Confined Herds Tule Elk Management Unit

Confined Tule Elk Herds: Tupman Tule Elk State Reserve, San Luis Refuge and Point Reyes National Seashore at Tomales Point

Description

Confined (enclosed by an elk proof fence) tule elk (*Cervus canadensis nannodes*) herds currently are maintained at the Tupman Tule Elk State Reserve (Tupman) in Kern County, San Luis National Wildlife Refuge (San Luis Refuge) in Merced County, and Point Reyes National Seashore at Tomales Point (Tomales Point) in Marin County. Tupman and San Luis Refuge are within the Central Valley and Sierra Nevada Province, and Tomales Point is within the North Coast and Klamath Province as identified in the California State Wildlife Action Plan (California Department of Fish and Wildlife 2015). All are within historical tule elk range as depicted by McCullough (1969), and are described in in detail below.

The 685-acre Tupman enclosure is approximately 20 miles southeast of Bakersfield, on property managed by the California Department of Parks and Recreation (CDPR). Topography is flat, and climate and vegetation are typical of the southern San Joaquin Valley. With limited riparian and marsh vegetation, habitat conditions are poor during late summer and fall, especially in a dry year when much of the enclosure is bare ground. Other large herbivores are absent within the enclosure and uncommon nearby.

The San Luis Refuge herd is within a 761 acre fenced enclosure, approximately five miles north of Los Banos, managed by the United States Fish and Wildlife Service (USFWS). Topography is flat and habitat is a mixture of valley grassland and riparian types. Other large herbivores are uncommon, but include black-tailed deer (*Odocoileus hemionus)* and domestic sheep near the enclosure.

The Tomales Point herd inhabits 2,600 acres at the northern end of Tomales Point, approximately 40 miles north of San Francisco. Elk cannot disperse to the east, north, and west due to the presence of Tomales Bay, Bodega Bay, and the Pacific Ocean. A fence that runs from Tomales Bay to the Pacific Ocean prevents dispersal to agricultural areas to the south. Tomales Point is part of Point Reyes National Seashore, managed by the United States National Park Service (NPS). Terrain varies from gently rolling to precipitously steep hills and canyons. Open grasslands, shrub dominated grasslands, and dense scrub with 70-100% shrub cover are predominant. Other large herbivores at or near Tomales Point include black-tailed deer, and domestic cattle (*Bos taurus*).

A fourth confined herd once existed at Concord Naval Weapons Station (CNWS) in Contra Costa County from 1977-2006. This herd was surrounded by residential development and the Sacramento River/Suisun Bay, which prevented its dispersal and range expansion. Public access was restricted and considered incompatible with the primary use of the area for storage/transport of weapons and munitions. In 2006, the

California Department of Fish and Wildlife (Department) removed all elk from CNWS to augment other existing herds.

Public access and recreational opportunities are excellent as the confined herds are managed by state and federal agencies (hunting and antler collecting are prohibited). Access inside the Tupman and San Luis Refuge enclosures is prohibited, but a tour route exists around the perimeter fence at the San Luis Refuge, and both enclosures have viewing platforms and interpretive displays. Pierce Point Road, which ends in a parking lot at Pierce point Ranch, provides access to Tomales Point. Elk are readily visible from a hiking trail that extends north from the parking lot for approximately five miles, as well as from boats on Tomales Bay.

Elk Distribution and Abundance

Intensive agricultural operations are adjacent to each of these herds. The Buttonwillow herd damaged crops and fences until it was moved into the Tupman enclosure in 1932 (McCullough 1969). Confining the elk resolved agricultural conflicts and prevented their extirpation. The historical Buttonwillow resolution shaped later decisions to place elk into enclosures at San Luis Refuge and Tomales Point during the 1970s(McCullough 1969). Confining elk was regarded as the only way to respect landowner rights and mitigate the economic threat to agricultural operations on private land within Merced and Marin counties.

