

## **The United States (US) Experience in Controlling Erosion: the Involvement of Government, Rural Vs. Urban Controls and the Blurring of Those Differences**

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**Abstract:** The United States (US) history and concern for erosion and its consequences is an interesting public policy study. Starting with the nation's settlement and founding in the 1700's, there is documentation that demonstrates our earliest settlers were aware of the problems caused by erosion as man disturbed the soil, and were interested in doing something to reduce it. With the advent of The War Between the States in 1861, there were documented cases of rivers and streams choked with sediment from poorly managed agricultural lands. With what looked to be unlimited land resources, it was common for farmers of that day to simply pick up their belongings and move west to new land when their original farms "wore out." The War also delayed the nation's attention to erosion as a problem. Soon however, as the nation became more populated coast-to-coast, that was no longer an option.

The great Plains "Dust Bowl" period in the 1930's, accompanied by the US Great Depression, became an opportunity for the Franklin D. Roosevelt Administration to deal with both unemployment and a natural resource problem. The federal Soil Erosion Service (SES) was established in the Department of Interior in 1933. The SES became the Soil Conservation Service (SCS) and was moved to the Department of Agriculture in 1935. In that same 1930's period, the states were passing legislation establishing the nation's first special purpose districts with erosion control as their principal mission. These Soil Conservation Districts (SCD's), in partnership with the natural resource agencies in each state and the federal SCS, became the "three-legged stool" which has successfully attacked erosion in much of the US.

In the 1970's, the US became concerned with accelerated erosion from construction sites in rapidly expanding metropolitan areas. In addition to the normal problems of dealing with unwanted sediment, degraded water quality was also now recognized as a problem. How the US chose to deal with urban erosion is the second part of this story. The lines separating agricultural and urban erosion are being blurred at a rapid rate.

In addition to exploring US erosion control history, this paper will mention common land management practices, their development, use, and effectiveness. From simple land management practices such as crop rotation, to cultivating on the contour, planting alternate contour strips, designing and installing grassed waterways and diversions, to using man-made geotextiles, the technology of erosion control has changed. The US experience should be of interest to other nations as they attempt to deal with the erosion challenge. The International Erosion Control Association (IECA) plays a vital role in serving as a global resource for erosion control information.

### **1 Introduction**

The United States (US) modern experience with erosion prevention and control legislation is an interesting study. While it may not always be stated as an objective of US erosion control legislation, the

idea of “sustainable development” has been closely connected. The relationship between humans and the natural world is changing, and with it the notions of our duties, obligations, and responsibilities with regard to the environment. (1) Borrowing Russell Peterson’s term, we speak of an “Earth Ethic” that commits us to preserving our biosphere while enhancing our present and future quality of life. (2) Our objective must be sustainable development. Part philosophy, part practical guidance, the notion of sustainable development provides a thoughtful blueprint for us all, and particularly for those engaged in public service, which in one manner of speaking, we all are. No development should occur that causes irreparable environmental degradation; for over the long run such activity can neither improve nor even maintain quality of life.

Simply put, sustainable development means meeting “the needs of the present without compromising our ability to meet those of the future.” (3) Long range planning is necessary. Nothing we do should mortgage the hopes and welfare of future generations. The challenge is enormous. Means must be found to improve the quality of human existence without harming fragile ecosystems. The people of the US care deeply about the environment, and they relate to the idea of living in harmony with it. The environmental movement is one of the largest social movements of the late 20th century. Those of us in the erosion control industry should believe we are among the first of the modern day “environmentalists.” Our world was created to work in a unified whole. There is a “proper ecological balance”, but it is not precise or absolute. Everything works together, and if one “part” gets too far out of balance, it upsets the system. We must be concerned about and protect the earth for the sake of man. (4) Our erosion control interest represents one way in which we can help preserve and protect the earth’s natural resources on which we depend. This idea is at the heart of the various pieces of US legislation that we will examine.

No consideration of US erosion and sediment control legislation can ignore the role of government. The appropriate distribution of powers between the states and the federal government has been a point of contention ever since the US gained its independence. In all likelihood, disputes will continue. Our representative constitutional form of government sought to strictly control the powers of the federal government, while delegating more power to the states. It hasn’t seemed to always work that way. Tracing some of the legislative history of US erosion and sediment control legislation will further an emerging public debate about the differences between environmental legislation in other countries and the US. Thus, our examination will focus on federal, state, and local legislation, all of which are important.

