

# A REVIEW OF LITERATURE PERTAINING TO PRONGHORN IN CALIFORNIA FROM 1769 to 2009

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*ABSTRACT:* Recent assessment of pronghorn (*Antilocapra americana*) translocations and urban development projects has revived interest in the legacy of pronghorn in California. These issues are of increased public concern, especially development projects that impact scarce native grassland – habitat for the few remaining herds in southern California. Therefore, the scientific and popular literature for pronghorn in California was investigated with an objective of making this data readily available for concerned sources. More than 125 reports from 1769 (Bolton 1927, Crisby 2003) to 2009 were located. Although pronghorn were historically abundant in California, few remain today, and these are predominantly located on northeastern rangelands. The impact of insidious civilization developments appears deleterious to herds experiencing perilously low numbers south of San Francisco. The plight of these wild herds is apparently tied to the perpetuation of native grassland abundant with forbs. There is concern that if pronghorn are to remain a heritage on southern rangelands of the “Golden State,” that native grasslands need to be perpetuated in healthy condition – then it may be feasible to perpetuate native pronghorn populations.

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*Key Words:* *Antilocapra americana*, California, pronghorn abundance and distribution, historic and current literature, impacts of urban developments, vegetation condition and restoration.

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### INTRODUCTION

Pronghorn were widely distributed and often abundant in many areas of California when Anglo-Americans first arrived, especially in the Sacramento and San Joaquin valleys (Bryant 1848, Fremont 1849, Newberry 1855, Baird 1857). With the advancement of modern civilization, these herds were decimated in all but the northeastern region (McLean 1944). A comparison of historic pronghorn habitat (McLean 1944) with recent occupied rangelands (Zeiner et al. 1990) discloses that possibly more than 70 percent of originally occupied rangelands lack pronghorn in modern times. This phenomena is not restricted to California, for Arizona (the state with the current highest increase in human population) has lost more than 75 percent of original habitat because of deteriorated conditions or occupancy by humans (Brown and Ockenfels 2007).

O’Gara and Yoakum (2004) provide a photograph of one of the last pronghorns shot in the 1920s near Mendota in the San Joaquin valley. The California Department of Fish and Game translocated herds in the 1980s and 1990s to several sites in Kern and San Luis Obispo counties to restore populations in southern California grasslands (Pysora 1987, Koch and Yoakum 2002, U.S. Bureau Land Management 2008). These herds continue to exist but in small numbers and may be seriously impacted as native grasslands are deteriorated or eliminated because of human impacts. The existence of pronghorn in California is enhanced by sustaining grasslands with abundant forbs and

shrubs (Yoakum 2000, 2006, Koch and Yoakum 2002). Jones (1991) studied foraging conditions for pronghorn near Cholame California and concluded that forbs and shrubs were in poor condition relative to pronghorn habitat requirements. Longshore and Lowrey (2007) investigated habitat conditions on the Carrizo Plain National Monument and reported that intensive farming and livestock foraging during the last 100 years resulted in deteriorated or lost native vegetation – thus contributing to poor forage conditions for pronghorn today. Northern California rangelands are producing relatively static pronghorn herds, whereas certain adjacent landscapes in Oregon and Nevada are currently experiencing large increases in herd numbers (Yoakum et al. 2008). These increased populations are attributed to enhanced nutritious, preferred, succulent forage resulting in increased fawn recruitment ratios.

The record is replete with case histories that sites with stagnant vegetation succession contribute to stagnant pronghorn populations (Ellis 1970, O’Gara and Yoakum 2004, and Yoakum 2004, 2006). The key to enhancing modern pronghorn herds is sustaining natural vegetation succession stages with wild or prescribed burns (U.S. Fish and Wildlife Service 1994, Yoakum 2004, 2006). As Starker Leopold advocated decades ago – rangelands with healthy forage conditions generally sustain higher numbers of wild ungulates, rangelands in poor condition sustain fewer – “All other influences are secondary” (Leopold 1966:57).

## PROCEDURES

An evaluation of bibliographies and literature reviews pertaining to pronghorn were an initial thrust of this project. Yoakum (1967, 1991, and 2000) provided a wealth of data. Brown et al. (2006) was of immense help, especially relative to reports of hunter observations during the late 1800s and early 1900s. All literature citations were listed in alphabetical order of authors, editors, or compilers.

