The History of Oil and Gas Conservation Legislation in Arkansas

I. The Common Law Background of Unregulated Production

a. The Rule of Capture

Oil and gas in its natural state, unlike hard minerals, is a fluid or vapor. It is fugacious and will migrate across boundary lines within the subsurface reservoir. It is susceptible to drainage from off-tract wells. The migratory character of oil and gas has proved to be its defining physical characteristic. It led to the venerable rule of capture[1] which permitted landowners the unrestricted right to drill and produce from wells located on-tract without incurring liability for off-tract drainage. An early oil and gas practitioner and commentator on the oil and gas conservation movement summed up the rule as "the owner of a tract of land acquires title to the oil and gas which he produces from wells drilled thereon, though it may proved that part of such oil or gas migrated from adjoining lands."[2] The remedy for the hapless landowner being drained by his adjoining neighbor's well was "Go and do thou likewise"[3], i.e., drill an offset protection well, the "evil twin" of the rule of capture.

The adoption of the rule of capture oil and gas was premised on the lack of scientific knowledge of the behavior of producing reservoirs that existed during the embryonic days of the industry.[4] It was known that oil and gas would migrate across surface boundary lines when produced but the technology did not exist to ascertain the source of the production within the reservoir. Consequently, early courts analogized to the common law of percolating waters (groundwater) and the law of obtaining possession to wild animals, both of which applied the rule of capture. Both of the analogies as a basis for applying the rule of capture to oil and gas production has proved to be ill-adapted. Subsequent proponents of state oil and gas conservation acts that attempted to eradicate the evils that attended unregulated production viewed the rule of capture as a product of ignorance .[5] Professor Maurice Merrill, an early oil and gas scholar, writing in the early 1960's, observed that state courts adopting the rule of capture did about as well as could be expected under the circumstances due to then state of knowledge.[6] Despite the evils associated with the rule of capture, it was not without its virtue. The modern justification for the rule is that it rewards those who exercise diligence and take the risk in drilling oil and gas wells.[7] The rule encourages development of oil and gas reserves.

b. Waste

The rule of capture is the cornerstone of unregulated production and has occasioned much mischief. Because oil and gas is produced from subsurface reservoirs which may, and frequently do, underlay numerous separately owned tracts, the rule of capture simply mandated the classic "common pool exploitation"[8] of the reservoir in which each tract owner, to ensure recovery of her "fair share" of the reservoir, was encouraged to drill as many wells and produce as much oil and gas from the "common pool," (common source of supply), as fast as possible. Enormous physical waste, including both surface and underground waste, as well as economic waste, were the consequences of the rule of capture.

Surface waste involves loss of oil at the surface resulting from spillage, overflows from earthen surface storage pits or open oil tanks and leaks from production and transportation equipment.[9] Land was also wasted as numerous wells meant excessive surface usage for drilling, producing operations, and transportation of the production. Economic waste was also rampant in that unnecessary investment was expended in the drilling and operation of needless wells. For example, in 1965 the East Texas field had an estimated 17,200 wells and one expert based on a study opined that it could have been efficiently and effectively drained by 1500 wells.[10]

The rule of capture also led to underground waste.[11] Underground waste occurs when oil and gas that could have been produced will be left behind because of wasteful and inefficient operation of the well. (The goal of oil and gas conservation is to achieve efficient recovery from the oil and gas reservoir. Underground waste defeats that goal.) Production that impairs the reservoirs natural energy mechanism that facilitates efficient recovery is one source of underground waste.[12] Oil and gas reservoirs are distinctly unique as to the reservoir pressure mechanism that effectuates production. Gas-cap drives, dissolved-gas drives, water-drives and any combinations of the three may characterize oil and gas reservoirs. In a gas-cap drive reservoir, the gas, which is lighter than oil, is on top of the oil zone. As the oil is produced, the gas expands to displace the oil and increases the reservoir pressure to drive the oil to the well bore and assists in the lift to the surface. In a dissolved -gas reservoir the gas is dissolved in the oil and as the oil is produced the dissolved gas in the oil expands

to increase the reservoir pressure and likewise facilitate production. In a water - drive reservoir, which are known for their potential for high rates of ultimate recovery from the reservoir, the oil is top of the water and as the oil is produced, the water expands and enhances the reservoir pressure and facilitates production.

Oil wells that produce high ratios of gas to oil in gas drive reservoirs or high ratios of water to oil in water drive reservoirs may unduly dissipate the reservoir pressure and their production should be limited if not restrained. A uniform rate of production is necessary to avoid wasted reservoir energy, and irregular and non-uniform migration of fluids that may by-pass large deposits of oil or gas that will be left behind in the reservoir and may result in premature abandonment of the field. The oil-water contact line or the gas-oil contact line needs to move uniformly through out the reservoir as the oil is produced to avoid "channeling" or "coning" that traps or by-passes oil or gas in the reservoir that may never be recovered.

Underground waste, like surface and economic waste, was rampant under unregulated production and the rule of capture.[13] Rapid and indiscriminate production from the legions of wells, most of which were unnecessary for efficient recovery, depleted the reservoir pressure and left behind much of the oil in the reservoir. Wide open flow of wells, the practice of the early operators whose vocabulary did not contain the word "choke", exacerbated the problem. Likewise, the practice of flaring gas was monstrously wasteful of oil and gas reserves. In the early days of the industry, there was no market for gas and it was viewed as a worthless by- product of production. More over, a general belief existed that if a well initially produced gas, the well had to be blown out, to deplete the gas in the reservoir by flaring the wells, before the well would produce oil.[14] Not only does flaring substantial quantities of gas from the reservoir, for whatever the reason, physically waste a valuable product, it also dissipates the reservoir pressure.

c. Physical Waste in Arkansas

The rule of capture was not benign in Arkansas. The history of oil and gas production in the State is replete with examples of excessive well density, undue surface waste and physical waste of oil and gas. W. Henry Rector, author of a tract on the history of Arkansas' early Oil and Gas Conservation laws,[15] summed

up the waste of oil and gas that occurred in the El Dorado and Smackover fields, discovered in 1921 and 1922, respectively:

> "The manner in which the El Dorado and Smackover fields were operated is a disgrace to the industry. Millions of barrels of oil were allowed to escape, polluting the waters of Smackover Creek and thereafter the Ouachita River. The conservation of gas produced with the oil was unheard of, billions of cubic feet being allowed to go to waste. The excuse was that the wells were oil wells; that the gas was merely incidental; that oil could not be lifted without liberating the gas, and that as the production of oil was the supreme object of the operators, they could not be concerned with the gas. Only a small portion of the gas produced was devoted to utilitarian purposes. Oil wells and gas wells producing richly gas would sometimes catch fire and be allowed to burn for weeks at a time. Great craters formed in portions of Smackover field and raging infernos consumed billions of feet of gas, creating conflagrations that could be seen for fifty miles."[16]

d. The Doctrine of Correlative Rights

The wasteful practices recounted by Rector in the early oil fields in Arkansas were not unique to the oil and gas industry. Underground waste was the highlight of unregulated production and the rule of capture. Excessive number of wells draining the reservoir, producing at a wide open flow, without regard to either the oil/gas ratios or oil/water ratios, along with wanton flaring of gas, characterized production in the early years of the 20th century. Tremendous physical waste, much of it underground waste, was experienced. The perils of underground waste were not early known. Unlike surface spills or evaporation of oil from surface pits, underground waste couldn't be observed. Bottom hole pressure tests that could lead to the obvious conclusion that declining production was related to declining pressure, only became prevalent in the late 1920's. Petroleum engineering, the science of reservoir performance, was in a nascent state of development. However, an awareness of reservoir characteristics and behavior and prudent management to avoid physical and economic waste was developing.

The doctrine of correlative rights developed parallel with the development of the theory and science of underground waste. Correlative rights has been described as "reciprocal rights and duties shared by all landowners in the common source of supply.[17] Correlative rights recognizes that the landowner's property interest is not merely in the oil and gas in that portion of the common source of supply that underlies his tract but extends to the right to "make use of the expulsive forces which constitute the reservoir energy."[18] The reservoir energy, like the oil and gas, constitute a common source of supply.[19] Stated another way, the oil and gas and the reservoir energy are a "package" that comprise the mineral owner's property interest in the oil and gas estate. Liability lies for breach of the doctrine of correlative rights for negligent or intentional spoilation of the common source of supply.[20]

The emergence and acceptance of the doctrine of correlative rights signifies that oil and gas conservation acts serve dual purposes: the prevention of waste and the protection of correlative rights. These two objectives, it has been observed, are "coequals, each worthy of pursuit in its own right, one for the sake of what may be called *economy*, the other for the sake of *equity*."[21] Others, however, opine that in the event of a conflict between the prevention of waste and property rights under conservation acts, the former prevails.[22]

e. The Early Conservation Practices

The depressed price for crude oil was the paramount problem of the industry during the era of unregulated production and the rule of capture. The race to drill as many wells and produce as much oil as possible yielded production in excess of the demand for oil and the transportation facilities in the field. Precipitous declines in the price of crude were experienced. The goal of the industry was state control of production so that the problem of surplus capacity could be eliminated. The rule of capture was the target for reform under the guise of conservation, including the prevention of economic and physical waste, but the primary objective was market stabilization. Though it was inevitable that the objective of conservation to limit the supply of crude in the market, and raised its price, would prove controversial, the effect of the relationship of "distressed crude oil" to physical waste was real:

