

Deterioration of Southern Arizona's Grasslands: Effects of New Federal Legislation Concerning Public Grazing Lands

David T. Cox

INTRODUCTION

The underlying assumption of this Note is that extensive environmental change, when discovered to be caused by man's technological advantage over other existing biotic factors in utilizing the environment, is something bad. Although man is still very much a part of the "natural ecosystem," a vague uneasiness exists that man can collapse the system either intentionally or unintentionally. As long as man's manipulative abilities increase more rapidly than does his comprehension of his impact on the ecosystem, a risk exists that some changes may be detrimental to his future utilization of the system, if not his very survival. Some environmental impact is obviously essential, however, unless we intend to forfeit technological benefits in favor of a more primitive way of life.¹

One use that has had a significant impact on the ecosystem is the grazing of livestock.² Lands in southern Arizona have been used primarily for livestock grazing, along with agriculture and mining, in the last century.³ Corresponding chronologically with these uses have been gradual but increasingly substantial changes in large portions of the various desert ecosystems.⁴ The most commonly noted and studied changes include the drying of marshes and streams, the channeling and

1. See generally R. WILKERSON, *POVERTY AND PROGRESS* (1973).

2. See J. HASTINGS & R. TURNER, *THE CHANGING MILE* 43, 284-85, 288-89 (1965); text & notes 62-140 *infra*.

3. See Coker, *Public Land Administration in Arizona: The Need for Congressional Action Now*, 8 ARIZ. L. REV. 19, 21 (1966); J. HASTINGS & R. TURNER, *supra* note 2, at 40-41 (1965). The fastest growing new use on public lands appears to be recreation. SEVENTH ARIZONA TOWN HALL, *PUBLIC LAND USE, TRANSFER AND OWNERSHIP IN ARIZONA: RESEARCH REPORT 6* (1965) [hereinafter SEVENTH ARIZONA TOWN HALL].

4. R. COOKE & R. REEVES, *ARROYOS AND ENVIRONMENTAL CHANGE IN THE AMERICAN SOUTH-WEST* 1-2, 6-7, 25, 80, 187-89 (1976); J. HASTINGS & R. TURNER, *supra* note 2, at 40-43; R. HUMPHREY, *THE DESERT GRASSLAND* 6, 62 (1958).

trenching of the streams, washes, and the valley floors,⁵ and the invasion of woody shrubs into the desert grasslands.⁶ Although the causes of these changes have been the subject of considerable debate,⁷ overgrazing by cattle almost always ranks high as a primary or secondary cause triggering the effects of some other pressure brought to bear on the ecosystem.⁸

Only seventeen percent of Arizona's surface is deed and private land.⁹ The rest is controlled, owned, or held in trust by governmental entities.¹⁰ Lands that the public may use include those lands controlled by the Bureau of Land Management [BLM] of the Department of the Interior, the Department of Agriculture, and the State Land Department of Arizona. These lands comprise over fifty-two percent of Arizona's surface.¹¹ Most of this land is leased under permit systems for livestock grazing,¹² over twenty-six percent is Indian Reservation, much of which is grazed, and over four percent is held by the Defense Department, some of which is leased for grazing.¹³ At least two-thirds of Arizona's land is used for grazing.¹⁴

In the 1960's, congressional concern over deterioration of federal public lands, and concern over several thousand often conflicting or antiquated acts relating to the public lands, led to the enactment of

5. R. COOKE & R. REEVES, *supra* note 4, at 25, 28-62; J. HASTINGS & R. TURNER, *supra* note 2, at 3, 41-43.

6. R. COOKE & R. REEVES, *supra* note 4, at 81, 82-83; J. HASTINGS & R. TURNER, *supra* note 2, at 37-38; R. HUMPHREY, *supra* note 4, at 6, 65.

7. R. COOKE & R. REEVES, *supra* note 4, at 15, 83; J. HASTINGS & R. TURNER, *supra* note 2, at 275; see text & notes 66-139 *infra*.

8. See R. COOKE & R. REEVES, *supra* note 4, at 84, 96; J. HASTINGS & R. TURNER, *supra* note 2, at 43, 284-85, 288-89; R. HUMPHREY, *supra* note 4, at 44; S. MARTIN, *ECOLOGY AND MANAGEMENT OF SOUTHWESTERN SEMIDESERT GRASS—SHRUB RANGES: THE STATUS OF OUR KNOWLEDGE* 20 (1975) (USDA Forest Service Research Paper RM-156).

9. ARIZ. ST. LAND DEP'T, ARIZONA LAND MARKS, S-1 (1975-1976) [hereinafter ARIZ. LAND MARKS].

10. *Id.* For discussion of the trust lands see text & notes 362-64 *infra*.

11. ARIZ. LAND MARKS, *supra* note 9, at S-1.

12. See Hart & Guyton, *A Review of the Recommendations of the Public Land Law Review Commission Directly Affecting Users of the Public Grazing Lands*, 6 LAND & WATER L. REV. 57, 58 (1970); Udall, *Arizona's Public Lands—Mixed Blessing, Mixed Burden*, 8 ARIZ. L. REV. 11, 13 (1966); discussion note 346 *infra*. "The term 'grazing permit and lease' means any document authorizing use of public lands or lands in National Forests in the eleven contiguous western States for the purpose of grazing domestic livestock." 43 U.S.C.A. § 1702(p) (Supp. 1978). Throughout this Note, where the terms "permit" or "lease" are used, the meaning intended is that quoted above, including "state trust lands" within the meaning of "public lands." Under revised regulations, they may be issued for periods of 1 to 10 years, although 10 years has been the common period. See discussion note 227 *infra* on preference rights. BLM, DEP'T OF THE INTERIOR, *Questions and Answers Concerning Revised Grazing Regulations for the Public Lands Administered by the Bureau of Land Management* (Information handout issued when proposed new regulations on range management appeared in 41 FED. REG. 31,504 (1976)).

13. ARIZ. LAND MARKS, *supra* note 9, at S-1. See discussion note 14 *infra*.

14. Of Arizona's 72 million acres, over 40 million are deemed grassland pasture under grazing. U. S. DEP'T AGRICULTURE, *AGRICULTURE STATISTICS* 425 (1977). These do not include forest land pastures within the National Forests, of which over eight million acres are grazed. Letter from W.R. Fallis, Director of Range Management, Region 3, National Forest Service, to David T. Cox (July 8, 1978) (on file at the Arizona Law Review offices).

federal legislation creating the Public Land Law Review Commission [PLLRC]. The PLLRC was created to study and report on the condition of all federal public lands and make recommendations for future policy and legislation.¹⁵ An extensive report,¹⁶ published by the Commission in 1970, led to the passage of the Federal Land Policy and Management Act of 1976¹⁷ [FLPM Act]—an Act affecting all BLM lands.¹⁸ The grazing provisions of the Act concern the grazing lands in the sixteen contiguous western states,¹⁹ which contain most of the federal land.²⁰ For the remainder of this Note the term "public land" will refer to BLM land in the western contiguous states, as distinguished from the other major federal lands of concern. Those lands held in trust by the states²¹ will be referred to as "state trust" lands.

Some of the broad policies expressed in the FLPM Act are federal retention of ownership of the land, systematic inventory and classification of all land, planning and management based on multiple use and sustained yield principles, receipt of fair market value for utilization, and protection of all aesthetic, scientific, and recreational values while at the same time recognizing the nation's need for resources.²²

A recently enacted statute, the Public Rangelands Improvement Act [hereinafter cited as the PRI Act], was written exclusively to authorize and fund restoration and improvement of the federal grazing lands under both the BLM and Forest Service.²³ The purpose of the

15. Act of Sept. 19, 1964, Pub. L. No. 88-606, 78 Stat. 982 (1964), codified at 43 U.S.C. § 1391 *et seq.* (1964). See Aspinall, *The Ownership, Administration, and Disposal of the Public Lands*, 8 ARIZ. L. REV. 4, 6-9 (1966); Pearl, *The Public Land Law Review Commission: An Overview*, 6 LAND & WATER L. REV. 7, 7, 8-9 (1970); Stoddard & O'Callaghan, *Creative Federalism and the Retention or Disposition of Public Lands*, 8 ARIZ. L. REV. 37, 37-40 (1966).

16. PUBLIC LAND LAW REVIEW COMM., ONE THIRD THE NATION'S LAND: A REPORT TO THE PRESIDENT AND TO THE CONGRESS (1970) [hereinafter cited as PLLRC REPORT]. Also published is a multi-volume set containing research reports contracted for by the Commission.

17. Pub. L. No. 94-579, 90 Stat. 2743 (1976) (codified in scattered sections of 5, 30, 42, 43 U.S.C. [hereinafter cited as FLPM Act]). This Act is commonly referred to as the BLM Organic Act.

18. Carver & Carver, *Federal Land Policy and Management Act of 1976—A Summary*, ROCKY MTN. MIN. L. NEWSLETTER, Oct. 1976, at 1. See 122 CONG. REC. S.2147, 2148 (daily ed. Feb. 23, 1976) (remarks of Sen. Haskell and statement by Sen. Metcalf) (the Senate version of the bill evidently embodied well over two-thirds of the principal recommendations contained in the PLLRC Report).

The FLPM Act chiefly affects BLM (Bureau of Land Management) lands, see 43 U.S.C.A. § 1702(e) (Supp. 1978). See generally Pub. L. No. 94-579, 90 Stat. 2743 (1976). However, certain specific sections expressly include National Forest lands. See, e.g., 43 U.S.C.A. §§ 1712(b), 1716, 1751, 1752, 1753 (Supp. 1978).

19. See 43 U.S.C.A. §§ 1751-1753 (Supp. 1978), as amended by Public Rangelands Improvement Act of 1978, Pub. L. No. 95-514, §§ 6(b), 7(b), 92 Stat. 1806-07; for a listing of the sixteen states see note 261 *infra*.

20. M. CLAWSON & B. HELD, *THE FEDERAL LANDS: THEIR USE AND MANAGEMENT* 36-39 (1957).

21. See text & notes 353-55 *infra*.

22. 43 U.S.C.A. § 1701(a) (Supp. 1978).

23. Public Rangelands Improvement Act of 1978, Pub. L. No. 95-514, 92 Stat. 1803 (to be codified in scattered sections of Title 43, U.S.C.). [Hereinafter cited as PRI Act].

PRI Act is to supplement the FLPM Act,²⁴ provide additional funding for improvement and maintenance,²⁵ focus attention on the specific problems of the grazing lands,²⁶ and provide possible solutions to these problems.²⁷ The considerations prompting the PLLRC study and report and subsequently the FLPM Act and PRI Act, coupled with a reading of the legislation's policies, reveals an increased awareness of the importance of environmental protection to conserve and enhance multiple use and sustained yield.²⁸

Arid lands are more fragile and delicate than moister lands.²⁹ Grazing pressures have caused a major detrimental impact on the arid desert grasslands in the past century and have been a leading cause of widespread deterioration of the range.³⁰ Whether the grazing pressures continue to have an adverse impact and whether the land is continuing to deteriorate is subject to debate.³¹ Proper records and extensive study may determine the answer to this question. Whatever the future portends, certain possibilities exist for range improvement.³² The missing ingredients necessary to accomplish this goal have been a strong and coordinated interest by agencies and ranchers, authority to implement and enforce remedial measures, and financing.³³ The FLPM Act and PRI Act seem to have supplied the necessary ammunition.³⁴

This Note will consist of a summary of the ecological changes commonly noted in the desert grasslands of southern Arizona and a discussion of the causes commonly claimed to be responsible for such changes. The role of cattle grazing in utilizing public lands throughout the West will then be discussed in its historical context. The effect of the FLPM Act and PRI Act on the future of cattle grazing, and the controversy over fees charged for the lease of federal lands will then be explored. Finally, an inquiry will be made not only into suggestions put forth to halt further deterioration, and perhaps reverse it, but also into funding, and management authority to effect the necessary pro-

24. See *id.* § 2(c) (to be codified in 43 U.S.C. § 1901(c)).

25. See *id.* § 5 (to be codified in 43 U.S.C. § 1904).

26. See *id.* § 2(a)(1)-(4) (to be codified in 43 U.S.C. § 1901(a)(1)-(4)).

27. See *id.* §§ 4, 5(c)-(d) (to be codified in 43 U.S.C. §§ 1903, 1904(c)-(d)).

28. See 43 U.S.C.A. §§ 1701(a), 1751(b); H.R. REP. NO. 1163, 94th Cong., 2d Sess. 1-2, reprinted in [1976] U.S. CODE CONG. & AD. NEWS 6175, 6175-76.

29. M. CLAWSON & B. HELD, *supra* note 20, at 84-85; J. HASTINGS & R. TURNER, *supra* note 2, at 4; see PLLRC REPORT, *supra* note 16, at 30.

30. See authorities cited note 8 *supra*; M. CLAWSON & B. HELD, *supra* note 20, at 57-59, 84-85; SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 70.

31. S. MARTIN, *supra* note 8, at 7-8, 10-14. Congress is aware of the land's deterioration and continued decline. See H.R. 10587, 95th Cong., 2d Sess. § 1(a)-(c) (1978).

32. See S. MARTIN, *supra* note 8, at 11-14, 14-17, 19-28, 34-35.

33. *Id.* at 7.

34. See Carver & Carver, *supra* note 16, at 1; PRI Act, Pub. L. No. 95-514, §§ 4, 5, 92 Stat. 1805 (to be codified in 43 U.S.C. §§ 1903, 1904). See generally Pub. L. No. 94-579, 90 Stat. 2743 (1976) (codified in scattered sections of 5, 30, 42, 43 U.S.C.).

grams. The BLM and trust lands of Arizona will be discussed to illustrate the policies set forth in the recent legislation.

The problems of dealing with a topic such as land deterioration in Arizona are diverse and complex.³⁵ However, the intent of this Note is to create an awareness of the fragile nature of man's involvement in the ecosystem, focusing on the impact of widespread ranching in the West, and particularly the southern Arizona grasslands. Man is at best scratching the surface of knowledge of the interrelationships involved in ecology, but public awareness is beginning to focus on the damage we may inflict on our own environment. As we utilize the finite earth resources, legal systems tend to establish interhuman rights, and duties owed future generations³⁶ in terms of conservation. It is hoped this Note may effect an increased awareness in the legal community that, in the future, dealing with resources requires further consideration than just that of present rights and financial benefits.

CHANGES IN THE ECOSYSTEM OF THE SONORAN DESERT AREA

Cultural History of the Sonoran Desert Area

Four centuries ago the Indian population of the Sonoran Desert area³⁷ was as large as the total population of the area in 1880, and the density may have been as great in much of the area as it was as late as 1940.³⁸ Some of the tribes subsisted on a nomadic hunting and gather-

35. Even the use of the term "deterioration" is subjective. See J. HASTINGS & R. TURNER, *supra* note 2, at 22; R. HUMPHREY, *supra* note 4, at 4; S. MARTIN, *supra* note 8, at 6. Change has occurred in the desert grasslands which render them less productive as grasslands. *Id.* The degree of change, in terms of both number of acres affected, and severity of change, have been only qualitatively described, and not quantified. See R. COOKE & R. REEVES, *supra* note 4, at 79-80, 187; J. HASTINGS & R. TURNER, *supra* note 2, at 3-4. See generally J. HASTINGS & R. TURNER, *supra* note 2 (containing a superb collection of comparative photographs, two photographs each of numerous locations in Southern Arizona, one taken around the turn of the century, the other more recently); R. HUMPHREY, *supra* note 4 (containing a compilation of many quotes from journals of early travelers through the Southwest, graphically portraying the land as it once was). Quantification is impossible since only subjective records or photos exist of what once existed.

Many pressures may have been brought to bear on the land, causing much debate as to the actual causes of change. See authorities cited note 7 *supra*; R. COOKE & R. REEVES, *supra* note 4, at 97-99; R. HUMPHREY, *supra* note 4, at 65. Some of the possible pressures are man-induced, such as grazing; others, such as climate, function free of human influence. See J. HASTINGS & R. TURNER, *supra* note 2, at 4, 275-83.

The land affected is under the control of many entities such as the Forest Service, BLM, State Land Department, Bureau of Indian Affairs, and private parties. Coker, *supra* note 3, at 20; Udall, *supra* note 13, at 12-13; see ARIZONA LAND MARKS, *supra* note 9, at S-1.

36. See generally Feinberg, *The Rights of Animals and Unborn Generations*, in PHILOSOPHY & ENVIRONMENTAL CRISIS 43, 50 (W. Blackstone ed. 1974).

37. The Sonoran Desert includes southwestern Arizona, most of the state of Sonora, Mexico, and the Baja Peninsula. See J. HASTINGS & R. TURNER, *supra* note 2, at 9 Fig. 1.

38. *Id.* at 22. Hastings and Turner have compiled what is perhaps the best historical sketch available, see *id.* at 22-46, clearly portraying the human utilization of the southwestern deserts in the context of probable environmental impact. See also R. COOKE & R. REEVES, *supra* note 4, at 24; S. MARTIN, *supra* note 8, at 7.

ing life style, but most engaged in some agriculture.³⁹ The influence of this culture on the ecological balance is uncertain.⁴⁰ Some minor impact may have been made through direct utilization of certain native plants for food and fiber, and possibly some use of fire for hunting.⁴¹ Any major changes were probably made through irrigation and clearing for cultivation.⁴²

The arrival of the Spanish in the sixteenth century had several separate impacts.⁴³ The Indian population declined to about one-third of its pre-hispanic numbers, although the survivors were concentrated around mission centers so that their agricultural influence probably remained similar to what it had been.⁴⁴ The greater Spanish influence was the introduction of livestock.⁴⁵ Probably eight million sheep and one million cattle existed in the Central Plateau of present Mexico one hundred years after the Spanish arrival.⁴⁶ No evidence is available indicating whether or not woody plant invasion (displacement of grasses with woody shrubs such as mesquite) occurred in Sonora at that time, but it appears unlikely that arroyo cutting occurred at that time.⁴⁷ Extensive mining carried on by the Spanish undoubtedly caused a negative local impact on plant life and the landscape.⁴⁸

During the nineteenth century the new nation of Mexico appeared, and cattle ranching first spread north into what is now southern Arizona.⁴⁹ The number of cattle in this area in the early 1800's was probably between 50,000 and 150,000, which was considerably less than the numbers to come in the late 1800's.⁵⁰ Probably no important vegetation changes occurred at this time.⁵¹

39. J. HASTINGS & R. TURNER, *supra* note 2, at 24. The tribes noted for some agriculture in the area were the Yumans, the Pimans (including the Papago), the Yaquis, and the Opatas. The nomadic Apaches, peripheral to the Sonoran area, also engaged in some agriculture. *Id.*

40. *Id.* at 24-25.