## **2 Federal rural, agricultural, erosion control**

US Concern with water and forest conservation emerged in the late nineteenth century and evolved steadily throughout the first half of the twentieth, but interest in soil conservation or erosion control developed at a later time. In the 1920’s a number of writers warned of the severe long-term problems confronting the nation because of the persistent erosion of productive croplands. Soil that had taken thousands of years to build up now was being lost by destructive farming practices. (5) The future food supply was seriously threatened. (6) These claims could be documented impressively. The amount of soil loss from the nations croplands reached millions of tons a year. During the 1930’s, examples of soil erosion by water were augmented by the even more dramatic case of wind erosion in the “Dust Bowl” of the Great Plains (the Great Plains area of the US is generally considered to be parts of North Dakota, South Dakota, Montana, Colorado, Wyoming, Nebraska, Kansas, Oklahoma, New Mexico and Texas). Crops withered and died. The dust swirled high into the air, creating huge clouds of air-borne soil that blackened the sky and generated dust storms that traveled hundreds of miles, mute testimony to the rest of the nation as to the effects of poor farming practices. (7)

Hugh Hammond Bennett played the role of prophet and politician for soil conservation and erosion control in the US, much as Gifford Pinchot had for forestry. He advocated a program to educate farmers and persuade them to change their methods. He had an ability to use images, visual and verbal, to promote erosion control. One specific instance is worth mentioning. (8) In this case nature supplied the visual effects. In the mid-1930’s during the early spring, it was not uncommon for one of the dust storms from the Dust Bowl region to be swept into the atmosphere and carried all the way out to the Atlantic seaboard. In 1935, Congressional converts to the erosion control idea had introduced a bill declaring soil

erosion a national menace and establishing a permanent Soil Conservation Service (SCS). (9) The SCS was renamed the Natural Resources Conservation Service (NRCS) in 1994. As these bills were making their way through Congress, Bennett was testifying before the Senate Public Lands Committee on his proposed agricultural erosion control legislation (The Soil Conservation Act, Public Law 74—46, enacted April 27th, 1935). He was also being informed that one of the dust storms had started eastward. He hoped that it might prove useful in the hearing. Here is his version of that story. (8)

“The hearing was dragging a little. I think that some of the Senators were sprinkling a few grains of salt on the tail of some of my astronomical figures relating to soil losses by erosion. At any rate, I recall wishing rather intensely at the time, that the dust storm then reported on its way eastward, would arrive. I had followed the progress of the big duster from its origin in northeastern New Mexico, on into the Ohio Valley, and had every reason to believe it would eventually reach Washington.

“It did - in sun darkening proportions - and at about the right time for the proposed legislation.

“When it arrived, while the hearing was still on, we took a little time off the record, moved from the great mahogany table to the windows of the Senate Office Building for a look. Everything went nicely thereafter.”

This little story tells how US legislation can be influenced by events and people.

## **2.1 The soil conservation act of 1935 (public law 74—46)**

Soil erosion as a menace to agriculture in the US received national recognition when Congress adopted the Buchanan Amendment to the Agricultural Appropriations Bill for 1930. (10) That amendment provided funding in the amount of \$160,000, to be used by the Secretary of Agriculture in conducting soil erosion investigations. On September, 19, 1933, the Soil Erosion Service (SES) was established without formal departmental order, as a temporary agency of the US Department of Interior, to carry out provisions of the National Industrial Recovery Act relating to soil erosion prevention.

Twenty-two Emergency Conservation Work Camps (ECWC) had been assigned to work under the technical direction of the SES on April 1, 1934. Much of their work was erosion control on agricultural lands. The SES was transferred to the US Department of Agriculture on March 23, 1935. After passage of the Soil Conservation Act of 1935, the SES became the Soil Conservation Service (SCS).

As we have just learned, the modern US interest in erosion and sediment control legislation started in the agricultural and rural parts of the country, and can be traced to the federal Soil Conservation Act of 1935 (Public Law 74—46, enacted April 27th, 1935). (9) That act created the United States Department of Agriculture’s Soil Conservation Service (SCS) for the purpose of the development of a continuing program of soil and water conservation. Thus, the SCS originally was the federal government’s first permanent “erosion control” agency.

