Subsidence: An Emerging Area of the Law

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For centuries, man has carried on activities that have directly or indirectly affected his environment. Unfortunately, the consequences of many of these activities have only begun to surface. Subsidence—the sinking of the land surface—is one environmental consequence triggered by man's activities. As major global centers sink at alarming rates,[1] subsidence will become an increasingly important area of the law. Until recently, damage due to subsidence was rare.[2] Consequently, no distinct body of law has developed in the area of subsidence, nor have the courts been confronted with the problem of redefining property rights to take account of the subsidence phenomenon. The task now facing the legislatures and the courts is to formulate rules governing liability and recovery for subsidence damage.

This Note will analyze and evaluate the various theories upon which a court might rely to impose liability for subsidence damage caused by the withdrawal of underground water. First, a framework for legal analysis will be provided by exploring the causes and effects of subsidence from the perspective of both the scientist and the economist. Negligence as a theory of liability will then be examined, along with the 1978 landmark Texas decision in *Friendswood Development Co. v. Smith-Southwest Industries*.[3] Because they relate to subsidence, the various theories of groundwater law will next be analyzed. In addition,

1. B. BOLT, W. HORM, G. MACDONALD & R. SCOTT, GEOLOGICAL HAZARDS 211-20 (1975) [hereinafter cited as BOLT]. Groundwater pumping is responsible for substantial subsidence in Taipei, China (maximum amount 1.9 m. in 1975); Tokyo, Japan (maximum amount 4.6 m. between 1919 and 1974); Wairakei, New Zealand (maximum amount 6-7 m. between 1964 and 1974); Denver, Colorado (maximum amount .38 m. up to 1962); Las Vegas Valley, Nevada (maximum amount .6 m. in 1975); the San Joaquin Valley in California (maximum amount 9 m. in 1956-57); the Santa Clara Valley in California (maximum amount 4 m. in 1962); and central Arizona (maximum amount 2.3 m. between 1952 and 1964). V. VIETS, C. VAUGHAN & R. HARDING, ENVIRONMENTAL AND ECONOMIC EFFECTS OF SUBSIDENCE App. B (1979). The figures in parentheses indicate the maximum amount of subsidence in meters for the study years indicated.

2. BOLT, *supra* note 1, at 198.

3. 576 S.W.2d 21 (Tex. 1978).

the law of private nuisance and the doctrine of subjacent support will be explored for their potential impact on the subsidence problem. Finally, statutory and administrative regulation of subsidence will be briefly surveyed.

THE FACTS ABOUT SUBSIDENCE

Subsidence is a downward movement or sinking of the land surface induced either by man's activities or by natural causes.[4] One of the most common causes of man-induced subsidence is the withdrawal of groundwater from underground aquifers.[5]

Land subsidence due to groundwater overdraft is irreversible.[6] While the subsidence process induced by overdraft can be stopped, it cannot be reversed so as to restore the land to presubsidence levels.[7] The solution to overdraft-induced subsidence is to reduce the rate of groundwater overdraft.[8] This reduction can be accomplished by importing water to replace the amount of the overdraft or by reducing pumping.[9] Mexico City, where groundwater overdraft caused the land surface of the city to subside seven meters between 1880 and 1970, is a vivid illustration.[10] From thirty centimeters per year in 1952, the rate of subsidence slowed to a few centimeters per year after Mexico City began to import water to supply its needs.[11] Another technique to retard subsidence is repressurization, whereby water is injected into an aquifer in order to halt the decline in fluid pressure which causes consolidation.[12] Methods like repressurization are stopgap measures since

4. BOLT, *supra* note 1, at 198; Bouwer, *Land Subsidence and Cracking Due to Groundwater Depletion*, 15 GROUNDWATER 358, 358 (1977).

5. BOLT, *supra* note 1, at 214. Subsidence resulting from groundwater pumping is caused by compaction or consolidation of underground strata due to declining water tables or artesian heads. Bouwer, *supra* note 4, at 358. The consolidation is caused by an increase in effective loading stresses brought about by a change in the buoyant support of soil particles or by a change in hydraulic gradients or seepage stresses. C. MCCAULEY, MANAGEMENT OF SUBSIDING LANDS: AN ECONOMIC EVALUATION 26 (1973). As the water table declines, increased loading stresses bring about consolidation of soil particles, resulting in surface subsidence. *Id.* at 25-26. All areas where major subsidence has occurred overlie confined aquifers consisting of permeable sand or gravel of low compressibility interbedded with clay strata of low permeability and high compressibility. *Id.* at 25. The term "aquifier" refers to the saturated, permeable earth materials from which groundwater is produced. F. TRELEASE, WATER LAW: RESOURCE USE AND ENVIRONMENTAL PROTECTION 459 (2d ed. 1974).

6. Bouwer, *supra* note 4, at 358. "Overdraft" occurs when the amount of water pumped from an aquifer exceeds the amount of natural recharge into that aquifer, thus denoting a net reduction in the supply of groundwater. Overdraft is also referred to as "mining" of groundwater. See F. TRELEASE, *supra* note 5, at 487.

7. BOLT, *supra* note 1, at 211.

8. C. MCCAULEY, *supra* note 5, at 53.

9. *Id.*

10. BOLT, *supra* note 1, at 215.

11. *Id.*

12. *Id.* at 211. The author states:

> The compression is caused by the fall in fluid pressure; when the fluid pressure is stabilized or raised, the settlement stops. . . . The pressures can be raised or maintained, for

elimination of the cause of the problem—groundwater overdraft—remains the ultimate cure.

Sinking or cracking caused by subsidence may result in many forms of damage. A basic distinction may be drawn between damage to natural structures and damage to artificial structures. Subsidence may have drastic consequences for man-made structures. Damage may result to transportation facilities such as highways, bridges, railroads, and pipelines.[13] Roads may become misaligned and cracked.[14] Domestic and urban structures may also be adversely affected.[15] Finally, subsidence may damage agricultural facilities such as wells, pumps, fields, and ditches.[16]

Damage to natural structures refers to alterations in the configuration of the earth's surface, which may include sinking, cracking, gullying, and loss of aquifer storage capacity caused by consolidation of the subsurface strata.[17] While the decline in the level of the land may not of itself cause damage, sinking does present a threat in coastal and low-lying areas that are subject to inundation.[18] Cracking, however, may be a far costlier phenomenon than sinking.[19] Cracking occurs because the land toward the center of the basin sinks more than the land at the periphery, thus forming a "subsidence bowl."[20] Strains in the earth's surface occur at the margin of the bowl. As the bowl deepens, these strains reach the breaking point and fissures open.[21] Small cracks may be widened overnight by erosion into large arroyos with resulting damage to agricultural land, buried pipelines, and major highways.[22]

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example, by pumping water into the peripheral regions of an oil field. In addition to slowing or stopping subsidence, the added water aids in increasing the amount of oil extracted from the field.

Id.

13. C. MCCAULEY, *supra* note 5, at 13-15.

14. *Id.*

15. *Id.* at 15-16. Cracking represents a greater threat to homes than does sinking, since the latter usually occurs uniformly throughout a basin. *Id.* In some situations, however, sinking may represent as great a threat as cracking. For example, nonuniform subsidence may result from different rates of water table decline or differences in compressibility of subsurface formations. Bouwer, *supra* note 4, at 358. Lateral subsidence, as opposed to vertical, may result from lateral compression of an aquifer caused by the lateral flow of groundwater. *Id.* In certain geologic formations, sinkholes may develop. BOLT, *supra* note 1, at 203.

16. C. MCCAULEY, *supra* note 5, at 16-24. Damage to wells usually occurs when the well casing collapses due to structural changes in the zone of dewatering. *Id.* at 16. Sand and gravel may then pass through the hole in the casing and destroy the pump. *Id.* Changes in field slope and elevation may upset irrigation and drainage patterns, making releveling a necessity. *Id.* at 19. Cracks in fields may require continued maintenance. *Id.* at 22. Ditches may collapse or, in unusual cases, their slope may actually be reversed. *Id.* at 22, 44.

17. *Id.* at 12-13.

18. A. GRIFFIN, THE NATURE OF THE WATER PROBLEM FACING THE TUCSON BASIN 195 (1980).

19. *Id.* at 201.

20. *Id.* at 194.

21. *Id.*

22. *Id.* at 194, 196. One of the worst occurrences of subsidence-induced cracking may be

Another potentially disastrous consequence of subsidence has been discovered only recently. Scientists have determined that groundwater overdraft contributes to geological faulting.[23] Overdraft-induced faulting is probably caused by differing rates of compaction along older faults,[24] but much more research is needed before its causes are fully known. Such faulting is believed to be occurring in California, Mexico, Texas, and Arizona.[25] Until this discovery, it was thought that sinking and cracking were the only types of ground damage attributable to groundwater overdraft.[26] Faulting is potentially more damaging than fissuring[27] since geological forces may act concurrently with groundwater declines to magnify the effects on the earth's surface.[28]

While the damage resulting from subsidence has probably been negligible until now,[29] such damage will increase unless groundwater overdraft is reduced.[30] Because both private and governmental landowners will be affected by subsidence, it is imperative to develop a body of legal rules to cope with the problems it presents.

THE ECONOMICS OF SUBSIDENCE

Subsidence can be viewed as an example of a negative externality. A negative externality, in economic terms, is an uncompensated injury inflicted upon one individual by another individual's production or consumption of an economic good.[31] As a result of one landowner's

found in south-central Arizona, where cracks have damaged State Highway 87 and Interstate Highway 10. C. MCCAULEY, *supra* note 5, at 13-14.

23. Holzer, Davis & Lofgren, *Faulting Caused by Groundwater Extraction in South-Central Arizona*, 84 J. GEOPHYSICAL RESEARCH 603, 603 (1979) [hereinafter cited as Holzer]; Davis, Subsidence and Land Fissuring, Southwestern United States 2 (1979) (unpublished manuscript abstract on file with the *Arizona Law Review*).

24. Davis, *supra* note 23, at 2.

25. Holzer, *supra* note 23, at 603.

26. *Id.*

27. Davis, *supra* note 23, at 2.

28. Holzer, *supra* note 23, at 611.

29. A. GRIFFIN, *supra* note 18, at 195, 197. Studies estimate that as much as four to eight feet of subsidence can occur before tilting and strains in the earth's surface begin to cause damage. *Id.* at 200.