41. *Id.* at 24-28.

42. *Id.* at 26. As to the environment, the Indian's position was a fluid one, having been produced over thousands of years. *Id.* at 27. The actual impact is a matter of speculation, but farming was probably a major force, although only in the desert valleys. *Id.* at 27-28.

43. *Id.* at 28, 30.

44. *Id.* at 30. During this period, when the native populations concentrated around mission centers and declined in total numbers, direct human pressures were removed from much of the desert lands and replaced by an indirect human factor, domestic grazing animals. *See id.*

45. *Id.* at 30, 32.

46. *Id.* at 30.

47. *Id.* at 31; R. COOKE & R. REEVES, *supra* note 4, at 85.

48. J. HASTINGS & R. TURNER, *supra* note 2, at 32. The major effect of the mining was the impoverishment of vegetation for miles, caused by the need for fuel to operate smelters, and the foraging of pack animals. *Id.*

49. *Id.* at 32-33. Apache raids may have been partly responsible for preventing earlier expansion of grazing northwards. *See id.* at 31, 33. With conditions for settlement less adverse for a short period, and with substantial land grants made by the Spanish to Indian, Spanish, and Mexican cattle ranchers between 1800 and 1831, large scale stock raising began in what is now southern Arizona. *Id.* at 33.

50. *Id.* at 34.

51. *Id.* The impact of the livestock grazing during the early 1800's was certainly the greatest

By 1854 the present boundary between Mexico and the United States had been established,⁵² facilitating American cattle ranching in southern Arizona. During the 1880's the western cattle industry began its expansion,⁵³ and by 1885 the number of cattle in Arizona alone exceeded 652,000.⁵⁴ At this point, concern began to be expressed, especially by some cattle associations, that the ranges were being overstocked.⁵⁵ Nevertheless, the number of cattle kept expanding to the bust year of 1891.⁵⁶ In that year estimates of the number of grazing cattle ranged from one million to one and a half million.⁵⁷ The rains were very poor for the next two years,⁵⁸ giving rise to a cattle mortality rate ranging from fifty to seventy-five percent.⁵⁹ Pictures and reports show thousands of square miles of land, previously rich in vegetation, totally denuded of grass.⁶⁰ Never again would the number of livestock approach those of the "boom and bust" years.⁶¹

Vegetational Changes in the Desert Grassland

The desert grassland of concern in this Note lies primarily in southeastern Arizona. This grassland is merely the edge of a much

pressure brought to bear on the ecosystem up to this time, rendering negligible any impact by the Indians, *id.*, but was probably only a fraction of the pressures which would come in the next 60 years. *See id.* at 34, 41.

52. *Id.* at 34.

53. *Id.* at 40. The foundations for the cattle industry's growth had been laid in the 1870's with government contracts for beef for military posts and Indian reservations. Cattle were driven and shipped in from Texas and the eastern states. *Id.*

54. [1885] REP. OF GOVERNOR 8 (Arizona territory).

55. J. HASTINGS & R. TURNER, *supra* note 2, at 41 (citing to *Southwestern Stockman*, Jan. 10, 1885; Mar. 14, 1885; April 11, 1885; July 25, 1885; statement of Tombstone Stock Grower's Association, *Tombstone Daily Epitaph*, April 4, 1886). "Overstocked" simply means that land contains more animals than the food supply can support on a continuing basis. For example, assume an annual plant must live six months to seed, and assume the density, i.e. number per acre, is such that 50% of the plants must seed for the crop to grow with the same density the subsequent year. It is obvious that if grazing pressure should consume more than 50% prior to seed formation, then the plant's density would be lower the following year, and it would be "overstocking" as to that one plant. Nevertheless, it should be apparent that the plot could be "overstocked" for several years before the plant density became so low it could not support the grazing animal. Overstocking does not necessarily mean the land cannot support the animal for several years at the same stocking density. But it does mean some factor in the range is being depleted or is deteriorating, whether it be soil, forage plants, ground water, etc.

56. J. HASTINGS & R. TURNER, *supra* note 2, at 41.

57. [1896] REP. OF GOVERNOR 20; J. HASTINGS & R. TURNER, *supra* note 2, at 41.

58. *Id.*

59. [1896] REP. OF GOVERNOR 20. The Governor noted that the ranges had been vastly overstocked but that cattle ranchers had refused to believe it until the drought and starvation had started. *Id.*

60. J. HASTINGS & R. TURNER, *supra* note 2, at 41, 284; *see id.* at 146.

61. *Id.* at 40-41; R. COOKE & R. REEVES, *supra* note 4, at 84-85; S. MARTIN, *supra* note 8, at 7. It should be noted at this point that Hastings and Turner emphasized that the cultural influences of various human populations on the environment in the Southwest have not resulted in isolated and separate impacts on the environment, but rather the cumulative impact has been a continuum. They readily point out that "no one disputes the fact that Anglo-American culture has had a greater ecological impact than its predecessors." J. HASTINGS & R. TURNER, *supra* note 2, at 45.

larger area extending into southern New Mexico, southwestern Texas, and northcentral Mexico.⁶² It is not a vast unbroken plain, but exists as a patchwork of grassland interspersed with other vegetational types in the desert valleys and around the bases of many of the island mountain ranges at lower elevations.⁶³ The Taylor Grazing Act of 1934⁶⁴ brought grazing on some 10,400,000 acres of this desert grassland and almost 8,000,000 acres of desert shrub land in Arizona and New Mexico under federal supervision.⁶⁵

Within the past 100 years, the vegetation in southern Arizona has undergone a great change—generally characterized as a woody shrub invasion.⁶⁶ Essentially, this has involved a decrease in perennial grasses and an increase in woody plants such as mesquite, opuntia, creosotebush, snakeweed, burroweed and acacias.⁶⁷ Hastings and Turner

62. R. HUMPHREY, *supra* note 4, at 4; S. MARTIN, *supra* note 8, at 1 (a map showing the range of the grasslands may be found as this page).

63. Defining what the desert grassland encompasses varies with the writers. J. HASTINGS & R. TURNER, *supra* note 2, at 109. This Note intends an application of the term similar to that employed by Hastings and Turner. Grasslands are "areas dominated either in the historic past or currently by grass, lying at a lower elevation than the woodland, but above or surrounded by the desert." *Id.* The area lies mainly above the 3,000 feet elevation, and generally stops above 4,000 to 5,000 feet. See R. HUMPHREY, *supra* note 4, at 1; S. MARTIN, *supra* note 8, at 3. At least historically it was dominated by a very rich grass flora including perennials and annuals, R. COOKE & R. REEVES, *supra* note 4, at 80-81, though presently other shrubs may tend to dominate. See R. HUMPHREY, *supra* note 4, at 6; S. MARTIN, *supra* note 8, at 6.

64. Ch. 865, 48 Stat. 1269 (1934) as amended (codified in 43 U.S.C. §§ 315-315r (1970)).

65. S. MARTIN, *supra* note 8, at 7.

66. See R. COOKE & R. REEVES, *supra* note 4, at 80-81; J. HASTINGS & R. TURNER, *supra* note 2, at 109, 273-74; R. HUMPHREY, *supra* note 4, at 4-6; S. MARTIN, *supra* note 8, at 6, 34. Although this Note concentrates on the desert grasslands, other vegetational changes have occurred in several other life zones in southern Arizona where grazing has been heavy. See J. HASTINGS & R. TURNER, *supra* note 2, at 46, 271. These changes are less obvious than woody shrub invasion, but may argue for other causative factors being at work as well as man's impact. The general trend has been an "upward displacement of plant ranges along a xeric to mesic gradient." *Id.* at 271. This means that lower elevation habitats, once moist enough to support certain plant species at their lower limits, have become dryer, forcing the plant population upwards to where the more favorable moister climate still exists. This is most notable in such transition zones as the demarcation between grassland and oak woodland. The oak line, in places, has been forced 1,000 feet upwards in elevation. *Id.* at 272-73. A particular plant species' genetic expression of tolerance to the environment fluctuates very little, except over very long time periods as natural selection plays its hand. Therefore, the shift noted in the specie's geographical location is solely a habitat change, which has consisted of a desertification, or drying of the habitat, pressuring an upward migration of many plant species to a moister and cooler environment. *Id.* at 271. Some plant species of the same habitat have exhibited little change or random changes with no pattern, *id.*, perhaps expressing the fact that the local habitat has not fluctuated, or that factors other than moisture, such as soil composition, play a more important role in the plant's distribution, or that the particular species is more tolerant of changes in soil moisture. The life zones studied by Hastings and Turner included what they labeled as the oak woodland, the desert grassland, and the desert. *Id.* at 46.

This upward displacement in some species should not be confused with the invasion of woody species in the grassland. Several of the woody plants invading the grassland, such as mesquite, ocotilla, turpentine bush, and desert broom, have also increased in density in the oak woodland. *Id.* at 182. Although the invading plants don't appear to be involved in an upward displacement of species over relatively wide ranges, it is quite possible that the same pressures affecting desertification and upward displacement also play some role in aiding the establishment of the invader species, and the subsequent decline in grasses. See *id.* at 279-83.

67. R. COOKE & R. REEVES, *supra* note 4, at 80-81; J. HASTINGS & R. TURNER, *supra* note 2, at 109, 273-74; R. HUMPHREY, *supra* note 4, at 4-6; S. MARTIN, *supra* note 8, at 6, 34. The term

graphically describe the invasion:

[T]he desert grassland has undergone some significant changes in recent years. In the most altered locations grasses have been supplanted by a shrubby vegetation new to the area, at least in historic times. In this depauperate stage, the grasses are so scarce that they give hardly an indication of their past importance . . . [W]oody species dominate the landscape, with the intervening spaces barren of perennial plants.⁶⁸

The beginning of this invasion coincided with widespread settlement by white men and the rapid increase in grazing of livestock.⁶⁹ These woody plants provide little forage value for cattle,⁷⁰ and reduce the density of grasses through a complex competition system.⁷¹ Woody

opuntia refers to those cacti commonly called cholla and prickly pear, which generally are nuisance plants for grazing purposes. *Id.* at 23-24. Creosote bush grows in the lower arid regions with relatively low potentials for perennial grasses. *Id.* at 23. Snakeweed and burroweed are smaller shrubs, both toxic, but generally non-fatal to cattle. *Id.* at 25. Mesquite is a much larger shrub, often attaining tree proportions, which reduces the density and herbage yield of perennial grasses. *Id.* at 20. Even moderate stands, such as 25 trees per acre, may cut herbage production in half. *Id.* The acacia species that increased include catclaw and white thorn. J. HASTINGS & R. TURNER, *supra* note 2, at 273. Pictures of these plants may be found in J. HASTINGS & R. TURNER, *supra* note 2, and in S. MARTIN, *supra* note 8.

Mesquite are the most visible invaders. They now occupy over 60 million acres of range land, much of this territory acquired through recent invasion. Reynolds & Glendening, *Merriam Kangaroo Rat a Factor in Mesquite Propagation on Southern Arizona Range Lands*, 2 J. RANGE MGT. 193, 193 (1949). Some remapping studies conducted on the Santa Rita Experimental Range show mesquite increases of from 64 to 99 trees per acre during a 16 year period. *Id.*

68. J. HASTINGS & R. TURNER, *supra* note 2, at 109.

69. See authorities cited note 4 *supra*. "Over large areas" more palatable perennials were replaced by unpalatable annuals, perennials, and shrubs. "With the advent of white man, intensive grazing, trampling, construction and the accompanying increased erosion produced great changes in the density and composition of the vegetation of the Desert Plains Grassland." Whitfield & Anderson, *Secondary Succession in the Desert Plains Grassland*, 19 ECOLOGY 171, 171 (1938). It is interesting to note that even these earlier studies speak of the changes in the past tense only, without emphasizing whether the problem is considered ongoing. See *id.* at 171-72. The above study was done some 50 years after the vegetational changes first began, see *id.*, while recent studies describe changes over spans of 80 years, see J. HASTINGS & R. TURNER, *supra* note 2, at 284, and 100 years. See R. COOKE & R. REEVES, *supra* note 4, at 79. The inference to be drawn seems to be that whatever changes have occurred are ongoing, and unless halted, may be expected to continue.

It should be noted that causation, in a historical context, can only be determined by circumstantial correlation because it is impossible to attempt reproduction of any change under laboratory conditions. Chronological correlation is shaky, at best, as a basis for labeling a causative factor, but where the manner of causation is rationally explainable and the historical-chronological correlation is very close, this circumstantial method of arguing causation becomes more palatable. The correlation between the beginnings of the shrub invasion and major arroyo cutting with the advent of white man, in light of current explanations, see text & notes 78-121, 131-39 *infra*, tends to sway this writer towards the position that Anglo-American settlement was a major causative factor in the deterioration of southern Arizona grasslands.

70. R. HUMPHREY, *supra* note 4, at 4; S. MARTIN, *supra* note 8, at 6.

71. See R. HUMPHREY, RANGE ECOLOGY 113-15 (1962); R. HUMPHREY, *supra* note 4, at 48; S. MARTIN, *supra* note 8, at 20. Plant competition can take many forms, and be intra or inter specific. If any essential element for growth, reproduction, or existence is required by more than one plant, and is in limited supply in a given area, then the plants will compete for the element. This may take the form of competition for soil, water, nutrients, physical space, or for available sunlight. Probably the most easily understood notion of competition concerns water. Its availability in desert lands is obviously limited, and if one plant is better able to extract water from the soil and so reduce the availability of water to another plant below its tolerance level, the latter plant cannot survive. For example, the lateral roots of grown mesquites remove moisture near the

plants are, therefore, considered to be detrimental to the ranges.⁷² Little objective data exists as to the extent of this invasion geographically.⁷³ The woody plants have always existed in the grasslands to some degree, but chiefly in drainages and rocky or shallow soils which support little grass.⁷⁴ A good deal of subjective evidence has been gathered through reports of early travelers who journeyed throughout the region and through a unique comparative analysis of rare, turn-of-the-century photographs with recent ones.⁷⁵ It is well accepted and documented that the invasion occurred extensively and continues as an ongoing process;⁷⁶ the debate is now chiefly centered over the causes.⁷⁷

Literature discussing the causes of woody plant invasion generally relies on records and observations made on the grasslands over time, coupled with the results of short term experiments run on relatively small land plots, and the authors' own experience and deductive analysis.⁷⁸ The most recent and comprehensive analyses of surface change in southern Arizona are *Arroyos and Environmental Change*⁷⁹ by Cooke and Reeves, and *The Changing Mile*⁸⁰ by Hastings and Turner.

The factors generally considered as relevant possibilities for causing the woody shrub invasion include rodents and rabbits, fire suppression, climate change, and livestock grazing.⁸¹ Rodents and rabbits have some influence on the spread of woody plants, especially mes-

surface, and so effectively compete for water with perennial grasses. Likewise, well established grasses may successfully compete to prevent establishment of mesquite seedlings. R. HUMPHREY, RANGE ECOLOGY 110-12 (1962); see S. MARTIN, *supra* note 8, at 20.

72. R. HUMPHREY, *supra* note 71, at 110-12; S. MARTIN, *supra* note 8, at 20. Martin has stated that as a result of the increase in woody shrubs "[t]he condition of many ranges has been depressed so long that no standard of potential is available." *Id.* at 6.

73. See R. HUMPHREY, *supra* note 4, at 6. Cooke and Reeves note that studies have utilized "a wide range of historical information, especially the diaries, field notes, memoirs, and reminiscences of residents, explorers, and travelers, photographs, and the U.S. General Land Office survey notes" to reconstruct the original vegetational patterns and their subsequent modification. R. COOKE & R. REEVES, *supra* note 4, at 79-80. The time span covered by these is probably about 300 years, although most information comes from the mid-nineteenth century.

74. See R. HUMPHREY, *supra* note 4, at 4.

75. R. COOKE & R. REEVES, *supra* note 4, at 79-80. See generally J. HASTINGS & R. TURNER, *supra* note 2, at 47-269 (compilation of photographs and explanatory remarks); R. HUMPHREY, *supra* note 4, at 7-33 (compilation of quotes from early travelers).

76. See authorities cited note 6 *supra*.

77. See authorities cited note 7 *supra*.

78. R. COOKE & R. REEVES, *supra* note 4, at 79-80, 187.

79. This book, published in 1976, discusses theories of arroyo formation in general and the possible causes of arroyo cutting, desiccation, and shrub invasion in southern Arizona, addressing every major drainage area in the region. See generally R. COOKE & R. REEVES, *supra* note 4.

80. This book, published in 1965, discusses surface changes in southern Arizona and their possible causes, but the study emphasizes vegetational changes. The fascinating feature of the book is the compilation of some 97 sets of black and white photo plates, each set being of the same landscape, one taken around the turn of the century and the recent copy taken in the late 50's or 60's, roughly 60 years later on the average. Superficial visual examinations disclose extensive vegetational change. Those in the grasslands show the extent of woody shrub invasion in many areas. See generally J. HASTINGS & R. TURNER, *supra* note 2.

