THE VALUE OF FARMLAND IN TWO OKLAHOMA COUNTIES AFTER A WETLAND DETERMINATION

By

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INTRODUCTION

The Wetland Resource

Definition and Ecological Values

Ecologically important areas called 'wetlands' include such diverse land types as salt marshes, prairie potholes and bottomland hardwood forests. Wetlands are defined as:

> "..those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (EPA, 1989).

Thus, wetlands are unique ecosystems having both aquatic and terrestrial characteristics.

Wetlands provide critical habitat and sources of food for many fish and wildlife species. High flood waters are absorbed by wetlands, reducing damage to neighboring areas. Furthermore, wetlands improve water quality by natural processes that remove pollutants from the flowing waters. Finally, these areas provide aesthetic, recreational and educational values (EPA, 1989).

Wetland Depletion

Several studies have documented the rapid depletion of

wetland ecosystems in the United States. Approximately 221 million acres of wetlands existed in the lower 48 states during the time of the nation's settlement. By the mid-1980s only 103.3 million acres remained, representing a 53% loss of the original wetland acreage (Dahl & Johnson, 1991). Between the mid-1950s and mid-1970s approximately 9 million acres of wetlands were destroyed, with annual losses averaging 458,000 acres. Agricultural conversion accounted for 87% of the losses (Goldstein, 1988). Between the mid-1970s and mid-1980s an estimated 2.6 million acres of wetlands were lost, with agricultural conversion accounting for approximately 54% of all losses (Dahl & Johnson, 1991). A few examples of agricultural conversion of wetlands may include clearing and draining bottomland hardwood forests to produce soybeans, diking of coastal wetlands, and draining prairie potholes to enlarge wheat fields (Kramer & Shabman, 1986).

Wetland Regulation in the United States

Historically, the wetland resource has been one of the most misunderstood resources in the country. Major federal policies toward wetland acreage reflect the changing perception and understanding of wetland values. Originally, wetlands were perceived as areas of low production and unhealthy environments (Bunkley & Edmonds, 1992). Consequently, during the mid-1890s, under the Swampland Acts, the federal government gave away 64.9 million acres of

wetlands in 15 states with the condition that these acres be converted to productive croplands, destroying valuable wetland ecosystems (Carey et al., 1990). It was not until 1899, with the passage of Section 10 of the River and Harbors Act which prohibited the unauthorized obstruction and alteration of navigable waters and dredge and fill activities, that the federal government attempted to address the degradation of wetlands. However, the Act only encompassed certain wetland types and was not, by any means, a comprehensive program. Regulatory authority for approval of activities affecting navigable waters including adjacent wetland areas was given to the United States Army Corps of Engineers (Corps) (Pontius, 1990). Increased scientific knowledge and public awareness of the inherent value of wetland ecosystems has increased interest in preserving this resource, and government polices have changed in recent years to reflect this new understanding. The two major federal wetland regulations are Section 404 of the Clean Water Act and the Swampbuster Provision in the 1985 Food Security Act.

Section 404 of the Clean Water Act

Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act) regulates wetland areas through water quality standards. This act includes two parts pertaining to wetlands. It regulates the discharge of dredged and fill materials into waters of the United States,

including wetlands, and it requires a permit program ensuring that the dredge and fill activities comply with environmental requirements. This act is administered by the United States Environmental Protection Agency (EPA) and the Corps, who share enforcement authority but have separate primary responsibilities. The Corps has responsibility for reviewing individual permit applications and issuing permits. EPA developed environmental guidelines to be followed by the permit applicants, reviews permits (has veto authority over the Corps), determines acceptability of exemptions, establishes extent of waters in the United States and works with state wetland programs. United States Fish and Wildlife Service (USFWS) and the Marine Fisheries Service have advisory roles to insure compliance with environmental standards contained in laws such as the Endangered Species Act and Marine Protection Research and Sanctuaries Act of 1972. Section 404 requirements exempt normal agricultural practices and wetland drainage (EPA, 1989).

The Swampbuster Provision

The first major federal wetland protection regulation was the Swampbuster provision in the 1985 Food Security Act. This provision, which linked wetland protection to agricultural policy, was added to hinder the conversion of wetlands for agricultural uses. The Swampbuster provision denies participation in all commodity program benefits (such

as price support payments, farm storage facility loans, crop insurance, disaster payments, and insured or guaranteed loans) for any year in which the farm operator converts wetland acreage in order to produce an annual agricultural crop (Carey et al., 1990).

The Swampbuster program is administered by the USDA Soil Conservation Service (SCS) and USDA Agricultural Stabilization and Conservation Service (ASCS). SCS has primary responsibility for identifying wetland areas and notifying landowners of the wetland determinations (EPA, 1991A). The process for identifying wetland boundaries is outlined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation, 1989). The identification process is based on the evaluation of three factors indicating wetland properties. These factors are wetland hydrology, hydric soil and hydrophytic vegetation. Technical criteria, field indicators and methods of proper analysis for each factor are described in the manual. To qualify as a jurisdictional wetland, all three factors must be met (EPA, 1991B).

ASCS has primary responsibility for enforcing the Swampbuster provision, specifically determining when wetland conversion occurred, who altered the acreage, and when commodity crops were planted (EPA, 1991A). This act exempts areas of natural wetlands farmed under natural conditions such as drought, artificial wetlands and conversions which

have minimal environmental effects (National Governors Association, 1991).

Property Rights and Wetland Regulation

Land Ownership

Fee simple ownership is the dominant form of private land ownership in the United States whereby the owner enjoys full ownership of all rights one can hold with respect to property. This 'bundle of rights' includes the right to possess and use, sell, devise, lease, mortgage, subdivide and to grant easements on the land. Incentive for ownership exists in the ability to possess and use the land to earn a monetary return or value from the land (Barlowe, 1978).

Rights Reserved to Government

The owner has exclusive rights but these are not absolute. The government reserves the right of escheat, to tax, to take for public use, and to control the use of all land in the United States (Barlowe, 1978). The government's right to take land for public use or control the use of the land has created legal controversy. Courts have traditionally viewed government regulations affecting private landowners as either a reasonable exercise of police powers or as a taking of land requiring just compensation. Police power gives the government the right to regulate properties in the interest of public welfare. This power prevents use of private lands in a way which is detrimental

to the public interest (Blinderman, 1977).

The taking clause of the Fifth Amendment states "..nor shall private property be taken for public use without just compensation." This Amendment gives the federal government power to obtain land whenever the government has need of the land for public use provided the landowner is compensated and thereby protected from undue seizure of his or her property. The Fourteenth Amendment extended this power to state and local governments (Bosselman, 1973).

An important question regarding the protection of wetlands by regulation is: when does such governmental action represent an undue seizure requiring compensation of property owners (Blinderman, 1977)? Farm owners argue that wetland regulations have reduced the value of their land by limiting future income, from production of commodities or sale of their property. Whether property values have been lowered by wetland regulations is the subject of this thesis. Whether reduced property values represent an undue seizure of property rights will remain a question for the judicial system to answer.

Objectives

General Objective

The general objective of this thesis is to determine whether wetland regulations have negatively affected agricultural land values in Kingfisher and Wagoner Counties of Oklahoma.

Specific Objective

The specific objectives of this thesis are as follows:

1) To measure impact of the presence of wetlands on agricultural land values.

2) To determine the impact on agricultural land values of making wetlands subject to increased regulation.

Summary of Hypothesis

The first hypothesis of this research is that agricultural land with wetland areas has a lower value than land without wetland areas, all else constant. Many wetland areas are not suitable to be planted and harvested; therefore, the total parcel earns less income compared to parcels without wetlands. The second hypothesis of this research is that land with a wetland determination has a lower market value then land without the determination. This land is explicitly subject to federal regulations and likely perceived by potential buyers as less attractive.

Procedures

A model of agricultural land values will be developed to test the hypotheses stated above. The value of land will be modeled as a function of expected income and factors affecting the use of the land. Cross sectional data from three secondary data sources will be used in the analysis. Federal Land Bank data from 1986 to 1991 will be used for agricultural land sales and sale prices. Information

concerning wetlands will be obtained from the USDA Soil Conservation Service. Land use and commodity program participation data will be acquired from USDA Agricultural Stabilization and Conservation Service.

Study Area

The study area encompasses two Oklahoma counties. These counties were chosen based on location, types of wetlands, quantity of wetlands and number of land sales from 1986 to 1991.

Kingfisher County

The diverse 900 square mile landscape of Kingfisher county, located in central Oklahoma, includes floodplains, prairies, blackjack post oak savannas, and sandhills. Elevation ranges from approximately 1000 feet in the east to 1500 feet in the southwest. Average annual temperature is 61°F with 30 inches per year average rainfall. The Cimarron River is the only major waterway in this county (USDA SCS, 1962). Types of wetlands include riverine upper perennial associated with high water tables and the cimarron terrace (Cowardin et al., 1979).

Wagoner County

The 595 square mile northeastern county of Wagoner ranges in elevation from 850 feet in the northeast to 500 feet in the southeast. Topography includes the Cherokee

Prairie, Boston Mountain and Ozark Highlands. Climate varies, ranging from humid in the east to moist and subhumid in the west. Average annual precipitation total is 41.9 inches, with yearly snowfall averaging 8 inches. Temperature ranges from an average daily minimum of 49°F to a maximum of 73°F. Three major rivers, the Arkansas, Grand and Verdigris create 65,000 acres of floodplains (USDA SCS, 1976). Major types of wetlands include riverine upper perennial associated with high water tables, riverine lower perennial associated with floodplain areas and palustrine forested wetlands defined as riparian and cut off zones (Cowardin et al., 1979).

