Pima Natural Resource Conservation District
NRCS Plant Materials Center
3241 N. Romero Road, Tucson, AZ 85705

December 16, 2013

To: Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Re: Docket Nos. CP13-73-000 and CP13-74-000, Sierrita Lateral Project

Madame Secretary,

The Pima Natural Resources Conservation District (PNRCD) herein provides comment on the Draft Environmental Impacts Statement for the proposed Sierrita Pipeline (Docket Nos. CP13-73-000 and CP13-74-000, Sierrita Lateral Project) (DEIS) and provides detailed commentary in this letter following my signature.
The mission of the PNRCD, as defined in the Arizona Revised Statutes (A.R.S. §37-1001) as follows:
To provide for:

- Restoration and conservation of lands and soil resources,
- Preservation of water rights,
- Control and prevention of soil erosion;

and thereby:

- conserve natural resources, conserve wildlife, protect the tax base, protect public lands, protect and restore the state's rivers, streams and associated riparian habitats including fish and wildlife dependent on those habitats;

- in such manner to protect and promote public health, public safety, and the general public welfare.

The Pima NRCD is an organization of voluntary cooperators who own or control land and are committed to conservation. The Pima NRCD geographically encompasses all of Pima County excluding the lands of the Tohono O'Odham Nation. As shown in attachment, a University of Arizona study has determined that agriculture within the

District boundaries contributes an annual economic impact of more than $240 million. The majority of this production occurs within the Altar Valley.

The Pima NRCD supports, endorses and defers to all comments submitted by the Altar Valley Conservation Alliance per Docket Nos. CP13-73-000 and CP13-74-000, Sierrita Lateral Project.

The Pima NRCD demands the Secretary of the Federal Energy and Regulatory Commission (Secretary) select the No Action Alternative.

As shown following this cover letter, the Pima NRCD reviewed the DEIS for the proposed Sierrita Pipeline and determined that it is incomplete in its present state and thereby denies the public adequate participation in the comment process. The DEIS inappropriately rushes the permitting process towards a decision founded on inadequate and in many parts, inaccurate and even defamatory claims.

Furthermore we have determined that only one alternative has been investigated in any detail. The only two alternatives The Federal Energy and Regulatory Commission (FERC) seriously examined are the West alternative route that promises to create a new smuggling and potential future enemy invasion expressway through the middle of the valley, and the No Action alternative. The Pima NRCD therefore supports the No Action Alternative as it represents the only legal alternative for FERC to choose at this time.

In addition to, and even greater than our mutual concern with the environmental impacts that the Altar Valley Conservation Alliance's comments address in great detail, is our concern that the proposed route would permanently facilitate significantly increased proximity and contact between violent criminals and the Pima NRCD's rural cooperators, endangering our cooperators' lives.

We find that the DEIS ignores the latest U.S. Fish and Wildlife Service findings regarding the positive or neutral effects of controlled livestock grazing management in the Altar Valley on listed threatened and endangered species including the Sonoran desert tortoise, Chiricahua leopard frog and the Mexican garter snake. Instead, the DEIS relies entirely on outdated, irrelevant and inaccurate literature that is very clearly biased against controlled livestock grazing by presuming all grazing is uncontrolled, unmanaged grazing.

Moreover, the DEIS is politically and unjustifiably biased against current, well-managed, controlled livestock grazing practices ongoing in the Altar Valley. As such, the DEIS is filled with scientifically unfounded accusations against all livestock grazing, including ongoing controlled grazing in the Altar Valley, mischaracterizes and misconstrues legal ownership of water rights, ignores the best available science on the ecological interactions of livestock with endangered species and rangeland and riparian health, is self-contradictory with regard to the interactions of controlled livestock grazing and endangered species, makes false statements regarding present ecological conditions while ignoring the best available science, selectively relies on information with a common

negative bias against well-managed, controlled livestock grazing while ignoring any and all peer-reviewed scientific studies showing the opposite, and therefore is arbitrary, capricious and unlawful and must be immediately withdrawn.

Sincerely,

Cynthia P. Coping
Chairman, Pima Natural Resources Conservation District

The DEIS promotes direct endangerment of the health and safety of U.S. citizens including Pima NRCD cooperators while defaming the good reputation of the same community the proposed pipeline project would most directly harm.

Page 2-22: Here, the DEIS promises that a roadway accessible to illegal traffic will be maintained in an accessible condition indefinitely.

> **2.6.1.2 Right-of-Way Maintenance**
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> In addition to the survey, inspection, and repair activities described above, operation of the pipeline would include maintenance of the right-of-way. The right-of-way would be allowed to revegetate after restoration; however, larger shrubs and brush may be periodically removed near the pipeline. The frequency of the vegetation maintenance would depend upon the vegetation growth rate. Sierrita has indicated that it would not need to maintain vegetation (i.e., mow) within the 50-foot-wide permanent right-of-way in most land uses types. However, in accordance with Sierrita's Plan, routine vegetation maintenance clearing of the permanent right-of-way is allowed but would not be done more frequently than every 3 years. To facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state.

The southern Arizona agricultural community has already suffered and continues to suffer the burning sting of the senseless murder of one of our own, Robert Krentz, by a person he identified as an illegal alien with his last words heard over a radio transmission. (Cochise County Sheriff's Office, 2010)[1] The murderer, who also shot Krentz's dog, left behind Mr. Krentz to bleed to death, the dog to be found alive 12 hours later with a broken spine, and a trail of footprints leading into Mexico.

At the time of his murder on March 27, 2010, Mr. Krentz was serving as the chairman of the Whitewater Draw Natural Resources Conservation District, a District whose

[1] http://borderreporter.com/2010/03/the-mystery-of-the-murdered-rancher/ Accessed December 15, 2013.

conservation efforts, results and achievements are negatively misrepresented within this DEIS.

We also inform FERC of the murder of U.S. Border Patrol BORTAC Agent Brian Terry, who was gunned down by the illegal alien criminals in the Atascosa Mountains that geologically border the Altar Valley. To make matters even worse, the U.S. Government illegally armed the very people who murdered Brian Terry, ICE agent Zapata (after he had interdicted some 80 "Fast and Furious" program weapons that were headed for our southern border)[2] and at least 300 additional persons in Mexico.[3] The U.S. Government in an illegal operation named, "Fast and Furious," knowingly and illegally delivered more than 2,000 high-powered firearms to prohibited buyers, prohibited possessors and the most violent drug cartel in the history of this hemisphere. That cartel is responsible for literally tens of thousands of murders in northern Mexico over the last four years.

The vast majority of those weapons continue in use to this day, many of which, no doubt, are currently present in the Altar Valley, in the hands of violent criminals. We further inform FERC of the recent murders of numerous Mexican border ranchers who once were next-door neighbors to our own border ranchers, whose ranches are still separated by just a four-strand barbed wire fence. The deceased were found in shallow graves, if found at all. They and other Mexican border ranchers who chose "plata sobre ploma" (silver over lead) offers left behind borderland ranches that are now controlled by drug cartels. Those lands are still separated from the Altar Valley by just a four-strand barbed wire fence. Exacerbating this situation are 18' tall pedestrian fencing bordering the Buenos Aires National Wildlife Refuge and the Yuma area, with nothing but a 4-strand barbed wire fence separating the agricultural lands in the Altar Valley from Mexico. Existing border infrastructure serves to funnel illegal traffic directly into the Altar Valley. The creation of a new north-south roadway as a result of the pipeline trench would only serve to significantly exacerbate the presently unacceptable situation even more. In fact, large groups of as many as 26 persons intending to illegally cross the border have already been observed traveling up the pipeline route that is presently under construction in Mexico.[4]

Criminal cartels are presently engaged in drug trafficking, rape and murder in the Altar Valley, as proven by the audio recordings of Border Patrol radio traffic posted on the website http://secureborderintel.org/arizona_audio.html. (Accessed December 15, 2013). Most of this radio conversation is due to illegal activity within the Altar Valley. There is

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[2] http://www.examiner.com/article/damaging-new-evidence-contradicts-government-agencies-fast-and-furious-murder Accessed December 15, 2013.

[3] http://dailycaller.com/2012/03/16/issa-similarities-between-fast-and-furious-sale-of-texas-guns-that-killed-ice-agent-jaime-zapata/ Accessed December 15, 2013

[4] personal communication December 12, 2013. (to protect the personal safety of the observer, this person shall remain anonymous)

also a recent history in the valley and across southern Arizona of violent "rip crews" and deadly competition between cartels over trafficking routes. (Banks, 2007)[5], (Doan, 2012)[6] In addition, the Secureborderintel.org website documents law enforcement incidents with armed smugglers, some of which are armed with IEDs. Between February 9, 2012 and May 28, 2013, the site documented 84 incidents in southern Arizona involving smuggling groups with weapons and/or homicides.[7] The Pima NRCD has no doubt the proposed pipeline route would become a premium contraband trafficking route facilitating easy access between the Mexican border and Arizona highway 85 that connects with Interstate 10.

The following are examples, but not necessarily a comprehensive list, of missing information that is necessary but unavailable to complete the DEIS:

Page 2-5: Sierrita has not yet provided FERC with requested information.

> "Specific to access road AR-26A, the BANWR has indicated that it has requested that Sierrita identify an alternative access road at this general location due to concerns about the road's existing conditions and ability to accommodate construction equipment. Therefore, access road AR-26A may no longer be needed for construction access and/or may be replaced by another access road. Until Sierrita files revised access road information, we have included access road AR-26A as part of the Project."

Page 2-8: Access roads to be used within BANWR are yet to be determined.

> "Several roads managed by multiple entities are located wholly or partially within the BANWR and are owned by the FWS. While the entity (e.g., Pima County) may have a lease from the FWS, the FWS would ultimately decide whether to authorize Sierrita's use and proposed modifications of these roads. See footnote d.Widening of some roads would be required to accommodate construction equipment and stringing trucks. Following construction, Sierrita would recontour the areas outside the original road footprint and

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[5] Banks, Leo. Following the Amnesty Trail. *Tucson Weekly*, February 15, 2007 http://www.tucsonweekly.com/tucson/following-the-amnesty-trail/Content?oid=1086828 Accessed December 15, 2013

[6] Doan, Claire. Immigration & Customs Enforcement: Rip Crews a Growing Problem in Arizona. KOLD K-GUN 9 News. April 10, 2012. http://www.jrn.com/kgun9/news/146916205.html Accessed December 15, 2013

[7] http://www.secureborderintel.org/BorderBlotter/Weapon_Involved_Incidents_060113.pdf Accessed December 15, 2013

seed disturbed areas with an appropriate seed mix unless otherwise requested by the landowner or land-managing agency.

No land would be required for access roads during operation of the Project. Access road would cross the BANWR and is subject to FWS approval for its use."

Pages 2-16 to 2-17:: Sierrita has not filed the results of its geotechnical investigation at the proposed CAP Canal HDD crossing.

"Sierrita has a prepared site-specific plan for the CAP Canal HDD crossing (see appendix K). Geotechnical investigations of the CAP Canal are underway and Sierrita is working with the appropriate CAP Canal and Pima County engineers to finalize the site-specific crossing plans, including the size and location of all temporary staging areas and access pathways, once the necessary geotechnical studies are completed. Sierrita has not yet filed the results of its geotechnical investigations for the CAP Canal and, therefore, we have recommended in section 4.3.2.6 that Sierrita file the results of its geotechnical investigation at the proposed CAP Canal HDD crossing. Section 4.3.2.6 provides additional discussion about the CAP Canal site-specific crossing plan."

Page 4-34: Locations of sensitive ephemeral washes <5 feet deep have not been identified

"Sierrita has been consulting with the Pima County RFCD regarding ephemeral wash crossings and would adjust the pipeline depth at wash crossings based on a more detailed site-specific scour analysis, which is currently in progress. In ephemeral washes, trench depths would range from 6 to 12 feet deep to provide additional cover above the pipeline and prevent scour, as the channels are highly erodible. Sierrita indicated that it would reduce the construction workspace to 75 feet for ephemeral washes that are 5 feet deep or less, have a scour burial depth of 5 feet or less, and have a building setback of 25 feet or less. The locations of these areas have not yet been identified. However, Sierrita indicated that, based on the initial results of its analysis, the required workspace areas for wash crossings and their respective acreage impacts on associated riparian areas are generally consistent with information already filed with the FERC and discussed in this draft EIS."

Page ES-4 and Page 5-2: Sierrita has not identified how it would protect topsoil during construction.

"We also are recommending that Sierrita identify how it would protect topsoil during construction, which would be susceptible to erosion during heavy rains or flash flooding and from wind."

Page ES-4: Results of geotechnical information on waterbody crossings have yet to be filed.

"The pipeline would cross one perennial and 206 ephemeral waterbodies. The perennial waterbody, the Central Arizona Project (CAP) Canal, would be crossed using the horizontal directional drill (HDD) method. **Because it has not been filed**, we are recommending that Sierrita provide the results of its geotechnical investigation at the CAP Canal crossing. Our analysis would be included in the final EIS."

Page ES-4: Ephemeral washes upstream of livestock tanks have not been identified.

Because certain ephemeral washes are connected to and upstream of a wildlife/livestock tank that would most likely support the federally threatened Chiricahua leopard frog and proposed northern Mexican gartersnake during monsoon season rainfalls, we are recommending that Sierrita provide a table listing by milepost ephemeral washes crossed by the Project that are also connected to and upstream of a wildlife/livestock tank. The Project would not affect wetlands.

Page ES-4: Vegetation seeding and monitoring plan is inadequate and impacts on survivability of AZ protected plants have not been identified or addressed.

"Sierrita would construct, restore, revegetate, and monitor the right-of-way in accordance with its Plan, Procedures, *Reclamation Plan*, and *Post-Construction Vegetation Monitoring Document* to minimize impacts on vegetation. We are recommending that Sierrita revise and file its *Reclamation Plan* to include and/or clarify information regarding seeding, vegetation monitoring, and survivability of saguaro cactus and Palmer's agave."

Page ES-5: Right-of-way widths and site-specific information have not been adequately identified.

"Sierrita would minimize impacts on riparian vegetation at Brown Wash, which is included within the area that has been proposed as jaguar critical habitat by crossing the area using a specialized method to reduce the construction right-of-way width to 75 feet. We are recommending that Sierrita provide site- specific justifications for where it would require ATWS less than 50 feet from

wash crossings and in riparian areas, and where it would require more than 75 feet of construction right-of-way at wash crossings and riparian areas."

Page ES-5: DEIS lacks information on how Sierrita will restore the vegetation over the trench cut or discourage use of vehicles.

We are recommending that Sierrita describe how it would implement noxious weed control and vegetation monitoring and maintenance in areas that have been restored to discourage the use of vehicles.

Page ES-6: No plan to protect the Pima Pineapple Cactus exists.

For the Pima pineapple cactus, we are recommending that Sierrita not begin construction of the Project until it files a plan developed with the FWS that details the methods it would implement to transplant and monitor Pima pineapple cacti that would be directly impacted by construction and FERC staff completes formal consultation with the FWS.

Page ES-7: Impact on human safety has not been adequately analyzed and evaluated, and no plan has been submitted to offset the increases of illegal immigration the pipeline will facilitate through the valley. This matter is directly related to human safety of local citizens including but not limited to Pima NRCD cooperators. Moreover, we adamantly disagree that objective criteria does not exist to evaluate smuggling impacts. Quantitative incident statistics from the Border Patrol and other law enforcement agencies dealing with border crimes do exist and represent objective criteria. Incident rates on existing natural gas right-of-ways in southern Arizona must be evaluated as a percentage of overall incident data. This comparison currently is lacking in the DEIS.

"We do not have any objective criteria to determine the level of significance of a project's effect on or contributing to illegal activities. We acknowledge that the Project could provide a new pathway for existing illegal activity within the Altar Valley. . .

We are recommending that Sierrita file a write-up describing the criteria for and sequential timing of each type of restoration measure to be installed following construction. We are also recommending that Sierrita provide a statement documenting its consultations with CBP and other applicable law enforcement agencies regarding its *Right-of-Way, Security, and Access Control Plan*."

Page ES-8: Historic site surveys and reports are incomplete. Historic sites include historic ranching sites and artifacts that are important to the heritage of Pima NRCD cooperators.

> The review process under section 106 of the NHPA is not yet complete. To ensure that the FERC's responsibilities under the NHPA are met, we are recommending that no construction activities begin until all required surveys are completed, reports and any necessary treatment plans are reviewed, and the appropriate consultations are completed.

Page 2-2: Sierrita's justifications for certain dry wash crossings are currently unavailable.

> **2.2.1 Pipeline Right-of-Way**
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> "Sierrita would use a 100-foot-wide construction right-of-way for a majority of the proposed pipeline. Sierrita would reduce the construction right-of-way width to 75 feet at a specific dry wash crossing, as discussed further in section 2.3.2.2. We have additionally recommended that Sierrita provide site-specific justifications for dry wash crossings requiring a greater than 75-foot-wide right-of-way, as discussed further in section 4.4.8.2.

Page ES-6: FERC has determined the project is unlikely to harm the Mexican garter snake but states on Page 4-123 that Sierrita has done no surveys for Mexican gartersnake, In the absence of survey data this determination is wishful thinking at best.

> No species-specific surveys have been conducted by Sierrita for the northern Mexican gartersnake; however, suitable habitat for this species exists within the general Project area in the form of wildlife/livestock tanks, which may also support preferred prey species.

In addition, the Tohono O'Odham Nation has officially filed a request of extension of time on the DEIS because historic and archaeological surveys have yet to be conducted on tribal ancestral grounds that will be disturbed by the connecting pipeline in Mexico. We endorse their request. As an "equal opportunity" organization we recognize there may be current and/or potential Pima NRCD cooperators whose ancestry and/or cultural heritage are directly tied to those yet-to-be-surveyed historical and archaeological sites.

Page 5-2: Protective measures are not identified.

> Protective and Sierrita proposed modifications to our Plan and Procedures that would exclude the use of several protective and restoration measures at ephemeral washes because these features are anticipated to be dry at the time of crossing. However, we believe that some of Sierrita's proposed modifications could result in adverse impacts on federally listed species at some ephemeral washes during monsoon season rainfalls and **are recommending**

that Sierrita adopt several measures as part of its Plan and Procedures to avoid these impacts. We also are recommending that Sierrita identify how it would protect topsoil during construction, which would be susceptible to erosion during heavy rains or flash flooding and from wind.

Page 4-123: The DEIS is incomplete because Sierrita has not identified ephemeral washes that are upstream of livestock tanks.

> ". . . we have recommended in section 4.3.2.6 that Sierrita identify ephemeral washes in the Project area that are connected to and upstream of wildlife/livestock tanks."

The Pima NRCD finds that the DEIS misrepresents the current status of border security in the Altar Valley.

Page 4-180. FERC is missing Pima County's point.

> Although we do not question the validity of costs and figures provided by Pima County, we, along with other agencies such as the BANWR, have noted that illegal immigration activities are dependent on several variables and factors such as U.S. Border Patrol operations and the national economy, as discussed in section 4.9.1. While pipeline right-of-way may be used by undocumented immigrants or other unauthorized uses, it would not necessarily cause an increase in illegal immigration. The amount of illegal activity at and near border crossings is dependent on many variables that are not directly measurable. However, we acknowledge that the Project could provide a new pathway for existing illegal activity within the Altar Valley. It is reasonable to assume that, with an increase in illegal immigration and human and drug trafficking in the Project area, there would be an increase in costs to public services. However, as noted above, while pipeline right-of-way may be used by undocumented immigrants or other unauthorized uses, it would not necessarily cause an increase in illegal immigration.

The introduction of the new permanent road that would be created by the pipeline installation would no doubt facilitate increased illegal traffic, and the litter (8 lb. per person) and accompanying health and safety hazards, through the immediate area where PNRCD's cooperators live and work. Whether overall nationwide illegal immigration increases or not as a result of the pipeline installation is entirely irrelevant to the immediate danger the pipeline would present to our cooperators and other residents living and/or working within the PNRCD's district. Illegal immigration is not the greatest issue of concern. It is armed, illegal smuggling of drugs, money and firearms that presents the greatest danger to PNRCD's cooperators because this traffic follows the path of least

resistance. The introduction of the pipeline would indeed increase illegal traffic through our cooperators' ranches and private lands by ingress of flow from other areas.

Page 4-186: FERC is making an inaccurate "apples-oranges" comparison of the Altar Valley to other areas on the border.

> "The U.S. Border Patrol has been informed by landowners and visitors (e.g., hunters, hikers) in other parts of the country that the increased efforts by and presence of the U.S. Border Patrol has actually instilled a sense of security."

First, people from "other parts of the country" do not live and work in the remote rural areas of the Altar Valley and are generally clueless as to what is happening on our southern border, particularly in rural areas between those well-protected towns and ports of entry. Second, the U.S. Border Patrol will parrot the inaccurate political propaganda coming from the White House that the "border is secure" because it is natural for employees of any organization to try to please the boss. There may be very unpleasant consequences otherwise, and retaliation against whistleblowers within the government has been documented. In this case, the boss is a politician looking to swell the ranks of his party. Third, the border is indeed secure at border cities and towns because there is 18" double fencing with a trench between the fences, and a disproportionate amount of Border Patrol staff monitoring that fence within cities and towns along the border. In the rural areas between the cities, including vast areas within the Altar Valley, the situation is quite different. We encourage FERC decision makers to come visit the rural areas of the border personally and take a tour. Please contact us to make arrangements. As shown in the photo below, vast remote areas of the Altar Valley, between the border cities, are separated from Mexico by only a four-strand barbed wire fence that is continually cut open by smugglers. (See Figure 1.) The Border Patrol does not assign agents to regularly monitor activity along this fence. They focus their manpower on the towns and cities. These remote areas are instead monitored continually by drug cartel scouts who occupy hidden locations (See Figure 2) on the hilltops and direct their "mules" by encrypted radio transmissions. These scouts own all the latest technology: solar panels, night vision, encrypted radios, heavy weaponry, etc.

Figure 1. Present-day U.S./Mexico border fence in Altar Valley


Figure 2. A drug cartel scout's hilltop hideout in the Altar Valley

Page ES-7: A contestable statement is made concerning resources available to the Border Patrol. The following statement cannot be validated because Border Patrol funding is subject to changes in Congressional appropriations and to the whims of the Executive branch. Even if the Border Patrol has the material resources it needs, over the course of history at least one sitting President has set a precedent, for political reasons, not to fully and faithfully honor his Oath of Office and enforce the law of the land, instead picking and choosing which laws he would wish to enforce. We consider therefore that the following statement is meaningless:

> The U.S. Border Patrol is responsible for responding to any possible increase in human trafficking, narcotic trafficking, and cross border-related illegal activity resulting from the Project and, as a cooperating agency in the preparation of this EIS, has indicated that it has sufficient resources to respond to any additional illegal activity potentially induced by the Project.

Other errors in the DEIS:
Page 4-77 to 4-78: Here, FERC identifies only a few factors in the time it would take for shrub habitat to regenerate. The main factor will be the amount of compaction by motorized vehicles and trampling by illegal aliens.

Most bird species in the Project area are either ground- or shrub-dwelling species. The cutting, clearing, and/or removal of existing vegetation in the right-of-way would destroy existing nesting sites. The effect to shrub-dwelling wildlife species would be greater because shrub habitat would take a comparatively longer time to regenerate. Such habitats could take 50 years or longer to regenerate, depending on site-specific conditions such as rainfall, elevation, grazing, and weed introduction.

Page 4-151: Here, FERC misidentifies ASTL lands as "public" lands. They are not "public" lands. They are private lands owned by the beneficiaries of the State School Trust Fund.

Most of the non-federal land in the Altar Valley is designated as ASTL, which are public lands managed by the ASLD (see section 4.8.2.2). Pima County, as part of its conservation efforts, has obtained leases from the ASLD for much of this land. Currently, Pima County uses these areas as conservation lands or open space, or for active grazing (Pima County, 2011). As listed in table 4.8.1-3, the Project would cross approximately 10.7 miles of ASTL that are under public grazing lease to Pima County and ranches.

The error on page 4-151 is correctly contradicted on page 4-161"

ASTL is land managed by the ASLD. ASTL is not considered public land (ASLD, 2013b), but instead is managed to enhance value and optimize economic return for the trust beneficiaries, and to provide support for resource conservation programs for the well-being of the public and the state's natural environment (ASLD, 2013c). . .

Page 4-152 The appropriate rancher must be fully compensated fully for any and all costs of animals lost, injured or killed as a result of construction. Replacement cost of a bred cow is at least three times her market value (more if the operation is raising seed stock) due to loss of calf production for two or three years.

"Some grazing animals could be trapped in the open pipeline trench and be exposed to additional injury or mortality from predation or other causes. Sierrita would minimize the impacts associated with an open trench on grazing animals by implementing the measures listed in section 4.5.2. These guidelines are based on recommendations from the wildlife agencies in Arizona and include reducing the length of open trench at any one time, providing ramps to allow animals to escape trenches, frequent inspection of trenches, and rescue of trapped animals. This would reduce mortality from entrapment in the pipeline trench. Additionally, Sierrita would offer manpower and/or equipment assistance to remove the animal, as appropriate, from the trench. As discussed in its Plan, Sierrita would coordinate with lessees prior to construction and would erect temporary fencing to minimize impacts on livestock, or work with

> the landowners and land management agencies to identify alternative measures to protect reclamation efforts for the Project."

Page 5-7 Sierrita must not feed anything to anyone's cattle without first obtaining the owner's written permission.

> The majority of land use affected by the Project would be open land used for grazing. Sierrita would implement various measures (e.g., placement of salt licks) to keep livestock away from the right-of-way.

The DEIS misrepresents and misconstrues valid existing privately held water rights.
Pages ES-4, 4-33, 4-36, 4-40, 4-44, 4-45, 4-46, 4-76, 4-77, 4-79, 4-89, 4-99, 4-102, 4-109, 4-110, 4-114, 4-116, 4-122, 4-123, 4-125, 4-126, 4-139, 4-140, 4-141, 4-142, 4-152, 4-153, 4-231, 5-3, and 5-14: Here, the DEIS misidentifies earthen livestock tanks as "wildlife/livestock tanks." For example:

> No species-specific surveys have been conducted by Sierrita for the northern Mexican gartersnake; however, suitable habitat for this species exists within the general Project area in the form of wildlife/livestock tanks, which may also support preferred prey species.
>
> There are approximately 43 wildlife/livestock tanks within 1 mile of the Project area that could support this species, 15 of which are within 1,000 feet of the Project area (see figure 4.7.1-7). The terrestrial spaces between aquatic habitats also support this species by allowing for thermoregulation, gestation, shelter, protection from predators, immigration, emigration, brumation, and foraging. Studies have observed northern Mexican gartersnakes moving several hundreds of meters away from water sources (FWS, 2013d)."

The nomenclature, "wildlife/livestock tanks," misrepresents both the actual purpose of these livestock watering tanks and misrepresents valid existing privately held surface water rights as something different. Most of the livestock water tanks identified in the DEIS are surface waters with rights to that water owned privately. Outside the BANWR and within the Altar Valley the federal government and the Arizona Game and Fish Department have few if any valid rights to surface waters. These livestock tanks were built by ranchers for livestock and are maintained by ranchers for livestock. The privately held, valid existing water rights are registered with the Arizona Department of Water Resources as such and secured by beneficial use for livestock. Without livestock, maintenance of these tanks would immediately cease and these tanks would eventually fill with silt or wash out and become non-functional. This was proven when livestock were exclosed from the Buenos Aires National Wildlife Refuge and very quickly, 21 developed water sites dwindled to just one serving only the Refuge headquarters. Livestock tanks are not built for watering wildlife, although most wildlife depends on livestock tanks for survival in the Altar Valley. Several ranchers in the Altar Valley have indeed entered into Safe Harbor Agreements using their livestock tanks and their private surface water rights to protect the endangered Chiricahua leopard frog. To refer to these

tanks as" wildlife/ livestock" tanks, however, may unconstitutionally infringe on existing, valid, privately-held water rights and also mislead whoever is reading the DEIS.

FERC must require Sierrita to fully compensate local landowners for all losses and injury resulting from the pipeline. Sierrita's responsibilities are inadequately defined. This DEIS must be withdrawn and revised to ensure that happens.

Pima NRCD demands that Sierrita must replace damaged wells at its own expense and fully and timely compensate each damaged well's owner for any other costs.

Page 4-28:

> If an impact occurs on a livestock well or an irrigation well, Sierrita would provide temporary water sources to sustain livestock while a new permanent water supply well is constructed.

The Pima NRCD notifies FERC herein of misrepresentative, false and negatively biased information published in the DEIS and/or misconstrued in context as representing the environmental effects of current, ongoing controlled livestock grazing practices in the Altar Valley. This DEIS is arbitrary, capricious, unlawful and must be immediately withdrawn.