81. R. COOKE & R. REEVES, *supra* note 4, at 83; J. HASTINGS & R. TURNER, *supra* note 2, at 275-83; R. HUMPHREY, *supra* note 4, at 38.

quite, through eating grasses that tend to hinder seedling production,⁸² and through dissemination of cactus and viable mesquite seeds.⁸³ Although it is accepted that jackrabbits tend to keep ranges in a deteriorated condition,⁸⁴ it is doubtful that pressure is exerted on good ranges by rodents.⁸⁵ Humphrey, a leading researcher and writer on range ecology in the desert grasslands, concluded that rodents and rabbits were not a major factor in shrub invasion.⁸⁶ Similarly, Hastings and Turner concluded that the major influence exerted by rodents and rabbits was in maintaining already depleted ranges in that condition; hence, some other cause must be found to explain the initial depletion of the range.⁸⁷

The relative importance of suppression of range fires in allowing shrub invasion has been a subject of considerable debate.⁸⁸ Evidence indicates that grass fires on ranges in fair to good condition generate enough heat to kill small and immature shrubs and seedling mesquites, without seriously damaging most of the grasses' roots, which will produce surface growth the following season.⁸⁹ Thus, if a range is burned over every few years it tends to suppress or eliminate most shrubs, without any significant effect on the grassland.⁹⁰ The suppression of range fires offers the woody shrubs an opportunity to form mature stands that may withstand a subsequent grass fire.⁹¹ The shrubs then compete successfully for water, which reduces the grass cover, and thus

82. R. COOKE & R. REEVES, *supra* note 4, at 83; see note 71 *supra*.

83. *Id.*; R. HUMPHREY, *supra* note 4, at 49. Certain types of seeds, such as mesquite, need their hard surface jackets scarred or broken in order to germinate successfully. J. HASTINGS & R. TURNER, *supra* note 2, at 275. This process, known as "scarification," often happens as seeds are swept down rocky streambeds by floodwaters, which may explain why such shrubs as mesquites used to be concentrated along waterways. See *id.*; R. HUMPHREY, *supra* note 4, at 4. Rodents evidently gnaw on seeds before storage to test for soundness, and this scarification contributes to the seed's ability to germinate after dissemination. J. HASTINGS & R. TURNER, *supra* note 2, at 277; Reynolds & Glendening, *supra* note 68, at 194-95. The seed coats of mesquite seeds are very hard and impervious to moisture, and generally require some scarring to be able to absorb water and germinate. *Id.* The rats gnaw on, then store the seeds in caches just below the soil surface, and if left undisturbed the seeds may germinate. *Id.*

84. See R. COOKE & R. REEVES, *supra* note 4, at 83; J. HASTINGS & R. TURNER, *supra* note 2, at 276-77, 285; R. HUMPHREY, *supra* note 4, at 49; S. MARTIN, *supra* note 8, at 26. Apparently the numbers of some species of rodents increase as the range deteriorates. J. HASTINGS & R. TURNER, *supra* note 2, at 276-77. In explanation of this phenomenon, it has been speculated that certain preferred grains increase on depleted ranges or that the rodents exhibit a preference for a more open terrain. *Id.* In any event, several studies seem to support the conclusion that once a range has deteriorated, jackrabbits and rodents may increase and maintain the deteriorated condition through grazing pressures and shrub seed dissemination. *Id.* at 276-77, 285; R. HUMPHREY, *supra* note 4, at 49.

85. See J. HASTINGS & R. TURNER, *supra* note 2, at 276-77, 285.

86. R. HUMPHREY, *supra* note 4, at 49-51, 64.

87. *Id.* at 277.

88. *Id.* at 59.

89. R. COOKE & R. REEVES, *supra* note 4, at 83, 84; J. HASTINGS & R. TURNER, *supra* note 2, at 278; R. HUMPHREY, *supra* note 4, at 60; S. MARTIN, *supra* note 8, at 20-26. See discussion of fires and range ecology in R. HUMPHREY, *supra* note 4, at 155-65.

90. R. HUMPHREY, *supra* note 4, at 60; see J. HASTINGS & R. TURNER, *supra* note 2, at 38.

91. S. MARTIN, *supra* note 8, at 23.

reduces the fuel for new fires.⁹² The desert grasslands have been called a fire-induced subclimactic community.⁹³ That is, absent the fires, the shrub communities now tending to dominate in many places are the true climax, but a regular occurrence of range fires could have maintained desert grasslands.⁹⁴

Based on early reports,⁹⁵ physical evidence,⁹⁶ and the use of fire as a hunting tool by Indians,⁹⁷ Humphrey concluded that fire was the major factor that long kept the woody shrubs from becoming dominant.⁹⁸ Hastings and Turner, on the other hand, present strong evidence contradicting the previously accepted belief that fires were commonplace and widespread.⁹⁹ They concluded that fires had almost no real impact in maintaining the grasslands because their incidence was too low. However, fires may have been important locally when and where they did occur.¹⁰⁰

Climatic change has also been suggested as a possible factor affecting shrub invasion.¹⁰¹ Humphrey, while accepting the possibility of climatic change, concludes: "There is . . . no evidence that would seem to link the consistent and widespread increase of woody species that has been taking place during the last hundred or so years in the Southwest to a change in climate."¹⁰² Hastings and Turner, on the other hand, acknowledge the lack of sufficient data, but conclude that climatic change is a major factor in the vegetation change.¹⁰³ In their opinion,

92. See *id.* at 20, 23, 25; R. HUMPHREY, *supra* note 4, at 49.

93. J. HASTINGS & R. TURNER, *supra* note 2, at 109; R. HUMPHREY, *supra* note 4, at 35-37.

94. *Id.* In discussing Humphrey's subclimactic theory, Hastings and Turner contrast a climactic with a subclimactic grassland community as follows: "a stable association in equilibrium with the climate and soil of the region where it occurs. . . . [as opposed to] an unstable, fire-induced form, susceptible to change even though soil and climate remain constant." J. HASTINGS & R. TURNER, *supra* note 2, at 109. The authors do not subscribe to the fire-induced subclimactic theory. *Id.* at 38-39.

95. R. HUMPHREY, *supra* note 4, at 51-59 (gathering reports written by early travelers through the area).

96. *Id.* at 59 (physical evidence was found in the form of charring around the trunks of old mesquites).

97. See J. HASTINGS & R. TURNER, *supra* note 2, at 26; but see *id.* at 27, 38 (questioning the prevalence of the use of fire).

98. R. HUMPHREY, *supra* note 4, at 64.

99. See J. HASTINGS & R. TURNER, *supra* note 2, at 38-39. In determining how often a range would need to be burned over to keep it shrub-free, and how long evidence of a burn would be visible, Hastings and Turner estimated that a nineteenth century traveler should, on the average, have seen 1 mile burned for every 20 traversed, at a minimum, if fires were the major factor in shrub suppression. *Id.* at 38. Utilizing only journals kept daily by travelers in groups where more than one member kept journals, a record of burn sightings were collected over a total area of about 1,000 miles. *Id.* at 38-39. One should expect at least a total of 50 miles to have been reported as recently burned, but no grass burns caused by "natural agents" were reported at all. *Id.* at 39-40.

100. *Id.* at 278, 287.

101. *Id.* at 278.

102. R. HUMPHREY, *supra* note 4, at 47.

103. J. HASTINGS & R. TURNER, *supra* note 2, at 287-89. Hastings and Turner consider cattle the other major factor, rodents and fire being rejected. *Id.*

the effect of a warming and drying trend has been to push some plant species beyond their physiological ability to endure, while favoring others.¹⁰⁴ The grasses have been weakened, facilitating the invasion of shrubs.¹⁰⁵ Hastings and Turner's study included the best historical climatic mapping done in relation to vegetation changes, and covered all vegetational systems in southern Arizona. Consequently, their study tends to offer more reliability than previous ones.¹⁰⁶

The importance of overgrazing as one of the major causes of weakening the grasses and facilitating shrub invasion is scarcely debated.¹⁰⁷ All recent works on the subject place grazing as one major factor.¹⁰⁸ Grazing operates in several ways to favor shrubs over grasses. The most direct is by opening the range through removal of grass.¹⁰⁹ A severe stripping of the cover contributes to the establishment of shrubs, although the competitive mechanisms are not clearly understood.¹¹⁰ Secondly, cattle aid in the spread of the shrubs by scattering seeds through their droppings,¹¹¹ and in scarifying many seeds

104. *Id.* at 289.

105. *Id.*

106. See R. COOKE & R. REEVES, *supra* note 4, at 83, 85-86; see generally J. HASTINGS & R. TURNER, *supra* note 2, at 10-21, 278-83, 287-89 (treatment of climate as a factor).

107. See J. HASTINGS & R. TURNER, *supra* note 2, at 41; R. HUMPHREY, *supra* note 71, at 118; R. HUMPHREY, *supra* note 4, at 38-44.

108. See R. COOKE & R. REEVES, *supra* note 4, at 84; J. HASTINGS & R. TURNER, *supra* note 2, at 275, 284-85, 288-89; R. HUMPHREY, *supra* note 4, at 44; S. MARTIN, *supra* note 8, at 20.

109. J. HASTINGS & R. TURNER, *supra* note 2, at 276. A basic, but understandable description of this process of "opening up" the range is found in R. HUMPHREY, *supra* note 71.

The physiology of perennial grasses' resistance to grazing is as follows: The leaves manufacture the plant's food, part of which is used for growth and part stored for future use in above and below ground portions of the plant. During normal years a surplus of food is produced and stored so that grazing may remove a portion of the above ground plant without seriously impairing the plant's manufacturing ability. The strength of a plant depends on its root system, which in turn depends on the above ground portion of the plant. When too much of the above-ground portion is removed through continuous overgrazing, not enough food can be manufactured for adequate root growth, let alone for storage for a possibly poor subsequent growth year. "A reduced root system leads to smaller tops the next year and these to still heavier grazing and more root starvation and so again, to still smaller tops and still smaller roots, until our plant passes out of the picture completely." *Id.* at 118.

This removal of the grass cover is related to the fire suppression theory. Removal of the grass reduces the fire carrying capacity and ability to generate much heat by removing the fuel. That is, a fire cannot be maintained on land with little or no fuel. This gives the shrubs an opportunity to mature. See J. HASTINGS & R. TURNER, *supra* note 2, at 276; R. HUMPHREY, *supra* note 4, at 38-44; 59-60; S. MARTIN, *supra* note 8, at 20.

110. G. GLENDENING & H. PAULSEN, REPRODUCTION AND ESTABLISHMENT OF VELVET MESQUITE AS RELATED TO INVASION OF SEMIDESERT GRASSLANDS 33-40 (1955) (USDA Forest Service Technical Bulletin No. 1127). One early study concluded:

An airplane view of the desert plains climax one to two hundred years ago would have shown much more grass than exists at the present time. . . . The desert and semi-desert shrubs, . . . though always present, have undoubtedly greatly increased their range and abundance as a result of lessened grass competition, the grasses having suffered more from heavy grazing than the shrubs.

Whitfield & Beutner, *Natural Vegetation in the Desert Plains Grassland*, 19 *ECOLOGY* 26, 37 (1938).

111. G. GLENDENING & H. PAULSEN, *supra* note 110, at 16-17; J. HASTINGS & R. TURNER, *supra* note 2, at 275; R. HUMPHREY, *supra* note 4, at 44. As many as 1,671 whole mesquite seeds have been found in a single "cow chip." *Id.* at 16. After dissemination, cattle may further aid in

that require this process for germination.¹¹² Cattle also transport some of the opuntia cactus in their hides.¹¹³ A third effect is to lower the moisture in the surface soil through removal of plant cover and soil compaction, both of which reduce water infiltration.¹¹⁴ This tends to favor the deep rooted shrubs over the more shallow rooted grasses.¹¹⁵

Most authorities conclude that a combination of the factors discussed above causes the woody shrub invasion.¹¹⁶ As climate weakens the grass cover, cattle enhance the trend toward soil aridity and shrub dissemination, and thereby facilitate establishment of the shrubs.¹¹⁷ A reduction of the grass cover also leads to fire suppression through depletion of fuel, thereby allowing establishment of the shrubs.¹¹⁸ Such a reduction also greatly eliminates competition with the shrub seedlings.¹¹⁹ Furthermore, as the ranges deteriorate, some rodents and rabbits seem to increase in numbers and tend to maintain the ranges in a deteriorated condition.¹²⁰ Cooke and Reeves summarize the causative factors as follows: "[I]t is clearly both possible and reasonable to maintain that the coincidence of several environmental changes—some related to natural factors, others caused deliberately or accidentally by man—led to regional modification of vegetation."¹²¹

Arroyo Cutting

About the same time that woody plant invasion into the grasslands started, between 1850 and 1920,¹²² the current arroyo cutting in the Southwest began.¹²³ Cooke and Reeves begin their discussion with the following description of this process:

During the past hundred years many debris-filled valleys throughout

the establishment of the shrubs through their trampling which in effect "plants" the seeds. R. HUMPHREY, *supra* note 71, at 120.

112. G. GLENDENING & H. PAULSEN, *supra* note 110, at 9-17; J. HASTINGS & R. TURNER, *supra* note 2, at 275. Tests have shown that after the seedcoats dry and harden, scarification increases germination in sound seeds from 6% to 7% to over 95%. *Id.* at 10-11. In passing through the cattle's digestive tract the seed is exposed to digestive acids which increases the germination potential, but not to the level of physical scarification. *Id.* at 16-17.

113. J. HASTINGS & R. TURNER, *supra* note 2, at 275; L. Mehrhoff, *Vegetation Changes on a Southern Arizona Grassland Range—An Analysis of Causes 35* (1955) (unpublished M.S. thesis in University of Arizona Library).

114. *See* R. COOKE & R. REEVES, *supra* note 4, at 84, 86-87; J. HASTINGS & R. TURNER, *supra* note 2, at 276, 284.

115. *Id.* at 276; *see generally* S. MARTIN, *supra* note 8, at 20.

116. *See* R. COOKE & R. REEVES, *supra* note 4, at 86; J. HASTINGS & R. TURNER, *supra* note 2, at 288-89; R. HUMPHREY, *supra* note 4, at 63-64.

117. J. HASTINGS & R. TURNER, *supra* note 2, at 289.

118. *Id.* at 276; R. HUMPHREY, *supra* note 4, at 44.

119. S. MARTIN, *supra* note 8, at 20.

120. J. HASTINGS & R. TURNER, *supra* note 2, at 276-77; R. HUMPHREY, *supra* note 4, at 49; *see text & notes 82-87 supra*.

121. R. COOKE & R. REEVES, *supra* note 4, at 86.

122. *Id.* at 187.

123. J. HASTINGS & R. TURNER, *supra* note 2, at 43; S. MARTIN, *supra* note 8, at 7.

the South-Western United States have experienced rapid and pronounced erosion. Gentle swales and broad, undissected plains that occasionally carried shallow floods became deeply incised with arroyos—valley bottom gullies characterized by steeply sloping or vertical walls in cohesive, fine sediments and by flat and generally sandy floors. Valley floors once covered by grass and sedge and adorned with occasional clumps of tress and bushes were transformed into desiccated alluvial terraces that have been periodically diminished by losses to encroaching arroyos.¹²⁴

The 1880's were apparently the most active arroyo cutting period.¹²⁵ Today, most of the valley floors are at least partly entrenched.¹²⁶ An important effect, other than loss of land and increased sediment production, is hydrological.¹²⁷ Although the valley floors were once inefficient in channeling water runoff causing more water to be infiltrated¹²⁸ and stored in alluvial fills, such that a ready source of water was supplied near the surface for vegetation,¹²⁹ arroyos now enable the water to run off rapidly, reducing supplies of near surface water, desiccating valley floors, and thereby affecting vegetation.¹³⁰

Overgrazing has been commonly cited as the initiator of arroyo cutting.¹³¹ The close correlation in time between the major overgrazing of the late 1880's and the onset of the erosion is certainly circumstantial evidence supporting the conclusion that overgrazing initiated arroyo cutting.¹³² Removal of plant cover can lessen water infiltration causing a faster forced runoff and erosion.¹³³ Also, ruts and scuffed surface soil tend to serve as focal points for runoff and, with sufficient precipitation, enlarge rapidly, initiating arroyos. Numerous grazing cattle wear trails causing such ruts.¹³⁴ Removal of vegetation then lowers the resistance of the soil to erosion.¹³⁵ Thus, although precipitation actually causes

124. R. COOKE & R. REEVES, *supra* note 4, at 1.

125. *Id.* at 2.

126. *Id.* at 97.

127. *Id.* at 4.

128. *Id.*

129. *Id.*

130. *Id.*

131. J. HASTINGS & R. TURNER, *supra* note 2, at 43; S. MARTIN, *supra* note 8, at 7. See R. COOKE & R. REEVES, *supra* note 4, at 84-85, 94-96.

132. *Id.*; see R. COOKE & R. REEVES, *supra* note 4, at 1-2. See discussion note 69 *supra*.

133. R. COOKE & R. REEVES, *supra* note 4, at 86; J. HASTINGS & R. TURNER, *supra* note 2, at 43.

134. Field observations indicate that "[w]ell worn ruts—wagon roads, game and cattle trails, footpaths, drainage ditches—tend to become focal points for runoff, then rapidly enlarge because of their bareness and become arroyos." J. HASTINGS & R. TURNER, *supra* note 2, at 43. See L. Mehrhoff, *supra* note 113, at 36. Cooke and Reeves have completed the most exhaustive analysis of arroyo cutting, and have correlated what they term "drainage-concentration features" with numerous large arroyo initiations. See R. COOKE & R. REEVES, *supra* note 4, at 94-97. These features include cattle trails, but they result primarily from ranching, agriculture, and transportation. See *id.*

135. J. HASTINGS & R. TURNER, *supra* note 2, at 43; L. Mehrhoff, *supra* note 113, at 36.

the arroyos, some surface disturbance may be necessary to initiate the formation. Hastings and Turner concluded that climate was probably the primary factor, and grazing secondary in initiating arroyo cutting,¹³⁶ while Cooke and Reeves concluded that "drainage concentration features"¹³⁷ were primary,¹³⁸ although they did not rule out climate and vegetational changes as factors.¹³⁹

The entire preceding sketch is painted with considerable generalization, but the conclusions appear accurate. An extremely brief outline has been provided of the most patent changes of ecological importance observed in the southwestern ranges to show that causative factors in an ecological system are only ascertainable with extreme difficulty. Nevertheless, it may be stated in summary that the arid desert lands of the Southwest are ecologically fragile, that extensive vegetational, topographical, and hydrological changes have occurred in the past century,¹⁴⁰ and that cattle have played a far from insubstantial role as causative agents.