Overview of Thesis

Chapter two will discuss in detail the wetland regulations and their potential effect on agricultural land values. Chapter three will explain the research procedure and the econometric analysis and present results of the analysis. Chapter four will present the conclusions and implications of the study and suggestions for future research.

CHAPTER II

WETLAND REGULATION AND AGRICULTURAL LAND VALUES

Wetland Regulation

The two main Federal Wetland Regulations that affect agricultural producers and land values are Section 404 of the Clean Water Act and the Swampbuster provision of the Food Security Act of 1985.

Section 404

The intent of the Clean Water Act (CWA, originally named the Water Pollution Control Act) is to "restore and maintain the chemical, physical and biological integrity of the Nation's waters and wetlands" (EPA, 1989). In 1972, amendments to the CWA added Section 404 establishing a permit system to regulate the discharge of dredged and fill material into the water and wetlands of the United States (Pontius, 1990). Dredged material as defined by regulations is "any material that is excavated or dredged from waters of the United States," (33 C.F.R. 323.2(c) 1987) and is categorized as a pollutant under the CWA (33 U.S.C. 1362(6) 1982). Fill material is defined as "any material used for the primary purpose of replacing an aquatic area with dry

land or of changing the bottom elevation of a waterbody" (33 C.F.R. 323.2(e) 1987). Waters of the United States are defined to encompass all surface waters such as coastal zones, rivers, streams, tributaries, estuaries, ponds, lakes, and wetlands, whose use or degradation could hinder interstate, intrastate or foreign commerce (EPA, 1989).

Activities regulated by the Section 404 permitting process often associated with dredged or fill discharges include port development, channel construction and maintenance, fills to create development sites (residential and commercial), highways, and water resource projects such as dams, jetties and levees (EPA, 1989). Some activities such as channelization and land clearing require a permit only if the activity deposits soil or other materials into the water (EPA, 1989).

In 1977, Section 404 was amended to include several new provisions. Three of the most notable provisions are the authorization of general permits for projects with minimal environmental consequences, transfer of authority to states for certain water types and exemption of certain limited activities from the permitting process that would have minimal adverse environmental effects (Pontius, 1990).

Agencies in Charge. The Corps has primary responsibility for the Section 404 permit process including approval and enforcement. The EPA reviews permits, develops environmental guidelines, shares enforcement responsibility with the Corps, and has veto power over the Corps' permit

approval decisions. USFWS and National Marine Fisheries Service inventory wetland areas and have vital advisory roles in regard to the environmental impact of the proposed activity exercised by comment on permit applications (National Governors Association, 1991).

Permitting Process. General or individual permit applications must be submitted by the applicant for the proposed project. General permits are required when the activity has minimal adverse environmental impact (EPA, 1989), whereas individual permits are required for all other nonexempt activities (National Governors Association, 1991). The permit applicant must submit form 4345, which is followed by application acknowledgment and processing by the Corps (Pontius, 1990). The Corps then issues a public notice which gives a description of the proposed activity, including the location, probable environmental impacts of the project and deadline for receiving public comments, usually with a 15 to 30 day comment period. Sometimes a public hearing is requested concerning the proposed project. Testimony will be used in the permit review process (Kusler, 1992).

The application is then evaluated by the Corps and other federal and state agencies. The Corps evaluates the application regarding section 404(b)(1) guidelines. The Corps cannot issue a permit if a practicable alternative to the proposed activity exists that would have less adverse impact on the aquatic ecosystem. A practicable alternative

is an activity that takes into account cost, technology and logistics. Permit acceptance is also based on compliance with other federal laws or standards such as toxic effluent, water quality standards, Endangered Species Act and Marine Protection, Research and Sanctuaries Act of 1972. Discharges cannot cause degradation of the waters of the United States, including impacts on human health, wildlife dependent on aquatic ecosystems, overall aquatic ecosystems, recreation, and aesthetic and economic values of the ecosystem (EPA, 1989). The final steps in the permit process are the Corps' ultimate decision, exercise of EPA's veto authority and permit issuance or denial (Kusler, 1992).

Penalties. Violators of Section 404 could be subject to administrative penalties, civil actions (for monetary judgment or injunction requiring the violator to restore the wetland) or criminal action (National Governors Association, 1991).

Exempted Activities. Section 404 guidelines specifically address certain exempted activities beneficial to the agricultural landowner. Exemptions include normal ongoing farming, ranching and forestry practices such as maintenance of dams, dikes and farm ponds, plowing, cultivating and minor drainage activities. Also exempted are some discharges if associated with ongoing farming activities such as changing (or adding) cultivation techniques, planting different crops as part of an ongoing

rotational cycle and removal of debris which is blocking drainage flow. Activities that are not a part of ongoing farm practices but represent exempted discharges include maintenance and construction for existing irrigation and drainage facilities and farm or stock ponds, so long as the areas are not enlarged. Discharges cannot be exempted if the proposed project represents a new use of the wetland area or if it impairs the flow of waters of the United States (National Governors Association, 1991).

Effectiveness of Section 404. Because Section 404 was not designed to be a comprehensive wetland protection program, it does not control all activities that cause wetland degradation. Drainage and ground water pumping are two activities that can harm wetland ecosystems but which are not subject to compliance with Section 404 because no solid material is removed from or added to the wetland (EPA, 1989). What the permit program does regulate is discharge of dredge and fill material into navigable waters of the United States, which includes wetlands (Kusler, 1992).

Critics claim the permitting process has uncertain criteria and long delays in the permit decision, that it lacks an appeal process and federal maps, and that interpretations of criteria vary. Although Kusler (1992) does not deny these problems exist, he suggests that state and local governments often fill the gaps that the federal agencies cannot fill. Over the past 10 years, 97% of all permit applications have been approved. This high approval

rate does not detract from the fact that the process is often time consuming and costly (Kusler, 1992).

Swampbuster

The Swampbuster provision of the 1985 Food Security Act, as amended by the Food, Agriculture, Conservation and Trade Act of 1990, was intended to directly combat the problem of wetland conversion on agricultural lands by discouraging such conversions through penalties in farm program benefits (Carey et al., 1990). Conversion occurs by draining, dredging, filling, leveling or any activity that makes it possible to grow crops on the wetland area (National Governors Association, 1991).

The Swampbuster provision was the first regulatory process that required the acceptance of federal farm program benefits be contingent on land stewardship practices. If a landowner or operator chooses to convert a wetland area, then farm program benefits will be adversely affected. Thus, Swampbuster creates a negative incentive to convert wetlands (Moseley, 1991).

The 1985 and 1990 provisions differ in two respects. The point of violation in the 1985 provision occurred when the farm operator planted on the converted wetland, whereas the later provision defined violation to occur as soon as the wetland acreage was converted to make planting possible. The earlier provision defined the penalty as the automatic loss of all program benefits; the 1990 provision

established a system of graduated penalties for first time, unintentional violators (National Governors Association, 1991). The new system penalties coincide with the severity of the violation but require that the farm operator restore the converted wetland (Norris et al., 1991).

Furthermore, the 1990 Swampbuster provision added two important options for the landowners. First, SCS can grant exemptions for conversions which have minimal effect on the overall ecological environment of the wetland after consultation with the USFWS to determine minimal effects. Second, farm operators can choose to participate in a mitigation program. Mitigation allows farm operators to compensate wetland losses on their land by restoring another wetland of equal value, with USFWS providing technical assistance in determining the wetland value (National Governors Association, 1991).

Agencies in Charge. The provision gave SCS the responsibility for determining wetland areas, mapping wetland areas and notifying landowners. Determinations are made by examining aerial photos, soil survey maps and USFWS's National Wetland Inventory Maps. SCS notifies any landowner participating in federal programs of the determination at which time a review period begins before the maps become final (Oklahoma Conservation Commission, 1991).

ASCS administers the Swampbuster provision by conducting audits to insure payments are withheld from

operators who convert wetlands (Heimlich et al., 1989). Specifically, ASCS has responsibility for determining date of conversion, when agricultural commodities were planted, and whether conversions were caused by the producer or a third party (EPA, 1991B).

Regulatory Process. SCS conducts wetland determinations concentrating on inland freshwater wetlands near or on croplands, the critical wetland areas having a high probability of being converted. SCS then notifies the landowners who are participating in commodity programs of the preliminary determination. At this time, the landowner can either agree with the preliminary determination in which case SCS finalizes the determination and sends the information to ASCS for administrative uses, or the producer can disagree with the preliminary determination. A disagreeing farm operator then can request the local SCS District Conservationist to reconsider the determination, at which time SCS will physically examine the supposed wetland area prior to final determination. Furthermore, SCS has established an appeal process allowing the landowner to formally disagree with the wetland determination at four levels: local, area, state, and national (Moseley, 1991).

To aid in determining compliance with the Swampbuster provision, a wetland classification system was established which enabled SCS to base wetland determinations on inherent value and landusers' previous use of the areas (Moseley, 1991). These categories are converted wetlands, prior

converted cropland, farmed wetlands, natural wetlands and abandoned converted wetlands. Converted wetlands are those areas where a wetland has been manipulated to make production of an agricultural crop possible and display no characteristics of a wetland area. If conversion occurs on a wetland area after December of 1985, the producer is in violation and federal farm program benefits are at risk. Prior converted cropland includes wetlands which were converted and planted prior to the December 1985 date; hence they are exempt from the Swampbuster provision. Farmed wetlands include areas that have been partially converted but still sustain wetland functions. A producer can maintain and farm this area as it was farmed prior to December 1985. However, improvements to the area or additional drainage will constitute a violation of the provision. Natural wetlands are those areas that have not been altered. A farm operator may plant on this area without changing the natural condition of the wetland. Finally, abandoned converted wetland areas are converted wetlands which have not been cropped, managed, or maintained in five years, are not enrolled in USDA conservation programs such as the set aside program, and have reverted to wetland conditions. Under the Swampbuster provision, this type of wetland is equivalent to a natural wetland with the same restrictions (National Governors Association, 1991).