"The inevitable result of the rule of capture's complete lack of legal restraint has been to force producers into one drilling race after another, in which each sought to drill as many wells as possible, as quickly as possible, in order to capture for himself the lion's share of the spoils. Nearly every discovery of an important oil field brought a mad rush of drilling that often produced more oil than the market could absorb. Whenever this occurred, the unhappy operator who could not find a buyer for his oil nevertheless continued to produce his wells rather than have his more fortunate neighbors drain oil from his lands. In field after field, with no other facilities available, this surplus oil was "stored" in pits dug out of raw earth, and even in open ditches; appalling quantities of oil were lost through evaporation and seepage, surface and underground waters were polluted, and serious fire hazards created, sometimes with disastrous results."[23]

(1) Prorationing

Prorationing is the obvious remedy for dealing with the problem of "distressed oil." In market demand prorationing, the state conservation agency restricts statewide production to the estimated market demand and then allocates the state total back to either fields or reservoirs and then to individual wells.[24] Thus, each producing well is assigned an "allowable." The intended effect is to accumulatively reduce the state's production to equal the market demand. The first proration statute was a market demand statute and was enacted in Oklahoma in 1915 after discovery of the huge Healdton and Cushing fields whose production glutted an already saturated market with oil far in excess of market demand.[25] The Act defined waste to include "production in excess of marketing or transportation facilities or reasonable market demand"[26] and authorized the Corporation Commission to prorate production from any common source of supply to avoid such waste.[27] Texas passed a similar market demand proration statute in 1919.[28]

Prorationing can also operate to limit the production from wells in the reservoir to a rate of production that avoids physical waste without out regard to the market for the production. Rapid and indiscriminate rates of production may dissipate reservoir pressure and cause underground waste of oil reserves. Parallel with the development of the theory of underground waste was the theory of the Maximum Efficient Rate of production (MER) that and "Maximum Ultimate

Recovery." The MER has been defined as the as the "highest sustainable rate at which a field can be produced for a designated period without appreciable loss in ultimate oil recovery."[29] The central tenet of MER prorationing is that there is a maximum efficient rate of production that will yield maximum ultimate recovery based upon the reservoir characteristics. There is probably not one rate of production that will yield maximum ultimate recovery but a *range* of production rates that attain efficient operation and maximum recovery.[30]

Market demand proration and MER prorationing can be administered jointly in a state's prorationing scheme. An allowable under market demand prorationing for a well could not be greater than the allowable for that well under the MER prorationing. To permit an allowable in excess of the MER allowable would permit an inefficient rate of production that may cause physical waste. If the market demand allowable is below the MER allowable, than the market demand allowable is operative. Despite its controversy, market demand prorationing continued until the early 1970's when the market changed and the demand for oil eclipsed the market supply of oil.

Market demand or MER prorationing may result in physical waste unless oil is purchased ratably from each well producing in the common source of supply. Ratable taking requires each purchaser to spread out the amount of its purchase from the reservoir equally between each producing well. Otherwise, some wells in the reservoir may produce, while others won't, resulting in an imbalance in production within the reservoir that may create an irregular oil-water or gas-oil contact line and trap or by-pass oil that may not be produced. Additionally, in the absence of ratable taking, the producing tracts may drain the non-producing tracts in violation of correlative.

(2) Well Spacing Acts

Well spacing acts were also central to the control of production and the abatement of the enormous economic and physical waste that followed the rule of capture. Such acts limit the number and location of wells that can be drilled in a reservoir to eliminate unnecessary wells. Relying on its general statutory authority to make rules and regulations to prevent waste oil oil and gas, the Texas Railroad Commission (TRC) promulgated Rule 37, the Texas well spacing regulation, was promulgated by the Texas Railroad Commission (TRC) in 1919. Rule 37 simply

prohibits the drilling of a well nearer than 300' to any other wells or nearer than 150' to any property line. This basically established a spacing pattern that prohibited drilling on a tract of less than two (2) acres. However, exception wells were permitted to prevent waste and protect correlative rights. Exception location wells may be permitted to prevent waste and protect correlative rights. Rule 37 was much amended as the spacing patterns were enlarged.

(3) Forced Integration (Compulsory Pooling)

Forced integration, known in most other oil and gas jurisdictions as "compulsory pooling," is complementary to the establishment and operation of spacing or drilling units under well-spacing Acts. Because the area encompassed by the drilling unit is limited to one (1) well for the common source of supply, some legal mechanism has to be available to merge or pool the separately owned tracts situated within the unit so that the legal effect will be as if they constitute one (1) tract for oil and gas development purposes. Voluntary pooling achieves that result. The oil and gas lessees (typically referred to as working interest owners) and any unleased mineral owners to the separately owned tracts may agree on a plan of development for the drilling and operation of the unit well and voluntarily pool their interests.[31] Voluntary pooling has the legal effect of integrating the separately owned tracts within the drilling unit so that they are treated as one tract for purposes of oil and gas development. Consequently, production from a well anywhere on the unit satisfies the habendum clause's secondary term requirement of production, regardless of the location of the well.[32] Likewise, voluntary pooling apportions royalty on a surface-acreage basis.[33]

(4) The 1930's: Distressed Oil and the Interstate Oil Compact

The discovery of the Oklahoma City field and the East Texas field in the early 1930's flooded an already depressed market with distressed crude. The price of crude oil fell to 10 cents a barrel. The price of Arkansas crude fell to 10 cents a barrel in 1933. In 1930-31, the state national guard was called out in both Texas and Oklahoma to close the Oklahoma City and East Texas fields to prevent further physical waste of oil and gas. The problem was so severe that oil and gas producing states began to consider an interstate compact that would authorize collective state action to deal with the problems of waste and excess market demand. Some impetus for the formation of an interstate compact to deal with oil

and gas conservation was to avoid legislation by congress that would impose federal regulation of oil and gas conservation.

The driving force for the creation of the Interstate Oil Compact (IOC) was to establish a compulsory system of state market demand proration to stabilize the price of oil. Ultimately, the creation of an IOC as a supra-governmental entity that could compel states to enact and enforce particular oil and gas conservation schemes failed. The IOC ,was approved by Congress in 1935, and operates solely in an education and advisory capacity that accumulates information on oil and gas conservation, assists member states in enacting sound oil and gas conservation laws and educates the public on the importance of the conservation of oil and gas resources. The Interstate Oil Compact Commission (IOCC), the governing body of the IOC, was most successful in disseminating the theory of physical and economic waste resulting from un regulated production and encouraging the prorationing and well-spacing. The arrival of the IOCC on the scene with its educational mission for oil and gas conservation signifies that knowledge of the science of oil and gas reservoirs and prudent reservoir management to avoid underground waste was prevalent.

Consequently, the 1930's were the era of the important oil and gas conservation acts. Oklahoma adopted a comprehensive conservation act in 1933, Louisiana and New Mexico adopted conservation acts 1935. Additionally, the period ushered in a system of market demand proration that lasted until the early 1970's when domestic supply changed from supply in excess of demand to demand in excess of supply. At that time, market demand proration dropped out of the system and MER prorationing reigned supreme.

II. The Early Arkansas Conservation Legislation

a. Act 166 of 1917

Arkansas attempts to conserve oil and gas by legislation began early and dealt with distinct problems of waste. The first legislative act was Act 166, Session Acts of 1917,[34] that dealt with shallow gas production in the early gas fields in Sebastian County. The Act required, *inter alia*, the confinement of water formations in the drilling of the wells to avoid flooding the productive reservoir,[35] mandated plugging of abandoned wells,[36] prohibited the long term flaring of gas[37],

and limited the production of gas to not in excess of 20% [38] of the open hole capacity of the well.[39] The latter requirement was likely to prevent loss of "back pressure" to prevent water encroachment on the producing formation from underlying formations of water. The Act was to be enforced by an Inspector of Gas[40], appointed by the Governor, and assessment of fines for violations.[41]

b. Act 118 or 1923

A statute that expanded the prohibition on waste was enacted by the legislature in 1923[42], one year after the discovery of the Smackover field. Although entitled an "Act to conserve crude oil or petroleum and natural gas," the overwhelming emphasis on the prevention of waste was on gas production.[43] The waste that is prohibited is primarily surface waste, loss of oil and gas at the surface, such as wanton flaring of gas and surface spills. All pipeline companies, gas distributors, oil and gas drilling and producing operators were mandated to prevent all waste of oil and gas in drilling, producing, storing, transporting and distributing operations.[44] Waste is defined broadly, however, encompassing "underground waste."[45] The Act did not contain a market demand proration scheme that authorized the agency to restrict the production of oil or gas in the reservoir and prorate the allowable among the producers. However, as to gas production, the Act provided that when production from the common source of supply exceeded the market demand, a producer could only take his proportionate share of the natural flow from the reservoir that could be marketed without waste.[46] The Act also imposed a "a common purchaser and ratable take" scheme for gas production.[47] Conspicuously absent from the Act was any regulation on oil production when the supply was in excess of the market demand or any common purchaser and ratable taking regulations.