One study has estimated the cost of subsidence damage. Total annual subsidence damage costs for the western half of Pinal County, Arizona were estimated to be $207,050. C. MCCAULEY, *supra* note 5, at 48. Because Pinal County consists primarily of agricultural land, damage to domestic and urban structures was negligible. *Id.* Damage might well be greater in an urban area. *See* A. GRIFFIN, *supra* note 18, at 199.

30. C. MCCAULEY, *supra* note 5, at 13-15.

31. A. FREEMAN, R. HAVEMAN & A. KNEESE, THE ECONOMICS OF ENVIRONMENTAL POLICY 72 (1973) [hereinafter cited as FREEMAN]. *See* R. BISH, THE PUBLIC ECONOMY OF METROPOLITAN AREAS 18-20 (1971). Bish defines externalities as "the results of an economic action that affect parties not directly involved in the transaction." *Id.* at 18. Externalities are sometimes called "spillover costs." *Id.*; FREEMAN, *supra*, at 67.

Illustrative of negative externalities are air, water, and noise pollution in cases where the polluter is not required to compensate other individuals for the damage caused by the decline in environmental quality. FREEMAN, *supra*, at 73; E. MISHAN, COST-BENEFIT ANALYSIS 110 (1976).

groundwater pumping, an uncompensated injury—subsidence—is imposed upon surrounding landowners.

The primary incentive for the extraction of substantial amounts of groundwater is its low cost as compared to alternative sources of water.[32] The cost of groundwater is, however, artificially low if it does not reflect the cost of the externalities. If the pumper was forced to pay for subsidence damage, along with the fixed and operating costs of pumping, groundwater might well prove to be more expensive than alternative sources.[33] If this was true, a rational groundwater pumper would switch to a less expensive source of water, assuming one was available, thus reducing his use of groundwater and halting the accompanying subsidence.[34]

Subsidence represents the cost to society of the activities of one who need not, under current law, take such external costs into account in his own economic decisionmaking.[35] Subsidence has traditionally cost the producer nothing.[36] Current legal and economic systems do not provide a straightforward method by which the producer can be required to compensate others for damage to land resulting from his groundwater pumping. Ultimately, society absorbs the cost in the form of a misallocation of resources.[37] The solution is to internalize the externality by forcing the person imposing it to pay the additional social cost created by his activities, or to pass it on to his customers.[38] The groundwater producer, forced to consider subsidence costs in his economic decisionmaking, theoretically will have an incentive to curtail withdrawals.[39]

One way externalities can be internalized is through the legal system.[40] The failure of the market to reflect the cost of negative external-

32. Teutsch, *Controls and Remedies for Ground Water-Caused Land Subsidence*, 16 HOUS. L. REV. 283, 284 (1979).

33. *Id.* Imposing the cost of externalities on the groundwater pumper may drive some pumpers out of business, thus affecting economic growth and the distribution of income.

34. *Id.* at 286. This statement assumes that the pumper's groundwater rights are transferable. *See* R. POSNER, ECONOMIC ANALYSIS OF LAW 30-31 (2d ed. 1977) ("If a property right cannot be transferred, resources will not be shifted from less to more valuable uses through voluntary exchange.").

35. E. MISHAN, *supra* note 31, at 110; R. POSNER, *supra* note 34, at 51-52.

36. Since the private cost of imposing subsidence is zero, the cost effectively escapes the market and there is no incentive to refrain from this activity. FREEMAN, *supra* note 31, at 65, 73-76; E. MISHAN, *supra* note 31, at 112-13; Teutsch, *supra* note 32, at 286.

37. *See* FREEMAN, *supra* note 31, at 72-76; R. STEWART & J. KRIER, ENVIRONMENTAL LAW AND POLICY 114 (2d ed. 1978).

38. *See* E. MISHAN, *supra* note 31, at 117-21; E. RABIN, FUNDAMENTALS OF MODERN REAL PROPERTY LAW 565-67 (1974). By forcing the producer of a negative externality to add the social cost to his marginal cost of production, his marginal costs would increase. E. MISHAN, *supra* note 31, at 119. In response, the producer would decrease output to the point where marginal revenue equals new marginal cost. *Id.* In theory, the externality ceases to be an external effect and becomes a properly priced product internalized into the producer's costing system. *Id.*

39. R. STEWART & J. KRIER, *supra* note 37, at 114; Teutsch, *supra* note 32, at 286.

40. Many areas of the law offer possibilities for such internalization. Nuisance law, for ex-

ities results in part from a lack of clearly defined and enforceable property rights.[41] Indeed, the legal protection of property rights is a primary incentive to the efficient use of resources.[42] Just as the legal system should reward those who contribute to the nation's wealth, so it should punish those who impose costs on society.[43]

Subsidence damage cannot be internalized unless the law first recognizes it as a legal injury. It is a well established legal principle that losses without invasion of legal rights or violation of legal duties are noncompensable.[44] Therefore, in order to be compensable, the injury must first be recognized by creating a legal right in landowners to be free from subsidence damage or, conversely, by imposing a legal duty on pumpers not to cause neighboring lands to subside. Only by establishing some system of rights and duties can subsidence damage be internalized, and thus compensated. This Note will now explore some of the theories that courts could use to confer such legal rights and impose such legal duties.

THEORIES OF LIABILITY

Damages for subsidence may be awarded under several theories of liability including negligence, various water law theories, nuisance, and subjacent support. Each of these theories will be evaluated as a possible legal solution to the subsidence problem.

1. *Negligence*

Negligence may be invoked to impose liability on a defendant whose pumping of groundwater has resulted in the subsidence of neighboring lands. Negligence consists of the breach of a legal duty resulting in injury to another to whom the duty is owed.[45] In order to

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ample, seeks to apportion external costs between the plaintiff and the defendant based on a weighing of the costs and benefits of the defendant's activity. *See* RESTATEMENT (SECOND) OF TORTS §§ 826-831 (1979), specifically § 826, Comment f. Another avenue to internalization is zoning law, developed in response to increasing land use externalities. *See* J. CRIBBET, PRINCIPLES OF THE LAW OF PROPERTY 397 (2d. ed. 1975). For instance, owners of homes in residential areas are commonly protected from the nearby establishment of industrial uses by zoning restrictions on noncompatible uses. Similarly, height restrictions protect the owner's access to light as well as his view. In both cases, zoning regulations prohibit the imposition of externalities on unwilling landowners. Property law, particularly the definition of property rights, is of utmost importance in any effort to internalize externalities. *See* R. BISH, *supra* note 31, at 24; FREEMAN, *supra* note 31, at 71-79; E. MISHAN, *supra* note 31, at 119.

41. *See* FREEMAN, *supra* note 31, at 71-76; E. MISHAN, *supra* note 31, at 112-13, 119; R. STEWART & J. KRIER, *supra* note 37, at 109-10.

42. R. POSNER, *supra* note 34, at 28.

43. *See id.*

44. Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 25, 28 (Tex. 1978). *See generally* W. PROSSER, HANDBOOK OF THE LAW OF TORTS, § 43, at 250-55, § 53, at 324-27 (4th ed. 1971).

45. *See generally* W. PROSSER, *supra* note 44, §§ 30-31, at 143-49. Whether there is a duty depends on whether the plaintiff's interest is entitled to legal protection from the defendant's con-

hold the defendant liable for negligence, the plaintiff must establish: 1) that the defendant has a legal duty to conform to a certain standard of conduct for the protection of others against foreseeable and unreasonable risks; 2) that the defendant has failed to conform to that standard; 3) that a reasonably close causal nexus exists between the defendant's conduct and the plaintiff's injury; and 4) that actual damage has resulted to the plaintiff's legally protected interests.[46]

In general, all interests in tangible property, real and personal, are protected against negligent interference.[47] Thus, the use of land in a negligent manner, resulting in injury to the land of another, may give rise to liability.[48] This rule might reasonably be applied to impose liability where subsidence results from a neighboring landowner's negligent exercise of his right to pump groundwater.

The 1978 decision by the Texas Supreme Court in *Friendswood Development Co. v. Smith-Southwest Industries*[49] was the first judicial recognition of a cause of action for negligence where a defendant's pumping of groundwater caused a plaintiff's land to subside.[50] In *Friendswood*, the defendant began pumping massive amounts of groundwater for sale to industrial consumers.[51] The pumping occurred in the Houston-Galveston region of the Texas Gulf Coast, one of the areas of the United States hardest hit by subsidence.[52] Nearby landowners brought a class action suit alleging that the defendant's negligent extraction of groundwater caused their land to sink below sea level, resulting in erosion damage and flooding.[53] Friendswood Development Company, the defendant, joined several third party defendants, alleging that their pumping contributed to the subsidence.[54] The trial court granted summary judgment for Friendswood, invoking the prevailing rule of Texas groundwater law that a landowner has the right, in the absence of willful waste or malicious injury, to withdraw groundwater from his own land without liability for resulting damage

duct. *Id.* § 53, at 325. In general, courts will find a duty where reasonable men would agree that the interest merits protection. *Id.* at 327. Once a duty is established, the defendant must use reasonable care to avoid infringing the plaintiff's protected interest. *Id.* at 324. *See* RESTATEMENT (SECOND) OF TORTS § 282 (1979) (defining negligence as conduct falling below the legal standard for protection against unreasonable risks of harm).

46. W. PROSSER, *supra* note 44, § 30, at 143.

47. *Id.* § 54, at 327.

48. *See* Turner v. Big Lake Oil Co., 128 Tex. 155, 157, 96 S.W.2d 221, 221-22 (1936) (involving injury to plaintiff's property occasioned by escape of salt water from ponds constructed and used by defendant in operation of oil wells).

49. 576 S.W.2d 21 (Tex. 1978).

50. *Id.* at 21-22.

51. *Id.*

52. *See* Gabrysch & Bonnet, Land-Surface Subsidence in the Houston-Galveston Region, Texas 1-2 (Tex. Water Dev. Bd. Rep. No. 188, 1975).

53. 576 S.W.2d at 22.