Penalties. There are no civil or criminal penalties associated with violating the Swampbuster provision, but the

violator will lose all or a part of federal farm program benefits for each year in which they violate the provision (National Governors Association, 1991).

Exempted Activities. Activities exempted from the Swampbuster provision include any agricultural practice in a natural wetland area which does not alter the hydrology of the area. For example, planting in a wetland area which is no longer wet due to drought conditions, thus making production possible, is an exempted activity. Additionally, areas that have wetland characteristics because of human activities, such as an irrigation project, are exempted. Finally, occasional exemptions are granted for converting a wetland if SCS has determined the change will have minimal effect on its natural ecological functions (National Governors Association, 1991).

Effectiveness of Swampbuster. The Swampbuster provision is intended to eliminate the indirect federal assistance for converting wetlands into cropland that existed in the past (Carey et al., 1990); yet it is not wholly effective in decreasing wetland conversions because its effectiveness is conditional on the existence of three elements. The farm operator must have wetlands on his or her property, the wetland conversion must be economically and physically feasible; and finally, the farm operator must be dependent on farm program benefits for a large portion of income whereby the sacrifice of the benefits would

significantly harm the operation (Heimlich et al., 1989). In other words, Swampbuster is effective in those areas where USDA programs such as commodity payments, Commodity Credit Corporation loans, Farmers Home Administration loan subsidies or federal crop insurance comprise a substantial part of total farm income (Carey et al., 1990).

Carey et al. found that as of January 1990, 760 acres of wetlands were converted by farm operators who lost a total of 1.8 million dollars in government payments; yet 5,259 farmers who converted wetlands applied for exemptions, with 78% granted. Therefore, relatively few producers have actually lost program benefits. Moreover, implementation of the program has been difficult so far because not all wetlands have been identified. As of February 1990, out of 60 million privately owned wetland acres, SCS had mapped only 7.4 million acres and 82,000 acres of converted wetlands (Carey et al., 1990).

Wetland Regulation and Land Value Controversy

The controversy over the piecemeal implementation of federal wetland regulations began with the enactment of the Clean Water Act and more specifically with the definition of a wetland. Landowners argued that the definition was too broad and included nonwetland areas while environmentalists contend that a narrower definition is counter to protecting the ecological value and functions of a wetland area

(Kusler, 1992).

Wetland Definition Controversy

The definition of wetlands came under attack immediately after the passage of the CWA in 1972, which required water quality standards for all waters of the United States. Originally, the focus of the CWA was to protect navigable waters from adverse human activities. The Corps continued to regulate navigable waters under the Rivers and Harbors Act of 1899, and as a result excluded wetlands, which was inconsistent with the broader definition of the CWA (Kilborn, 1991). Environmental groups claimed that the broad definition of waters of the United States should include wetlands, while opponents claimed that Congress never intended to include wetlands in the CWA (Kusler, 1992). Natural Resources Defense Council, Inc. v. Calloway (392 F.Supp. 685, 1975) challenged this jurisdiction, and the court ordered the Corps to include in its regulations all waters of the U.S. as defined by the CWA. Thus wetland areas were included in the Corps' regulatory jurisdiction (Kilborn, 1991).

The first attempt to officially define wetlands was the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. All federal agencies involved in the wetland delineation process were to follow this manual, achieving nationwide uniform standards for determining what is and is not a wetland. Problems with the manual erupted

immediately. Common complaints from landowners and developers were numerous. Specifically, opponents believed the new definition included areas that were not really wetlands, that the manual was developed without considering economic impacts (such as time consuming, nature and cost of the permit process), and finally, the manual was too technical and difficult to understand (Kusler, 1992).

In response to these complaints, a new proposed manual is currently being reviewed. The new manual proposes a narrower definition of wetlands by tightening the criteria parameters. Farmers, developers and landowners support the new manual because it will limit areas under federal regulation and provide a less costly delineation process. Many state and local governments, environmentalists and scientists oppose the new manual because the narrower definition is inconsistent with the goals of the CWA, the manual will define wetlands so narrowly as to not preserve any wetlands, and finally, that complaints against the manual are unjustified as many activities are already exempted. Furthermore, the opponents claim that the solutions to the problems will not be resolved by a narrower definition but should be addressed in the implementation of the permitting process (Kusler, 1992).

Land Value Controversy

Landowners and developers have claimed that wetland regulations infringe on property rights by causing land

values to decline (Carpenter, 1991). Both the popular press and organizations representing these groups have argued against wetland regulations. Farmers are a significant part of the voice arguing that such regulations devalue their property. A Tulsa World reporter told of a landowner who claimed her six acres of designated wetlands were created by beaver dams. She questioned the fairness of these regulations that are restricting the use of her land. The landowner stated that the acreage in question was pasture prior to the beaver invasion, and she wishes to return the designated land to its previous use. The wetland determination requires such a change to impact farm program participation (Averill, 1992).

A story in Business Week magazine told of another farmer in Huntsville, Mo. who feels "the Feds are trying to keep me from touching my own land", referring to his 560 acre parcel designated as a wetland. Additionally, this producer suggested that he has compromised enough with conservation programs and that there should be a limit to the amount of regulation on agricultural land (Cahan & Blank, 1990). Other farmers have questioned wetland benefits such as additional waterfowl which can cause severe crop damage (Walter, 1990).

Oklahoma Farm Bureau Executive Secretary Delano Clark wrote, "this bureaucratic mess has disrupted agricultural production and economic activity." He asserts that a piece of property which has restricted uses is thereby less

profitable and the landowner should be compensated for that loss by the government (Oklahoma Farm Bureau, 1990).

Restrictions that potential developers and business owners face from wetland protection regulations have received attention as well. A U.S. News and World Report article told of prospective home builders who bought property on Chesapeake Bay's Eastern Shore to find a year later they were unable to build since the area was a wetland. As a result, the value of the lot fell. In Morrisville, Pa., a mechanic was convicted of illegally filling a wetland and was sentenced to three years in prison and fined. The area in question was a piece of property previously used as a dump which he cleaned up and filled in to build a garage. The owner believed he was improving the property; consequently, he did not contact appropriate federal agencies (Carpenter, 1991).

U.S. Representative Jimmy Hayes (1991) reported, in Reader's Digest, on a Louisiana businessman who constructed crawfish ponds next to wetlands. The Corps' required that the levees be destroyed under threat of criminal penalties. The ponds never produced crawfish, yet the money borrowed to build the ponds must be repaid.

The Legal Issue

While most people support protection of the environment, landowners are questioning who will bear the cost of the decrease in land value after land use

restrictions are enforced on their land (Collins, 1991). This question has been raised in the court system as affected landowners have challenged land use regulation, including wetland regulations. Most concerns have centered around the rights of private property ownership and the taking issue (Want, 1988).

Police Power and The Taking Issue. Courts have traditionally viewed government regulations affecting private landowners as either a reasonable exercise of police powers, which gives government control to set regulations of property in the interest of the public welfare, or as a taking of land requiring compensation (Blinderman, 1977). The taking clause of the Fifth Amendment prohibits the taking of property, defined as the actual physical appropriation of property, without just compensation or payment (Want, 1988).

Generally, when determining whether a taking has occurred, the court first addresses the police power issue. In doing so the court asks if the regulation serves a legitimate state interest and if all procedures were followed properly in the enactment and administration of the regulation. If the regulation is valid and procedures are properly applied, the government regulation is viewed as a reasonable exercise of police power. The court then addresses the taking issue. In determining if a taking of property has occurred, the court examines the property owner's "bundle of rights" and questions whether the

regulation in question has deprived the owner of all reasonable use of the property. Specifically, the court examines the nature of the questioned activity and the degree of harm to the public health or welfare (Powers, 1985).

While the permit requirements under Section 404 and Swampbuster do not physically take the wetland acreage from the owner, the regulations can restrict its profitable use and limit the exercise of property rights (Want, 1988). Consequently, the taking interpretation is difficult for wetland regulations. At first glance, regulatory restrictions do not appear fundamentally harmful to the landowner, yet they may leave the owner with relatively few economically viable uses for the land (Powers, 1985).

Court Cases. Traditionally, courts have upheld regulations that do not deprive the owner of the property's total use or regulations that protect the public (Powers, 1985). In the case of wetland legislation, the courts have upheld regulations that restrict the use of private property as a legitimate regulation in order to protect public welfare (Want, 1988). In Just v. Marinette County (56 Wis.2d 7, 1972), the Wisconsin court described the ecological importance of wetlands and the inherent value of the land. The Justs' wanted to extend their lakeside property line by filling in the designated wetland shoreline and claimed that denial of the permit to fill the area had depreciated the value of their property and

entitled them to compensation (Bosselman et al., 1973). The court explained that the depreciation of the Just's property was not based on the land in its natural state but rather on what it would be worth developed. Lost value based on changing land uses at the expense of public rights does not come into play when defining a 'taking' (Blinderman, 1977).

In United States v. Riverside Bayview Homes (474 US 121, 1985), Riverside Bayview Homes started preparations for construction of a housing development. The Corps claimed this area as a wetland subject to the permitting process. Although this case dealt primarily with defining wetlands and the Corps' jurisdiction, the taking issue was also addressed. The United States Supreme Court stated their general approach of determining if a government land use regulation amounts to a 'taking' of land by citing Agins v. Tiburon (447 US 255, 1980). Agins established a two part test under which a land use regulation may become a taking "if it does not substantially advance legitimate state interest or if it denies an owner economically viable use of his land". In the Riverside Bayview Homes case, the court held that the Section 404 permit requirement did not constitute a taking under the Agins test.