To provide information regarding the focus of pronghorn data to California, a rating system was developed. This was accomplished by placing a symbol in front of each literature citation as follows:

- (A) Denoted publications containing information entirely collected and relative to pronghorn in California.
- (B) Refers to reports not specific to California, but for which some findings were collected or pertained to California.
- (C) Contains information regarding the protection, management, or conservation of pronghorn and habitat for various regions in North America, and of potential value for current management in California.

## FINDINGS

One strategy for enhancing pronghorn populations is to review the literature documenting tried and tested practices that have increased herds. Therefore, this review was conducted as an aid to making such references readily available to wildlife management. The following literature totaling more than 125 publications provides a comprehensive listing of technical and popular publications pertinent to the ecology and management of pronghorn in California.

- (A) Ackerly, W.F. and V. Regier. 1956. Northeastern California antelope studies. Special Report. California Department Fish and Game, Sacramento, California, USA.
- (A) Anderson, H.T., Jr. 1932. The pronghorn antelope. California Fish and Game 18:258-259.
- (A) \_\_\_\_\_. 1934. The pronghorn antelope in Los Angeles County. California Fish and Game 20:91-92.
- (C) Autenrieth, R.E., D.E. Brown, J. Cancino, R.M. Lee, R.A. Ockenfels, T.M. Pojar and J.D. Yoakum, compilers. 2006. Pronghorn management guides. Pronghorn Workshop and North Dakota Game and Fish department, Bismarck, North Dakota, USA.
- (B) Baird, S.F. 1857. *Antilocapra americana* Ord. Pages 666-670 in U.S. House of Representatives. Reports of explorations and surveys to ascertain the most practicable and economical route for a railroad from the Missouri River to the Pacific Ocean, 1853-56. Executive Document number 91, Vol. 8. Washington, D.C., USA.
- (B) Bolton, H.E. 1927. Fray Juan Crespi, missionary explorer, on the Pacific Coast 1769-1774. University of California Press, Berkeley, California, USA.
- (A) Brewer, W.H. 1930. (F. Farquhar, editor). Up and down California in 1960-1864. University of California Press, Berkeley, California, USA.
- (B) Brown, D.E., J. Cancino, K.B. Clark, M. Smith and J. Yoakum. 2006. An annotated bibliography of references to historical distribution of pronghorn in Southern and Baja California. Bulletin Southern California Academy Science 105(1):1-16.
- (D) Brown, D.E. and R.A. Ockenfels. 2007. Arizona's pronghorn antelope: A conservation legacy. Arizona Antelope Foundation, Phoenix, Arizona, USA.
- (A) Bryant, J. 1848. What I saw in California. D. Appleton Company, New York, New York, USA.
- (B) Burcham, L.T. 1957. California rangelands, a historico-ecological study of the range resources of California. Department Natural Resources, Sacramento, California, USA.
- (A) California Department Fish and Game. 1966. California fish and game plan. Volume I, 2, and 3. Sacramento, California, USA.
- (A) \_\_\_\_\_. 1997. Final environmental document regarding pronghorn antelope hunting. Sacramento, California, USA.
- (A) Capodice, J.A., C. McCarthy, and R. Thomas. 1982. Adobe Valley pronghorn habitat management plan. U.S. Bureau of Land Management, Bishop, California, USA.
- (B) Caton, J.D. 1877. The antelope and deer of America. Forest and Stream Publication Company, New York, New York, U.S.
- (A) Chattin, J.E. and C.M. Herman. 1944. A parasite from antelope in California. Transactions American Micrology Society 63:27-29.
- (A) Chattin, J.E. and R. Lassen. 1950. California antelope reproduction potentials. California Fish and Game 36:328-329.
- (A) Cheney, E.S. 1929. Prong-horned antelope in California. California Fish and Game 15:175.