Major highways exist near the confined herds at Tupman and San Luis Refuge. California State Route 165 is a rural highway, within a few miles of the San Luis Refuge that connects Interstate Highway 5 to State Route 99 for transport of agricultural products and manufactured goods. The Tupman enclosure is located a few miles west of Interstate Highway 5, the major west coast transportation thoroughfare. These thoroughfares are primary factors for keeping the Tupman and San Luis herds confined.

In 1932, the State Park Commission purchased the Tupman Reserve. Upon construction of a perimeter fence, the Buttonwillow herd was moved into the enclosure. Tule elk habitat initially was good and regular flooding maintained riparian and marsh vegetation. Subsequent water management projects such as the Buena Vista Canal and construction of Isabella Dam, have reduced inundation and caused riparian vegetation to deteriorate, so supplemental feeding became necessary [McCullough 1969, United States Department of Interior Bureau of Land Management (BLM) 1992]. Although habitat improvement projects have been completed (Bureau of Land Management 1992), riparian and marsh vegetation remain inadequate, and habitat conditions are marginal.

Initial parcels for the San Luis Refuge were purchased with Federal Duck Stamp funds in 1966, and were noteworthy as the last expanse of unplowed native valley bottomland in California (Fowler 1985). In 1974, eighteen tule elk from the San Diego Wild Animal Park were released within the enclosure. The San Luis Refuge has since expanded to more than 26,000 acres, but elk remain confined to the initial enclosure because of

potential highway conflicts and depredation conflicts on private land. Much of the San Luis Refuge is inundated, and riparian/marsh vegetation is good.

Point Reyes National Seashore was established by federal legislation in 1962, and currently encompasses approximately 71,000 acres. In 1976, Congress designated approximately 33,000 acres of the seashore, including Tomales Point, as wilderness, later naming it the Phillip Burton Wilderness. In March 1978, the Department placed two bulls and eight cows from the San Luis Refuge into a temporary holding pen at Tomales Point. Historically, Tomales Point was heavily grazed by cattle. To prevent competition and minimize depredation conflicts, the existing cattle were to be removed from the enclosure prior to reintroduction of elk, and an elk-proof fence was to be built to confine the elk within the northernmost 2,600 acres at Tomales Point. Upon completion of the fence, a legal dispute arose over grazing rights. At that point, elk mingled with domestic cattle for over a year until the dispute was resolved and cattle were removed from the Tomales Point enclosure.

The current population estimate for all three of the confined herds (Tupman, San Luis Refuge, and Tomales Point) is 500 animals. Table 1 contains historical population numbers for Tupman, based on Fowler (1985) and periodic surveys by CDPR staff. The maximum population objective for Tupman is 30-32 elk, but population size has exceeded this objective on numerous occasions.

Table 2 contains historical population numbers for the San Luis Refuge, based on periodic surveys by USFWS and California Department of Fish and Wildlife (Department) personnel. The desired objective for the San Luis Refuge is 40-50 elk. As with Tupman, population size has periodically exceeded this objective. Tables 3 and 4 contain population survey results for Tomales Point and Point Reyes National Seashore, based on Gogan (1986) and surveys by NPS staff.

Elk population objectives for Tomales Point have changed over time. The initial objective was 300 animals “until proposed studies provide additional data” (Bureau of Land Management 1979, National Park Service 1982). Fowler (1985) dissented with this objective and supported a density of 10 elk per square mile (equivalent to 41 elk); this was similar to the density objective for Grizzly Island. Gogan (1986) estimated the elk carrying capacity at Tomales which varied from 90 elk based on vegetation biomass, to 350 elk (based on livestock equivalency). Gogan (1986) recommended basing population management decisions on an objective threshold of 140 elk.