The 1923 Act is problematic. The Smackover Field appears to be composed of associated oil and gas reservoirs. Gas was a waste product in 1923, without a market, and wanton flaring of the gas was the rule of the day. In addition to the gas being wasted, dissipation of the reservoir pressure by flaring the gas was wasting the oil. If you enforce the Act by prohibiting the wasteful flaring of gas, underground waste of oil will be prevented. Was that the gambit of the legislature? The answer to that pithy question is irrelevant. The Act was never enforced. The explanation offered for the lack of enforcement is that the State legislature levied a severance tax of 2 ½ of market value on oil and gas a month

before the enactment of the Conservation measure.[48] Enforcing the Act to prevent the waste of gas would have greatly reduced the flush oil production, decreasing the oil severance revenues that were filling the coffers of the state's treasury, as well as the operators.[49]

The 1923 Act also contains no express regulations to limit the density of drilling to prevent the physical and economic waste associated with the legions of unnecessary wells drilled under the rule of capture. However, the Act did vest the Arkansas Railroad Commission[50] with the authority to administer the Act and promulgate all necessary rules and regulations to conserve oil or gas including the imposition of further control over the production of oil or gas.[51] Arguably, the Arkansas Railroad Commission had the authority to implement well-spacing regulations by rule making.

c. Act 234 of 1933

The state legislature primarily re-enacted the substantive provisions of the 1923 Conservation Act as Act 234 of 1933.[52] The Arkansas Board of Conservation was created to administer the Act. The five (5) member Board were to be "experienced in and having a fair knowledge of the oil and gas industry."[53] The waste of oil and gas as defined and proscribed in the 1933 Act were identical to the provisions of the 1923 Act.[54] The common purchaser and ratable take and market demand proration provisions for gas were also identical. The Board of Conservation was authorized to promulgate rules and regulations. Ominously, however, the Board's authority to impose further administrative control over oil and gas production by rule making was excluded by the 1933 Act.
The Rodessa Field

(1) The Rodessa Field

1937 was a lamentable year for Act 234 and the Board of Conservation. The Rodessa Field, discovered in 1935, spanned from Jefferson, Texas to Caddo Parish in Louisiana, was extended into south Miller County, Arkansas by a discovery well in June of 1937. The Rodessa Field was the most important oil and gas discovery in Arkansas since 1925. The discovery well indicated that the reservoir had a large gas cap and to attain optimum recovery from the reservoir production of gas should be minimized.[55] Both Louisiana and Texas regulated the

production in their respective share of the tri-state field by well-spacing and prorationing regulations. The Board of Conservation was largely dormant in Arkansas at the time of the Rodessa Field discovery because of the lack of funding.[56] The Board only had two employees, a field man and a stenographer. [57] There was no geologist or petroleum engineer employed by the Board. The agency was not adequately staffed or funded to deal with the challenge of the Rodessa Field. Moreover, Act 234 was inadequate to address the issues of waste and the protection of correlative rights.[58] Nevertheless, with 10 wells having been completed in the field, the Board issued an Order that dictated a scheme of prorationing for the Arkansas field consistent with the Texas and Louisiana regulations.[59] A hue and cry against the Order was raised by furious landowners, operators and royalty owners and the local press. Mass meetings of protests were held and the governor was implored to intervene and seek the lifting of the Order by the Board.[60] Three days before the Order was to be effective, it was enjoined by a Miller County court in an action brought by a local operator. One argument advanced by the operator before the local court was that market demand prorationing had nothing to do with physical waste and everything to do with price fixing.[61]

The state court injunction allowed continuation of the unrestrained production that lasted for approximately one year. During that period the Rodessa Field in Arkansas lost 75% of its reservoir pressure while Louisiana[62] and Texas lost 18% and 14% of their respective reservoir pressure.[63] The loss of pressure was a result of excessive and non-ratable flow rates[64] from the wells and the dense well-spacing.[65] It is estimated in 1938 that the Arkansas portion of the field produced $7 million in oil but that the underground waste caused by the unregulated production resulted in $25 million in non- recoverable reserves being left behind.[66] Approximately 1300 acres of the estimated 3500 acre field had been developed by 98 wells at the end of the year of unregulated production.[67] The dissipation of the reservoir pressure by the closely spaced wells and open flow production made it uneconomical to developed the remainder of the acreage.[68]

(2) The Schuler Field

The contrast between the physical waste in the Arkansas section of the tri-state field resulting from unregulated production and the exemplary performance from the regulation production in Louisiana and Texas made a compelling case for

regulated production. The lesson was not lost on the interested parties in the Schuler Field that was discovered in July of 1937.[69] Royalty owners, operators and landowners from the Schuler Field area petitioned the Board of Conservation for a hearing on the problems of uncontrolled production. Because the Board was without jurisdiction to enforce well-spacing and its authority to Order prorationing questionable due to the Miller County injunction, and it was without funds or petroleum engineers, the Schuler Field group agreed to provide funds to hire the necessary personnel so that regulations for the field could be promulgated and implemented by the Board. The group voluntarily agreed to abide by the Board's rules and regulations. The arrangement was to last until the Board of Conservation asked to resume state regulation. The Board agreed to the arrangement and the funds were advanced, engineers hired, and the Board held a hearing and issued well-spacing and prorationing regulations for the Schuler Field. The arrangement proved to be successful and the Schuler field avoided the tragedy that plagued the Arkansas Rodessa Field.

The voluntary scheme of controlled production, with the Board of Conservation as the administrator for the Schuler Field, was a stopgap measure designed to avoid irreparable physical waste and violation of correlative rights in the Schuler Field to give the state time to enact an adequate and comprehensive Conservation Act. During the interval a committee of legislators, oil and gas operators and members of the Board of Conservation drafted a proposed Act to submit to the legislature as a replacement to Act 234.[70] O.C. Bailey, the Chairman of the Board of Conservation, and the first Chairman of the AOGC, reported the drafting committee adopted the 'best features' of the conservation laws of other states.[71] Chairman Bailey attended the initial meetings of the IOGC and was likley knowledgeable of the "model acts" the IOGC had been drafting since the early 1930's. Bailey opined that the drafting committee's Act, destined to be enacted as Act 105 of 1939, was the "most modern and comprehensive statute adopted by any up to that time."[72]

Bailey's view was not universally accepted. It has been recorded that the interim between the implementation of the voluntary conservation scheme in the Schuler field and the passage of Act 105, was a period of "vilification, misunderstanding, scurrilous newspaper editorials, and vitrolic public expression of opinion" particularly on prorationing.[73] The adoption of well-spacing, forced

integration, and proration of production that ended unregulated production of oil and gas under the rule of capture did not happen without a struggle.

III. The Arkansas Oil and Gas Conservation Act of 1939 (Act 105 of 1939)

The 1923 Conservation Act was doomed as an effective oil and gas conservation Act. The lack of comprehensive coverage, particularly the absence of an oil pro-rationing statute, a common purchaser or ratable take statue, and a well spacing act to limit the density of drilling, left the industry as it began, unregulated and vulnerable to waste and instability. The Arkansas Oil and Gas Conservation Act (ACT) was enacted in 1939 to correct the deficiencies of the prior Act and to provide a comprehensive regulatory scheme to prevent waste and protect correlative rights.[74] The Act is representative of the numerous state oil and gas conservation statutes enacted in the 1930s to remedy the evils associated with common pool exploitation by modifying the rule of capture and regulating the drilling of production of oil and gas.

The Act expressly provides that all common sources of supply for oil and gas discovered after January 1, 1937 shall be controlled and regulated by Act 105.[75] Although the Act was enacted on February 20, 1939, the legislature specifically make the statute retroactive to January 1, 1937. The obvious reason for the legislature's making the Act effective as to common sources of supply discovered after 1937 is that the Board of Conservation had regulated or attempted to regulate the Rodessa and Schuler fields that had been discovered before that date. Surely, a majority of the interests in the Schuler field, some of whom had participated in the drafting of the Act, wanted the protection of Act 105. In early days of the Act, the number of wells in the uncontrolled fields exceeded the number of wells in the controlled fields.[76] Uncontrolled production still exists in Arkansas.

a. The Arkansas Oil and Gas Commission

The Act established the AOGC to administer the production and conservation sections of the Act.[77] The AOGC is authorized to promulgate rules and regulations to ensure the proper administration and enforcement of the Act.[78] The Act, as well as the AOGC's rules and regulations, is enforced by

a fine of no more than $2,500 for violation as well as each day of violation.[79] Production in violation of the Act known as illegal oil, gas or product is sanctioned[80] and subsequent dealing, such as selling, purchasing, or refining of illegal oil, gas or product is prohibited.[81] The administration and enforcement of the Act, including all AOGC's activities, is funded exclusively by a tax on production of liquid hydrocarbons.[82]

b. Prevention of Waste and Protection of Correlative Rights

The purpose of the Act is to prevent waste and protect correlative rights.[82] The common occurrences of physical waste of oil and gas associated with the rule of capture are proscribed by the Act.[83] The following are expressly prohibited: (1) "inefficient, excessive, or improper use" of reservoir energy, and the locating, spacing, drilling, equipping, operating or producing of any oil or gas well or wells in a manner which results in less than ultimate recovery; [84] (2) "inefficient storing of oil and the locating, spacing, drilling, equipping, operating, or producing of any oil or gas well" that reduces surface loss or destruction of oil or gas usage; [85](3) abuse of correlative rights due to nonuniform, disproportionate, and unratable withdrawals causing undue between tracts; (4)"producing oil or gas in such [a] manner [causing] unnecessary water channeling or coning;"[86] (5) operating wells with inefficient oil-gas ratios;[87] (5) "drowning with water...any stratum capable of producing oil or gas;[88] (6) permitting "the escape into the open air of gas in excess of the amount that is necessary for the efficient drilling or operation of a well producing both oil and gas;"[89] and permitting gas to escape from a well producing gas.[90] Any act or practice that results in underground waste is proscribed even if not specifically defined by the Act.[91]

c. Proration and Ratable Take

Prorationing for oil, as well as gas, or both, was authorized in Act 105.[92] The AOGC was authorized to restrict the production of oil or gas in the reservoir and prorate the allowable among the producers.[93] Unlike the predecessor act of 1933 that limited the amount of gas production from gas wells when the supply of gas exceeded market demand, MER prorationing was authorized by the Act. The legislature bailed out on market demand prorationing. The language of the Act simply authorizes the Commission to prorate production of oil or gas, or both, from any field or pool to prevent waste.[94] Omitted from the statute is the language usably contained in market demand proration acts that expands the

definition of waste to include production "in excess of transportation or market facilities or reasonable market demand."[95] Assumably, the critics of market demand prorationing from the Rodessa and Schuler field battles killed a market demand proration scheme in Act 105.