- (A) Clausen, A. 1999. Behavioral correlates of fawning, territorial and breeding activities in a pronghorn antelope (*Antilocapra americana*) population on the Carrizo Plains, California. Thesis, California Polytechnic State University, San Luis Obispo, California, USA.
- (A) Cook, B.B., L.E. Witham, M. Olmstead, and A.F. Morgan. 1949. The influence of seasonal and other factors on the acceptability of food values of the meat of two subspecies of California deer and of antelope. *Hilgardia* 19(8):265-284.
- (B) Crosby, H.W. 2003. Gateway to Alta California: The expedition to San Diego 1769. Sunbelt Publications, San Diego, California, USA.
- (A) Dasmann, W.P. 1952. Antelope planting investigations. Special Report, California Department Fish and Game, Sacramento, California, USA.
- (A) Elliot, D.G. 1904. Catalogue of mammals collected by E. Heller in southern California. Field Columbian Museum Publication 91, Zoological Series Vol. 3(16):284-285.
- (B) Einarsen, A.S. 1947. The interstate aspect of pronghorn census work in management. *Proceedings Western Association State Fish and Game Commissioners* 27:127-129.
- (A) Ellis, J. 1970. A computer analysis of fawn survival in the pronghorn antelope. Dissertation, University California, Davis, California, USA.
- (B) \_\_\_\_\_. 1972. Observations on pronghorn population dynamics. *Proceedings Pronghorn Antelope Workshop* 5:55-65.
- (A) Fatooth, J., T.L. Russi, and A.E. Goldsmith. 1994. Pronghorn reintroduction to Mono County, California: 12 years after. *Proceedings Pronghorn Antelope Workshop* 16:35-49.
- (A) Ferrel, C.M. and H.R. Leach. 1950. Food habits of the pronghorn antelope in California. *California Fish and Game* 36:21-26.
- (A) \_\_\_\_\_ and \_\_\_\_\_. 1952. The pronghorn antelope of California with special reference to food habits. *California Fish and Game* 38:285-293.
- (B) Fremont, J.G. 1849. Notes of travel in California. D. Appleton and Company, New York, New York, USA.
- (B) Gabrielson, I.N. 1935. The antelope situation. *American Game* 24(4):54, 59.
- (B) \_\_\_\_\_. 1943. Wildlife refuges. The MacMillan Company, New York, New York, USA.
- (A) Gilman, J. 1960. Antelope in California. *Transactions Interstate Antelope Conference* 3:48-57.
- (A) Godoy, D.F. and D.N. Oberhoff. 1998. Summer home range and investigations of nocturnal movements of pronghorn in Carrizo Plain, San Luis Obispo County, California. Thesis. California Polytechnic State University, San Luis Obispo, California USA.
- (A) Goldsmith, A.E. 1988a. Behavior and ecology of pronghorn after reintroduction to Adobe Valley, California. Dissertation, University California, Berkeley, California, USA.
- (A) \_\_\_\_\_. 1988b, History and research on reintroduction of pronghorn in California. Pages 288-297 in L. Nelson and R.D. Brown (editors). *Translocation of wild animals*. Wisconsin Humane Society Incorporated, Milwaukee, Wisconsin and Caesan Kleberg Wildlife Research Institute, Kingsville, Texas, USA.
- (B) \_\_\_\_\_. 1990. Vigilance behavior of pronghorn in different habitats. *Journal Mammalogy* 71(3):460-462.
- (B) \_\_\_\_\_. 1992. A summary of the behavior and ecology of reintroduced pronghorn. Pages 135-138 in B. Bubek, K. Perzanowski, and W. Reglin (editors). *Global trends in wildlife management*. International Union Game Biologists 18th Congress, Krakow, Poland.
- (A) Gordon, B.L. 1979. Monterey Bay Area: natural history and cultural imprints. Second edition. The Boxwood Press, Pacific Grove, California, USA.
- (B) Graves, J.A. 1912. Out of doors, California and Oregon. Grafton Publishing Company, Los Angeles, California, USA.
- (B) \_\_\_\_\_. 1927. My seventy years in California: 1857-1927. Times-Mirror Press, Los Angeles, California, USA.
- (B) Griffith, G.K. 1962. Guidelines for antelope management. *Transactions Interstate Antelope Conference* 13:102-114.
- (A) Grinnell, J. 1933. Review of the recent mammal fauna of California. *University California Publications in Zoology* 40(2):71-234.
- (A) Grinnell, J. and T. Storer. 1924. Animal life in the Yosemite. University California Press, Berkeley, California, USA.