LEGAL CONSIDERATIONS OF GRAZING ON PUBLIC LANDS

Origins of the Ranching Pattern

In the formative years of the nation, the major national land policy rested on the principle of private land ownership.¹⁴¹ As land accession expanded westward, the central thrust of significant land laws was aimed at divesting federal title for the benefit of individual landowners and the railroads.¹⁴² Since the 1900's the policy of divestiture of federal

136. J. HASTINGS & R. TURNER, *supra* note 2, at 45. Hastings and Turner acknowledged the lack of precision in such terms as "overgrazing" and "climatic change," but based their opinion on the given historical evidence, that is, the incidence of heavy grazing elsewhere before the 1880's without the onset of arroyo cutting. *Id.*

137. "Drainage concentration features" are items such as roads, ditches, and ruts caused by trails. See R. COOKE & R. REEVES, *supra* note 4, at 94. Livestock adds to the drainage concentration features through trampling which leads to soil compaction, reduced infiltration, and increased runoff. Moreover, cattle herds were the cause of trail formation and the scuffing of soil surface, creating focal points for runoff and easy soil removal. See text & notes 133-35 *supra*; R. COOKE & R. REEVES, *supra* note 4, at 96.

138. R. COOKE & R. REEVES, *supra* note 4, at 99.

139. *Id.*

140. The United States Congress expressly recognized the deteriorated condition of much of the Southwestern grasslands in the PRI Act. Pub. L. No. 95-514, § 2(a)(1), 92 Stat. 1803 (to be codified in 43 U.S.C. § 1901(a)(1)). The Act notes that such unsatisfactory conditions create high risks of soil loss, desertification, surface runoff, and possible long term climatic change, as well as reducing aesthetic and recreational values. *Id.* § 2(a)(3) (to be codified in 43 U.S.C. § 1901(a)(3)).

141. Aspinall, *supra* note 15, at 4.

142. *Id.* at 5; see SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 25-28. Of an original 1,807,681,920 acres of federal land, only something over 700 million acres remain in federal control. Aspinall, *supra* note 15, at 6; Udall, *supra* note 12, at 12.

Omitting military and Indian lands, some 376 million acres of rural land, or about 19% of the United States (excluding Alaska and Hawaii) are federally controlled. M. CLAWSON & B. HELD, *supra* note 20, at 36. This 19% probably contributes only 6% to 8% of the nation's resource base, since the more valuable lands have been transferred to private ownership. *Id.* at 40. But see PLLRC REPORT, *supra* note 16, at 105 (explaining significance of public land). As stated by

title made a complete turnabout,¹⁴³ and with the passage of the FLPM Act the express policy is retention of federal title.¹⁴⁴ The most widespread use of federal lands today, excluding Alaska, is for grazing.¹⁴⁵

Arizona's land area is 72,688,000 acres.¹⁴⁶ About eighteen percent of this acreage is BLM land, and about thirteen percent is state trust land.¹⁴⁷ Most of the BLM and state trust lands in Arizona are leased for grazing,¹⁴⁸ and it is with these lands that this Note's ecological analysis is chiefly concerned.

The history of the cattle industry in the West centers on the easy availability of space on the federal lands, and the total inability of the federal government to enforce its land laws.¹⁴⁹ Title to land in the great plains area was chiefly acquired by settlers through the Preemption Act of 1841,¹⁵⁰ the Homestead Act of 1862,¹⁵¹ the Timber Culture

Marion Clawson, Director of the BLM from 1948 to 1953, "one may conclude that the federal lands have too many resources to be neglected, but too few in total to be a dominant factor in the national prosperity or lack of it." *Id.* at 40. As to the value of the BLM grazing lands, Clawson has stated: "In a part of a grazing district where much less than half of the land area is federally owned one does not have to see the federal land to know that it will be the driest, rockiest, steepest, least productive part of the whole area." *Id.* at 50.

Federal lands furnished only about 10% of the total feed requirements of livestock in the western states. U.S. BUREAU OF THE BUDGET, NATIONAL RESOURCES USER CHANGES: A STUDY 3 (1964). Of the land under federal control, approximately 160 million acres are national forests and 485 million acres are administered by the BLM. Aspinall, *supra* note 15, at 6.

Excluding Alaska, over 90% of the federal lands are in the 11 western states. PLLRC REPORT, *supra* note 16, at 22; see listing note 252 *infra*. About 166 million acres of BLM land outside Alaska have been administered under the Taylor Grazing Act, ch. 865, 48 Stat. 1269 (1934) *as amended* (codified in 43 U.S.C. §§ 315-315r). For exposition of the Act, see text & notes 162-67 *infra*.

143. SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 25-28. Around the turn of the century the ethic switched from disposition to conservation. P. GATES, HISTORY OF PUBLIC LAND LAW DEVELOPMENT 769-72 (1968) (written for the PLLRC). See M. CLAWSON & B. HELD, *supra* note 20, at 3-4, 5-7.

144. 43 U.S.C.A. § 1701(a)(1) (Supp. 1978).

145. PLLRC REPORT, *supra* note 16, at 28. Approximately 245 million acres of federal lands in western states are grazed under federal permits. U.S. BUREAU OF THE BUDGET, NATIONAL RESOURCES USER CHANGES: A STUDY 3 (1964).

146. ARIZONA LAND MARKS, *supra* note 9, at S-1.

147. *Id.* See Coker, *supra* note 3, at 21; Udall, *supra* note 12, at 13. Excluding Alaska, Arizona ranks first among the states with total land area controlled by some governmental agency, with over 61 million acres so controlled. See SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 33. The federal government controls 70% of Arizona land; only 17% is privately owned. ARIZONA LAND MARKS, *supra* note 9, at S-1. About 16% of the federal land in Arizona is national forest. See *id.*

148. See UNITED STATES DEP'T OF INTERIOR, PUBLIC LAND STATISTICS 87 (1976) (about 11 million acres are under BLM grazing management); ARIZONA LAND MARKS, *supra* note 9, at S-15 (8,844,241 acres of state trust land are leased for grazing); Udall, *supra* note 12, at 13. A substantial portion of the Indian, national forest, military, and private lands are also used for grazing. See P. GATES, *supra* note 143, at 49-86, 765-72; SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 8.

Nationally, the federal government administers about 160 million acres of BLM land, excluding Alaska. Aspinall, *supra* note 15, at 6. In 1956 grazing pressure on BLM lands totaled 15,301,000 AUMs and on forest lands 7,126,000 AUMs. (An AUM is an Animal Unit Month—or very generally speaking, one month's grazing by one adult cow.) See M. CLAWSON & B. HELD, *supra* note 20, at 405 Appendix Table 2, 418 Appendix Table 12.

149. Scott, *The Range Cattle Industry: Its Effect on Western Land Law*, 28 MONT. L. REV. 155, 155, 159-60 (1967).

150. Ch. 16, 5 Stat. 453 (1841).

151. Ch. 75, 12 Stat. 392 (1862).

Act of 1873,¹⁵² and the Desert Land Act of 1877,¹⁵³ as well as through piecemeal sales by the federal government at auctions and acquisition from the states and railroads.¹⁵⁴ In the nineteenth century the federal government's policy was to open the public domain to everyone,¹⁵⁵ but the intent was to expand farming.¹⁵⁶ Because ranchers could not obtain enough private land to operate profitably, they acquired large amounts of public domain lands.¹⁵⁷ Many of these acquisitions were by "extra legal" methods.¹⁵⁸ By the late 1800's many federal and state courts were upholding the "rights" of the ranchers to the land, prior possession being good title against all but the federal government.¹⁵⁹ Many cattle associations became very influential locally and were able to get favorable state laws passed.¹⁶⁰ Their efforts were largely ignored on the federal level, and in return, they largely ignored federal laws.¹⁶¹ Their private interests in the public domain became much stronger as these interests were handed down through generations, until in 1934 the Congress finally bowed to the private interests and perpetuated them by enacting the Taylor Grazing Act, which legitimized the already existing holdings of the ranchers.¹⁶²

This Act authorized the Secretary of the Interior to formalize and regulate livestock grazing on the public lands.¹⁶³ It authorized the formulation of necessary rules and regulations, and "any and all things necessary" to promote the purposes and objects of the Act, which were

152. Ch. 277, 17 Stat. 605 (1873), *amended* ch. 55, 18 Stat. 21 (1874).

153. Ch. 107, 19 Stat. 377 (1877).

154. Scott, *supra* note 149, at 156-58.

155. *Id.* at 159.

156. *Id.*

157. *Id.*

158. *Id.* at 161-74. Some of the "more legal" methods included buying up the only land with a water supply, which in effect gave control over a much larger area without water, *id.* at 162, or owning or controlling land at the headwaters of streams and then forming irrigation companies under state corporation laws, and diverting the waters from lower settler's lands. *Id.* at 166. In addition, associations were formed with a system of "range rights" (the land claimed up and down a stream, and all land back to the divide or highland separating the next stream). Newcomers were excluded from participation in common roundups, corrals, protection from Indians. *Id.* at 166. Finally, fencing techniques were employed whereby peripheral lands were purchased and fenced to enclose large amounts of public domain lands inside. *Id.* at 168-71.

"Extra-legal" methods included force, destruction of farmer's crops, "appropriation" of small rancher's livestock, claim-jumping, and control of state legislatures to effect passage of such laws as fence laws that required farmers adequately to fence their crops before liability could be imposed on the rancher for destruction of the crops by stray cattle. *Id.* at 172-73.

159. See *Atherton v. Fowler*, 96 U.S. 513, 518-19, 520 (1877); *Tidwell v. Chiricahua Cattle Co.*, 5 Ariz. 352, 365-66, 53 P. 192, 196 (1898); *Parks v. Barkley*, 1 Mont. 514, 517 (1872); *Nickals v. Winn*, 17 Nev. 188, 194, 30 P. 435, 436 (1882); *Staininger v. Andrews*, 4 Nev. 59, 69-70 (1868).

160. Scott, *supra* note 149, at 177; see note 158 *supra*.

161. Scott, *supra* note 149, at 182.

162. *M. CLAWSON & B. HELD, supra* note 20, at 84-85; Scott, *supra* note 149, at 183. Act of June 28, 1934, ch. 865, 48 Stat. 1269 (codified as amended in 43 U.S.C. §§ 315 to 315r (1970)).

163. 43 U.S.C. § 315 (1970). The Secretary was to accomplish this control procedure through the formation of regional grazing districts, comprised of vacant public lands chiefly valuable for grazing. *Id.*

"to regulate . . . [the land's] occupancy and use, to preserve the land and its resources from destruction or unnecessary injury, to provide for the orderly use, improvement, and development of the range."¹⁶⁴ It also authorized continued study of erosion and flood control, and the performance of "such work as may be necessary amply to protect and rehabilitate the areas subject to the provisions of this chapter, through such funds as may be made available for that purpose. . . ."¹⁶⁵

Although the goal of the legislation seems to be resource protection in the public interest, the Act actually bows to recognition of historic user interests.¹⁶⁶ In retrospect, the apparent intent of Congress was that the BLM lands play the same role of stabilizing the industry that the Forest Service lands under the supervision of the Department of Agriculture had since the turn of the century.¹⁶⁷

Although grazing pressures have declined somewhat over the past forty years of regulation,¹⁶⁸ and leasing fees have climbed towards a fair market return for the government,¹⁶⁹ the obvious concern of Congress in authorizing the PLLRC and enacting the FLPM and PRI Acts, was that after decades under the older laws, the public grazing lands were still deteriorating, fees were still inadequate, and the controlling agency was still without explicit implementing mechanisms or guidelines necessary to administer the land properly.¹⁷⁰ The need for greater public input in the planning and use of public lands, which was in response to the growing concerns over recreational, environmental, scientific, and aesthetic values, was also recognized.¹⁷¹

Grazing Fees

The subject of administration and amount of grazing fees on BLM

164. 43 U.S.C. § 315a (1970).

165. *Id.*

166. Scott, *supra* note 149, at 183; see Nielsen & Wennergren, *Public Policy and Grazing Fees on Federal Lands: Some Unresolved Issues*, 5 LAND & WATER L. REV. 293, 301-02 (1970); see text & note 167 *infra*.

167. Nielsen & Wennergren, *supra* note 166, at 302. See M. CLAWSON & B. HELD, *supra* note 20, at 84-85. The Forest Service's role is explained in a statement made by the Secretary of Agriculture in 1925. U.S. DEPT OF AGRICULTURE, AGRICULTURE YEARBOOK 87-89 (1925). He advocated restricting further distribution of permits to give greater support and stability to existing producers, *id.* at 88, and stated "every reasonable form of security should be given the livestock producer. . . ." *Id.* at 87. The intent of the Department of Agriculture was to favor conservation of the resource for the purpose of stabilizing and protecting the user industry, with no indication that public interest in protection and use of the lands was considered. See *id.*; Nielsen & Wennergren, *supra* note 166, at 301-02.

168. S. MARTIN, *supra* note 8, at 10.

169. See Nielsen & Wennergren, *supra* note 166, at 305.

170. See authority cited notes 15, 28 *supra*; text & notes 23-27 *supra*.

171. Aspinall, *supra* note 15, at 8-9; see SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 6 See generally 43 U.S.C.A. §§ 1701(a)(5), (8), 1712(a), (b), (c)(2), (3), (9), (f), 1714(h), 1739, 1753 (Supp. 1978) (examples of the many areas of the FLPM Act requiring public input).

and Forest Service lands has long been bitterly contested.¹⁷² Several arguments exist in support of charging a fair market value rental fee for the use of public grazing lands.¹⁷³ For example, if the use of public land to produce cattle for market costs less on a per animal basis than does the use of private land, then the federal government would be randomly aiding the public land user to compete unfairly with the private land owner or lessor. A second argument is that since the federal government, as a unit, operates on a roughly fixed yearly budget, leasing the public lands at below what the ranching industry would and could pay necessarily means that one potential source of financing the fixed budget is ignored at the expense of some other revenue resource, probably the general public as taxpayer.¹⁷⁴ Thus, indirectly, the public land user is unjustly enriched at the public's expense. It is also reasonable to assume that the less money received directly from the land leases, the less likely a substantial sum will be invested in maintenance and improvement of the land.

The above considerations all argue for receipt of a fair market return by the government on grazing leases. In order to understand recent and current battles over grazing fees, and to understand exactly what the government is currently receiving for the lease of public lands, a discussion of the history of grazing fees is necessary.

The first grazing fees charged for utilizing public land were assessed by the Forest Service in 1906 on a per-head basis.¹⁷⁵ The right of a government agency to assess public land use fees was challenged and upheld by the United States Supreme Court in the 1911 decision, *United States v. Grimaud*.¹⁷⁶ The early fee levels charged reflected only administrative costs¹⁷⁷ and were never commensurate with the costs of private leasing.¹⁷⁸ From the outset, grazing permits held by landowners adjacent to forest service land were regarded as having an intrinsic value of their own.¹⁷⁹ Contracts for the sale of the ranches with permit rights began to include a value for the permits.¹⁸⁰

In 1934, the Taylor Grazing Act first authorized fee charges on public lands that were under the supervision of the Department of Interior.¹⁸¹ The Secretary was empowered to see "reasonable fees,"¹⁸² but

172. M. CLAWSON & B. HELD, *supra* note 20, at 220.

173. See discussion of recent controversy, text & notes 204-22 *infra*.

174. See note 192 *infra*.

175. Nielsen & Wennergren, *supra* note 166, at 295.

176. 220 U.S. 506, 521-23 (1911).

177. Nielsen & Wennergren, *supra* note 166, at 296-97.

178. *Id.* at 297.

179. *Id.*

180. *Id.*

181. *Id.* at 302.

182. 43 U.S.C. § 315b (1970).

like the Forest Service rates, the fees were set at a rate lower than private leasing rates.¹⁸³ An amendment to the Act in 1947¹⁸⁴ indicates that costs of administration were the determining factor.¹⁸⁵ Attempts by the BLM were made to relate the fees to market prices for the products produced,¹⁸⁶ but this did not necessarily reflect fair market forage value for the land.¹⁸⁷ As with forest service permits, grazing permits became intrinsically valuable.¹⁸⁸ They represented a preferential privilege to continued use of land leased at less than private rates, and they were renewable and transferable.¹⁸⁹ When a ranch was sold, the buyer had to pay the seller not only for his personal and real property, but also for a value inherent in the permit, which represented the preferential privilege to utilize land at a cost below private market value, capitalized over a period of years.¹⁹⁰

In 1964, a report by the Bureau of the Budget,¹⁹¹ emanating from a study of grazing fees, espoused the principle that fees should be based on the economic value of the land, excluding permit costs, so that the government would receive a fair return.¹⁹² An economic model was developed in the Western Livestock Grazing Survey of 1966 to explain how public land forage was actually valued by the user; permit costs were the major consideration.¹⁹³ This model was tested in Utah in

183. See Nielsen & Wennergren, *supra* note 166, at 303-05.

184. Act of Aug. 6, 1947, ch. 507, § 1, 61 Stat. 790 (1947).

185. M. CLAWSON & B. HELD, *supra* note 20, at 222.

186. Nielsen & Wennergren, *supra* note 166, at 306-07.

187. *Id.* at 307.

188. See *id.* at 209-14.

189. See authorities cited and discussion at notes 12 *supra*, 227, 336 *infra*.

190. See notes 193, 200, 227 *infra*.

191. U.S. BUREAU OF THE BUDGET, NATIONAL RESOURCES USER CHARGES: A STUDY (1964).

192. *Id.* The report stated:

In the conduct of their various activities many of the Federal agencies . . . authorize the use of Federal resources which convey special benefits to identifiable recipients above and beyond those which accrue to the public at large. In fairness to the general taxpayer, who bears the major share of support of Federal activities, the Government has adopted the policy that the recipient of these special benefits generally should pay a reasonable charge . . . for the resource used.

Id. at 1.