In 1993, NPS convened a panel of experts to provide elk management recommendations. This eventually culminated in completion of the Point Reyes National Park Seashore Tule Elk Management Plan and Environmental Assessment in 1998, with the following recommendations: continue testing experimental contraception (initiated in 1997) to limit population growth at Tomales Point, establish a free-ranging elk herd within Point Reyes National Seashore, and use minimal management intrusion to maintain populations within management limits based on threshold indicators. In addition, the 1998 Environmental Assessment established population objectives of 350-

450 elk for Tomales Point and 250-350 for the free-ranging herd.

In December 1998, 45 tule elk were moved from Tomales Point to a holding pen near Limantour Beach within the Philip Burton Wilderness and tested repeatedly for Johne's disease (individuals that tested positive were culled). Six months later, Department staff released 28 elk to free roaming conditions within Point Reyes National Seashore. Within days of their release, two cow elk moved from the Limantour area to Drakes Beach, whereby 2011 a separate herd was established after the arrival of a bull elk and additional cows. In recent years, there has been no evidence of mixing between the Limantour and Drakes Beach herds, and the two are considered separate herds by PRNS (D. Press, Point Reyes National Seashore, personal communication).

Between 2012 and 2015 the population at Tomales Point declined by approximately 50% dropping from 540 to 283. The loss of animals is believed to be related to drought conditions, mineral deficiencies, and a population level above carrying capacity within the enclosure.

Management Goals, Objectives, and Actions

In 1979, a statewide tule elk management plan was prepared by the Tule Elk Interagency Task Force with an overall goal "to ensure the continued growth of healthy, free-roaming tule elk herds of sizes that are ecologically compatible with the suitable habitats of California." The document also contained specific short term and long-term objectives and policies regarding the reintroduction and management of tule elk.

The management goals for the confined herds are to: 1) reduce the number of confined herds and reduce the frequency for removing excess animals; 2) enhance habitat within enclosures; and 3) enhance opportunities for public use and enjoyment of elk that includes wildlife viewing and education. Specific objectives and actions for each goal are listed below. Department regional and headquarters staff will perform the identified actions.

Goal 1. Reduce the number of confined herds and the frequency for removing excess animals.

Tule elk herds have been reestablished throughout suitable historical habitat in California, and recovery objectives of state and federal legislation during the 1970s have been attained. Confined herds once provided a convenient source of stock for reintroduction. Although these herds continue to provide opportunities for public viewing and education, artificial conditions associated with their confinement are undesirable in the long term. The Department should shift objectives to emphasize managing tule elk in a free-roaming state to the maximum extent possible, as specified in the Management Plan for the Conservation of Tule Elk (Tule Elk Interagency Task Force 1985). The Tupman and San Luis herds occupy relatively small areas at relatively high densities. Suitable adjacent habitat for dispersal may be limited in perpetuity by agricultural development and the potential for highway conflicts. Although each confined

herd exists within historical tule elk range, their captive-habitat conditions likely preclude reaching or maintaining optimal population levels that promote long-term population viability and genetic diversity without jeopardizing habitat conditions.

Although poaching incidents and natural mortalities have occurred within confined herds, recruitment still exceeds mortality. In the absence of regulated elk hunting, capture and translocation of surplus elk to other locations has been the primary population management strategy for confined herds at Tupman and San Luis Refuge. Other strategies have been used to reduce the frequency of translocation projects, including culling, contraception, and manipulation of sex ratios to reduce the number of reproducing females.

For Tomales Point, elk reproduction initially was low and total numbers remained relatively stable (Table 3). Tomales Point elk were copper-deficient, based on analysis of liver, serum and hair samples (Gogan 1986). Additionally, Johne's disease caused by *Mycobacterium paratuberculosis*, was diagnosed in Tomales Point tule elk (Jessup et al. 1981). Found also in domestic livestock and free-ranging axis and fallow deer at Point Reyes, Johne's disease was fatal to individual elk and initially suppressed population growth (Gogan 1986). It is highly infectious and potentially damaging to livestock and wild ungulates. Clinical symptoms included diarrhea, severe debilitation, and weight loss. Although techniques have advanced since 1981, diagnosis in elk remains cumbersome and unreliable, and non-lethal treatments are not available.

