Wetlands
LOSSES IN THE UNITED STATES
1780's TO 1980's

Principal Author
Thomas E. Dahl
U.S. Fish and Wildlife Service
National Wetlands Inventory
St. Petersburg, Florida

Technical Assistance and Background Data Assembled by
U.S. Fish and Wildlife Service
National Wetlands Inventory Group
St. Petersburg, Florida

Branch of Special Projects
Washington, DC

This report should be cited as follows:

Dahl, T.E. 1990. *Wetlands losses in the United States 1780's to 1980's*. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 21 pp.

PREFACE

Wetlands are disappearing at a rapid rate. Although measures are actively being sought to stem wetland losses and restore wetland acreage, the rate of wetland conversion over the years has been dramatic.

This is the first of two reports to Congress on the status of wetland resources in the United States. This report, a one-time effort, focuses on documenting historical wetland losses that occurred from colonial times through the 1980's. It is a compilation of existing data from a variety of sources. The second report will update the information contained in *Status and Trends of Wetlands and Deepwater Habitats in the Conterminous United States*. The study effort for the second report will generate new information based on a statistical analysis of wetland changes from the 1970's to the 1980's. The status and trends report will be updated every ten years as required by the Emergency Wetlands Resources Act of 1986.

This report is the product of the Fish and Wildlife Service, National Wetlands Inventory. Special appreciation is extended to Constance Harriman, Assistant Secretary, Fish and Wildlife and Parks; John Turner, Director, Fish and Wildlife Service; Maryanne Bach, Chief, Office of Program Analysis; and Bill O. Wilen, Project Leader, National Wetlands Inventory.

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EXECUTIVE SUMMARY

In 1989, the Congress directed the Secretary of the Interior to assess the estimated total number of wetland acres as of the 1780's and the 1980's in the areas that now comprise each state. Congress also required an assessment of the estimated percentage of loss of wetlands in each state during this 200-year timespan. This report has been prepared to fulfill those requirements.

In compiling the information in this report, an attempt has been made to present the most reliable data on wetland acreage. Information has been taken from a variety of sources and different types of data sets to generate these acreage estimates. The user is encouraged to refer to the source materials presented documenting acreage estimates for the timeframes for each state.

At the time of Colonial America, the area that now constitutes the 50 United States contained an estimated 392 million acres of wetlands. Of this total, 221 million acres were located in the lower 48 states. Another 170 million acres occurred in Alaska. Hawaii contained an estimated 59,000 acres.

Over a period of 200 years, the lower 48 states lost an estimated 53 percent of their original wetlands. Alaska has lost a fraction of one percent while Hawaii has lost an estimated 12 percent of its original wetland areas. On average, this means that the lower 48 states have lost over 60 acres of wetlands for every hour between the 1780's and the 1980's.

The data presented in this report indicate that 22 states have lost 50 percent or more of their original wetlands. California has lost the largest percentage of original wetlands within the state (91%). Florida has lost the most acreage (9.3 million acres). The data presented in this report should be interpreted in context. The estimated percent of wetlands loss for an individual state must be examined in context to the total estimated surface acreage of the state, the 1780's total estimated wetland acreage of the state, and the current 1980's estimated wetland acreage. For instance, the State of California has a total surface area of approximately 101 million acres and it is estimated that in the 1780's California had 5 million acres of wetlands, or approximately 5 percent of California's total acreage was considered wetlands. It is now estimated that California has less than 500,000 wetland acres remaining. This estimate represents a wetlands loss of 91 percent of the 1780's estimated acreage, but also means that currently less than one-half of 1 percent of California's total acreage is wetlands.

Wetland acreage data, by state, has been tabulated for the 200-year timespan.

INTRODUCTION

Throughout the United States, a wide variety of wetland types exist ranging from permafrost underlain wetlands in Alaska to tropical rain forests in Hawaii to riparian wetlands in the arid southwest. Although wetlands occur in every state in the Nation, they vary in size, shape, and type because of differing climate, vegetation, soils, and hydrologic conditions.

Since the time of Colonial America, wetlands have been regarded as a hindrance to productive land use. Swamplands, bogs, sloughs, and other wetland areas were considered wastelands to be drained, filled, or manipulated to "produce" other than natural services or commodities.[1] Recently we have begun to recognize that wetlands are vital areas that constitute a productive and invaluable public resource. Wetlands are important for providing fish and wildlife habitats; for maintaining ground water supplies and water quality; for protecting shorelines from erosion; for storing floodwaters and trapping sediments that can pollute waterways; and for modifying climatic changes.