This DEIS is inaccurate and biased in its reliance exclusively on literature that condemns all livestock grazing, as if modern grazing practices remain utterly unchanged from the uncontrolled grazing of the late1890's, while overlooking and/or ignoring all peer-reviewed studies that demonstrate the ecological benefits of controlled grazing, which is the only grazing practice in the Altar Valley. Peer-reviewed literature that discusses the ecological benefits of controlled grazing, within the Altar Valley, all of which FERC has completely ignored, is included in attachment (Parker, 2009). A bibliography of peer-reviewed scientific literature discussing the ecological benefits of livestock grazing, none of which are cited in this biased DEIS, is also included in attachment. (Parker, 2009)

The fact that the information about grazing published throughout this DEIS is selectively biased against livestock grazing indicates a malicious intent to misrepresent the cattle industry in a negative light. The Cumulative Impacts analysis appears to deliberately misrepresent ongoing, well-managed controlled grazing within the Altar Valley in as negative a manner as possible so as to pretend the proposed project will produce minimal incremental damage. This DEIS is filled with pure deceit in that regard. We consider the DEIS biased, overtly defamatory and damaging to our livestock grazing cooperators. In selectively relying almost exclusively on literature that is biased against livestock grazing while ignoring peer-reviewed literature that demonstrates the ecological benefits of livestock grazing, FERC violates the intent of Congress that this DEIS rely solely on the best available scientific and commercial information. This DEIS is therefore arbitrary, capricious and unlawful, and it must be withdrawn.

The DEIS not only ignores the safety, economic and environmental concerns of the people whose lives and livelihoods the project would negatively impact but it goes farther to inappropriately attack, misrepresent and defame their good names and those of their ancestors. The effect of such inaccuracies published in a source as trusted as the Federal Register promises to bring undue social, litigious and regulatory harassment against our cooperators. These dishonest claims attack either directly or by innuendo,

current, well-managed controlled grazing practices, and obstruct an objective evaluation of anticipated cumulative environmental impacts of the proposed pipeline. Moreover such claims expose innocent citizens and their livestock to undue litigation, to physical harm to their lives, and invites theft and vandalism of their property, including but not limited to cruelty to animals, by misguided and mentally unstable persons who feel justified in such actions as a direct result of believing such inaccurate, biased and defamatory information as FERC has already published in the Federal Register within this DEIS.

Page 4-29, 4-221. Here, inaccurate historical information compounded by omission of significant facts, results in the DEIS promoting a lie that generic cattle grazing and farm levees alone caused historical environmental destruction.

> Starting in the mid-1860s cattle grazing was introduced to southern Arizona, and is thought to have significantly contributed to the removal of vegetation, compaction of soils, and subsequent erosion of the watershed basin. The shallow channels that once worked to slow the flow velocity became more and more entrenched with time, allowing flow velocity to increase and subsequently causing increased bank erosion and sediment transport. Additionally, farm levees were constructed, which narrowed the floodplain and further increased flow velocity (Pima County, 2000).

We will first address the egregious historical inaccuracy of this statement. Francisco Vasquez de Coronado introduced domestic European livestock breeds into Southern Arizona in 1540 by. His expedition moved several thousands of head of livestock, including sheep, rams, horses, cattle, pigs and chickens, in addition to more than 1,500 men, through southern Arizona, presumably northward through the San Pedro River Valley.[8]

Pedro de Castañeda, a horseman with the expedition, wrote of crossing the Great Plains (which he stated was by then a full year's journey into the USA),

> "Who will be able to believe that when a thousand horses and five hundred of our cattle, more than five thousand rams and ewes and more than one thousand five hundred persons among the allies and servants [of the expedition] were traveling across those plains [and had] finished crossing [an area] they left no more trace than if no one had ever crossed there." [9]

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[8] 2012-04-16). Documents of the Coronado Expedition, 1539–1542: "They Were Not Familiar with His Majesty, nor Did They Wish to Be His Subjects" (Kindle Locations 18579-18580). University of New Mexico Press. Kindle Edition

[9] (2012-04-16). Documents of the Coronado Expedition, 1539–1542: "They Were Not Familiar with His Majesty, nor Did They Wish to Be His Subjects" (Kindle Locations 15162-15165). University of New Mexico Press. Kindle Edition.

The DEIS then inaccurately lays blame for the stated environmental changes that occurred as a direct result of the 1895 drought entirely on generic "cattle grazing," when in fact this landscape change was the result of a combination of one of the most severe droughts in recorded history and *uncontrolled* grazing, which is no longer practiced in the Altar Valley. There were more than ten head of cattle per acre of land at that time as today, and that is only one of the many management differences. The quoted statement misrepresents and defames present grazing practices by omitting significant facts and telling a half-truth, a.k.a. a clever lie.
The actual 300- year history of domestic cattle presence in southern Arizona is discussed in greater detail in our response to similar false accusations on page 4-221 of this DEIS.

Page 4-29. Misleading information that substantially downplays significant, long-term voluntary conservation efforts by ranchers in the Altar Valley.

> Recently, some ranchers have modified livestock grazing management to control erosion, and efforts are ongoing to restore impacted washes and watersheds.

This statement falsely implies that uncontrolled grazing practices of 1862 are still in effect on most of the ranches in the Altar Valley and that only a minority of these ranchers care enough to do anything differently, and even they have only awakened to their folly in the last two or three years. The fact is that all ranchers in the Altar Valley practice controlled grazing and have done so with increasing levels of scientific knowledge and improved infrastructure since 1935.

Control of grazing is required by law through grazing permits regulated and regularly monitored by the Forest Service, the Bureau of Land Management and/or the Arizona State Lands department. Most ranches in Arizona combine contiguous private, State, and Federal lands and manage grazing under a single coordinated land use plan signed on to by all the relevant federal agencies, state agencies, and the Pima NRCD. Second, voluntary efforts to restore watersheds began in 1935 with the creation of the Soil Conservation Service and in Arizona, the Natural Resource Conservation Districts. The State of Arizona likewise recognized early the need to restore impacted watersheds through voluntary partnerships with private landowners. The State Lands Department website http://www.azland.gov/programs/natural/nrcd.htm gives details. Many of Pima NRCD's cooperators in the Altar Valley are fourth- and fifth-generation ranchers whose families have worked in partnership with the Pima NRCD and/or the NRCS restoring the watersheds since 1935. Many began working on conservation efforts long before that.The Altar Valley Conservation Alliance was created in 1995. The history of conservation efforts made by that group is described online at http://www.altarvalleyconservation.org/about/history/.

Page 4-47 Here, FERC relies on information that is outdated, wholly inaccurate and wholly irrelevant while offensively misrepresenting cattle ranchers across all of southeastern Arizona as uncaring land abusers.

> "The mixed grass-scrub series is the dominant grassland type found in Arizona and is considered one of the most important grasslands in the state due to the high diversity of species found. However, intense cattle grazing and associated soil disturbance has favored the growth of annual, non-native grasses and shrubs over

> native bunch grasses found in these communities. In addition, fire suppression has protected the growth of non-fire resistant scrub over fire tolerant grasses. These factors have led to high occurrences of invasive shrubs and cacti in these communities. In some cases, scrub has completely taken over the grasses, such as with the mesquite stands near Portal, Paradise, and Douglas, Arizona (Bennett et al., 2004)."

The statement above falsely blames "intense cattle grazing and associated soil disturbance" as *ongoing* practices favoring the growth of exotic annuals and shrubs over native bunch grasses. First, "intense" cattle grazing in Arizona went out of fashion with massive cattle death losses following the drought of 1895. The rangelands in Arizona today are stocked at less than $1/10^{th}$ of that intensity. The loss of native bunch grasses was predominantly caused by a combination of the worst drought in recorded history in 1895 combined with the inability of ranchers *at that time* to quickly remove stock in response to the drought. Subsequent heavy monsoon rainstorms washed the topsoil away. This situation provided the motivation for the scientifically controlled grazing and adaptive management that is universally practiced in the Altar Valley and across the western United States today. Range management practices and in turn rangeland health across the United States have improved dramatically since 1900 and more rapidly since the creation of the Soil Conservation Service in 1935. And they continue to improve based on ongoing scientific research.

Indeed, peer reviewed literature included in attachment attests to the fact that sound management of livestock grazing has been instrumental in restoring native bunch grasses both in the Altar Valley and elsewhere in the southwest. (Holechek et al., 2005)[10] (Parker, 2009)[11].

The quoted paragraph finishes with an irrelevant and patently false statement: "In some cases, scrub has completely taken over the grasses, such as with the mesquite stands near Portal, Paradise, and Douglas, Arizona (Bennett et al., 2004)." This statement is irrelevant because Portal, Paradise, and Douglas all lie in Cochise County on the opposite side of several mountain ranges and not in the Altar Valley, much less within the Project area.

Moreover, FERC errs in its statement that due to fire suppression, "shrubs have ***completely*** taken over the grasses, such as with the mesquite stands near Portal, Paradise, and Douglas, Arizona." Here, FERC relies on obsolete and misrepresentative information. FERC completely ignores the fact that that the area mentioned was engulfed in two massive wildfires in 2010 and 2011: Horseshoe I and Horseshoe II. The latter was the fifth largest wildfire in Arizona history, scorching 222,954 acres (348.3656 sq mi;

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[10] Holechek, J. L., Baker, T.T., and J.C. Boren. Impacts of Controlled Grazing versus Grazing Exclusion: What we have learned. 2005. New Mexico State University Range Improvement Task Force Report No. 57

[11] Parker, Dennis. 2009. Citations to Publications Showing Benefits of Controlled Grazing and Selected Publications Relating to Riparian Habitat, Native Fishes and Political Ecology

90,226.3 ha).[12] Illegal aliens most likely ignited the Horseshoe II fire, the Monument fire and two other major wildfires that occurred significantly closer and which threatened the Project area in 2011: the Murphy Fire and the Pajarito fire. (Banks, 2011)[13]
Furthermore, Bennett (2004) examines only the effects of historical *uncontrolled* livestock grazing and is therefore irrelevant to *controlled* grazing practices currently ongoing in the Project area.
Page 4-47 Here again, the DEIS ignores the best scientific and commercial data available, favoring instead the typical propaganda produced by self-publishing NGOs that are not held accountable to anyone for scientific accuracy or quality control. The paragraph quoted below is speculative, inaccurate and soundly refuted in attachment by the best available science.

> "A study conducted by the Nature Conservancy (Gori and Enquist, 2003) mapped grassland types within the Project area (see figure 4.4-2). This study shows that the majority of the mixed grass-scrub community crossed by the Project (approximately 372 acres) is exotic-dominated grasslands, defined as grassland with 10 to 35 percent total shrub cover, in which mesquite cover is less than 15 percent and non-native perennial grasses are common or dominant. High-quality native grassland and historical grassland are also found within the Project area. The high-quality grassland found in the Project area (approximately 20 acres) is defined as grassland composed of native perennial grasses and herbs with 10 to 35 percent total shrub cover, in which mesquite cover is less than 15 percent, and that has restoration potential. Historical grassland (approximately 28 acres found in the Project area) is defined as former grasslands with greater than 15 percent canopy cover of mesquite combined and/or greater than 35 percent total shrub cover, along with perennial grass canopy cover that is usually less than 1 percent and always less than 3 percent, and type conversion to shrubland that is either permanent or would require 40 plus years of livestock exclusion for partial recovery of perennial grasses."

The Nature Conservancy is not the highest authority on soil and vegetation surveys in the Altar Valley. The NRCS is, and we defer in the analysis of such to comments being submitted by NRCS.

Furthermore, the quack-science prescription of "40 plus years of livestock exclusion for partial recovery of perennial grasses" is presented without citation to any scientific range management study and clearly has no relationship whatsoever to the best available scientific information.

What the best available scientific information does say, in stark contrast, is that

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[12] Wikipedia. Horseshoe 2 Fire. https://en.wikipedia.org/wiki/Horseshoe_2_Fire Accessed December 15, 2013

[13] Banks, Leo. "Arizona Burning." *Tucson Weekly* June 30, 2011. http://www.tucsonweekly.com/tucson/arizona-burning/Content?oid=3046857 accessed December 15, 2013.

native perennial vegetation can and has been rapidly restored within the Altar Valley in the presence of controlled livestock grazing. Fleming and Holechek (2002) [14] states the following about one of the grazing allotments in the Altar Valley:

> The Montana Allotment has been in a strong upward trend for the last 17 years based on various surveys by range consultants and Forest Service range conservationists. A significant shift in composition from shortgrass (curly mesquite) to more productive, palatable midgrasses (sideoats grama) has occurred over the period from 1984 to 2000.(Fleming et al. 2001)[15]

Holechek et al., 2005[16] states:

> "On the Montana Allotment on the Coronado National Forest in southeastern Arizona, a combination of rest rotation grazing and conservative stocking over a 10-year period resulted in rapid improvement of both riparian vegetation and bank characteristics (Fleming et al. 2001). Hundreds of riparian trees became established in riparian reaches where they had been absent 13 years ago. Based on a system using 10 indicators, riparian health on the Montana Allotment was judged to be excellent. This study shows that well planned grazing can result in rapid riparian habitat improvement under some conditions in the southwestern United States."

Page 4-62: Here, the statement implying that the pasture fencing in the Altar Valley fragments wildlife habitat is founded entirely on unreliable speculation rather than verifiable facts. While one can agree that pasture fencing *has the ability* to fragment habitat for some species of wildlife, a survey by fly-over in a helicopter cannot possibly evaluate the fencing in the Altar Valley as to its degree of wildlife habitat fragmentation. Is the fence 3-strand, 4-strand or 5 strand? Are the top and bottom wires barbed or smooth? What is the minimum distance between the wires? What structural allowances are built in to allow wildlife movement? What is the minimum distance from the ground to the bottom wire? What is the maximum height of the top wire? These are factors ranchers consider in building wildlife-friendly fencing that does *not* fragment habitat, and that cannot be evaluated from a two-dimensional perspective at a distance of several thousands of feet away and traveling at high speed.

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[14] William Fleming and Jerry Holechek. "Soil Erosion Rate on the Montana Allotment, Arivaca, Arizona, May 2002. A Consulting Report" http://www.chiltonranch.com/images/soil_erosion_rate.pdf accessed December 15, 2013

[15] William Fleming, Dee Galt and Jerry Holechek. "Ten Steps to Evaluate Riparian Health" and "The Montana Allotment: A Grazing Success Story" 2001. Rangelands 23(6) pp. 24-27 http://chiltonranch.com/images/fleming.pdf Accessed December 15, 2013

[16] Holechek, J.L., Baker, T.T., and J.C. Boren, 2005. "Impacts of Controlled Grazing versus Grazing Exclusion on Rangeland Ecosystems: What We Have Learned" New Mexico State University Range Improvement Task Force Report No. 57" http://aces.nmsu.edu/pubs/_ritf/RITF57.pdf Accessed December 15, 2013

> We reviewed the Project area during a helicopter fly-over in the fall of 2012 and also have conducted a more recent aerial photo assessment of the Project area. Based on these reviews, we observed that the natural landscape crossed by the Project has already experienced fragmentation in the form of existing roads and trails from human and grazing activities, other rights-of-way (e.g., Highway 286, electric transmission line), and clear cuts.

Page 4-66 Here, FERC again presents inaccurate and irrelevant information regarding the effects of *uncontrolled* grazing and misconstrues it to represent the effects of *controlled* livestock grazing under the management techniques currently practiced within the Project area.

> Riparian habitat is essential for many of the big game, raptors, migratory birds, and sensitive species in the Project area. Fire, weed colonization, livestock grazing, oil and gas development, and drought, among others influences, have reduced or degraded riparian habitat in the western United States.

The statement that generic "livestock grazing… [has] reduced or degraded riparian habitat in the western United States"-without consideration of timing, duration, seasonality, stocking levels, utilization, grazing intensity, pasture rotation, adaptive management, or other significant factors–falsely implies this is the predictable effect of the controlled grazing practices currently ongoing in the proposed Project area. Indeed, within the Altar Valley, riparian habitat has been quickly *improved* through carefully controlled grazing management. What the best available scientific information tells us, in stark contrast to this DEIS, is that native perennial vegetation can and has been rapidly restored within the Altar Valley in the presence of controlled livestock grazing. Fleming and Holechek (2002) states, [17]

> The Montana Allotment has been in a strong upward trend for the last 17 years based on various surveys by range consultants and Forest Service range conservationists. A significant shift in composition from shortgrass (curly mesquite) to more productive, palatable midgrasses (sideoats grama) has occurred over the period from 1984 to 2000.(Fleming et al. 2001)[18]

Holechek et al., 2005[19] states:

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[17] William Fleming and Jerry Holechek. "Soil Erosion Rate on the Montana Allotment, Arivaca, Arizona May 2002 A Consulting Report." http://www.chiltonranch.com/images/soil_erosion_rate.pdf Accessed December 15, 2013

[18] William Fleming, Dee Galt and Jerry Holechek. "Ten Steps to Evaluate Riparian Health" and "The Montana Allotmernt: A Grazing Success Story" 2001. Rangelands 23(6) pp. 24-27 http://chiltonranch.com/images/fleming.pdf Accessed December 15, 2013

[19] Holechek, J.L., Baker, T.T., and J.C. Boren, 2005. "Impacts of Controlled Grazing versus Grazing Exclusion on Rangeland Ecosystems: What We Have Learned" New Mexico State University Range Improvement Task Force Report No. 57" http://aces.nmsu.edu/pubs/_ritf/RITF57.pdf Accessed December 15, 2013

> "On the Montana Allotment on the Coronado National Forest in southeastern Arizona, a combination of rest rotation grazing and conservative stocking over a 10-year period resulted in rapid improvement of both riparian vegetation and bank characteristics (Fleming et al. 2001). Hundreds of riparian trees became established in riparian reaches where they had been absent 13 years ago. Based on a system using 10 indicators, riparian health on the Montana Allotment was judged to be excellent. This study shows that well planned grazing can result in rapid riparian habitat improvement under some conditions in the southwestern United States."

Page 4-56: Here, historic fires and fire suppression are misrepresented with accusations of this folly laid entirely upon the grazing industry as if it was done entirely by ranchers and for the benefit of only ranchers. This accusation is both utterly false and defamatory. Here again, irrelevant references are made to areas far outside the Project area that were addressed previously in our comments regarding the misrepresentations, false accusations and irrelevant information found on Page 4-47.

> The Scrub-Grassland habitat was historically maintained by naturally occurring fires that resulted from lighting strikes during the monsoon season. Native grasses are generally fire tolerant and are favored by periodic fires, as fires reduce the cover of non-fire tolerant scrub species. However, due to livestock grazing practices, fire has been historically suppressed in Scrub-Grasslands, contributing to the expansion and dominance of scrub species (FWS, 2003). In some cases, scrub has completely taken over the grasses, such as with the mesquite stands near Portal, Paradise, and Douglas, Arizona (Bennett et al., 2004).

Contrary to the misinformation published in this DEIS, a century of fire suppression policies were in fact enacted primarily to protect human life.[20] These policies followed the 1871 Peshtigo fire that swept through Wisconsin and killed 1,500 people. The Great Fire of 1910[21] followed that, burning three million acres in western Montana, Idaho and northeastern Washington. The area burned included parts of the Bitterroot, Cabinet, Clearwater, Couer d'Alene, Flathead, Kaniksu, Kootenai, Lewis and Clark, Lolo, and St. Joe national forests. The firestorm burned over two days (August 20–21, 1910), and killed 87 people,[22] mostly firefighters.[23] It was also the deadliest event for firefighters in American history until the terrorist attack of September 11, 2001.

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[20] Wikipedia https://en.wikipedia.org/wiki/History_of_wildfire_suppression_in_the_United_States https://en.wikipedia.org/wiki/History_of_wildfire_suppression_in_the_United_States Accessed December 16, 2013.

[21] Great Fire of 1910 http://www.freebase.com/view/en/great_fire_of_1910 Accessed December 15, 2013

[22] Egan, Timothy. - "Ideas & Trends: Why Foresters Prefer to Fight Fire With Fire". - *The New York Times*. - August 20, 2000

According to the Forest History Society, fire suppression policies were adopted first to protect human life and second, to protect valuable commercial timber supplies. Ranchers in fact *opposed* the fire suppression policies because light burning was a good range management tool.[24] Light burning was also practiced on the Buenos Aires Ranch before it became a National Wildlife Refuge. The small fires maintained the masked bobwhite quail habitat before the ranch was acquired for the BANWR. (Sayre, 2002)[25]

> The 1910 fires had a profound effect on national fire policy. Local and national Forest Service administrators emerged from the incident convinced that the devastation could have been prevented if only they had had enough men and equipment on hand. They also convinced themselves, and members of Congress and the public, that only total fire suppression could prevent such an event from occurring again, and that the Forest Service was the only outfit capable of carrying out that mission. Three of the men who had fought the 1910 fires—William Greeley, Robert Stuart, and Ferdinand Silcox—served from 1920 to 1938 as Forest Service chief, which put them in a position to institute a policy of total fire suppression.
>
> This policy had two goals: preventing fires, and suppressing a fire as quickly as possible once one started. To prevent fires, the Forest Service came out in opposition to the practice of light burning, even though many ranchers, farmers, and timbermen favored because it improved land conditions. It must be remembered that at this time foresters had limited understanding of the ecological role of fire. Forest Service leaders simply argued that any and all fire in the woods was bad because it destroyed standing timber. Educating the public about the need for fire prevention became an important part of this goal. In 1944, the Forest Service introduced the character Smokey Bear to help deliver its fire prevention message.

The policy of fire suppression was also applied to Sequoia, General Grant, and Yosemite national parks when they were established in 1890, and Army patrols were initiated to guard against fires, livestock trespass, and illegal logging.[26]

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[23] Deadliest incidents resulting in the deaths of 8 or more firefighters". *nfpa.org*. National Fire Protection Association. February, 2012. Retrieved 1 July 2013. (86 firefighters)

[24] Forest History Society. U.S. Forest Service History: U.S. Forest Service Fire Suppression. http://www.foresthistory.org/ASPNET/Policy/Fire/Suppression/Suppression.aspx Accessed December 16, 2013

[25] Sayre, N. 2002. Ranching, Endangered Species, and Urbanization in the Southwest, Species of Capital. The Arizona Board of Regents.

[26] van Wagtendonk, Jan W. (2007). "The History and Evolution of Wildland Fire Use". *Fire Ecology* (Association for Fire Ecology) **3** (2): 3–17. doi:10.4996/fireecology.0302003. Retrieved 2008-08-24. (U.S. Government public domain material published in Association journal. See *WERC Highlights -- April 2008*

FERC, in this DEIS, is apparently trying to conceal the fact that the Altar Valley Conservation Alliance (AVCA) was created for the purpose of bringing prescribed fires into the valley as a means to restore the native grassland. The AVCA website states:[27]

> Grasslands of the Altar Valley likely burned every 8-12 years, prior to Euro-American settlement in the 1880s. Fire regimes likely played a crucial role in maintaining the area's grasslands by suppressing woody species and encouraging new growth. Like much of the western United States, the presence of fire in the Altar Valley diminished throughout the 20th century, and the dominance of woody species steadily increased. Returning fire to the watershed ecosystem was a goal that drew people together to form the Altar Valley Conservation Alliance in the mid 1990s.
>
> After years of effort, a consortium of watershed partners led by the US Natural Resources Conservation Service and the Alliance completed a landmark watershed wide fire management plan in 2010. The plan addressed the entire watershed, except the Buenos Aires National Wildlife Refuge, which has an extensive fire program already in place. Learn more by looking at the actual fire plan!
>
> Thanks to two major grants from the National Fish and Wildlife Foundation, the Alliance and its partners are now working on plans for specific fires. In 2010, the Alliance received its first multi-year fire research and implementation grant through the National Fish and Wildlife Foundation. Under that grant, the Alliance and partners created five state-approved, surveyed, and mapped prescribed burn plans totaling more than 17,000 acres of mixed private, county, state and federal lands: Keystone Peak, West Mill, Pig Mountain, Las Delicias and Rancho Seco. In the fall of 2012, the Alliance was awarded a second grant from the National Fish and Wildlife Foundation to create two additional burn plans, add erosion control measures to all seven of the burn sites prior burning, and, if conditions allow, execute the seven prescribed burns.
>
> Fire has a way of operating of its own accord too. Many major wildfires have occurred in the watershed since 2000, many caused by humans. To learn more, read about the Elkhorn Fire 2009.
>
> To read more about the Alliance's efforts to return fire to the Altar Valley, click here to read Tana Kappel's article "Burning Desire," which appeared in Field Notes, the Nature Conservancy's magazine for Arizona members.

Page 4-56: Here, FERC once again misrepresents Lehmann's lovegrass as having been introduced solely by ranchers, solely to benefit livestock, as if FERC misunderstands Lehmann's to be superior forage over native grass species.

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[27] Altar Valley Conservation Alliance / Fire Plan 2008. http://altarvalleyconservation.org/wp-content/uploads/pdf/Altar_Valley_Fire_Management_Plan.pdf
http://www.altarvalleyconservation.org/cooperative-conservation/fire/ Accessed December 15, 2013

> Lehmann's lovegrass, although not identified as a prohibited, regulated, or restricted species by the ADA, is a non-native species that was also introduced to improve livestock grazing and has become well established in the Project area. Lehmann's lovegrass is the dominant grass on 75 percent of the BANWR and throughout the Altar Valley (FWS, 2003).

Lehmann's lovegrass was in fact originally introduced in the 1930's as a cover plant to stop soil erosion following the Dust Bowl era. According to the U.S. Forest Service,

> Lehmann lovegrass is native to South Africa. It was first introduced in the arid Southwest in the 1930's for range restoration purposes. Between 1940 and 1980, ranchers and government land managers established Lehmann lovegrass on more than 172,000 acres (70,000 ha) [10]. However, because of edaphic and climatic requirements of the plant, most stands in Texas, New Mexico, and central Arizona disappeared within 5 years of planting [11]. In 1988, Lehmann lovegrass was considered a major plant species on about 347,000 acres (140,000 ha), with the majority of this acreage in southeastern Arizona [12].
>
> . . .Lehmann lovegrass has been widely used for roadside stabilization and range restoration in the Chihuahuan and Sonoran deserts [30]. The Highway Division of the Arizona Department of Transportation uses Lehmann lovegrass in seed mixes with other grasses to minimize erosion and sediment damage to highways during construction [5]. Several cultivars are available [28].

Page 4-85 Table 4.5.3-1 Here, FERC accuses grazing and farming as threats to the movement of mountain lions, javelina, coyotes and bobcats. There is no well-designed scientific study that addresses the relationship of cattle to these species, much less proves this claim to be true. This claim is just something someone made up and wrote in a government document, and it is believed by simple virtue of being stated in print. In fact, all these species cohabitate cattle ranches across southern Arizona. Agriculture enhances and expands habitat for these and other species of wildlife by providing water and prey that would not otherwise be available.

Page 4-117 Here, FERC makes a baseless accusation that generic "livestock grazing"– is a "main threat" to endangered masked bobwhite quail.

> The main threats to this species [Masked bobwhite quail] are habitat degradation and loss from livestock overgrazing, unnatural fire regimes, and possibly competition with other quail species (FWS, 2002).

No well-designed scientific study has ever examined the relationship of livestock to masked bobwhite quail. Furthermore, "overgrazing" is not a current livestock management practice in the Altar Valley. FERC must define what is meant by an "unnatural fire regime."

Page 4-123: Here, the DEIS contradicts itself, falsely implies "overgrazing" occurs within the Project area, and relies on obsolete information while ignoring the best available scientific information.

> Major threats to this species [Mexican gartersnake] are from habitat degradation and loss from urbanization, overgrazing, water diversions and groundwater pumping, predation by invasive species (i.e., bullfrogs and predatory fish), reduced availability of native prey base from predation/competition with nonnative species, and genetic effects from fragmentation of populations (AGFD, 2001b).
>
> No species-specific surveys have been conducted by Sierrita for the northern Mexican gartersnake; however, suitable habitat for this species exists within the general Project area in the form of wildlife/livestock tanks, which may also support preferred prey species.

Overgrazing does not occur in the proposed Project area or anywhere else in Arizona. Only controlled grazing occurs in the Altar Valley. The DEIS contradicts itself by stating that "water diversions" are a "major threat" to the species and immediately thereafter stating that suitable species habitat consists of livestock tanks, which typically are filled by diverting floodwater from nearby washes.

Here, FERC states that the practice of livestock grazing has created and maintained suitable habitat in the form of functional earthen stock tanks; but cites baseless accusations against livestock "overgrazing" and "water diversions" (an example of which is the channeling of water into earthen stock tanks that are ironically hailed on Page ES-6 as "suitable habitat" for T&E species) as an ongoing threat causing the alleged demise of the Mexican garter snake. To the contrary, no relevant, well-designed studies exist that examine the relationship of livestock grazing or water diversions such as in the Altar Valley to the well-being of Mexican garter snakes. Clearly the previous paragraph states that livestock tanks (which rely on water diversions) are suitable habitat for the species, but fails to recognize these tanks would not exist but for the benefit of livestock. Indeed, grazing exclusion is also a major threat to the species.

Quoting from attachment (Parker, 2009)[28],,

> The Northern Mexican garter snake provides yet another example. When Arivaca Cienega became known as an "historic locality for both the Mexican garter snake and Chiricahua leopard frog" in 1970 (Rosen and Schwalbe, 1988[29]), livestock grazing had occurred there for the better part of 300 years and was then currently ongoing. It was only after livestock grazing was eliminated from the vast majority of Arivaca Cienega, however, that "extensive snake trapping carried out in the cienega in 1994 and 2000 yielded a total of 3 checkered garter snakes . . . and a single

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[28] Parker, Dennis. Comments submitted on behalf of Southern Arizona Cattlemen's Protective Association in response to Coronado Draft Management Plan. 2009

[29] Rosen, P.C. and C.R. Schwalbe. 1988. *Status of the Mexican and narrow-headed garter snakes (Thamnophis eques megalops and Thamnophis rufipunctatus rufipunctatus) in Arizona.* Unpubl. Report from Arizona Game & Fish Dept. (Phoenix, Arizona) to U.S. Fish & Wildlife Service, Albuquerque, New Mexico.