The absence of reliable diagnostic and treatment techniques for Johne's disease has eliminated using capture and translocation to control elk population numbers at Tomales Point. Moving diseased or otherwise contaminated animals is contrary to the Management Plan for the Conservation of Tule Elk (1985), the current elk management plan, and the Department's elk relocation criteria. NPS conducted contraception trials from 1997-2002. NPS has emphasized minimal management intervention and population control strategies (including contraception). Whether long-term intervention will be needed to control elk population numbers remains unknown. Panel recommendations from 1993 called for agency culling if other strategies proved unfeasible or were rejected. However, specific vegetation management thresholds have not been established and public opposition to agency culling will likely be high.

<u>Objective 1.1. Eliminate one or more confined herds by 2025.</u>

Action 1.1.1
Evaluate the feasibility of releasing animals to free-roaming conditions on adjacent land, or moving animals to establish new herds, or augment existing herds in an effort to eliminate an enclosure. Expected completion: 2023.

Action 1.1.2
Evaluate the feasibility of combining the Tupman and San Luis Refuge herds. Expected completion: 2023.

Objective 1.2. Reduce population levels within enclosures and identify preferred population control methods by 2025.

Action 1.2.1
Coordinate with CDPR, USFWS, and NPS to evaluate the feasibility of population control mechanisms to reduce frequency of removing animals that are above the enclosure objectives. Expected completion: 2023

Goal 2. Enhance habitat within enclosures.

Elk within confined herds rely on a limited area of use to acquire yearlong nutrition. Habitat conditions within enclosures should be enhanced to provide a healthy environment for elk.

Objective 2.1. Enhance elk habitats by at least 5% by 2028.

Action 2.1.1
Map current elk habitat to detect change over time and guide management decisions. Expected completion: 2021.

Action 2.1.2
Meet annually with CDPR, USFWS, and NPS to identify opportunities to enhance elk habitats. Ongoing.

Action 2.1.3
Work with NPS to identify/establish specific vegetation management thresholds for Tomales Point. Expected completion: 2021.

Action 2.1.4
Continue to work with NPS to determine the prevalence of Johne's disease within tule elk at Tomales Point, as well as the free-roaming herd. Ongoing.

Goal 3. Enhance opportunities for public use and enjoyment of elk that include wildlife viewing and education.

The Department will continue to take advantage of opportunities to inform the public about elk within the Unit and promote various recreational opportunities such as wildlife viewing, photography, and nature study. The Department will continue to work with conservation partners to provide information on elk and elk management to the public.

Objective 3.1. Increase elk viewing and educational opportunities by 20% by 2023.

Action 3.1.1
Coordinate with CDPR, USFWS, and NPS to determine baseline elk

viewing visitor usage. Expected completion: 2020.

Action 3.1.2
Set up display booth and participate in tule elk days at San Luis National Wildlife Refuge. Ongoing.

Action 3.1.3
Coordinate with CDPR, USFWS, and NPS to participate in educational talks. Ongoing.

Objective 3.2. Provide information on the Department web page to inform the public about elk and elk viewing opportunities by 2020.

Action 3.2.1
Work with agencies and non-governmental organizations (NGOs) to provide information on elk and elk viewing. Expected completion: 2020.