However, well allowables were not exclusively assigned solely on the principles of efficient rate of production and ultimate maximum recovery of MER. The obstacle was the production from the uncontrolled fields. The Act required the AOGC to determine the aggregate amount of the statewide production from the controlled reservoirs by MER prorationing.[96] The Act did not specify how the aggregate amount of production from the uncontrolled fields was to be determined but it was to be calculated. Once the statewide total of oil or gas production was established, that amount was to be allocated between the controlled and uncontrolled reservoirs on a "reasonable basis."[97] "Small wells" in the uncontrolled fields were to be given a "sufficient allowable", i.e., a "living allowable," that would not accelerate or encourage their premature abandonment.[98]

The question is fairly presented as to whether the AOGC used market demand prorationing to determine the aggregate statewide production from both the controlled and uncontrolled fields. As to the controlled production, they would only limit a well's allowable if the market demand allocation was below its MER allocation. Although Arkansas is not usually listed as one of the market demand proration states,[99] there is some hint that the AOGC might have engaged in the practice. The suspicions surrounds Order No. 38-39[100] issued by the AOGC on August 16, 1939, that suspended the pending schedule of production allowables and "shut down" all producing wells in the controlled fields. The Emergency Order was ostensibly to determine if physical waste was occurring in the fields and if some well were incapable of making their well allowables. The Order did recite that the AOGC had been previously petitioned to refrain from reducing allowables to retard the decline in reservoir pressure because the industry was in a period of "high oil consumption." Moreover, at a susbsequent hearing to be held on the emergency Order within 10 days, the AOGC was to hear evidence on the "bona fide ratable outlet" for oil and gas in the various controlled fields for the forthcoming months. The validity of the emergency Order was ultimately appealed to the Arkansas Supreme Court in Lion Oil Refining Co. v. Bailey[101] that held that authority of the Commission to issue emergency orders without first having a hearing did not violate due process clauses of the State or

Federal Constitutions. Although the case never mentioned market demand prorationing or the AOGC's general authority to prevent waste, it has been cited for the proposition that the conservation agency has the implied right to engage in market demand prorationing pursuant to its general statutory authority to prevent waste.[102]

The traditional common purchaser or ratable take statutes that complement prorationing statutes and are found in many conservation acts to ensure that non-uniform rates of production by wells in the common source of supply to prevent waste and protect correlative rights is absent from Act 105. Instead, the Act 105 defines waste to include the "abuse of correlative rights of each owner of oil and gas in a common reservoir due to nonuniform, disproportionate, and unratable withdrawals causing undue drainage between tracts of land."[103] Consequently, the AOGC can make rules and regulations to prevent the waste or violation of correlative rights by non-uniform withdrawals but it is not authorized to compel purchasers to take and purchase ratably from all wells in the common source of supply. The AOGC's authority to compel the purchaser to take ratably is doubtful.[104]

d. Well Spacing and Limiting the Density of Drilling: The Drilling Unit

The most significant and far-reaching addition to the conservation of oil and gas made by the new Act is its well-spacing scheme. To avoid the excess density of drilling, with its unnecessary and uneconomical wells,[105] as well as the underground waste associated with the excessive rates of production occasioned by too many wells, the Act established "drilling units" that permitted one well in the common source of supply for each drilling unit.[106] Drilling units were to be established by determining the maximum area that one well would efficiently and economically drain based on the geologic and and engineering characteristics of the reservoir. The area that one (1) well will "efficiently and economically" drain has often been misunderstood. The standard of" economic drainage" was intended to permit adoption of wider spacing regulations, creating larger units, for deeper, more costly wells to ensure development of the reservoir. A field requiring deep expensive wells may not be economically feasible to develop on a tight spacing pattern that employs smaller drilling units that permits more wells to be drilled in the field. The accumulated cost of drilling numerous expensive

wells on smaller drilling units may ward off the investment required to develop the field.

The early drilling units established by the AOGC were configured to correspond to the rectangular system of legal descriptions. Drilling units were fashioned as squares and rectangles that corresponded to the rectangular system of legal descriptions of land that applies exclusively in Arkansas. Thus, a 640-acre spacing involves drilling units composed of governmental sections, 160-acre spacing involves drilling units composed of quarter sections, 80-acre spacing involves drilling units based on half-quarter sections, 40-acre spacing involves drilling units composed of quarter-quarter sections, and 10-acre spacing involves quarter-quarter-quarter sections.[107] The Act required the well to be located at the center of the drilling unit unless geologic disadvantage or topographical conditions, including surface improvements, prevented drilling at that location.[108] Later, the AOGC permitted drilling anywhere within the unit not prohibited by an external set back location restriction.[109] In the event that surface topographical features prohibited drilling at a prescribed location, an exception location that permitted an off-pattern well could be authorized with a penalty in the form of a lower well allowable to avoid any drainage attributed to the off-pattern well.[110]

The well-spacing scheme of the 1939 Act also protects the correlative rights of the mineral owners who produce form the drilling units that overlay the reservoir. The Act specifically incorporates the "fair share" principle.[111] The Act specifically recognizes that a producer is entitled, subject to reasonable requirements for prevention of waste, to his "just and equitable share" in the reservoir.[112] The producer's just and equitable share of the reservoir is the amount of production "which is substantially in the proportion that the quantity of recoverable oil and gas in the developed area of the producers tract in the pool bears to the recoverable oil and gas in the total developed area of the pool, in so far as that amount can be practically ascertained."[113] The correlative rights of the producer in the drilling unit is further protected because the AOGC cannot require the producer to drill unnecessary wells to recover his just and equitable share.[114] More importantly, the AOGC must protect his tract from net uncompensated drainage unless offset protection wells, in addition to the drilling unit well, have been drilled on the unit to protect against drainage.[115]

e. Forced Integration

Forced integration, known in most other oil and gas jurisdictions as "compulsory pooling," is complementary to the establishment and operation of drilling units under well-spacing Acts. Because the area encompassed by the drilling unit is limited to one (1) well for the common source of supply, some legal mechanism has to be available to merge or pool the separately owned tracts situated within the unit so that the legal effect will be as if they constitute one (1) tract for oil and gas development purposes. Voluntary pooling achieves that result. The oil and gas lessees (typically referred to as working interest owners) and any unleased mineral owners to the separately owned tracts may agree on a plan of development for the drilling and operation of the unit well and voluntarily pool their interests.[116] Voluntary pooling has the legal effect of integrating the separately owned tracts within the drilling unit so that they are treated as one tract for purposes of oil and gas development. Consequently, production from a well anywhere on the unit satisfies the habendum clause's secondary term requirement of production, regardless of the location of the well.[117] Likewise, voluntary pooling apportions royalty on a surface-acreage basis.[118]

Forced integration is necessitated to permit development of a drilling unit when the working interest owners and unleased mineral owners fail to agree to a plan of development and voluntary pooling. Courts refused to judicially effectuate pooling, known as "equitable pooling," to permit the developing party in the unit to drill a unit well when non-consenting working interest owners refused to voluntarily pool. Thus, development of the drilling unit could be thwarted by non-consenting unit interests.

Compulsion by the state to achieve pooling when the parties failed to voluntarily pool was a controversial matter in 1939. The state's meddling with property rights to the extent that it could compel a mineral owner to participate in a drilling venture, committing its share of the minerals in the reservoir to the project and imposing recovery of the prorata share of costs, in the absence of consent, was viewed with much skepticism. The state of Texas, always the largest oil and gas producer in the lower 48, didn't enact a compulsory pooling statute until 1965. Kansas doesn't yet have such a statute. On the other hand, the lack of ability of working interest owners to force integrate gave non-consenting parties undue leverage to exact unfair terms in the negotiation of the voluntary

pooling agreement. Moreover, in the absence of forced integration, the refusal to voluntarily pool by intransigent non-consenting working interest owner or unleased mineral owners could bar development of society's valuable natural resources.

Arkansas was progressive in adopting forced integration in the 1939 Act. Reciting the policy of preventing waste and avoiding the drilling of unnecessary wells, the Act provided that when working interest owners or unleased mineral owners in two or more separately owned tracts located within a drilling unit fail to voluntarily pool, the AOGC shall integrate their interest so that the drilling unit can be developed.[119] The terms of the mandated integration must be just and reasonable, provide each integrated party the opportunity to recover their fair share of the reservoir without unnecessary expense and avoid net uncompensated drainage.[120]

Despite the spirit of enlightenment that included forced integration in the 1939 Act, the system of forced integration implemented by the statute was flawed. The party who integrated the non-consenting interest to drill the unit well recovered the integrated party's share of the development costs (drilling, completing and operating costs) from the integrated party's share of the unit production. With the exception of permitting the developing mineral owner to recover a reasonable charge for supervision from the integrated party, the scheme is identical to the accounting applied to the developing and non-consenting co-tenants under the Statute of Anne. The integrating party fronts the integrated party's share of the development costs and only recovers those costs from the latter's share of production. The integrated party is a "carried interest" who gets a free ride down the well bore in event the well is a dry hole or a producing well that never pays out. The risk of loss on the integrated party's share of the well costs is solely on the integrating party. The integrated party is not compensated for assuming the risk of loss.