54. *Id.*

to his neighbor's land.[55]

The Texas Court of Civil Appeals reversed, holding that plaintiff had stated a cause of action in nuisance in fact[56] and negligence.[57] The appeals court found it necessary to reconcile the water law doctrine of absolute ownership with the rule that a landowner has a duty to use his property so as to avoid injury to others.[58] Because of the landowner's unrestricted right to withdraw groundwater under the absolute ownership doctrine, the fact that his pumping causes subsidence is not, standing alone, actionable.[59] If the manner of the landowner's pumping is negligent, however, and subsidence is a proximate result, "the fact that he owns the water produced will not insulate him from the consequences of his negligent conduct."[60]

The Texas Supreme Court, relying upon the established rule that for negligence to lie there must be a violation of a legal right and the breach of a legal duty,[61] reversed the court of appeals.[62] Under Texas law the pumping of groundwater was lawful. Thus, there was no legal duty to protect against injury to land caused by pumping, and the landowner's interest in freedom from subsidence remained legally unrecognized.[63]

In the Texas Supreme Court's view, the doctrine of absolute ownership was controlling. That doctrine was an established rule of property law under which many persons had acquired groundwater rights.[64] While acknowledging that some aspects of the rule were "harsh and outmoded,"[65] the court noted that the Texas Legislature had as recently as 1975 confirmed private ownership of groundwater.[66] Invoking the doctrine of stare decisis,[67] the court refused to depart from the absolute

55. *Id.*

56. See note 139 *infra* for a definition of nuisance in fact.

57. Smith-Southwest Indus. v. Friendswood Dev. Co., 546 S.W.2d 890, 898 (Tex. Civ. App. 1977). For further discussion of the court of appeals decision, *see generally* 15 HOUS. L. REV. 454 (1978); 9 TEX. TECH. L. REV. 392 (1978).

58. 546 S.W.2d at 896-97. See text & notes 55 *supra*, 86-93 *infra*, for further discussion of the doctrine of absolute ownership.

59. 546 S.W.2d at 897.

60. *Id.*

61. 576 S.W.2d at 28 (citing State v. Brewer, 141 Tex. 1, 5-6, 169 S.W.2d 468, 471 (1943)).

62. *Id.* at 22. For further discussion of the Texas Supreme Court's decision in *Friendswood, see generally* 31 BAYLOR L. REV. 108 (1979).

63. 576 S.W.2d at 25-28.

64. *Id.* at 29.

65. *Id.* at 28.

66. *Id.* at 27. See text & note 211 *infra*.

67. Stare decisis is a judicially-created policy of adherence to precedent in cases where the facts are substantially the same as in the case in which the precedent was established. BLACK'S LAW DICTIONARY 1261 (5th ed. 1979). The doctrine is based on the theory that security and certainty require that established legal rules under which rights have accrued be followed, even though later found to be legally unsound. Otter Tail Power Co. v. Von Bank, 72 N.D. 497, 513, 8 N.W.2d 599, 607 (1943). Nevertheless, considerations of public policy may sometimes demand

ownership rule as to past subsidence.[68]

The court further held, however, that a negligence action would lie as to future subsidence damage caused by wells drilled or produced after the *Friendswood* decision.[69] If a landowner withdraws groundwater in a negligent manner, and such conduct is a proximate cause of the subsidence of neighboring lands, the landowner will be liable for damages arising from such subsidence.[70] Reasoning that no other use of private property enjoys the immunity from negligence liability thought to be conferred by the absolute ownership doctrine, the court imposed on groundwater pumpers a legal duty to produce water in a manner that will not damage the lands of others.[71]

Friendswood must be analyzed in light of the fact that Texas applies the English rule of absolute ownership to groundwater.[72] Under that rule, there is no liability for damage to land resulting from pumping in the absence of waste or malicious injury.[73] The court was thus forced to find another theory on which to base liability, and it adopted negligence law. Because the court merely announced the new rule without applying it, many questions concerning the application of a negligence theory remain unresolved.

One issue that has not been explored is the application of the foreseeability requirement. A defendant is negligent if he acts unreasonably in failing to guard against a risk that he does or should recognize.[74] There is no liability for failure to protect against risks that a reasonable

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departure from precedent. Colonial Trust Co. v. Flanagan, 344 Pa. 556, 561, 25 A.2d 728, 730 (1942).

The plaintiffs in *Friendswood* urged that the gravamen of their injury was damage to land and that water law did not control. 576 S.W.2d at 24. The court interpreted the plaintiffs' argument as a contention that the reasonable use doctrine, see text & notes 94-112 *infra*, should be applied to groundwater and that the Texas doctrine of absolute ownership, *see* text & notes 86-93 *infra*, should be overruled. 576 S.W.2d at 24. This interpretation paved the way for application of the rule of stare decisis, which ultimately permitted the court to hold for the defendant.

68. 576 S.W.2d at 29.

69. *Id.* at 22, 30. In refusing to hold the defendant liable under this new rule, the court emphasized that the defendant had drilled its wells from 1964 through 1969. *Id.* at 28. During the 1964-69 period, unlimited withdrawals of water were sanctioned by the doctrine of absolute ownership. *Id.* at 29. The court found further sanction for defendant's conduct in the RESTATEMENT OF TORTS § 818 (1939), quoted at note 173 *infra*, which exempted a landowner from liability under the law of subjacent support for subsidence caused by withdrawal of groundwater. 576 S.W.2d at 28.

Two post-1969 events influenced the *Friendswood* court to declare a rule imposing liability for future subsidence. First, the court noted that the American Law Institute had adopted a tentative revision of § 818 in 1969, completely reversing its earlier position. *Id.* at 28. See note 185 *infra*. More importantly, the court noted that the Texas Legislature had amended the state water code in 1973 to provide for regulation of subsidence. 576 S.W.2d at 30. See TEXAS WATER CODE ANN. tit. 4, § 52.117 (Vernon 1972); text & notes 207-15 *infra*.

70. 576 S.W.2d at 30. The court also reaffirmed two other grounds of liability long recognized by the Texas courts: willful waste and malicious injury. *Id.*

71. *Id.*

72. See text & notes 86-93 *infra* for an explanation of the doctrine of absolute ownership.

73. *See* text & notes 86-87 *infra*.

74. W. PROSSER, *supra* note 44, § 31, at 145.

person would not appreciate.[75] The test of foreseeability is an objective standard of reasonableness—whether the defendant could reasonably have foreseen that injury would result from his conduct, or whether his conduct was reasonable in light of what he could anticipate.[76] Although the *Friendswood* court did not elaborate on the elements required to prove negligence, it seems clear that owners of subsiding land must allege and prove that the subsidence was a foreseeable consequence of the defendant's pumping.[77] Whether the defendant knew or should have known that subsidence might result from his pumping will be a question of fact in each case. The standard for determining the issue of foreseeability may vary with the nature of the defendant.[78] For instance, the courts might expect a municipal water supplier to have greater knowledge than a small farmer.

Causation is another element of negligence whose application in subsidence cases remains to be determined. Negligence requires a reasonably close causal connection between defendant's conduct and plaintiff's injury.[79] The plaintiff must prove that it is more probable than not that the defendant's conduct was a substantial factor in bringing about his injury.[80] Since expert testimony is sufficient to establish causation,[81] proof of this element should not present a great obstacle to recovery in land subsidence cases.[82]

Finally, since one goal of negligence law is to distribute the costs of injury, the courts should apply the familiar rules of contribution and indemnity to subsidence cases. Contribution distributes the loss among tortfeasors by requiring each to pay a proportionate share.[83] Indemnity shifts the entire loss from one tortfeasor who was compelled to pay it to another who should have borne it.[84] Because many landowners often pump simultaneously from the same aquifer, these principles should be applied to apportion the damages caused by subsidence equitably.

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75. *Id.*
76. *Id.* § 43, at 250.
77. 15 HOUS. L. REV. 454, 464 (1978).
78. W. PROSSER, *supra* note 44, § 32, at 151.
79. *Id.* § 30, at 143.
80. *Id.* § 41, at 241.
81. *Id.*
82. Hydrologists are able to trace pumping from one well to nearby subsidence damage. Teutsch, *supra* note 32, at 298. In addition, the relative contribution of a particular well to declines in a water table in any given location can be determined from pumping records and hydrological data. *Id. See* State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 292, 217 N.W.2d 339, 345 (1974); C. MCCAULEY, *supra* note 5, at 25. *See also* BOLT, *supra* note 1, at 204-11 (discussing current methodologies for detecting, measuring, and controlling subsidence).
83. W. PROSSER, *supra* note 44, § 51, at 310.
84. *Id.*

2. *Water Law*

A few courts have applied principles of groundwater law to overdraft-induced subsidence.[85] Three major theories of groundwater law will be presented as possible legal solutions to the subsidence problem.

The first groundwater theory is the absolute ownership or English rule. The English rule gives the landowner a right to all the water he can withdraw from his land for use on or off the premises; any injury to his neighbor's land or wells resulting from his pumping is not actionable.[86] There are only two limitations on the English rule. First, the landowner who pumps groundwater may be liable for willfully wasting water. Second, the pumper may be liable for maliciously taking water in order to injure his neighbor.[87] Courts applying the English rule have generally denied liability for subsidence damage,[88] reasoning that absolute ownership of groundwater cannot coexist with or be limited by the principle that one must use his property so as not to harm the property of others.[89]

In *Friendswood*, the Texas Supreme Court alleviated the harshness of the English rule by recognizing a prospective cause of action in negligence for subsidence damage.[90] The decision creates an anomaly in Texas law by limiting the ostensibly absolute right to pump groundwater.[91] A groundwater pumper whose pumping results in subsidence

85. *See* 15 HOUS. L. REV. 454, 455 (1978). *See, e.g.*, Finley v. Teeter Stone, Inc., 251 Md. 428, 248 A.2d 106 (1968); Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21 (Tex. 1978); State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 217 N.W.2d 339 (1974); Langbrook Properties, Ltd. v. Surrey County Council, [1969] 3 All E.R. 1424. *But see* Friendswood Dev. Co. v. Smith-Southwest Indus. Inc., 576 S.W.2d 21, 31 (Tex. 1978) (Pope, J., dissenting).

86. Acton v. Blundell, 152 Eng. Rep. 1223, 1235 (Ex. 1843). *See* Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 149-51, 81 S.W. 279, 280-82 (1904); Huber v. Merkel, 117 Wis. 355, 363, 94 N.W. 354, 357 (1903), *overruled in* State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 298, 217 N.W.2d 339, 348 (1974); 9 TEX. TECH. L. REV. 392, 393-95 (1978). The rationale for the English rule is that groundwater is as much a part of the freehold through which it percolates as the soil and rocks found therein, and therefore falls within the maxim that a landowner owns everything above and below the land to an indefinite extent. Houston & Tex. Cent. Ry. Co. v. East, 98 Tex. 146, 150, 81 S.W. 279, 281 (1904); Steelhammer & Garland, *Subsidence Resulting from the Removal of Ground Waters*, 12 S. TEX. L.J. 201, 205 (1970).