Recently rulings have reversed to favor the landowner, calling enforcement of wetland protection regulations a taking requiring compensation by the government. The first case to overturn the Corps' permit denial under Section 404 exclusively on the taking ground was Florida Rock Industries

Inc. v. United States (791 F.2d 893, 1986). Florida Rock Industries purchased land for the purpose of mining limestone prior to the implementation of wetland regulations. When the company decided to start mining, the newly administered regulations required them to apply for a permit to dredge the wetland on their property. The Corps denied the permit on the grounds that the mining operation would be detrimental to public health both by destroying the wetland and by creating phosphate pollution. The company had a strong case for the taking issue because they purchased the land prior to the regulation for the intent of mining, the environmental values were not considered significant, and, applying the Agins test, the permit denial did in fact deprive the company of its only viable use for the property (Want, 1988). The U.S. Claims Court ruled in favor of the company, awarding a precedent million dollar compensation (Nicholas, 1992).

Lucas v. South Carolina Coastal Council (112 S.Ct 2886, 1992) was another recent case ruling in favor of the landowner. Lucas purchased two beachfront lots in a residential zone with the intent to build houses. A beachfront management act was later passed which restricted Lucas from building the homes. Lucas applied the Agins test stating the regulation denied the landowner of all economically viable uses of his land, rendering it worthless (Bureau of National Affairs, 1992). The Supreme Court ruled in favor of Lucas and stated that government land use rules

constitute a regulatory taking by the government only when the regulations deny owners all value of their land. The court stated that such regulation could be considered the same as physically occupying the land, requiring the government to compensate the owner for the value of his property (Barret, 1992). Justice Scalia wrote, "even if a regulation addresses a serious harm, the government must compensate a property owner denied all economically viable uses of his land" (Bureau of National Affairs, 1992).

However, a recent two party case addressed the taking issue similar to Just v. Marinette County (56 Wis.2d 7, 1972) and Lucas v. South Carolina Coastal Council (112 S.Ct. 2886, 1992). In Esposito v. South Carolina Coastal Council (939 F.2d 165, 1991), Esposito and Chavous claimed South Carolina's Beachfront Management Act restricted use of their property so much so as to constitute a taking.

Esposito owned a beachfront lot with a house whereas Chavous owned a vacant beachfront lot. The controversial Act clearly defined specific areas near the shoreline to be protected against further erosion thus restricting building and repairing of homes. Moreover, if a home is destroyed by natural causes in the stated zones, the home may not be rebuilt. Both plaintiffs claimed these restrictions on building activities, if applied to them in the future, were so severe as to constitute a taking.

The court applied the Agins test and determined that the Esposito's claim did not hold. First, the regulation did

protect stated interest to "protect, preserve, restore and enhance the beach/dune system." Second, while Esposito argued the enactment of the regulation denied them of all economically viable uses for their property by diminishing the value of their property, more specifically by depriving them of their future expectation to sell or borrow money against their property, the court found the act enabled the Espositos to continue to use the property in the same manner both before and after the enforcement of the regulation.

On the other hand, applying the Agins test to the Chavous property, the court ruled that, while regulation was in the best interest of the state, the act did deny this owner economically viable use of the land. However, the court removed the ruling on hypothetical grounds, asking the lower court to review the case again due to an amended Act and the fact that Chavous had not exhausted the administrative appeal process.

This case raises the question of hypothetical impacts often argued by landowners affected by wetland regulations, which is whether future uses of agricultural land are restricted and as a result land values have declined. The courts have not been asked to address such a case, and the details of each individual case are important in determining the constitutionality of land use regulations.

Theory of Land Value and Capitalization

Economic theory provides that the current market value

of land resources is determined by the expected future income, salvage value and other factors capitalized into the total value of the land. Other factors which are capitalized into the land are directly related to future income stream or nonagricultural influences (Reynolds, 1984). Examples include commodity programs and location of the farm. Vollink (1978) identified factors that affected the bare land price per acre of farmland in four counties of North Carolina. He reported that farm influences such as tobacco allotments and amount of tillable farm acreage increased sale price of bare land. However, as the size of the tract increased, the per acre sale price of bare land decreased. Nonfarm influences which increased the price of land included farms with commercial or residential influences. Vollink further suggests that government policies for tobacco allotments significantly sway farmland prices by the capitalizing of allotment rights into land prices. Drummond and White (1973) determined the price of farmland is also affected by the price of forestland and that proximity to forestland should be considered when determining the value of farmland.

CHAPTER III

PROCEDURES AND ANALYSIS

Modeling Wetlands Regulation Impacts on Agricultural Land Values

Where agricultural land values are a function of expected future income and other factors affecting the use of the land, a model of wetland regulation impacts on agricultural land values can be formulated. Such a model should include income earned by the land, potential for additional income, and other factors which a perspective buyer might consider. The following theoretical model is proposed:

Sale price = f(size, returns to farming operations, potential for additional returns to farming, farm program impacts, the general farm economy, delineated wetland acreage, and regulatory jurisdiction considerations).

Sale price is the price per acre of the bare land, with all buildings and other such improvements excluded.

Size of the parcel sold would be expected to impact land values since previous research has suggested that larger parcels have sold for lower per acre prices (Vollink, 1978). However, one would not expect that relationship to be linear.

Returns to farming operations is an important function in determining farmland values. Burt (1986) determined that profits two years prior and one year prior to the current year are capitalized into the value of the farmland and that this information can be used to anticipate income from production for future years. Phipps (1984) found that farm based returns are linked to farmland prices and are dependent on production process and opportunity costs of the farmland.

A number of factors would be expected to influence the potential for future income from farming. These might include acreage not currently in production or general productivity of the land.

Participation in federal commodity programs, including maintenance of a base acreage and crop yield history, might be expected to increase the value of the land since participation in such programs generally reduces the variability of income while also providing a floor for income to crop production. Participation in other programs, such as the Conservation Reserve Program, would also impact income potential of the parcel. Shoemaker (1989) reports that CRP rent payments are generally higher than what the farmer would earn by producing on the below average quality land and that the value of CRP payments is capitalized into the value of land.

General health of the farm economy is an important factor since one would not expect the demand for

agricultural land to be very great when agricultural prices and incomes are low or declining. Castle and Hoch studied farm sales from 1920 to 1978 to determine if the real estate value of farmland could be explained solely by capitalized rent. The study concluded that capitalized rent explains only half of the farm value and the remainder can be explained by the capitalization of capital gains which includes real gains or losses from price level changes (Reynolds, 1984).

Wetland acreage is important since most wetland acres are going to be less productive than nonwetland acres. Thus, as wetland acreage is greater, income potential of the parcel will be smaller. Palmquist and Danielson (1989) studied the effect of erosion and drainage on land values in North Carolina. The hedonic analysis concluded that, if the soil is so wet as to require drainage, soil type causes approximately a 25% reduction in land price. Furthermore, the results indicated that draining wet soils would increase the land value of the parcel by an average of 34%. A farm operator could use this information to balance the drainage cost with increased land value and possible loss of benefits incurred by violating the Swampbuster provision.

Finally, the identification of jurisdictional wetlands on the parcel might be perceived by potential buyers as evidence of restrictions for future use of the land. Establishment of jurisdiction for wetlands might be indicated by the receipt, by the owner, of a wetlands

determination letter from SCS. Henneberry and Barrows (1990) studied the effects of agricultural zoning and land capitalization. It was expected that zoning restrictions would lower the value of land by depriving development. However, the results of the study showed land value was dependent on the parcel characteristics and political climate of the area.

Data Sources

Farm Sales Data

The primary data source for the empirical analysis was a data set of farm sales for the period of 1986 to 1991 maintained by the Federal Land Bank. The data is collected by the Farm Credit Services in Wichita from actual farm sales on a per county basis. Farm sales data for Kingfisher and Wagoner Counties was drawn from the total data set. The sales data include year and month of sale, total sale price for the property, value of home, value of all improvements including home, value of improvements other than home, value of bare land, value of bare land under improvements, value of timber land, per acre value of land, per acre value of cultivated land, per acre value of property, acres of pasture, total acres purchased, acres of timber, acres of cultivated land, acres of irrigated land, number of animal units which can be maintained on the property, state code, FIPS (Federal Information Processing Standards) county code, section number, township and range for each farmland sale.

For the purpose of this study, only farm sales of 40 or more acres were selected. The average farm size in Kingfisher and Wagoner Counties in 1987 was 507 acres and 250 acres (Wickham, 1991). Although parcels of 40 acres might be transferred from one operating farm to another, it is also possible that 40 acre tracts are being sold for non-agricultural uses. Because the Swampbuster provision impacts only farmers participating in USDA commodity programs, smaller parcels without active cropping would not add to the study. On this basis, 184 sales were observed for Kingfisher County and 158 sales for Wagoner County.

For each farm sale, the exact location within the township and range was identified through research at the appropriate county clerk's office. At the office, deeds are filed according to the township, range and section and further specify the exact legal description of the parcel. This location information was needed to determine farm and tract number of the specific property sold.

Farm Characteristics and Wetlands

Specific location was used to obtain tract and farm numbers of the parcel from aerial photographs maintained at each county's ASCS office. Using the farm numbers, information was then available in ASCS records on base acres and program payment yields for crops associated with the parcel. Information concerning the Conservation Reserve Program (CRP), including acres in CRP, rental rates and year

the farm entered the program was also obtained from ASCS.