It is unsound to apply the Statute of Anne standard of accounting applicable to developing and non-consenting co-tenants to force integration under the Conservation Act. Placing the risk of loss for development on the integrating party provided little incentive for the non-consenting working interest owner or unleased mineral owner to voluntarily pool pursuant to plan of development that required paying their proportionate share of the costs of development and participating in the risk. Going forced integration, avoiding the dry hole or

unprofitable well loss of investment, with costs recovered from production, wasn't too bad a deal.

The Arkansas legislature by amendment made major changes to forced integration in 1963.[121] Overall, the amendment provided integrated parties with a choice of elections. A risk factor penalty was imposed on carried interests to compensate those who were taking their share of the risk. Unleased mineral owners who elected the carried interest status were accorded a statutory 1/8 royalty in addition to their proportionate share of production after pay out.

Force Integration in Arkansas today, reflecting the 1963 Amendment, can be simply described. If the parties do not agree to pool voluntarily, the AOGC, upon the application of any mineral owner or oil and gas lessee, is required to force integrate all tracts and interests for unit development.[122] The integration order authorizes the drilling, completion, equipping and operation of the well on the unit[123] and designates the operator of the well.[124] The unleased mineral owner has choices in the integration order.[125] She may elect to participate in the well, paying her proportionate share of the costs and taking her proportionate share of revenues attributable to her proportionate share of the production.[126] Having paid her well costs up front, she takes her share of the risk by participating in the well. Another option is for the unleased mineral owner to go "non-consent" and be "carried" by the participating owners who pay her share of the costs that are subsequently, if ever, recovered from her proportionate share of the revenues attributable to her proportionate share of the production.[127] Because the participating owners are taking the risks of her share of the costs, the AOGC will assess a "risk factor" penalty against the carried interest based on the geologic risk.[128] The risk factor penalty is usually 400% her proportionate share of the production times four (4) unless the prospect involves extraordinary risk, which will enhance the risk factor penalty.[129] Additionally, the Act generously accords the non-consenting unleased mineral owner a 1/8 royalty share pending payout.[130] Finally, the unleased mineral owner can elect to be "leased" in which she receives a competitive royalty, but not less than a 1/8th share, plus a bonus based on a "reasonable consideration" to be determined by the AOGC.[131] If the unleased mineral owner fails to make an election, she will be deemed to be leased.[132]

The working interest owner - the lessee who holds an oil and gas lease from a mineral owner in the unit - may participate in the drilling of the well by

paying its share of the costs or by electing to go nonconsent.[133] If the working interest owner fails to specify its election, it is deemed to have elected to go non-consent.[134]

Once the AOGC promulgates an integration order for a drilling unit, all operations on any part of the unit, including drilling or operation of a well, are deemed to be as if the operations were conducted on each separately owned tract and interest in the drilling unit.[135] Likewise, production from any part of the drilling unit shall be deemed to be production from every tract or interest located in the unit.[136] In effect, the Act dictates that the integration order has the same effect on oil and gas lease terms, including the secondary term requirement of production in the habendum clause, as to the voluntary pooling of the lease interests.[137]

f. A Brief History of Drilling Units in Arkansas

For many years, the drilling units established by the AOGC were "production units." Before the AOGC had jurisdiction to establish drilling units - a common source of supply - a reservoir had to be discovered. The AOGC required a party drilling a discovery well in the reservoir to appear before the agency and seek field rules, which established drilling units, within six months of completion of the discovery well or before three producing wells were drilled in the reservoir, whichever occurred first.[138] The "field rules" establish a drilling unit or units for the applicants' completed well or wells and also for direct and offsets to the newly established productive drilling units. The practice is a modified well-by-well approach to establishing drilling units.

Exploratory drilling units were authorized by legislative amendment to the Act in 1985.[139] An exploratory drilling unit must be comprised of a governmental section or its equivalent and must be prospective of oil or gas, or both.[140] When 50% of working interest owners or unleased mineral owners from the proposed unit area agree to pool, the AOGC has authority to integrate the remaining non-consenting working interest owners or unleased mineral owners.[141] The established exploratory drilling unit, along with the right of forced integration, is limited to a period of one year from the date of the order, or alternatively, one year from the cessation of unit drilling or production from operations.[142] The primary benefit of the addition of the exploratory drilling unit is that it provided the remedy of forced integration to assist in the leasing of exploratory projects.

From 1939 to the advent of the Fayetteville Shale Play in 2004, the oil and gas production regulated by the Act and the AOGC was from conventional reservoirs. The administration of the Act by the AOGC during this lengthy period reflects Justice Holme's admonition that "the life of the law has not been logic: it has been experience."[143] Moreover, the AOGC's practices in establishing drilling units is a classic example of the diversity that exists in state regulation of oil and gas production under conservation acts.[144] The Arkansas well-spacing scheme is sui generis, unique in the oil and gas regulatory world. The rationale underlying the Arkansas experience in administering the Act's well-spacing scheme, harking back to the political struggle to adopt the Act and subvert he common law rule of capture, was expressed by the aphorism "one cup, one straw."[145] This has sometimes been expressed as the unwritten "Rule of One."[146] Fundamental fairness, as well as equal opportunity, dictated that each drilling unit is only entitled to one well in the reservoir. Accompanying the one cup, one straw proposition was the view that if a producer shouldered the risk and paid for its share of the cost of a producing well, the AOGC was not going to meddle with the configuration of the drilling unit by deleting a tract from the unit or otherwise diluting the ownership interest. This proposition was known in Arkansas as the principle of "vested rights."[147] Strict adherence to the Rule of One also obviated the need to deal with vested rights issues resulting from either downsizing or re-forming established and developed drilling units.

The AOGC also adhered to the rectangles and squares on the surface of the earth that corresponded with the rectangular survey system of legal descriptions to draw the drilling units.[148] The AOGC eschewed drawing geologic units whose surface unit boundaries conrresponded with the boundaries of the subsurface reservoir.[149] The eight-inch well bores of the vertical producing wells in the reservoir provided insufficient direct evidence of the porosity, permeability, and size of the productive sand to delineate with confidence the subsurface boundaries of the reservoir. Moreover, when the field rules for the reservoir were established, there were too few producing wells in the reservoir to provide the well control necessary for the formation of geologic units. Not only would the AOGC not fashion geologic units, it would also not gerrymander the configuration of the drilling units on the surface in an attempt more closely to approximate the geographic confines of the sub-surface reservoir. The AOGC would not cross section lines or quarter section lines in the configuration of the drilling units. The objective was uniform-sized drilling units, fortuitously

arranged on the basis of the rectangular survey system of legal descriptions, in an orderly pattern that spanned the developed field and avoided the presence of "windows."[150]

In the early days of the Act, the non-associated gas fields of the Arkoma Basin in north Arkansas were developed on 640 acre drilling units.[151] The 640-acre drilling units were based on the AOGC's determination that 640 acres was the area that one well would economically and efficiently drain. Over the course of time, 640-acre drilling units, based on governmental sections, became the norm for gas drilling units in north Arkansas. As older fields matured and greater knowledge of the geology of the gas fields accumulated,[152] doubts existed as to whether one-unit well was efficiently and economically draining the units.[153] Nevertheless, the Rule of One reigned supreme in Arkansas and increased density of drilling; permitting "infill" drilling in the large units was not an option. Evidence that the existing unit well was not economically and efficiently draining the drilling unit would not elicit an additional unit well from the AOGC. An additional well in a drilling unit would be authorized only if the applicant could prove that the second well would produce a reservoir separate and distinct from the reservoir of the unit well.[154] Unlike Oklahoma, there is no case law or statute in Arkansas that permitted modification of an AOGC order establishing drilling units due to the subsequent acquisition of geological data that signaled a change of condition in the reservoir.[155]

The inability to drill infill wells to recover gas not being drained by the unit and problems in establishing separation of reservoirs, when reservoirs were sometimes vertically stacked and underlay a 640-acre drilling unit, made a mockery of the Rule of One's well-spacing regulations.[156] Consequently, in 2003, the legislature amended the well-spacing regulations.[157] The amendment created a statutory presumption in favor of a 640-acre unit composed of a governmental section, though it permitted the AOGC to establish a larger or smaller unit. The AOGC is specifically authorized to permit additional wells in the unit and regulate the spacing between the multiple-unit wells.[158] Deleted from the Act is the requirement, universally recognized by oil and gas conservation lawyers and academicians, that drilling units be established on the basis of the maximum area that one well would efficiently and economically drain. Statutory guidance to the AOGC on the parameters to be used in drawing drilling units no longer appears in the Act. One may infer that the legislature, adopting the norm of the 640-acre square mile unit as the presumptive standard, intended by implication for the

AOGC to apply a standard of "reasonableness" in fashioning drilling units under the amended Act.