It is worth looking at the intent of the Congress with the passage of the Soil Conservation Act of 1935. The introduction reads... “That it is hereby recognized that the wastage of soil and moisture resources on farm, grazing, and forest lands of the Nation, resulting from soil erosion, is a menace to the national welfare and that it is hereby declared to be the policy of Congress to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs, and maintain the navigability of rivers and harbors, protect public health, public lands, and relieve unemployment, and the Secretary of Agriculture, from now on, shall coordinate and direct all activities with relation to soil erosion, ...”

This act authorized the SCS to:

- make agreements to furnish technical or financial assistance to any agency or person. subject to the conditions needed for the purpose of the act;
- conduct investigations relating to the character of soil erosion and needed prevention measures, and carry out such measures on private or public land.

The prevention measures included, but were not limited to, engineering operations, methods of cultivation, growing of vegetation, and changes in the use of land.

Because of the rapid succession of new legislation, new USDA assignments, and a workload that continued to accelerate, SCS moved from an erosion control agency to one with many programs and functions. The erosion control function remains as one of its most important, however.

## 2.2 The watershed protection and flood prevention act (Public Law 83—566)

Another piece of USDA legislation that is important in this context, is the Watershed Protection and Flood Prevention Act, Public Law 83—566, enacted August 4, 1954. (11) This is commonly called the Small Watershed Program. Again it is helpful to look at the intent of the Congress with the passage of this act. They said... “That erosion, floodwater, and sediment damages in the watersheds of the rivers and streams of the United States, causing loss of life and damage to property, constitute a menace to the national welfare; and it is the sense of the congress that the federal government should cooperate with the States and their political subdivisions, soil or water conservation districts, flood prevention or control districts, and other local public agencies for the purpose of preventing such damages, of furthering the conservation, development, utilization, and disposal of water, and the conservation and utilization of land and thereby of preserving, protecting, and improving the Nation’s land and water resources and the quality of the environment.”

A key concept with this Small Watershed Program is the “watershed protection” component, the idea of keeping the raindrops as close to where they fall as possible with erosion control measures. Even before the planners take a look at structural solutions to problems being studied, they are supposed to address the upland, erosion control problems.

The watershed as the logical unit for dealing with natural resource problems including erosion in the U.S., has long been recognized. The genesis of ideas about US watershed management or protection as it related to erosion, runoff, sedimentation, and a number of other environmental issues also goes back to the origins of the SCS. (12) We saw earlier how Hugh Hammond Bennett became convinced that soil erosion was a threat to future food productivity, and determined that he would work for a national program to correct the problem. When “Black Sunday” occurred on April 14th, 1935, Bennett’s work took on new meaning, and his efforts came into sharper focus. Bennett decided to concentrate on watersheds near the US erosion experiment stations, where he might use the results of research. The significant lesson is that from the beginning, the early US soil conservationists or erosion control specialists were concerned about the cumulative effects of erosion control on the entire watershed.

## 3 Federal encouragement of conservation districts

It was mentioned earlier that the SCS was the federal governments first “erosion control” agency. One of the ways that SCS did its job, was to operate “erosion control demonstration projects.” The federal government, through the SCS, would buy, lease, or otherwise acquire control over considerable farm acreage on which soil erosion was a serious problem. Then, the SCS would develop a complete erosion control plan for that acreage, and install that plan on the ground. Other farmers in the area were encouraged to come to this demonstration project and learn how to install erosion control measures on their own farms. It was soon apparent to some key USDA officials, that as beneficial as the demonstration projects were, the US would never be able to control erosion on millions of farms, in at that time 48 states, out of Washington, DC. More local involvement and interest was needed. In about the spring of 1935, Assistant Secretary of Agriculture M.L. Wilson assisted by Phillip M. Glick, started developing model legislation that could be offered to the states for their consideration that would establish state conservation or erosion control districts. These conservation districts were modeled after “conservancy districts”, a local unit of state government such as county or a city, established by state statute, with responsibility for water management activities. (14)

In the US, the Federal Government does not have the authority to regulate private land use. The Federal Government does not have authority to establish local units of government. The states can establish local units of government, but the Congress of the US cannot. Consequently, Wilson and Glick developed model conservation district legislation that they hoped states would adopt. The conservation district would be the local “erosion control” unit of government, and could work in partnership with state and federal agencies in addressing erosion control problems. The districts are supervised by locally elected directors (occasionally there will be a mix of appointed and elected directors), and have broad authority to plan and execute erosion control projects. Over time, all the states have adopted some form of conservation district legislation; consequently there are conservation districts in every state and

territory. These conservation districts have become the focal point for rural conservation activities, including water quality, and are particularly important at the urban-rural interface.