87. City of Corpus Christi v. City of Pleasonton, 154 Tex. 289, 293-94, 276 S.W.2d 798, 801 (1955). *But see* Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 30 (Tex. 1978) (negligence added as a third limitation on a landowner's rights under the English rule).

88. *E.g.*, New York Cont'l Jewell Filtration Co. v. Jones, 37 App. D.C. 511, 518 (1911) (where drainage of groundwater in construction of a tunnel caused subsidence, defendant held not liable based on common law right to capture groundwater); Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 29, 30 (Tex. 1978) (recovery denied where English rule immunized groundwater pumpers from liability for damage to neighboring landowners; prospective cause of action for negligence recognized); Langbrook Properties, Ltd. v. Surrey County Council, [1969] 3 All E.R. 1424, 1439-40 (liability for negligence or nuisance denied where English rule made pumping of water lawful and there was no duty to protect against the injury).

89. *E.g.*, Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 24-29 (Tex. 1978); Langbrook Properties, Ltd. v. Surrey County Council, [1969] 3 All E.R. 1424, 1439-40.

90. 576 S.W.2d at 30. See text & notes 69-71 *supra*.

91. 15 HOUS. L. REV. 454, 468 (1978).

can now be held liable for waste, malicious injury, or negligence.[92] Since the exceptions are beginning to swallow the absolute ownership rule, it appears that the rule has outlived its usefulness.[93]

The theory of groundwater law followed in the majority of states is the American rule, or the doctrine of reasonable use.[94] The doctrine of reasonable use arose as a reaction to the harshness and the abuses possible under the English rule.[95] The reasonable use rule restricts the landowner's right to pump groundwater by limiting his withdrawals to an amount reasonably necessary for some useful purpose in connection with the overlying land.[96] In theory, the definition of reasonable use depends on all the facts and circumstances, such as the parties involved, the nature of their respective uses, the defendant's intentions, the defendant's actions or failure to act to correct the situation after the effect of his pumping on the plaintiff's lands is known, and the appropriateness of the use to the locality.[97] The reasonable use rule may be

92. 576 S.W.2d 21 at 30.

93. 15 HOUS. L. REV. 454, 468 (1978).

94. State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 293, 217 N.W.2d 339, 345 (1974). According to *Michels Pipeline*, twenty-five states have adopted the reasonable use rule of percolating groundwater. *Id. E.g.*, Shenk v. City of Ann Arbor, 196 Mich. 75, 81-91, 163 N.W. 109, 111-14 (1917); Forbell v. City of New York, 164 N.Y. 522, 526, 58 N.E. 644, 646, 124 N.Y.S. 902, 904 (1900); Canada v. City of Shawnee, 179 Okla. 53, 55, 64 P.2d 694, 697 (1937).

95. Steelhammer & Garland, *supra* note 86, at 206. Many writers have advocated abandonment of the English rule because its rationale has been undercut by drastic changes in conditions since adoption of the rule in 1843 in Acton v. Blundell, 152 Eng. Rep. 1223 (Ex. 1843). *E.g.*, 15 HOUS. L. REV. 454, 464-68 (1978); 9 TEX. TECH. L. REV. 392, 399-401 (1978). In Frazier v. Brown, 12 Ohio St. 294 (1861), the court gave two reasons for adopting the English rule. First, the movement of groundwater was unknown, making any damage unforeseeable. *Id.* at 311. Second, commerce and industry would suffer without an unlimited right to pump groundwater. *Id.* Neither of these conditions hold true today. 15 HOUS. L. REV. at 464-65; 9 TEX. TECH L. REV. at 400-01. Perhaps the most objectionable facet of the English rule is the inequity of allowing the landowners with the biggest pumps to impose externalities upon neighboring owners with impunity. 15 HOUS. L. REV. at 465-66; 9 TEX. TECH. L. REV. at 401. See text & notes 31-44 *supra* for a discussion of subsidence as a negative externality.

96. 15 HOUS. L. REV. 454, 458 (1978). *See* Katz v. Walkinshaw, 141 Cal. 116, 134, 74 P. 766, 771 (1903); Canada v. City of Shawnee, 179 Okla. 53, 55, 64 P.2d 694, 697 (1937).

97. Bristor v. Cheatham, 75 Ariz. 227, 237, 255 P.2d 173, 179 (1953); MacArtor v. Graylyn Crest III Swim Club, Inc., 41 Del. Ch. 26, 29, 187 A.2d 417, 419 (1963); Finley v. Teeter Stone, Inc., 251 Md. 428, 439-40, 248 A.2d 106, 113-14 (1968). *See* RESTATEMENT (SECOND) OF TORTS § 850A (1979), quoted in full at note 113 *infra*, for a list of the factors to be considered in determining reasonableness.

The determination of negligence, like that of reasonable use, involves a weighing of all the facts and circumstances to decide whether a landowner will be liable for a particular use of his property or water rights. 15 HOUS. L. REV. 454, 463 (1978). Among the factors which might be considered under both theories are the use to which the water is put, the amount and rate of withdrawal, the rate of natural recharge, waste, and the defendant's motive. *Id.* at 463 n.88. *See* RESTATEMENT OF TORTS § 852, Comments b - c (1939). The test for both negligence and reasonable use is an objective standard of reasonableness. 15 HOUS. L. REV. 454, 464 (1978). The reasonable use rule imposes a duty on each landowner to use his property so as not to injure others; *see* text & notes 98-99 *infra*, and negligence law imposes a duty to use reasonable care in one's activities. *See* W. PROSSER, *supra* note 44, § 30, at 143. Negligence differs from the reasonable use rule in that negligence requires that the injury be foreseeable by the defendant, *see* notes 74-76 *supra*, whereas foreseeability may be just one factor in the reasonable use formula. 15 HOUS. L. REV. 454, 463-64 (1978). Furthermore, the negligence concept of "proximate cause" does not appear in the law of reasonable use.

viewed as an application of the principle that a landowner has a duty to use his property so as to avoid injuring others.[98] Accordingly, a landowner must exercise his right to withdraw groundwater from his own land in a manner that will not unreasonably harm the property rights of neighboring landowners.[99]

In practice, however, the reasonable use rule has been interpreted to mean that only a use or sale of water off the land from which it is withdrawn is unreasonable.[100] If the pumper puts the water to a beneficial use in connection with the overlying land, he is not liable for harm to adjoining landowners.[101] Thus, a landowner who pumps enormous amounts of water to the damage of his neighbors is not liable unless he uses or sells the water off the land, or puts it to an unreasonable use in connection with the land from which it was extracted.[102] The rationale for the rule is that so long as the water is used on the overlying land, some of the water will percolate back into the aquifer and thus will not be entirely lost to the basin.[103]

In *Finley v. Teeter Stone, Inc.*,[104] the Maryland Supreme Court applied the foregoing interpretation of the reasonable use rule to subsidence allegedly caused by the defendant's draining of a quarry pit.[105]

98. Finley v. Teeter Stone, Inc., 251 Md. 428, 436, 248 A.2d 106, 112 (1968); Steelhammer & Garland, *supra* note 86, at 206.

99. Steelhammer & Garland, *supra* note 86, at 206. *See, e.g.*, Storey v. Central Hide & Rendering Co., 148 Tex. 509, 226 S.W.2d 615 (1950); McKain v. Haynes, 203 S.W.2d 970 (Tex. Civ. App. 1947); Brown v. Cooper, 10 Tex. Civ. App. 512, 31 S.W. 316 (1895).

100. *See* Bristor v. Cheatham, 75 Ariz. 227, 235, 237-38, 255 P.2d 173, 178, 180 (1953); Meeker v. City of East Orange, 77 N.J.L. 623, 638-39, 74 A. 379, 385 (1909); Canada v. City of Shawnee, 179 Okla. 53, 55, 64 P.2d 694, 697 (1937).

101. State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 301, 217 N.W.2d 339, 350 (1974).

102. *See* Bristor v. Cheatham, 75 Ariz. 227, 235, 237-38, 255 P.2d 173, 178, 180 (1953); Meeker v. City of East Orange, 77 N.J.L. 623, 638-39, 74 A. 379, 385 (1909).

The American rule has been criticized as affording too little protection for neighboring landowners. State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 301, 217 N.W.2d 339, 350 (1974). The rule does not restrict the owner's right to use the water for any useful purpose on his own land, nor his right to use it anywhere else in the absence of proof of injury to adjoining landowners. *Id.* at 299, 217 N.W.2d at 349. Thus, the rule does not protect a small user from a neighboring large user who uses the water on his own land. *Id.* at 301, 217 N.W.2d at 350. Consequently, objection has been made to the assumption that a use is reasonable per se solely because it is made in connection with the overlying land. *Id.* In *Michels Pipeline*, the court overruled the English rule, rejected the reasonable use rule, and adopted the *Restatement* rule. *Id.* at 298, 301, 217 N.W.2d at 348, 350. See text & notes 113-23 *infra* for a discussion of the *Restatement* rule.

103. *See* Forbell v. City of New York, 164 N.Y. 522, 526, 58 N.E. 644, 646, 124 N.Y.S. 902, 904 (1900); 9 TEX. TECH. L. REV. 392, 395 (1978).

In Farmers Investment Co. v. Bettwy, 113 Ariz. 520, 558 P.2d 14 (1976), the court stated that a user will incur liability under the reasonable use rule for the use or sale of water off the land from which it is withdrawn: "Water may not be pumped from one parcel and transported to another just because both overlie the common source of supply if the plaintiff's *lands* or wells upon his lands thereby suffer injury or damage." *Id.* at 527, 558 P.2d at 21 (emphasis added). Thus, the court refused to permit the defendant to use its water on property other than that from which the water was withdrawn, even though the water would recharge the aquifer if used on any portion of the land overlying the aquifer.

104. 251 Md. 428, 248 A.2d 106 (1968).