Herd Viability

By 1870, tule elk in the Buttonwillow herd in Kern County were the last free-roaming tule elk remaining. Conditions from 1870-1932 became increasingly confining as agricultural development intensified in the southern San Joaquin Valley, and the herd has now been enclosed within fencing at Tupman for more than 80 years. The San Luis Refuge has supported tule elk for almost 40 years, and Tomales Point has supported them for 35 years. Tule elk from other locales have been added to the confined tule elk herds to facilitate genetic diversity and herd viability. In 1987, five bulls and five cows from the Detroit Zoo were released at Tupman and San Luis Refuge; in 1981, three bulls from the Owens Valley were released at Tomales Point; and in 2013, one adult female from San Luis Refuge was released at Tupman. The extent to which bulls mixed with the established herds is unknown, however, it is important to note that all tule elk are ultimately descended from the Buttonwillow stock. Confined herds provide surplus animals for reintroduction or improving genetic diversity/viability of established herds, but the surplus exceeds levels needed for reintroduction and diversity/viability.

Unit Highlights

The enclosures at Tupman and San Luis Refuge served to conserve tule elk and provided important sources of surplus stock to reestablish tule elk in California.

- From 1978-2015, approximately 400 tule elk were moved from San Luis Refuge and Tupman to reestablish and augment herds in California.

- From 2005-2007, staff at the Department, USFWS, and University of California at Davis investigated the possibility of establishing free range tule elk in the Grasslands Wildlife Management Area (in Merced County).

Unit Specific Research

A partial listing of studies, reports and monitoring/management activities within the Unit is as follows:

Burtch, L.A. 1934. The Kern County elk refuge. California Fish and Game 20(2):140-147.

California Department of Fish and Game. 1976. Biennial report on tule elk, 1974-1975. California Department of Fish and Game, Sacramento, USA.

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Greco, S. and P. Huber. 2007. Feasibility investigation (Phase 1): free-ranging tule elk in the Grasslands Wildlife Management Area, Merced County, California. LDA: tule elk GIS corridor model. Final report to the wildlife health center. University of California, Davis, USA.

Greco, S. and P. Huber. 2012. Year 3 final report: an assessment of the central valley ecoregion for potential tule elk habitat and reintroduction. Report to the U.S. Fish and Wildlife Service. Landscape analysis and systems research laboratory, Department Environmental Design, University of California, Davis, USA.

Greco, S.E., P.R. Huber, J. Hobbs, J. Garcia, K. Stromayer, and R. Parris. 2009. Year 1 final report: grasslands ecological area tule elk reintroduction feasibility study. Report to the Rocky Mountain Elk Foundation. Landscape Analysis and Systems Research Laboratory, Department of Environmental Design, University of California, Davis, USA.

Greco, S.E., P.R. Huber, J. Hobbs, J. Garcia, K. Stromayer and R. Parris. 2011. Year 2 final report: grasslands ecological area tule elk reintroduction feasibility study implementation alternatives & management guidelines. Report to the Rocky Mountain Elk Foundation. Landscape Analysis and Systems Research Laboratory, Department of Environmental Design, University of California, Davis, USA.

Huber, P.R., S.E. Greco, and J. Hobbs. 2011. Assessment of habitat for the potential reintroduction of tule elk to the San Joaquin Valley, California. California Fish and Game 97(3):117-129.

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Shideler, S.E., M.A. Stoops, N.A. Gee, J.A. Howell, B.L. Lasley. 2002. Use of porcine zona pellucida (PZP) vaccine as a contraceptive agent in free-ranging tule elk (*Cervus elaphus nannodes*). Reproductive Supplement 60:169-176.

Tule Elk Interagency Task Force. 1979. The management plan for the conservation of tule elk. California Department of Fish and Game, Sacramento, California, USA.

Literature Cited:

Bureau of Land Management. 1979. The tule elk in California; 3rd annual report to congress. Bureau of Land Management, Sacramento, California, USA.

Bureau of Land Management. 1992. The tule elk in California; 10th annual report to congress. Bureau of Land Management, Sacramento, California, USA.

California Department of Fish and Wildlife. 2015. California state wildlife action plan, 2015: a conservation legacy for Californians. Edited by Armand G. Gonzales and Junko Hoshi, Ph.D. Prepared with assistance from Ascent Environmental, Inc., Sacramento, California, USA.