Because the values of wetlands and their overall environmental importance have been only recently recognized, the United States has a 200-year history of wetland conversion. Collectively, wetland losses have diminished the quality of our natural resource base to the point where we must carefully balance our economic, social, and environmental goals. The issue of how much wetland acreage has been lost in the United States has led to heated debates about limiting alteration of natural resources.[2] Overstatements or misrepresentations of the remaining wetland acreage are usually the result of emotional arguments rather than factual data. This report and other forthcoming reports prepared by the Department of the Interior will provide the needed information on the acreage status of our Nation's wetlands.

FOCUS OF THE REPORT

Section 401(a) of the Emergency Wetlands Resources Act of 1986 [16 U.S.C. 3931(a)] was amended by section 18 of the North American Wetlands Conservation Act of 1989 (P.L. 101-233). The amendment requires the following:

(A) an assessment of the estimated total number of acres of wetland habitat as of the 1780's in the areas that now comprise each state; and

(B) an assessment of the estimated total number of acres of wetlands in each state as of the 1980's, and the percentage of loss of wet lands in each state between 1780's and the 1980's.

The information presented in this report fulfills those requirements. Data on acres of wetland habitat as of the 1780's, total number of acres of wetlands in each state as of the 1980's, and the percent of wetlands lost have been estimated. This information is in a tabular format to give a factual, quantitative measure of the acreage losses sustained during the 200-year timeframe.

ESTIMATING WETLAND LOSSES

It is difficult to make accurate estimates of wetland acreage during colonial times. Two problems make it difficult to utilize original acreage surveys or land use reports: (1) Quantitative information on wetlands is not available from early engineer-

FIGURE 1: GEOGRAPHICAL CONFIGURATION OF COLONIAL AMERICA IN 1775
(Adapted from Stoll 1970[3])

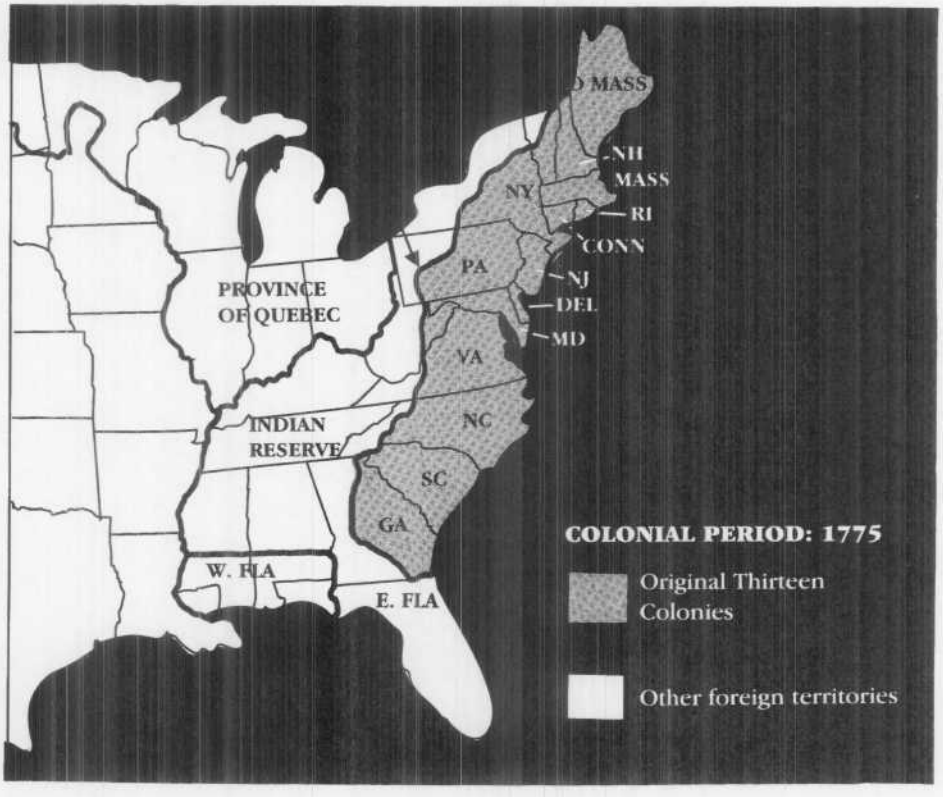
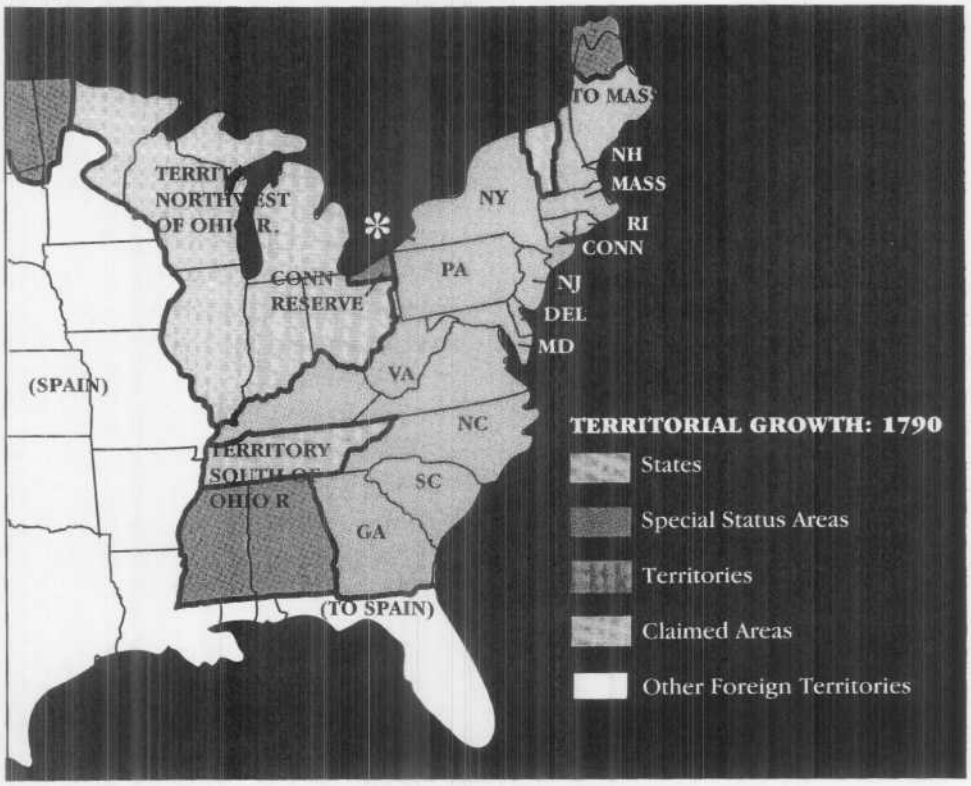