#### **4 Federal urban erosion control**

US Environmental concerns were rooted in the vast social changes that took place after World War II. Although some beginnings can be identified in earlier years, only after the war did they become widely shared social phenomena. (5) Evolving environmental values were closely associated with rising standards of living and levels of education. These changed markedly after the war. The US experienced the transition from an older stress on efficient development and use of natural resources such as soils, water and forests, known as the conservation movement, which took place in the first four decades of the twentieth century. The transition was to an environmental movement. Conservation gave way to environment after World War II amid a rising interest in the quality of life beyond efficiency in production. The two tendencies often came into conflict as resources long thought of as important for their material commodities came to be prized for their aesthetic and amenity uses.

Environmental affairs in US society stems from the circumstances of daily life, not from those shaped by technical specialization. People live and work in different places, and the character of those places is attractive or degraded, healthful or dangerous, acceptable or unacceptable. What is defined as problems arise from these settings and are solved or not in those environments of personal meaning. We can identify the city, the wild lands, and the countryside as three distinct environments from which distinct ideas and actions flow. What the “environment” means to people in one setting, differs considerably from what it means in another.

One of the most durable and pervasive issues of the American constitutional order is the distribution of powers geographically. The federal system affects nearly every policy issue in America, ranging from issues such as national defense and medical care to the management of natural resources, including soil and water. (13) Despite the secular trend in the twentieth century toward an increasing role for the national government in public policy generally and natural resource policy in particular, recent enactment's with respect to water pollution control and air pollution control clearly demonstrate that resource policy will continue to be a shared responsibility between the national government and the states. Undoubtedly, the national government and the states will continue to sort out their responsibilities through laws and litigation well into the future.

The variability of the state responses to increased but shared responsibilities with respect to natural resources policy is illustrated by the roles they have played with respect to controls of point (generally considered an urban source) and non-point (generally considered agricultural or rural sources) sources of pollution. Non-point sources of pollution were generally divided into these five classes; nutrients, pesticides, salts, animal waste, and sediment. The federal presence is greatest regarding point sources of water pollution, with the US Environmental Protection Agency (EPA) specifying standards, means of achieving them, and time tables, for compliance. With respect to nonpoint sources, the federal presence is considerably less, setting attainment goals but leaving the method and procedures up to the states.

##### **4.1 Federal water pollution control act (public law 92—500)**

The Federal Water Pollution Control Act, also called the Clean Water Act, Public Law 92—500, was enacted in 1972. (15) The objective of this act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The act considered both “point” and “non-point” sources of pollution. Concerning non point sources, which generally are considered as coming from the rural areas, farms and ranches, etc., the act said... “It is the national policy that programs for the control of non-point sources be developed and implemented in an expeditious manner so as to enable the goals of this act to be mew through the control of both point and nonpoint sources of pollution.” The act was much more descriptive in its treatment of point sources.

Point sources are generally thought of as those that can be clearly shown as coming from a “point.” In many cases that point is a pipe or culvert that drains waste from storm or sanitary sewers, commercial and industrial plants, etc. If that point source drains directly into a stream or other water body, and is

contaminated, it can do tremendous harm to the water body. Rather than allow contaminated waste to drain directly into water bodies, the act encouraged it to be treated at treatment plants. The act established the following policies. It declared it to be the national goal that discharge of pollutants into the navigable waters be eliminated by 1985. It also declared that it be the national policy that area-wide treatment management planning processes be developed and implemented to assure adequate control of sources of pollutants in each state. It also established that a major research and demonstration effort be made to develop technology necessary to eliminate the discharge of pollutants into the navigable waters and the oceans.

As the states and the federal government paid more attention to water quality, and as sediment became identified as a “class” of pollutant, urban erosion control gained much more attention. While sediment by itself can do much damage by filling up reservoirs and ponds, silting up of navigation and other channels, damaging recreation areas, etc., the poisons that can attach to sediment is also recognized as a public health concern. (15) The Clean Water Act influenced many states to either strengthen or pass for the first time, stormwater management and sediment control legislation. This legislation addresses other than rural sediment control, usually concentrating on housing developments, highway construction, shopping centers, etc. Over the years, the interface between rural and urban area has become blurred, and erosion control practices are no longer thought to apply to only one situation. Practices used in rural areas are usually those that are the least costly to apply.