Details concerning wetland acreage on each parcel sold and date the SCS office notified the landowner of a wetland determination were obtained from records at the county SCS office. Soil classifications for the parcels were determined from each county's SCS soil survey publication. SCS soil survey categorizes soil types by land capability classes. The soil capability class scale for this study ranges from one to seven. Capability class one has soil characteristics with the widest range of uses, representing nearly level, well drained and productive land. Class seven soils have major limitations making this classification not suitable for cultivation.

Model Specification

Multiple linear regression was used to estimate the relationship between actual bare land prices per acre and factors relating to the bare land price, including the presence of wetlands. These factors are predicted to be capitalized into the value of the land thus determining its sale price. The general form of the equation is:

PRICE = f(SIZE, SIZE2, PROFIT1, PROFIT2, PCABA, PWET, DWET, DLET, DSL, CRP, RECEIPT, SOIL)

where:

PRICE	= bare land price per acre
SIZE	= number of acres in the parcel sold
SIZE2	= number of acres in the parcel sold squared
PROFIT1	= total production profits for the parcel from one year prior to the sale

PROFIT2	= total production profits for the parcel from two years prior to the sale
PCABA	= percent of cropland acres exceeding crop acreage base
PWET	= percent of parcel acreage designated as wetlands
DWET	= 1 if wetlands on parcel, 0 otherwise
DLET	= 1 if letter of determination received prior to the sale, 0 otherwise
DSL	= dummy variable for interaction between PWET and DLET
CRP	= present value of remaining per acre CRP payments
RECEIPT	= percent change in aggregate farm receipts from period 2 years prior to 1 year prior to sale year
SOIL	= soil classification on cropland

Definitions and Calculations of Variables

LOTUS Spreadsheet. The LOTUS computer program was used for initial data entry and preliminary data manipulations. The Federal Land Bank Data as well as the data collected from ASCS and SCS offices was entered into a spreadsheet. Price per acre of each parcel (PRICE) was determined by dividing price of bare land by acres sold. All prices were transformed to 1991 dollars. The SIZE variable, from the FLB data, accounts for the difference in price per acre of small and large parcels. It is expected that smaller parcels will be sold for a greater per acre price than larger parcels. The SIZE variable was squared (SIZE2) to test whether a linear relationship exists between SIZE and PRICE. It is expected that a nonlinear relationship exists.

Returns to cropland for one year prior to the sale (PROFIT1) and two years prior to the sale (PROFIT2) were based on crop production and grazing on the parcel and

indicate the potential for future income. The calculation of profits was performed to limit the potential problem of collinearity in the model which might have resulted if each individual component contributing to income was added into the model.

The profit variables were calculated as follows. First, using wheat as an example, crop production on the parcel was estimated by:

$$WHEAT = CABw \times PYield \times (1 - SA)$$

where WHEAT is the total wheat production for the parcel in the year of interest, CABw is the wheat acreage base for that parcel, PYield is the payment yield for wheat for that parcel, and SA is the percent set aside for wheat for the year of interest. Set aside percentages are provided in Appendix A. Similar calculations were done for each crop for which the parcel maintained a base and yield history.

Again, using wheat as an example, gross returns from crop production were calculated as:

$$GRwht = WHEAT \times TPwheat$$

where GRwht is the gross returns from wheat production, WHEAT is total wheat production as calculated above and TPwheat is the target price for wheat for the year of

interest. Target prices are provided in Appendix A.[1]

Total costs of crop production were calculated using enterprise budgets generated for the individual crops. Winter and spring grazed wheat were treated differently from other crops since wheat set aside was assumed spring grazed, thereby precluding harvest costs on that acreage. Thus,

$$TCwht = (COST1wht \times CABwht \times (1-SA)) + (COST2wht \times CABwht \times SA)$$

where TCwht is the total costs of wheat production, COST1wht is the per acre costs of production, including harvest cost, and COST2wht is the per acre costs of production excluding harvest costs. For other crops, for example grain sorghum,

$$TCgs = COSTgs \times CABgs \times (1 - SA).$$

Finally, total net returns or profits from cropland for each parcel for each crop for the years prior to the sale and two years prior to the sale were calculated using; for example:

$$NRwht = TRwht - TCwht$$

where NRwht is the total net returns from wheat production, TRwht is the total revenue from wheat production and TCwht

[1] Market price was used instead of target price for those years in which market price exceeded target price.

is total cost of wheat production.

For parcels with CRP contracts, the crop acreage base was changed for the year in which the parcel entered the program and subsequent years.

The total returns to pasture for the years prior to the sale and two years prior to the sale were calculated by adding returns from non-wheat pasture, wheat graze-out, and winter wheat pasture.

$$TR = (AcPast \times RR) + (CABwht \times SA \times SRR) + (CABwht \times \%G \times (1 - SA) \times WRR)$$

where TR is the total returns from pasture, AcPast represents the acres of pasture as given in FLB data base, RR is pasture rental rate for the region, SRR is the rental rate for spring wheat pasture grazing, %G is percent of wheat land winter grazed in the county (estimated by the local Extension agent) and WRR is rental rate for winter wheat pasture.

PROFIT1 was calculated by summing returns for all crops and for pasture for that year, dividing by the parcel size and deflating for the year the sale occurred, giving a weighted per acre return for the year prior to the sale. PROFIT2 was calculated in a similar way. Again, all values were transformed to 1991 dollars.

The PCABA variable was included to account for the difference in the number of acres indicated as cropland cultivated by FLB and the crop acreage base information from

the ASCS records. It is expected that the additional acreage cultivated not accounted for by the crop acreage base data could increase productivity of the parcel beyond the income variable calculated, thus increasing the land value. PCABA was calculated in the LOTUS spreadsheet using the cultivated acres value from the FLB data set.

$$PCABA = ((AcCult - TCAB)/AcCult) \times 100$$

where PCABA is percent of cropland acres exceeding total crop acreage base, AcCult is cultivated acres on the parcel as given by the FLB data, and TCAB is the total of all crop acreage bases for the farm.

The presence of wetlands on the parcel might be perceived by the potential owner as evidence of future restrictions or loss of productivity. Thus it is expected that the presence of a wetland on the parcel would decrease the value of the land. A wetlands dummy variable (DWET) was used to indicate the presence of wetlands and assigned a value of 0 if there was no wetland determination made for the parcel or 1 if a wetland determination was made for the parcel.

It is expected that as the extent of wetland acreage increases on the parcel, the value of land will decrease due to the lower productivity potential of these lands. Thus the more wetland acreage on the property, the more or less productive the land (see Figure 1). The model variable for

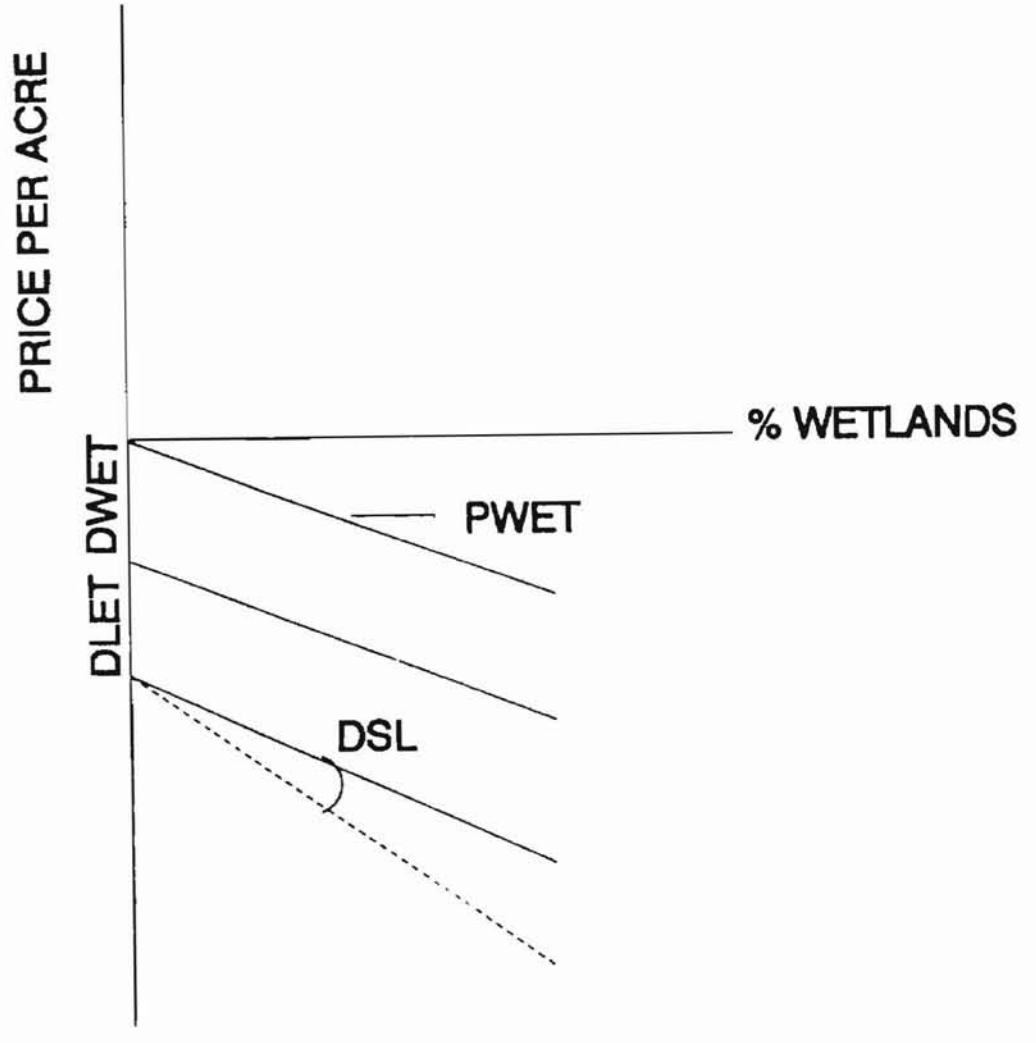

Figure 1. Expected relationship between dummy variables, percent wetlands and price

the extent of wetlands on the parcel (PWET) was calculated by:

$$PWET = (WETacres / SIZE) \times 100$$

where PWET is the percent of parcel acreage designated as a wetland, WETacres is the acres of wetlands on the parcel according to the SCS determinations, and SIZE is the number of acres in the parcel. Wetland determinations only included those wetlands located in or adjacent to cropland; therefore, wooded wetlands and some pasture/range areas are not included in the analysis.