> Mexican Garter Snake (2000), along with a single road-killed black-necked garter snake" (Rosen et al. 2001[30]). Similar observations also hold true for the San Bernardino and Buenos Aires National Wildlife Refuges, the lower San Rafael Valley, the Bog Hole in the upper San Rafael Valley, and the Audubon Research Ranch, where Northern Mexican garter snake populations were also reported to have substantially declined (USFWS 2008[31]) after all livestock grazing was eliminated.
>
> Based on these facts, the rational hypothesis regarding these T&E species' decline is that the exclusion of well-managed, controlled livestock grazing may have contributed to both the diminishment of their numbers and their disappearance from areas of formerly historic and common occurrence.

FERC has also chosen to ignore he U.S. Fish and Wildlife Service's latest findings on the relationship of livestock grazing in the Altar Valley to the Chiricahua leopard frog and the Mexican garter snake, as stated in the attached July 2013 press release:

> Some northern Mexican gartersnakes occupy stock tanks, or impoundments maintained by cattlemen as livestock watering holes. Today's proposal includes a special rule under Section 4(d) of the Act exempting operation and maintenance of livestock tanks on private, State, and tribal lands from the Act's prohibitions on "take" of listed species. Landowners will not be in violation of the Act should they or their livestock harass, harm or kill a gartersnake during normal use, operation and maintenance of their livestock tanks.
>
> "Livestock operations do not pose a significant threat to either gartersnake; in fact many ranchers have created and maintain habitat for northern Mexican gartersnakes," said Spangle. "In 2002, we provided regulatory flexibility for livestock operators at threatened Chiricahua leopard frog waters. Their resulting stewardship has netted remarkable recovery advances for the frog – we anticipate similar results for the gartersnake."[32]

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[30] Rosen, P.C., Wallace, J.E. and C.R. Schwalbe. 2001. *Resurvey Of The Mexican Garter Snake (Thamnophis Eques) In Southeastern Arizona.* Unpubl. Report to Arizona Game & Fish Dept. and U.S. Fish & Wildlife Service. 64p.

[31] U.S. Fish & Wildlife Service. 2008. *New 12-month finding for the petition to list the northern Mexican gartersnake as threatened or endangered.* Federal Register, Vol. 73, No. 228, Tuesday, November 25, 2008.

[32] U.S. Fish and Wildlife Service News Release July 9, 2013: "Endangered species act protection proposed for two southwest gartersnakes and their habitat"

FERC is advised here also to note that the U.S. Fish and Wildlife Service correctly refers to these important watering holes as "livestock tanks" not "wildlife/livestock" tanks.

The DEIS is therefore not founded on the best available science. We urge FERC to withdraw the DEIS and issue a corrected DEIS including further research of livestock grazing and its controlled use as a tool of possible benefit to fishes, frogs, and garter snakes, consistent with Rosen's recommendation (Rosen et al. 2001, p. 25), as an important and critical component of its revised DEIS.

Page 4-127 Here, the DEIS relies on outdated information and ignores the best available science.

> "In the early 1980s, desert tortoise suffered a notable population decline due to an upper respiratory tract disease in Arizona, California, and Nevada. Major threats to this species consist of habitat degradation and loss from invasive plants, unnatural fire regimes, urban and agricultural development, off-road vehicle use, **overgrazing,** and illegal immigration and U.S. Border Patrol activities, habitat fragmentation from roads and highways, introduction of barriers to dispersal and genetic exchange, drought, climate change, illegal collection and vandalism, and predation from feral dogs, ravens, and humans (FWS, 2012f; Pima County, 2012c)."

The cited Pima County reports on the Sonoran Desert Tortoise are irrelevant to the Altar Valley. The US Fish and Wildlife Service has more recently, after receiving new information in the form of a 20-year study by Dr. Walter Meyer, et al., determined that livestock grazing within Arizona, all of which ***is*** managed, does not significantly affect the desert tortoise, but also found that grazing may remain a threat to the tortoise within Sonora, Mexico primarily due to the planting of fire-prone buffelgrass, ineffective livestock management and overgrazing *there*.

> "In consideration of the literature presented above, we conclude that grazing effects to the Sonoran desert tortoise may occur but are likely limited in severity and scope in Arizona, because habitat shared by livestock and Sonoran desert tortoises is not a significant proportion in most areas in Arizona, and because livestock grazing in Arizona is actively managed by land management agencies (see Factor D). We also acknowledge that data generated from research on grazing effects to tortoises and their habitat are variable, making it difficult to accurately assess the risk of livestock grazing to the Sonoran desert tortoise." (Federal Register/Vol. 75, No. 239/Tuesday, December 14, 2010/Proposed Rules AT 78120)

The U.S. Fish and Wildlife Service also recognizes (75 Federal Register at 78125) the threat of illegal immigration to Sonoran Desert Tortoises, citing two first hand accounts of border crossers carrying them for a food source more than 65 miles north of Mexico.

> "Sonoran desert tortoises have also been documented as a food source for undocumented immigrants on their journey through the

> Sonoran Desert of Arizona, specifically in the Ironwood Forest National Monument. Coping (2009, p. 4) claims that by the time undocumented immigrants reach the Ironwood Forest National Monument, many have been abandoned by their guides and left without food, water, or a sense of direction, leaving them in intense desperation (Coping 2009, p. 4). In one instance on June 2, 1997, a small group of undocumented immigrants approached a resident living within the Ironwood Forest National Monument. The immigrants had a live Sonoran desert tortoise they had captured along the way that had a rope tethered to its front leg. They told this resident that if they did not receive food from him, they planned to eat the tortoise (Coping 2009, p. 5). In another reported observation, a livestock grazing permittee on the Ironwood Forest National Monument stated that he had seen immigrants carrying tortoises, "presumably with the intent to consume. (Averill-Murray and Averill-Murray 2002, p. 29)."

Clearly, the proposed pipeline route will increase demand for tortoises as food due to facilitating illegal immigration through Sonoran desert tortoise habitat. The published mission of the Buenos Aires National Wildlife Refuge is, "*Located in southern Arizona, Buenos Aires National Wildlife Refuge was established for the reintroduction of masked bobwhite quail* ***and to restore the natural landscapes and native wildlife that depend upon it."*** The Pima NRCD does not recognize that harming the Sonoran desert tortoise and other native wildlife by creating an unnecessary corridor of illegal immigration through the Altar Valley could possibly "restore the natural landscapes and native wildlife that depend upon it." We therefore recommend that the DEIS be withdrawn and Sierrita resume discussion with the U.S. Fish and Wildlife Service to reconsider the east route.

Page 4-150: Here, the DEIS misleadingly makes "overgrazing" sound as if it is a continuing practice in the Project area today by failing to define the period when this occurred.

> Prior to overgrazing and the introduction of invasive plant species, the grasslands of the Altar Valley are believed to have been similar to the Sonoran savanna grassland communities of the plains of Sonora, which include species of three-awn (*Aristida* spp.), grama grasses (*Bouteloua* spp.), windmill grasses (*Chloris* spp.), and tanglehead (*Heteropogon contortus*) (FWS, 2003). Also, mesquite (*Prosopis* spp.) was considered to be rare in the Altar Valley.

Overgrazing is not practiced in the western United States today because only a small fraction of rangeland is privately owned. On the rest, grazing permits place limits on the stocking intensity and seasonal duration allowed. Overgrazing became highly unfashionable after the drought of 1895, with massive cattle death losses and the ensuing crash in cattle market prices. The practice of overgrazing that devastated southern Arizona rangelands began to end in 1900 with the establishment of a Bureau of Grazing within the Forest Service. More rangelands were brought under regulatory control of what is now the Bureau of Land Management after passage of the 1934 Taylor Grazing

Act. The USDA Soil Conservation Service was established in 1935. Since that time, range scientists have continually improved the management of rangelands across the West, and the rangelands have continually improved with the expanding knowledge base.

4-151 Here FERC misleadingly implies that local cattlemen are antagonistic to conservation when in fact these same cattlemen, who are also active Pima NRCD cooperators, originated this project and continue to lead it.

> "Much of the Altar Valley is still managed for livestock grazing or wildlife habitat; however, local conservation efforts are attempting to reestablish native grassland species."

Contrary to FERC's quoted statement, 493,000 acres, or about 4/5 of the 610,000 acres of desert grassland in the Altar Valley is managed for controlled livestock grazing. The remainder is excluded from livestock grazing as a policy of the Buenos Aires National Wildlife Refuge. Led by local cattle ranching families who, beginning in 1995 organized themselves, the BANWR, and additional federal agencies, conservation groups and others into the Altar Valley Conservation Alliance, local conservation efforts are re-establishing native grassland species across the entire watershed. In addition, private ranches have individually invested heavily and have achieved measurable and well-documented success in private grassland restoration efforts.

Page 4-153 Inaccurate claim based on irrelevant citation.

> "Revegetation following construction may be problematic due to livestock grazing in reclaimed areas before vegetation has become established. Grazing can contribute to the rapid spread of weeds, which can reduce habitat quality and accelerate natural fire cycles (Belsky et al., 2000)."

As explained herein and in much greater detail in attachment (Holechek et al., 2005) (Parker, 2007)[33], (Parker, 2009), Belsky et al., 2000 reviewed only various studies showing that uncontrolled livestock grazing degrades riparian ecosystems when, in fact, only controlled livestock grazing is practiced on lands within the Altar Valley. Thus, Belsky's conclusions are entirely irrelevant because the issue at hand involves the effects that *controlled* – not uncontrolled – livestock grazing might have on the spread of weeds. Because Belsky's conclusions are not relevant to controlled livestock grazing, which is the only form of livestock grazing that is actually practiced on lands within the Altar Valley, those conclusions are irrelevant. Accordingly, Belsky et al. (2000) does not provide scientific evidence in support of the claim or innuendo made in this DEIS that *controlled* "livestock grazing" degrades habitat, causes the spread of weeds, and leads to wildfire presently in the proposed Project Area. A bibliography of studies showing the ecological benefits of controlled grazing is included in attachment.

Furthermore, illegal immigration is by far the biggest contributor to the spread of fire-

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[33] Parker, Dennis. Letter to FWS Field Office Supervisor Steven Spangle: Re: Petition to List the Cactus Ferruginous Pygmy Owl: Documentation Proving Lack of Substantial Information to Support Livestock Grazing as a Threat to Such at the 90 Day Petition Finding Level. April 27, 2007 (attached)

prone weeds, particularly buffelgrass, because buffelgrass is actively seeded widely across Sonora. Migrants wander or drive through the vast buffelgrass fields of Sonora picking up seeds in their clothing, backpacks and vehicles and then illegally cross the border into the remote areas of the Altar Valley. These seeds are then spread along their foot trails and along wildcat roads created by smugglers. Smuggling routes are where buffelgrass is found predominantly in southern Arizona. Recent wildfires have accordingly been remarkably concentrated along routes of illegal migration on both sides of the border.

If Sierrita truly cares about the potential spread of fire-prone weeds into the re-vegetation project, the company should make a far greater effort to persuade the Department of Interior to approve the eastern route and thereby avoid creating a new smuggling corridor.

Page 4-85 Table 4.5.3-1 inaccurately identifies livestock grazing as a threat to bobcats, mountain lions, coyotes and javelinas. There is no citation to any controlled study proving this is factual. In its present form the statement is simply defamatory.

Page 4-67: The DEIS is incomplete because a clear plan for revegetation is not completed. The text implies Sierrita would take over management of grazing leases. Management responsibilities must be better clarified. Affected grazing permittees must be directly involved in these decisions. Pima NRCD should be brought in as a cooperating agency. We recommend Sierrita enter into a Coordinated Resource Management Plan with the Pima NRCD, AZ State Lands Dept, FERC, the appropriate federal land management agency or agencies, and NRCS before the revegetation plan is finalized.

> As mentioned above, Sierrita would adopt an adaptive management strategy, and would further evaluate livestock management options (e.g., grazing rotation, herd management) and other revegetation measures after the second growing season in conjunction with the FERC and other appropriate agencies.

Page 4-88: The DEIS is incomplete because a time frame for grazing exclusion has not been incorporated. It is recommended that where the pipeline crosses ranch boundaries, Sierrita install cattleguards. We believe the proposed route will become a permanent roadway crossing several ranches, and we are not convinced Sierrita will care about that once they are allowed to break ground. Fencing will be cut and vandalized. Gates will be left open, and cattle will not only cross pasture boundaries but ranch boundaries as well. The only remedy is cattleguards. In addition, Sierrita committed to installing fencing across the right-of-way in specific or sensitive locations to minimize unauthorized vehicular access and/or livestock grazing to further promote revegetation and restoration.

Page 4-117: Here, by omission of significant details, the DEIS makes a scientifically unsound, defamatory statement.

> The main threats to [the masked bobwhite quail] are habitat degradation and loss from livestock overgrazing, unnatural fire regimes, and possibly competition with other quail species (FWS, 2002).

First, the species is not threatened by "overgrazing" in the Altar Valley because all grazing in the valley is controlled grazing. The innuendo that overgrazing is practiced in the Project area is defamation of honest people who invest significant time and money out of their personal resources into conservation efforts and who consider themselves caring stewards of the land. Second, no study exists correlating

significant effects of cattle grazing with the welfare of the masked bobwhite quail. Third, the last time this species thrived independently in Arizona pre-dated creation of the BANWR and the extirpation of cattle from that preserve. The bird thrived in the presence of cattle grazing on the Buenos Aires Ranch (pre-BANWR) because the land was actively managed at that time in a manner that maintained suitable habitat for the species. That management included prescribed burns, which technically fall under the category of "unnatural fire regimes." (Sayre, 2002)

Page 4-123. Here the DEIS makes a false and defamatory statement.

> Major threats to [the Mexican garter snake] are from habitat degradation and loss from urbanization, overgrazing, water diversions and groundwater pumping, predation by invasive species (i.e., bullfrogs and predatory fish), reduced availability of native prey base from predation/competition with nonnative species, and genetic effects from fragmentation of populations (AGFD, 2001b).

This false statement defames every rancher, many of which are Pima NRCD cooperators, in the Altar Valley and everywhere else. It accuses "livestock grazing"–without any qualification whatsoever as to management, grazing intensity, utilization, breed, seasonality, rainfall, timing and grazing duration, rotation or any other critical factor–of posing a "major threat" to this listed threatened species. The attached U.S. Fish and Wildlife Service press release dated July 9, 2013, announcing the "threatened" status listing of this species, soundly refutes this false and inflammatory accusation. The press release states,

> "Some northern Mexican gartersnakes occupy stock tanks, or impoundments maintained by cattlemen as livestock watering holes. Today's proposal includes a special rule under Section 4(d) of the Act exempting operation and maintenance of livestock tanks on private, State, and tribal lands from the Act's prohibitions on "take" of listed species. Landowners will not be in violation of the Act should they or their livestock harass, harm or kill a gartersnake during normal use, operation and maintenance of their livestock tanks.
>
> "Livestock operations do not pose a significant threat to either gartersnake; in fact many ranchers have created and maintain habitat for northern Mexican gartersnakes," said Spangle. "In 2002, we provided regulatory flexibility for livestock operators at threatened Chiricahua leopard frog waters. Their resulting stewardship has netted remarkable recovery advances for the frog – we anticipate similar results for the gartersnake."

Please also notice that the US Fish and Wildlife Service correctly recognizes stock tanks as "impoundments maintained by cattlemen as livestock watering holes," and "livestock tanks" in contrast to the phony "wildlife/livestock tank" nomenclature errantly used throughout this DEIS.

Page 4-174 Here the DEIS inaccurately implies overgrazing has occurred "throughout the 20th century . . . and resulting in a trench . . . 15-20 feet deep and up to 400 feet wide." The innuendo here through misuse of dangling modifiers is overtly defamatory of current

grazing management in the Altar Valley. No present-day rancher in the Altar Valley overgrazes the range.

> For example, prior to the 20th century, the Altar Wash did not exist; there was no trench or defined channel (Sayre, 2002). However, subsequent overgrazing, fire suppression, diminished vegetation cover, and droughts followed by flood events throughout the 20th century all contributed to runoff and erosion, resulting in a trench that was originally approximately 6 feet wide and 6 feet deep early in the 20th century to become a trench measuring approximately 15 to 20 feet deep and up to 400 feet wide within the last several decades (Sayre, 2002).

Moreover, livestock tanks typically depend on water diversions from xeroriparian washes to be filled during intermittent floods, so the accusation that "water diversions" pose a "major threat" to the Mexican garter snake is likewise entirely false and defamatory.
Page 4-221, Table 4.14-1 on Page 4-222, summary on Page 4-224: Here, the DEIS paints an inaccurate and maliciously defamatory misrepresentation of the history of cattle grazing in southern Arizona. Domestic cattle have grazed in southern Arizona more than 300 years. Prescribed burning does not convert grasslands to scrub/shrub. In fact, just the opposite happens. Current grazing practices do not contribute to degraded ecosystems. Planting of non-native grasses was not solely to enhance grazing but also to stop soil erosion. Overgrazing ended in the 1900-1935 time frame.

> 4-221:"The Altar Valley has evolved from open, undeveloped Sonoran desert grassland into shrub/scrub land used primarily for cattle grazing and as open space. As noted in the FWS' CCP for the BANWR, prior to the 1800s, southern Arizona was not grazed by domestic animals. In the mid-1860s the valley became populated by large ranches and was opened to cattle grazing. The previously existing dense, varied, native grasslands were intentionally replaced through vegetation slashing, burning, and seeding by ranchers in favor of fast-growing, non-native vegetation (e.g., Lehman's lovegrass, Johnsongrass, buffelgrass) that was better able to accommodate cattle foraging needs. Not only did these actions contribute to the removal of native vegetation, but they resulted in the compaction of soils and the subsequent erosion of the watershed basin."
>
> 4:224 In summary, the Project area has been significantly impacted by past natural and human actions such as planting of non-native vegetation to support grazing activities, overgrazing, drought, fires, urban and road development, off-road foot and vehicle traffic, and the impacts associated with those activities (e.g., spread of noxious weeds, creation of gullies, erosion, littering). As such, the current conditions of the Altar Valley are not representative of the once untouched and unique Sonoran desert grassland.

The quoted paragraphs above are broadly inaccurate, as explained herein and in much greater detail in attachment (Parker, 2009). Controlled, well-managed grazing as is in practice across the Altar Valley today did not cause the loss of vegetation in the 1890's.

That ecological disaster resulted from a combination of the worst drought on record for southern Arizona, *uncontrolled* grazing, a sudden rush to dump cattle on the market when the drought hit, and the bottom dropping out of cattle prices. (Sayre, 2002)

The claim that this destruction was "intentional" is nothing short of baseless, malicious defamation of the ranching industry and the heritage of modern ranchers who live and work on the same ranches as their ancestors did several generations before. It was never any rancher's "intention" to replace native grasslands with exotic vegetation. There is no reason for any sane person to want that because permanent removal of valuable forage has never profited anyone. We challenge FERC and FWS both to provide documented proof in support of this brazenly defamatory assertion. Ranchers both historically and today have burned rangelands to reduce shrubby invasions and restore native perennial grasses (Sayre, 2002). Prescribed fire is currently one of the tools for grass restoration in the Altar Valley (NRCS, Pima NRCD local work group minutes). After the devastation wrought by drought and overstocked rangelands from 1885-1930, bare soil needed something growing on it to halt soil erosion. Native grasses are very difficult to re-establish with the original soil structure destroyed. Lehmann's was seeded because it could quickly restore soil stability and provide a medium wherein native grasses had any chance to become re-established. The Arizona Department of Transportation has likewise seeded roadsides for soil stability with Lehmann's lovegrass.[34] Seeding of Lehmann's has in fact aided in restoration of native grass species.

The assertion that no domestic livestock were introduced into Arizona prior to 1860 is likewise patently false. Livestock have grazed southern Arizona for more than 300 years. The Spanish expedition led by Francisco Vasquez de Coronado in the late spring of 1540 first introduced livestock into southern Arizona. The expedition brought with it thousands of head of horses, cattle, pigs, sheep, rams and chickens from Culiacán, Sonora into southern Arizona. A year later, when these explorers reached the buffalo lands of the Great Plains east of present-day Albuquerque, they still possessed more than 2,500 head. Pedro de Castañeda wrote:

> Who will be able to believe that when [a thousand horses and five hundred of our cattle, more than five thousand rams and ewes and more than one thousand five hundred persons among the allies and servants [of the expedition] were traveling across those plains [and had] finished crossing [an area] they left no more trace than if no one had ever crossed there. So much [was this so] that it was necessary to put up large heaps of bones and [bison] dung at intervals in order that the rearguard could be guided behind the [main body of the] expedition and not get lost.575 When the grass is walked on, although [it is] very short, it returns upright, as unmarked and straight as it was before. [35]

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[34] United States Forest Service. http://www.fs.fed.us/database/feis/plants/graminoid/eraleh/all.html#MANAGEMENT%20CONSIDERATIONS Accessed December 15, 2013

[35] (2012-04-16). Documents of the Coronado Expedition, 1539–1542: "They Were Not Familiar with His Majesty, nor Did They Wish to Be His Subjects"

The following excerpt is taken from Dennis Parker's 2009 comments submitted on the Draft Coronado Forest Plan Revision:

> "First, as shown in the chronology of livestock presence attached, it cannot be credibly argued that the presence of livestock had no lasting ecological effects in the Southwest prior to 1880. Instead, as graphically shown in attachment, large-scale stock raising (of both large and small stock) was practiced, subject to intermittent disruption by the Apaches in particular, from 1586 on in northern Mexico and from the 1680s on in southern Arizona (Allen, 1989[36]).
>
> By 1694, 100,000 head of livestock were estimated to be present on ranches which included the upper San Pedro River in southeastern Arizona and the headwaters of the San Pedro and Bavispe Rivers in northeastern Sonora (Allen, 1989). In 1700, 1040 head of livestock (including cattle, sheep and horses) were present at San Xavier del Bac near present day Tucson, while another 1000 head of cattle, along with four droves of horses, were present at nearby San Simon y San Judas del Siboda in northern Sonora (Bolton, 1919[37]).
>
> In fact, by 1700, some of the larger livestock ranches established by the Spanish were those at Sonoita, Babocomari, La Aribac (Arivaca), Calabasas, Sopori, Tubac and San Bernardino in present day southeastern Arizona (Allen, 1989). By 1701, stock ranches were also established in northern Sonora and southeastern Arizona at Caborca, Tubutama, Imuris, Quiburi (confluence of the San Pedro and Babocomari Creek), Bacoancos, Guevavi, Busanic, San Lazaro, Saric, Santa Barbara and Santa Eulalia (Bolton, 1919).
>
> While it is true that troubles with both the Pimas and Apaches caused the temporary abandonment of many of these livestock operations on many occasions over time, such abandonment was generally relatively short-lived in duration. For example, the Pima Revolt of 1751 lasted only a few months before peace was restored (Bancroft, 1884[38]), and by 1752, the Spanish had established a

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(Kindle Locations 15162-15168). University of New Mexico Press. Kindle Edition.

[36] Allen, L.S. 1989. *Roots of the Arizona Livestock Industry*. Rangelands 11(1): 9-13, February, 1989.

[37] Bolton, H.E. 1919. *Kino's Historical Memoir of Pimeria Alta, 1683-1711.* Vols. I, II. The Arthur H. Clark Company, Cleveland, Ohio. 396p., 342 p.

[38] Bancroft, H.H. 1884. *History Of The North Mexican States.* Vol. I. 1581-1800. A.L. Bancroft & Company, San Francisco, California. 751p.

presidio at Tubac (Allen, 1989). The exception to this general condition is the time period from about 1767, when the Jesuits were expelled from New Spain (Wagoner, 1975[39]), to about 1800, when a period of relative peace with the Apaches ensued. During this 30-40 year time period of general abandonment, however, several large ranches were also established (Allen, 1989).

Beginning in 1800, and lasting through the early 1830s, a time of relative peace with the Apaches resulted in the reestablishment of the same ranches originally founded in the early 1700s by the Spanish. During this time period, approximately 100,000 head of cattle were present on the San Bernardino Ranch alone, and large herds were growing in the Altar, Santa Cruz and San Pedro valleys as well (Allen, 1989). The magnitude of stock raising at this time, on lands either within or adjacent to the present day Coronado National Forest, was high, as is exemplified by the many land grants petitioned for and confirmed during this time period (Wagoner, 1975; see also: chronology, attached).

By 1830, approximately 30,000 head of horses, possessed by the Apaches, were present in the Gila River watershed of present day Arizona and New Mexico (Allen, 1989), and by the early 1830s, renewed Apache depredations resulted in the abandonment of the San Bernardino again, with approximately 100,000 head of cattle going wild (Allen, 1989).

However, not all of the large ranches were abandoned during the early 1830s. The Maria Santisima del Carmen (Buena Vista), for one, was occupied continuously for stock raising from the early 1800s until 1851 (Wagoner, 1975).

Similarly, on the Babocomari, large herds of cattle and horses flourished until 1846. At that time, the Babocomari was one of the largest cattle establishments in the then Mexican state of Sonora (Wagoner, 1975). In 1846, however, renewed depredations by Apaches caused the abandonment of the Babocomari (as well as most other haciendas in the region) and resulted in many thousands of head of cattle, horses and mules going wild (Allen, 1989, Wagoner 1975). Wild cattle became abundant in southern Arizona at this time (Allen, 1989), and in 1851, Bartlett estimated that up to 40,000 head of wild cattle, plus a large number of horses and mules, then ranged along the entire length of the upper San Pedro River and its tributaries (Wagoner, 1975).

By 1855, the Canoa was occupied by Pete Kitchen and ranches adjoining the Canoa along the Santa Cruz River were also again occupied by 1857 (Wagoner, 1975). With the coming of the Civil

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[39] Wagoner, J.J. 1975. *Early Arizona: Prehistory to Civil War.* The University of Arizona Press, Tucson, Arizona. 547p.

War in 1861, and until its end in 1865, Apache depredations again accelerated and caused relocation or abandonment of many ranches. In 1862, Pete Kitchen removed his stock raising operation to Portero, northwest of present day Nogales, and was one of the few ranchers (along with Tom Gardner on Sonoita Creek) who were able to weather the Apache hostilities of the 1861-1865 time period in the Sonoita Creek / Nogales area. On the other hand, during this same time period, Pedro Aguirre established the Buenos Aires Ranch in the Altar Valley in Arizona in 1864 (F&WS, 2008[40]).

By 1870, Maish and Driscoll were running 300 head of cattle at the Canoa (Wagoner, 1975), and by 1876, range use in Arizona was rapidly expanding (Allen, 1989). In 1877, stock raising had become a leading industry in the Arizona Territory with hundreds of thousands of cattle coming in from adjacent states (Allen, 1989).

Although Apache depredations continued through this time period (1870-1886), ranches continued to be established – even in the Apache stronghold of northwest Chihuahua, where, in 1882, Jack Bailey of Texas reestablished the old Spanish hacienda, San Jose de Bavicora, as a massive stock raising operation (Remington, 1893).

In 1884, Texas John Slaughter purchased the old San Bernardino (Allen, 1989) and began stocking it again, and, by 1885, Maish and Driscoll were running 10,900 head of livestock on the Canoa alone (Wagoner, 1975).

By 1890, Slaughter & Lang were running 50,000 head of cattle on the San Bernardino. In 1891, 1.5 million head of livestock were estimated to be occupying Arizona's rangelands as a whole (Allen, 1989)

In 1892, the worst drought on record hit Arizona, and during that year, cattle began to die by the thousands. Fifty to seventy-five % of the animals on the range perished during the summer of 1893, and only 250 head of calves were branded between Florence and Tucson that year. By June of 1893, over 200,000 cattle were shipped from Arizona's rangelands (Allen, 1989). How many remained on the ground is a matter of conjecture, although it is highly likely that more than 50,000 head remained on the range at the drought's end.

This is because the drought did not affect everyone equally. Unlike many ranches in Arizona, the San Bernardino had a natural supply of water from the Rio Yaqui drainage and extensive water developments, including drilled artesian wells and a lake backed up by a cement dam. These natural and developed waters saved John

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[40] Buenos Aires National Wildlife Refuge
http://www.fws.gov/southwest/refuges/Arizona/buenosaires/history.html Accessed December 15, 2013

Slaughter during the severe drought of 1892-93 when many other cattlemen went under (Wagoner, 1975; Discover S.E. AZ., 2008[41]).

Similarly, the hacienda San Jose de Bavicora in northwest Chihuahua not only survived, but thrived during the 1892-93 time period. In 1893, 200 cowboys tended thousands of head of cattle and many horses on the San Jose de Bavicora, and there is no contemporary mention of drought (Remington, 1893[42]; Remington, 1895[43]).

Many of southern Arizona's smaller ranches, established during the 1870s and 1880s, also survived the drought of 1892-93 and began to thrive again thereafter. Today, many of these same ranches are sustainably operated by the descendants of those who founded them."