FIGURE 2: STATE BOUNDARIES AND TERRITORIAL EXPANSION CIRCA 1790

(Adapted from Stoll 1970[3])



*Erie triangle ceded by New York to U.S. 1781;sold to Pennsylvania in 1792

East and West Florida retroceded by Great Britain 1n 1783

Vermont extralegally self governing 1777- 1791

ing or reconnaissance survey reports. In many instances these reports contain narrative descriptions of landscapes only; (2) Political boundaries and in some instances, geographical boundaries have changed dramatically since the 1780's. Six of the thirteen original colonies do not occupy the same land area now as states that they once did as colonies.[3] In several instances, these changes are significant, resulting in large land blocks shifting between states or forming new states (*refer to Figures 1 and 2*).

In the 1780's, the present boundaries of the Nation as we know it today were composed of states, state-claimed areas, organized and unorganized territories, and foreign lands. For these reasons historical acreage estimates are based only partially on colonial or state historical records. In addition, land use records tracing conversion of lands by use categories, drainage statistics, and information on the extent of hydric soils (drained and undrained), in combination with historical wetland acreage data, have been used to estimate the original wetland acreage for each state (*refer to Table 1*).

Data on existing (1980's) wetland acreage also must be interpreted with caution. For some states, the wetlands have been mapped for the entire state by the National Wetlands Inventory, and acreage summary reports are available detailing the extent of wetlands. However, for those states where wetlands are not completely mapped or where acreage summaries are not yet compiled, an accurate accounting of wetland acreage is not always available. For some states, there are conflicting data sets reflecting inconsistencies in inventory terminologies or techniques, inadequate inventory data, or simply outdated information. In several cases, published documentation on the extent of wetlands amounts to little more than speculation. In these instances, an effort was made to assess the validity of the information and reconcile acreage statistics with the best national or regional data sets available to determine statewide totals.

Additionally, the current status of wetlands in the United States is constantly changing. It is estimated that, on average, over 60 acres of wetlands have been lost every hour in the lower 48 states

during this 200-year timespan. While some state and Federal agencies are attempting to restore wetlands in certain parts of the country, restoration falls far short of this loss rate. In all instances, data sources for state estimates have been referenced.

SUMMARY OF FINDINGS 1780'S - 1980'S

The land area that now comprises the United States originally contained almost 392 million acres of wetlands (221 million acres in the lower 48 states). Historical estimates of wetland distribution by state indicate that 21 states possessed three million acres or more of wetlands.