- (A) Grinnell, J., J. Dixon, and J.M. Linsdale. 1930. Vertebrate natural history of a section of northern California through the Lassen Peak region. University California Publications in Zoology 35:1-594.
- (A) Hacker, D.G. 2002. Pronghorn and a California highway: Potential impacts and mitigation. Proceedings Pronghorn Workshop 20:143-152.
- (B) Hall, E.R. and E.R. Kelson. 1959. The mammals of North America. Ronald Press, New York, New York, USA.
- (A) Hall, R.C. 1963. Impact on antelope and deer sagebrush ranges by the sagebrush defoliator--*Aroga websteri*. Transactions Interstate Antelope Conference 14:40-48.
- (B) \_\_\_\_\_. 1965. Sagebrush defoliator outbreak in northern California. Pacific Southwest Range Experiment Station Research Notes PSW-79. U.S. Forest Service, Berkeley, California, USA.
- (B) Hanley, T.A. 1980. Nutritional constraints on food and habitat selection by sympatric ungulates. Dissertation, University Washington, Seattle, Washington, USA.
- (B) \_\_\_\_\_. 1982. The nutritional basis for food selection by ungulates. Journal Range Management 35(2):145-151.
- (B) Hanley, T.A. and K.A. Hanley. 1982. Food resource partitioning by sympatric ungulates on Great Basin rangelands. Journal Range Management 35(2):152-158.
- (A) Herman, C.M. 1945. Hippoboscids as parasites of game animals in California. California Fish and Game 31:16-25.
- (B) Hjermsman, H.A. and J.D. Yoakum. 1959. The pronghorn as a range animal. Transactions Interstate Antelope Conference 10:76-83.
- (A) Holder, C.F. 1906. Life in the open: Sport with rod, gun, horse and hound in southern California. G. Putman's Sons, London and Knickerbacher Press, New York, New York, USA.
- (A) Horne, W.R. 1925. The return of the antelope in Lassen County. California Fish and Game 11:89.
- (B) Humboldt, A. von. 1811. Essai politique sur le Royaume de la Nouvelle Espagne. Two volumes, Paris, France.
- (B) Ingles, L.G. 1965. Mammals of the Pacific States. Stanford University Press, Stanford, California, USA.
- (A) Jaeger, E.C. 1956. Last stand of the pronghorn. Desert Magazine 19(7):17-18.
- (B) \_\_\_\_\_. 1957. The North American desert. Stanford University Press, Palo Alto, California, USA.
- (B) \_\_\_\_\_. 1961. Desert wildlife. Stanford University Press, Palo Alto, California, USA.
- (A) Jameson, E.W. and H.J. Peeters. 1988. California mammals. University California Press, Berkeley, California, USA.
- (A) Johnson, F.W. 1931. Antelope on the Shasta National Forest. California Fish and Game 17:167-168.
- (A) Jones, F.L. 1954. Report on resurvey of proposed antelope planting sites, California Department Fish and Game, Sacramento, California, USA.
- (A) Jones, K.S. 1991. Feeding study of pronghorn antelope in San Luis Obispo, California. Thesis, California Polytechnic State University, San Luis Obispo, California, USA.
- (A) Kidwell, A. 1996. Bill McHaney: He found and lost a gold mine. Hi-Desert Magazine, Summer II.
- (A) Koch, A.J. and J.D. Yoakum. 2002. Reintroduction and present status of pronghorn on the Carrizo Plain National Monument and surrounding areas. Proceedings Pronghorn Workshop 20:25-41.
- (A) Leopold, A.S. 1951. Game birds and mammals of California: A laboratory syllabus. California Book Company, Berkeley, California, USA.
- (B) \_\_\_\_\_. 1966. Adaptability of animals to habitat changes. Pages 65-75 in F.F. Darling and J.P. Milton, editors. Future environments of North America. Doubleday and Company, New York, New York, USA.
- (B) Leopold, A.S., R.J. Gutierrez, and M.T. Bromson. 1984. North American game birds and mammals. C. Scribner's Sons, New York, New York, USA.
- (A) Loft, E. 1989. Pronghorn antelope: A California success story. Outdoor California 50:1-4.
- (B) Longhurst, W.M. 1957. The effectiveness of hunting in controlling big game populations in North America. Transactions North American Wildlife Conference 22:544-569.
- (B) \_\_\_\_\_, A.L. Lesperance, M. Morse, R.J. Mackie, D.L. Neal, H. Salwasser, D. Swickard, P.T. Tueller, P.J. Urness, and J.D. Yoakum. 1983. Livestock and wild ungulates. Pages 42-64 in J.W. Menke, editor. Proceedings of the workshop on livestock and wildlife-fisheries relationships in the Great Basin. Special Publication 179, Agriculture Sciences Publication, University California, Berkeley, California, USA.