Page 4-223. Table 4.14-1

Prescribed burns...throughout the Altar Valley...Removed existing vegetation, established fast-growing vegetation (sometimes exotic species) for livestock consumption.

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[41] http://www.discoverseaz.com/History/SanBernRnch.html Accessed December 16, 2013

[42] Remington, F. 1893. *An Outpost of Civilization.* Harper's new monthly magazine, New York. Vol. 88 (523), December, 1893.

[43] Remington, F. 1895. *Pony Tracks.* Harper and Brothers, New York. 294p.

Additional inaccurate, biased, and/or defamatory Statements in the Draft EIS for Sierrrita Pipeline

We do not add comment on the following statements only because the comment period is too limited in length and the DEIS too full of inaccurate, biased, and libelous statements to allow time for us to comment on each and every one of them. We copy such statements below in protest. Many of these, however, are refuted in our comments in response to other statements and/or in attachment.

Page 4-229:

> Recreation, livestock grazing, agricultural activities, and urban and residential development have also contributed to increased consumption of both surface water and groundwater in the watershed, reducing the groundwater to levels that have caused land subsidence in the northern portion of Altar Valley (see section 4.14.1.3) (Pima County, 2000).

Page 4-230:

> The total amount of vegetation that may be affected by all of the Project or anticipated projects is not substantial relative to the abundance of similar habitat in the region; however, impacts resulting from construction of the proposed pipeline would result in the long-term and permanent loss of non-herbaceous vegetation and would cause an incremental increase in fragmentation of desertscrub and riparian areas. Sierrita developed and would implement a *Reclamation Plan*, *Post-Construction Vegetation Monitoring Document*, and *Noxious Weed Control Plan*, all of which would aid in restoring native vegetation. Livestock grazing; off-road vehicle use; illegal immigrant, drug trafficking, and human trafficking activities; and other land use activities have also contributed to the cumulative loss and degradation of vegetation over the years through the removal of native vegetation, introduction and spread of non-native species, alteration of the fire regime, disruption of soil conditions, and acceleration of erosion.
>
> In general, the grazing and ranching practices, prescribed and natural burns, recreational activities, and illegal activities in the Altar Valley are ongoing and may result in future impacts on vegetation. All the projects identified in table 4.14-1 (with the exception of the restoration projects) would continue a trend toward a reduction and degradation of these vegetation communities.

Page 4-231:Here, FERC publishes misrepresentative and defamatory innuendo implying this is an effect of ongoing grazing practices in the Altar Valley. This statement is refuted as such in attachment: (Parker, 2007) (Holechek et al., 2005) (Fleming et al., 2004)[44]

> Livestock grazing in riparian areas can damage riparian resources by reducing fish and wildlife habitat, causing soil erosion, and diminishing water quality and quantity. Riparian habitat also often serves as important wildlife movement corridors, and removal or degradation of this habitat can disrupt wildlife movement patterns (AGFD, 2012i). Some experts estimate that livestock grazing has damaged 80 percent of the streams and riparian ecosystems in the western United States (Belsky et al., 1999).

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> The electrical transmission, road, and other commercial projects would presumably be required to restore areas of degraded habitat and would protect habitat from future development and other uses (e.g., grazing), thereby minimizing some impacts on wildlife and wildlife habitat.

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> Other private activities, however, such as grazing and restoration projects would not be required to consult on special status species. Consequently, we believe that past and present projects and activities could have varying cumulative effects on special status species because these impacts would be generally tied to habitat. We do not believe that construction of the Project would result in significant cumulative impacts on special status species or their associated habitat, given that habitat types crossed are widely available for wildlife use outside of the immediate area of project disturbance, with the exception of riparian habitat. However, as discussed in section 4.14.7, based on the already reduced state of riparian habitat in the Project area, the cumulative impacts associated with the Project, when combined with the activities and projects described, are anticipated to have a long-term and adverse impact on riparian habitat.

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> As discussed in section 4.14, the Altar Valley and Tucson area have historically evolved from open, undeveloped Sonoran desert grassland into shrub/scrub land used primarily for cattle grazing. Recent land use activities in the Altar Valley continue to be dominated by cattle grazing. However, recent activities by ranchers and land-managing agencies (e.g., BANWR, ASLD) are attempting to control erosion and, in some locations, restore the native grasslands, while continuing ranching. In addition, the establishment of the

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[44] Fleming, W., Galt, D. and J. Holechek. "10 Steps to Evaluate Rangeland Riparian Health" and "The Montana Allotment: A Grazing Success Story". 2001. *Rangelands* 23(6). Pp. 22-27

BANWR in 1985 removed approximately 118,000 acres of land in the Altar Valley from cattle grazing to be used to establish native grasslands and vegetation suitable for native wildlife and federally listed endangered species, including the masked bobwhite quail. In addition to ranching and grazing, the Altar Valley is used by undocumented immigrants and drug and human traffickers, the U.S. Border Patrol, hunters, and recreationalists. The foot and vehicle traffic associated with these users, along with prolonged drought conditions, have made it difficult to re-establish native vegetation and have in several locations established trails that are easily susceptible to erosion and the formation of additional dry washes and gullies.

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Because the Project would not substantially affect the current land uses, most Project-related impacts would be short-term, often lasting only for the duration of construction through that area, after which the area would be restored to its preconstruction condition.

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The Project, when combined with the activities and projects described, is not anticipated to have a significant cumulative impact on land use in the Project area because land uses such as grazing would be allowed to continue following construction, or recreation in the Project area because the impact from construction would be temporary and localized.

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The grazing and ranching practices, prescribed and natural burns, recreational activities, and illegal activities in the Altar Valley are ongoing and may result in future impacts on cultural resources. The extent of past damage to cultural resources cannot be determined because no systematic surveys throughout the Altar Valley had been completed prior to the disturbance. Similarly, the extent of potential future damage to cultural resources from grazing and ranching practices, prescribed and natural burns, recreational activities, and illegal activities in the Altar Valley cannot be predicted because these activities do not require systematic cultural resources surveys to be completed.

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It should be noted that the area in the vicinity of the Project, and extending into Mexico, has been significantly impacted by past natural and human actions such as planting of non-native vegetation to support grazing activities, overgrazing, drought, fires, development, fragmentation from the border fence, off-road foot and vehicle traffic, and the impacts associated with those activities (e.g., trash, creation of gullies, erosion).

Page 4-238 This statement ignores all documented ecological benefits of the trans-boundary fencing. The fencing has reduced human impacts in the areas where it exists,

such as eliminating the average 8 pounds of trash and human waste per illegal immigrant left behind, preventing new wildcat roads, and eliminating trampling and compaction of soils.

> For example, the existing fence at the U.S./Mexico border, which extends several miles on either side of the Sasabe point of entry, has resulted in habitat fragmentation and created a barrier to large wildlife movement patterns between the United States and Mexico in this area.

Page 5-10

Here, FERC is attempting to make the proposed Sierrita project look good by misrepresenting and defaming ranching in the Altar Valley as practiced today as well as historically. The harm done here is that Sierrita will not be held accountable in the long term for any long-term environmental damage. Sierrita is only required to monitor vegetation for five years, whereas this DEIS claims restoration may require 50 years or more. Guess who gets the burden of that responsibility after 5 years! By default, the grazing permittee gets it, that is, if he manages to survive all the defamation currently published about him in the Federal Register. All long-term damage resulting from the pipeline installation will eventually be blamed on the grazing permittees and they will be burdened with the long-term cost of that damage. Here, FERC is already shifting the long-term responsibility to the ranching industry for the anticipated environmental damage the pipeline construction will cause.

> In summary, the Project area has been significantly impacted by past human actions such as planting of non-native vegetation to support grazing activities, overgrazing, drought, fires, urban and road development, off-road foot and vehicle traffic, and the impacts associated with those activities (e.g., spread of noxious weeds, creation of gullies, erosion, littering). The significant impacts of past actions are related mainly to waterbodies, vegetation, and wildlife. Because the impacts of past actions on these resources are significant, the cumulative impacts of past actions when considered in conjunction with the Project and other present and reasonably foreseeable actions, regardless of magnitude, also would be significant. For this reason, we have focused many of our recommended mitigation measures in section 5.2 below on these sensitive resources. Regarding other resources discussed in this EIS, we have determined that the impacts of the Project when considered in conjunction with past, present, and reasonably foreseeable actions would not be significant.

Attachments

- Arizona Farm Bureau. 2005. Economics of Arizona Agriculture.
- Fleming, W., Galt, D. and J.L. Holechek. 2001. Ten Steps to Evaluate Rangeland and Riparian Health. *Rangelands* 23(6): 22-27.
- William Fleming and Jerry Holechek. "Soil Erosion Rate on the Montana Allotment, Arivaca, Arizona, May 2002. A Consulting Report" http://www.chiltonranch.com/images/soil_erosion_rate.pdf
- Holechek, J.L., Baker, T.T., and J.C. Boren, 2005. "Impacts of Controlled Grazing versus Grazing Exclusion on Rangeland Ecosystems: What We Have Learned" New Mexico State University Range Improvement Task Force Report No. 57" http://aces.nmsu.edu/pubs/_ritf/RITF57.pdf Accessed December 15, 2013
- Parker, Dennis. April 27, 2007 Letter to USFWS Field Office Supervisor Steven Spangle Re: Petition to List the Cactus Ferruginous Pygmy Owl: Documentation Proving Lack of Substantial Information to Support Livestock Grazing as a Threat to Such at the 90 Day Petition Finding Level
- Parker, Dennis. Letter to Ms. Jennifer Ruyle, Coronado National Forest Re: Comments on Coronado National Forest Plan Revision Process. January 30, 2009
- Parker, Dennis. January 30, 2009. Chronology of Livestock Presence in American Southwest and Northern Mexico (1531 – 1913)
- Parker, Dennis. 2009. Citations to Publications Showing Benefits of Controlled Grazing and Selected Publications Relating to Riparian Habitat, Native Fishes and Political Ecology
- U.S. Fish and Wildlife Service News Release July 9, 2013: "Endangered species act protection proposed for two southwest gartersnakes and their habitat"

The University of Arizona has conducted studies on the economic impact of agriculture in the state. As you may know these numbers tell a story about the growth of agriculture between 2000 and 2004. The economic impact was estimated at $6.6 billion, $9.0 billion, and $9.2 billion for 2000, 2002, and 2004 respectively. These figures represent the direct, indirect and induced effects, totaling economic impact.

Although these numbers provide a story for the state as a whole, we have taken the numbers one step farther. The nature of the University of Arizona's model does not provide for a breakdown of the economic impact by county but by incorporating the findings from U of A with statistics issued by NASS we were able to come up with a formula for determining the economic impact by county.

By taking the total cash receipts provided for the State by NASS and dividing them by the total economic impact finding, a correlation was found between the two studies. That multiplier was 2.819 in 2000, 2.855 in 2002 and 2.906 in 2004.

Agriculture Economic Contribution By County

County	Cash Receipts*	FSA Payments**	EQIP Payments**	Total Receipts	Total Economic Contribution***
Apache	$14,496,000	$823,706	$935,542	$16,255,248	$47,237,751
Cochise	$97,326,000	$6,146,182	$2,403,940	$105,876,122	$307,676,011
Coconino	$19,189,000	$952,704	$515,389	$20,657,093	$60,029,512
Gila	$4,531,000	$1,150,086	$1,624,875	$7,305,961	$21,231,123
Graham	$87,010,000	$2,656,155	$832,680	$90,498,835	$262,989,615
Greenlee	$6,636,000	$378,635	$240,045	$7,254,680	$21,082,100
La Paz	$89,322,000	$3,764,256	$636,778	$93,723,034	$272,359,137
Maricopa	$1,022,736,000	$19,995,921	$1,465,797	$1,044,197,718	$3,034,438,569
Mohave	$20,954,000	$1,465,040	$444,635	$22,863,675	$66,441,840
Navajo	$47,141,000	$667,438	$571,988	$48,380,426	$140,593,518
Pima	$80,103,000	$1,916,174	$670,024	$82,689,198	$240,294,809
Pinal	$621,811,000	$18,716,364	$2,359,690	$642,887,054	$1,868,229,779
Santa Cruz	$10,173,000	$337,264	$173,252	$10,683,516	$31,046,297
Yavapai	$64,206,000	$1,236,619	$652,627	$66,095,246	$192,072,785
Yuma	$879,968,000	$6,203,156	$1,430,148	$887,601,304	$2,579,369,389
Total	$3,065,602,000	$66,409,700	$14,957,410	$3,146,969,110	$9,145,092,234

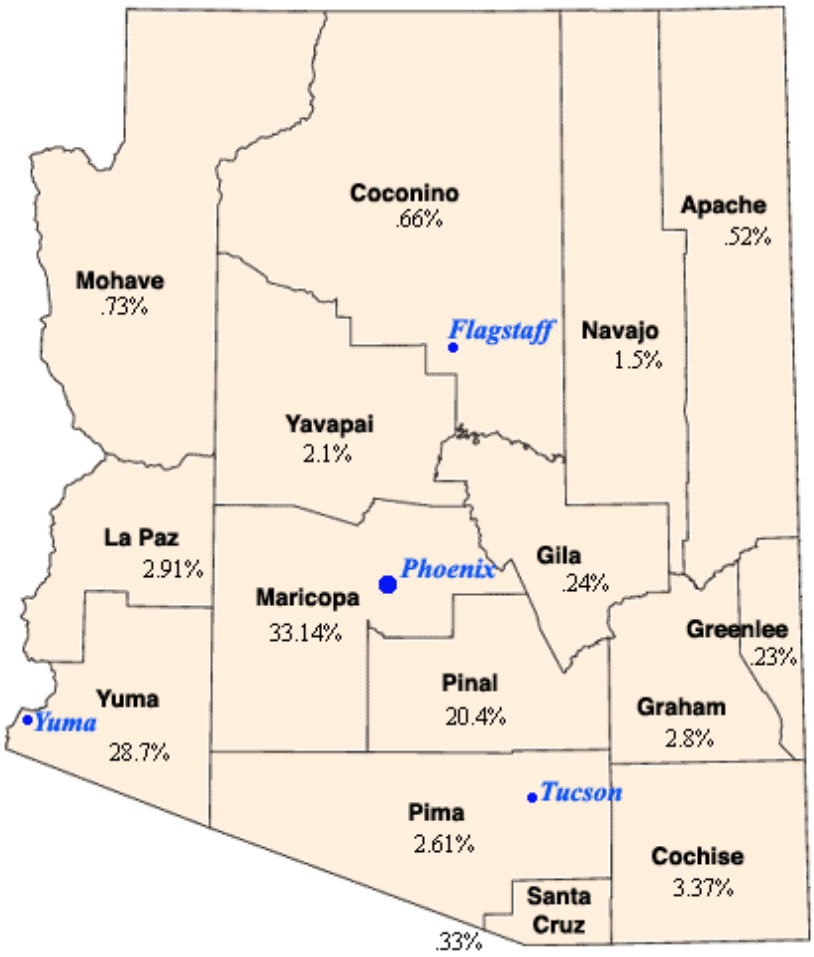
* Information from NASS 2004 Arizona Agricultural Statistics Bulletin

** 2004 Government Payments

*** Total receipts multiplied by 2.906

Mathematically, these figures are very close. Although these numbers will be less accurate when applied to counties (direct, indirect, and induced effects will be different, for example, in Yuma County than they are in Cochise County), we can still derive estimates for the economic impact of agriculture by county. In the table above we have collected all cash receipts for each county as well as government payments made to each county through FSA and NRCS. By multiplying total receipts by 2.906 we determined the economic impact by county for 2004, the most recent year available. Remember these figures are only estimates and should be treated as such.

% of Total Impact By County



*Using economic impact figures for counties we were able to derive the input of each county for the total economic impact in the state.

10 Steps To Evaluate Rangeland Riparian Health

These steps provide a simple, semi-quantitative guide for evaluating riparian health.

By William Fleming, Dee Galt and Jerry Holechek

In the widespread landscapes of the western United States there is a need for natural resource monitoring systems that allow ranchers, government agencies and private land owners to make land management decisions. There are no generally accepted and easily applied criteria for evaluating and comparing health of riparian ecosystems.

Riparian habitat quality measures how well it supplies various ecosystem functions, services and products. We have developed and tested a survey that focuses on 10 indicators of riparian health. These range from vegetation cover to streambed geology. Each criterion is semi-quantitatively evaluated on a scale of 1 to 4, with 4 the healthiest and 1 the least healthy. This approach is based on riparian survey experience gained by the authors and several riparian professionals.

In this article, we'll look at our 10 basic indicators of riparian health and demonstrate their application on the Montana Allotment in southeastern Arizona (See "A Grazing Success Story," page 24.)

Riparian Evaluation Methods

Several criteria for evaluating the health of riparian habitats in the western United States have been suggested by researchers in the past. Although these criteria are often oriented toward stream habitats for fish, they can be adapted for a wider range of organism classes, including birds. A riparian environment that is healthy for fish and birds is considered healthy for a wide range of other ecosystem organisms.

The 10 criteria we consider most useful to evaluate aquatic habitat are described in Table 1. The amount of flow and types of aquatic insects are included in perennial stream systems. Let's discuss these criteria:

1 & 2) Streambed Geology and Embeddedness— Streambed geology plays a critical role in maintaining a continuous flow of water, oxygen and food sources for various organisms. Stream geology can be evaluated by walking in a zig-zig pattern and stopping every two steps to determine the size of material in front of the evaluator's toe. If more than 50% of material is comprised of gravels, cob-

Table 1. Description of health indices used to evaluate riparian habitat.

Parameter / Score	Excellent 4	Good 3	Fair 2	Poor 1
Riparian vegetation Structural diversity	3 height classes grass/tree/shrub	2 height classes	1 height class	sparse vegetation
Bank stability	>90% stable	50-90% stable	10-50% stable	<10% stable
Vegetation cover	>90%	70-90%	50-70%	<50%
Buffer width	>18 m	12-18 m	6-12 m	<6 m
Vegetation diversity	>20 species	15-20	5-14	<5
Embeddedness	<25%	25-50%	50-75%	>75%
Canopy shading	mixed/sun shade	sparse canopy shade	90% sun or	no shade
Width/depth ratio	<7	8-15	16-25	>25
Pool/riffle ratio	<5	6-15	16-25	>25
Streambed geology	>50% boulders cobbles, gravels	25-50%	10-25%	<10%

bles and boulders, the habitat is considered optimal. At least 20 samples should be selected in each stream reach and size percentages calculated. If more than 50% of the substrate is sand size or smaller, the habitat is considered "poor". If more than 50% of the substrate is gravels, cobbles and boulders the habitat is considered "excellent".

Embeddedness measures how much of the surface area of larger substrate particles is surrounded by fine sediment (sand, silt and clay). This parameter allows an evaluation of the streambed as a habitat for benthic macroinvertebrates (fish food) and spawning fish. Heavy silting is an indication of upstream watershed disturbance and is known to cause a reduction in insect diversity and production.

3) Width/Depth Ratio—The ratio of channel width to depth is optimal for fish and aquatic insect habitat if less than 7:1. A very wide and shallow stream with a width/depth ratio of more than 25:1 is considered poor habitat for fish and the macroinvertebrate food supply they depend on. A tape measure and yard stick are used to measure the width and depth of the channel.

4) Bank Stability—Bank stability is considered excellent if less than 10% of the banks are vertical and unvegetated if not rock ledges. If more than 50% of bank area or length is in unstable and eroding condition, it is rated poor as this indicates degraded habitat for fish and aquatic insects.

5) Pool/Riffle Ratio— Optimal riffle to stream width values for aquatic insects and fish are given in Table 1. Aquatic communities thrive in an integrated environment (substrate, food availability, current, etc.). Maximum variability in streambed morphology generally supports highest species diversity. Upstream land use activities can profoundly change pool/riffle relationships. The evaluator uses a tape to measure the average distance between riffles and the width of the channel.

6) Buffer Width—Vegetative buffer strips are effective in filtering pollutants such as sediment and nutrients from streams. Twenty yards of buffer width is sufficient for healthy riparian conditions. Where riparian areas have very steep slopes and/or involve heavily fertilized agricultural runoff, a wider buffer may be necessary. The entire riparian buffer zone on the side of the stream nearest to disruption (road, housing development, row crop, etc) is measured. If the vegetated width is less than 20 feet, it is considered poor.

7 & 8 & 9) Vegetation Characteristics—Vegetative diversity is evaluated by determining how many species occur in the riparian area. Twenty or more perennial plant species in the riparian zone is considered optimum while less than six species is poor.

Vegetation cover, expressed as a percent, is estimated by randomly choosing a transect direction to walk and noting at toe point on every other step either live vegetation cover, litter, or bare soil. Greater than ninety percent vegetation cover is considered excellent for erosion control, while less than 50% is considered poor.

10) Canopy Shading—Shading provided by vegetation canopy cover is important in reducing summer water temperatures and mediating solar energy available for photosynthetic activity and primary production. Shade conditions are considered to be optimal when alternating areas of a stream reach receive direct sunlight, complete shade and filtered light. The evaluator estimates the percentage of sun and shade by looking upstream and downstream from the middle of the stream reach. The optimal is 50% of the stream receiving shade. Noon is the ideal time to do this survey.

Upland rangeland in excellent condition on the Montana Allotment in October 2000. In the period from 1984 to 2000 upland ecological condition has shown major improvement from a combination of conservative stocking, rest rotation grazing and improved livestock distribution.

The Montana Allotment: A Grazing Success Story

In late summer 2000, the authors were invited to do evaluations on the Montana Allotment focusing primarily on riparian conditions. Eight sites were selected for evaluation in California Gulch, the primary drainage on the Montana Allotment. Five sites were randomly selected and another three sites were chosen because they are used for monitoring by Forest Service biologists.

The Montana Allotment is located on the Coronado National Forest south of Arivaca, Arizona just north of the Mexican border. The Chilton Ranch purchased the grazing lease for the Montana Allotment from the previous rancher in 1991 and added this allotment to their existing private, National Forest and State Trust grazing lands. Mr. Chilton's family has been ranching in Arizona for five generations since their ancestors drove covered wagons and livestock into the Territory in the late 1800's.

Elevations on the Montana Allotment range from 3,500 feet at the Mexican border to 5,376 feet at the summit of Montana Peak. Precipitation varies from 16 to 22 inches annually depending on the elevation, with normal peaks in February and August and a dry season from April through June. Rainfall is often minimal in the September through November period, and maximal during July and August.

The vegetation type is Sonoran Desert Chaparral/Grassland. Dominant plant species include various liveoaks, mesquite, sideoats grama, plains lovegrass, cane beardgrass, tanglehead, green sprangletop, slender grama and curly mesquite. In riparian areas, deergrass, bullgrass, and giant sacaton are dominant grasses. Significant palatable browse plants include guajilla and range ratany. Riparian trees include velvet ash, netleaf hackberry, Goodding willow, Bonpland willow, yewleaf willow, cottonwoods, and some walnut trees.

Several important game species are found on the Montana Allotment. They include whitetail deer, mule deer, mountain lion, javelina, Mearn's quail, Gambel's quail, white-winged doves and mourning doves. The four pastures in the Montana Allotment (Schumacher, Warsaw, Ruby and Chimenea) have very high esthetic value and receive considerable recreational use by campers and hunters.

Most parts of California Gulch, the primary drainage on the Montana Allotment, are dry during the months of April-June and again in fall months and are not suitable year-long habitat for fish. However, the Sonora shrub in Mexico swims north into portions of Schumacher pasture in California Gulch when seasonal rains cause the Gulch to run. When

temporary flows cease and the subflow can no longer resupply small pools, the trapped fish die.

Grazing management on the Montana Allotment involves a modification of the Santa Rita rest-rotation grazing system. This system was initiated on the Montana Allotment in 1990-91 after a six-year period of fence-building and water development made possible the change from a two-pasture, yearlong continous grazing program.

Through cooperation between the Coronado National Forest and the Chiltons, the rest-rotation system designed and implemented on the Schumacher and Warsaw pastures provides for summer grazing in alternate years. After four months of summer grazing the grazed pasture is rested for a 20-month period. Schumacher Pasture is grazed in even numbered years while Warsaw Pasture is grazed in odd numbered years. Ruby Pasture is grazed in the spring every year and Chiminea Pasture is grazed in late fall and winter every year. Forest Service surveys in 1983 noted a total of seven cottonwoods in all the drainages in the Montana Allotment and cited a general lack of riparian vegetation. Various Forest Service range conservationists on the Coronado (Larry Allen, George Proctor, Duane Thwaits) have described a lack of deergrass cover in the bottoms, the near absence of riparian tree recruits and the dominance of annuals and shortgrasses on the uplands of the Montana Allotment prior to the 1990's.

In 1996, after the new grazing system had been in place for five years, all riparian trees in California Gulch were censused. Trees were identified and placed in age classes in each reach of the Gulch to create a quantitative record that could be updated in 5-year intervals to document trends in riparian recruitment under the rest-rotation grazing system. The census tallied hundreds of riparian trees growing in reaches where they had been mostly absent 13 years earlier.

Various grazing intensity surveys initiated by the Chiltons in spring 1998 show conservative use of Montana Allotment pastures. The Montana Allotment has been in a strong upward trend over the last 16 years based on various surveys by range consultants and Forest Service range conservationists (Table 2). A significant shift in composition from short grasses (curly mesquite) to more productive, palatable midgrasses (sideoats grama) has occurred over the period from 1984 to 2000 (Table 2). Precipitation in this period was 104% of the long term average (18 inches). Most of this shift occurred in the 1990's. An intensive forage production survey in winter of 2000 showed perennial grass production averaged 986 pounds per acre across the allotment (Table 2) after a year of near average precipitation. This same survey showed about 69% of the climax vegetation remained on the allotment using the USDA-Natural Resources Conservation Service criteria for evaluating range condition. This is considered to be high good or late seral ecological condition. The primary perennial grass encountered on upland areas was sideoats grama.

Table 2. Precipitation, stocking level, forage production, grazing use, and rangeland ecological condition on the Montana Allotment for the 1984-2000 period.[1]

	1984	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Precipitation (inches/year)	27.74	15.56	19.43	27.57	22.63	18.54	17.30	16.00	28.25	16.35	14.00
Actual cattle animal unit years	—	125	400	490	490	492	495	491	500	476	380
Fall perennial forage standing crop (lbs/acre)	—	—	—	—	—-	—	1,005	—-	—	986	—-
Forage use % (across all pastures)	—	—	—	—	—	—	—	—	23	23	25
Forage use % (grazed pastures)	—	—	—	—	—	—	—	—	36	35	38
Range ecological condition scores	21	—	—	—-	—	—	68	—-	—	69	—-

[1]Data from Forest Service range monitoring reports and range consultant reports (Holechek and Galt 1998, Galt and Holechek 2000).

Riparian Survey Results We applied the riparian health evaluation protocal described in the Flemming et al. "10 Steps" article in this issue to the Montana Allotment in southeastern Arizona over a two day period, and all eight sites were found to be in good to excellent condition (Table 3). The average riparian score was 3.54 (excellent). Vegetation diversity, bank stability, and streambed geology received a 4 at all sites. Canopy shading and width/depth ratios could be improved on a few of the sites. Significant numbers of riparian tree recruits were observed. These included various willow species, ash, and cottonwoods.

Each site was rated for 10 parameters, except for 4 sites with insufficient flow to determine the pool/riffle ratio (Table 3). Numerical ratings were summed for each site and the total divided by the number of parameters evaluated to determine the rating. A site with a score between 3.5 and 4 was rated "excellent," between 3.0 and 3.5 "good," between 2.0 and 3.0 "fair," and less than 2.0 "poor." The eight sites received ratings ranging from 3.2 to 3.7, which are all in good or excellent categories.

We have quantitatively evaluated riparian health at several locations in the southwestern USA. The Montana Allotment is a positive standout among all the sites we have evaluated that received livestock grazing. The rest rotation

Table 3. Riparian health scores for 8 sites on the Montana Allotment on September 15-17, 2000.

Riparian Characteristic	Site: Vernon Dale	Tinaja	Casa Piedra	Forest Service Exclosure	California Gulch	Lower Tinaja	Black Diamond	Warsaw
Parameter								
Riparian vegetation structural diversity	4	4	4	4	4	4	4	4
Bank Stability	4	4	4	4	4	4	4	4
Vegetation Cover	3	4	3	3	2	3	3	2
Buffer Width	3	4	4	4	4	4	4	4
Vegetation Diversity	4	4	4	4	4	4	4	4
Embeddedness	4	3	3	3	3	3	3	3
Canopy Shading	4	3	2	4	2	3	4	3
Width/Depth Ratio	4	3	3	2	2	3	3	3
Pool/Riffle Ratio	3	4	3	4	*	*	*	*
Streambed Geology	4	4	4	4	4	4	4	4
Score	37	37	34	36	29	32	33	31
Score/#parameters	3.7	3.7	3.4	3.6	3.2	3.6	3.7	3.4
Rating	Excellent	Excellent	Good	Excellent	Good	Excellent	Excellent	Good

*Stream dry.

grazing system in conjunction with conservative grazing over the past 10 years has promoted a high degree of riparian vegetation diversity and bank stability as well as excellent streambed geology conditions on the 7 grazed sites.

Our survey indicates that carefully controlled grazing may promote the same rate of riparian improvement as grazing exclusion on some sites. The Forest Service exclosure (Table 3) had a similar score to four of the other sites. Overall the seven grazed areas had a mean score of 3.5 compared to 3.6 for the exclosure. The Forest Service exclosure was in the grazing rotation until July 1998.