Two more dummy variables were generated to capture regulation impacts. A dummy variable was included to indicate if the wetland area is, in fact, an established jurisdictional wetland subject to regulations. The receipt of a letter indicating a jurisdictional wetland on the parcel prior to sale is expected to cause a decrease in the sale price of the parcel. The date of letter dummy variable (DLET) was assigned a value of 0 if the wetland determination notification letter was received by the landowner after the sale of the parcel and 1 if the letter was issued prior to the sale of land.

It is possible that not only does the presence of a jurisdictional wetland cause the value of the property to decline but that the slope of the decline is steeper (see Figure 1). A slope dummy variable (DSL) was added to

capture the rate at which jurisdictional wetland quantity discounts the value of a parcel. The slope dummy variable (DSL) was calculated as the product of the letter dummy variable (DLET) and the percent wetlands variable (PWET).

Conservation Reserve Program rental payments were included into the model to account for the capitalization of the payments into the value of land. The model variable CRP, per acre present value of remaining CRP payments, was calculated as:

$$CRP = (CRPacres \times RR \times r)/SIZE$$

where CRP is the per acre present value of CRP payments, CRPacres is the number of acres enrolled in the CRP program, RR is the per acre rental rate of the CRP contract and r is the appropriate annuity interest factor for the years remaining in the contract.

The aggregate farm receipts variable (RECEIPT) was added into the model to capture the impact of the general health of the agricultural economy. The variable was calculated as the percent change in total receipts from the year two years prior to the sale to the year prior to the sale. It is expected that if agricultural prices and incomes are low, the demand for agricultural land will also be less causing a decline in the market value of land.

The soil classification variable (SOIL) represents the soil capability class most dominant in the cropland area of

the parcel and was entered directly into the LOTUS spreadsheet. This variable accounts for the general productivity potential of the land when considering soil fertility and uses, where capability class one is nearly level, well drained and productive land and capability class seven is rough, broken, and generally unproductive land. Therefore, as soil capability level increases, it is expected that the value of land will decrease.

Data Limitations

Initially, this study set out to determine if wetland regulations have negatively affected land values in Kingfisher and Wagoner Counties. When the model specifications were considered and data needs were identified, implications arose in acquiring complete data for all model variables. As a result, 139 observations were reported for Kingfisher County and 114 observations for Wagoner County.

Problems in Data Collection

In the data gathering process, many problems occurred which limited the data base. First, no determinations were made or records kept on wetlands located on noncropland acres. Purchase price of a parcel could have been impacted by wetlands on the parcel if the wetland area was not located on the cropland area; there was no way to determine if this was the case.

Second, according to Steve Tully at the state SCS office, only 60% of the Oklahoma wetlands determinations were finished at the time of this research. As a result, some possible wetland determinations may not have been made. One criteria for choosing a county for this project was that the county have all determinations finished. Although this was attempted and Wagoner County was supposed to have completed all determinations, several files indicated 'determination to be made at a later date', implying that not all of the determinations were finished.

Third, the available data was not always accurate. The FLB data set included categories for timberland and irrigated acreage. However, no observations yielded data for those categories. Furthermore, the FLB data base proved imprecise as some legal descriptions were inaccurate and some parcel descriptions were duplicated. Other problems with reported sales data included: deeds for all sales in the FLB data were not filed at county clerk's office; acreage reported on FLB data did not always match the acreage on the deed filed at county clerk's office; all land transfers were not reported to ASCS which made it difficult in determining acreage base and yield histories for the parcels transferred; some specific farm tracts sold were added to a landowner's property whose primary residence was located in another county so that ASCS records were not kept in the county office where data was collected.

Assumptions Made in Data Collection

Due to the data limitations, two assumptions were made in the data gathering process. First, it was assumed that all wetlands on the parcel were located on cropland acreage as indicated by SCS's determinations. If no determination was made, it was assumed there were no wetlands on the parcel. Second, it was assumed that wetland determinations were accurate in defining the wetland acreage and procedures for each determination were conducted without bias.

Problems with Wagoner County Analysis

The Wagoner County data had more limitations then the Kingfisher data for several reasons. First, since wheat is not the primary enterprise in Wagoner County, as it is in Kingfisher, relatively fewer farmers are participants in USDA programs. As a result, wetlands information was scarce. Due to the lack of farm program participation and the associated limited number of wetland determinations for the parcels in the data set, less then 10% of the 114 parcels were identified as having wetlands. In actuality, Wagoner County is reported to have a high quantity of wetland acreage.

As a related problem, the Wagoner County data set had only one observation for which the sale of the parcel occurred after the landowner received a letter verifying a wetland determination. Therefore, the letter dummy variable (DLET) could not yield any information.

Data Analysis and Model Estimation

Analysis Using SAS

The variables calculated in LOTUS were imported into a SAS data set and statistical summaries for model variables were generated. A summary of the variables for the Kingfisher and Wagoner County models are given in Table I and Table II.

Average bare land price per acre in Kingfisher County was $492.30. The average parcel size was 150.70 acres, with parcels ranging from 40 acres to 640 acres. The average total profits for the parcel from one year prior to the sale was $13.40 per acre with a range from $-5.70 to a high of $60.80 per acre. The average total profits for the parcel from two years prior to the sale was $13.10 per acre, ranging from $-0.50 to a high of $54.20 per acre profit. Thirty percent of the Kingfisher County observations had wetlands; the average wetland acreage per parcel containing wetlands was 7.68 acres and 5% of the landowners received determination letters prior to the sale.

Average bare land price per acre in Wagoner County was $641.90 for an average parcel size of 105.2 acres. This county had observations as small as 40 acres and as large as 575 acres. The average total profits for parcels from one year prior to the sale was $11.40 per acre with a range from $0 to $51.80 per acre. The average total profits for the parcel from two years prior to the sale was $11.00 per acre,

TABLE I

STATISTICAL SUMMARY OF MODEL VARIABLES
FOR KINGFISHER COUNTY

Variable	Obs	Mean	Std Dev	Minimum	Maximum
PRICE	139	492.3	166.0	170.3	961.0
SIZE	139	150.7	82.5	40.0	640.0
PROFIT1	139	13.4	9.4	-5.7	60.8
PROFIT2	139	13.1	8.7	-0.5	54.2
PCABA	139	19.7	31.8	0.0	100.0
PWET	139	2.1	5.7	0.0	33.1
DWET	139	0.3	0.4	0.0	1.0
DLET	139	0.05	0.2	0.0	1.0
DSL	139	0.42	2.5	0.0	25.4
CRP	139	7.6	42.2	0.0	316.9
RECEIPT	139	8.1	4.7	1.4	17.1
SOIL	139	2.5	1.1	1.0	6.0

TABLE II

STATISTICAL SUMMARY OF MODEL VARIABLES
FOR WAGONER COUNTY

Variable	Obs	Mean	Std Dev	Minimum	Maximum
PRICE	114	641.9	337.1	152.9	2072.2
SIZE	114	105.2	91.6	40.0	575.0
PROFIT1	114	11.4	6.9	0.0	51.8
PROFIT2	114	11.0	7.2	0.0	61.0
PCABA	114	18.4	33.2	0.0	100.0
PWET	114	1.3	8.3	0.0	85.2
DWET	114	0.09	0.2	0.0	1.0
DLET	114	0.008	0.09	0.0	1.0
RECEIPT	114	8.8	4.9	1.4	17.1
SOIL	114	2.8	1.4	1.0	7.0

ranging from $0 to $61.00 per acre. Nine percent of the Wagoner County observations had wetlands which was lower then expected; average size of wetland acreage per parcel containing wetlands was 10.05 acres and less then 1% of the landowners received determination letters prior to the sale.

SAS was also used to make preliminary OLS runs. Multicollinearity diagnostics were examined and showed no problems.

Analysis Using SHAZAM

The final data set from SAS was then imported into the SHAZAM program for additional OLS diagnostics to test for the presence of heteroscedasticity. SHAZAM's HET Diagnostic test showed the presence of heteroscedasticity. The test showed that as price per acre increased, the error variances also increased. The SHAZAM routine to correct for dependent variable heteroscedasticity was used, so that:

$$\sigma_i^2 = \alpha_0 + \alpha_1 E(Y_i^2)$$

where:

σ^2 = error variance
α_0 = error variance mean
α_1 = variation of mean
Y = dependent variable

Corrected model results are shown in Table III.