- (A) Longshore, K. and C. Lowrey. 2007. Habitat analysis and food habits of pronghorn antelope in the Carrizo Plain National Monument, California. U.S. Geological Survey, Western Ecological Research Center, Henderson, Nevada, USA.
- (A) Mackie, N.W. 1929. Life history notes--Antelope in Kern county. California Fish and Game 15(3):285.
- (B) Maher, C.R. 1992. Variable behavior of pronghorn (*Antilocapra americana*): Territoriality in male social organization and female group stability. Dissertation, University California Davis, California, USA.
- (B) \_\_\_\_\_. Pronghorn male spatial organization: Population differences in degree of nonterritoriality. Canadian Journal of Zoology 72:455-464.
- (A) Mankins, J.V. 1962. Conjunctivitis of a pronghorn antelope (*Antilocapra american*). Journal Mammalogy 43:415.
- (A) Margolin, M. 1978. The Ohlone way. Heyday Books, Berkeley, California, USA.
- (A) McAllister, H.M. 1924. Census of California big game. California Fish and Game 10(2):76-77.
- (A) McCarthy, C., editor. 1981. Environmental assessment for the introduction of pronghorn antelope into Mono County, California. U.S. Forest Service, Bishop, California, USA.
- (A) McCarthy, C. and J.D. Yoakum. 1984. An interagency approach to evaluating pronghorn transplant sites in Mono County, California. Proceedings Pronghorn Antelope Workshop II:134-143.
- (A) McLean, D.D. 1944. The prong-horned antelope in California. California Fish and Game 30:221-241.
- (A) Meyers, L.H. 1963. A general history of the pronghorn antelope in California. Transactions Interstate Antelope Conference 14:81-102.
- (B) Nelson, E.W. 1925. Status of the pronghorned antelope, 1922-1924. Bulletin 1346, U.S. Department Agriculture, Washington D.C., USA.
- (B) Newberry, J.S. 1855. Report upon the zoology of the route. No. 2, Chapter I. Pages 70-71 in H.L. Abbot. Reports of exploration and surveys to ascertain the most practical and economic route for a railroad from the Mississippi River to the Pacific Ocean. Executive Document 78, Volume VI. U.S. Senate, Washington D.C., USA.
- (B) North, O. 1876. Rambles after sport or travel and adventures in the Americas and at home. The Field Office, London, England.
- (A,C) O'Gara, B.W. and J.D. Yoakum. 2006. Pronghorn: Ecology and management. University Press Colorado, Boulder, Colorado, USA.
- (A) Priestly, H.I. 1937. A historical, political, and natural description of California by Pedro Fages, soldier of Spain. University California Press, Berkeley, California, USA.
- (A) Pysora, L.B. 1977. Pronghorn antelope in northeastern California. Wildlife Management Administrative Report 77-2. California Department of Fish and Game, Sacramento, California, USA.
- (A) \_\_\_\_\_. 1982. Pronghorn antelope management plan. California. California Department Fish and Game, Redding, California, USA.
- (A) \_\_\_\_\_. 1987. Pronghorn management in California. Transactions Western Section The Wildlife Society 23:75-80.
- (A) Richards, G.D. and M.L. McCrossin. 1990. A new species of antilocapra from the late quaternary of California. Geobios 27(5):623-635.
- (B) Sadak, R.B. 1987. The ontogeny of behavior in pronghorn fawns. Thesis, Humboldt State University, Arcata, California, USA.
- (B,C) Salwasser, H. 1980. Pronghorn antelope population and habitat management in the northwestern Great Basin environments. Interstate Antelope Conference, Alturas, California, USA.
- (A) Salwasser, H. and K. Shimamoto. 1979. Some aspects of pronghorn ecology and management in northeastern California. Transactions Cal-Neva Wildlife 15:1-10.
- (A) \_\_\_\_\_ and \_\_\_\_\_. 1984. Pronghorn, cattle, and feral horse use of wetland and upland habitats. Pages 210-213 in R.E. Warner and K.M. Hendrix, editors. California riparian systems. University Press, Berkeley, California, USA.
- (A) Sayana, K. 1952. Sarcocystis in deer and elk of California. California Fish and Game 38:99-104.
- (B) Sheldon, H.H. 1959. The prong horned antelope – how many miles an hour? Pacific Discovery 12(3):18-21.
- (B) Springer, L.M. 1950. Aerial census of interstate antelope herds of California, Idaho, Nevada, and Oregon. Journal Wildlife Management 14:295-298.
- (A) Starr, F.R. 1934. Antelope does cover fawns to conceal them. California Fish and Game 20:291.
- (A) Stephens, F. 1906. California mammals. The West Coast Publishing Company, San Diego, California, USA.