Range management effectiveness is based on ecological condition, trend, grazing intensity and grazing capacity (Holechek et al. 2001). Using these criteria, we consider the Montana Allotment to be a primary grazing management success story in the southwestern USA (Tables 2 and 3). Quantitative data and photographic records (Figure 1 and 2) collected by various range professionals on the Montana Allotment show both upland and riparian areas across the allotment to now be in high ecological condition.

A very strong upward trend has occurred over the past 16 years. Grazing intensity levels across the allotment have been light to conservative. A major increase in grazing capacity has occurred. Recent quantitative watershed health surveys have rated soil stability and water quality excellent across the Montana Allotment. Qualitative surveys by Holechek and Galt made these same observations.

The Montana Allotment case study provides strong evidence that rapid upland and riparian health improvement can occur under controlled grazing in the southwestern USA. The key features of the strategy on the Montana Allotment are that upland areas are managed for conservative use and a combination of herding, salting and strategic access to water results in uniform livestock distribution.

Alternate year summer grazing of Schumacher and Warsaw pastures, at conservative to moderate intensities, has been highly effective in promoting cover and biomass increases of desirable grasses and shrubs. Summer grazing of the two riparian pastures in alternate years accounts for part of the success. During the summer green grass and water are plentiful in the uplands which reduces cattle preference for the riparian lowlands. Alternate year grazing of each pasture facilitates tree recruitment and allows those plants that are intensively grazed to fully recover. Well-distributed water in upland areas in conjunction with herding has also greatly facilitated range improvement.

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Riparian habitat in excellent condition in California Gulch on the Montana Allotment in September 2000. A combination of conservative utilization and rest rotation grazing has given high rate of increase of desirable riparian grasses and woody plants.

SOIL EROSION RATE ON THE MONTANA ALLOTMENT, ARIVACA, ARIZONA MAY 2002

A CONSULTING REPORT

by

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Summary

1. Soil erosion across 10 sites on the Montana Allotment averaged 0.32 tons/acre/year. This is below what is considered to be the natural rate of erosion (0.4 tons/acre/year) for this type of rangeland.
2. All 10 sites on the Montana Allotment had erosion rates below the tolerable rate (1 ton/acre/year).
3. Soil health across the Montana Allotment is considered to be excellent based on this survey of soil erosion and various other surveys of vegetation health.
4. There is no evidence of accelerated erosion due to cattle grazing on the Montana Allotment. Some accelerated erosion may be occurring in a few locations due to roads, mining, and camping activities.

Introduction

Accelerated soil erosion is the most serious consequence of unsound grazing practices on rangelands (Holechek et al. 2001). One thousand years or more are required to form 1 inch of soil (Brady and Weil 2002). However an inch or more of soil can be lost within one or two years when heavy livestock or wildlife grazing is coupled with severe drought (Brady and Weil 2002, Holechek et al. 2001). Separation of geological (natural erosion) from accelerated erosion has long been a major challenge facing range managers in the western United States. Various equations have been developed to predict soil loss based on a combination of variables typically including plant cover, vegetation composition, soil texture, percent slope, length of slope, amount of annual precipitation, and precipitation intensity (Blackburn et al. 1986). Although these equations may be satisfactory for measuring relative erosion rates among sites, they have generally been considered unreliable for measuring actual erosion (soil loss).

An alternative, reliable approach is to measure actual sediment collection in livestock ponds of known age in small, closed watersheds where the land area can be accurately calculated. Although this

is a practical, reliable approach for determining erosion rates on western rangelands, its actual utility has not been demonstrated.

In March 10, 2002 Dr. Bill Fleming and Dr. Jerry Holechek were formally requested by Mr. Jim Chilton to do a survey of soil erosion on Ruby, Schumacher, and Warsaw Pastures. These pastures are part of the Montana Allotment under a U.S. Forest Service grazing permit, and are south of Arivaca, Arizona near the Mexican border. Dr. Bill Fleming, a hydrologist, and Dr. Jerry Holechek, a range scientist, accepted the assignment.

Montana Allotment and Chilton Ranch Description

The Montana Allotment is located on the Coronado Nation Forest south of Arivaca, Arizona just north of the Mexican border. The Chilton Ranch purchased the grazing lease for the Montana Allotment from the previous rancher in 1991 and added this allotment to their existing private, National Forest and State Trust grazing lands. Mr. Chilton's family has been ranching in Arizona for 5 generations since their ancestors drove covered wagons and livestock into the Territory in the late 1800's.

Elevations on the Montana Allotment range from 3,500 feet at the Mexican border to 5,376 feet at the summit of Montana Peak. Precipitation varies from 16 to 22 inches annually depending on the elevation, with normal peaks in February and August and a dry season from April through June. Rainfall is often minimal in the September through November period, and maximal during July and August.

The vegetation type is Sonoran Desert Chaparral/Grassland. Dominant plant species include various liveoaks, mesquite, sideoats grama, plains lovegrass, cane beardgrass, tanglehead, green sprangletop, slender grama and curly mesquite. In riparian areas, deergrass, bullgrass, and giant sacaton are dominant grasses. Significant palatable browse plants include guajilla and range ratany.

Riparian trees include velvet ash, netleaf hackberry, Goodding willow, Bonpland willow, yewleaf willow, cottonwoods, and some walnut trees.

Several important game species are found on the Montana Allotment. They include whitetail deer, mule deer, mountain lion, javelina, Mearns quail, Gambel's quail, white-winged doves and mourning doves. The 4 pastures in the Montana Allotment (Schumacher, Warsaw, Ruby and Chimenea) have very high esthetic value and receive considerable recreational use by campers and hunters.

Most parts of California Gulch, the primary drainage on the Montana Allotment, are dry during the months of April-June and again in autumn months and are not suitable year-long habitat for fish. However, the Sonora chub in Mexico swims north into portions of Schumacher pasture in California Gulch when seasonal rains cause the Gulch to run. When temporary flows cease and the subflow can no longer resupply small pools, the trapped fish die.

Grazing management on the Montana Allotment involves a modification of the Santa Rita rest-rotation grazing system. This system was initiated on the Montana Allotment in 1990-91 after a 6-year period of fence-building and water development made possible the change from a 2-pasture, yearlong continuous grazing program.

Through cooperation between the Coronado National Forest and the Chiltons, the rest-rotation system designed and implemented on the Schumacher and Warsaw pastures provides for summer grazing in alternate years. After four months of summer grazing the grazed pasture is rested for a 20-month period. Schumacher Pasture is grazed in even numbered years while Warsaw Pasture is grazed in odd numbered years. Ruby Pasture is grazed in the spring every year and Chiminea Pasture is grazed in late fall and winter every year. Forest Service surveys in 1983 noted a total of 7 cottonwoods in all the drainages in the Montana Allotment and cited a general lack of riparian vegetation. Various

Forest Service range conservationists on the Coronado (Larry Allen, George Proctor, Duane Thwaits) have described a lack of deergrass cover in the bottoms, the near absence of riparian tree recruits and the dominance of annuals and shortgrasses on the uplands of the Montana Allotment prior to the 1990's.

In 1996, after the new grazing system had been in place for 5 years, all riparian trees in California Gulch were censused. Trees were identified and placed in age classes in each reach of the Gulch to create a quantitative record that could be updated in 5-year intervals to document trends in riparian recruitment under the rest-rotation grazing system. The census tallied hundreds of riparian trees growing in reaches where they had been mostly absent 13 years earlier.

Various grazing intensity surveys initiated by the Chiltons in spring 1998 show conservative use of Montana Allotment pastures. The Montana Allotment has been in a strong upward trend over the last 17 years based on various surveys by range consultants and Forest Service range conservationists. A significant shift in composition from short grass (curly mesquite) to more productive, palatable midgrasses (sideoats grama) has occurred over the period from 1984 to 2000(Fleming et al. 2001). Precipitation in this period was 104% of the long term average (18 inches). Most of this shift occurred in the 1990's. An intensive forage production survey in winter of 2000 showed perennial grass production averaged 986 pounds per acre across the allotment after a year of near average precipitation. This same survey showed about 69% of the climax vegetation remained on the allotment using the USDA-Natural Resources Conservation Service criteria for evaluating range condition. This is considered to be high good or late seral ecological condition. The primary perennial grass encountered on upland areas was sideoats grama. The reader is referred to Fleming et al. (2001) for a peer reviewed description of range management outcomes on both upland and riparian areas across the Montana Allotment.

Methodology for Determining Soil Erosion

Our basic experimental approach involved selection of 10 small watersheds ranging from 35 to 179 acres in size draining into a livestock pond of known age. In some cases the ponds had been cleaned within the last 10 years. In these cases the exact date of cleaning was known. Exact area of each watershed was determined from detailed maps and ground truthing. The area of each pond within the watershed was determined on site with the aid of a wheeled planimeter. The amount of sediment was determined by use of 5 equally spaced transects that spanned the length of each pond. Along each transect (across the pond width) five equally spaced measurements were taken of sediment depth using a specially designed depth probe purchased by Mr. Chilton. A total of 25 sediment depth measurements were taken per pond. Average sediment depth of the pond was multiplied by pond area to derive sediment volume. We assumed that the weight of a cubic foot of sediment is 100 pounds (Rollins 1981). Sediment weight (tons) for each pond was divided by pond age in years to derive tons/year of sediment accumulation. This number was then divided by the area (acres) of the watershed and then divided by the estimated sediment delivery ratio (0.5) to derive the erosion rate (tons soil loss/acre/year).

The sediment delivery ratio (0.5) we used was derived from Brooks et al. (1997) and is based on the size of the watershed drainage area. Sediment delivery ratio is defined as the ratio between the sediment yield at a particular point in a watershed and the total erosion from the watershed above that point (Brooks et al. 1997). The sediment delivery ratio increases as watershed size decreases. Basically the sediment delivery ratio provides an estimate of soil loss from various sites on a particular watershed that has not yet accumulated as sediment in the watershed outlet (pond or reservoir). As an example only 30% of hill slope soil loss reached the outlet in small watersheds (120-1200 acres) in northwestern Colorado (Hadley and Shown 1976).

We refer the reader to Renard and Stone (1981) for more details on our methodology and its applications on southern Arizona rangelands. This survey was accomplished on May 16-19, 2002 by Dr. Bill Fleming, Dr. Jerry Holechek, and Mr. Jim Chilton.

Results

Soil loss across the 10 sites we evaluated averaged 0.32 tons/acre/year (tay) (Table 1). Holden pond had the lowest erosion rate (0.02 tay) while Nogalito pond had the highest (0.78 tay). There is some evidence that current grazing management (last 10 years) on the Montana Allotment has reduced the soil erosion rate compared to previous management. The average erosion on ponds 15 years or older was 0.4 tay compared to 0.27 tay for ponds under 10 years of age (Table 1).

The tolerable rate of erosion for rangelands in the western United States is considered to be 1 tay (Rollins 1981, Pimentel 1995). Based on experimental watersheds near Tombstone, Arizona (Renard and Stone 1981), the natural (geological) rate of erosion for most sites on the Montana Allotment is probably near 0.4 tay. Our survey shows the well managed cattle grazing that now occurs on the Montana Allotment (see Fleming et al. 2001) is having no effect on soil erosion. This finding is supported by various vegetation and soil surveys by Dr. Dee Galt and Dr. Jerry Holechek summarized by Fleming et al. (2001) that have consistently found high vegetation cover levels, light to conservative grazing intensities, and clear water in all ponds across the Montana Allotment.

Conclusion

Our survey of 10 small watersheds well distributed across the Montana Allotment showed no evidence of accelerated erosion. The average erosion rate of 0.32 ton/acre/year across the 10 sites is below what is considered to be the natural rate of erosion for this type of rangeland (0.4 tons/acre/year). Based on this survey of soil erosion rate and various others of vegetation health (Fleming et al. 2001), we consider soil health and stability on the Montana Allotment to be excellent.

Cattle grazing under the present management plan on the Montana Allotment is having no effect on soil erosion. However at some locations mining, roads, and campsites could be causing some degree of accelerated erosion.

Table 1. Sediment yield and soil loss rates on the Montana Allotment, Arivaca, Arizona.

Stock Pond	Watershed Area (acres)	Pond Age (years)	Sediment Weight (tons)	Sediment Yield (tons/acre/year)	Soil Loss[1] tons/acre/year
Japanese	109	16	514	0.29	0.58
Narrows	58	9	84	0.16	0.32
Warsaw	51	72	832	0.23	0.46
Lower Warsaw	90	9	71	.09	0.18
Company Well	58	9	63	0.12	0.24
Nogalito	35	9	123	0.39	0.78
Mujeres	77	56	804	0.19	0.38
Alta Schumacher					
old	147	44	316	0.05	0.10
new	147	9	43	0.03	0.06
Pico	50	15	367	0.24	0.48
average	91			0.16	0.32

[1] Sediment delivery ratio is considered to be 0.5 based on Brooks et al. (1997).

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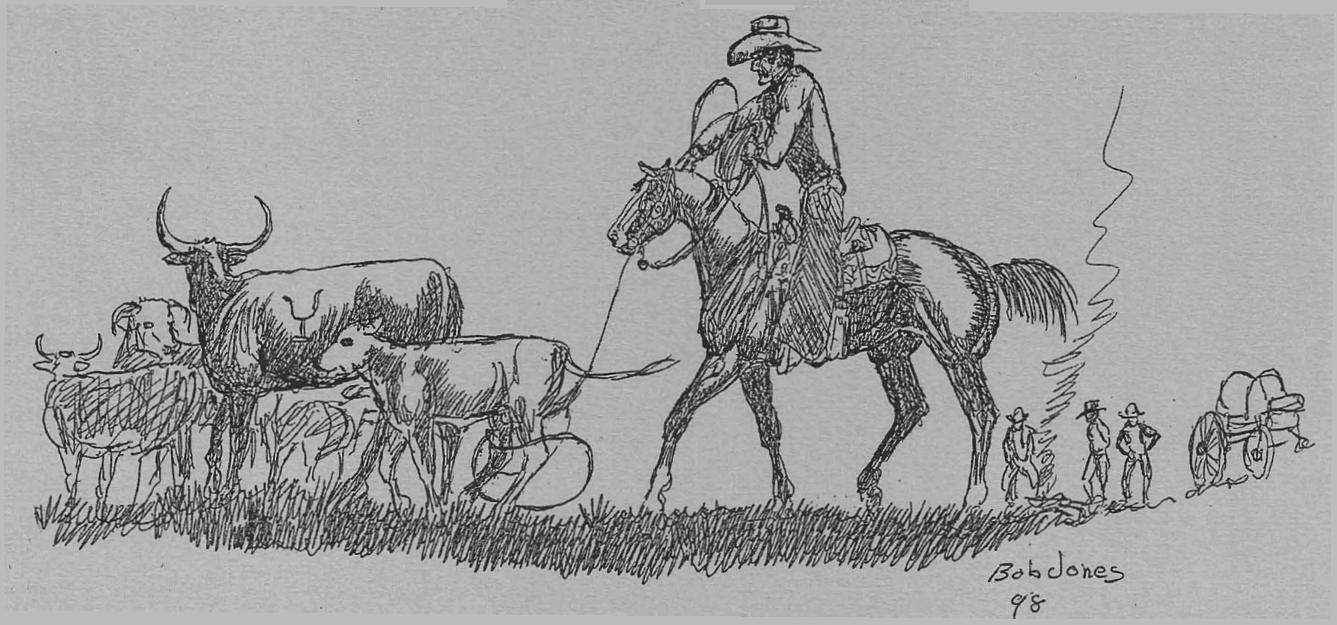
Report 57

Impacts of Controlled Grazing Versus Grazing Exclusion on Rangeland Ecosystems: What We Have Learned



NEW MEXICO STATE UNIVERSITY

Range Improvement Task Force
Agricultural Experiment Station
Cooperative Extension Service

College of Agriculture and Home Economics

Impacts of Controlled Grazing Versus Grazing Exclusion on Rangeland Ecosystems: What We Have Learned

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Abstract

This paper examines the impacts of carefully controlled livestock grazing versus grazing exclusion on rangeland ecosystems, focusing on arid and semi-arid areas. Eighteen studies were found that evaluated the effects of controlled grazing versus grazing exclusion on rangeland vegetation. These studies provide evidence that controlled livestock grazing may enhance rangeland vegetation by altering plant succession, increasing plant diversity and productivity, and reducing plant mortality during drought. These positive impacts of livestock grazing are most likely to occur when grazing intensities are light to conservative. Although more than 30 studies consistently show that controlled grazing adversely impacts soils through increased compaction, reduced infiltration and increased erosion, these impacts are minor and are ameliorated by natural processes that cause soil formation, soil deposition and soil loosening. Plant seedling establishment and mineral cycling can be increased by livestock treading. Research from the Chihuahuan Desert indicates that moderately grazed mid seral rangelands support a higher diversity of wildlife species than those lightly grazed in near climax condition. Riparian habitat improvement has occurred under carefully timed grazing at light to conservative intensities. The impacts of controlled grazing on fish populations have not been well studied. In conclusion, there is limited scientific evidence that controlled grazing can play an important role in managing and maintaining rangelands in arid and semiarid regions for a variety of uses and ecosystem services. However, more and better designed research is needed on this subject.

Introduction

Conflict over management of public grazing lands in the western United States is becoming increasingly contentious; the land base there has shrunk due to rapid human population increase, urban sprawl, and changing social values. Through research, the impacts of controlled livestock grazing on rangeland ecosystems of the western United States have become better understood during the last 20 years. However, most of this research is in technical peer-reviewed journal articles that are generally not read by the public. A careful analysis of this research is needed to provide the public, ranchers, lawmakers, government planners, and conservationists with a sound basis for decision making. The focus of this review is the impact of controlled livestock grazing on rangeland health, emphasizing vegetation. Soil, watershed, and wildlife will be discussed briefly. Semiarid and arid areas will receive emphasis because livestock grazing on public rangelands of the western United States is under the greatest scrutiny (Donahue 1999).

Primary Sources of Information

All grazing studies of the western United States will not be exhaustively reviewed. Only those that have involved careful control of intensity, timing and frequency of grazing will be reviewed. However, influential reviews and "opinion articles" that examine livestock grazing from different perspectives will be identified.

The primary range management textbooks include Stoddart et al. (1975), Valentine (1990), Heady and Child (1994), and Holechek et al. (2004). These books draw heavily from peer reviewed science and focus on controlled grazing outcomes. Relevant, more specialized textbooks include Branson et al. (1981) on rangeland watershed management, Vavra et al. (eds.)

(1994) on grazing impacts on Western plant communities, Krausman (ed.) (1996) on rangeland wildlife, and Heitschmidt and Stuth (eds.) (1991) on rangeland ecology

Another level of books and handbooks is directed toward the layman or rancher seeking applied information. These include Bell (1973), Savory (1999), and Sayre (2001). Bell (1973) provides an excellent overview of range management based on his experiences as a range conservationist with the USDA Soil Conservation Service. Sayre (2001) more closely ties his observations, case studies, and viewpoints to peer reviewed studies than Savory (1999).

Noteworthy anti-grazing books include Jacobs (1992) and Donahue (1999). Both books contain some factual information but also rely heavily on opinions and viewpoints.

The most comprehensive reviews of scientific information on grazing impacts on rangeland vegetation include Ellison (1960), Milchunas et al. (1988), and Milchunas and Lauenroth (1993). Reviews providing a defense for public land grazing include Holechek (1980) and Holechek (1981). Those that make the case against public land grazing include Fleischner (1994) and Jones (2000). Belsky et al. (1999) reviews various studies showing that uncontrolled livestock grazing degrades riparian ecosystems.

Problems with Grazing Exclusion Studies

Fleischner (1994) and Jones (2000) review a wide variety of grazing versus grazing exclusion studies that show livestock grazing has adverse impacts on vegetation diversity, vegetation structure, plant succession, soil stability, nutrient cycling, wildlife diversity, and riparian health. Neither of these reviews that involved more than 100 studies take into account critical details such as grazing intensity, timing, and frequency, which greatly influence experimental outcomes. Fleischner (1994) fails to consider any of the 35 long-term controlled

grazing studies later identified and summarized by Van Poollen and Lacey (1979), Holechek, et al. (1999) and Holechek, et al. (2004) as the foundations of range management. Only one of these foundational studies is mentioned by Jones (2000). Nearly all the studies considered in the Fleischner (1994) and Jones (2000) reviews have flaws (Brown and McDonald 1995), including inadequate descriptions of grazing treatments or practices, weak study designs, and/or lack of pre-treatment data.

Weak study designs typically include lack of replication in time and space, grazing treatments so poorly described they cannot be reconstructed, non-uniform experimental units, and excessively small experimental units that do not adequately reflect the area studied (Brown and McDonald 1995, Larsen et al. 1998). In the case of grazing versus grazing exclusion studies, very few provide information on grazing intensity, season of use, frequency of use, and use by native herbivores prior to construction. Consequently, the reader cannot discern the nature of the grazing impacts that impaired the area.

Controlled Grazing Studies

It has been known for over 100 years that sustained heavy to severe grazing intensities are harmful to soil, vegetation, and wildlife. Range scientists and ranchers have long acknowledged that damage to soil and vegetation occurred in the late 1800s and early 1900s because of severe grazing over much of the western United States. However, it is well established that steady improvement has occurred on both publicly and privately owned rangelands over the past 60 years due to better controlled grazing (Table 1). A quick review of the controlled grazing studies will be provided before consideration of controlled grazing versus grazing exclusion. The basis for this review is Holechek et al. (1999) and Holechek et al. (2004).

Table 1. Comparative percentages of Bureau of Land Management rangelands in excellent, good, fair, and poor condition between 1936 and 1998.

YEAR	EXCELLENT (CLIMAX)	GOOD (LATE SERAL)	FAIR (MID SERAL)	POOR (EARLY SERAL)
1936	1.5	14.3	47.9	36.6
1966	2.2	16.7	51.6	29.5
1975	2.0	15.0	50.0	33.0
1984[a]	5.0	31.0	42.0	18.0
1993[a]	4.0	33.0	38.0	14.0
1998[a]	5.0	28.0	39.0	11.0

Source: USDI 184, 1994, 1998.
[a] Less than 100% totals because some lands have not been rated as to range condition.

For more details on various controlled grazing studies, the reader is referred to Van Poollen and Lacey (1979), Lacey and Van Poollen (1981), Milchunas and Lauenroth (1993), and Vavra et al. (eds.) (1994).

What is Sustainable Grazing?

Various stocking rate studies characterize grazing intensity treatments as heavy, moderate conservative, and light. Klipple and Bement (1961) define heavy grazing as a degree of forage utilization that does not permit desirable forage species to maintain themselves. Moderate grazing is a degree of herbage utilization that allows the palatable species to maintain themselves but usually does not permit them to improve in herbage-producing ability. Light grazing is a degree of herbage utilization that allows palatable species to maximize their herbage producing ability.

The primary measure of grazing intensity used in long-term grazing studies has been percent use of palatable forage species. Although it has limitations as a measure of grazing intensity, percent use is more easily understood by ranchers and non-range professionals than other measurements such as stubble heights, percentage of grazed plants, or minimum residues (Jasmer and Holechek 1984). When several years of data have been collected, percent use of forage was well related to changes in productivity of primary forage plants, livestock performance, and financial returns (Holechek et al. 1999).

When all the stocking rate studies were averaged, Holechek et al. (1999) found heavy grazing averaged 57% use of primary forage species compared to 43% use for moderate and 32% use for light grazing (Table 2). Research was remarkably consistent in showing that moderate grazing involved about 45% use of forage (Johnson 1953, Klipple and Costello 1960, Beetle et al. 1961, Paulsen and Ares 1962, Houston and Woodward 1966, Launchbaugh 1967, Martin and Cable 1974, Skovlin et al. 1976, and Sims et al. 1976). In some years, use approached 60% while in others it was only 20%. Over long time periods, an average near 45% maintained vegetation productivity for arid to semi-arid range types (see also Milchunas and Lauenroth 1993).

Table 2. Summary of 25 studies on effects of grazing intensity on native vegetation and livestock production in North America.

	GRAZING INTENSITY		
	HEAVY	MODERATE	LIGHT
Average use of forage (%)	57	43	32
Average forage production (lbs./acre)	1,175[1] (1,065)[2]	1,473[1] (1,308)[2]	1,597[1]
Forage production drought years (lbs./acre)	820[1]	986[1]	1,219[1]
Range trend in ecological condition	down (92%)[3]	up (52%)[4]	up (78%)[4]
Average calf crop (%)	72[1] (77)[2]	79[1] (84)[2]	82[1]
Average lamb crop (%)	78	82	87
Calf weaning wt (lb)	381[1] (422)[2]	415[1] (454)[2]	431[1]
Lamb weaning wt (lb)	57	63	----
Gain per steer (lb)	158	203	227
Steer/calf gain per day (lb)	1.83	2.15	2.30
Steer/calf gain per acre (lb)	40.0	33.8	22.4
Lamb gain per acre (lb)	26.0	20.4	13.8
Net returns per animal ($)	38.06[1] (29.00)[2]	51.57[1] (39.71)[2]	58.89[1]
Net returns per acre ($)	1.29[1] (1.72)[2]	2.61[1] (2.24)[2]	2.37[1]

Source: Holechek et al. 1999a.
[1] Average for those studies comparing heavy, moderate, and light grazing (studies comparing only heavy and moderate grazing excluded).
[2] Average for all studies.
[3] Percentage of studies with downward trend.
[4] Percentage of studies with upward trend.

Unlike stocking rate studies, research comparing continuous or season-long and rotation grazing systems has shown much inconsistency regarding influences on rangeland vegetation (Van Poollen and Lacey 1979, Holechek et al. 1999, Table 3). Across all studies, forage production was 7% higher under rotation compared to continuous grazing. In the semi-arid and desert range types, rotation grazing systems generally showed no advantage over continuous or season-long grazing. However, in the more humid range types, forage production averaged 20 to 30% higher under rotation grazing. Generally, rotation grazing has been more beneficial than

continuous grazing to desirable forage species in the humid types. However, in flat semiarid and arid areas, rotation has shown no definite advantage from a vegetation standpoint. In mountainous areas, rotation grazing systems provide easier access areas (riparian zones), opportunity for recovery, and can be advantageous over season-long grazing. More detailed discussions of the results from various grazing system studies are provided by Vallentine (1990), Heady and Child (1994), and Holechek et al. (2004).

Table 3. Summary of 15 studies on effects of rotation grazing systems on native rangeland vegetation and livestock production in North America.

CHARACTERISTIC	SEASON-LONG OR CONTINUOUS GRAZING	ROTATION GRAZING
Average use of forage (%)	41.8	42.4
Average forage production (lb/acre)		+7%
Range trend	up=61%, stable=31%, down=8%	up=69%, stable 85, down=23%
Average calf crop (%)	89.4	85.9
Calf weaning wt (lb)	504.6	494.1
Net returns ($/acre)	6.60	6.37

Source: Holechek et al. 1999.

One point made by leading range managers should be emphasized; stocking is and always will be the major factor affecting the condition of rangeland resources (Pieper and Heitschmidt 1988). No grazing system can counteract the negative impacts of long-term overstocking. These conclusions are well supported by various long-term studies from North America (Holechek et al. 2001) and Africa (O'Reagan and Turner 1992).

More than 35 controlled grazing studies from North America and over 50 studies from other parts of the world (O'Reagan and Turner 1992, Milchunas and Lauenroth 1996, Ash and Smith 1996) show managed livestock grazing using scientific principles is sustainable and

generally results in rangeland improvement. Rather than focusing on what is well known (that unmanaged grazing damages rangelands), we must examine how controlled grazing at light to moderate intensities affects rangelands relative to ungrazed controls. We selectively review those studies judged to have adequate experimental design to separate controlled grazing from climatic, soil, and other environmental effects.

Vegetation Studies

Research Identification

In western North America, we have found 20 studies that compare vegetation responses of controlled grazing at moderate to light intensities with grazing exclusion. These studies are summarized in Table 4. Sixteen of these studies evaluated trend, 11 evaluated productivity, and 2 evaluated under managed grazing compared to grazing exclusion during drought. Only 7 of the studies involved arid rangelands.

Table 4. Studies comparing vegetation responses of controlled grazing at moderate to light intensities with grazing exclusion.