The present value of remaining per acre CRP payments (CRP) and the dummy slope (DSL) variables were not included

TABLE III

LAND VALUE MODEL RESULTS FOR KINGFISHER AND WAGONER COUNTIES

Variable	Kingfisher Regression Coefficient (Standard Error)	Wagoner Regression Coefficient (Standard Error)
INTERCEPT	700.44 (64.592)	913.18 (92.118)
SIZE	-1.0379* (0.3662)	-4.0229* (0.5765)
SIZE2	0.00110** (0.0006)	0.00650* (0.0012)
PROFIT1	3.4529 (3.5013)	41.1600* (11.9400)
PROFIT2	-1.7027 (3.6492)	-40.8690* (10.6010)
PWET	-6.5977* (1.9143)	6.6157** (3.8558)
DWET	25.7860 (31.3270)	-293.4100* (79.1590)
DLET	89.4200 (78.8890)	178.7900 (144.5000)
DSL	0.3893 (6.2350)	
CRP	0.06289 (0.2442)	

(Continued)

Variable	Kingfisher Regression Coefficient (Standard Error)	Wagoner Regression Coefficient (Standard Error)
PCABA	-0.1828 (0.3958)	0.9022 (0.7986)
RECEIPT	3.9665 (2.6863)	12.9300* (4.5690)
SOIL	-53.3330* (9.2910)	-35.4710* (10.5270)
R^2	0.2334	0.2903
F Test	3.19	4.21
α_0	144.85	282.77
α_1	0.28104 (.018138)	0.39067 (0.02955)

* Indicates significance at 5% level
** Indicates significance at 10% level

in the Wagoner County model. There were no land parcels in the Wagoner County data set with CRP contracts. There was only one observation of the letter dummy variable (DLET) with value of 1, so that the lack of variation in the DSL variable created collinearity problems and contributed no information to the model.

Results

The Kingfisher County results are shown in the first column of Table III. The size of the parcel (SIZE) was significant at the 5% level. Size of parcel squared (SIZE2) was significant at the 10% level, suggesting a nonlinear relationship between size of the parcel and price (see Figure 2). A one acre increase in farm size away from the mean parcel size suggests a decrease of $0.71 per acre selling price. Percent of the parcel in wetlands (PWET) significantly impacted price. A 1% increase in the percent of wetland acreage on the parcel resulted in a decrease of $6.60 in the price per acre of the parcel. Finally, the soil variable (SOIL) was also significant at the 5% level, suggesting a $53 dollar per acre decrease when soil type changed to the next lower soil productivity classification. Results indicate that the value of the parcels sold in Kingfisher County was not affected by the anticipated returns from the land (PROFIT1 and PROFIT2), general health of the farm economy (RECEIPT) or the present value of per acre CRP payments (CRP). Moreover, the percent of cropland

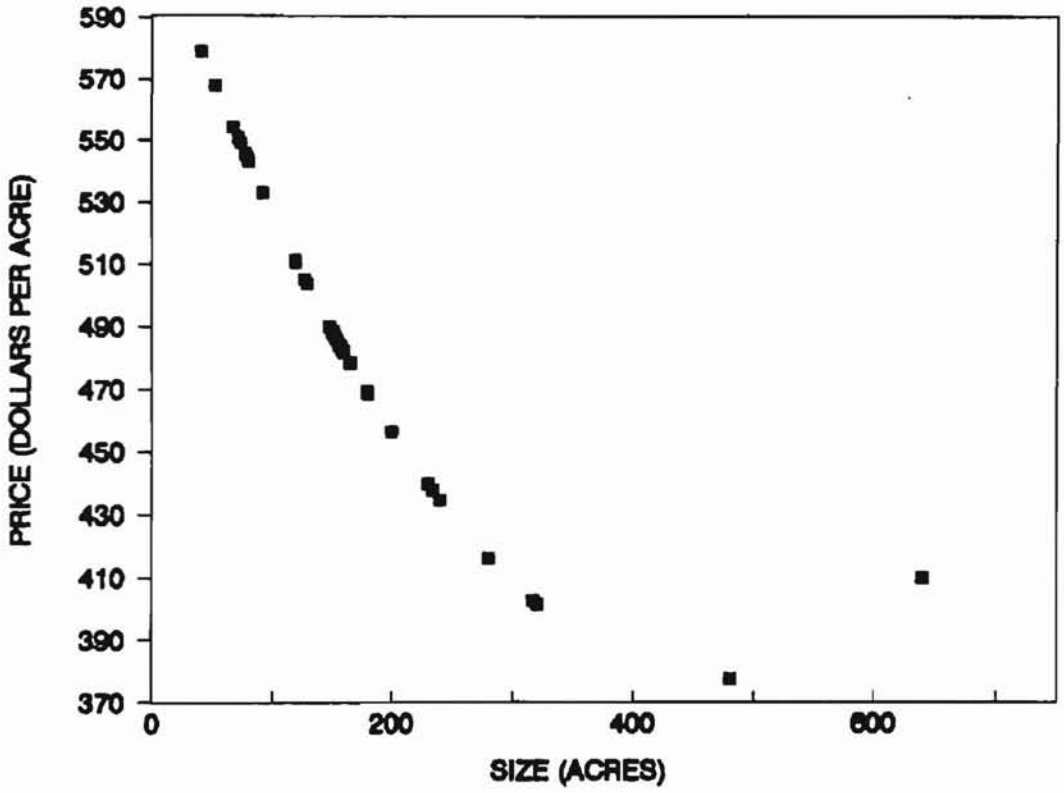

Figure 2. Relationship between size and price in Kingfisher County

acreage exceeding crop acreage base (PCABA) did not significantly affect the value of land. Finally, the presence of wetlands (DWET) and wetland determinations (DLET) did not significantly impact land values.

Wagoner County results are shown in the second column of Table III. The size of the parcel (SIZE) was significant at the 5% level. Size of parcel squared (SIZE2) was also significant suggesting a nonlinear relationship between size of the parcel and price (see Figure 3). A 1 acre increase in farm size away from the mean parcel size suggests a decrease of $2.65 per acre selling price. Profits for the year before the sale (PROFIT1) increased the value of the land by $41.16 per acre for each $1 increase in profits. Profits for two years prior to the sale (PROFIT2) decreased the value of the land by $40.86 per acre for each $1 increase in profits. The presence of a wetland area (DWET) decreased the value of the parcel; per acre price declined by $293.41 for each observation which had a wetland on its parcel. Each $1 increase in the farm receipts variable (RECEIPT) increased the price per acre by $12.93 per acre. The next lower soil classification (SOIL) caused the value of the parcel to decrease by $35.47 per acre. Percent of land in wetlands (PWET) was significant at the 10% level and indicated an increase of $6.61 per acre for each 1% increase in wetland acreage percentage.

The lack of significance in the letter dummy variable (DLET) indicates that wetland regulations did not impact

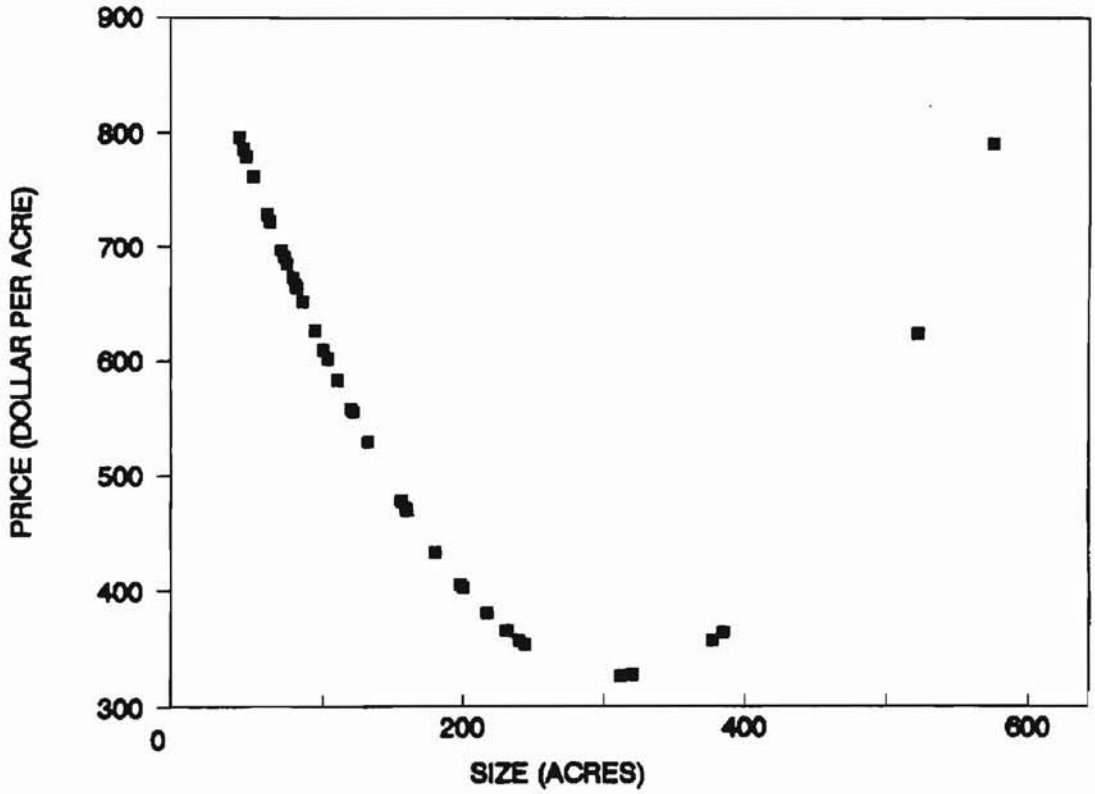

Figure 3. Relationship between size and price in Wagoner County

land values in Wagoner County. Also, the percent of cropland acreage exceeding crop acreage base (PCABA) did not significantly affect the value of land.

CHAPTER IV

CONCLUSIONS AND IMPLICATIONS

Summary

Wetlands are one of America's most misunderstood and controversial resources. Scientists have provided evidence of the inherent value of wetland ecosystems and federal regulations have been generated in response. Landowners have expressed the belief that the total burden of preserving a wetland for the public good should not be placed entirely on them. Landowners have suggested society should accept some, if not all, of the economic burden of preserving wetlands.