Regardless of the theory that underlies the presumption of a 640-acre, or square mile, statutory unit, the practice before the AOGC on well spacing in the north Arkansas gas fields had radically changed. As opposed to hearing evidence on the acreage that a single well would economically and efficiently drain, the AOGC hears evidence on the "most effective and efficient manner of locating multiple wells for the effective, but cost efficient, removal of the maximum amount of oil and gas from a square mile unit."[159] The emphasis is on economic efficiency based on the geologic characteristics of the reservoir. One may argue that economic efficiency is not foreign to the traditional formula of maximum area of economic and efficient drainage, and, thus, the change in the standard in Arkansas is not necessarily profound. Whatever one think of the dearth of the statutory standards for delineating drilling units, it is difficult to argue that the amendment is not an improvement over the Rule of One.

g. Drilling Units in the Fayetteville Shale

The AOGC draws perspective drilling units for the Fayetteville Shale and other unconventional gas reservoirs in Arkansas. Each governmental section in each county in which the Fayetteville is known or thought to exist is covered on a county-by-county basis.[160] The drilling units in the counties are labeled as either "exploratory drilling units" or "established drilling units," the latter being production units. Once a producing well has been completed on an exploratory unit, that unit, and the offset units contiguous to it, become production units.[161]

Sixteen vertical or horizontal wells, or a combination thereof, may be drilled in an exploratory drilling unit.[162] For vertical wells, that amounts to a forty-acre spacing pattern. For horizontal wells, even though sixteen is permitted, the external and internal unit well-location restrictions have the potential to allow six to eight horizontal wells in the unit. The internal well-location restriction requires multiple wells in the unit to be spaced 448 feet apart with an allowed 20% variance.[163] This restriction may be waived by obtaining written consent from all unit working interest owners.[164] The external well-location restriction, designed to protect other drilling units from drainage, requires all wells to be set back a distance of 560 feet from any unit

boundary line or any other drilling unit's well.[165] Exception location wells may be granted by the AOGC for topographical or geologic advantage reasons.[166] The 560-foot setback creates a buffer zone of 1,120 feet that extends around any drilling unit.

Horizontal wells are drilled vertically and then turn on a tight radius before proceeding horizontally through the gas-bearing strata. The well bore for a horizontal well is defined by the AOGC rules as the entire perforated length of the lateral section of the horizontal well.[167] Consequently, based on that definition, a horizontal well involves a long narrow cylinder of a producing reservoir. The cylinders may be arranged in such a fashion to achieve effective and cost-efficient drainage of the reservoir.[168]

The AOGC permits horizontal wells to extend into more than one drilling unit when the majority in interest of working interest owners seeks authorization from the Commission and voluntarily agrees to the allocation of costs and the proceeds form production.[169] Administrative approval[170] of the "cross unit" well by the Director of the AOGC, which avoids a hearing and a decision by the Commission, is authorized if the affected drilling units have been previously integrated.[171] The costs and proceeds of production for the "cross unit" well are allocated by drawing a "cylindrical unit" around the perforated well bore. The costs and proceeds shared between each participating drilling unit are based on the proportion of the cylindrical unit (the calculated area) that is located in each such drilling unit.[172] The cylindrical unit is drawn by dividing a circle with a radius of 560 feet at both the beginning point and the ending point of the perforated lateral well bore and inserting a rectangle 560 feet in width on both sides of the perforated horizontal lateral.[173] It should be noted that the cylindrical unit is not a formal "drilling unit" under the Arkansas well-spacing regime, but is merely a basis for allocating costs and proceeds of production from cross unit wells.

Permitting horizontal wells to extend into, or encroach upon, adjoining drilling units facilitates the production of gas situated in the 1120-foot buffer zone that are situated in the 1,120-foot buffer zones that are situated between the productive areas of the drilling units and that are designed to protect against drainage. Otherwise, the gas would be stranded, and optimum development of the reservoir would be precluded.

[1] For a definitive discussion of the evolution of the Rule of Capture in oil and gas law, See , Bruce M. Kramer and Owen L. Anderson, The Rule of Capture - An Oil and Gas Perspective, 35 Envtl. 899 (2005).

[2] "The owner of a tract of land acquires title to the oil and gas which he produces from wells drilled thereon, though it may proved that part of such oil or gas migrated from adjoining lands." Robert E. Hardwicke, The Rule of Capture and Its Implications as Applied to Oil and Gas, 13 Tex. L. Rev. 391, 393 (1935). Kramer and Anderson, N. 1 at 900 refer to Hardwicke's definition as a "straight forward formulation of the rule."

[3] Barnard v. Monongahela Gas Co., 216 Pa. 362, 365, 65 A. 801, 802 (1907).

[4] 1 Eugene Kuntz, A Treatise on the Law of Oil and Gas § 4.2 at ____ (1987).

[5] Get cite

[6] The Rule of Capture has become almost a phrase of contempt. Given the then well-established recognition of the landowner's right to produce the minerals beneath his land, and the existing want of information concerning the properties, the source, and the probable longevity of oil and gas, I hardly see how the judges could have evolved any other se t of principles than they did. Maurice H. Merrill, The Public's Concern with the Fuel Minerals 32 (1960).

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[8] See Richard J. Pierce, Jr., State Regulation of Natural Gas in a Federally Deregulated Market: The Tragedy of the Commons Revisited, 73 Cornell L. Rev. 15 (1987).

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[10] Wallace F. Lovejoy and Paut T. Homan, Economic Aspects of Oil Conservation Regulation, 121 (1967).

[11] The Model Conservation Act, I.O.C.C. (1964) defines Waste as follows:
"Waste" means:

(A) the inefficient, excessive, or improper use of reservoir energy or unnecessary dissipation of reservoir energy;

(B) the inefficient storing of oil or gas;

(C) the locating, drilling, equipping, operating, or producing of an oil or gas well in a manner that causes or tends to cause a reduction in the quantity of oil or gas ultimately recoverable from a reservoir under prudent and proper operations,

the drilling of unnecessary well, or the loss or destruction of oil or gas either at the surface or below the surface;

(D) the production of oil or gas in excess of pipeline, marketing, or storage capacities, in excess of reasonable market demand, in excess of the amount reasonably required for properly drilling, completing, testing, or operating a well or other facilities for recovering, processing, or transporting oil, gas, or by-products, or in excess of the amount otherwise utilized on the acreage from which the oil or gas in produced; or

(E) other dissipation, production, or use of oil or gas underground or above ground, or in storage, that is careless, needless, or without valuable result.

[12] For a extended discussion of reservoir mechanics relating to production, see, ____ , The Origin, Occurrence and Production of Oil, 8-32, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

[13] "Efficient recovery of the oil from a reservoir is not taken care of by chance; it may be fulfilled only through careful and deliberate action by the producers. Experience has shown that one of the most essential factors in meeting these requirements is control of the rate of production. Excessive rates of withdrawal lead to rapid decline of reservoir pressure, to release of dissolved gas, to irregularity of the boundary between invaded and non-invaded sections of the reservoir, to dissipation of gas and water,, to trapping and by-passing of oil, and, in extreme cases, to complete loss of demarcation between the invaded and non-invaded portions of the reservoir, with dominance of the entire recovery by inefficient dissolved -gas drive. Each of these effects of excessive withdrawal rates reduces the ultimate recovery of oil. The Origin, Occurrence and Production of Oil, p. 31, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

[14] See, Stabilization Through Conservation A-52, The Oil and Gas Journal (1959)

[15] W. Henry Rector, *Legal Conservation of Oil and Gas Law in Arkansas; A Symposium, in* LEGAL HISTORY OF CONSERVATION OF OIL AND GAS, 16 (Am. Bar. Ass'n 1938).

[16] *Id.* at 19.

[17] *See* 1 KUNTZ, *supra* note 4, § 4.3 at 119.

[18] The Origin, Occurrence and Production of Oil, p. 31, in *Oil for Today - and for Tomorrow*, Interstate Oil Compact Commission (1953)

[19] *Id.*

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[21] Wallace F. Lovejoy and Paut T. Homan, Economic Aspects of Oil Conservation Regulation, 26 (1967), citing Erich W. Zimmerman, *Conservation in the Production of Petroleum*, Yale University Press, p. 24, (New Haven, 1957).

[22] "The primary purpose of a petroleum conservation statute is prevent physical waste above ground and underground in oil and gas production operation: however, the due process and equal protection clauses of the Federal Constitution, and usually similar clauses in state constitutions, as well as provision or provisions in conservation statutes, require that the regulation must protect the property rights of those who have the right to produce, subject to reasonable regulation to prevent waste. IOCC Governors' Special Study Committee, p. 6,, (Oklahoma City, 1964), cited in Lovejoy and Homan, N. 20 at p.27. The implication is that "prevention of physical waste appears as the primary aim" of conservation acts. *Id.*.

[23] George W. Hazlett, Property Rights and Oil Production, in Oil for Today - and for Tomorrow, Interstate Oil Compact Commission 37 (1953).

[24] Wallace F. Lovejoy and Paul T. Homan, supra N. 20 at 128.

[25] 52 Okl. St. Ann. 271-280, Though enacted in 1915, the Act wasn't used until the 1930's.

[26] *Id.*

[27] For a discussion of the 1915 Proration Act and its amendments, *see*, 1 W.L. SUMMERS, § 6.15 - 6.19.

[28] Title 102, Revised Civil Statutes of Texas, Article 6014. Pursuant to the Act, Texas defines waste as "The production of crude petroleum oil in excess of transportation or market facilities or reasonable market demand."

[29] Wallace F. Lovejoy and Paul T. Homan, supra N. 20 at 128.

[30] *Id.* at 203.

[31] ARK. CODE ANN. § 15-72-303(b) (Supp. 2009).

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[34] Act 166 of March 17, 1917, 1917 Ark. Acts 890.

[35] *Id.* at § 1.

[36] *Id.* at § 3.

[37] *Id*, at § 8.

[38] A similar statute was enacted in 1921. Act 166 of February 18, 1921, 1921 Ark. Acts. 216.

[39] In Nowata Gas Co. v. Henry Oil Co., 269 F. 742, 748 (8th Cir. 1920), The Eight Circuit Court of Appeals, discussing 52 Okla. St. Ann. § 29, an early Oklahoma act that prohibited the taking of more than 25% of the daily natural flow of gas wells, explained the rationale for the Act as follows: "When natural gas is permitted to flow freely, it tends to drain the gas from the underlying sands in the neighborhood of the well too rapidly, with the result that the water below the gas sands finds it way up towards the outlet of the gas at the base of the well, cuts off the lateral inflow of the gas, and drowns the well. If the outflow of gas is under pressure, and lateral flow towards the well will be more extensive and long continued, and in the end the gas will be more completely removed from the gas sands, and the gas field more thoroughly exhausted."