Range Type	Location	Vegetation Responses Studied	Grazing Treatment	Reference
Northern mixed prairie	Alberta, Canada	Production	Light grazing, Grazing exclusion	Johnston 1962
Northern mixed prairie	North Dakota	Trend	Moderate grazing, Grazing exclusion	Brand and Goetz 1986
Northern mixed prairie	Alberta, Canada	Trend	Grazing intensities, Grazing exclusion	Smoliak et al. 1972
Northern mixed prairie	Montana	Trend	Conservative stocking, Grazing exclusion	Vogel and Van Dyne 1966
Southern mixed prairie	Texas	Productivity, Trend	Stocking rates, Grazing systems, Grazing exclusion	Wood and Blackburn 1984
Southern mixed prairie	Texas	Trend	Stocking rates, Grazing systems, Grazing exclusion	Thurow et al. 1986
Southern mixed prairie		Productivity, Trend	Stocking rates, Grazing exclusion	Heitschmidt et al. 1985
Southern mixed prairie	Texas	Productivity, Trend	Stocking rates, Grazing systems, Grazing exclusion	Reardon and Merrill 1976
Shortgrass prairie	Colorado	Productivity	Stocking rates, Grazing exclusion	Milchunas et al. 1994
Shortgrass prairie	Colorado	Trend	Stocking rates, Grazing exclusion	Hart and Ashby 1998
Coniferous forest	Colorado	Productivity, Drought response Trend	Stocking rates, Grazing exclusion	Johnson 1956, Smith 1967
Coniferous forest	Oregon	Productivity, Trend	Stocking rates, Grazing systems, Grazing exclusion	Skovlin et al. 1976
Palouse bunchgrass	Oregon	Productivity, Trend	Stocking rates, Grazing systems, Grazing exclusion	Skovlin et al. 1976
Sagebrush grassland	New Mexico	Trend	Moderate stocking, Grazing exclusion	Holechek and Stephenson 1983
Sagebrush grassland	Idaho	Trend	Timed grazing, Grazing exclusion	Bork et al. 1998
Sagebrush grassland	Oregon	Drought response	Grazing intensity, Grazing exclusion	Ganshopp and Bedell 1981
Chihuahuan Desert	New Mexico	Trend, Drought response	Grazing intensities, Grazing exclusion	Paulsen and Ares 1962
Chihuahuan Desert	New Mexico	Productivity, Trend	Conservative grazing, Grazing exclusion	Herbel and Gibbens 1996
Salt Desert	Utah	Trend	Grazing timing, Grazing exclusion	Alzerreca-Angelo et al. 1998
Mojave Desert	Utah/Arizona	Trend	Grazing intensity, Grazing exclusion	Jeffries and Klopatek 1987

Analysis of Trend Studies

Fourteen of the 18 studies evaluating trend had sufficient baseline information, where vegetation changes through time could be determined. In all 14 of these studies, ungrazed and moderately to lightly grazed treatments showed the same trend. Ten studies showed an upward trend, two showed a downward trend, and two showed no definite trend. Paulsen and Ares (1962) reported a downward trend on Chihuahuan Desert rangeland due to extended drought, while Skovlin et al. (1976) associated a downward trend on coniferous forest rangeland with increasing tree cover. In 6 of the 18 studies, plant species composition did not differ between grazed and ungrazed areas. Grazed, compared to ungrazed, areas were considered to be in higher ecological condition (more climax vegetation) in 5 studies and lower in 5 studies. Two studies (Paulsen and Ares 1962, Hart and Ashby 1998) merit special consideration because they involved long-time periods (more than 20 years), were well replicated in space, and provided detailed characterization of grazing intensity. In both studies, grazing was found to be sustainable at intensities that involved up to 40% utilization of forage.

On the Colorado shortgrass prairie, prickly pear cactus (*Opuntia Polyacantha* Haw.) biomass was lowered by 55 years of moderate grazing (40% use) compared to exclusion (Hart and Ashby 1998). Shrub biomass (mostly fringed sagewort [*Artemisia frigida willd.*], slender bush eriogonum [*Erogonum microthecum* Nutt.], and broom snakeweed [*Gutierrizea sarothrae* Pursh]) was higher under exclusion than under grazing. The lower cactus and shrub component under grazing treatments were considered advantageous because these plants have low forage value for livestock and some wildlife species. Light and moderate grazing reduced cool-season graminoids but increased warm-season graminoids compared to exclusion. Forb biomass did not

differ among grazed and ungrazed treatments. It was concluded that moderate cattle grazing had been sustainable during the 55-year period of study.

In the Chihuahuan Desert of New Mexico, black grama (*Bouteloua eriopoda* Torr.) basal cover over a 37-year period was maintained at a higher level under conservative grazing (35% use) than under no grazing or heavier grazing levels (Paulsen and Ares 1962) (Figure 1). Black grama is the primary decreaser forage grass in the Chihuahuan Desert and dominates upland rangelands in high ecological condition. Tobosa (*Hilaria mutica* Buckley) is the second most important livestock forage grass in the Chihuahuan Desert; it is also important for a variety of wildlife species including ground-nesting birds, and dominates lowland flood plains. Tobosa had over twice as much basal area on long-term (15 years) conservatively and moderately grazed quadrats as those protected (Table 5). The authors stated that tobosa plants tend to stagnate when old growth is not removed. Thus, moderate grazing is desirable to maintain a vigorous tobosa stand. Findings from the Paulsen and Ares (1962) study are supported by additional follow-up research from the same study areas by Herbel and Gibbens (1996). These two Chihuahuan Desert studies provide strong evidence that managed livestock grazing at light to moderate levels is sustainable in arid environments.

Table 5. Average basal area of tobosa (cm^{-2}) on square meter quadrats receiving 4 different intensities of cattle grazing in the 1928 to 1943 period on Jornada Experimental Range in southern New Mexico (Paulsen and Ares 1962).

Grazing Intensity	Use of Forage (%)	Average Basal Area of Tobosa (cm^{-2})
Protected	0	1,191
Conservative	<40%	2,461
Intermediate (Moderate)	40-55%	2,718
Heavy	>55%	2,294

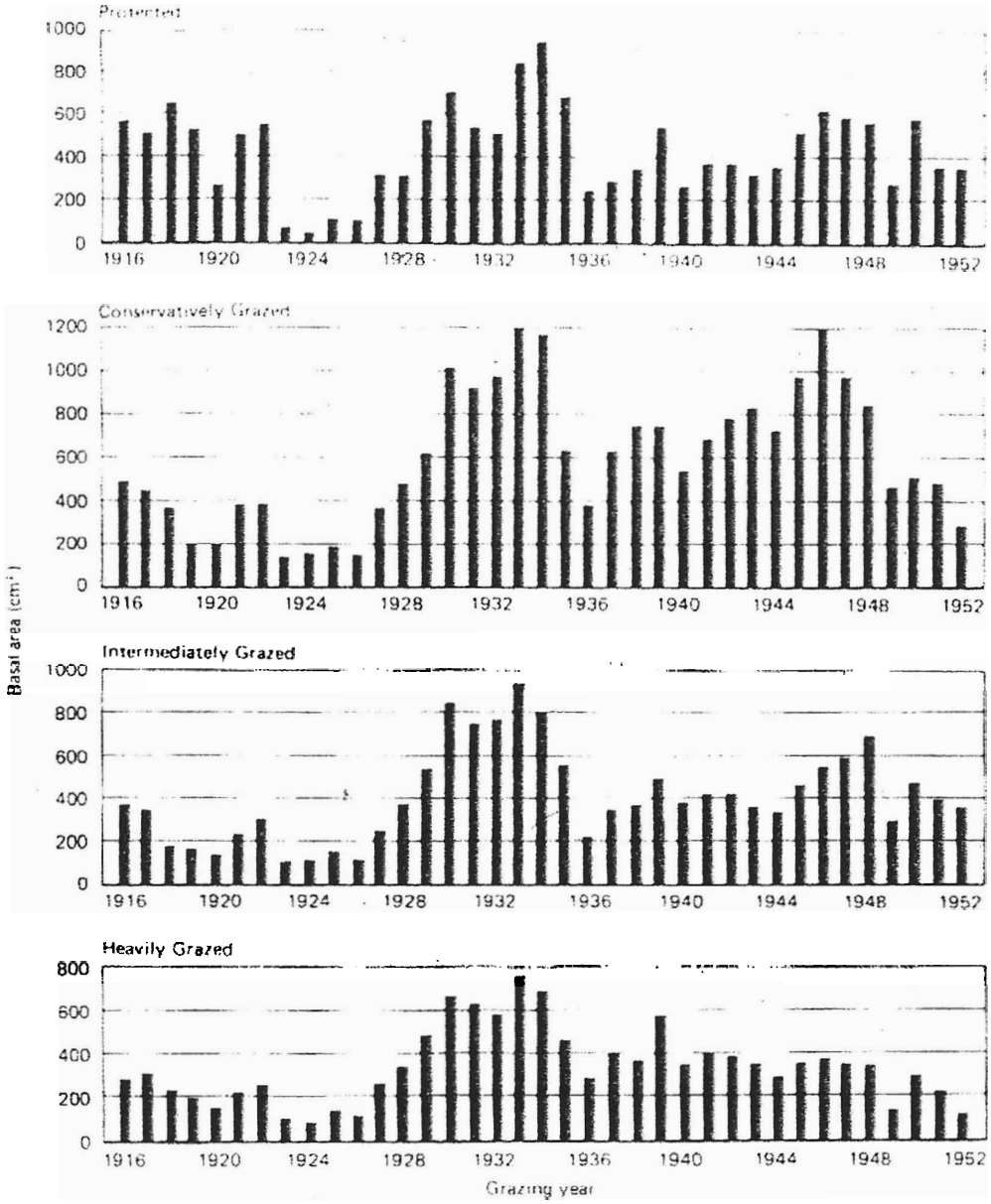

Figure 1. Basal area of black grama on meter-square quadrats protected from grazing and at three intensities of grazing on the Jornada Experimental Range, southern New Mexico, 1916-1953 (From Paulsen and Ares 1962.)

Further evidence that grazing is sustainable in arid environments is provided by Navarro et al. (2002). This study evaluated long-term (1952-1999) trend in ecological condition on 41 grazed sites distributed across Bureau of Land Management rangelands in the Chihuahuan Desert

of southern New Mexico. Over the 48-year study period, major changes occurred in rangeland condition due to fluctuations in precipitation. At the end of the study, however, average ecological condition score across sites was the same as the beginning. The average percent cover of primary forage grasses was the same. The authors concluded managed livestock grazing is sustainable on Chihuahuan Desert rangelands.

Plant Diversity

Very few studies have evaluated the effects of controlled grazing on plant diversity in arid and semiarid areas. In the Chihuahuan Desert of southern New Mexico, Smith et al. (1996) reported that vegetation diversity was higher on long-term, conservatively grazed late seral rangeland than on lightly grazed rangeland in near-climax condition. In another study in the same area, Nelson et al. (1997) reported that vegetation diversity was the same on moderately grazed mid seral and conservatively grazed late seral rangelands. On the shortgrass prairie of Colorado, Milchunas et al. (1988) found that plant diversity increased as grazing intensity decreased. However, the difference in plant diversity between ungrazed and lightly grazed areas was small.

Vegetation Productivity

Long-term managed grazing, compared to grazing exclusion, on average reduced grass production 13% and total vegetation production 4% across 11 different studies (Table 6). The Chihuahuan Desert study merits particular consideration because it involved two sites and 19 years of data collection (Herbel and Gibbens 1996). Grazing intensities were conservative (30-35% use of forage). On both sites in this study, managed grazing resulted in slightly higher grass production than exclusion. Grazing intensity was lower in this study than in the others cited

Table 6. Summary of studies evaluating vegetation productivity under controlled grazing and grazing exclusion in North America.

			Grass Productivity			Total Vegetation Productivity		
			Grazed	Excluded		Grazed	Excluded	
			kg ha^{-1}		% Difference	kg ha^{-1}		% Difference
Johnston 1962	Alberta, Canada	Northern mixed prairie	1,390	1,625	-14	2,429	2,471	-2
Brand & Goetz 1986	North Dakota	Northern mixed prairie	1,540	1,780	-13	1,908	1,908	-8
Vogel & Van Dyne 1966	Montana	Northern mixed prairie	477	522	-9	655	733	-11
Wood & Blackburn 1984	Texas	Southern mixed prairie	3,281	4,202	-22	-----	-----	-----
Heitschmidt et al. 1986	Texas	Southern mixed prairie	1,152	1,430	-19	1,171	1,441	-19
Reardon & Merrill 1976	Texas	Southern mixed prairie	1,211	1,015	+14	2,436	1,578	+54
Milchunas et al. 1984	Colorado	Shortgrass	710	750	-5	-----	-----	-----
Johnson 1956	Colorado	Coniferous forest	733	1,229	-40	982	1,637	-40
Skovlin et al. 1976	Oregon	Coniferous forest	101	160	-37	280	337	-17
Skovlin et al. 1976	Oregon	Palouse prairie	175	204	-14	374	350	+7
Herbel & Gibbens 1996	New Mexico	Chihuahuan desert	215	206	+4	-----	-----	-----
Average			999	1,193	-13	1,250	1,294	-4

above. In arid areas, it appears that grazing at light to conservative levels may have no effect or a stimulative effect on forage production. This, however, needs to be better studied.

Two studies provide evidence that long-term grazing exclusion can result in vegetation stagnation. On chaparral rangeland in south-central Texas, Merrill and Reardon (1976) found that production of decreaser grasses was lower under grazing exclusion than under a moderately stocked four-pasture deferred-rotation grazing system. On desert shrub rangelands in Nevada, Tueller and Tower (1979) found productivity of desirable shrubs (bitterbrush) was lower, but that of grasses higher on grazing excluded compared to grazed areas. This study was not included in Table 6 because information on grazing intensity was vague.

Most of the productivity studies in Table 6 apparently did not use cages on grazed areas to account for herbage removed by livestock. Another problem encountered in reviewing the studies is that many of them do not clearly state whether old growth was separated from new growth. In the Herbel and Gibbens (1996) study, where grass production was slightly higher on grazed areas, the authors do state that their estimates involved only current year growth.

Drought Response

Three studies indicate that light to conservative grazing may actually benefit grass plants during drought compared to no grazing (Johnson 1956, Paulsen and Ares 1962, Ganskopp and Bedell 1981). In eastern Oregon, lightly grazed Idaho fescue (*Festuca idahoensis* Elmer) and bluebunch wheatgrass (*Agropyron spicatum* Pursh) had as much and in some cases more herbage, seed stalks, and final height than ungrazed plants following severe drought (Ganskopp and Bedell 1981). Similar observations were made for black grama on Chihuahuan Desert rangeland in New Mexico (Paulsen and Ares 1962). On coniferous forest rangeland in Colorado, Johnson (1956) found that moderately and lightly grazed pastures had less reduction in forage

production than plots excluded from grazing during drought. In their book, *Sonoran Desert*, researchers Bock and Bock (2000) reported that moderate livestock grazing reduced drought-caused mortality on perennial grasses in southeastern Arizona. In southeastern Montana, Eneboe et al. (2002) found that moderate grazing did not adversely affect primary native grasses (i.e., blue grama, western wheatgrass) during and after drought.

Positive Influences of Controlled Grazing

Possible positive influences of managed grazing compared to grazing exclusion on range plant productivity are reviewed by Holechek (1981), and Holechek et al. (2001). These include removal of excess vegetation that may negatively affect net carbohydrate fixation, maintaining an optimal leaf area index, reducing transpiration losses, reducing excess accumulations of standing dead vegetation and mulch, increased tillering in grasses, reducing apical dominance in shrubs and inoculating plant part with saliva to stimulate growth. Nearly all of the studies identifying these responses were conducted in greenhouses rather than under range conditions. Research by McNaughton (1983) in the African Serengeti provides one of the best validations that grazing does have positive or compensating effects on forage plant productivity, while Belsky (1986) reviews contradictory evidence. A major challenge for rangeland researchers in the 21st century will be to provide better information on this subject.

Soil and Watershed Studies

In contrast to vegetation, several (over 30) studies are available that have evaluated the effects of controlled grazing versus exclusion on rangeland soils and watershed properties. Various reviews of these studies include Gifford and Hawkins (1978), Branson et al. (1981), Blackburn (1984), Thurow (1991), Heady and Child (1994), and Holechek et al. (2004). Unlike

the studies on rangeland vegetation, the research on soils and watershed properties under controlled and grazing exclusion is remarkably consistent. These studies all show that light to moderate grazing reduces soil bulk density, increases water infiltration, decreases overland flow (Figure 2) and reduces soil erosion (Figure 3) relative to grazing exclusion. However, the effects of light to moderate grazing compared to grazing exclusion on soil properties have been of small magnitude and non-significant (Figures 2 and 3).

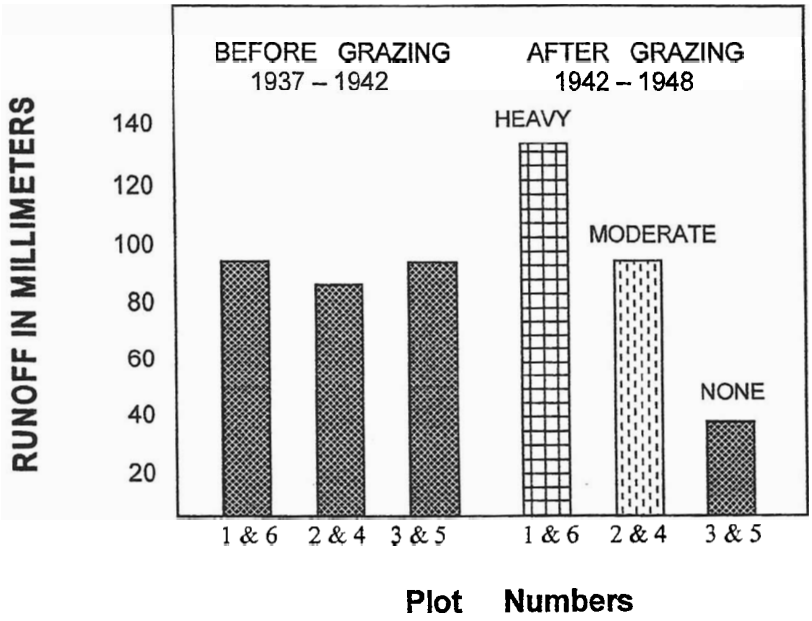

Figure 2. Runoff for bunchgrass rangeland in Colorado prior to grazing (1937–1942) and after (1942-1948) heavy and moderate grazing. (Adapted from Dunford 1949 by Branson et al. 1981.)

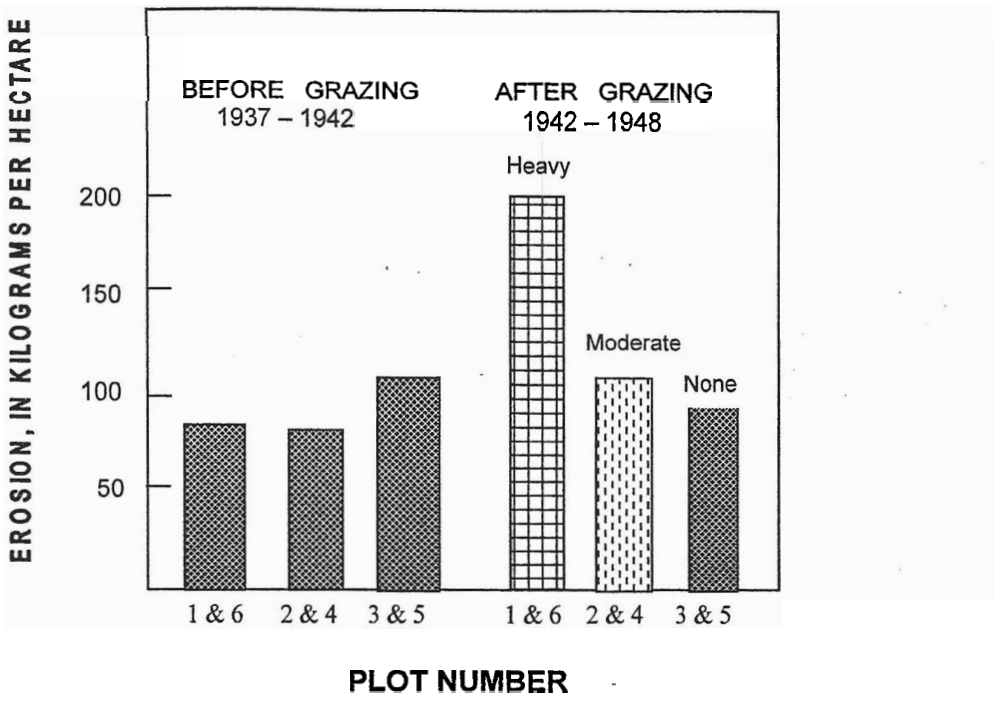

Figure 3. Average erosion from plots subject to different grazing intensities before grazing (1937-1942) and after grazing (1942-1948) on bunchgrass range in Colorado. (Adapted from Dunford 1949 by Branson et al. 1981.)

A popular belief has been that intensive grazing can loosen the soil surface during drying periods and increase infiltration (Savory and Parsons 1980). Several studies reviewed by Thurow (1991), Heady and Child (1994), and Holechek et al. (2004) are consistent in showing that heavy livestock grazing has caused the opposite effect; increasing compaction, reducing infiltration, and increasing erosion.

Short-duration heavy grazing involving concentrated livestock hoof activity for short time periods has been promoted for its capability to improve water infiltration into the soil and increase forage production. The most detailed evaluation of hydrologic responses under short-duration grazing was reported by Warren et al. (1986 a,b,c). They studied infiltration and

sediment production on a silty clay soil in Texas using a short-duration grazing system with moderate, double-moderate, and triple-moderate stocking rates. Short-duration grazing at all intensities reduced infiltration and increased sediment production compared to no grazing (Warren et al. 1986c) (Table 7). These deleterious effects were increased as stocking rate increased. The damage was augmented when the soil was moist at the time of treading. Thirty days of rest was insufficient to allow hydrologic recovery. Another part of the study evaluated seasonal changes in infiltration and sediment production under short-duration grazing at a moderate stocking rate (Warren et al. 1986a). The infiltration rate declined and sediment production increased following the short-term intense grazing periods inherent to this system. These effects were most severe during drought and dormancy, due to reduced vegetation standing crop. It was also found that there was no hydrologic advantage to increased stocking density via manipulation of pasture size and numbers (Warren et al. 1986b).

Table 7. Infiltration rate and sediment production in relation to stocking rate and soil water content at the time of trampling on the Edwards Plateau, Texas (from Warrant et al 1986c).

STOCKING RATE	TRAMPLED DRY	TRAMPLED MOIST
	INFILTRATION RATE (MM/HR.)	
0	166	160
1X	140	133
2X	121	99
3X	117	96
	SEDIMENT PRODUCTION (KG/HA)	
0	976	2,007
1X	2,827	2,875
2X	3,438	4,274
3X	4,788	5,861

1X = moderate stocking rate, 2X = double-moderate stocking rate, 3X = triple-moderate stocking rate.

Available research is consistent in showing that heavy short-duration grazing increases sediment production compared to moderate continuous grazing (McCalla et al. 1984, Thurow et al. 1986, Weltz and Wood 1986, Pluhar et al. 1987). The reduced vegetation standing crop and cover associated with short-duration grazing appeared to cause the higher sediment production.

Sediment production under various other specialized grazing systems has been compared with moderate continuous grazing (Wood and Blackburn 1981, Gamougoun et al. 1984, Pluhar et al. 1987). As in the case of infiltration, these studies show little difference between grazing systems other than heavy short-duration intensive grazing.

Although treading by livestock can have undesirable effects such as soil compaction, it can also have desirable effects. Treading incorporates standing dead material into the soil surface, increasing mineral cycling (Pieper 1974). It can reduce large accumulations of mulch and litter by incorporating these materials into the soil. Moderate treading by livestock appears to favor emergence and survival of perennial grass seedlings while heavy treading can favor forbs and shrubs (Hyder and Sneva 1956, Eckert et al. 1986). Like so many things, a small to moderate level of livestock hoof action can be beneficial while heavy amounts are destructive.

Discussions of the role of livestock grazing on mineral cycling are provided by Briske and Heitschmidt (1991), Haynes and Williams (1993), and Heady and Child (1994). Without question, livestock grazing increases the rate of nutrient flow and availability in rangeland ecosystems by biting, chewing, rumination, digestion, urination, and defecation. These processes cause a large proportion of essential nutrients otherwise tied up in plant material to more rapidly become available in mineral form to support plant growth. While this is a positive aspect of controlled grazing, a detailed discussion of mineral cycling by livestock is beyond the scope of this paper.

Various types of compensation ameliorate the impacts of light to moderate livestock grazing on rangeland soils. Soil formation is an ongoing process. Natural soil formation compensates to some extent for erosion that occurs under light to moderate grazing. Natural deposition of soil from overland flow of water replaces some of the soil loss from grazing. Activities of insects and burrowing mammals relieve soil compaction from grazing as does scratching and dusting by birds. Termite activity decomposes manure and accelerates nutrient cycling. Soil compaction by grazing animals occurs primarily in the first 5 cm of soil and seldom extends beyond 15 cm (Reynolds and Packer 1963). Alternate swelling and shrinking of soils from wetting, drying, freezing, and thawing can cause complete recovery from heavy treading within 2 to 3 years (Lusby 1970, Stephenson and Veigel 1987). Under light to moderate livestock treading, most rangeland soils are little impacted or recover within a year or less.

Impacts of Controlled Grazing on Rangeland Wildlife

The impact of livestock grazing on rangeland wildlife is largely dependent on the grazing management practices used. It is important to remember that it is impossible to make broad generalizations on the impact of livestock grazing on rangeland wildlife because each grazing situation is unique, and various wildlife species have different habitat requirements. Therefore, livestock grazing plans should be site-specific and based on the habitat needs of the wildlife species of interest. Important livestock grazing management variables that affect wildlife habitat include stocking rates, stocking density, the age and physiological condition of livestock, grazing season, forage selection, and livestock distribution. Other factors including range condition, soil type, temperature, and precipitation also can greatly effect the relationships between livestock grazing and habitat quality for rangeland wildlife.

During the last 20 years, a vast amount of research has become available on interactions between rangeland wildlife and livestock. However, it also important to note that many scientific studies that have examined the effects of grazing (heavy vs. light or no grazing) tend to be compromised by lack of true controls, weak methodologies, and inaccurate or overly broad quantification of grazing intensity and ecological effects. Despite these limitations in the literature, comprehensive reviews on the interactions between livestock and rangeland wildlife include Holechek et al. (1982), Kie et al. (1994), Krausman (ed.) (1996), and Holechek et al. (2004).

The various ways properly managed livestock grazing can positively impact wildlife are summarized by Holechek et al. (1982), Launchbaugh et al. (1996) and Holechek et al. (2004). These include:

1. Increasing diversity of vegetation composition and improve forage availability and quality for early to mid successional wildlife species.
2. Creating patchy habitat with high structural diversity for feeding, nesting, and hiding.
3. Opening up areas of dense vegetation to improve forging areas, including greater production of forbs, for upland gamebirds and songbirds.
4. Removal of rank, coarse grass to encourage re-growth and improve abundances of high quality forages for wild ungulates.
5. Stimulating browse production by reducing grass biomass.
6. Improving nutritional quality of browse by stimulating plant re-growth.

Various examples of these positive impacts on individual wildlife species are provided by Holechek et al. (1982), Krausman (ed 3.) (1994), and Holechek et al. (2004). However, actual studies evaluating the response of groups of wildlife species on particular rangelands to various grazing programs are limited. The primary research available on this issue comes from a series of studies in the Chihuahuan Desert of southern New Mexico. These studies compared mammal and

bird observations on lightly grazed rangeland in near climax condition, conservatively grazed rangeland in late-seral condition, and moderately grazed rangeland in mid-seral condition. Lightly grazed climax rangelands and conservatively grazed late-seral rangelands had similar songbird and total bird populations but pronghorn, jackrabbits, scaled quail, and mourning dove observations were lower on the climax rangeland (Smith et al. 1996). Overall wildlife diversity was higher on the conservatively grazed late-seral than the lightly grazed climax rangeland. In a follow up study, Nelson et al. (1997) found that total wildlife observations were greater on moderately grazed mid-seral Chihuahuan Desert rangelands compared to conservatively grazed late-seral rangelands (Table 8). Overall wildlife diversity did not differ between mid- and late-seral rangelands. A follow-up study by Joseph et al. (2003) further confirmed the findings of Nelson et al. (1997).

Nelson et al. (1999) evaluated wildlife preferences for grassland (late seral), shrub-grass (mid seral), and shrubland (early seral) communities in the Chihuahuan Desert of New Mexico. They found total observations for birds and mammals were higher in shrub-grass than in grassland or shrubland. Shrubland communities were preferred over grassland communities. In general, plant succession will move toward shrubland communities with heavy livestock grazing, shrub-grass communities with moderate grazing, and grassland communities with conservative to no grazing. These studies (Nelson et al. 1997, Nelson et al. 1999, Joseph et al. 2003) indicate that conservatively to moderately grazed areas in mid or late seral condition supported greater diversity of birds and large mammals than ungrazed areas in climax condition in the Chihuahuan Desert. Therefore, maintaining a patchwork of lightly, conservatively, and moderately grazed pastures appears to provide habitat that supports high wildlife diversity. However, these studies do not provide information on livestock grazing (i.e. grazing intensity) on population dynamics

for particular wildlife species, and some species associated with the Chihuahuan Desert require a high component of herbaceous vegetation for suitable habitat.

Table 8. Average wildlife sightings (sightings km^2) on conservatively grazed late seral and moderately grazed mid seral rangelands in southern New Mexico (From Nelson et al. 1997).