193. Nielsen & Wennergren, *supra* note 166, at 309-11. The "permit value" is the value one might be expected to pay for the right to secure the use of a commodity, for a period of time, at a bargain rate. As discussed by Nielsen & Wennergren, *id.*, the model for determining permit value may be stated symbolically as $P_v = \frac{(P_2 + E_2) - (F_1 + E_1)}{i}$

where P_v = permit value, P_2 = private lease rate; E_2 = private use costs excluding lease rate; F_1 = public grazing fee; E_1 = public use costs excluding fee; i = relevant rate of interest for capitalization to express the permit value as a function of time, since it only takes on value as it is used over time. From this formula follows the relationship $V = F_1 + i(P_v)$ where V = the value of the public forage per AUM if F_1 and P_v are calculated per AUM. AUM = animal unit month, or the amount of forage necessary to support one cow and calf for one month. The first equation can be used to calculate the reasonable value of a permit, and this figure can be checked against actual values to see if reasonable competition occurs between public and private grazing—that is, are ranchers actually paying a reasonable value for the right to graze the land. The "forage value" is the value of the utilizable forage on public lands, as determined by costs actually expended to

1966, and it was concluded that a relatively free market existed in public grazing. In other words, forage was believed to be valued competitively by the users on public and private lands.¹⁹⁴ However, a substantial amount of the compensation calculated as paid for the forage on public lands was actually paid as consideration to the prior holder for the purchase of the permit, and not to the government as fee charges.¹⁹⁵ This means that any alteration in grazing fees on public lands or private lease fees that would reduce the difference in the two would lower the present purchase value of the permit.¹⁹⁶ If the two fees became equal, theoretically the permit should become valueless,¹⁹⁷ except insofar as it represents the privilege to use a finite resource.¹⁹⁸

Presumably the permit value has already been paid by the permit holders,¹⁹⁹ and until it is amortized, an increase in fees to full market value would result in a loss to the holders of the value paid as consideration for the permit.²⁰⁰ Some sort of credit given for this value has been proposed and much debated.²⁰¹ The PLLRC report recommended charging users fair market value, but with credit for the permit value.²⁰² This recommendation has been ignored and a stated policy of the FLPM Act is to receive fair market value "unless otherwise provided for by statute."²⁰³ The best solution would probably entail a gradual phase-in of fair market value rates.

As a response to general disagreement between the Departments

secure its use. The second equation will determine the forage value per AUM on public land, if it is determined that a free market exists by first correlating the expected with the actual value of the grazing permit by equation 1.

194. *Id.* at 311.

195. *See id.* at 311-12, 313-14, see also discussion note 200 *infra*.

196. Nielsen & Wennergren, *supra* note 166, at 312-13.

197. *Id.* See discussion note 193 *supra*. At this zero-value point the government would be receiving fair market value in the fees charged. Nielsen & Wennergren, *supra* note 166, at 313.

198. Even though fair market value must be paid for the use of public lands, there is some additional value represented by the availability of the public lands if other land is unavailable.

199. The estimated value in 1969 of all federal permits in the country was estimated to be in the hundreds of millions of dollars. Nielsen & Wennergren, *supra* note 166, at 313-14.

200. Presumably, the first permit holder was paying below fair market value, and realized an excessive profit on the sale of his product, and also realized a profit on the sale of the permit. The second holder of the permit presumably would have paid the fair market value of the permit to the first holder, and if a free market existed in grazing, the second holder initially made no excessive profit on the sale of his product, relative to the private lessee or owner. But depending on the capitalization rate of the permit, and the time factor, holder number two would eventually be able to sell the permit at a profit due to inflation in land values, and the process would start again. So until capitalized, the purchaser of the permit is in effect paying fair market value for forage use to raise his product, but a large portion of his payment goes as profit to the previous permit holder who had either already capitalized the permit, or was the initial holder. The federal government has never received the fair market value in fees.

201. *See* Nielsen & Wennergren, *supra* note 166, at 314-30.

202. PLLRC REPORT, *supra* note 16, at 117-18; Geraud, *A Review of the Public Land Law Review Commission's Recommendations of Significance to Grazing*, 6 LAND & WATER L. REV. 47, 53-54 (1970).

203. 43 U.S.C.A. § 1701(a)(9) (Supp. 1978).

of Agriculture and Interior with the House over the fee formula to be used,²⁰⁴ the FLPMA Act commanded that a joint study be made by the Secretaries of Agriculture and Interior in 1977, and that proposals be made to Congress upon completion.²⁰⁵ The study was to recommend grazing values that were "equitable to the United States and to the holders of grazing permits and leases on such lands."²⁰⁶ Consideration was to be given to production costs, differences in forage values, and other factors relating to "reasonableness" of the fees.²⁰⁷ A moratorium was placed on fee increases pending completion of the report.²⁰⁸

In response to the command of the FLPMA Act, the Secretaries of

204. The comments in the report of the House Committee on Interior and Insular Affairs concerning the FLPMA Act noted that the subject of fees had been controversial since passage of the Taylor Grazing Act, and had interfered with the administration of the Act and the procuring of adequate funds for management and improvement programs. H.R. REP. NO. 1163, 94th Cong., 2d Sess. 11, *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6175, 6185. In the 1960s the Secretaries of Agriculture and Interior jointly studied the problem and produced a formula with a base fee to be adjusted annually to reflect changes in private lease rates. *Id.* at 12, U.S. CODE CONG. & AD. NEWS at 6186. This formula took into consideration the permit value paid to the prior holders, see text & notes 125-32 *supra*, which resulted in the government not receiving market value.

The amended House version of the FLPMA Act set standard fee amounts to be adjusted annually by a formula based on beef prices and production prices. H.R. REP. NO. 1163, 94th Cong., 2d Sess. 12, *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6175, 6186. Both the Departments of Agriculture and Interior wrote the committee concerning their disagreement with this fee schedule. *Id.* at 40, 48, U.S. CODE CONG. & AD. NEWS at 6214, 6222. See text & notes 216-22 *infra*. The Department of Agriculture argued the fee was below market value, and that the index for adjustment should be based on private lease rates. *Id.* at 40, U.S. CODE CONG. & AD. NEWS at 6214. The Department of Interior argued that the fee was too low, would remain static, and an even larger disparity would exist between it and private lease rates. *Id.* at 48, U.S. CODE CONG. & AD. NEWS at 6222. In a joint House and Senate conference committee on the Act, the mandatory fees of the House version could not be agreed upon, and the present form of the FLPMA Act replaced it. *Id.* at 63, U.S. CODE CONG. & AD. NEWS, at 6234; 43 U.S.C.A. § 1751(a) (Supp. 1978).

A comment in the Act states that it was anticipated that the joint report of the Secretaries, see 43 U.S.C.A. § 1751(a) (Supp. 1978), would be such as to enable the Congress to evaluate the House's formula. H.R. REP. NO. 1163, 94th Cong., 2d Sess. 63, *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6175, 6234-35. The comments mentioned only the "reasonableness" requirement. *Id.* Little change in statutory language regarding fees has occurred since 1934. Compare 43 U.S.C. § 315(b) (1970) with 43 U.S.C.A. § 1751(a) (Supp. 1978). The Taylor Grazing Act left the fee setting responsibility up to the Secretary of the Interior, whereas the FLPMA Act requires the initial determination be made by the Secretaries of Agriculture and Interior jointly and be submitted for approval to the Congress, but the intent appears to have substantially changed towards higher lease rates, which at least partially reflect private lease rates. See text & notes 202-08. The comments of the House Committee on Interior and Insular Affairs, discussed above, indicating that present fees interfere with adequate funding for improvement programs, reinforce the belief that the House at least intended fees be raised. H.R. REP. NO. 1163, 94th Cong., 2d Sess. 11, *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6175, 6185. The comment implied that fees had been inadequate for both cost of administration and funding improvement programs. See *id.*

One commentary on the historical fee controversy concluded in 1970 that it will take congressional action, following efforts of the PLLRC and the regulatory agencies, to determine whether the historical controversy over user charges continues in the same "unstructured arena." Nielsen & Wennergren, *supra* note 166, at 320. In light of the present legislation and its history, it appears that the above comment is as valid seven years later as it was when made.

205. 43 U.S.C.A. § 1751(a) (Supp. 1978); see H.R. REP. NO. 1163, 94th Cong., 2d Sess. 63, *reprinted in* [1976] U.S. CODE CONG. & AD. NEWS 6175, 6234.

206. 43 U.S.C.A. § 1751(a) (Supp. 1978).

207. *Id.*

208. *Id.*

Agriculture and Interior established a joint task force in 1977 to study grazing fees. Public meetings were held, recommendations were sent to Congress, and proposed regulations were published in the Federal Register on the subject of grazing fees.²⁰⁹ The following proposals were published: fair market value determinations should be based on the Western Livestock Grazing Survey of 1966, as updated annually in relation to private grazing land lease rates; grazing fees should be increased to fair market value, excluding consideration of permit costs, but limited to a present yearly increase of no more than twenty-five per cent of the preceding year's rates; after reaching fair market value yearly charges should be increased by no more than twelve per cent of the previous year's fee; under specific conditions a fee should be established for yearlings; and, data on private leases should be collected, refined, and evaluated to use in determining the public grazing leases.²¹⁰

In these regulations proposed simultaneously by the Departments of Agriculture and Interior, the Forest Service discussed the concept of fair market value.²¹¹ Fair market value is defined as the "equivalent of the price agreed upon by a willing buyer and willing seller, each with adequate knowledge . . ." and is to exclude consideration of any value attributable to a permit.²¹² To be more precise, fair market value is the difference between the total costs a private land lessee incurs to raise a cow including private lease expenses, and the total costs incurred by a federal land lessee, excluding permit cost and fees already being paid to the government.²¹³ The costs to be included in the calculation are set out in the proposal.²¹⁴

In the United States Congress, bitter debate over the grazing fee formula again erupted in the committee debates over the PRI Act.²¹⁵ The most controversial issue concerned the grazing fee formula.²¹⁶ The PRI Act established a formula that will be computed in part from the cost of beef production and sales price; the fee will fluctuate with the

209. 42 FED. REG. 60,109, 60,110 (1977) (to be codified in 43 C.F.R. § 4100); 42 FED. REG. 60,108 (1977) (to be codified in 36 C.F.R. §§ 222, 231).

210. *Id.*

211. 42 FED. REG. 60,108-09 (1977).

212. *Id.*

213. *Id.* The fees proposed by both the BLM and Forest Service after March, 1978, are \$1.89 per AUM. *Id.* The Wall Street Journal reports the average cost of leasing private grazing land as \$5.75 per AUM. WALL ST. J., Feb. 7, 1978, at 48, col. 2.

214. 42 FED. REG. 60,108-09 (1977).

215. A progression of events that occurred as the PRI Act (H.R. 10587 and its counterpart, S.2475) moved through the Congress may be seen in the following summaries of action: PUBLIC LANDS NEWS, Feb. 23, 1978, at 4-5; March 9, 1978, at 9; March 23, 1978, at 5-6; April 6, 1978, at 3-4; April 20, 1978, at 2-3; May 4, 1978, at 4; May 18, 1978, at 10; June 1, 1978, at 8; June 29, 1978, at 6; July 13, 1978, at 1-3.

216. *Id.*

overhead expenses and prices received in the cattle industry.²¹⁷ Industry strongly supported this formula since, in effect, it guarantees a profit margin.²¹⁸ The Carter Administration, particularly the BLM and Forest Service, and some environmental groups strongly opposed the proposed formula²¹⁹ and supported the fair market value formula discussed above.²²⁰ Congress passed the PRI Act with the intention of testing the new formula for seven years starting in 1979.²²¹ In the meantime, a new moratorium on grazing fees, which will be in effect for the 1978 grazing year, has been approved by Congress and signed by President Carter.²²²

EFFECT OF NEW FEDERAL LEGISLATION ON PUBLIC GRAZING LANDS

The Planning Duties of the Secretary of the Interior

The FLPM Act sets forth three areas in which the Secretary of the Interior has responsibility for long-range planning with respect to public lands under the control of the BLM. These areas of responsibility are to: (1) inventory the lands;²²³ (2) develop land use plans by tract or area;²²⁴ and (3) develop allotment management plans for local grazing

217. *Id.* April 6, 1978, at 3, April 20, 1978, at 3, July 13, 1978, at 1-3. Pub. L. No. 95-514, § 6, 92 Stat. 1806 (to be codified in 43 U.S.C. § 1905). The formula would start with the base price established by the 1966 Western Livestock Grazing Survey. This price would then be multiplied by the sum of a forage value index added to a beef cattle price index minus a price paid index. *Id.* Basically, the fee would fluctuate as a reflection of changes in the general economic welfare of the industry. 3 PUBLIC LANDS NEWS, March 23, 1978, at 6.

218. PUBLIC LANDS NEWS, March 23, 1978, at 5-6, April 6, 1978, at 3, July 13, 1978, at 1-3. The Public Lands Council, which represents the livestock industry, argued that the bill's formula would establish a price almost identical to the administration's fair market value formula, see text accompanying notes 211-14 *supra*, by 1979, but would protect and buffer the industry when beef prices drop. *Id.*, July 13, 1978, at 3.

219. PUBLIC LANDS NEWS, July 14, 1978, at 1-3; March 23, 1978, at 5-6; May 4, 1978, at 4; May 18, 1978, at 10. Such groups as the Sierra Club and the National Wildlife Federation supported the Administration's fair market value formula. *Id.* July 13, 1978, at 2. Rex Resler, associate chief of the Forest Service, argued that the bill's cost of production formula was designed to reflect the industry's economic welfare, while the first concern of the formula should be the protection of the public lands. *Id.* at 6. Interior Secretary Cecil Andrus said that to invest over \$2 billion in public lands during the next 20 years and simultaneously guarantee the livestock industry a profit by charging less than fair market value is an unsupportable position. *Id.* July 13, 1978, at 3. The National Wildlife Federation argued that the guaranteed profit resulting from such a cost of production formula would increase pressure for increased allotments when the misused lands cannot support more cattle. *Id.* President Carter issued a statement supporting the fair market value formula, and expressing disapproval of the bill's formula. Arizona Daily Star, July 22, 1978, § A, at 9, col. 1-2. He said: "I believe it is unfair to provide a special subsidy at the public's expense to those 5 percent of all livestock operators who use public lands, while the vast majority of operators use private lands at much greater expenses." *Id.* The vast majority who use private lands do so east of the Rockies. See text & notes 141-48 *supra*.

220. See text & notes 209-14 *supra*.

221. PUBLIC LANDS NEWS, July 13, 1978, at 1, May 4, 1978, at 4, April 20, 1978, at 3.

222. *Id.* July 13, 1978, at 2; Arizona Daily Star, July 22, 1978, § A, at 9, col. 1.

223. 43 U.S.C.A. § 1711(a) (Supp. 1978).

224. *Id.* at § 1712(a).

leases.²²⁵ These plans are to be coordinated as fully as possible with the National Forest lands and state, local, and Indian lands.²²⁶ Since the geographical pattern of most private grazing lands is such that it is substantially affected by public land regulations,²²⁷ the eventual shape of these inventories and plans will control the future of the southern Arizona desert lands.²²⁸

The first long-range duty of the Secretary is to inventory²²⁹ all the public lands under the Department of the Interior, including their resources and "other values."²³⁰ Areas of critical environmental concern

225. *Id.* § 1752(d).

226. *Id.* § 1712(c)(9).

227. See discussion note 354 *infra*. Other than certain large Spanish land grants and small private ranches, most ranches in Arizona include a small amount of private land and large amounts of leased public lands, sometimes including state trust, National Forest, and BLM lands on one ranch. See text & notes 146-48 *supra*. "Base lands" and "base waters" are the private rights owned which generally give the preferential right to a permit. See discussion note 12 *supra*, defining "permit" and "lease." The Taylor Grazing Act stated:

Preference shall be given in the issuance of grazing permits to those within or near a district who are landowners engaged in the livestock business, bona fide occupants or settlers, or owners of water or water rights, as may be necessary to permit the proper use of lands, water or water rights owned, occupied, or leased by them. . . .

43 U.S.C. § 315b (1970).

Accompanying new proposed regulations on range management, appearing in 41 FED. REG. 31,503 (1976), the Department of Interior, BLM, issued a fact sheet entitled *Questions and Answers Concerning Revised Grazing Regulations for the Public Lands Administered by the Bureau of Land Management*. The language in this publication summarizes well the concept of "preference" and "base property":

Those livestock operators now authorized to graze public lands under a license, permit, or lease have a preference [sic] for continued grazing use on the public lands under the revised regulations. . . . Preference is the priority for and the amount of grazing use a livestock operator is allowed on the public lands. This grazing preference is attached to base property owned or controlled by the livestock operator. . . .

Base property is privately owned or controlled land or water that is used in connection with grazing use on the public lands. . . .

[Under past regulations land base property was required to produce sufficient feed to maintain the livestock for a specified period, but] under the revised regulations, there will be no base property production requirements. . . .

[Water base property] requirements will not change. Base water has to be located so that it can be used by the livestock authorized to graze a particular area of public lands. . . .

[A] grazing preference can be transferred from one party to another with the sale of the base property to which the grazing preference is attached. The grazing preference can also be transferred from one base property to another.

Arizona has operated on the base water system because availability of water seems to be the most important element in utilization of public lands. For discussion of the underlying considerations see M. CLAWSON & B. HELD, *supra* note 20, at 219. The best and most productive lands have been taken for private use. *Id.* at 50; see discussion note 142 *supra*. This gives the owners of the private rights substantial power, benefits, and control over adjoining federal land without the responsibilities and costs. M. CLAWSON & B. HELD, *supra* note 20, at 50.

228. For a discussion of state trust lands see text & notes 353-94 *infra*.

229. To "inventory" the public lands probably entails compiling a master listing of all lands currently administered by the BLM, along with other pertinent data, such as current use classification and all values of the land which are currently known. As funds and manpower become available, the Secretary is to provide boundary identifications in the form of maps and signs for the public, and provide the inventory information to state and local governments for their planning use on proximately located nonfederal lands. 43 U.S.C.A. § 1711(b) (Supp. 1978).

230. *Id.* § 1711(a). "Other values" is expressly stated to include outdoor recreation, and scenic values. *Id.* No complete inventory of the public lands and their resources has ever been compiled. Carver & Carver, *supra* note 18, at 3.

receive priority in preparing this inventory.²³¹ Once prepared, the inventory is to be updated as necessary to reflect any changes.²³²

The second duty, an area of major creative work to be done by the Secretary, is the "land use planning" duty set out in 43 U.S.C. § 1712.²³³ With *public involvement*, and consistent with this Act, land use plans are to be developed, maintained, and, when appropriate, revised for all lands by tract or area.²³⁴ Nine directives are set forth to guide the planning, and are ranked with varying emphasis as follows: (1) mandatory use of the principles of multiple use and sustained yield; (2) mandatory use of a "systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences"; (3) mandatory provision for compliance with pollution laws and standards; (4) priority given to the designation and protection of areas of critical environmental concern; (5) reliance on the inventory as available; (6) consideration of present and potential uses; (7) consideration of the relative scarcity of the values involved; (8) balancing long and short term benefits; and (9) to the extent consistent with administrative laws for public lands, coordination with other governmental entities—federal, state, and local.²³⁵ These directives, then, will set the parameters of human interaction with the land.²³⁶ It is these plans which will determine if livestock grazing is to continue as a chief use of most of these lands, or even whether the lands remain available for grazing.²³⁷

The Act expressly states that much of the public land has been deteriorating.²³⁸ As discussed previously in this Note, much of this deterioration is of a long-term, ecologically complex type.²³⁹ In this context, the directive to achieve an integrated consideration of scientific

231. *Id.* See discussion note 244 *infra*.