Fowler, G.S. 1985. Tule elk in California – history, current status and management recommendations. California Department of Fish and Game. Interagency Agreement. #C-698. Sacramento, California, USA.

Gogan, Peter J.P. 1986. Ecology of the tule elk range, Point Reyes National Seashore. Dissertation, University of California, Berkeley, USA.

Jessup, D.A., B. Aggas, D. Behymer, and P. Gogan. 1981. Paratuberculosis in tule elk in California. Journal of the American Veterinary Medical Association 179:1252-54.

McCullough, D.R. 1969. The tule elk, its history, behavior, and ecology. University of California Publication in Zoology 88. University California Press, Berkeley, USA.

National Park Service. 1982. Interim tule elk management plan, Point Reyes National Seashore. Unpublished. USDI National Park Service, Point Reyes National Seashore, California, USA.

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Tule Elk Interagency Task Force. 1979. The management plan for the conservation of tule elk. California Department of Fish and Game, Sacramento, California, USA.

Tule Elk Interagency Task Force. 1985. A management plan for the conservation of tule elk. US Bureau of Land Management. Sacramento, California, USA.

Data Tables/Figures

Table 1. Tupman Tule Elk State Reserve, Population History and Survey Results.

Year	Number of Elk Counted					Removed
	Bulls	Cows	Calves	Unknown	**Total**	
1932				140	**140**	
1935				112	**112**	28 to Owens Valley
1947	50	58	14		**122**	
1948	50	58	7	?	**?**	
1949	50	58	2	?	**?**	
1950	44	27	2		**73**	9 to "parks"
1951				35	**35**	Approximately 40
1971					**about 32**	
1973	19	15	9		**43**	
1977				60	**60**	
1978			17	57	**73**	43
1979	17	12	11		**40**	
1980	16	12	24		**52**	
1981*	22	26	13		**61**	
1982	24	37	10		**71**	
1983*	29	41	14		**84**	53 to var. locations
1984	17	11	8		**36**	
1985	13	13	8		**34**	
1986	13	11	8		**32**	13 to Covelo
1987*	16	15	7		**38**	
1988	21	17	11		**49**	
1989				23	**59**	36 to La Panza
1990				21	**21**	2 to Fresno Zoo
1991						1 to La Panza, 2 to Mendocino
1992				22	**22**	
1993						1 to Parkfield
1995				30-35	**30-35**	
1996						9 to Cache Creek
1998						10 to West. Merced, 7 to Cache Creek
2007						38 removed, Chimineas Ecologal Reserve and Grizzly
2016			1	24	**25**	

No surveys 1998-2015.

Sources: Fowler, 1985; Calif. Dept. Pks & Rec. Tupman Tule Elk Reserve files; BLM Reports to Congress (various); DFG Reports to Legislature (various); CDFW relocation files.

* in 1981, two yearling males were added from the Owens Valley;

* in 1983, two yearling males were added from the Fresno Zoo;

* in 1987, five bulls were added from the Detroit Zoo.

Table 2. San Luis National Wildlife Refuge, Population History and Survey Results.