Wildlife species	Late Seral/Conservatively Grazed	Mid Seral/Moderately Grazed
	(Sightings km^2)	
Pronghorn	9.3	0.5
Coyote	0.5	3.1
Jackrabbit	49.1	63.4
Cottontail	8.1	12.4
Total Mammals	67.1	79.6
Mourning dove	12.4	19.3
Scaled quail	8.1	16.2
Total Gamebirds	20.5	35.5
Meadow lark	5.2	14.9
Western kingbird	18.0	20.5
Loggerhead shrike	6.2	13.1
Sparrow/juncos	110.7	138.7
Mockingbird	6.2	14.9
Lark bunting	20.5	42.9
Other songbirds	4.9	23.9
Total songbirds	171.7	268.7
Total raptors	13.1	16.8
Ravens	10.1	11.8
Total other birds	10.6	12.4
Total birds	215.9	333.4
Total wildlife	282.0	413.0

Similar research has evaluated the response of birds and rodents to grazing exclusion and moderate cattle grazing in southeastern Arizona (Bock et al. 1984). In this study, the grazed area supported higher bird numbers during the summer, but densities did not differ in winter. Rodents

were more abundant in the grazing exclusion areas. It was concluded that moderate cattle grazing favors birds over rodents as a class.

With regard to managed livestock grazing systems on particular wildlife species, significant research has been conducted with upland gamebirds and large mammals. For example, Mearns quail and prairie chickens are upland gamebirds sensitive to livestock grazing. Adequate residual bunchgrass cover following the growing season is required for nesting and escaping predators. Grazing use levels of no more than 35% to 40% of forage appear necessary to maintain Mearns quail populations (Brown 1982). Recent research suggests that Mearns quail need a minimum of 20 cm height of bunchgrasses and at least 50% herbaceous cover (Bristow and Ockenfels 2003). Light to moderate cattle grazing can benefit Mearns quail by increasing availability of food plants (Brown 1982, Bristow and Ockenfels 2000). An intensive study of Mearns quail habitat in southeastern Arizona showed more Mearns quail coveys occurred on grazed than ungrazed rangelands (Bristow and Ockenfels, 2000). Grazing intensities were considered to be light to moderate on the areas studies. The investigators cautioned that heavy grazing would be harmful to Mearn quail as demonstrated by Brown (1982) through excessive removal of cover and food.

Studies in New Mexico (Campbell et al. 1973, Saiwana et al. 1998) have indicated that conservative to moderate grazing can benefit scaled quail by improving their mobility through opening up dense grass stands. However, on severely degraded rangelands, any benefits of livestock grazing to scaled quail are doubtful (Joseph 2001).

Livestock grazing can be used to enhance forage for elk, and grazing systems can be used to manage the distribution of elk across habitats within a herd's range. Managed livestock grazing can benefit elk by increasing availability of preferred grasses in early growth stages,

improving nutritive value of herbaceous vegetation, and improving accessibility of high quality grasses by removing surrounding litter. A variety of research projects also illustrate ways to coordinate livestock grazing and mule deer habitat needs. For example, managed livestock grazing and prescribed burning are common tools to maintain or increase shrub production for mule deer. Many rangelands can provide habitat for both pronghorn and livestock. The key is maintaining the rangelands in good ecological condition. Pronghorn thrive in subclimax habitats, but production decreases when excessive livestock grazing produces poor range conditions (Howard et al. 1990). In desert regions in poor ecological condition, the potential for competition between cattle and pronghorn is highest from March to August, when both species are grazing forbs and grasses. For all of these large mammals, carefully managed livestock grazing intensity and timing are critical in accomplishing the objective of maintaining or improving habitat quality.

Analysis of the literature shows many wildlife species are tolerant of moderate grazing, and many appear to benefit from light to conservative grazing. However, studies that clearly isolate grazing as the primary factor endangering specific species are scarce. This is largely due to the fact there have been very few studies designed to detect these relationships. Although there is certainly strong circumstantial evidence that heavy grazing can be a major factor resulting in the decline of several endangered rangeland wildlife species, carefully controlled studies are needed to better examine and understand the relationships between controlled grazing (i.e. light, conservative, and moderate grazing intensity) and endangered species in arid or semiarid environments.

Controlled Livestock Grazing Impacts on Riparian Habitat

Several studies reviewed by Ohmart (1996) and Belsky et al. (1999) have demonstrated that poorly managed livestock grazing can be destructive to riparian habitat. Only recently have studies become available comparing the effects of carefully controlled grazing and grazing exclusion on riparian habitat. In eastern Oregon (Shaw and Clary 1995) and central Idaho (Clary et al. 1999), carefully timed cattle grazing at light to moderate intensities had a similar effect on riparian vegetation as grazing exclusion. Many riparian improvements occurred under both controlled grazing and grazing exclusion in the Idaho study (Clary et al. 1999). It was concluded light to moderate cattle grazing in late spring is compatible with riparian habitat maintenance and improvement.

Unfortunately, in the southwestern United States, research evaluating the effects of controlled grazing on riparian habitat is limited. On the Montana Allotment on the Coronado National Forest in southeastern Arizona, a combination of rest rotation grazing and conservative stocking over a 10-year period resulted in rapid improvement of both riparian vegetation and bank characteristics (Fleming et al. 2001). Hundreds of riparian trees became established in riparian reaches where they had been absent 13 years ago. Based on a system using 10 indicators, riparian health on the Montana Allotment was judged to be excellent. This study shows that well-planned grazing can result in rapid riparian habitat improvement under some conditions in the southwestern United States.

However, in a recent study conducted in south-central New Mexico, Lucas et al. (2004) observed no negative impacts of grazing at light (20-30% forage utilization) and moderate (40-50% forage utilization) levels during the cool, warm, or dormant seasons as compared to areas excluded from grazing. No significant differences were detected between grazed and ungrazed

plots with respect to plant species diversity, runoff and sediment production, stream profiles, or cottonwood numbers and growth. The study observed increasing use of cottonwood saplings during cooler seasons and with increasing grazing intensity but concluded that grazing at these levels during these seasons were within the systems' ability to respond from grazing.

Controlled Livestock Grazing Impacts on Fish

Very little research addresses fish/grazing relationships in the western United States (Rinne 1999). Much of what is known about the effects of grazing on fishes is summarized by Platts (1991) and Rinne (1999). Scientific consensus, as summarized by Platts (1991), has been that grazing has irrefutably harmed fishes and their habitats. Despite this statement, Platt (1991) and Rinne (1999) both acknowledge that controversy exists because published, valid evaluations of grazing strategies as related to fishery productivity are lacking in the literature. Therefore cause and effect are not completely understood between livestock grazing and fishes. After reviewing 166 papers relating to fish and grazing, Rinne (1999) found only 30 that evaluated fish population responses to grazing. The rest were concerned primarily with grazing effects on riparian habitat attributes. After careful dissection, it was found only 3 of the 30 studies contained pretreatment data essential to separate grazing effects from natural variations in populations. Various other experimental limitations were found in these studies such as lack of replication in time and space. Lack of statistical analyses and failure to report in peer-reviewed publications were other important limitations.

Nearly all of the literature on grazing and fishes involves upper-elevation, mountain areas inhabited by coldwater salmonid species (Rinne 1999). Knowledge of grazing effects on salmonids (trout) cannot be readily applied to warm-water species (minnows and suckers)

occupying lower-elevation streams and rivers because their habitat requirements and behavioral traits differ (Rinne and Neary 1997). Several warm-water fish species are threatened or endangered such as the spikedace and Rio Grande sucker. However, lack of research prevents drawing definite inferences about the effects of controlled grazing on this category of fish. Rinne and Neary (1997) found that endangered cyprinid fish populations in the Verde River, Arizona actually disappeared when grazing was excluded. It can be conjectured that grazing strategies that result in riparian habitat improvement will generally benefit salmonid fish species but this may not apply to some warm-water fish species.

Conclusions

Several literature reviews have compared the impacts of unmanaged livestock grazing with grazing exclusion on various components of rangeland ecosystems. These reviews are consistent in showing that unmanaged grazing can be destructive to rangeland vegetation, soils and wildlife habitat. Unfortunately, reviews comparing the impacts of managed livestock grazing to grazing exclusion are limited. Analysis of 20 studies shows that carefully managed grazing can have neutral or in some cases positive effects on plant species composition, productivity, and drought survival.

Although claims have been made that intensive grazing can be beneficial to rangeland soils, over 30 studies are consistent in showing that grazing even at light to moderate intensities adversely impacts soils by increasing compaction, reducing infiltration, and increasing erosion. However, the magnitude of these adverse effects is ameliorated by natural forces that cause soil formation, soil deposition, and soil loosening. Treading of soil by livestock can improve grass seeding establishment and increase mineral cycling, particularly on highly degraded sites.

Managed grazing can be beneficial to some desirable wildlife species. Evidence that grazing at light to conservative intensities has harmed or endangered wildlife species is lacking. Recent research shows some riparian habitats can rapidly improve under properly timed grazing at light to conservative intensities. Poorly controlled grazing can harm habitat of various salmonids but impacts on warm-water fish species are uncertain. Research comparing the impacts of carefully controlled grazing versus grazing exclusion on fish populations is lacking. Habitat for salmonids can improve under controlled grazing, but grazing exclusion may give a faster rate of improvement.

The current literature, particularly that which is readily accessed by the general public (i.e., popular press), is replete with examples of poorly designed studies comparing controlled grazing versus grazing exclusion. Many peer-reviewed research studies that do exist have serious shortcomings. These include lack of pretreatment information, lack of replication in time, lack of replication in space, and failure to apply statistical tests, making it difficult to objectively evaluate many grazing studies conducted in the arid southwest. Well-designed long-term studies are needed that better evaluate the impacts of various grazing intensities and systems versus grazing exclusion on rangeland vegetation. Knowledge of how vegetation is impacted by controlled grazing versus grazing exclusion can be readily used in decisions regarding management of watersheds, wildlife habitat, and fish habitat.

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Via Certified Mail

April 10, 2007

Mr. Steve Spangle, Field Supervisor
U.S. Fish & Wildlife Service
Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, AZ 85021

Re: Petition to List the Cactus Ferruginous Pygmy Owl: Documentation Proving Lack of Substantial Information to Support Livestock Grazing as a Threat to Such at the 90 Day Petition Finding Level

Dear Mr. Spangle,

Recently, you received a petition from the Center for Biological Diversity (CBD) seeking to list the Cactus Ferruginous Pygmy Owl as endangered in Arizona. In that petition, the CBD inaccurately claims that this owl's existence is threatened by livestock grazing. The CBD cites Schulz and Leininger 1990, Armour et al. 1991, Fleishner 1994, Krueper 1996, Ohmart 1994, Belsky et al. 1999, and Abouhaider (1992) as support for its claim.

None of these studies, however, actually support the CBD's claim that livestock grazing threatens the Cactus Ferruginous Pygmy Owl with extinction. First, CBD cites no specific scientific study designed to analyze livestock grazing and the effects of such on Cactus Ferruginous Pygmy Owls because no such study exists. Second, none of the studies cited by the CBD compares controlled livestock grazing -- which is the only form of livestock grazing that occurs on federal lands or on those lands to which Endangered Species Act authority applies -- with grazing exclusion. Third, none of these studies consider critically relevant details that greatly influence experimental outcomes (i.e., grazing intensity, timing and frequency). (*See:* Holechek, 2005, *Controlled Grazing Versus Grazing Exclusion Impacts on Rangeland Ecosystems: What We Have Learned*, attached; *See also:* Milchunas, D.G. 2006. *Responses of Plant Communities to Grazing*

in the Southwestern United States. Gen. Tech. Rep. RMRS-CTR-169, USDA Forest Service, at ftp://ftp-fc.sc.egov.usda.gov/NHQ/nri/ceap/milchunasrmrs_gtrl169.pdf).

For example, neither Belsky's 1999 review nor Fleischner's (1994) review of over 100 grazing versus grazing exclusion studies took into account grazing intensity, timing or frequency – all critically relevant and important details that greatly influence experimental outcomes. Instead, Belsky (1999) reviewed various studies showing that uncontrolled livestock grazing degrades riparian ecosystems, and Fleischner (1994) did not consider any of the thirty-five long-term controlled grazing studies identified by Van Poollen and Lacey (1979) and Holechek, et al. (1999 & 2001) as the foundations of range management. Further, nearly all of the studies considered by Belsky (1999) and Fleischner (1994) have serious flaws including, but not limited to, inadequate design, weak study design, and/or lack of pre-treatment data.

The same failings apply to Schulz and Leininger (1990), Armour et al. (1991), Krueper (1996), and Ohmart (1994). All of these studies/reviews are compromised by weak study design. That is, all lack replication in space and time, all describe grazing treatments so poorly that they cannot be reconstructed, all attempt to draw conclusions by comparing non-uniform experimental units with one another, and, in the case of Abouhaider (1992) particularly, attempt to draw broad conclusion based on the short-term study of excessively small experimental units that do not adequately reflect the area studied.

While there can be no argument with the conclusions of these authors/editors that unmanaged livestock grazing is damaging to rangeland ecosystems, CBD's and Defenders' misuse of such to claim that managed livestock grazing, or livestock grazing as currently conducted on federal lands, threatens the existence of the Cactus Ferruginous Pygmy Owl is wrong and, not surprisingly, unsupported by substantial information.

This is because the CBD and Defenders, like the authors/editors they cite, fail to recognize that severe, heavy, moderate, conservative, and light grazing intensities each have different impacts on rangeland ecosystems. Thus, it is necessary to review those studies that have adequate experimental design to separate controlled grazing from climatic, soil, and other environmental factors in determining what it is that relevant, substantial information on the subject of livestock grazing – or the best scientific and commercial information available -- actually supports.

When those studies having adequate experimental design are reviewed, the conclusions that light to moderate livestock grazing may enhance rangeland vegetation by accelerating plant succession, increase plant diversity, increase plant productivity, and reduce plant mortality during drought are supported by substantial information based solely on the best scientific and commercial information available. (*Id.)* Review of these studies and others (provided hereto in attachment) also reveals that the Petitioners' claim that current livestock grazing practices threatens the Cactus Ferruginous Pygmy Owl with extinction is sheer speculation unsupported by even a scintilla of substantial information.

In closing, livestock grazing as conducted on lands to which ESA jurisdiction applies cannot be identified as a threat to this owl by the Service in reaching a 90-day finding on the CBD's petition to list the Cactus Ferruginous Pygmy Owl because the best scientific and commercial information available overwhelmingly concludes otherwise. Moreover, with your receipt of this letter and those studies, you now have this substantial scientific information in your possession. Therefore, as required by law and your own regulations, your 90-day petition finding must conclude that substantial information does not support the CBD's and Defenders' claim that managed livestock grazing as practiced on lands to which ESA jurisdiction applies poses a threat to this owl's existence.

Thank you for the opportunity to provide this information to you during your initial 90-day review of the CBD's petition to list the Cactus Ferruginous Pygmy Owl as endangered.

Sincerely,

Dennis Parker,
Attorney at Law,
Representing Mr. Jim Chilton & Chilton Ranches

cc: Mr. Jim Chilton

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January 30, 2009

Coronado National Forest
ATTN: Ms. Jennifer Ruyle
Forest Plan Revision Core Team
300 W. Congress St.
Tucson, AZ 85701

Re: Comments on Coronado National Forest Plan Revision Process

Dear Ms. Ruyle,

The following comments on the Coronado National Forest Plan revision process are submitted on behalf of the Southern Arizona Cattlemen's Protective Association. Their purpose is to aid the Coronado National Forest in understanding the needs and concerns of livestock growers, to contribute to the development of a sound information base, and to help the Coronado make better decisions as a result.

1. Controlled Livestock Grazing is an Important, Sustainable and Highly Beneficial Multiple Use of the Coronado National Forest

Although the Core Team recognizes that controlled livestock grazing, as practiced on the Coronado National Forest today, is both sustainable and of possible benefit to rangelands, it cites only one of a considerable number of publications that actually address this subject matter. While the Team does cite Loesser (2007) for support of the proposition that controlled grazing may benefit Arizona rangelands during drought, it does not cite Holechek et al. (2004), which is directly on point with that conclusion, or any of the many other publications where controlled livestock grazing has been variously shown to be environmentally beneficial to a number of plant and animal species (See: citations to publications, attached).

For example, a growing body of scientific literature and data supports the conclusion that controlled livestock grazing does or can provide substantial and positive benefit to native fishes and their habitat. Bayley and Li (2008), Kodric-Brown and Brown (2007), Jackson et al (2006), Saunders and Fausch (2007). Other publications warn of the consequences of ignoring geologic variation in evaluating grazing impacts relative to native warm water fishes and their habitats (Long and Medina, 2006), while yet another warns against making livestock exclusionary management decisions on the basis of the unfounded assumption that livestock grazing has measurable and negative effects on native fishes and their habitats when, in fact, such assumption is unsupported by the existence of any scientific data. Rinne (2004).

Scientific data, obtained both on the Coronado and other National Forest units in Arizona, provide further caution against this assumptive form of decision making. This data supports the conclusion that controlled grazing does and can benefit native warm water fishes and their habitats. For example, on the upper Verde River, native fishes declined from making up over 80% of the aggregate of all fishes found in that part of the river under a controlled livestock grazing regime in 1994 to just 15% of the aggregate of all fishes found there 2008, a little more than a decade after the Forest Service totally excluded livestock from the river (RMRS monitoring data, 1994-2008).

The first to go was the Spikedace, which became extinct in the upper Verde just two years after all livestock were excluded from the river by the Forest Service. Moreover, two of the upper Verde's most formerly common native fishes, the Long-finned Dace and the Speckled Dace, were found in 2008 to be relegated in occurrence to just two privately-owned stretches of the upper Verde River where controlled use by livestock is yet practiced. (RMRS monitoring data, 2008).

Similarly, on the Coronado, in Redrock Canyon near Patagonia specifically, the Gila Topminnow also disappeared entirely a little more than a decade after the exclusion of livestock from its habitat in the absence of NEPA by the Forest Service. In fact, no Gila Topminnows have been detected in Redrock Canyon since 2006. (Petersons, Redrock Ranch, pers. comm. 2008).

Native warm water fishes, however, are not the only species shown to benefit by the practice of carefully controlled livestock grazing. Grassland birds (Bock & Bock et al., 1984), Southwestern willow flycatchers (Brodhead, Stoleson & Finch, 2007), Mearns Quail (Bristow & Ockenfels, 2000), Elk (Anderson & Scherzinger, 1975), Mule Deer (Smith et al, 1979) and terrestrial invertebrates (Saunders & Fausch, 2007), among other species, have also been shown to ecologically benefit from carefully controlled livestock grazing (See: citations, attached).

Clearly, ranching, and controlled grazing as a land use, is ecologically sustainable and compatible with the natural heritage of the Coronado National Forest. Despite the claims of its detractors, the truth of the matter is that ranching keeps lands and landscapes open, stewarded and intact. Ranching also keeps human residential densities low while protecting private lands from fragmentation (Knight, 2007[44]).

Economically, ranching, and its employment of controlled grazing as a land use, provides high quality, locally grown food. Moreover, ranching also pays its own way and supports a fiscally responsible economy (Knight, 2007) sustained by production, rather than a fiscally irresponsible economy based on the illusory and undependable availability of second-hand or production derivative dollars expended by tourists.

Culturally, ranching on the Coronado National Forest extends over a time period of more than 300 years (See: chronology of livestock presence, attached) and, unlike tourism, is one of the oldest consistently productive and sustainable land uses practiced on the Coronado. This thread of historical, cultural and social continuity remains alive and is embodied as an asset by the Coronado's ranchers today.

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[44] Knight, R.L. 2007. *Ranchers as a keystone species in a West that works.* Rangelands 29(5): 4-9.

In sum, as stated by Knight (2007): "[t]he protection of open space, food production, ecosystem services, and the aesthetics of rural areas runs right through agriculture. At the one end stands a rancher, at the other end a developer." As a result, and for all of the other reasons stated above, we urge the Coronado National Forest to consider ranching, and its use of controlled grazing, as an integral and central theme of the Forest Plan revision process. To do less threatens the very future of the values that the public, the Coronado National Forest and its ranchers share most in common.

2. Diminishing T&E Species Numbers Follow Exclusion of Livestock from Their Habitats

As touched upon above, the Spikedace and the Gila Topminnow went extinct in the upper Verde River and Redrock Canyon, respectively, only after exclusion of livestock from those areas by the Forest Service. Ironically, livestock presence was excluded from both of these areas by the Forest Service as allegedly necessary to properly protect these same and respective T& E listed fishes. As previously mentioned, the Spikedace became extinct in the upper Verde only two years after livestock exclusion, while at Redrock, the Gila Topminnow became extinct after about a decade of livestock exclusion on its purported behalf. Unfortunately, these are not the only tragic examples of species decline resulting from assumptive decision making.

The Northern Mexican garter snake provides yet another example. When Arivaca Cienega became known as an "historic locality for both the Mexican garter snake and Chiricahua leopard frog" in 1970 (Rosen and Schwalbe, 1988[45]), livestock grazing had occurred there for the better part of 300 years and was then currently ongoing. It was only after livestock grazing was eliminated from the vast majority of Arivaca Cienega, however, that "extensive snake trapping carried out in the cienega in 1994 and 2000 yielded a total of 3 checkered garter snakes . . . and a single Mexican Garter Snake (2000), along with a single road-killed black-necked garter snake" (Rosen et al. 2001[46]). Similar observations also hold true for the San Bernardino and Buenos Aires National Wildlife Refuges, the lower San Rafael Valley, the Bog Hole in the upper San Rafael Valley, and the Audubon Research Ranch, where Northern Mexican garter snake populations were also reported to have substantially declined (USFWS 2008[47]) after all livestock grazing was eliminated.

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[45] Rosen, P.C. and C.R. Schwalbe. 1988. *Status of the Mexican and narrow-headed garter snakes (Thamnophis eques megalops and Thamnophis rufipunctatus rufipunctatus) in Arizona.* Unpubl. Report from Arizona Game & Fish Dept. (Phoenix, Arizona) to U.S. Fish & Wildlife Service, Albuquerque, New Mexico.

[46] Rosen, P.C., Wallace, J.E. and C.R. Schwalbe. 2001. *Resurvey Of The Mexican Garter Snake (Thamnophis Eques) In Southeastern Arizona.* Unpubl. Report to Arizona Game & Fish Dept. and U.S. Fish & Wildlife Service. 64p.

[47] U.S. Fish & Wildlife Service. 2008. *New 12-month finding for the petition to list the northern Mexican gartersnake as threatened or endangered.* Federal Register, Vol. 73, No. 228, Tuesday, November 25, 2008.

Based on these facts, the rational hypothesis regarding these T&E species' decline is that the exclusion of well-managed, controlled livestock grazing may have contributed to both the diminishment of their numbers and their disappearance from areas of formerly historic and common occurrence. Therefore, we urge the Coronado to include further research of livestock grazing and its controlled use as a tool of possible benefit to fishes, frogs, and garter snakes, consistent with Rosen's recommendation (Rosen et al. 2001, p. 25), as an important and critical component of its revised Forest Plan.

3. Arbitrary Snapshot in Time (circa 1880) Is Neither a Relevant nor Reliable Reference for the Development of Desired Future Conditions

The underlying assumption, seemingly accepted by the Coronado for Forest Plan revision purposes to date, is that because the "pre-settlement" period ended sometime around 1880, and because livestock presence had no lasting environmental effects prior to that time, desired future conditions for the Coronado can be developed based on photographs from, and conjecture relative to conditions thought to be existent, during that period in time. This approach is fundamentally flawed for at least three good reasons.

First, as shown in the chronology of livestock presence attached, it cannot be credibly argued that the presence of livestock had no lasting ecological effects in the Southwest prior to 1880. Instead, as graphically shown in attachment, large-scale stock raising (of both large and small stock) was practiced, subject to intermittent disruption by the Apaches in particular, from 1586 on in northern Mexico and from the 1680s on in southern Arizona (Allen, 1989[48]).

By 1694, 100,000 head of livestock were estimated to be present on ranches which included the upper San Pedro River in southeastern Arizona and the headwaters of the San Pedro and Bavispe Rivers in northeastern Sonora (Allen, 1989). In 1700, 1040 head of livestock (including cattle, sheep and horses) were present at San Xavier del Bac near present day Tucson, while another 1000 head of cattle, along with four droves of horses, were present at nearby San Simon y San Judas del Siboda in northern Sonora (Bolton, 1919[49]).

In fact, by 1700, some of the larger livestock ranches established by the Spanish were those at Sonoita, Babocomari, La Aribac (Arivaca), Calabasas, Sopori, Tubac and San Bernardino in present day southeastern Arizona (Allen, 1989). By 1701, stock ranches were also established in northern Sonora and southeastern Arizona at Caborca, Tubutama, Imuris, Quiburi (confluence of the San Pedro and Babocomari Creek),

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[48] Allen, L.S. 1989. *Roots of the Arizona Livestock Industry*. Rangelands 11(1): 9-13, February, 1989.

[49] Bolton, H.E. 1919. *Kino's Historical Memoir of Pimeria Alta, 1683-1711.* Vols. I, II. The Arthur H. Clark Company, Cleveland, Ohio. 396p., 342 p.

Bacoancos, Guevavi, Busanic, San Lazaro, Saric, Santa Barbara and Santa Eulalia (Bolton, 1919).

While it is true that troubles with both the Pimas and Apaches caused the temporary abandonment of many of these livestock operations on many occasions over time, such abandonment was generally relatively short-lived in duration. For example, the Pima Revolt of 1751 lasted only a few months before peace was restored (Bancroft, 1884[50]), and by 1752, the Spanish had established a presidio at Tubac (Allen, 1989). The exception to this general condition is the time period from about 1767, when the Jesuits were expelled from New Spain (Wagoner, 1975[51]), to about 1800, when a period of relative peace with the Apaches ensued. During this 30-40 year time period of general abandonment, however, several large ranches were also established (Allen, 1989).

Beginning in 1800, and lasting through the early 1830s, a time of relative peace with the Apaches resulted in the reestablishment of the same ranches originally founded in the early 1700s by the Spanish. During this time period, approximately 100,000 head of cattle were present on the San Bernardino Ranch alone, and large herds were growing in the Altar, Santa Cruz and San Pedro valleys as well (Allen, 1989). The magnitude of stock raising at this time, on lands either within or adjacent to the present day Coronado National Forest, was high, as is exemplified by the many land grants petitioned for and confirmed during this time period (Wagoner, 1975; see also: chronology, attached).

By 1830, approximately 30,000 head of horses, possessed by the Apaches, were present in the Gila River watershed of present day Arizona and New Mexico (Allen, 1989), and by the early 1830s, renewed Apache depredations resulted in the abandonment of the San Bernardino again, with approximately 100,000 head of cattle going wild (Allen, 1989).

However, not all of the large ranches were abandoned during the early 1830s. The Maria Santisima del Carmen (Buena Vista), for one, was occupied continuously for stock raising from the early 1800s until 1851 (Wagoner, 1975).

Similarly, on the Babocomari, large herds of cattle and horses flourished until 1846. At that time, the Babocomari was one of the largest cattle establishments in the then Mexican state of Sonora (Wagoner, 1975). In 1846, however, renewed depredations by Apaches caused the abandonment of the Babocomari (as well as most other haciendas in the region) and resulted in many thousands of head of cattle, horses and mules going wild (Allen, 1989, Wagoner 1975). Wild cattle became abundant in southern Arizona at this time (Allen, 1989), and in 1851, Bartlett estimated that up to 40,000 head of wild

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[50] Bancroft, H.H. 1884. *History Of The North Mexican States.* Vol. I. 1581-1800. A.L. Bancroft & Company, San Francisco, California. 751p.

[51] Wagoner, J.J. 1975. *Early Arizona: Prehistory to Civil War.* The University of Arizona Press, Tucson, Arizona. 547p.

cattle, plus a large number of horses and mules, then ranged along the entire length of the upper San Pedro River and its tributaries (Wagoner, 1975).

By 1855, the Canoa was occupied by Pete Kitchen and ranches adjoining the Canoa along the Santa Cruz River were also again occupied by 1857 (Wagoner, 1975). With the coming of the Civil War in 1861, and until its end in 1865, Apache depredations again accelerated and caused relocation or abandonment of many ranches. In 1862, Pete Kitchen removed his stock raising operation to Portero, northwest of present day Nogales, and was one of the few ranchers (along with Tom Gardner on Sonoita Creek) who were able to weather the Apache hostilities of the 1861-1865 time period in the Sonoita Creek / Nogales area. On the other hand, during this same time period, Pedro Aguirre established the Buenos Aires Ranch in the Altar Valley in Arizona in 1864 (F&WS, 2008[52]).

By 1870, Maish and Driscoll were running 300 head of cattle at the Canoa (Wagoner, 1975), and by 1876, range use in Arizona was rapidly expanding (Allen, 1989). In 1877, stock raising had become a leading industry in the Arizona Territory with hundreds of thousands of cattle coming in from adjacent states (Allen, 1989).

Although Apache depredations continued through this time period (1870-1886), ranches continued to be established – even in the Apache stronghold of northwest Chihuahua, where, in 1882, Jack Bailey of Texas reestablished the old Spanish hacienda, San Jose de Bavicora, as a massive stock raising operation (Remington, 1893). In 1884, Texas John Slaughter purchased the old San Bernardino (Allen, 1989) and began stocking it again, and, by 1885, Maish and Driscoll were running 10,900 head of livestock on the Canoa alone (Wagoner, 1975).

By 1890, Slaughter & Lang were running 50,000 head of cattle on the San Bernardino. In 1891, 1.5 million head of livestock were estimated to be occupying Arizona's rangelands as a whole (Allen, 1989).