105. *Id.* at 429-31, 248 A.2d at 108-09. Plaintiff alleged that the defendant violated his duty of support, but made no allegation of negligence or nuisance. *Id.*

The court stated that the defendant would not be liable for withdrawals causing subsidence if the water was applied for any reasonable purpose in connection with the defendant's land.[106] Because "the conducting of quarrying operations is normally a legitimate and reasonable use of land," liability was denied.[107] The court emphasized that the pumping of large quantities of water incident to mining and quarrying operations is not only accepted practice, but necessary to make the operations economically feasible.[108]

The *Finley* case reveals the inadequacy of the reasonable use rule as applied to subsidence cases. In the absence of "waste, malice or sale of percolating waters, or other unreasonable use," there can be no liability under that rule.[109] Specifically, the case condones extensive dewatering of the soil in order to extract minerals, resulting in the eventual collapse of neighboring lands.[110] Apparently, any defendant whose activities are "legitimate and reasonable" and who confines his use of water to the overlying land will be permitted to pump unlimited quantities of groundwater to the destruction of neighboring lands.[111] Liability for subsidence damage should not depend on the nature or the place of the defendant's use. The reasonable use rule is therefore a poor theory for imposing liability in subsidence cases.[112]

A third theory of groundwater law is the rule set forth in the *Restatement (Second) of Torts*.[113] To be subject to liability under the *Re-*

106. *Id.* at 439, 248 A.2d at 113.
107. *Id.*
108. *Id.* at 439-40, 248 A.2d at 114.
109. *Id.* at 442, 248 A.2d at 115.
110. *Id.* at 429-31, 248 A.2d at 108-09.
111. *See id.* at 439-42, 248 A.2d at 113-15; text & notes 100-03 *supra.*
112. One can only speculate as to the result in a reasonable use jurisdiction where the defendant's use is not reasonable or where he sells or uses the water off the land from which it is withdrawn.
113. RESTATEMENT (SECOND) OF TORTS § 858 (1979) provides:

§ 858—Liability for Use of Ground Water

(1) A proprietor of land or his grantee who withdraws ground water from the land and uses it for a beneficial purpose is not subject to liability for interference with the use of water by another, unless

(a) the withdrawal of ground water unreasonably causes harm to a proprietor of neighboring land through lowering the water table or reducing artesian pressure,
(b) the withdrawal of ground water exceeds the proprietor's reasonable share of the annual supply or total store of ground water, or
(c) the withdrawal of the ground water has a direct and substantial effect upon a watercourse or lake and unreasonably causes harm to a person entitled to the use of its water.

(2) The determination of liability under clauses (a), (b) and (c) of Subsection (1) is governed by the principles stated in §§ 850 to 857 [concerning riparian rights].

Under § 858(2), the determination of reasonableness is governed by § 850(A) which provides:

§ 850(A)—Reasonableness of the Use of Water

The determination of the reasonableness of a use of water depends upon a consideration of the interests of the riparian proprietor making the use, of any riparian proprietor harmed by it and of society as a whole. Factors that affect the determination include the following:

statement, the withdrawal of groundwater must cause unreasonable harm.[114] The standard of reasonableness, however, differs from that of the reasonable use rule. Under the *Restatement*, a use of water may be unreasonable regardless of whether it is made on the land from which it is taken or whether the nature of the use is "reasonable."[115] The determinative factor is not the place or nature of the use but the withdrawal of excessive quantities of groundwater causing substantial harm.[116] The *Restatement* limit on the right to pump groundwater is similar to nuisance law limits on the use of other property.[117] Thus, liability may be imposed on a landowner whose pumping unreasonably interferes with neighboring landowners' water rights.[118]

The *Restatement* rule imposes liability for harm caused by "lowering the water table or reducing artesian pressure."[119] Since subsidence can be caused by the lowering of the water table or artesian head,[120] it may be argued that subsidence constitutes unreasonable harm within the meaning of the rule.[121] The *Restatment*, however, refers only to "liability for interference with the use of water by another,"[122] and makes no reference to subsidence damage. Thus, its applicability may be limited to the adjustment of competing rights to groundwater.[123]

An argument can be made that all groundwater law theories should be limited to situations involving competing rights to water.[124] The essential purpose of water law is to allocate the available water supply among competing uses so as to maximize the benefit to society.[125] The vast majority of groundwater cases deal with disputes over

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(a) The purpose of the use,
(b) the suitability of the use to the watercourse or lake,
(c) the economic value of the use,
(d) the social value of the use,
(e) the extent and amount of the harm it causes,
(f) the practicality of avoiding the harm by adjusting the use or method of use of one proprietor or the other,
(g) the practicality of adjusting the quantity of water used by each proprietor,
(h) the protection of existing values of water uses, land, investments and enterprises, and
(i) the justice of requiring the user causing harm to bear the loss.

114. *Id.* § 858(1)(a); see note 113 *supra.*
115. State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 302, 217 N.W.2d 339, 350 (1974). *See* RESTATEMENT (SECOND) OF TORTS § 858, Comment c (1979); 9 TEX. TECH. L. REV. 392, 395 (1978).
116. RESTATEMENT (SECOND) OF TORTS § 858, Comment e (1979).
117. State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 296, 217 N.W.2d 339, 347 (1974).
118. *Id.* at 302-03, 217 N.W.2d at 350-51.
119. RESTATEMENT (SECOND) OF TORTS § 858(1)(a) (1979); see note 113 *supra.*
120. *See* note 5 *supra.*
121. 9 TEX. TECH. L. REV. 392, 400 (1978).
122. RESTATEMENT (SECOND) OF TORTS § 858(1); see note 113 *supra.*
123. *But see* 9 TEX. TECH. L. REV. 392, 400 (1978).
124. *See* 15 HOUS. L. REV. 454, 467-68 (1978).
125. J. CRIBBET, *supra* note 40, at 368-69; F. TRELEASE, *supra* note 5, at 5-6.

groundwater as a commodity.[126] By contrast, subsidence involves interference with the plaintiff's use and enjoyment of his land, apart from its relationship to the supply of groundwater.[127] The extension of groundwater law to cases where the defendant's pumping destroys the surface estate of his neighbor therefore seems strained.[128]

In *Friendswood*, despite the plaintiffs' protest, the Texas Supreme Court dealt with the subsidence problem in terms of water law.[129] The court did not attempt, however, to explain exactly how water law theories applied to subsidence. Rather, it focused on the doctrine of stare decisis: defendants had justifiably relied on the "established rule of property law" that permits the pumping of unlimited amounts of groundwater in the absence of waste or malice.[130] Dissatisfied with the English rule, however, the court held that "absolute" ownership of groundwater would no longer immunize pumpers whose negligence resulted in subsidence.[131] *Friendswood* is thus a strong indication that the courts will find a way to avoid the English rule and impose liability for subsidence damage.

In summary, the water law theories discussed above are an inadequate basis upon which to impose liability for subsidence damage. Liability for subsidence damage is conceptually inconsistent with the English rule, which confers on landowners a right to pump unlimited amounts of groundwater for nonmalicious, nonwasteful purposes. The *Friendswood* court avoided the harsh result of the English rule by limiting the landowner's immunity to nonnegligent withdrawals, but in so doing rendered the landowner's right less than absolute. Under the reasonable use rule, liability turns on the nature and place of the defendant's use. No liability arises under that rule so long as the defendant confines his use of water to the overlying land and his activities can be characterized as legitimate and reasonable. The language of the *Restatement* indicates that its application is limited to the adjustment of competing rights to groundwater. Furthermore, the use of water law to resolve subsidence disputes will leave the outcome of each case dependent upon the particular theory of water law to which the jurisdiction adheres.[132] Finally, water law is designed to allocate water among

126. Teutsch, *supra* note 32, at 297.

127. *See* 15 HOUS. L. REV. 454, 467-68 (1978); Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 31 (Tex. 1978) (Pope, J., dissenting); Smith-Southwest Indus., Inc. v. Friendswood Dev. Co., 546 S.W.2d 890, 893 (Tex. Civ. App. 1977), *rev'd*, 576 S.W.2d 21 (Tex. 1978).

128. *See* Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d at 31 (Tex. 1978) (Pope, J., dissenting); Teutsch, *supra* note 32, at 297.

129. 576 S.W.2d at 24.

130. *Id.* at 29.

131. *Id.* at 30. See text & notes 69-71 *supra*.

132. Steelhammer & Garland, *supra* note 86, at 201; 9 TEX. TECH. L. REV. 392, 396 (1978).

competing users, and should not be extended to cases where the defendant destroys the surface estate of his neighbor.

3. *Nuisance Law*

Private nuisance consists of tortious interference with the use and enjoyment of land.[133] Nuisance law protects a landowner's interest in the enjoyment of his property in an unimpaired condition.[134] There are three basic requirements for nuisance liability. The interference must be (1) substantial, (2) unreasonable, and (3) offensive or inconvenient to an ordinary person.[135] The element of reasonableness bears some similarity to the reasonable use rule in water law. Each landowner is privileged to make use of his own property despite some harm to his neighbors, so long as the harm is within reasonable bounds.[136] Only conduct that is unreasonable under the circumstances results in nuisance liability.[137] Reasonableness in nuisance law is determined by balancing the utility of defendant's conduct against the gravity of harm to the plaintiff.[138] If the injury to the plaintiff is great as compared to the lesser social value of the defendant's conduct, the activity is deemed a nuisance.[139] Thus, nuisance law appears to apply cost-benefit analysis, along with other factors, to resolve competing property interests.[140]

For example, in *Friendswood* the Texas Supreme Court denied liability under the English rule. 576 S.W.2d at 29. Liability might have been imposed, however, in a jurisdiction following the reasonable use rule since defendants sold the groundwater off the land. *See id.* at 22. Furthermore, assuming *arguendo* that the *Restatement* applies to subsidence, there can be no question that the *Friendswood* plaintiffs' damage constituted unreasonable harm. *See* 9 TEX. TECH. L. REV. 392, 400 (1978).

133. W. PROSSER, *supra* note 44, § 89, at 591. Liability may be grounded on negligence or strict liability, or it may be imposed for intentional conduct. *Id.* § 87, at 573-77.

134. *Id.* § 89, at 591.

135. *Id.* § 87, at 577, 580, § 89, at 593. *See generally* RESTATEMENT (SECOND) OF TORTS §§ 821-831 (1979).

136. W. PROSSER, *supra* note 44, § 87, at 581.

137. *Id.*

138. *Id.* § 89, at 596-602. *See, e.g.*, McCarty v. Natural Carbonic Gas Co., 189 N.Y. 40, 46, 81 N.E. 549, 550, (1907); Johnson v. Drysdale, 66 S.D. 436, 440, 285 N.W. 301, 304 (1939); Gulf, C. & S.F. Ry. Co. v. Oakes, 94 Tex. 155, 159, 58 S.W. 999, 1000 (1900). For factors involved in evaluating utility of conduct and gravity of harm, see RESTATEMENT (SECOND) OF TORTS §§ 826-831 (1979).