Year	Number of Elk Counted					Translocated/Removed
	Bulls	Cows	Calves	Unknown	Total	
1974	13	8	4		**25**	
1975			7	18	**25**	
1976			10	22	**32**	
1977			3	39	**42**	
1978			7	28	**35**	10
1979			5	17	**22**	20
1980			7	20	**27**	
1981			9	25	**34**	
1982			11	32	**43**	
1983	22	13	11	8	**54**	
1984			12	52	**64**	
1985*	29	35	24		**88**	64
1986	20	2	1		**23**	
1987*	13	8	2		**23**	7
1988	14	9	3		**26**	
1989	15	12	3		**30**	
1990	9	13	3		**25**	
1991	12	11	5		**28**	
1992	12	17	6		**35**	
1993	11	19	10		**40**	
1994	15	22	12		**49**	
1995	10	22	15		**37**	14
1996	22	18	13		**53**	
1997	27	26	14		**67**	
1998	19	12	8		**39**	29
1999	25	20	10		**55**	
2000	27	21	11		**59**	
2001	28	27	14		**69**	30
2002	19	19	6		**44**	
2005	22	11	7		**40**	35
2006*	25	12	1		**38**	
2007	25	14	4		**43**	
2008	27	16	7		**50**	
2009	28	18	7		**53**	
2010	31	21	11		**63**	
2011	36	23	14		**73**	
2012	38	30	14		**82**	
2013	52	33	7		**92**	10
2014*	29	13			**42**	36
2015	35	17	11		**63**	
May 2016	36	24	7		**67**	
Dec. 2016	32	26	8	8	**74**	

Sources: Fowler, 1985; USFWS files, Los Banos; BLM Reports to Congress (various); DFG Reports to Legislature (various); CDFW relocation files.

* Total remaining at the end of 1985: 20 bulls and 2 cows;

* In 1987, five implanted cows were added from Detroit Zoo, 7 bulls relocted to Bitterwater;

* In 2006, two cows added from Concord. 2014 survey prior to calving period.

Table 3. Point Reyes National Seashore, Tomales Point, Population and Survey Results.

Year	Number of Elk Counted				Total
	Bulls	Cows	Calves	Unknown	
1978*	2	8	7		**17**
1979	4	8	3		**15**
1980	4	10	1		**15**
1981*	4	8	5		**17**
1982	6	10	8		**24**
1983	10	14	8		**32**
1984			9	32	**41**
1985			10	45	**55**
1986					**70**
1987					**82**
1988					**96**
1989					**109**
1990					**132**
1991					**169**
1992					**205**
1993					**220**
1994					**241**
1995					**288**
1996					**381**
1997					**465**
1998*	253	234	65		**552**
1999	174	210	92		**476**
2000	130	260	61		**451**
2001	116	254	50		**420**
2002	145	241	30		**416**
2003	91	241	50		**382**
2004	81	217	40		**338**
2005	105	246	79		**430**
2006	128	276	114		**518**
2007	156	332	97		**585**
2008	104	270	85		**459**
2009	130	247	45		**422**
2010					
2011	140	309	38		**487**
2012	105	291	101	43	**540**
2013	122	188	46		**356**
2014	95	168	23		**286**
2015	86	170	27		**283**
2016	77	165	48		**290**
2017	94	212	97		**403**

Sources: Fowler, 1985; National Park Service, Point Reyes; BLM Reports to Congress ; CDFW relocation files.

*Initial relocation consisted of 2 bulls and 8 cows from San Luis NWR in March, 1978; initial calves conceived at San Luis NWR. Three adult bulls brought from Owens Valley in December, 1981. 1996 Survey Fixed Wing (DFG plane). In 1998, some 45 elk were captured at Tomales Point and moved to an enclosure near Limantour Beach. Several months later, 28 elk were released from the enclosure.

Table 4. Point Reyes National Seashore, Population and Survey Results, Free Ranging Elk.

Year	Number of Elk Counted				Total
	Bulls	Cows	Calves	Unknown	
1999	3	18	9		**30**
2000	7	16	5		**28**
2001	8	18	6		**32**
2002	8	16	4		**28**
2003	9	19	8		**36**
2004	11	20	9		**40**
2005	12	21	12		**45**
2006	16	28	12		**56**
2007	17	30	11		**58**
2008	32	36	14		**82**
2009	31	46	16		**93**
2010	37	44	23		**104**
2011	37	63	19		**119**
2012	46	87	27		**160**
2013	46	80	21		**147**
2014	67	114	32		**213**
2015	72	108	33		**213**
2016	140	119	22		**281**
2017	159	129	41		**329**

Source: National Park Service, Point Reyes National Seashore.