- (A) \_\_\_\_\_. 1921. An annotated list of mammals of San Diego County, California. Transactions San Diego Society Natural History 3:41-56.
- (A) Stock, C.C. 1956. Rancho La Brea, a record of Pleistocene life in California. Science Series 20, Paleontology 11.Los Angeles County Museum. Los Angeles, California, USA.
- (A) Stokes, J.D. 1952. Antelope management in California. Proceedings Western Association Game and Fish Commissioners 32:99-101.
- (A) Stutz, S.S. 1967. Pronghorn antelope habitat management plan. U.S. Forest Service, Alturas, California, USA.
- (B) Van Dyke, T.S. 1905. Sport on the Lower Colorado. Western Field 6:3-7.
- (A) U.S. Bureau of Land Management. 2008. Carrizo Plain National Monument draft resource management plan and draft environmental impact statement. Three volumes. U.S. Bureau of Land Management, Bakersfield, California, USA.
- (C) U.S. Fish and Wildlife Service. 1994. Final environmental impact statement: Hart Mountain National Antelope Refuge comprehensive management plan. 2 volumes. U.S. Fish and Wildlife Service, Lakeview, Oregon, USA.
- (B) Yoakum, J.D. 1967. Literature of the American pronghorn. U.S. Bureau Land Management, Reno, Nevada, USA.
- (B) \_\_\_\_\_. 1991. Literature review of the pronghorn: A bibliography with key words and reference citations. Special Report. Western Wildlife, Verdi, Nevada, USA.
- (B) \_\_\_\_\_. 2000. Selected literature on pronghorn. Proceedings Pronghorn Antelope Workshop 17:86-90.
- (A) \_\_\_\_\_. 2000. An assessment of wildfires and pioneering pronghorn in Long Valley, California/Nevada. Proceedings Pronghorn Workshop 18:94-98.
- (B,C) \_\_\_\_\_. 2006. Influences of vegetation on pronghorn populations in the Intermountain West. Proceedings Pronghorn Workshop 22:53-68.
- (C) Yoakum, J.D. and D.E. Spalinger. 1979. American pronghorn articles published in the Journal of Wildlife Management 1937-1977. The Wildlife Society, Washington, D.C., USA.
- (C) Yoakum, J.D., K. Gray, and M. McColm. 2008. Recent changing vegetation conditions and pronghorn populations near Elko. Nevada. Proceedings Pronghorn Workshop 23:48.
- (A) Zwinger, A. 1986. John Xantus: The Fort Tejon letters, 1857-1859. University Arizona Press, Tucson, Arizona, USA.
- (A) Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. Pronghorn *Antilocapra americana*. Pages 354-355 in California's wildlife: Mammals. Volume III. Department of Fish and Game, Sacramento, California, USA.

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