Considerable change in wetland distribution and abundance has taken place since the 1780's (*refer to Figures 3 and 4*). In the conterminous United States, an estimated 104 million acres of wetlands remained as of the 1980's. This amounts to a 53-percent loss from the original acreage total. The 50-state total indicates that an estimated 274 million acres remain.

In the 1980's wetlands constitute only 5 percent of the land surface in the lower 48 states; 12 percent if Alaska and Hawaii are included. The State of Alaska has the vast majority of wetland acres. An estimated 170 million acres are believed to exist in Alaska alone. This represents approximately 45 percent of the State's total surface area.

Among the lower 48 states, Florida, Louisiana, Minnesota, and Texas are the 4 states with the greatest wetland acreage. Other states with considerable wetlands include Alabama, Georgia, Maine, Michigan, Mississippi, North Carolina, South Carolina, and Wisconsin.

The data on wetlands lost during this 200-year timespan indicate that the State of Alaska has lost the lowest percentage of its original wetland acreage (estimated less than 1% loss). The states of Hawaii, New Hampshire, and Rhode Island have lost the fewest wetland acres overall, 7,000, 20,000 and 38,000 acres respectively. However, this amounts to a 12-percent loss of wetlands statewide for Hawaii, 9 percent loss for New Hampshire, and a 37-percent loss for Rhode Island.

Ten states—Arkansas, California, Connecticut, Illinois, Indiana, Iowa, Kentucky, Maryland, Missouri, and Ohio—have lost 70 percent or more of their original wetland acreage. Overall, the data indicate that 22 states have lost 50 percent or more of their original wetland areas. The state with the highest percent loss of wetlands is California (an estimated 91 percent loss from the 1780's to the 1980's). Florida has lost approximately 9.3 million acres of wetlands during this 200-year timespan.

With the exception of Alaska, New Hampshire, and Hawaii, no state has lost less than 20 percent of its original wetland acreage.