139. Storey v. Central Hide & Rendering Co., 148 Tex. 509, 514, 226 S.W.2d 615, 618-19 (1950). Note that such a balancing process is necessary only when considering nuisance in fact, defined as an activity lawful in itself which becomes a nuisance because of the manner or place in which it is conducted. *Id.* at 512, 226 S.W.2d at 617. *See* 9 TEX. TECH. L. REV. 392, 397. A nuisance per se is an activity that interferes with others' use and enjoyment under all circumstances, regardless of location or manner of operation. The mere fact that it interferes with others makes it enjoinable. *Id.*

140. *Cf.* RESTATEMENT (SECOND) OF TORTS § 826, Comment f (1979). Other factors to be considered in determining nuisance liability include: the extent, duration, and character of the harm; the social value of the use made of the land by both plaintiff and defendant; the suitability to the locality of the use made of the land by both plaintiff and defendant; whether plaintiff or defendant could easily avoid the harm; whether defendant would be forced to cease operations if it were required to compensate the plaintiff for the invasion; and the motive of the defendant. *See id.* §§ 827-828 (1979); W. PROSSER, *supra* note 44, § 89, at 596-602.

Only one court has held that a defendant may be liable for subsidence resulting to neighboring lands on nuisance grounds.[141] In *Friendswood*, the plaintiffs alleged, in addition to negligence, that defendant's pumping constituted a nuisance.[142] The Texas Court of Civil Appeals agreed, holding that plaintiffs had stated a cause of action in nuisance.[143] On appeal, the Texas Supreme Court summarily rejected the nuisance argument, but held that subsequent plaintiffs would have a cause of action for subsidence damage under a negligence theory.[144] Analysis of all the facts and circumstances might have revealed that Friendswood's activity was a nuisance since the extent of the harm was enormous, the plaintiffs could do little to avoid it, and the defendant presumably could have avoided the harm by procuring water from other sources.[145] Although the *Friendswood* court rejected nuisance as a possible cause of action for future subsidence, the theory may still be viable in other jurisdictions.[146]

4. *The Law of Subjacent Support*

Perhaps the most logical theory under which to attach liability for subsidence is the law of support. Under this theory a landowner has a right to the support of his soil in its natural state, both laterally from adjacent land and subjacently from the subsurface.[147] The duty to support the land of another is absolute and the law of support imposes

141. *See* Smith-Southwest Indus., Inc. v. Friendswood Dev. Co., 546 S.W.2d 890, 898 (Tex. Civ. App. 1977), *rev'd on other grounds*, 576 S.W.2d 21 (Tex. 1978).

142. 546 S.W.2d at 892. Plaintiffs contended that the gravamen of the injury lay in damage to land and that water rights were not involved at all. *Id.* at 893.

143. *Id.* at 898.

144. 576 S.W.2d at 28, 30. See text & notes 69-71 *supra*.

145. *See* RESTATEMENT (SECOND) OF TORTS §§ 827-831 (1979).

146. Under certain circumstances, subsidence resulting from groundwater pumping may give rise to a public nuisance, as where the subsidence is deemed to substantially and unreasonably interfere with the public interest. *See* State v. Michels Pipeline Constr., Inc., 63 Wis. 2d 278, 217 N.W.2d 339 (1974). In *Michels Pipeline*, the state of Wisconsin brought suit to enjoin as a public nuisance defendant's dewatering of the soil in order to construct a sewer. *Id.* at 281-82, 217 N.W.2d at 340. The complaint alleged that numerous citizens were damaged by subsidence-caused drying up of wells and cracking of foundations, walls, and driveways. *Id.* The court held that the complaint stated a cause of action in public nuisance, reversing a lower court order sustaining the defendant's demurrer. *Id.* at 288, 217 N.W.2d at 343. The court rejected the contention that all persons in the community must be injured in order to recover for public nuisance, and held that damage to a sufficiently "large number of persons" would suffice. *Id.* The allegations of the complaint met that requirement. *Id.*

Although the state alleged both damage to land (subsidence) and to water rights (drying up of wells), the court did not discuss the two separately. Therefore, it is unclear whether public nuisance will lie for subsidence damage alone.

A private person suing for public nuisance must demonstrate some particularized damage—damage different in kind from that suffered by the public generally. W. PROSSER, *supra* note 44, § 88, at 586-87. Since the plaintiff in *Michels Pipeline* was the state, the particularized damage requirement presented no obstacle. This requirement might raise a problem, however, in a suit by a private person.

147. J. CRIBBET, *supra* note 40, at 364. *See* Sloss-Sheffield Steel & Iron Co. v. Wilkes, 231 Ala. 511, 518, 165 So. 764, 770 (1936); Sanders v. State Highway Comm'n, 211 Kan. 776, 783, 508 P.2d 981, 987-88 (1973).

strict liability.[148] The principle of subjacent support would seem to apply to subsidence resulting from depletion of the underlying aquifer since water, like soil, can provide support for land.[149]

Friendswood[150] was viewed by the two justices dissenting therein as a support case. They agreed with the plaintiffs that the case did not involve water law, arguing that the issue at stake was the plaintiffs' "absolute right to keep the surface of their land at its natural horizon."[151] The dissenters analogized the right of subjacent support to the rule which protects one's subsurface from damage by a mining or drilling operation on adjoining lands.[152] Further authority for their position was found in the law of easements of support.[153] The majority summarily rejected these attempts to bring the case within the law of support.[154]

The doctrine of subjacent support has traditionally been restricted to the right to have soil in its natural state supported by the land beneath it.[155] Recovery for damage to land burdened with artificial structures, where the weight of the structures contributes to the subsidence,[156] is left to the law of negligence.[157] The rationale seems to be that requiring support of improved land would interfere with the

148. J. CRIBBET, *supra* note 40, at 364. To establish liability, the plaintiff need only prove that the defendant removed the support of the plaintiff's property proximately causing the damage complained of. No allegation of negligence is required. *E.g.*, Sanders v. State Highway Comm'n, 211 Kan. 776, 783, 508 P.2d 981, 988 (1973); Bjorvatn v. Pacific Mechanical Constr., Inc., 77 Wash. 2d 563, 567, 464 P.2d 432, 434 (1970); Muskatell v. City of Seattle, 10 Wash. 2d 221, 235-36, 116 P.2d 363, 370 (1941).

The law of support should not be confused with negligence. If one excavates his property in a negligent manner proximately causing damage to his neighbor's land, then he is liable under the law of negligence. J. CRIBBETT, *supra* note 40, at 364.

149. *See* Gamer v. Milton, 346 Mass. 617, 620, 195 N.E.2d 65, 67 (1963); Muskatell v. City of Seattle, 10 Wash. 2d 221, 235, 116 P.2d 363, 370 (1941).

150. See discussion in text & notes 49-71 *supra*.

151. 576 S.W.2d at 31 (Tex. 1978) (Pope, J., dissenting).

152. *Id.* at 32.

153. *Id.* at 33. Such easements involve contractual agreements for the removal of minerals from beneath the servient owner's surface estate. *Id.*

154. *Id.* at 27-28. The court gave two reasons for rejecting the law of support as a basis for liability. First, the court invoked the common law distinction between subsidence caused by withdrawal of solid minerals and that caused by withdrawal of water. *Id.* at 27. See text & notes 169-72 *infra*, for an evaluation of this dichotomy. Second, the court refused to follow the tentative draft of *Restatement* § 818 (subsequently adopted without modification by the American Law Institute) which removed any immunity for withdrawal of liquids. The court held that because the defendants had relied on the original *Restatement*, they were immune. *Id.* at 28. For a discussion of the *Restatement* rule, see text & notes 183-89 *infra*.

155. J. CRIBBET, *supra* note 40, at 365. *See* Jennemann v. Hertel, 264 S.W.2d 911, 914 (Mo. Ct. App. 1954).

156. Compton, *The Right to the Subjacent Support of Oil and Gas*, 49 CALIF. L. REV. 354, 362 (1961). *See* Sanders v. State Highway Comm'n, 211 Kan. 776, 783, 508 P.2d 981, 988 (1973); Muskatell v. City of Seattle, 10 Wash. 2d 221, 236, 116 P.2d 363, 370 (1941).

157. *See, e.g.*, Gilmore v. Driscoll, 122 Mass. 199, 207, 23 Am. Rep. 312, 319-20 (1877); Comanche Duke Oil Co. v. Texas Pac. Coal & Oil Co., 298 S.W. 554, 559-60 (Tex. 1927); Walker v. Strosnider, 67 W. Va. 39, 44, 67 S.E. 1087, 1090 (1910). *See generally* J. CRIBBET, *supra* note 40, at 365.

rights of neighboring landowners.[158] Accordingly, a landowner should not be permitted, by the improvement of his own land, to increase the duty of support or hinder the use or development of adjoining property.[159]

In situations where the land would have subsided as a result of defendant's activities regardless of the weight of the structures, two lines of authority have developed.[160] The majority rule imposes strict liability for damage to both land and artificial structures.[161] These courts reason that a landowner by improving his land does not thereby lose his right to support; damage to both land and structures is compensable as long as it cannot be ascribed to the weight of the landowner's buildings.[162] The minority rule limits the plaintiff to an action for negligence based on defendant's failure to use due care in the removal of support.[163] Colorado, apparently the last bastion of the minority rule, abandoned it in 1978 in favor of strict liability.[164]

Where subsidence is due to the pumping of groundwater, the weight of the artificial structures will be miniscule compared to the weight of the rock and soil overlying the aquifer.[165] Consequently, the groundwater pumper is unlikely to prevail by arguing that the erection of structures increased his duty of support,[166] or that the weight of the structures contributed to the subsidence.[167] The situation thus falls squarely within the majority rule imposing strict liability for damage to both land and structures whenever the subsidence is not attributable to the weight of the stuctures.[168]

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158. J. CRIBBET, *supra* note 40, at 365. Thus, if A built first, and B has an absolute duty to support both land and building, B might be limited in developing his own land. *Id.*

159. Northern Transp. Co. v. Chicago, 99 U.S. 635, 645 (1878); Covell v. Sioux City, 224 Iowa 1060, 1063, 227 N.W. 447, 449 (1938); Neyman v. Pincus, 82 Mont. 467, 485, 267 P. 805, 809-10 (1928); Bay v. Hein, 9 Wash. App. 774, 777, 515 P.2d 536, 538 (1973); Compton, *supra* note 156, at 362.