[40] *Id.* at § 12. 4,5 and 15.

[41] *Id.* at § 4,5 and 15.

[42] Act 664 of March 23, 1923, 1923 Ark. Acts. 555.

[43] The Act defined waste as follows: "Waste ... in addition to its ordinary meaning shall include (1) escape of natural gas in commercial quantities into the open air; (2) the intentional drowning with water of gas stratum capable of producing in commercial quantities; (3) underground waste; (4) the permitting of any natural gas well to wastefully burn; (4) and, the wasteful utilization of such gas" *Id.* at § 2.

[44] *Id.* at § 1.

[46] *Id.* at § 4.

[47] *Id.* at § 5, 6.

[48] Act 118 of February 13, 1923, 1923 Ark. Acts 67.

[49] L. L. Jordan, Drake Well Foundation Symposium, p. 2 (2003, n.p.).

[50] The Administration of the Act was transferred from the Arkansas Railroad Commission to the four (4) member Board of Conservation in 1927. Act 221 of March 23, 1927, 1927 Ark. Acts 714.

[51] § 20 Act 664 of March 23, 1923, 1923 Ark. Acts. 555.

[52] Act 234 of March 28 of 1933., 1933 Ark. Acts 720.

[54] *Id.* at 7,8.

[55] *Id.* at § 6,7

[56] Gerald Forbes, Brief History of the Petroleum Industry in Arkansas, 1 The Arkansas Historical Quarterly, 28, 36 (March 1942).

[57] Petroleum Investigation, Hearing on H.R. 290 and H.R. 7302 Before the Subcomm. on Interstate and Foreign Commerce, 77th Cong. 971, 1007 (1940) (statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission.

[58] Id.

[59] Natural Gas Investigation, Dock. No. G-580, (statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission, p. 2 Federal Power Commission .(Nov. 26, 1945).

[60] Alec M. Crowell, Rodessa an Object Lesson in Control, The Oil and Gas Journal, p. 28, (September 29, 1938).

[61] Id. at 105.

[62] Id.

[63] Louisiana's reservoir performance might have been better but for the fact that off set wells from the Rodessa field in Arkansas were permitted to produce in excess of the state's fixed allowables to prevent drainage from Arkansas' open flow wells. Gerald Forbes, supra N. 24 at 37.

[64] O.C. Bailey, Oil and Gas Resources of Arkansas, The Southern Conservationist, p. 9 (October 1938).

[65] The purchasers of crude in the field refused to buy the excessive output from the Arkansas wells. Gerald Forbes, supra N. 24 at 37.

[66] Alec M. Crowell, supra N. 27 at 105.

[67] Gerald Forbes, supra. N 24 at 38.

[68] Id at 106.

[69] Id.

[70] The first discovery of the Shuler field was in March of 1937 with the completion of the Morgan 1-A well to the Cotton Valley at 5,559 feet that initially produced 320 bopd. Owing to the lenticularity of the sands, now known as the Morgan sands, only 14 wells were successfully completed, with a maximum depth of 6000 feet, and all wells were on artificial lift by 1940. The initial discovery in the Jones sand was at depth of 7615 feet and produced 2500 bopd. _____, Secondary Recovery of Petroleum in Arkansas, A Survey, Ch. 35, p. 219 (date?) The Jones sands well cost an average of $85,000 to drill and complete. Gerald Forbes, supra. N. 24 at 38. In March of 1938 the Reynolds Oolite section of the Schuler field was discovered. . _____, Secondary Recovery of Petroleum in Arkansas, A Survey, Ch. 35, p. 219 (date?). This is sometimes referred as to the Reynolds Zone (Smackover Lime) of the Schuler field.

[71] Natural Gas Investigation, supra. N. 27 at 1,2.

[72] Id. at 2.

[73] Id.

[74] Gerald Forbes, supra N. 24 at 37.

[75] The Arkansas Oil and Gas Conservation Act (Act) originated from Act No. 105 of 1939. The Act's conservation statutes begin at § 15-72-101 of the Arkansas Code.

[76] Id. at 15-71-107 (1994).

Petroleum Investigation, Hearing on Before the Subcomm. on Naval Affairs, 79th Cong. ___(1943) (statement of O.C. Bailey, Chairman, Arkansas Oil and Gas Commission. Chairman Bailey noted that were 1349 oil wells in controlled fields and 2422 oil wells in uncontrolled fields in 1943. The daily production from the controlled fields draw fed the like production from the uncontrolled fields, 64,923 b/d to 16,876 b/d.

[77] ARK. CODE ANN. § 15-71-101 (1994d) (Supp. 2009).

[78] ARK. CODE ANN. § 15-71-110(d) (Supp. 2009).

[79] ARK. CODE ANN. § 15-72-103(a)(1) (Supp. 2009). Additionally, the filing of a false entry or statement of fact, or the omission of full, true, and correct entries, or mutilation or alteration of any report or transaction, in an attempt to evade any Arkansas Oil and Gas Commission (AOGC) rule, regulation, or order is a misdemeanor and punishable by a $5,000 fine or imprisonment for six months, or both. ARK. CODE ANN. §15-72-104(a)(1)-(4) (1994).

[80] ARK. CODE ANN. § 15-72-102 (4)-(6) (Supp. 2009) (defining illegal gas, illegal oil, and illegal product). The penalty for producing illegal oil or gas is a fine of not more than $2,500 a day for each and every act of violation. ARK. CODE ANN. § 15-72-103(a)(l).

[81] ARK. CODE ANN. §§ 15-72-404, 15-72-406 (1994).

[81] ARK. CODE ANN. § 15-71-116(a)(l) (Supp. 2009).

[82] Ark. Code Ann. § 15-72-101 (1994). The Declaration of Policy of the Act reads as follows:
In recognition of past, present, and imminent evils occurring in the production and use of oil and gas, as a result of waste in the production and use thereof in the absence of coequal or correlative rights of owners of crude oil or natural gas. . this law is enacted for the protection of public and private interests against such evils by prohibiting waste and compelling ratable production.

[83] Ark. Code Ann. § 15-72-105 (1994) ("Waste of oil or gas as defined in this act is prohibited.") The statutory definitions of waste appear at Ark. Code Ann. § 15-72-102 (15) (Supp. 2009).

[84] ARK. CODE ANN. § 15-72-102(15)(A).

[85] *Id* § 15-72-102 (15) (B).

[86] *Id* § 15-72-102(15)(0).

[87] *Id* § 15-72-102(15)(E).

[88] *Id* § 15-72-102(15)(F).

[89] *Id* § 15-72-102(15)(I)

[90] *Id* § 15-72-102(15)(K).

[91] *Id* § 15-72-102(15)(O).

[92] §11(J) Act 105 of February 30, 1939, 1939 Ark. Acts 219, codified at 15-71-110 (d)(10).

[93] See, *Id.* at § 16.

[94] Id. at §11(J)

[95] Article 6014(J), Title 102, Revised Civil Statutes of Texas.

[96] §11(J) Act of 105 of February 30, 1939, 1939 Ark. Acts 219, codified at 15-71-110 (d)(10)

[97] § 16 Act of 105 of February 30, 1939, 1939 Ark. Acts 219, codified at 15-72-324(a).

[98] Id.

[99] Wallace F. Lovejoy and Paul T. Homan, supra N. 20 at 129. The states with market demand statutes in 1965 were Texas, Louisiana, Oklahoma, New Mexico, Kansas, Alabama, Florida, Iowa, Michigan, North Carolina, North Dakota and Washington. The top 5 market demand states were Texas, Louisiana, Oklahoma, New Mexico and Kansas who had 70% of the crude oil production.

[100] Order No. 38-39, Aug. 16, 1939, Conservation and Prevention of Waste of Crude Petroleum and Natural Gas in the State of Arkansas.

[101] 260 Ark. 436, 139 S.W.2d 683 (1940).

[102] Eugene O. Kuntz, et al., Oil and Gas Law Cases and Materials, p. 89 (West Publishing Co., 1986).

[103] § I(3) Act of 105 of February 30, 1939, 1939 Ark. Acts 219, codified at 15-72-102 (15)(C).

[104] 1 W.L. SUMMERS § 317.

[105] The language of Act 105 well states the necessity for well spacing: "For the prevention of waste and to avoid the augmenting and accumulation of risks arising from the drilling of an excessive number of wells, ...the Commission shall ...a drilling unit or units for each pool." Act 105 of February 20, 1939, 1939 Ark. Act. 210, § 14(B).

[106] Id. § 15-71-102(1)(d)(12).

[107] Rarely, if ever, did the AOGC cross-section lines or quarter-section lines in establishing drilling units.

[108] Act of Mar. 31, 2003, § 1, 2003 Ark. Act. 964 (amending Ark. Code Ann. § 15-72-302(c)(1)).

[109] *See* ARK. CODE ANN. § 15-72-302(c)(l) (Supp. 2009).

[110] *Id* § 15-72-302(c)(l)-(2)

[111] Wronski v. Sun Oil Co., 279 N.W.2d 564, 569-70 (Mich. Ct. App. 1979) (discussing the "fair share" principle.

[112] Ark. Code Ann. § 15-72-302(d)(l).

[113] *Id.*

[114] ARK. CODE ANN. § 15-72-302(a)(1).