TABLE 1: WETLAND LOSSES IN THE UNITED STATES 1780'S TO1980'S

STATE	SURFACE AREA (ACRES)[4] LAND	WATER	TOTAL	WETLANDS ESTIMATES OF ORIGINAL WETLANDS CIRCA 1780'S	SOURCE	% OF SURFACE AREA	ESTIMATES OF EXISTING WETLANDS CIRCA 1980'S	SOURCE	% OF SURFACE AREA	% OF WETLANDS LOST
AL	32,544,640	485,120	33,029,760	7,567,600	5	22.9%	3,783,800	5	11.5%	-50%
AZ	72,680,320	221,440	72,901,760	931,000	9	1.3%	600,000	10	0.8%	-36%
AR	33,392,000	594,560	33,986,560	9,848,600	11	29.0%	2,763,600	12	8.1%	-72%
CA	100,183,680	1,379,840	101,563,520	5,000,000	13, 14	4.9%	454,000	15, 16	0.4%	-91%
CO	66,428,800	289,920	66,718,720	2,000,000	17	3.0%	1,000,000	18	1.5%	-50%
CT	3,116,800	88,960	3,205,760	670,000	9	20.9%	172,500	19	5.4%	-74%
DE	1,268,480	48,000	1,316,480	479,785	20	36.4%	223,000	20	16.9%	-54%
FL	34,647,040	2,831,360	37,478,400	20,325,013	21, 22, 23	54.2%	11,038,300	24	29.5%	-46%
GA	37,246,080	434,560	37,680,640	6,843,200	11	18.2%	5,298,200	25	14.1%	-23%
ID	52,906,880	563,200	53,470,080	877,000	9	1.6%	385,700	10	0.7%	-56%
IL	35,761,280	334,720	36,096,000	8,212,000	27	22.8%	1,254,500	28	3.5%	-85%
IN	23,160,960	65,280	23,226,240	5,600,000	29	24.1%	750,633	30	3.2%	-87%
IA	35,867,520	158,080	36,025,600	4,000,000	31, 32	11.1%	421,900	31, 33	1.2%	-89%
KS	52,515,840	133,120	52,648,960	841,000	9	1.6%	435,400	10	0.8%	-48%
KY	25,504,640	348,160	25,852,800	1,566,000	34	6.1%	300,000	35	1.2%	-81%
LA	28,899,200	2,155,520	31,054,720	16,194,500	11	52.1%	8,784,200	36	28.3%	-46%
ME	19,797,120	1,460,480	21,257,600	6,460,000	37	30.4%	5,199,200	38	24.5%	-20%
MD	6,330,240	439,040	6,769,280	1,650,000	11	24.4%	440,000	39	6.5%	-73%
MA	5,013,120	271,360	5,284,480	818,000	37	15.5%	588,486	19	11.1%	-28%
MI	36,363,520	894,720	37,258,240	11,200,000	40	30.1%	5,583,400	10	15.0%	-50%
MN	50,744,960	3,058,560	53,803,520	15,070,000	11	28.0%	8,700,000	41	16.2%	-42%
MS	30,309,120	229,120	30,538,240	9,872,000	42	32.3%	4,067,000	12	13.3%	-59%
MO	44,189,440	409,600	44,599,040	4,844,000	11, 43	10.9%	643,000	44	1.4%	-87%
MT	93,185,920	982,400	94,168,320	1,147,000	9	1.2%	840,300	10	0.9%	-27%
NE	48,974,080	451,200	49,425,280	2,910,500	11	5.9%	1,905,500	10	3.9%	-35%
NV	70,328,960	416,640	70,745,600	487,350	45	0.7%	236,350	46	0.3%	-52%
NH	5,781,120	173,440	5,954,560	220,000	9	3.7%	200,000	47	3.4%	-9%
NJ	4,820,480	194,560	5,015,040	1,500,000	10	29.9%	915,960	48	18.3%	-39%
NM	77,724,800	141,440	77,866,240	720,000	9	0.9%	481,900	10	0.6%	-33%
NY	30,646,160	1,092,480	31,728,640	2,562,000	9, 49	8.1%	1,025,000	49	3.2%	-60%
NC	31,283,200	2,371,840	33,655,040	11,089,500	42	33.0%	5,689,500	12	16.9%	-49%
ND	44,339,200	886,400	45,225,600	4,927,500	50	10.9%	2,490,000	51	5.5%	-49%
OH	26,251,520	130,560	26,382,080	5,000,000	52	19.0%	482,800	10, 52	1.8%	-90%
OK	44,149,760	598,400	44,748,160	2,842,600	53, 54, 55	6.4%	949,700	53, 54, 55	2.1%	-67%
OR	61,573,760	494,080	62,067,840	2,262,000	9	3.6%	1,393,900	10	2.2%	-38%
PA	28,816,000	197,120	29,013,120	1,127,000	56	3.9%	499,014	39, 56	1.7%	-56%
RI	671,360	105,600	776,960	102,690	57	13.2%	65,154	58	8.4%	-37%
SC	19,379,200	496,000	19,875,200	6,414,000	42	32.3%	4,659,000	12	23.4%	-27%
SD	48,611,840	698,240	49,310,080	2,735,100	59	5.5%	1,780,000	51	3.6%	-35%
TN	26,474,240	561,920	27,036,160	1,937,000	42	7.2%	787,000	12	2.9%	-59%
TX	168,300,800	2,796,160	171,096,960	15,999,700	60	9.4%	7,612,412	61	4.4%	-52%
UT	52,723,840	1,622,400	54,346,240	802,000	62	1.5%	558,000	63, 64	1.0%	-30%
VT	5,935,360	214,400	6,149,760	341,000	65	5.5%	220,000	19	3.6%	-35%
VA	25,498,240	624,640	26,122,880	1,849,000	10	7.1%	1,074,613	39, 66	4.1%	-42%
WA	42,664,320	978,560	43,642,880	1,350,000	67	3.1%	938,000	67	2.1%	-31%
WV	15,413,760	62,080	15,475,840	134,000	68	0.9%	102,000	39	0.7%	-24%
WI	34,856,960	1,081,600	35,938,560	9,800,000	69	27.3%	5,331,392	70	14.8%	-46%
WY	62,259,840	405,120	62,664,960	2,000,000	10	3.2%	1,250,000	71	2.0%	-38%
SUBTOTAL (CONTERMINOUS U.S.)	1,899,526,400	34,672,000	1,934,198,400	221,129,638		11%	104,374,314		5%	-53%
ALASKA	362,516,480	12,787,200	375,303,680	170,200,000	6	45.3%	170,000,000	7, 8	45.3%	-0.1%
HAWAII	4,112,000	3,200	4,115,200	58,800	26	1.4%	51,800	16, 26	1.3%	-12%
TOTAL U.S.	2,266,154,880	47,462,400	2,313,617,280	391,388,438			274,426,114		11.9%	-30%

NOTE: Surface area – There are some discrepancies between the total surface area of states. These differences are probably due to shifting river channels forming state borders. The area given is that presented by the U.S. Geological Survey, National Atlas of the United States, 1970.

Wetland distribution and changes vary dramatically within states dependent on both geographical and /or land use patterns.