232. *Id.*

233. 43 U.S.C.A. § 1712 (Supp. 1978).

234. *Id.* § 1712(a).

235. *Id.* § 1712(c)(1)-(9). See Carver & Carver, *supra* note 18, at 3. The BLM has described the provision for land use planning as one that "fully considers all potential uses and interests." BLM, Department of the Interior, Mandate for Public Land Management Becomes Law, News Release, Oct. 29, 1976.

236. Land use planning is the new classification process replacing that under the Taylor Grazing Act where lands were to be classified as chiefly suitable for grazing or for disposition. All existing classifications must be reviewed under the land use planning process. 43 U.S.C.A. § 1712(a), (d) (Supp. 1978); Carver & Carver *supra* note 18, at 3.

237. See *id.* Section 1752(c)(1), which sets up priority rights to permits if "the lands for which the permit or lease is issued remain available for domestic livestock grazing in accordance with land use plans prepared pursuant to section 1712. . . ."

In a news release the FLPM Act was described as providing "[b]road management authority based on the widest possible variety of uses and yields of renewable resources. . . ." BLM, Department of Interior, Mandate for Public Land Management Becomes Law, News Release, Oct. 29, 1976. See text & notes 275-352 *infra*.

238. 43 U.S.C.A. § 1751(b)(1) (Supp. 1978).

239. See text & notes 62-139 *supra*.

disciplines in formulating the plans becomes extremely important.²⁴⁰ Funds are allocated and authorization is given to the Secretary to conduct investigations, studies, and experiments on his own or in cooperation with others.²⁴¹ A mandate is also given to allow opportunity for public involvement.²⁴² Procedures are to be established by the Secretary, and are to include public hearings, where appropriate, to give adequate notice and opportunity to comment and participate in formulating these plans.²⁴³ In light of these directives to the Secretary, and opportunity for public input, this is the stage at which any scientific interest in the future of southern Arizona's desert lands should be expressed. It is also at this land use planning stage that arguments for areas of critical environmental concern should be made.²⁴⁴

In view of the apparently widespread deterioration of the southern Arizona desert area,²⁴⁵ the need for grazing as the chief use of these public lands should be strictly scrutinized. An interdisciplinary approach is mandated,²⁴⁶ and this should necessarily include not only ecological and environmental considerations along with the range studies, but also a thorough local, statewide, and national economic analysis of the value of cattle grazing in southern Arizona.²⁴⁷ Balanced with these considerations must be other possible values to the public, such as recreation or scenic potential. Unless grazing is found to be essential to

240. 43 U.S.C.A. § 1712(c)(2) (Supp. 1978). See text & notes 275-352 *infra*.

241. See *id.* §§ 1736, 1737, 1738.

242. *Id.* § 1712(a).

243. *Id.* at § 1712(f). In addition to public notice and hearings, "[t]he Secretary is authorized to establish advisory councils . . . from among persons who are representative of the *various major citizen's interests* concerning the problems relating to land use planning or the management of the public lands located within the area for which an advisory council is established." *Id.* § 1739(a) (emphasis added). The Secretary may prescribe the rules for appointment procedures. *Id.* Such councils, if formed of members from the scientific, political, and public interest organizations, could vastly enhance the quality and public acceptability of information and advice presented to the Secretary. The liberal use of such councils must be strongly urged on the Secretary of the Interior.

244. Areas of critical environmental concern are those where "special management attention is required . . . to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes. . . ." *Id.* § 1702(a). Priority consideration and protection are to be given these areas in the inventory and land use planning stage. *Id.* §§ 1711(a), 1712(c)(3). This is a far more liberal grant of discretion to the Secretary than that embodied in the recommendation of the PLLRC Report. See Hart & Guyton, *supra* note 12, at 60. The Report recommended that grazing be excluded from "frail lands" if necessary to protect the natural environment, and gave as examples of frail lands the more arid regions of the West. *Id.* at 60 n.11.

245. See text & notes 66-77, 122-30 *supra*.

246. 43 U.S.C.A. § 1712(c)(2) (Supp. 1978).

247. The purpose of such an economic analysis is to more sharply define the concept of public land value. Environmentalists and those interested in recreation often place values on land which are aesthetic or pleasure oriented and indeterminable within the construct of a dollar value. On the other hand, since the United States apparently has no serious beef shortage, the value of grazing may be easily computed in dollars and cents. The purpose of such analysis would be an attempt to determine losses to the economy and those whose livelihood depends on ranching, if grazing were to be substantially reduced in southern Arizona, and then such a monetary value could be considered the price of purchasing other environmental or recreational values on the same land by just letting it remain unmolested except by native fauna and flora.

a sound local economy or proven to be harmless to the stability of the local ecosystem it should at least be reduced in intensity until, at some future date, range ecology can engineer methods to graze fragile arid areas more heavily without damaging them, and economics or food needs require such land utilization.

Although BLM lands fail to include a substantial portion of the grasslands,²⁴⁸ BLM management policies must have a substantial effect on much of southern Arizona due to the intermingled pattern of lands,²⁴⁹ and due to the leadership of the federal government in researching land laws and land needs.²⁵⁰ Perhaps the chief characteristic of grazing is its historical prevalence.²⁵¹ It was the first major land use and aided in settling the West.²⁵² Before other industry developed, ranching was of major economic importance to Arizona. But to hang onto values that may only be historical, at the possible price of destroying much unique and fragile southern Arizona land, is not an exchange consistent with the multiple-use,²⁵³ sustained yield,²⁵⁴ and environmental objectives mandated by the FLPM Act. Further research is desirable ecologically and economically to enable the BLM to plan the future role grazing is to play on public lands.²⁵⁵

The third planning activity affects those lands which will be established as available for grazing in the land use planning stage.²⁵⁶ It calls

248. Since "grasslands" are not well defined in southern Arizona, no exact acreage data is available as to quantity in existence or who controls the land. However, the major areas of grassland lie in the southeastern part of the state. R. HUMPHREY, *supra* note 4, at 1; S. MARTIN, *supra* note 8, at 1. A map entitled Public Land Ownership in Arizona 1971, prepared by the Department of Economic and Development for the State of Arizona, breaks down land ownership by color coding in units as small as a half section. The major grassland areas appear to be controlled by the following entities listed in descending order of area controlled: State Land Department, private, BLM, Forest Service, Indian reservation.

249. See ARIZONA LAND MARKS, *supra* note 9, at 25-26; discussion note 356 *infra*.

250. See text & notes 378-80, 291-94 *infra*.

251. See generally text at notes 1-8 *supra*, discussing the possibility that the current grazing pressure in southern Arizona is an historical hangover.

252. See text & notes 43-61, 149-62 *supra*.

253. See text & note 235 *supra*. "Multiple use" requires management of land resource values for utilization to best meet the present and future needs of the American people "without permanent impairment of the productivity of the land and the quality of the environment." It should not necessarily consider the uses that will bring the largest economic return. The land need not be utilized to exploit all possible resources. 43 U.S.C.A. § 1702(c) (Supp. 1978). A stated policy of the FLPM Act is that certain values, which include ecological and environmental ones, be protected. *Id.* § 1701(a)(8). These objectives mandated by the FLPM Act indicate that whenever a land resource or value is being depleted or deteriorated, very strict scrutiny is required on the part of the BLM. Unless the particular land use is extremely important to the present needs of the American people, such use must be stopped in accordance with the balancing of values and needs as mandated by "multiple use" planning. *Id.* §§ 1701(a)(7), 1702(c), 1712(c)(1).

254. "Sustained yield" means achievement and maintenance of high level productivity in perpetuity. *Id.* § 1702(h).

255. See text & notes 275-352 *infra*.

256. 43 U.S.C.A. § 1752(d) (Supp. 1978) as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978). Administrative practices of the BLM and Forest Service regarding grazing have been unified by passage of the FLPM Act. See *id.*; Carver & Carver, *supra* note 18, at 4.

for development of allotment management plans²⁵⁷ through consultation with the land users.²⁵⁸ These plans are to be completed for all BLM and Forest Service lands leased for grazing at the Secretary's election. These plans are then to be incorporated into land lease agreements.²⁵⁹ The Act defines these plans as documents applying to livestock operations on BLM or Forest Service lands in the eleven contiguous western states.²⁶⁰ Such plans are to prescribe the extent and manner of grazing in order to meet multiple use, sustained yield, economic, and other objectives as determined by the Secretary, and describe the range improvement methods to be utilized.²⁶¹ These plans are not to refer to non-federal lands, except where the lands are intermingled or the lessee has consented.²⁶² Under most circumstances, in developing these allotment management plans, the land users may form grazing advisory boards to advise and make recommendations concerning such plans.²⁶³ The Act emphasizes the role of the users in

257. 43 U.S.C.A. § 1752 (Supp. 1978) as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978). See note 265 *infra*. The FLPM Act includes a definition describing these plans:

An "allotment management plan" means a document prepared in consultation with the lessees or permittees involved, which applies to livestock operations on the public lands or on lands within National Forests in the eleven contiguous Western States and which:

- (1) prescribes the manner in, and extent to, which livestock operations will be conducted in order to meet the multiple-use, sustained-yield, economic and other needs and objectives as determined for the lands by the Secretary concerned; and
- (2) describes the type, location, ownership, and general specifications for the range improvements to be installed and maintained on the lands to meet the livestock grazing and other objectives of land management; and
- (3) contains such other provisions relating to livestock grazing and other objectives found by the Secretary concerned to be consistent with the provisions of this Act and other applicable law.

43 U.S.C.A. § 1702(k) (Supp. 1978).

258. 43 U.S.C.A. § 1752(d) (Supp. 1978), as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978).

259. *Id.* § 1752(d), (e). These plans are to be completed by October 1, 1988, but those completed earlier may then be incorporated in the lease agreements. *Id.*

260. *Id.* § 1702(k). The 11 contiguous western states are Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. *Id.* § 1702(o). The PRI Act has encompassed five additional states within its scope and refers to them as the "sixteen contiguous states." The additional states are Kansas, Nebraska, North Dakota, Oklahoma, and South Dakota. Pub. L. No. 95-514, § 13(b), (i), 92 Stat. 1804 (to be codified in 43 U.S.C. § 1902(b), (i)).

261. *Id.* § 1702(k)(1), (2). See note 265 *infra*; text & notes 275-352 *infra* for a discussion of improvement suggestions.

262. *Id.* § 1752(f). "Intermingled" lands refers to large grazing acreages, composing a unified pasture, which may consist of parcels of federal, state trust, and private lands. Improvement project plans cannot make reference to just the isolated tracts of BLM land, but must refer to the entire unit. Nevertheless, the apparent intent of this provision is that the agency not be able to prescribe duties on private lands as conditions to permit rights. The Secretary, if he elects to develop such a plan must do so "in careful and considered consultation, cooperation and coordination" with the lessees and landowners "and any State or States having lands within the area to be covered by such allotment management plan." *Id.* § 1752(d) as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978).

263. *Id.* § 1753. By petition of a simple majority of livestock lessees within a grazing district the agency must establish a grazing advisory board made up of lessees elected by lessees. *Id.*

helping formulate these plans and nowhere calls for a general public involvement in these plans.²⁶⁴

Although general public input is not called for at this planning stage, this is where the generalized and wide ranging goals derived over the next decade or two from the land use planning stage must be personalized and particularized for each permit and lease holder in the form of specific duties.²⁶⁵ Unless broad ranging management goals are particularized as obligations, duties, and rights in each lease agreement, the broad scheme will fail.²⁶⁶ In other words, if the new lease agreements are merely reworded to conform to new semantic requirements of the FLPM Act, but in substance are virtually the same as the agreements held prior to the Act's passage, any general land use plans formulated will be practically worthless. Individual lease agreements must be made to conform to and particularize land use plans as they are drawn up.

The PRI Act

The PRI Act²⁶⁷ substantially increases funding for improvement projects on public grazing lands,²⁶⁸ and mandates that over eighty percent be spent for on-the-ground improvement programs.²⁶⁹ Within its declaration of policy, the Act indicates that vast segments of the public grazing lands are in "unsatisfactory condition,"²⁷⁰ some are deteriorating further,²⁷¹ and that significant increases in levels of management and improvement funding are necessary to correct the situation.²⁷² The Act is designed to supplement and expand the impact of the FLPM Act on federal grazing lands.²⁷³ The Act has potential for a substantial im-

264. See *id.* §§ 1702(k), 1752(d) as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978). Public involvement must be during the land use planning stage. See text & notes 233-44 *supra*.

265. 43 U.S.C.A. § 1702(k) (Supp. 1978). See the definition of allotment management plans in note 257 *supra*. The objectives and goals the land use planning stage promotes are to be incorporated individually into the allotment management plans which then may be incorporated into the individual lease agreements. *Id.* § 1752(d) as amended by PRI Act, Pub. L. No. 95-514, § 8(a), 92 Stat. 1807 (1978). The year 1988 is the target date for these plans to be completed, *id.*, but completion is not mandatory at that time. See exceptions at *id.* § 1752(e).

266. Unless the broad goals can be rewritten and particularized as mechanical means of achieving those goals, they will exist only as words in a vacuum with no specific guidance to the land users as to their obligations in assisting to realize the goals.

267. Pub. L. No. 95-514, 92 Stat. 1803 (1978) (to be codified in various sections of 43 U.S.C.).

268. *Id.* § 5(a), (b). The bill appropriates \$15 million annually between 1980 and 1982, in addition to the funding provided by the FLPM Act. *Id.* § 5(a). Thereafter, the Secretary is required to request as much or more for the following years, through 1999. *Id.*

269. *Id.* § 5(c).

270. *Id.* § 2(a)(1).

271. *Id.* § 2(a)(2).

272. *Id.* § 2(a)(4). For discussion of the risks involved due to the unsatisfactory conditions, see text & notes 66-72, 122-30 *supra*.

273. PRI Act, Pub. L. No. 95-514, § 2(c), 92 Stat. 1804 (1978) (to be codified in 43 U.S.C. § 1901(e)). See *id.* §§ 2(b)(1), (2), 4(a), (b), 5(a), (c).

pact on public lands by its increased funding for man-induced reversal of the deterioration. However, there exists a danger of precipitating hastily prepared improvement programs which could cause unforeseeable and harmful long-term results.²⁷⁴

Possibilities for Range Improvement

Half of the fees to be collected under the FLPM Act will be earmarked for improvement programs.²⁷⁵ The money is to be used for "on-the-ground range rehabilitation, protection, and improvements"—one quarter in the district, region, or national forest where it originated and the other quarter where the respective Secretary directs.²⁷⁶ The House Committee comment to this section emphasizes that "on-the-ground" means the money cannot be used for "overhead or other administrative purposes."²⁷⁷ The PRI Act would appropriate additional funds,²⁷⁸ and is explicit as to how the funds are to be spent.²⁷⁹ No less than eighty percent is to be used for "on-the-ground" maintenance and improvement, and no more than fifteen percent is to be used on personnel to supervise and enforce the land use plans.²⁸⁰ As such funds become available, the possibilities for improvement of rangelands must be explored.

The fundamental goal of studies reviewing the changes in the Southwest is to isolate past causative factors where a change has been ascertained.²⁸¹ They have not predicted the future nor offered value judgments as to whether the changes are good or bad ecologically. Such limited subjective value judgments as to whether the changes are bad have meaning only in a relative context.²⁸² For example, relative

274. See note 318 *infra*.

275. 43 U.S.C.A. § 1751(b)(1) (Supp. 1978).

276. *Id.*

277. H.R. REP. NO. 1163, 94th Cong., 2d Sess. 12, reprinted in [1976] U.S. CODE CONG. & AD. NEWS 6175, 6186.

278. Pub. L. No. 95-514, § 5(a), 92 Stat. 1805 (1978) (to be codified in 43 U.S.C. § 1904(a)). The Act will establish a \$385 million fund for improvements over the next 20 years. *Id.*

279. See *id.* §§ 5(c), 8(a).

280. *Id.* § 5(c).

281. An early exception, which went beyond isolating causation and suggested a new approach for user attention to take, is G. GLENDENING & H. PAULSEN, *supra* note 110, which at least indicated the direction in which man must focus his attention in order to halt and reverse shrub invasion, suggesting reduced grazing pressures, and where mesquites are already established, artificial clearing. *Id.* at 48.

282. Humphrey, in noting a general relationship between range condition and stages in secondary plant succession, stated, "[t]his generalization, however, should not overshadow the fact that a range condition classification is basically a utilitarian classification [related to success in supporting cattle] and must not be restricted by any ecological concepts." R. HUMPHREY, *supra* note 71, at 190. Hastings and Turner discuss certain "loaded value judgements about civilization and nature" which contrast a "'natural' situation which is 'good' with an 'unnatural' influence that is 'bad,' and which, furthermore, stems from the activities of civilized man." J. HASTINGS & R. TURNER, *supra* note 2, at 22. Modern "naturalists" sometimes "feel that Anglo-American culture is 'unnatural' and that it has been pervasively disruptive of an existing 'natural' order." *Id.* Hastings and Turner prefer to speak in terms of a "fluid environment shifting with the centuries under

to the viability of a livestock industry the changes have been bad.²⁸³ Rangelands in uniformly good condition are rare.²⁸⁴ Estimates of potential productivity are generally unavailable since the range conditions have been depressed for so long,²⁸⁵ but much of the land is certainly falling far short of possible forage production.²⁸⁶ Many ranges have improved somewhat since the 1930's²⁸⁷ with enactment of the Taylor Grazing Act,²⁸⁸ and attempts have been made to control grazing pressures on public lands through regulations.²⁸⁹ Nevertheless, ranchers still tend to overstock.²⁹⁰

A number of possible methods for improving range conditions in southern Arizona have been suggested by Clark Martin, who headed a range research station south of Tucson for the Forest Service.²⁹¹ Most are based on the concept of treating the rancher as a "forage farmer."²⁹²

the impact of a succession of cultures," *id.*, although they admit "the fact that Anglo-American culture has had a greater ecological impact than its predecessors. . . ." *Id.* at 45.