160. Compton, *supra* note 156, at 363.

161. *Id. E.g.*, Paris Purity Coal Co. v. Pendergrass, 193 Ark. 1031, 1035, 104 S.W.2d 455, 457 (1937); Sanders v. State Highway Comm'n, 211 Kan. 776, 783, 508 P.2d 981, 988 (1973); Muskatell v. City of Seattle, 10 Wash. 2d 221, 233, 116 P.2d 363, 369 (1941).

162. Prete v. Cray, 49 R.I. 209, 213, 141 A. 609, 612 (1928).

163. Colorado Fuel & Iron Corp. v. Salardino, 125 Colo. 516, 522-23, 245 P.2d 461, 464-65 (1952). *Salardino* was overruled in Gladin v. Von Engeln, 195 Colo. 88, 575 P.2d 418 (1978), where the court explained that the application of strict liability should not turn on whether the thing damaged is natural or articifial. Rather, "the distinction must hinge on whether an artificial condition created on plaintiff's land contributed to the injury, or whether the subsidence would have occurred even if the land had remained in its natural state." *Id.* at 92, 575 P.2d at 421. *See* Miller v. State, 199 Misc. 237, 98 N.Y.S.2d 643 (1950); Williams v. Southern Ry. Co., 55 Tenn. App. 81, 396 S.W.2d 98 (1965); Klemme, *The Enterprise Liability Theory of Torts*, 47 COLO. L. REV. 153 (1976).

164. Gladin v. Von Engeln, 195 Colo. 88, 92, 575 P.2d 418, 421 (1978).

165. *See* RESTATEMENT (SECOND) OF TORTS § 820, Comment d (1979); Compton, *supra* note 156, at 363.

166. Compton, *supra* note 156, at 363 n.53. *See* text & note 159 *supra.*

167. *See* RESTATEMENT (SECOND) OF TORTS § 820, Comment d (1979); text & notes 156-57 *supra.*

168. *See* cases cited note 161 *supra.*

At one time, considerable doubt existed as to whether the law of subjacent support applied to the removal of fluid, as well as solid support.[169] Two early cases denying liability for subsidence damage caused by drainage of groundwater suggested that the nature of fluid support somehow required a departure from the general rule of strict liability for removal of subjacent support.[170] Both cases were decided in jurisdictions applying the absolute ownership doctrine of groundwater,[171] and were thus undoubtedly influenced by the notion that there is no liability for withdrawal of groundwater in the absence of waste or malice.[172]

Initially, the *Restatement* adopted the position that there was no liability for subsidence resulting from withdrawal of fluid, as opposed to solid support.[173] The *Restatement* imposed strict liability on one who withdrew the subjacent support from the land of another resulting in subsidence,[174] but expressly exempted from liability subsidence

169. *See* A. CASNER, AMERICAN LAW OF PROPERTY, § 28.46, at 131-32 (1952); Compton, *supra* note 156, at 356, 358-60.

170. *See* New York Cont'l Jewell Filtration Co. v. Jones, 37 App. D.C. 511 (1911); Popplewell v. Hodkinson, L.R. 4 Ex. 248 (1869). The distinction between liability for removal of solid as opposed to fluid support stems from *Popplewell.* In that case the court denied liability when defendant drained water from his land resulting in subsidence and consequent damage to plaintiff's buildings. *Id.* at 251-52. The court emphasized that the plaintiff should have foreseen that the adjoining land would have to be drained to be put to its best use. *Id.* at 252. Underlying *Popplewell* is the rule that denies a landowner an absolute right to support of artificial structures: one cannot, through the improvement of his own land, increase his neighbor's duty of support or hinder his neighbor's development of his own land. *See* cases cited note 159 *supra*; Compton, *supra* note 156, at 359, 362.

The only other case that has ever suggested that the nature of fluid support requires a departure from subjacent support rules is New York Cont'l Jewell Filtration Co. v. Jones, 37 App. D.C. 511 (1911). As in *Popplewell*, the court denied recovery to a plaintiff whose home was damaged by subsidence caused by drainage of groundwater in the construction of a tunnel. *Id.* at 512, 518. The court cited *Popplewell* as controlling, but added that the *Popplewell* rule arose from the doctrine of absolute ownership of groundwater. *Id.* at 515. *New York Cont'l* has been criticized on three grounds. First, the court's reliance on *Popplewell* was misplaced because the element of foreseeability was lacking in *New York Cont'l.* Compton, *supra* note 156, at 359. Second, *Popplewell* did not even mention the absolute ownership doctrine. *Id.* Finally, *New York Cont'l* failed to take into account the "basic conflict between a landowner's right to take percolating water and his duty to provide subjacent support to the adjoining land." *Id.* Neither *Popplewell* nor *New York Cont'l* grappled with these competing policies, and thus neither has much value as precedent. *Id.*

171. See text & notes 86-93 *supra* for an explanation of the absolute ownership doctrine.

172. *See* New York Cont'l Jewell Filtration Co. v. Jones, 37 App. D.C. 511, 515 (1911); text & notes 86-87 *supra.*

173. RESTATEMENT OF TORTS § 818 (1939) provided: "To the extent that a person is not liable for withdrawing subterranean waters from the land of another, he is not liable for a subsidence of the other's land which is caused by the withdrawal." The original *Restatement* was based on the *Popplewell* and *New York Cont'l* decisions, discussed in note 170 *supra. See* Friendswood Dev. Co. v. Smith-Southwest Indus., Inc., 576 S.W.2d 21, 27 (Tex. 1978); RESTATEMENT (SECOND) OF TORTS § 818, Reporter's Note to the Institute at 1 (1979).

174. *See* RESTATEMENT OF TORTS § 820 (1939) which provided:

> Except as stated in § 818, a person who withdraws the naturally necessary subjacent support of land in another's possession . . . is liable for a subsidence of such land of the other as was naturally dependent upon the support withdrawn, in the absence of a superceding cause or other reason for relieving him.

Id.

caused by the withdrawal of groundwater.[175]

In *Finley v. Teeter Stone, Inc.*,[176] the Maryland Supreme Court relied on the original *Restatement* provision in rejecting the plaintiff's argument that subsidence caused by the defendant's quarrying operations should be actionable under the law of support.[177] Because groundwater is "normally flowing, shifting, or changing position in response to . . . virtually every change in conditions, both natural and man-made,"[178] the court agreed with the original *Restatement* position that strict liability should not apply to the removal of fluid support.[179]

Other courts have refused to draw any distinction between solid and fluid support.[180] These courts have imposed strict liability for subsidence damage caused by removal of water from beneath plaintiff's land.[181] This view appears to be in accord with scientific reality since land subsidence can result from withdrawal of fluid as well as solid support.[182]

Acknowledging the soundness of this position, the American Law Institute in 1969 abandoned the solid-fluid dichotomy.[183] The new *Restatement* continues to impose strict liability for subsidence damage to both land and artificial structures caused by withdrawal of solid subsurface support.[184] In addition, it extends strict liability to subsidence resulting from withdrawal of groundwater, oil, and "other substances."[185] The new rule applies regardless of whether the privilege to withdraw the substance arises from an agreement with the owner, as in

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175. *See* RESTATEMENT OF TORTS § 818 (1939); note 173 *supra*.

176. 251 Md. 428, 248 A.2d 106 (1968). See text & notes 104-12 *supra* for a discussion of the facts and the water law issue in *Finley*.

177. *Id.* at 443, 248 A.2d at 116.

178. *Id.*

179. *Id.*

180. *E.g.*, Cabot v. Kingman, 166 Mass. 403, 405, 44 N.E. 344, 345 (1896); Bjorvatn v. Pacific Mechanical Constr., Inc., 77 Wash. 2d 563, 568, 464 P.2d 432, 435 (1970); Muskatell v. City of Seattle, 10 Wash. 2d 221, 235-38, 116 P.2d 363, 370-71 (1941). Cases recognizing that water can be support for land in the context of suits for negligent removal of aqueous support include Gamer v. Milton, 346 Mass. 617, 620, 195 N.E.2d 65, 67 (1963) (rejecting *Popplewell*); New York Cent. Ry. Co. v. Marinucci Bros., 337 Mass. 469, 472, 149 N.E.2d 680, 682 (1958); Farnandis v. Great N. Ry. Co., 41 Wash. 486, 497-98, 84 P. 18, 21 (1906).

181. *See* cases cited note 180 *supra*.

182. Compton, *supra* note 156, at 360.

183. *Compare* RESTATEMENT OF TORTS § 818 (1939) *with* RESTATEMENT (SECOND) OF TORTS § 818 (1979).

184. RESTATEMENT (SECOND) OF TORTS § 820 (1979) provides:

> (1) One who withdraws the naturally necessary subjacent support of land in another's possession or the support that has been substituted for the naturally necessary support is subject to liability for a subsidence of the land of the other that was naturally dependent upon the support withdrawn.
>
> (2) One who is liable under the rule stated in Subsection (1) is also liable for harm to artificial additions that results from the subsidence.

See § 817, Comment n.

185. *Id.* § 818. Section 818 provides: "One who is privileged to withdraw subterranean water, oil, minerals or other substances from under the land of another is not for that reason privileged to cause a subsidence of the other's land by the withdrawal."

the case of a mineral lease, or whether the privilege is "independent of [the owner's] consent."[186] Thus, the privilege of withdrawal, whether conferred by the doctine of absolute ownership[187] or under a lease, is no defense to the strict liability imposed by the *Restatement*.[188] The rationale for this change is that the imposition of strict liability under the law of subjacent support should not depend on the physical state of the substance that serves as support.[189]

Following the lead of the *Restatement*, courts should invoke the law of subjacent support to hold groundwater pumpers strictly liable for subsidence. This ground of liability is especially necessary where a plaintiff cannot point to negligence on the part of the defendant. There is no reason to exempt fluid support from the general rule that a landowner is strictly liable for subsidence damage to land.[190] In addition, since overdraft-induced subsidence is not caused by the weight of artificial structures,[191] courts should not hesitate to extend strict liability to damage to structures as well as land.

STATUTORY AND ADMINISTRATIVE REGULATION OF SUBSIDENCE

Enactment of statutes and regulations imposing liability for subsidence may be an alternative to judicially adopted theories of liability. As might be expected, statutes have been passed in the places hardest hit by subsidence.