In 1892, the worst drought on record hit Arizona, and during that year, cattle began to die by the thousands. Fifty to seventy-five % of the animals on the range perished during the summer of 1893, and only 250 head of calves were branded between Florence and Tucson that year. By June of 1893, over 200,000 cattle were shipped from Arizona's rangelands (Allen, 1989). How many remained on the ground is a matter of conjecture, although it is highly likely that more than 50,000 head remained on the range at the drought's end.

This is because the drought did not affect everyone equally. Unlike many ranches in Arizona, the San Bernardino had a natural supply of water from the Rio Yaqui drainage and extensive water developments, including drilled artesian wells and a lake

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[52]U.S. Fish and Wildlife Service Buenos Aires National Wildlife Refuge
http://www.fws.gov/southwest/refuges/Arizona/buenosaires/history.html

backed up by a cement dam. These natural and developed waters saved John Slaughter during the severe drought of 1892-93 when many other cattlemen went under (Wagoner, 1975; Discover S.E. AZ., 2008[53]).

Similarly, the hacienda San Jose de Bavicora in northwest Chihuahua not only survived, but thrived during the 1892-93 time period. In 1893, 200 cowboys tended thousands of head of cattle and many horses on the San Jose de Bavicora, and there is no contemporary mention of drought (Remington, 1893[54]; Remington, 1895[55]).

Many of southern Arizona's smaller ranches, established during the 1870s and 1880s, also survived the drought of 1892-93 and began to thrive again thereafter. Today, many of these same ranches are sustainably operated by the descendants of those who founded them.

Clearly, as evidenced by the foregoing, desired future conditions for the Coronado cannot be based on conditions thought to exist circa 1880, because it is patent fiction to suggest that that time period somehow represents what "pre-settlement" conditions were like on the Coronado. To base desired future conditions on actual pre-settlement conditions, one must know what those conditions were on the Coronado prior to 1700 (at the latest). Because we do not know what those conditions were, we cannot possibly base desired future conditions on an assessment of actual pre-settlement conditions, let alone attempt to do so by use of the circa 1880 time period as an inadequate surrogate.

Second, desired future conditions cannot be based on a snapshot in time because, unlike a snaphot, the ecosystems of the Coronado never have been, nor currently are, static in nature. Rather, these ecosystems are constantly responding to changes in and the nuances of meteorological regimes. The recent work of Webb, Leake & Turner (2007[56]) is highly instructive in this regard.

Based on 2,724 sets of repeat photographs spanning, in some instances, more than 120 years, these researchers concluded that riparian vegetation was remarkably sparse overall, and only very localized in abundant occurrence, in Arizona during the 1863-1900 time period (Webb, Leake & Turner, 2007). They also establish that riparian vegetation in Arizona experienced a marked and overall increase beginning in about 1940, and did so irrespective of the presence of domestic livestock (*Id.*). These researchers also found

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[53] http://www.discoverseaz.com/History/SanBernRnch.html Accessed December 15, 2013

[54] Remington, F. 1893. *An Outpost of Civilization.* Harper's new monthly magazine, New York. Vol. 88 (523), December, 1893.

[55] Remington, F. 1895. *Pony Tracks.* Harper and Brothers, New York. 294p.

[56] Webb, R.H., Leake, S.A. and R.M. Turner. 2007. *The Ribbon of Green.* The University of Arizona Press, Tucson, Arizona. 462p.

that increases in density of riparian woody plants appear to have accelerated after the 1970s, and that those increases were followed by increases in plant size. Moreover, no relation between changes in riparian vegetation and elevation, latitude or longitude was detected (*Id.*).

Further, Webb, Leake & Turner (2007) provide substantial evidence indicating that a period of regional storms, characterized by intensive flood events accompanied by arroyo cutting and filling, beginning during the pre and early settlement periods in Arizona and ending about 1940, was mainly responsible for the relative paucity and/or localization of abundant riparian woody vegetation observed along Arizona's rivers and streams during the 1863-1940 time period. When it is further considered that cottonwood was found to have increased by 69% overall in Arizona since 1940 (*Id.*), the error of basing desired future riparian conditions on riparian conditions as they existed circa 1880 – when riparian vegetation was remarkably sparse overall (as opposed to today when it is far more abundant) – is clearly obvious.

Third, and equally obvious, is the inability of the circa 1880 "pre-settlement" snapshot to include Mesquite, which was very sparse in occurrence on or adjacent to the rangelands of the Coronado prior to the early 1900s, as a species of import in the development of desired future conditions. Today, Mesquite is a predominant tree species, found up to more than 5,000 feet in elevation, on and adjacent to the rangelands of the Coronado. The presence of Mesquite and other thorny pea family shrubs and trees, such as *Mimosa dysocarpa*, Cat-claw mimosa and Cat-claw Acacia, helps support several species of birds whose ranges are predominantly more southerly. Examples of such include Gray Hawks, Varied Buntings, Thick-billed Kingbirds and Violet-crowned Hummingbirds, among several others. Obviously, then, because use of a circa 1880 snapshot as a basis for identifying desired future conditions cannot possibly recognize the importance of Mesquite or these species' close association with it, this methodology of approach fails for this additional reason as well.

Rather, the better and much more defendable approach is to allow sound management, confirmed by scientifically conducted monitoring and assessment, to determine desired future conditions. For ranching and rangelands, scientific protocols are established that include evaluation of riparian health (Fleming, Galt & Holechek, 2001[57]). Moreover, this approach would have great utility because it is consistent with that adopted in the 2008 draft of the Pima County Multi Species Conservation Plan. As a result, we urge the Coronado to adopt sound management, confirmed by scientifically conducted monitoring and assessment, as the determiner or driver of desired future conditions, rather than attempting do so by adoption of an arbitrary period in time.

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[57] Fleming, W., Galt, D. and J.L. Holechek. 2001. *Ten Steps to Evaluate Rangeland and Riparian Health.* Rangelands 23(6): 22-27.

4. Tourism and Recreational Revenues Are Not Production Dollars and Therefore Cannot be Described or Treated as Such or Relied Upon as Sustainable

The underlying assumption, seemingly accepted by the Coronado for purposes of Forest Plan revision to date, is that tourism and recreational dollars can be regarded as production dollars. This is certainly not the case. Only actual production creates new wealth without which no economy is fiscally sustainable.

Here, the tourism and recreational revenues apparently regarded by the Forest to date as production dollars are, in fact, actually second-hand or recycled derivatives of production dollars. As such, their availability is squarely dependent on the hea lth of the production economy that underpins them. Thus, when the economy slows, as it currently has, the availability of these second-hand dollars diminishes and becomes highly undependable. As a result, these derivative dollars do not represent a sustainable or dependable source of revenue that can be readily counted upon by the Forest Service.

On the other hand, revenues provided by ranching are both sustainable and dependable because they are primary, production dollars that contribute to the health of the production economy that underpins them. As a result, we urge the Forest Service to properly segregate tourism and recreational revenues from those revenues resulting from actual production in its revised Forest Plan. We also urge the Forest to recognize, within its revised Forest Plan, that controlled livestock grazing, as a sustainable production economy practice, is critical to the long-term health and sustainability of the Coronado National Forest as a whole (especially in regard to intact landscapes, open land, species benefit and the continuing practice of multiple use).

5. Public Access to the Forest Through Private Lands

While the Forest Plan revision process devotes considerable discussion to this continuing problem, it offers no reasonable solution. Moreover, by dismissing legitimate private landowner liability concerns as merely "perceived," the Forest Plan revision process to date actually does this continuing problem a disservice while missing a golden opportunity to correct this unfortunate situation.

That golden opportunity is to establish a legal mechanism within the Forest Plan by which landowners who allow public access across their lands to the Forest are immunized from potential liability to the extent allowed by law for doing so. This could be accomplished through contract by which, in exchange for allowing the public access to the Forest through their private lands, private landowners are indemnified by the United States for doing so to the maximum extent allowable under Arizona and federal law. As a result, we also urge the Coronado Forest to adopt this contract approach as the means of addressing and solving the continuing public access through private property problem.

Thank you for the opportunity to comment on the Coronado National Forest's Forest Plan revision process. We look forward to contributing additional input to the Coronado as this Forest Plan revision process evolves and opportunity allows.

Sincerely,

Dennis Parker,
Attorney at Law,
Representing the Southern Arizona Cattlemen's Protective Association

cc: Dr. Ted Noon

Chronology of Livestock Presence in American Southwest and Northern Mexico (1531 – 1913)
Compiled by Dennis Parker

Year	Name / Location	Number of livestock	Citation
1531	Guzman, Rio Mayo, Alamos, present day southern Sonora	unknown number of horses & hogs, the latter of which took five days to butcher	Bancroft (1884)
1539	Fray Marcos de Niza, N. Mex.,	unknown number of horses and other stock	Bolton (1919)
1542	Coronado, N. Mex., present day Arizona, New Mexico	>6000 (5000 sheep, 150 cattle, several hundred horses)	Allen (1989)
1586	Diego de Ibarra, N. Mex.,	33,000	Allen (1989)
1586	Rodrigo Rio de la Loza, N. Mex., (neighbored Ibarra)	42,000	Allen (1989)
1598	Onate, Caypa, 40 miles west of present day Santa Fe, NM	7,000 (cattle, sheep, goats)	Wagoner (1975)
1613	Father Pedro Mendez, Rio Mayo, present day Sonora, Mexico	numbers not provided	Wagoner (1975)
1680	Jose Romo de Vivar, San Lazaro, Sonora, upper Santa Cruz River	numbers not provided	Center for Desert Archeology (2005)[58]
1683	Guevavi, near present day Nogales, Arizona, upper Santa Cruz River	numbers not provided	Wagoner (1975)
1687	Padre Eusebio Kino arrives at Nuestra Senora de los Dolores, San Cacurpe, Rio San Miguel, present day northern Sonora	----------	Wagoner (1975)

[58] http://www.cdarc.org/pages/what/current/SCNHA/chapter_04.pdf

1692	Northern Mexico	100,000 (cattle & sheep)	Allen (1989)
1694	SE Arizona, NE Sonora ranches including headwaters of the the San Pedro in SE Arizona, and the headwaters of the Rio Bavispe, in NE Sonora	100,000	Allen (1989)
1695	By 1695, Father Eusebio Kino had established a chain of missions up and down the valleys of the Altar and Magdalena Rivers and another chain northeast of Senora de los Dolores. Each were stocked, to some degree, with livestock received from Padre Kino		Bolton (1919)
1695	Father Saeta, San Cayetano, present day Arizona	sheep & goats	Bolton (1919)
1695	Father Saeta, San Xavier del Bac, present day Arizona	some cattle	Bolton (1919)
1695	Father Saeta, Caborca, Sonora; Father Saeta killed by Pimas on April 1 and livestock stampeded and scattered; most of the stock rounded up and driven to Dolores; peace restored with Pimas in August	> 220 (105 cattle, 115 sheep plus horse herd)	Wagoner (1975)
1695	Padre Kino, Tumacacori, Santa Cruz River, NW of Nogales, present day Arizona	cattle & sheep	Wagoner (1975)
1696	Padre Kino, Quiburi, confluence of Babocomari Creek & San Pedro River, present day Arizona	a few head of cattle & a small drove of mares	Bolton (1919)
1697	Padre Kino, Quiburi	100 (cattle alone)	Wagoner (1975)
1697	Santa Cruz de Gaybanipitea, San Pedro River, upstream of Quiburi, present day Arizona	100 (cattle alone)	Manje (1954)[59]

[59] Manje, Juan Mateo. *Luz de Tierra Incognito: Unknown Arizona and Sonora, 1693-1721*. Translated by Harry J. Karns and associates. Tucson: Arizona Silhouettes, 1954.

1697	Padre Kino, Cocospera, upper Santa Cruz River, present day northern Sonora	>1000 (500 cattle, 500 sheep & goats, 2 droves of mares, 1 drove of horses & oxen)	Bolton (1919)
1697	Padre Kino, San Xavier del Bac, present day Arizona	cattle, sheep, goats & a small drove of mares	Bolton (1919)
1698	Los Reyes de Sonoidag, Sonoita Creek near present day Patagonia, Arizona	numbers unknown	Wagoner (1975)
1699	Early Spanish ranches – some of the larger ranches were at Sonoita, Babocomari, Arivaca, Calabasas, Sopori, Tubac and San Bernardino	numbers unknown	Allen (1989)
1699	Padre Kino, San Marcel del Sonoidag, Quitobaquito Springs, Arizona / Sonora border	36	Manje (1954)
1699	Padre Kino, San Luys de Bacoancos, Santa Cruz River, upstream from Guevavi, present day Arizona	>210 (7 cattle, 200 sheep & goats, & a small drove of mares & colts)	Bolton (1919)
1699	Padre Kino, El Tubutama, Rio Concepcion, northern Sonora	100 (cattle & small stock)	Bolton (1919)
1700	Padre Kino, San Marcel del Sonoidag, Quitobaquito Springs, Arizona / Sonora border	100 (50 cattle)	Manje (1954) Bolton (1919)
1700	Padre Kino, San Lazaro, upper Santa Cruz River, present day Sonora	>170 (150 cattle, 117 sheep & goats, & small drove of mares)	Bolton (1919)
1700	Padre Kino, Guevavi, Santa Cruz River, present day Arizona	84 (sheep & goats)	Manje (1954)
1700	Padre Kino, San Xavier del Bac present day Tucson, Arizona	>1040 (1000 cattle,	Wagoner (1975) Bolton (1919)

		40 sheep & small drove of mares)	
1700	Padre Kino, San Simon y San Judas del Siboda, N. Sonora	>1000 (1000 cattle, 4 droves of horses)	Bolton (1919)
1700	Padre Kino, La Concepcion del Caborca, present day Sonora	200 (100 cattle, 100 sheep & goats)	Bolton (1919)
1700	Padre Kino, El Tubutama, Rio Concepcion, present day Sonora	150 (50 cattle, 100 sheep & goats)	Bolton (1919)
1700	Padre Kino, San Ambrosio del Busanic y del Tucubabia, present day northern Sonora	>160 (70 cattle, 70 sheep & goats, 5 droves of mares)	Bolton (1919)
1700	Nuestra Senora de los Dolores, Rio San Miguel, Sonora	1400 (cattle alone)	Bolton (1919)
1700	Padre Kino gives Father Salvatierra 300 head of cattle, 200 of which are shipped by boat to Baja California for mission establishment there. This was repeated several times.	300 (cattle alone)	Bolton (1919)
1701	Guevavi established as Cabecera	600 (400 cows, 200 sheep)	Manje (1954) Desert Mag.(1966)[60]
1701	San Marcel del Sonoidag, Quitobaquito Springs, Arizona / Sonora Border	80 (cattle)	Manje (1954)
1701	Padre Kino, Rancho San Simon y San Judas del Siboda, present day Sonora	>1000 (1000 cattle, 7 droves of mares, plus sufficient numbers of horses and mules for all the new missions being founded)	Bolton (1919)

[60] http://www.scribd.com/doc/2402508/196612-Desert-Magazine-1966-December

1701	Padre Kino, El Saric, Rio Concepcion, present day northern Sonora	80 (sheep & goats)	Bolton (1919)
1701	Padre Kino, Rancho San Luys, Santa Cruz River upstream from Guevavi, present day Arizona	340 (cattle alone)	Bolton (1919)
1701	Padre Kino, Tubutama, Rio Concepcion, Sonora	>100 (80 cattle, 4 droves of mares)	Bolton (1919)
1701	Padre Kino, San Ambrosio, N. Sonora ?	>150 (135 cattle, 3 droves of mares	Bolton (1919)
1701	Padre Kino, Rancho Cucurpe, Rio San Miguel, northern Sonora: Apaches sack Rancho Cucurpe, carry off all sheep and goats and some horses; horses recovered; most sheep and goats also recovered	200 (cattle, sheep, goats & horses)	Bolton (1919)
1701	By 1701, stock ranches were established by Padre Kino, or directly under his supervision, at Dolores, Caborca, Tubutama, Imuris, Quiburi, Tumacacori, Cocospera, San Xavier del Bac, Bacoancos, Guevavi, Siboda, Busanic, Sonoita, San Lazaro, Saric, Santa Barbara and Santa Eulalia		Bolton (1919)
1702	By 1702, had established the beginnings of ranching in the valleys of the Altar, Magdalena, Santa Cruz and Sonoita	4200 (cattle alone, missions of the Pimeria Alta)	Bolton (1919)
1703	Padre Kino, missions of the Pimeria Alta	1000 (sheep & goats)	Bolton (1919)
1705	Padre Kino, Santa Maria de Bagota, 22 leagues (66 miles) north of Dolores, Sonora	>400 (300 cattle, 100 sheep & goats, a drove of mares & a drove of horses)	Bolton (1919)
1705	Padre Kino, San Marcel del Sonoidag, Quitobaquito Springs	65 (cattle alone)	Bolton (1919)
1706	Padre Kino, San Lazaro, upper	23	Bolton (1919)

	Santa Cruz River, northern Sonora	(cattle alone)	
1707	Padre Kino, Santa Gertrudis del Saric, San Bernardino de Aquimuri, Rio Concepcion, northern Sonora	> 200 (cattle, sheep, goats & 5 droves of mares)	Bolton (1919)
1751	Pima Revolt – nearly all Haciendas abandoned		Wagoner (1975)
1752	Presidio established at Tubac – for the next century or so, ranching in Arizona prospered or declined at the whim of the Apaches, but several large herds were established	numbers not provided	Bancroft (1884) Allen (1989)
1770	Hacienda San Jose de Bavicora established, NW Chihuahua	numbers not provided	Remington (1893)
1774	de Anza, Arivaca Cienega, Arizona; de Anza states La Aribac had been inhabited until 1751 and estimates, based on experience, that more than 5,000 head of large stock could be sustained here.	numbers not provided	Bolton (1930)[61]
1800 – 1820s	Same ranches occupied in early 1700s reestablished; herds grow in Altar, Santa Cruz, San Pedro and San Bernardino Valleys	numbers not provided	Allen (1989)
1812	Augustin Ortiz, La Aribac, Arivaca, AZ	numbers not provided	Wagoner (1975)
1820	Tomas & Ignacio Ortiz, La Canoa, Santa Cruz River, present day Arizona	numbers not provided	Wagoner (1975)
1821	Ignacio de Perez, San Bernardino, southeastern Arizona	thousands of head of cattle, horses and mules	Wagoner (1975)
1821	Leon Herreros, San Jose de Sonoita, Sonoita Creek near Patagonia, AZ	rapidly increasing herd of cattle	Wagoner (1975)

[61] Bolton, H.E. 1930. *Anza's California Expeditions, Volume II*. University of California Press, Berkeley, California.

1821	Manuel Bustillo, San Rafael de la Zanja, San Rafael Valley, Arizona	considerable numbers of livestock	Wagoner (1975)
1826	Francisco Jose de Tuvera, Maria Santisima del Carmen (Buena Vista), Santa Cruz River, near present day Kino Springs, both sides of present day international border	occupied for stock raising until 1851	Wagoner (1975)
1827	San Ignacio del Babocomari, Don Ignacio & Donna Eulalia Elias Gonzalez, San Pedro and Santa Cruz watersheds, southern Arizona	large herds of cattle and horses; herds flourished until about 1846 when abandoned due to Apache depredations; one of the largest cattle establishments in the then Mexican state of Sonora	Wagoner (1975)
1827	Rafael Elias Gonzalez, San Rafael del Valle, San Pedro River near present day Hereford, Arizona	large herds of cattle and cultivation; eventually deserted due to Apache depredations	Wagoner (1975)
1827	Ignacio Elias Gonzalez and Nepomucinco Felix, San Juan de las Boquillas y Nogales, both banks of the San Pedro River extending about an equal distance from the north and south juncture of Babocomari Creek, Arizona; included old Kino rancheria site	no information on numbers	Wagoner (1975)
1830	Apaches, Gila River Watershed, Arizona and New Mexico	30,000 horses	Allen (1989)
1830s	San Bernardino Ranch again abandoned	100,000 head of cattle go wild	Allen (1989)
1840	Hacienda San Jose de Bavicora, northwest Chihuahua; sacked by Apaches and stock run off; abandoned until 1882	numbers not provided	Remington (1893)
1846	Most haciendas abandoned again	wild cattle abundant	Allen (1989)

		in southern Arizona; groups of 5 or 6 cows with each bull	
1851	San Ignacio del Babocomari, San Pedro River and Santa, Cruz watersheds, southern Arizona	40,000 cattle plus a large number of horses & mules; wild cattle range along the entire length of the San Pedro River and its Tributaries	Allen (1989), Wagoner (1975)
1854	Gandara, Hulsemann Calabasas Ranch, confluence of Sonoita Creek and Santa Cruz River, Arizona	>6300 (200 cattle, 5,000 sheep, 1,000 goats, 100 brood mares, 10 horses, 6 pack mules & 10 yokes of oxen)	Wagoner (1975)
1857	Canoa, adjoining ranches, Santa Cruz River, Arizona	280 (stolen by Apaches)	Wagoner (1975)
1857	Bill Kirkland, Canoa	200 (apparently stolen by Apaches in 1860)	Wagoner (1975)
1855 - 1862	Pete Kitchen, Canoa	numbers not provided	Wagoner (1975)
1861 - 1865	Civil War		
1862	Pete Kitchen, Portrero, near present day Nogales, Arizona	numbers not provided	Wagoner (1975)
1864	Pedro Aguirre, Buenos Aires, Altar Valley, Arizona	numbers not provided	F&WS (2008)
1865	large herds of longhorns brought to Arizona from Texas	numbers not provided	Allen (1989)
1870	census indicating only 5,132 head of cattle in Arizona is highly suspect	5,132	Allen (1989)
1870	Maish & Driscoll, Canoa	300	Wagoner (1975)
1876 - 1880	Range use in Arizona	numbers	Allen (1989)

	rapidly expands	not provided	
1877	Arizona Governor Safford reports that stock raising is a major industry with hundreds of thousands of cattle coming in from adjacent states	>100,000	Allen (1989)
1879	Adolphus Noon establishes the Oro Blanco Ranch south of Arivaca. This ranch is still in operation today as a sustainable family ranching enterprise that has been passed down through 4 generations of family members		Personal communication
1882	Jack Bailey reestablishes hacienda San Jose de Bavicora as cattle ranch, NW Chihuahua	numbers not provided	Remington (1893)
1884	Maish & Driscoll, Canoa	10,000	Wagoner (1975)
1885	Maish & Driscoll, Canoa	>10,900 (including 500 horses & 400 Durham and Devon bulls)	Wagoner (1975)
1884	Texas John Slaughter purchases the San Bernardino	numbers not provided	Allen (1989)
1885	Cattle claimed by later reviewers to be present in sufficient numbers to severely lower the vigor of native grass plants	numbers not provided	Allen (1989)
1890	Slaughter, Lang, San Bernardino, Arizona / Sonora	50,000 (cattle alone)	Wagoner (1975)
1891	Arizona as a whole	1,500,000	Allen (1989)
1892 - 1893	Worst drought on record		Allen (1989)
1892	Arizona as a whole – cattle began to die by the thousands	numbers not provided	Allen (1989)
1893	Arizona as a whole – 50-75% of the animals on the range perished during the summer; only 250 head of calves branded between Florence	numbers not provided	Allen (1989)

	and Tucson that year; by June, over 200,000 cattle shipped from Arizona's rangelands		
1893	Unlike many ranches in Arizona, the San Bernardino had a natural supply of water from the Rio Yaqui drainage and extensive water developments, including artesian wells that were drilled and a lake backed up by a cement dam. These waters saved Slaughter during the severe drought of 1892-93 when many other cattlemen went under.	<50,000	Wagoner (1977) Discover S.E. AZ. (2008)
1893	Southern Arizona – no breakdown of numbers of livestock provided, but fair to say, in view of the preceding, that more than 50,000 head of cattle probably yet existed in southern Arizona where natural or developed waters persisted to the conclusion of this drought in 1893.	numbers not provided; > 50,000 likely	Allen (1989)
1893	Bailey, hacienda San Jose de Bavicora, NW Chihuahua; no mention of drought	thousands of cattle, 200 cowboys employed, many horses	Remington (1893), Remington (1895)
1902	Establishment of Forest Reserves		Allen (1989)
1913	Proctor Ranch, west side of the Santa Rita Mountains, southern Arizona (present day Santa Rita Experimental Range)	last year Blue Gramma was hayed	George Proctor, pers. comm., (2008)

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News Release

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ENDANGERED SPECIES ACT PROTECTION PROPOSED FOR TWO SOUTHWEST GARTERSNAKES AND THEIR HABITAT

The U.S. Fish and Wildlife Service is proposing to classify the northern Mexican gartersnake and the narrow-headed gartersnake as threatened under the Endangered Species Act (Act). Both snakes are predominantly aquatic; both occur in Arizona and New Mexico (the northern Mexican gartersnake also occurs in Mexico). The proposal to protect the species, to be published in the *Federal Register* tomorrow, also identifies habitat important to the conservation of both species. The Service is seeking comment on the proposals through September 9, 2013.

Northern Mexican gartersnake and narrow-headed gartersnake populations have declined primarily from interactions with nonnative bullfrogs, crayfish, and nonnative spiny-rayed fish. The nonnative species prey upon, or compete with, the gartersnakes and the native prey species that are vital to their existence. Human activities that diminish surface water or degrade streamside (riparian) vegetation are also significant threats, but particularly where they co-occur in the presence of nonnative species. Efforts to control nonnative predators and restore native aquatic and riparian communities could significantly benefit both gartersnakes and a suite of other imperiled native fish and amphibian species throughout their range.

“Many Americans’ earliest outdoor recollections include memories of frogs and gartersnakes at a family swimming hole,” said Steve Spangle, Arizona Field Supervisor. “Taking care of these Southwestern critters and habitats today, may guarantee our kids and grandkids can have such important experiences.”

The Service has identified areas in which Federal agencies can assist in the conservation of the species through habitat management. In total, approximately 421,423 acres, including 912 stream miles are being proposed as critical habitat for the northern Mexican gartersnake and 210,189 acres, along 1,503 stream miles are being proposed for the narrow-headed gartersnake in seven counties in Arizona and four counties in New Mexico. The northern Mexican gartersnake may occur along streams or use seeps, springs, cienegas, and ponds within regional grassland landscapes while the narrow-headed gartersnake occurs primarily along streams. There is overlap in the proposed critical habitat for these species.

Critical habitat is a term in the Act that identifies geographic areas containing features essential for the conservation of a threatened or endangered species, and which may require special management considerations or protection. Federal agencies that undertake, fund or permit activities that may affect critical habitat are required to consult with the Service to ensure such actions do not adversely modify or destroy designated critical habitat. Designation of critical habitat does not affect land ownership, or establish a refuge or preserve, and has no impact on private landowners taking actions on their land that do not require federal funding or permits.

Some northern Mexican gartersnakes occupy stock tanks, or impoundments maintained by cattlemen as livestock watering holes. Today's proposal includes a special rule under Section 4(d) of the Act exempting operation and maintenance of livestock tanks on private, State, and tribal lands from the Act's prohibitions on "take" of listed species. Landowners will not be in violation of the Act should they or their livestock harass, harm or kill a gartersnake during normal use, operation and maintenance of their livestock tanks.

"Livestock operations do not pose a significant threat to either gartersnake; in fact many ranchers have created and maintain habitat for northern Mexican gartersnakes," said Spangle. "In 2002, we provided regulatory flexibility for livestock operators at threatened Chiricahua leopard frog waters. Their resulting stewardship has netted remarkable recovery advances for the frog – we anticipate similar results for the gartersnake."

The northern Mexican gartersnake can grow to 44 inches, and lives in dense vegetation along the banks or in the shallows of wetlands (cienegas and stock tanks) and stream pool or backwater habitats. Historically, the snake lived in perennial rivers, intermittent streams and isolated wetlands throughout the southern half of Arizona, extreme western New Mexico, and the Sierra Madre Occidental and Mexican Plateau in Mexico. Currently, within the United States, the northern Mexican gartersnake is believed to be constrained to the middle/upper Verde River drainage, middle/lower Tonto Creek, the San Rafael Valley, the Bill Williams River and a few isolated wetland habitats and stream reaches in southeastern Arizona. Its persistence in other areas is believed to be tenuous.

The smaller (up to 34-inch), narrow-headed gartersnake is the most aquatic of the southwestern gartersnakes and is a specialized predator on native fish species and trout found primarily in clear, rocky, higher-elevation streams along the Mogollon Rim from northern and eastern Arizona into southwestern New Mexico. Females of both species give live birth to their young.

Comments on the proposals to list the gartersnakes and designate critical habitat must be received by COB September 9, 2013, and can be submitted by one of the following methods:

- Federal eRulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments on the critical habitat proposal and associated draft analyses to Docket No. FWS–R2–ES–2013–0022; or
- U.S. mail or hand-delivery: Public Comments Processing, Attn: FWS–R2–ES–2013–0022; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

More information on the proposed rule, maps, and other details about the gartersnakes are available online at: http://www.fws.gov/southwest/es/arizona/.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service. For more information on our work and the people who make it happen, visit ***www.fws.gov****. Connect with our Facebook page at www.facebook.com/usfws, follow our tweets at www.twitter.com/usfwshq, watch our YouTube Channel at http://www.youtube.com/usfws and download photos from our Flickr page at http://www.flickr.com/photos/usfwshq.*

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