FIGURE 3: WETLAND DISTRIBUTION CIRCA 1780'S

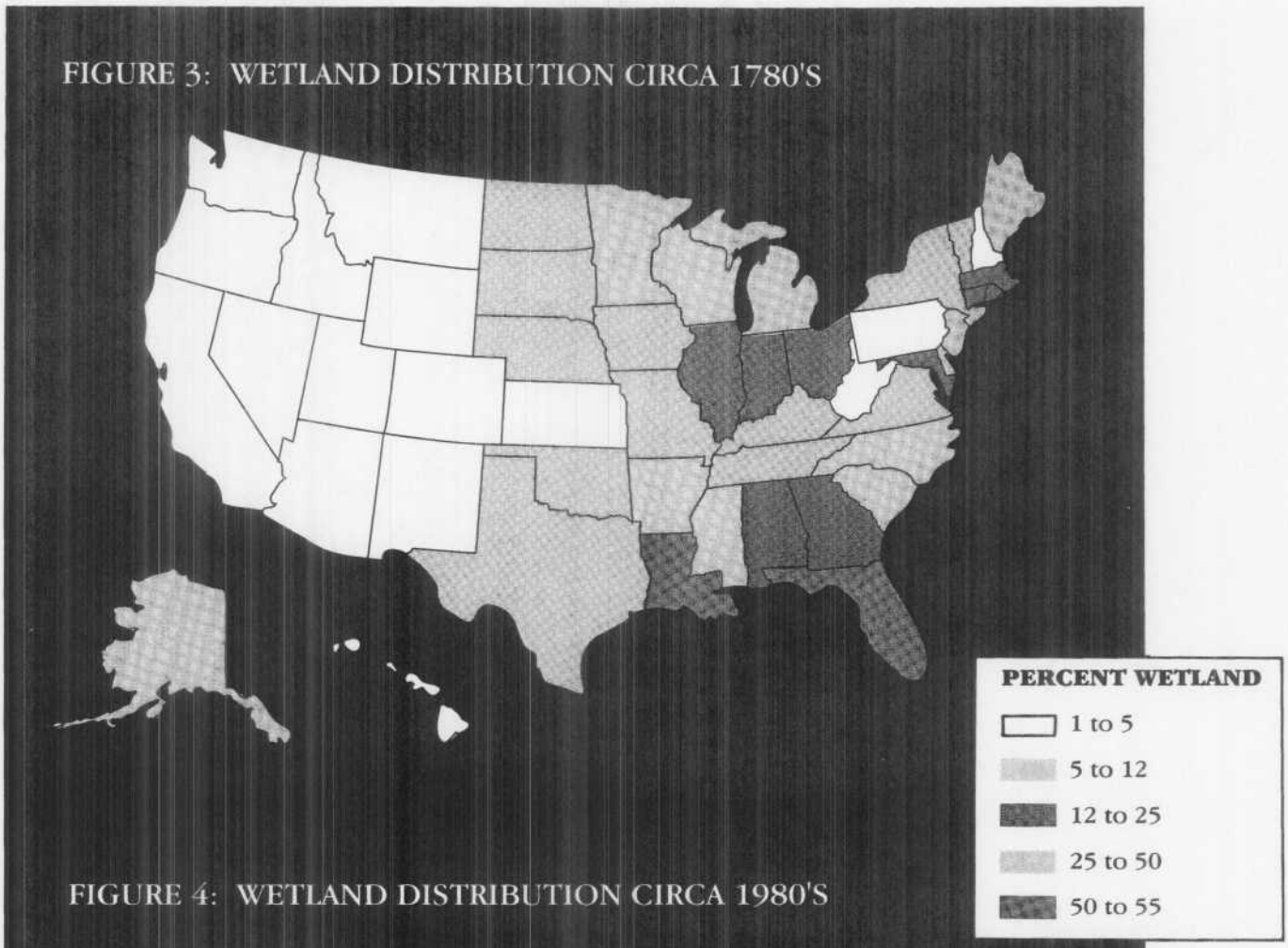


FIGURE 4: WETLAND DISTRIBUTION CIRCA 1980'S

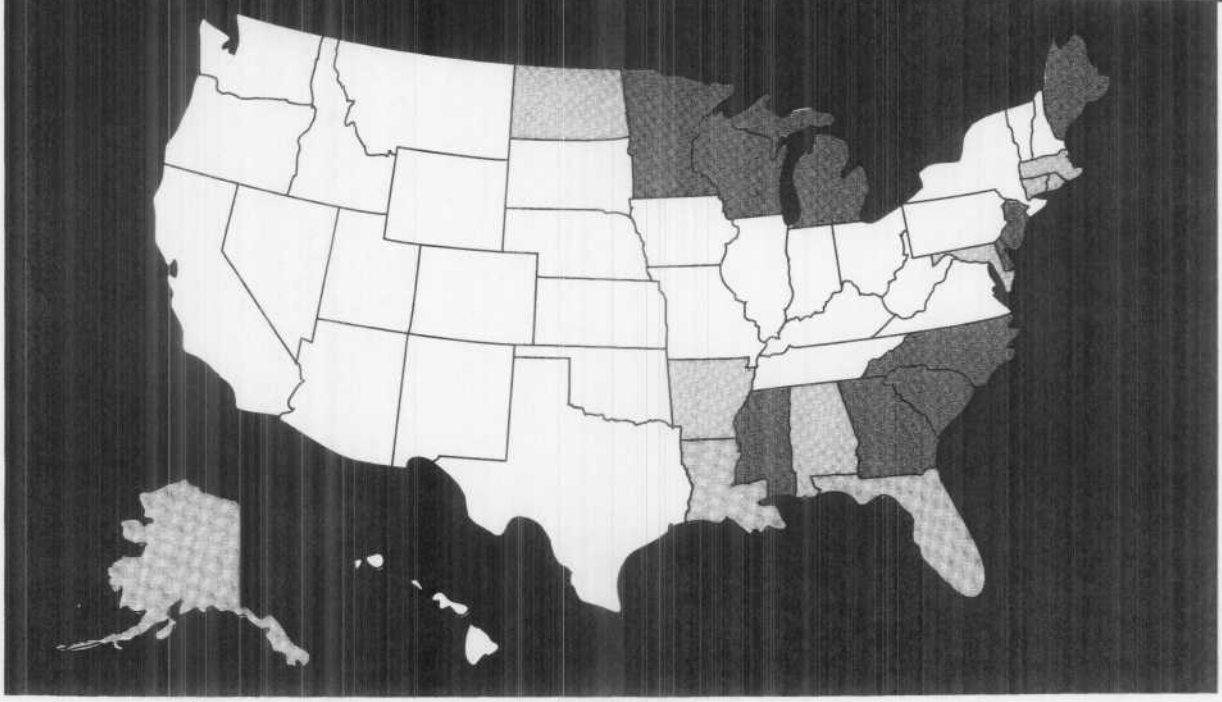


TABLE 2
ORIGINAL WETLAND ACREAGE ESTIMATES
Comparison of Various Data Sets

	Millions of Acres	Percent Difference *(this study)*
Roe and Ayers, 1954	215*	-3
Aquatic suborder soils (hydric) Soil Taxonomy, 1975	211 165 (AK)	-5
USDA Economic Research Service	217	-2
USDA Economic Research Service, 1987 *(agricultural drainage plus remaining wetlands)*	109 drained 104 remaining 213Total	-4
This study *(Table on Wetland Losses in the United States)*	221 170 (AK)	

* Figures are for the conterminous 48 states and do not include Alaska unless stated.

CORRELATION WITH OTHER DATA SETS

There appears to be close agreement between the data tabulated in this report and other data from sources that have been used to estimate original or existing wetland acreage. The total wetland acreage reported here for the 1980's is comparable with the findings of Frayer et al.[72] given the statistical range of variability. (Frayer et al. estimated 99 million acres existed as of the mid-1970's in the conterminous U.S. ± 6.4%). Because the techniques for determining acreage totals for the various estimates are very different, it is useful to draw comparisons to other national data sets on wetlands.