## **5 State and local erosion and sediment control legislation**

Generally speaking, as the US states addressed sediment control legislation, they have tended to approach it from two different perspectives. Some states are very “prescriptive” in the sense that they tell a developer quite specifically what they must do in a specific circumstance. Other states have chosen the path of being more “performance based”, wherein they set the standards, and it is up to the developer to meet them using methods of their choosing. Many subdivisions of state government, namely cities and towns, have also passed erosion and sediment control legislation pertinent to their jurisdiction. Most of them were influenced by federal or state legislation in existence.

## **6 Considering erosion and sediment control as a profession**

There are many reasons why the notion of specialists in erosion and sediment control should be recognized as professionals (16). Today’s complex use of our natural resources demands professionals with many skills. No single science, discipline or interest can claim exclusive expertise in erosion and sediment control. To be a fully competent practitioner, one must have some background in soils, plant science, civil and agricultural engineering, geology, hydraulics and hydrology, environmental sciences, etc. Rarely does one possess all those skills without some training and experience gained by working in the field with others. In the US, no college or university grants undergraduate degrees in erosion and sediment control. IECA is working with some major universities that could move in that direction. In the meantime, some states have already recognized the need for professional recognition, and have enacted state legislation to provide it. The IECA has been a co-sponsor of this program of Certified Professionals in Erosion and Sediment Control (CPESC’s) since 1992. There are CPESC’s in the PRC.

## **7 Legislative effects on soil erosion**

Questions arise frequently from the press, Congress, and the public about the results of the erosion and sediment control programs begun in the US in the 1930’s. Essentially, the inquirers want to know whether the public funds expended on research, the technical assistance provided by various levels of government, and the financial assistance provided in the implementation of erosion control practices, have decreased erosion rates and otherwise led to environmental improvements.

Recently, the federal government through the USDA has been systematically collecting data that allows for comparisons of erosion rates over time. Most of the information relates to rural, agricultural

erosion. Urban erosion caused by development, road construction, etc., is less well documented. There may be project by project information available from various jurisdictions.

The USDA studies are based on historical research and statistical analysis, and compare erosion rates between 1930 and 1992. For this paper it was not feasible to make a comparison for the whole country, so we will concentrate on the Driftless Area of the Northern Mississippi Valley. (17) It is an 18.9 thousand square-mile (48.8 thousand square kilometer) region including all or part of 28 counties, six counties in northeastern Iowa, six counties in southeastern Minnesota, 15 counties in southwestern Wisconsin, and a single county in northwestern Illinois. The results indicate a change from the 1930 rates of 14.9 tons per acre per year (36.8 tons per hectare per year), to a 1992 rate of 6.3 tons per acre per year (15.6 tons per hectare per year), a 58 percent decrease. The practices installed also enhanced many other resources and values such as wildlife, water quality, and aesthetic and recreational qualities, but no effort was made to quantify those contributions. No claims should be made that this result approximates erosion rate reductions nationwide. The US is too diverse to make such claims. The study does correct sweeping generalizations that have attempted to say that soil erosion has worsened since the Dust Bowl days of sixty years ago.

## 8 Conclusion

The United States has an interesting history of erosion control legislation. This paper has only scratched the surface. Much of the technology and practice standards and specifications in use throughout the U.S. had their start in the agricultural erosion control work initiated by the federal government in the 1930's. That was also when the notion of looking at the complex interactions of natural, agricultural systems on the entire watershed was developed. The growth of the concern, as urban dwellers became more interested in water quality, has served to advance the state of technology of erosion control materials used when massive land disturbing activities take place. In the final analysis the US has made the issue of erosion and sediment control a national priority. There can be no more important priority than ensuring that our nation's precious soil and water resources are protected and preserved for future generations. It also is clear that the erosion control work in the US has been effective and produced many environmental benefits.

Let me close with a thought expressed by Aldo Leopold in "A Sand County Almanac." (18) Leopold said, "A system of conservation based solely on economic self-interest is hopelessly lopsided. It tends to ignore, and thus eventually to eliminate many elements in the land community that lack commercial value, but that are essential to its healthy functioning. It assumes, falsely I think, that the economic parts of the biotic clock will function without the uneconomic parts. It tends to relegate to government many functions eventually too large, or too complex, or too widely dispersed to be performed by government. An ethical obligation on the part of the private owner is the only visible remedy for these situations."

A wise person once said "we don't inherit the earth from our parents; we borrow it from our children." By being active in the erosion control industry we are all part of the resource protection solution. This is a profession of which we can be proud!

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