283. See G. GLENDENING & H. PAULSEN, *supra* note 110, at 45-48; S. MARTIN, *supra* note 8, at 6; Reynolds & Glendening, *supra* note 83, at 193; PRI Act, Pub. L. No. 95-514, § 2(a)(1)-(3), 92 Stat. 1803 (1978) (to be codified in 43 U.S.C. § 1901(a)(1)-(3)).

284. S. MARTIN, *supra* note 8, at 6.

285. *Id.*; see R. HUMPHREY, *supra* note 71, at 192-209 (discussion of various methodologies which may be employed to classify range lands, and a critique of each).

286. S. MARTIN, *supra* note 8, at 8; PRI Act, Pub. L. No. 95-514, § 2(a)(1)-(3), 92 Stat. 1803 (1978) (to be codified in 43 U.S.C. § 1901(a)(1)-(3)). Humphrey explains the classification system usually employed as involving four classes: "excellent," producing from 75% to 100% of all the forage the site should produce under practical management; "good," producing from 50% to 75%; "fair," producing from 25% to 50%; and "poor," producing less than 25%. R. HUMPHREY, *supra* note 71, at 191.

287. S. MARTIN, *supra* note 8, at 7.

288. Act of June 28, 1934, ch. 865, 48 Stat. 1269 (1934) (codified as amended in 43 U.S.C. §§ 315-315r (1970)).

289. See text & notes 184-93 *supra*.

290. S. MARTIN, *supra* note 8, at 10. The reasons given for overstocking are varied. "[T]he rancher views himself as a cattleman—his standing among cattlemen and his self-esteem are based to a degree on the number of cattle he owns." *Id.* at 10-11. The difficulty of determining capacity, and the fact that, in the short run, a greater number of cattle almost always puts more money in the pocket, are further reasons for overstocking. *Id.* Regarding the difficulty of determining capacity, Humphrey summarized and critiqued the methods employed by the Forest Service and BLM to determine range condition for stocking capacity. R. HUMPHREY, *supra* note 71, at 200-09. He stated:

As a long-term result of the grazing-management recommendations based on these surveys, they affect not only the ultimate succession and vegetal cover of these lands, but their water-yielding capabilities as well. These effects obviously impose a heavy responsibility on any agency that uses this or any other range-rating method for determining, insofar as possible, its reliability and freedom from mathematical or personal bias.

Id. at 202. He goes on to state that the rating system's substantial reliance on discretion can be its greatest weakness or strength, depending on the "training, competence, and judgement of the individuals making the allotment analyses." *Id.* at 203. See also S. MARTIN, *supra* note 8, at 14.

291. S. MARTIN, *supra* note 8, at 9-33. The research station is the Santa Rita Experimental Range, located about half-way between Tucson and Nogales, Arizona, on the western side of the Santa Rita Mountains. A great deal of research work has been done there, culminating in such studies as G. GLENDENING & H. PAULSEN, *supra* note 110, and Reynolds & Glendening, *supra* note 83.

292. S. MARTIN, *supra* note 8, at 11. Martin suggested that the rancher change his image from "cattleman" to "forage grower," and demote the cow to the status of "forage harvester and processor." *Id.* at 11. Such a switch in the underlying self-image should go a long way toward initiating

Perennial grasses are the most important forage, but palatable shrubs and weeds also provide necessary forage during a short part of the summer and in the winter.²⁹³ Maintenance of vigorous stands of the grasses and edible shrubs, and reduction of less palatable competing plants should be the goals of range management.²⁹⁴ According to Martin, proper stocking intensity (number of cattle per acre over time) is the key to maintenance, and should be kept at a level that utilizes about forty percent of the perennial grass produced in an average year.²⁹⁵ Most ranges are grazed yearlong, which is satisfactory if intensity is kept low and rest periods are allowed.²⁹⁶

The major problem with yearlong grazing systems is selective grazing,²⁹⁷ which places excessive pressure on certain plants and particular areas.²⁹⁸ Alternatives to selective grazing have been tried, but many have failed to produce more weight gain²⁹⁹ in cattle and have failed to improve the range.³⁰⁰ Martin attributes the lack of success to short, infrequent, or incorrectly timed rest periods, or simply overstocking.³⁰¹ He discussed four promising rotational schemes, each involving utilization of alternate pastures, followed by rest periods.³⁰²

a proper attitude toward range management. *Id.* However it retains an exploitive attitude towards the land.

293. *Id.*

294. *Id.*

295. S. MARTIN, *supra* note 8, at 10. This advice is made in recognition of the absence of reliable estimation techniques for determining future forage production. *Id.* at 13-14. Studies show that overgrazing during drought years aggravates the problems of reduced range production. *Id.* at 14.

296. *Id.* at 14-15.

297. *Id.* at 15. Spring and summer grazing can be detrimental if too severe or frequent, due to selective grazing. *Id.* at 14. Selective grazing refers to the preference of livestock for certain areas of the range, such as around a water source, and preference for the more palatable plants. *Id.* This results in excessive grazing pressure in local areas or to certain forage species, leaving others barely utilized. *See id.* In effect, selective grazing is merely localized overgrazing.

298. *Id.* at 15.

299. Faster weight gain can lead to earlier marketing or higher prices, since the value of the animal is based on the weight and quality.

300. *Id.* at 15.

301. *Id.*

302. The "rest rotation" system divides the range into a number of pastures, allows heavy grazing on some pastures, even if forage is scarce, but requires rest periods after each grazing with a duration long enough for the designated purposes of allowing the plants time for either food storage, seed ripening, seedling establishment, or litter accumulation. *Id.*

A "high-intensity low-frequency" system allows heavy grazing on an individual pasture until the desired level of forage utilization (a percentage of forage removal) had been reached, then require removal to another pasture. *Id.* This would reduce selective grazing, and give relatively long rest periods. *Id.*

The "Santa Rita three-pasture rotation" system utilizes three equal pastures, each being allowed to rest March through October, two out of three years, with grazing during this period the third year, and grazing from November to February between the two successive summer rest periods. *Id.* at 16.

The "Schmitz three-pasture rotation" system also uses three equal pastures. Each is used March to June one year, July to October the next, and November to February the third. This system divides the years at July, such that sixteen months rest are provided after each summer grazing, and four after winter and spring. *Id.*

The obvious goal in all rotational systems is to decrease selective grazing pressures and supply sufficient rest periods for efficient regrowth.³⁰³ Although the rancher would incur additional costs,³⁰⁴ the use of some rotational system is the best insurance against future range deterioration and assures the continued vitality of the livestock industry.³⁰⁵

Several methods have been suggested for reversal of the woody shrub invasion.³⁰⁶ Removal of the shrubs may be effected by fire, herbicides, or physical destruction brought about by chaining or cabling.³⁰⁷ However, these methods carry a risk factor to the desirable vegetation, and are of limited effect.³⁰⁸ Where the undesirable competing vegetation is removed or nonexistent, seeding, fertilization, and special forms of irrigation may be of some limited aid in reestablishing, or rapidly increasing, forage plants.³⁰⁹

As originally introduced in the House or Representatives, the PRI Act explicitly categorized range improvement methods.³¹⁰ The final version of the statute, as passed by Congress, has deleted these categori-

303. *Id.* at 16-17. For a discussion of the need for rest periods see R. HUMPHREY, *supra* note 71, at 118.

304. The disadvantages to the rancher are in the mechanics. The division of ranges often requires additional water supplies and fencing. S. MARTIN, *supra* note 8, at 16. The cattle must be moved several times a year, although handling costs may be reduced due to their concentration in smaller areas. *Id.*

305. *Id.*

306. See text & notes 62-121 *supra*. Once mesquite stands have been established, mere removal of such environmental pressures as grazing, aridity, and fire suppression may not initiate a reversal to grasslands. See G. GLENDENING & H. PAULSEN, *supra* note 110, at 48. Hastings and Turner express the concern as follows:

[T]here . . . remains a residuum of change that may be irreversible, and it is centered about events in the old grassland, where grazing has been heaviest. Can cooler, wetter conditions eradicate mesquite . . . ? In the light of what we know at present about the relation between these tenacious plants and their environment, and about competition between them and the grasses, it is not easy to imagine that a combination of rainfall and temperature alone will suffice.

J. HASTINGS & R. TURNER, *supra* note 2, at 288-89. If a reversal is desired, it appears that man must take a conscious hand to effect it.

307. *Id.* at 20-26.

308. See S. MARTIN, *supra* note 8, at 20-26.

309. *Id.* at 19-20, 26-27.

310. H.R. 10587, 95th Cong., 2d Sess. §§ 2(g), (h), 4(f), (h) (1978). The bill categorized range improvement methods as "environment impact improvements" and "nonenvironment impact improvements." *Id.* Environment impact improvements were defined as "range improvements which involve manipulation of the environment so as to artificially alter the natural vegetation and ecologic process. . . ." *Id.* § 2(g). Examples given were chaining, chemical treatment, including herbicides, and seeding activities to introduce non-native species or increase forage above what would occur naturally under optimum conditions. *Id.* See text & notes 309-11 *supra*. Nonenvironment impact improvements were defined as "range improvements designed to augment, restore, or prevent deterioration of naturally occurring range conditions or facilitate the environmentally sound management of the range through intensive grazing management." *Id.* § 2(h). Examples given included manipulation of vegetation through grazing management, fish and wildlife enhancement projects, and restoration of native vegetation through methods other than chaining and chemical treatment. *Id.* § 2(h)(1)-(3). See text & notes 293-302, 306-09 *supra*.

zations, and speaks in broad policy-oriented language,³¹¹ giving the Secretary broad discretion in implementing improvements.³¹²

The funds provided by the PRI Act are to be distributed "as the Secretary deems advisable."³¹³ The Secretary is directed to have "careful and considered consultation and coordination"³¹⁴ with user groups, and hold public meetings where appropriate before expending the funds.³¹⁵ Emphasis is placed on entering cooperative agreements with range users for installation and maintenance of on-the-ground improvements.³¹⁶

Prior to expenditure of any funds for improvement programs the Secretary is to have prepared an "environmental assessment record" for each project.³¹⁷ If the Secretary determines that a significant impact will result on the "quality of human environment," an environmental impact statement is mandated.³¹⁸ As new studies indicate possible methods to increase forage production and reduce the deterioration of the grasslands caused by woody shrub invasion and arroyo formation,³¹⁹ funds should become available from increased fees³²⁰ and congressional appropriation³²¹ for use in improvement programs. The chief advantages of the PRI approach over the Taylor Grazing Act is express policy recognition of the plight of the lands,³²² mandates given the concerned departments to initiate in-depth plans to improve the situation,³²³ and allocation of funding for on-the-ground improve-

311. See PRI Act, Pub. L. No. 95-514, 92 Stat. 1803 (1978) (to be codified in various sections of 43 U.S.C.).

312. *Id.* § 5(c), (d) (to be codified in 43 U.S.C. § 1904(c)(d)). In one sense it is unfortunate that the specific language of the original bill was deleted. Congress chose not to mandate or expressly authorize specific types of programs. This removes a sense of direction from the statute as enacted. However, the language of the bill could have engendered a great deal of controversy concerning the ecological soundness of the measures proposed. Congress should not become too explicit in authorizing environment reconstruction programs. The political process does not lend itself well to dictating scientific programs. Also, since future research is mandated, new improvement methods may emerge and any statute should provide the Secretary with discretion to cope with new information and improvement programs as they emerge.

313. *Id.* § 5(c) (to be codified in 43 U.S.C. § 1904(c)).

314. *Id.*

315. *Id.* See text & notes 256-64 *supra*.

316. *Id.* § 5(c).

317. *Id.* § 5(d). Nowhere in the Act is "environment assessment record" defined.

318. *Id.* These provisions in the PRI Act are a result of concern with the original form of the bill. The bill would have authorized immediate use of funds for nonenvironment impact improvements. H.R. 10587, 95th Cong., 2d Sess. § 4(h) (1978); see note 310 *supra*. Nonenvironment impact improvements were expressly exempted from 42 U.S.C. § 4332(c) (1977), which requires environmental impact statements to be drawn for major federal actions. This attempt to provide for certain types of improvement programs which bypassed the environmental impact statements led to concern and opposition from some environmentalists, notably the Natural Resources Defense Council. See PUBLIC LANDS NEWS, Feb. 23, 1978, at 5; March 23, 1978, at 5-6.

319. See text & notes 275-309 *supra*.

320. See text & notes 204-22, 275-77 *supra*.

321. See text & notes 278-80 *supra*.

322. See Pub. L. No. 95-514, § 2, 92 Stat. 1803 (1978) (to be codified in 43 U.S.C. § 1901).

323. See *id.* §§ 2(a)(4), (5), 4 (to be codified in 43 U.S.C. §§ 1901(a)(4), (5), 1903); 43 U.S.C.A. §§ 1711, 1712, 1752 (Supp. 1978); text & notes 229-64 *supra*.

ments.³²⁴

Initially, the land use planning stage³²⁵ will determine whether portions of land are to be totally freed from grazing pressure.³²⁶ Where agreements continue to permit grazing on public lands, the allotment management plans must incorporate grazing plans that attempt to halt or reverse deterioration of the land.³²⁷ Such schemes as rotational grazing systems³²⁸ and mechanical removal of shrubs³²⁹ may be incorporated into these plans and into the lease agreements themselves.

Numerous tools have been given the Secretary to aid in the implementation and enforcement of these plans. Funding has been allocated from several sources for on-the-ground range improvements.³³⁰ Other monies are provided for improvements and administrative costs through various appropriation mechanisms.³³¹ Authority is granted to utilize specialists outside of the department for conducting studies³³² which may lead to very close cooperation between the many disciplines conducting relevant research in the university systems. Also, civil and criminal remedies are provided,³³³ as well as authority to contract for and train enforcement personnel.³³⁴

By far the most potent weapon granted the Secretary is the power to revoke or suspend any use instrument granted.³³⁵ The Act requires in all use instruments a provision authorizing revocation or suspension, after notice and hearing, upon a final administrative finding of violation of any terms of the instrument, including conditions requiring compliance with applicable state or federal air or water quality plans.³³⁶ The Act further provides that in certain emergency situations, where necessary to protect health, safety, or the environment, immediate temporary suspension may be ordered prior to a hearing.³³⁷ Any such violation must have occurred on the land covered by the instrument and in connection with the exercise of rights and privileges

324. See text & notes 275-77 *supra*.

325. See text & notes 233-47 *supra*.

326. Under the definition of "multiple use" in the FLPM Act is included a combination of balanced and diverse resource uses that include recreational, wildlife, scenic, and scientific values as well as more economic ones. 43 U.S.C.A. § 1702(c) (Supp. 1978). The use that gives the greatest economic output is not necessarily a controlling factor or even a consideration. *Id.* Arguably, some public lands should be completely freed of grazing pressure. See text & notes 1-37, 247-49 *supra*.

327. See text & notes 275-318 *supra*.

328. See text & notes 298-305 *supra*.

329. See text & notes 307-09 *supra*.

330. See text & notes 275-80 *supra*.

331. See, e.g., 43 U.S.C.A. §§ 1713(k), 1734, 1735(a), 1736, 1737(c) (Supp. 1978).

332. *Id.* § 1737(a).

333. *Id.* § 1733(a), (b).

334. *Id.* § 1733(c).

335. *Id.* § 1732(c).

336. *Id.* §§ 1732(c), 1752(a).

337. *Id.* § 1732(c).

granted by it.³³⁸ The obvious concern is that this power should not be used to coerce compliance with regulations or policies on private lands.

The major weakness of the FLPM Act and PRI Act appears to be a subordination of nonuser interests and values in the land, such as aesthetics, wildlife, and outdoor recreation, to historic user interests.³³⁹ Legislative policies acknowledge and support all possible values,³⁴⁰ and mandate that intensive study and planning be performed within the appropriate agencies to assess and implement multiple use.³⁴¹ However, the basic intent of the legislation is apparently to protect the cattle industry by encouraging the implementation of improvements to increase the land's value for livestock.³⁴² This is the concept of forage farming.³⁴³ The goal of the improvement programs is to improve the ranges for livestock, and only incidentally to also improve it for other uses.³⁴⁴ Obviously, any improvement of the rangelands, as ranges, will mitigate many of the environmental problems discussed earlier in this Note.³⁴⁵ However, whether the land should be exploited as range for domestic livestock at all is not seriously considered by the FLPM Act or the PRI Act.

The critical issues appear to be whether and what sort of balancing of interests is necessary in determining the future of the public lands. The chief economic value for most of the acreage in southern Arizona

338. *Id.*

339. The PRI Act lists the problems inherent in the deteriorated public grazing lands, such as soil loss, desertification, underproductivity, threatened fish and wildlife habitat, increased surface runoff, and reduced value for recreation and aesthetic purposes. Pub. L. No. 95-514, § 2(a)(3), 92 Stat. 1803 (1978) (to be codified in 43 U.S.C. § 1901(a)(3)). However, it states that the only methods available to correct the conditions are significant increases in funding and rangeland management. *Id.* § 2(a)(4). The implication is that all such lands will continue to be treated as livestock range. One basic policy of the PRI Act is to maintain and improve the land condition for maximum productivity for all rangeland values. *Id.* § 2(b)(2). The obvious implication is to create a policy of utilization which apparently would conflict with any attempt to correct the deterioration and then let some lands lie fallow.

John McComb of the Sierra Club's Washington office stated: "Historically, BLM has taken care of the grazing industry. . . . Everything else gets the short end of the stick. The bill [H.R. 10587] does make some needed improvements but overemphasizes range improvements and doesn't get other areas such as recreation, wilderness review, and wildlife management." PUBLIC LANDS NEWS, June 29, 1978, at 2. Rex Resler, Associate Chief of the Forest Service, stated that the grazing fee formula, which looks in part to production costs, does not concern itself primarily with the value of the land, and therefore is faulty. The implication is that the public lands themselves should be the primary concern of a grazing fee formula, but are not under the proposed formula. PUBLIC LANDS NEWS, March 23, 1978, at 6.