The objective of this research was to examine whether agricultural landowners have a valid concern. They complain that recent wetland regulations which restrict land use activities cause a decrease in land values. Multiple linear regression was used to model the value of land as a function of expected income and factors affecting the use of the land. The presence of wetlands and the impact of making wetlands subject to increased regulations were included as model variables. Three secondary data sources describing individual land transactions and characteristics were used in the analysis.

In general, results of the analysis indicate that the wetlands do impact land values in the study areas. For the parcels included in the Kingfisher County sample, as the percent of wetlands on the parcel increased, the value of that land decreased. Therefore, we fail to reject the hypothesis that agricultural land with wetland areas has a lower value. However, the wetland dummy variable representing the presence of a wetland was not significant in Kingfisher County, meaning smaller acres of wetlands have no affect on land price.

In the Wagoner County sample, both the wetland dummy variable representing the presence of a wetland and the percent of wetlands on the parcel were significant. The presence of the wetland negatively impacted land values while the percent of wetlands on the parcel increased land values. The different outcomes of these variable are probably due to missing amenity values present in Wagoner County and overall lack of wetland data; only 11 observations had wetlands information.

The measure of wetland regulatory impact was the determinations letter dummy variable representing the establishment of jurisdiction for wetlands and the slope dummy variable representing the extent of impact on land values of the determination. The variables were not significant, which suggest that for Kingfisher County land sales, making wetlands subject to increased regulations did not impact sale prices. Therefore, the hypothesis that land

with a wetland determination has a lower market value then land without the determination is rejected. Results of this study suggest that land did not sell for less after a wetland determination was made.

In the Wagoner data set only one observation had a value of one for the letter dummy variable. Therefore, no information could be obtained from this variable. Also the slope dummy variable could not be added to the model due to lack of variation and collinearity problems. Even though the letter dummy variable was not significant, meaning wetland regulations had not impacted land values, this is only tentative because of the fact that only one observation with the letter dummy variable occurred before the sale of the land. Therefore, no general conclusions can be drawn with only one observation.

Other factors found to affect land values include size of the parcel and total production profits for the parcel from one year prior to the sale. As size increased, the value of the land decreased. As profits for one year increased the value of the land also increased, while for profits two years prior to the sale, the land value decreased as profits increased. Percent increase in aggregate farm receipts from the period two years prior to one year prior to sale year resulted in increased land values. Soil classification was also a significant variable; the change to the next lower soil capability level decreased the value of land.

Implications of Study

The results of this research suggest that the presence of wetlands does in fact decrease the value of agricultural lands. However, this negative impact on land values is likely due to economic forces and is not a function of the wetland policies. Where wetland areas are less productive than nonwetland areas, one would expect land values to reflect their presence.

This research did not find that wetland restrictions reduced land values in Kingfisher County. The data in Wagoner County was insufficient concerning the wetland information to draw any conclusions. However, due to the data limitations, this research was unable to include the impact of wetlands on land value when wetlands are located on pasture lands or wooded areas. For example, the original Wagoner County data set included an observation verifying that some land may sell for less after a determination.

One of the parcels included in the FLB data set was a large wooded tract. The entire tract was determined by SCS to be a wetland. However, the observation was not included in the analysis because the size of the wetland was more than 9 times the size of the next smallest wetland area in the sample, and no other wooded wetlands were identified in the data set. Nevertheless, sources in the county stated that an initial purchase offer for the property was withdrawn after the wetland determination was made. The land finally sold at auction for less then half of the price

originally offered. The initial offer came from an individual who planned to clear the land for crop production but found he could not do so without losing USDA program benefits for other land farmed.

In United States v. Riverside Bayview Homes (474 US 121, 1985), the court encountered a similar situation in which a landowner was deprived of some but not all viable uses of a tract of land. The court applied the Agins test stating that all viable uses of the land must be deprived by the regulation in order to constitute a taking. This suggests that, while the Wagoner landowner realized a loss in the value of his land, he was not deprived the total value and compensation for his loss would not be required given the current legal interpretation.

When wetland restrictions do apply, this may limit future land use options and income potential. If wetlands were converted, this would constitute an improvement to the land and land value would be expected to increase. Palmquist and Danielson (1989) found that drained wetlands increased land values while undrained areas reduced the value of the land. The landowner would have to consider whether cost of conversion would be less than the benefit, the increase in property value. Under Swampbuster, cost of conversion is much higher because USDA benefits are lost. Additionally, landowners who decide to give up farm program benefits must still consider compliance with Section 404 of the CWA guidelines.

With respect to the courts' response to taking cases and requests for compensation, lost value based on changing land uses at the expense of public rights does not come into play when defining a 'taking' as stated in the decision of Just v. Marinette County (56 Wis.2d 7, 1972). But if society, and hence congress, are persuaded that farm landowners alone should not bear the cost of preserving wetlands, this study might provide input into decisions about offsetting longer-run costs of preserving wetlands.

This research did not address those areas where wetlands may actually enhance land values. Walters (1990) reported on several farmers who were nominated to participate in the Farming in Flyways program. This program was established for farm operators who have shown an interest in conservation practices which enhance wildlife on their properties; often this includes wetland preservation or establishment to attract wildlife. These farmers feel the presence of wildlife on their properties adds to the value of their farms. Wagoner County has land which is highly desirable for vacation and retirement homes. Jurisdictional wetlands on these lands, often in wooded areas, have not been mapped. Our model does not account for these amenity values. However, if delineated wetlands indicated the presence of other wetlands, possibly wooded, this may help to explain the discrepancies between the sign of the wetland dummy variable and percent wetland acreage in the parcel variable.

Suggestions For Future Research

Information on wetland determinations could only be obtained for cropland areas. This data limitation suggests an alternative approach might be useful in obtaining information on other kinds of wetlands or on wetlands on lands owned by non-participants in USDA programs. For example, a survey could be sent out to all landowners who own a substantial amount of land to determine current uses of the land (including recreation activities, timber, or other nonprogram crop production), future plans for land use, location, acreage and type of wetlands on their properties. These landowners could be asked to provide an estimate of what their land might sell for.

A survey of potential buyers could also be used to indicate what type of land characteristics the potential buyer considers when making a land purchase and how those characteristics affect the price the buyer would pay. The problem of working with people's "perceptions" or "opinions" of the value of wetlands would still exist. The survey would not indicate whether the buyer would actually act on the opinions stated.

Additional land sales data could be added to the study, concentrating on counties which are known to have high rates of USDA program participation. For example, Alfalfa County is known to have a high quantity of wheat acres and cotton acreage is abundant in Tillman County.

Additionally, data problems associated with timing could

be addressed. Swampbuster was passed in 1985, yet data was not available on farm sales prior to this date. Therefore, this study was unable to determine whether the regulation had impacted land sales at that point. Although, it can be argued that the receipt of the letter confirming the wetland determination is the real point at which the landowner "feels" the restriction. Still, most determinations were conducted in 1990 to 1991 and the majority of the data for land sales was prior to these dates. Adding data beyond 1991 might aid in broadening and balancing the data base to draw conclusions about regulatory impacts on agricultural land values. Finally, a future study may need to wait until wetland determinations are completed in order to include all possible cropland areas with wetlands.

Ultimately, the impact of wetlands regulations will depend on decisions made by congress and by federal agencies regarding wetland definitions and jurisdictional roles. The Federal Manual for Identifying and Delineating Jurisdictional Wetlands is currently under revision. The new revisions may help to clarify the definition of wetland areas, but it will not address confusion as to the enforcement procedures of wetland regulations. This must be addressed in order to adequately research wetland regulatory impacts on land values.

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APPENDICES

APPENDIX A

SET ASIDE PERCENTAGES AND TARGET PRICES

TABLE IV

SET ASIDE PERCENTAGES AND TARGET PRICES FOR CROPS IN KINGFISHER AND WAGONER COUNTIES

CROP	YEAR	SET ASIDE	TARGET PRICE
BARLEY	1984	10	2.60
	1985	10	2.60
	1986	17.5	2.60
	1987	20	2.60
	1988	20	2.51
	1989	10	2.43
	1990	10	2.36
	1991	7.5	2.36
CORN	1984	10	3.03
	1985	10	3.03
	1986	17.5	3.03
	1987	20	3.03
	1988	20	2.93
	1989	10	2.84
	1990	10	2.75
	1991	7.5	2.75
OATS	1984	10	1.90*
	1985	10	1.75*
	1986	17.5	1.60
	1987	20	1.75*
	1988	5	2.10*
	1989	5	2.10*
	1990	5	1.77*
	1991	0	1.55*

(Continued)

CROP	YEAR	SET ASIDE	TARGET PRICE
SORGHUM	1984	10	4.27*
	1985	10	3.46*
	1986	17.5	2.88
	1987	20	2.88
	1988	20	4.83*
	1989	10	3.84*
	1990	10	3.81*
	1991	7.5	3.96*
WHEAT	1984	20	4.38
	1985	20	4.38
	1986	22.5	4.38
	1987	27.5	4.38
	1988	27.5	4.23
	1989	10	4.10
	1990	5	4.00
	1991	15	4.00

* Used the largest of the target price or local average market price. In this case, the market price for the crop was higher.

APPENDIX B

PRICE INDICES

TABLE V

PRICE INDICES

YEAR	GROSS DOMESTIC PRODUCT*	FARM RECEIPTS**
1984	0.773	
1985	0.801	
1986	0.823	1.42
1987	0.849	7.14
1988	0.882	9.99
1989	0.921	17.1
1990	0.961	6.51
1991	1.0	7.44

* price deflator used to deflate farmland prices
** the percent change in total farm receipts from year two years to the year one year prior to the sale. For example, the 1986 percent change represents the percent change in farm receipts from 1984 to 1985

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