[115] Id § 15-72-302(a)(2).

[116] ARK. CODE ANN. § 15-72-303(b) (Supp. 2009)

[117] For a modern treatment of the Voluntary Pooling Clause contained in the oil and gas lease, see Mitchell E. Ayer, *Navigating the Pooling Clause Waters: New and Recurring Issues,* 53 ROCKY MTN. MIN. L. INST. 33-1 (2007).

[118] 3 EUGENE KUNTZ, KUNTZ: A TREATISE ON THE LAW OF OIL AND GAS § 42.5(f), at 415-16(1989)

[119] Act 105 of Feb. 20, 1939, 1939 Acts of Ark. 219, § 15(A).

[120] *Id.*

[121] Act 536 of March 20, 1963, 1963 Acts of Ark. 1648.

[122] ARK. CODE ANN. § 15-72-303(b).

[123] ARK. CODE ANN. § 15-72-304(b)(l) (1994).

[124] *Id* § 15-72-304(b)(2).

[125] See generally Ark. Code Ann. § 15-72-304; ARK. OIL & GAS COMM'N. GENERAL RULES & REGULATIONS B-43(g)-(h) (2009), *available at* http://www.aogc.state.ar.us/OnlineData/Forms/Rules *%20and%20Regulations.pdf.*

[126] ARK. CODE ANN. § 15-72-304(b)(3); see Daily, supra note 7, at 41. (Check daily)

[127] See ARK. CODE ANN. § 15-72-304(b)(4); Daily, supra note 7, at 41.

[128] Daily, *supra* note 7, at 41; see also ARK. CODE ANN. § 15-72-304(b}(4).

[129] Daily, *supra* note 7, at 42 n.19

[130] *"Payout* is that point where the other 7/8 of revenue equals the amount of all drilling completion and equipment costs, multiplied by the *risk factor penalty* plus 100% of subsequent operating expenses." *Id* at 42 n.20 (emphasis in original).

[131] *Id* § 15-72-304(b)(4), (d).

[132] Daily, *supra* note 7, at 41. Find cite to statute)

[133] ARK. CODE ANN. § 15-72-304(b)(4)

[134] Daily, *supra* note 7, at 41

[135] ARK. CODE ANN. § 15-72-305(b) (Supp. 2009).

[136] *Id.*

[137] See 3 KUNTZ, supra note 55, § 42.5(f), at 418

[138] ARK. OIL & GAS COMM'N. GENERAL RULES & REGULATIONS B-38(a) (2009), *available at* http://www.aogc.state.ar.us/OnlineData/Forms/Rules *%20and%20Regulations.pdf.*

[139] Act of 1985, No. 881 (codified at ARK CODE ANN. § 15-72-302(e)(1)-(3)(Supp. 2009)).

[140] ARK. CODE ANN.§ 15-72-302(e)(2).

[141] *Id.*

[142] *Id* § 15-72-302(e)(3).

[143] OLIVER WENDELL HOLMES, THE COMMON LAW 1, (Little, Brown, & Co. 1881).

[144] Owen L. Anderson, *"State Conservation Regulation-Single Well Spacing and Pooling-Vis-à-vis Federal and Indian Lands, "Special Institute on Federal Onshore Oil and Gas Pooling and Unitization*, in Federal Onshore Oil and Gas Pooling and Unitization 2-1 (ROCKY MT. MIN. L. FOUND. 2006).

[145] The aphorism "one cup, one straw" was the explanation for the Arkansas well-spacing scheme under the Act provided by the former Chairman of the AOGC, Boyd Alderson, who served many years on the commission, was a player in the industry prior to 1939, and witnessed the political process that resulted in the adoption of the Act.

[146] Thomas A. Daily & W. Christopher Barrier, *Well, Now, Ain't That Just Fugacious!: A Basic Primer on Arkansas Oil and Gas Law,* 29 U. ARK. LITTLE ROCK L. REV. 211, 242 (2007); Dorsey Ryan, *Optimal Density*, 39th ANN. NAT. RES. L. INST. 1, 2 (ARK. BAR ASS'N 2000). Ryan, the chief proponent of increased density in the North Arkansas gas fields, described the rule as the "infamous rule of one."

[147] The late Ned Price, a south Arkansas oil producer and longtime member of the AOGC, was a passionate proponent of the "vested rights" principle in administering the Arkansas well-spacing scheme.

[148] Daily & Barrier, *supra* note 81, at 242-43.

[149] *Id.*

[150] A "window" is acreage in the oil and gas field that is not included in an established drilling unit. If such acreage was smaller than the drilling units prescribed by the field rules, an off-pattern drilling unit, with a reduced well allowable, would be required to avoid a takings claim under Arkansas or federal due process constitutional provisions. The policy of avoiding "windows" was part of the motivation of AOGC's refusal to cross section lines in configuring drilling units.

[151] Ryan, *supra* note 81, at 7.

[152] In the earlier formative period of the Arkansas Conservation Act, oil and gas deposits in Arkansas were thought to underlay the subsurface in a "blanket" fashion. Modern theory is that subsurface hydrocarbons mainly lie within prehistoric river channels. Daily & Barrier, *supra* note 81, at 243. In North Arkansas most gas deposits were deltaic river channels. *Id* at n.193.

[153] Ryan, *supra* note 81, at l, 7-8.

[154] *Id* at 7, 8, 11-12.

[155] *In re* Peppers Ref. Co., 272 P.2d 416 (Okla. 1954). The Oklahoma Supreme Court opined in Peppers as follows:

To hold that the Commission could never modify a well-spacing pattern established by a previous order not appealed from, upon a showing of characteristics about a common source of supply, and the withdrawals therefrom, that were not known or anticipated at the time of the original order, would "tie the hands" of the Commission and often prevent it from performing its statutory duties under our Oil and Gas Conservation Act.

Id at 424.

[156] Daily, *supra* note 81, at 243.

[157] The amended statute, now defines a unit and the AOGC's regulatory authority as follows:

> (A) As used in this subchapter, "drilling unit" means a single governmental section or the equivalent unless a larger or smaller area is requested by an owner, as defined in [Arkansas Code Annotated section] 15-72-102, within the drilling unit to be established and a larger or smaller area is established by order of the commission. The drilling unit shall constitute a developed unit as long as a well is located thereon that is capable of producing oil or gas in paying quantities.
>
> (B) The commission shall have the continuing authority to:
>
> (i) Designate the number of wells that may be drilled and produced within a drilling unit; and
>
> (ii) Regulate the spacing among multiple wells drilled and produced within a drilling unit. ARK. CODE ANN. § 15-72-302(b)(2)(A)-(B)(ii) (Supp. 2009).

[158] *Id* § 15-72-302(b)(2)(B)(i)-(ii).

[159] Daily & Barrier, *supra* note 81, at 244. The authors further note that "[s]ometimes this will involve a single well for each separate reservoir within the unit. Other times, the AOGC will find the necessity for multiple unit wells within single tight reservoirs." *Id*

[160] Rule B-43(c) provides that spacing rules are applicable to all "conventional and unconventional sources of supply in Arkansas, Cleburne, Conway, Cross, Faulkner, Independence, Jackson, Lee, Lonoke, Monroe, Phillips, Prairie, St. Francis, Van Buren, White and Woodruff Counties, Arkansas." ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 59, at B-43©.

[161]**********

[162] *Id* at B43(i)(4).

[163] Id at B-43(i)(3).

[164] *Id* at B-43(i)(3).

[165] *Id* at B-43(i)(2).

[166] *Id* at B-43(i)(5).

[167] *Id* at B-43(a)(2)(C).

[168] Daily, supra note 81, at 244 ("These cylinders are then laid side by side and/or end to end in patterns that accomplish remarkably effective and cost-efficient drainage while, at the same time, reducing surface impact.").

[169]ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 59, at B-43(o).

[170]A proposed amendment to Rule B-43 is winding its way through the administrative process. The amendment modifies the requirements for cross unit wells that are subject to administrative approval pursuant to Rule B-43(0). The purpose of the amendment is to prevent operators from holding a drilling unit by production during the secondary term of the unit leases by extending a short, insignificant horizontal lateral into the unit pursuant to a cross unit horizontal well. The amendment requires that to secure administrative approval of a cross unit well, one of the following must exist as to each drilling unit:

(1) a well that is producing or capable of producing, and is not an exception-location well, be located entirely within the drilling unit; or that such a well will be drilled and completed or drilled and awaiting completion within six months of the date of the spudding of the administratively approved cross unit well; or

(2) that there is one well or a combination of multiple wells, including cross-unit wells, producing or capable of producing, that have a combined perforated lateral length within the drilling unit of not less than 4,160 feet; or

(3) within twelve months from the date of the spudding of the administratively approved cross unit well, one well or combination of multiple wells, including cross unit wells, with a combined perforated lateral length of not less than 4,160 feet, will be producing, capable of producing or awaiting

completion, on the drilling unit; or

(4) at least 75% of the fee mineral ownership within each drilling unit that does satisfy above requirements that agree in writing to the drilling of the well.

See ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS B-43 (2009) {proposed amendment).

[171] ARK. OIL & GAS COMM'N, GENERAL RULES & REGULATIONS, *supra* note 59, at B-43(0)(1).

[172] *Id* at B-43(o)(l)(A)-(B).

[173] *Id* at B-43(o)(1)(A). The "half circle" drawn at the beginning and ending of the perforated horizontal well bore is a modification for horizontal wells of the theory of radial drainage, inherent in the doctrine of compensatory drainage, applied to traditional vertical wells. *See* Anderson, *supra* note 79, at 2-9.