- ❖ Mortalities observed:
 - ❖ #243 Female → predated, Jan. 11 (Covey 1)
 - ❖ #247 Male → predated, Jan. 17 (Covey 2, initially 6)
 - ❖ # 248 Female → predated, Jan. 24 (Covey 2)
 - ❖ # 249 Male → predated, Jan. 22 (Covey 2)
 - ❖ # 250 Female → predated, Jan. 26 (Covey 2)
 - ❖ # 702 Male → Frozen, Jan. 23 (Covey 2)
 - ❖ # 701 Female → Frozen, Jan. 24 (Covey 2)
- ❖ # 701, # 248, # 249 remained in covey despite reduced size (3) → died
- ❖ Mortalities from freezing observed within 3 days of first severe storm from Jan. 19 – 23.



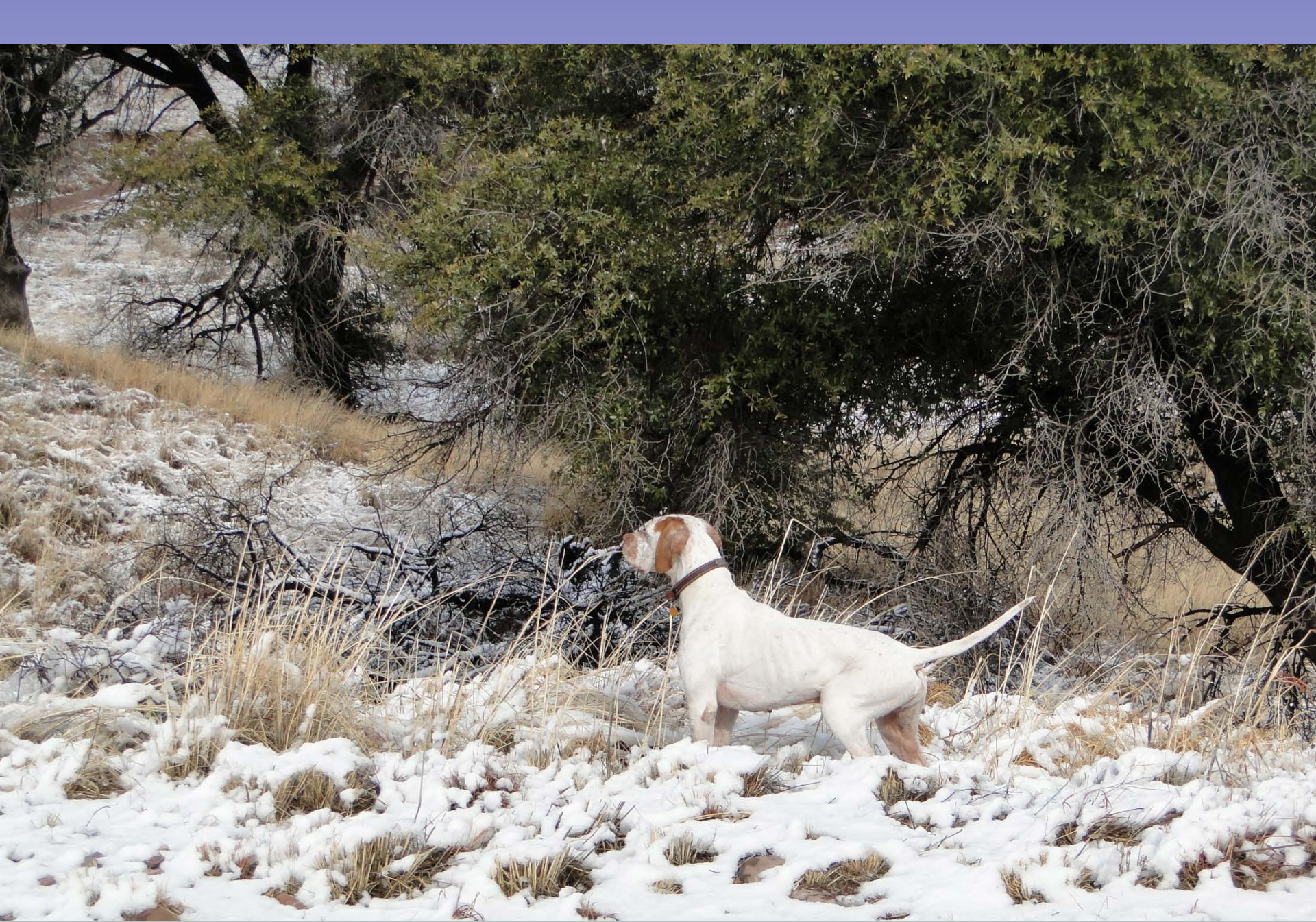


Results, cont'd [Radiotracking] :

- ❖ **Mortalities observed:**
 - ❖ **#706 Male → Frozen, Feb. 1 (Covey 3, initially 6)**
- ❖ **By Feb. 10 at least 3 tagged birds in Covey 3 had died, with 1 other missing but likely predated**
- ❖ **Covey dynamics:**
 - ❖ **2 coveys of 6 and 3 individuals, Feb. 2 at night, by day group of 10**
 - ❖ **2 coveys of 5 and 4 individuals, Feb. 6**
 - ❖ **1 covey of 6 individuals, Feb. 15**
 - ❖ **Only 1 radiotagged individual remained through March 13**
- ❖ **Kaplan-Meier estimate of finite survival probability → $S = 0.048 \pm 0.037$**
- ❖ **Birds were observed to be:**
 - ❖ **sluggish, preferred to scuttle / run away than flush**
 - ❖ **when flushed, flew shorter distance**
 - ❖ **gorging on food in between persistent precipitation events**











Discussion:

- ❖ **Strong El Niño January – February 2010**
 - ❖ combination of sleet, snow, heavy rain strong winds
 - ❖ strong winds with gusts up to 40 – 60 mph in valleys, and up to 80 mph in the mountains
- ❖ **National Weather Service in Tucson reported:**
 - ❖ January 2010 as 8th wettest January on record
 - ❖ 22 January as 5th wettest January day on record
 - ❖ February 2010 as 11th wettest February on record
 - ❖ 28 February as 7th wettest February day on record
- ❖ **Impact on Montezuma quail:**
 - ❖ Birds frozen on roosts if covey size below 4
 - ❖ unrelenting precipitation → lethargic birds → higher risk of predation
 - ❖ birds may not have been able to dig for food due to frozen soil
- ❖ **Decreased abundances from flush counts in hunted areas parallels or corroborates decreased abundances observed in non-hunted site**

Management implications:

- ❖ Strong need to evaluate impact of winter precipitation on populations of Montezuma quail, especially when El Niño conditions forecasted
- ❖ The timing of precipitation and climate conditions is more important than just accounting how much precipitation received within a season
- ❖ Accurate prediction of Fall population abundances must take into account sources and rates of mortality following the hunting season
- ❖ Impact on Montezuma quail:
 - ❖ Birds frozen on roosts if covey size below 4
 - ❖ unrelenting precipitation → lethargic birds → higher risk of predation
 - ❖ birds may not have been able to dig for food due to frozen soil
- ❖ Decreased abundances from flush counts in hunted areas parallels or corroborates decreased abundances observed in non-hunted site
- ❖ How do you manage for Montezuma quail in the face of natural catastrophes as observed in Winter 2010 ?

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