Although a major policy of the FLPM Act is multiple use, see discussion note 384 *infra*, the provision for forming grazing advisory boards and creating allotment management plans for the grazing lands at least impliedly supports a policy of continued use for grazing and economic exploitation, and deemphasizes any purely esthetic values. See 43 U.S.C.A. § 1752 (Supp. 1978).

340. See 43 U.S.C.A. § 1701(a) (Supp. 1978); PRI Act, Pub. L. No. 95-514, § 2, 92 Stat. 1803 (1978) (to be codified in 43 U.S.C. § 1901).

341. See text & notes 223-73 *supra*.

342. See note 339 *supra*.

343. *Id.* See text & notes 281-318 *supra*.

344. See note 339 *supra*.

345. See text & notes 62-139, 281-318 *supra*.

has traditionally been and remains livestock grazing.³⁴⁶ The arid land is relatively fragile, as ecosystems go,³⁴⁷ and abusive grazing practices in the past have substantially contributed to extensive changes in the land surface, hydrology, and vegetation.³⁴⁸ These changes have been counterproductive to grazing use, and thus are considered undesirable relative to range economics.³⁴⁹

The number of people involved in ranching in Arizona, and the economic impact of the industry on the state and nation, is relatively small, though significant.³⁵⁰ However, almost the entire southwestern desert is affected by the land use pattern of ranching, and the impact and change to the ecosystem has been extensive in deteriorating natural desert grassland in the past that may well continue in the future.³⁵¹ As the agencies seek public input during the planning stages in the coming years, and as Congress considers further legislation emanating from the PLLRC work,³⁵² the public must question whether it is willing to accept a continuation of heavy pressures on the entirety of an extensive and fragile, but unique, ecosystem for the purpose of continuation of the Southwest's livestock industry in its traditional form.

STATE TRUST LANDS

The deterioration of the southern Arizona grasslands includes all those lands grazed. However, the scope of federal legislation obviously

346. Using rounded figures, the BLM manages, for grazing, about 9.9 million acres of vacant public lands, about .9 million acres of reserved lands, and about .3 million acres for other agencies. UNITED STATES DEPT OF INTERIOR, PUBLIC LAND STATISTICS 87 (1976). The Forest Service manages about 8.3 million acres within the National Forests for grazing. Letter from W.R. Fallis, Director of Range Management, Region 3, National Forest Service, to David T. Cox (July 18, 1978) (on file at the Arizona Law Review). Over 8.8 million acres of state trust lands are leased for grazing. ARIZONA LAND MARKS, *supra* note 9, at S-15. Of the approximately 33 million acres in Arizona under the control of these three agencies, over 28 million are leased for grazing. Much of the remaining 39 million acres of land in the state is Indian or private land, a substantial portion of which is grazed, although statistics are not readily available. See P. GATES, *supra* note 143, at 49-86, 765-72. See generally SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 7-8; note 350 *infra*.

347. See authorities cited note 28 *supra*.

348. See text & notes 62-139 *supra*.

349. See text & notes 281-90 *supra*.

350. In 1977 there were 1,065,000 cattle in Arizona, worth \$228,975,000. UNITED STATES DEPT OF AGRICULTURE, AGRICULTURE STATISTICS 306, table no. 429 (1977). There were 122,896,000 cattle in the entire U.S., worth \$25,268,725,000. *Id.* at 305, table no. 427. Thus, Arizona has less than one percent of the nation's cattle population, and Arizona's cattle value is less than one percent of the total national value.

In 1976 the gross income to the state of Arizona from the cattle industry was \$410 million. *Id.* at 312, table no. 435. This is a substantial sum, but other industries contribute far more. For example, state tourism revenues for just the first quarter of 1978 were \$762,000,000. Arizona Daily Star, July 20, 1978, § B, at 1, col. 3. Mexican nationals crossing the border to shop in Arizona spent nearly \$315 million in a one year period during 1977-78. *Id.* at § B, 1, col. 2. Arizona's economy no longer solely depends on the historical three C's: copper, cotton, and cattle. See Coker, *supra* note 3, at 21.

351. See text & notes 62-139 *supra*.

352. See text & notes 15-27 *supra*.

encompasses only federal public lands.³⁵³ The future use of private lands is beyond the scope of this Note. A substantial amount of Arizona land is under state control, and although it will not be governed under the new federal legislation, it may benefit indirectly by the federal experience.³⁵⁴ A discussion of the origin, control, and use of these lands will reveal how they interrelate with, and will be affected by, the new federal policies concerning grazing lands.

The Enabling Act of 1910 enabled the people of the Territories of Arizona and New Mexico to form constitutions and state governments.³⁵⁵ It also granted the states certain lands, and sections 10 and 28, applying to New Mexico and Arizona respectively, place all federally granted land and revenues derived therefrom in trust with the state for the benefit of various public institutions, primarily educational ones.³⁵⁶ The sections also require that "[a]ll lands, leaseholds . . . before being offered, shall be appraised at their true value, and no sale or other disposal thereof shall be made for a consideration less than the value so ascertained. . . ."³⁵⁷

One writer has argued that New Mexico, under the same fiduciary duty as Arizona,³⁵⁸ has breached the trust in three ways: by failing to appraise the value of the land adequately, by leasing for lower than market value, and by failing to take reasonable steps to conserve the corpus of the trust.³⁵⁹ Legislative history and the wording of the Enabling Act clearly indicate that the requirement of appraisal before either the disposal or leasing of the land was one of several strong

353. See text & notes 18-20, 23 *supra*.

354. See text & notes 373-94 *infra*.

355. Ch. 310, 36 Stat. 557 (1910). Sections 1-18 apply to New Mexico and sections 19-35 apply to Arizona.

356. *Id.* It is unclear exactly who has authority to enforce the trust. Section 28 states that it shall be the duty of the Attorney General of the United States to enforce the trust, but that nothing limits the power of the state or any citizen to enforce the provisions. *Id.*

Arizona has a total of 9,615,075 acres of state trust land. ARIZONA LAND MARKS, *supra* note 9, at S-1. Of this total, 9,495,292 surface acres were leased in 1976, bringing in total lease fee receipts of \$4,112,851.35. *Id.* at S-15 to S-16. Grazing leases accounted for approximately 93% of the surface trust land leased, but only 24% of receipts. *See id.* Other uses include agricultural, commercial, rights of way, and federal government contracts. *Id.* The distribution of these lease lands is highly fragmented so that sections are often situated between federal or private lands, forming a patchwork quilt pattern. *See id.* at 25-26.

357. Ch. 310, §§ 10, 28, 36 Stat. 557 (1910). The Arizona State Land Department is headed by the State Land Commissioner who is appointed by the Governor for six year terms. SEVENTH ARIZONA TOWN HALL, *supra* note 3, at 109. Before any land may be leased, it must be classified, within the discretion of the commissioner, and then may be leased only for that purpose. *Id.* at 117. Grazing leases have no statutorily mandated acreage limitations, last for 10 years, and have preferential renewal rights, as do the federal leases. *Id.* at 117-18. The FLPMA Act, of course, has no direct application to state trust lands. For discussion of possible indirect application, see text & notes 373-94 *infra*.

358. See text & notes 355-57 *supra*.

359. Note, *Administration of Grazing Leases of State Lands in New Mexico: A Breach of Trust*, 15 NAT. RESOURCES J. 581, 581-82 (1975). See text at note 366 *infra*.

safeguards Congress intended to apply.³⁶⁰ The issue of fair compensation is closely tied to the appraisal requirement.³⁶¹ In *Lassen v. Arizona Highway Department*,³⁶² the United States Supreme Court upheld the requirement of full appraisal prior to disposition, with the subsequent result of "appropriate compensation" for the trust.³⁶³ The Court stated that the purpose of the constraints on sale or disposal within the Enabling Act was to prevent private advantage or unreasonably low prices, and to assure that the state trust "received in full fair compensation for the trust lands."³⁶⁴ Considering the intent of Congress to stop private enrichment at the expense of the trusts,³⁶⁵ it seems reasonable to assume that "true value" as stated in the Enabling Act, means at least fair market value, since any lower value would still result in private enrichment.

A trustee has a duty to conserve and make productive the corpus of a trust.³⁶⁶ The eighth circuit has expressly stated that the financing necessary to protect the trust lands may come from the trust moneys.³⁶⁷ Range deterioration is arguably deterioration of the trust corpus, and may constitute breach of trust.³⁶⁸ True appraisals of the land, which would include accurate appraisals of carrying capacity, are also tied to

360. See Ch. 310, § 28, 36 Stat. 557 (1910); *Lassen v. Arizona Highway Dep't*, 385 U.S. 458, 463, 464 (1967); Note, *supra* note 359, at 584-85.

361. See Note, *supra* note 359, at 589.

362. 385 U.S. 458 (1967) (*reversing* *State v. Lassen*, 99 Ariz. 161, 407 P.2d 747 (1965)).

363. *Id.* at 463-64. In that case the Arizona Supreme Court had stated that it may be conclusively presumed that highways built across state lands enhance the value of remaining lands at least as much as the value of the lands taken. *State v. Lassen*, 99 Ariz. 161, 164-66, 407 P.2d 747, 750-52 (1965), *rev'd*, 385 U.S. 458 (1967). Therefore, reasoned the court, when purchasing state trust lands for a highway, no compensation for payment of appraised value need be paid by the state. *Id.* The Supreme Court of New Mexico had held substantially the opposite in *State v. Walker*, 61 N.M. 374, 378-79, 301 P.2d 317, 321-22 (1956), under the same Enabling Act.

364. 385 U.S. at 463. Therefore it was held that the state must compensate the trust for the "full appraised value," without diminishing the value by considering the possible enhancement of the value of remaining lands. *Id.* at 466, 469. The United States Supreme Court did, however, relieve the state of the requirement to purchase the trust lands at auction. It stated that the purchase could be made according to rules established by the state land commissioner, since the threat of condemnation by the state would leave any auction "empty." *Id.* at 463-65.

365. See *id.*

366. RESTATEMENT (SECOND) OF TRUSTS §§ 176, 181 (1959).

367. *United States v. Swope*, 16 F.2d 215, 219 (8th Cir. 1926). In this case the United States sued the Commissioner of Public Lands of the State of New Mexico for spending trust moneys, under the Enabling Act, for expenses incurred in managing the trust. The eighth circuit noted that the common law had always authorized expenditure of trust moneys for trust administration expenses. *Id.* at 217. The court reasoned:

It is obvious that large expenditures must be made in the examination, protection, control, sale, and leasing of this land. . . . It must be presumed that Congress was aware of the heavy burden of expense that would be required in the management of these grants, and that it also had knowledge of the settled rule for the construction of such statutes, that where no provision is made in the granting of the trust estate, relating to the expense of administering the trust, the necessary expenses of executing the trust may be paid out of the trust estate.

Id. at 219.

368. See Note, *supra* note 359, at 597-600.

conservation of the trust corpus.³⁶⁹

Whether the State Land Department of Arizona has properly managed its trust is beyond the scope of this work—although, *prima facie*, range deterioration constitutes some breach. However, an apparent acknowledgement of and commitment to this duty may be inferred from a statement made by the Land Use Planning Office in the 1976 Report to the Governor.³⁷⁰ “The twofold goal to which the Land Use Planning Office is committed includes the development of land plans which insure long range benefits to the Trust, and the creation of a maximum [*sic*] revenue income to the Trust under a leasing program consistent with use and management criteria.”³⁷¹ The annual report also states that the substance of Arizona law requires leasing at fair market value.³⁷²

Since 1971 the State Land Department has tried, though unsuccessfully, to develop a comprehensive statewide land use plan.³⁷³ It might be well advised to attempt to adopt parts of the new federal legislation.³⁷⁴ After years of comprehensive study and the expenditure of millions of dollars,³⁷⁵ the federal government has found that the federal lands are deteriorating, has established a set of policies and guidelines, granted adequate authority and funding to ensure that the federal lands will be appraised adequately, and that a fair value will be received for their use, and that plans will be developed to ensure their long range protection and enhancement.³⁷⁶

Federal policies, then, parallel the trust mandates and the common law trust duties on state land. Arguably the federal land management is freer to return a larger proportion of moneys received to range improvements than the state management which is bound to a fiduciary duty to the trust beneficiaries. Nevertheless, a great portion of the management goals of both governments seem to be identical.³⁷⁷

The 1976 Report to the Governor by the State Land Department concluded that it does not function in isolation, and that part of its viability depends on cooperation with such other governmental agencies as the BLM and the Forest Service.³⁷⁸ One of the declared policies of the FLPMA is that the national interest will be best realized if

369. *Id.*

370. ARIZONA LAND MARKS, *supra* note 9, at 25.

371. *Id.*

372. *Id.* at VII. See text & notes 209-14 *supra*.

373. See *id.* at VI. Blame for this failure has been placed on the inability to determine a comprehensive policy.

374. See discussion of federal legislation at text & notes 223-74 *supra*.

375. See Hart & Guyton, *supra* note 12, at 57; Pearl, *supra* note 15, at 12-15, 30.

376. See text & notes 223-74 *supra*.

377. Compare text at note 71 *supra* with text at note 376 *supra*.

378. ARIZONA LAND MARKS, *supra* note 9, at X.

present and future use of the public lands and their resources "is projected through a land use planning process coordinated with other Federal and State planning efforts."³⁷⁹ Due to the patchwork land ownership pattern in Arizona, state trust lands are commonly interspersed with or in proximity to National Forest and BLM lands.³⁸⁰

Ultimate statutory goals of the FLPM Act and Enabling Act are certainly at variance, but in regard to land use they are compatible. The PLLRC Report stated the new federal ethic as to public lands to be retention for the highest public good.³⁸¹ The stated goal of the FLPM Act is that management generally be on the basis of multiple use and sustained yield.³⁸² The concept of "multiple use" is complex,³⁸³ but it attempts to define a requirement of judicious use of the land for the good of the public, viewing all the land as an integrated whole and comprehending present and future needs.³⁸⁴ On the other hand, the statutory goal involved in retention of the state trust lands under the Enabling Act is to benefit various state institutions, chiefly education.³⁸⁵ Since the lands are held in trust, the state has a fiduciary relationship to contend with, and must deal with the lands in the capacity of trustee.³⁸⁶

Since a trustee must seek to conserve and protect the corpus insofar as it is necessary to ensure a future flow of income to beneficiaries,³⁸⁷ and since the State Land Department has apparent authority to expend trust income for trust protection,³⁸⁸ and since the Commis-

379. 43 U.S.C.A. § 1701(a)(2) (Supp. 1978).

380. See ARIZONA LAND MARKS, *supra* note 9, at 25-26; discussion note 356 *supra*.

381. PLLRC REPORT, *supra* note 16, at 7.

382. 43 U.S.C.A. § 1701(a)(7) (Supp. 1978).

383. See discussion note 254 *supra*.

384. The term "multiple use" means the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

43 U.S.C.A. § 1702(c) (Supp. 1978).

385. Ch. 310, § 6, 36 Stat. 557 (1910).

386. *Id.* Congress is under no restrictions in dealing with the federal lands under the plenary power granted by art. IV, § 3, cl. 2 (property clause) and art. VI, cl. 2 (supremacy clause) of the United States Constitution. See *Kleppe v. New Mexico*, 426 U.S. 529, 538-39, 542-43 (1976); *Alabama v. Texas*, 347 U.S. 272, 273 (1954); *United States v. Midwest Oil Co.*, 236 U.S. 459, 474 (1914).

387. See RESTATEMENT (SECOND) OF TRUSTS §§ 176, 181 (1959); discussion at note 367 *supra*.

388. See *United States v. Swope*, 16 F.2d 215, 219 (8th Cir. 1926).

sioner is cloaked with discretionary authority to classify state trust lands,³⁸⁹ it appears that, by inference, the goals of the trust lands are comparable and compatible with those of the federal public lands. It would certainly be no breach of trust to utilize the time and research expended by the federal government, and to coordinate future research closely with the federal agencies in appraisals and the establishment of a fair return on the grazing lease lands. As to the land use planning and allotment management plans the BLM is required to establish,³⁹⁰ the state would do well to follow the planning pattern established by the federal legislation. Moreover, if range deterioration is a breach of trust, then in order for the Commissioner-Trustee to conserve the trust, planning methods similar to those developed by the FLPM Act and PRI Act and BLM need to be followed, balanced only by the rights of the beneficiary—education.

Many of the state and federal lands are in close proximity.³⁹¹ The federal government has seen fit to expend millions of dollars to research and implement a comprehensive and unified statutory base to benefit public lands and improve the return of resources and value to the general public.³⁹² The policies and goals enacted do not appear to conflict with the indirect goals of trust lands.³⁹³ Furthermore, the FLPM Act has mandated a close working relationship between federal and state administration.³⁹⁴ Maintenance and improvements on Arizona trust and federal grasslands should be strongly correlated, and the federal inventory and planning should be scrutinized comprehensively by the state, with an eye towards substantial adoption of similar plans if they appear to be aimed at long term environmental protection in the grasslands. Finally, grazing fees should be kept commensurate with those adopted on BLM and Forest Service lands.

CONCLUSION

The southwestern desert is ecologically fragile. Extensive deterioration of range lands through woody plant invasion, arroyo cutting, and a general drying of the streams and soils, has occurred in the past one hundred years. Livestock grazing is one of the major causes cited for this deterioration. Much of the land affected is now under the control of some governmental entity. Mounting public concern has led to extensive study and an overhauling of legislation at the federal level.

389. See discussion note 355 *supra*.

390. See text & notes 233-64 *supra*.

391. See ARIZONA LAND MARKS, *supra* note 9, at 25-26; discussion note 354 *supra*.

392. See text & notes 15-28 *supra*.

393. See text & notes 382-89 *supra*.

394. See 43 U.S.C.A. § 1701(a)(2) (Supp. 1978).

The new law requires comprehensive planning coordinated with public input to establish the future uses and protections for these lands. State lands should coordinate as far as possible with the emergent plans on the federal level. It is during these planning years that the future trends and uses of most of the Southwest will be determined. This is the time for all interested public groups to become actively involved.