For example, in response to increasing subsidence caused by oil and gas withdrawal,[192] California enacted the Anti-Subsidence Act of

186. *Id.*, Reporter's Note to the Institute at 3. As an example of a privilege to withdraw arising independent of the surface owner's consent, the Reporter cites the case of one who has a vein of ore under his land and is permitted by domestic mining law to follow it under another's land. *Id.* Arguably, the absolute ownership doctrine also confers a privilege to withdraw water independent of any neighboring owner's consent.

187. *See* text & notes 86-93 *supra*.

188. RESTATEMENT (SECOND) OF TORTS § 818, Reporter's Note to the Institute at 3 (1979).

189. *Id.* at 2. In support of the change, the Reporter cited cases imposing strict liability for withdrawal of substances in varying physical states. *Id. See, e.g.*, Woodward Iron Co. v. Mumpower, 248 Ala. 502, 28 So. 2d 625 (1947) (solid minerals); Muskatell v. City of Seattle, 10 Wash. 2d 221, 116 P.2d 363 (1941) (water); Jordeson v. Sutton, S. & D. Gas Co., [1899] 2 Ch. 217 (quicksand); Trinidad Asphalt Co. v. Ambord, [1899] A.C. 594 (asphalt, a semi-fluid hydrocarbon).

Once subsidence damage becomes apparent, the statute of limitations may become important. In lateral support cases the statute of limitations begins to run against an action for loss of support when the damage appears, not when the excavation is made. West Pratt Coal Co. v. Dorman, 161 Ala. 389, 49 So. 849 (1909); Steelhammer & Garland, *supra* note 86, at 213. Such a rule is imperative since it may take years for the effects of subsidence to appear. J. CRIBBETT, *supra* note 40, at 366. In effect, harm to the surface is an element of the cause of action such that the statute runs from the date of subsidence. *Id.* at 367. *See* Western Coal & Mining Co. v. Randolph, 191 Ark. 1115, 1119, 89 S.W.2d 741, 743 (1936). Under the minority view, however, the cause of action arises when the support is withdrawn since the legal wrong is deemed to be the failure to maintain the natural state of the land. *See* Noonan v. Pardee, 200 Pa. 474, 483, 50 A. 255, 256 (1901).

190. *See* text & notes 180-89 *supra*. *See generally* Compton, *supra* note 156.

191. *See* text & note 165 *supra*.

192. *See generally* Compton, *supra* note 156.

1958.[193] The aim of the statute is to compel oil and gas producers to unitize[194] and undertake repressurization of the oil or gas aquifer.[195] Owners of oil and gas interests are given the option of voluntarily entering into cooperative repressurization agreements in a specified subsidence area.[196] If such agreements do not materialize, the Oil and Gas Supervisor is vested with the power to compel a joint effort by all owners of interests in particular oil and gas aquifers.[197] The statute also gives the Supervisor the power to bring suit to enjoin violations of his own orders as well as statutory violations.[198] If the Supervisor fails to bring suit, private persons who are or may be adversely affected may sue to enjoin the violation.[199] By forcing oil and gas producers, and ultimately consumers, to bear the cost of repressurization, the subsidence externality will theoretically be internalized.[200] The statute contains some loopholes, however, reflecting a legislative intent to retain the economic benefits of oil and gas production.[201]

Another example of subsidence regulation is found in the coal mining laws of England. There, administrative procedures have been employed to compensate property owners for subsidence damage.[202] The Coal Mining (Subsidence) Act of 1957 directs the National Coal Board to repair privately owned property that is damaged by subsidence due to coal mining operations.[203] The Board must repair the property as necessary to render it "reasonably fit for use for the purposes for which, at the date immediately before the damage occurred, it was or might in all the circumstances reasonably have been expected to be used."[204] Alternatively, the Board may award damages equal to the

193. *See* 1958 Cal. Stats. ch. 73, § 1, at 280-304 (current version codified at CAL. PUB. RES. CODE §§ 3315-3347 (West 1972 & Supp. 1980)).

194. Oil and gas producers "unitize" when they combine or cooperate in certain aspects of their activities so as to operate as a unit. Compton, *supra* note 156, at 355 n.6. As one commentator put it, "[s]uch unit operation is necessary where a single purpose—such as repressurization—takes precedence over the individual purpose of each operator to capture a maximum amount of the available oil and gas." *Id.*

195. *Id.* at 355.

196. CAL. PUB. RES. CODE §§ 3320, 3320.1 (West 1972).

197. *Id.* § 3320.2.

198. *Id.* § 3344(a).

199. *Id.* § 3344(b).

200. *See* text & notes 31-44 *supra.*

201. Compton, *supra* note 156, at 355. Compulsory unitization is conditioned on a finding by the Supervisor that the costs of repressurization (both capital and operating) will not exceed the estimated value of the increased oil and gas production resulting from repressurization. CAL. PUB. RES. CODE § 3320.2(2) (West 1972). This is nothing more than an application of cost-benefit analysis to the subsidence problem. *See generally* E. MISHAN, *supra* note 31. Furthermore, unitization cannot be compelled without the approval or ratification of interest owners entitled to 65% of the proceeds, as calculated prior to payment of royalties, of oil and gas production within the proposed unit area. CAL. PUB. RES. CODE § 3322.1 (West 1972).

202. Coal Mining (Subsidence) Act, 1957, 5 & 6 Eliz., c. 59. *See* Compton, *supra* note 156, at 367 n.68.

203. Coal Mining (Subsidence) Act, 1957, 5 & 6 Eliz., c. 59, § 1.

204. *Id.*

cost reasonably incurred by the landowner in repairing the land.[205] This statute recognizes that mineral production is essential to the economy and that consumers should bear the cost of subsidence.[206] The English law may lay the foundation for similar statutes governing subsidence in areas of the United States hard hit by the mining of groundwater.

The Texas Legislature has adopted as a policy goal the cessation of groundwater overdraft and resulting subsidence.[207] The Texas Water Code authorizes the formation of underground water conservation districts with broad powers over groundwater.[208] Each district is to provide for "conservation, preservation, protection, recharging, and prevention of waste of the underground water . . . and to control subsidence caused by withdrawal of water. . . ."[209] To control subsidence, the district may "provide for the spacing of water wells and may regulate the production of wells."[210] The statute specifically confirms private ownership of groundwater, thus reaffirming the common law doctrine of absolute ownership.[211]

The Texas Water Code provides a cause of action for violation of its provisions and preserves existing common law remedies.[212] Operating a well without a permit or at a higher rate of production than that approved is declared to be "illegal, wasteful per se and a nuisance."[213] Remedially, the statute authorizes suits for injunctive relief, as well as for damages suffered by reason of illegal operations.[214] While the Texas Water Code appears to be the most comprehensive attempt thus far to ameliorate subsidence, there are problems with the Code which may limit its application.[215] Furthermore, since the Code leaves the ultimate determination of liability to the courts, the legislature should clarify the circumstances under which liability will be imposed in order to ease the judicial burden.

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205. *Id.*
206. Compton, *supra* note 156, at 367.
207. *See* TEXAS WATER CODE ANN. tit. 4, §§ 52.001-.401 (Vernon 1972 & Supp. 1980).
208. *Id.* § 52.021 (Vernon 1972).
209. *Id.*
210. *Id.* § 52.117 (Vernon 1972).
211. *See id.* § 52.002 (Vernon 1972). See text & notes 86-93 *supra*.
212. TEXAS WATER CODE ANN. tit. 4, § 52.120(e) (Vernon 1972).
213. *Id.* § 52.120(a).
214. *Id.* § 52.120(b), (c). In a suit for damages, the operation of a well in violation of district rules is prima facie evidence of illegal withdrawal. *Id.*
215. 31 BAYLOR L. REV. 108, 119 (1979). A suit for injunction based on violation of district rules can be brought only by the owner of land adjacent to or within one-half mile of the violator's well. TEXAS WATER CODE ANN. tit. 4, § 52.120(b) (Vernon 1972). Even more severe is the limitation prohibiting the district from regulating wells producing less than 100,000 gallons per day. *Id.* § 52.118. Finally, the Code applies only when a district has been formed. *Id.* § 52.004. For further discussion of the Texas Water Code, see Tyler, *Underground Water Regulation in Texas*, 39 TEX. B.J. 532, 533-35 (1976); 31 BAYLOR L. REV. 108, 118-20 (1979).

The Arizona Legislature has recently acknowledged the subsidence problem in the 1980 Groundwater Code.[216] The Code designates four initial active management areas [AMA's][217] and provides procedures for designating future AMAs.[218] Additional AMAs may be established if it is determined that subsidence or fissuring is endangering property or aquifer storage capacity.[219] Moreover, the Code provides for periodic review of areas not initially designated as AMA's.[220] The new Code not only permits the imposition of active groundwater management in areas hard hit by subsidence but may also form the basis of administrative regulations for control of subsidence.

CONCLUSION

This Note has surveyed various legal theories courts could employ to compensate property owners injured by subsidence caused by groundwater pumping. Many courts have clouded the subsidence issue by applying water law to determine liability. The problem with any water law theory is that subsidence involves interference not with water rights, but with rights in land. Dissatisfied with the results of applying water law to subsidence, the Texas Supreme Court held, in the landmark *Friendswood* decision, that negligence would be a cause of action to redress future subsidence.

The best theory of liability for subsidence damage, however, is loss of subjacent support. The prevailing rule under the law of support is that the defendant is strictly liable for damage resulting from withdrawal of support. The former rule which denied recovery for damage to artificial structures in the absence of negligence has been restricted to cases in which the weight of the structure is proven to have caused the subsidence. The *Restatement* and several cases have finally recognized that there is no valid distinction between withdrawal of solid and fluid substances for purposes of imposing strict liability under subjacent support principles. Since subsidence may result from groundwater pumping even in the absence of negligence, strict liability is superior to a negligence theory. Unlike any water law theory, the law of support

216. ARIZ. REV. STAT. ANN. §§ 45-401 to 45-637 (Supp. 1980-81).
217. *Id.* § 45-411.
218. *Id.* § 45-412.
219. *Id.* § 45-412(A)(2). The statute provides that a new AMA can be designated if any of the following three conditions exist:
1. Active management practices are necessary to preserve the existing supply of groundwater for future needs.
2. Land subsidence or fissuring is endangering property or potential groundwater storage capacity.
3. Use of groundwater is resulting in actual or threatened water quality degradation.
Id. § 45-412(A).
220. *Id.* § 45-412(C).

recognizes that the injury is to rights in land rather than to water rights. Until legislatures respond to the problem, adherence to the law of subjacent support is the best approach to internalizing the costs of subsidence.