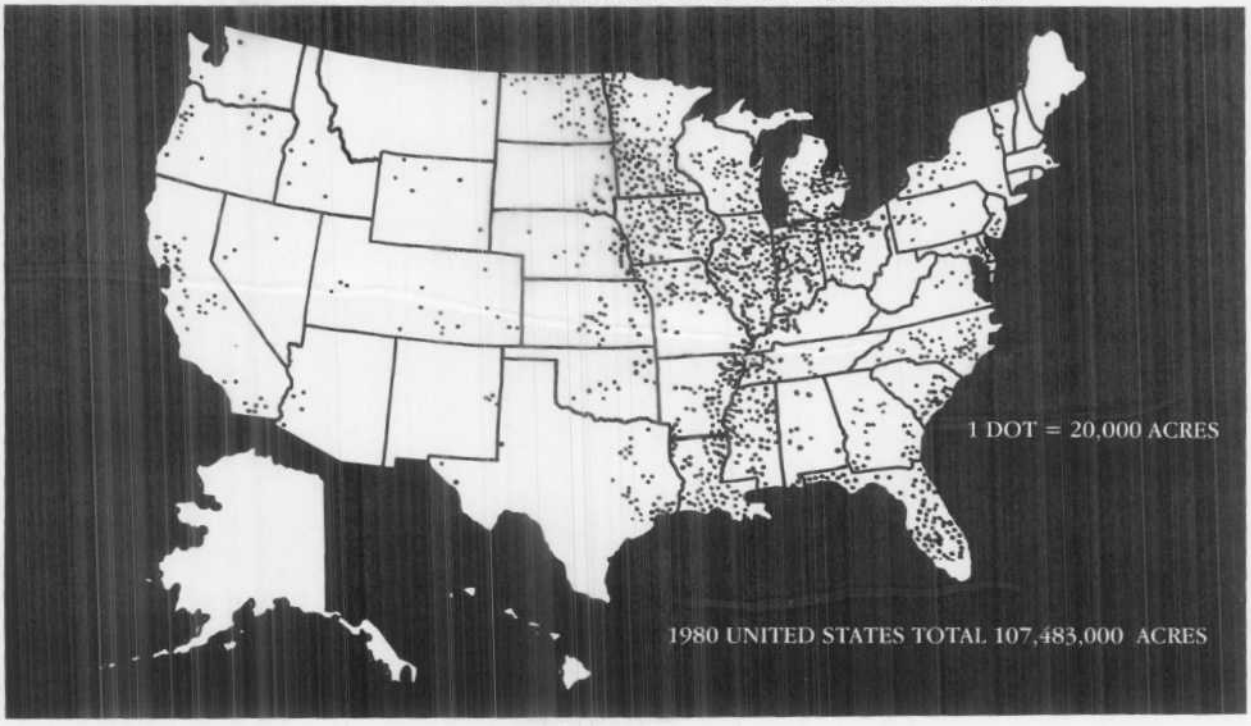
ESTIMATES OF ORIGINAL WETLAND ACREAGE

Estimates of original wetland acreage have been made by a variety of researchers and agencies (*refer to Table 2*). There are four sources that have produced viable acreage information that can be used to approximate wetlands as they existed at the time of settlement in the lower 48 states. In 1954, Roe and Ayres[73] conducted an analysis of land already drained and potential land drainage needed to put the maximum area into agricultural production. They estimated that an area of 215 million acres or 24 percent of all potential agricultural land in the lower 48 states would require drainage for optimum crop production. This figure has been used as an original wetlands estimate in several national reports.[74,75,76]

Hydric soils data have also been used in some instances to approximate wetland acreage. Hydric soils are those soils described by the Soil Conservation Service that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part. Under normal circumstances, these soils support wetland vegetation and can be used as an indicator of wetlands.[77] The National Technical Committee for Hydric Soils has developed criteria to identify hydric soil series and has produced a list of soils within the United States that are hydric. The publication *Soil Taxonomy*[78] lists soil

FIGURE 5: EXTENT AND LOCATION OF ARTIFICIALLY DRAINED AGRICULTURAL LAND IN THE UNITED STATES, 1985

(Courtesy of U.S. Department of Agriculture Economic Research Service.) Frayer et al. estimated that 87 percent of the wetland losses from the mid-1950's to the mid-1970's were due to agricultural conversion.[72]



acreage estimates for the United States. Because soil characteristics change slowly, even following drainage, summation of the soil acreages indicative of wetland conditions should approximate the wetland acreage that existed at the time of settlement. Summing the acreage estimates of soils with aquic suborders* results in a total for the lower 48 states of 211 million acres. There are an additional 165 million acres of soils with aquic suborders in Alaska. (*refer to Table 2*)

The U.S. Department of Agriculture's Economic Research Service[79] has also estimated original wetland acreages for the lower 48 states. Their estimate was based upon land in drainage in 1950, plus the maximum of inventoried wetlands based upon the U.S. Fish and Wildlife Service's wetland trends study[72] or the U.S. Department of Agriculture's national resources inventory,[80] whichever was greater. The estimated total of original wetlands in the lower 48 states using this method was 217 million acres.

The final data set that is comparable on a national basis was also produced by the U.S. Department of Agriculture's Economic Research Service. It details farm drainage trends in the United States.[81] Because a very high percentage of wetland losses has been due to agricultural conversion,[72] these data may be used to approximate the percentage of wetland area lost to agricultural drainage over time. By adding drainage figures to estimated existing wetland acreage, this method indicates that a total of 213 million acres once existed in the conterminous 48 states. It is interesting to note that three of the national data sets hinge on estimates of agricultural drainage. This is not unreasonable given that the vast majority of wetland losses have been due to agricultural conversion. Figure 5 illustrates the extent and location of artificially drained agricultural land in the United States.

*Aquatic suborder soils, as defined by Soil Taxonomy, are those soils that have a reducing regime that is virtually free of dissolved oxygen because the soil is saturated by ground water or by water of the capillary fringe.

NATIONAL STATUS SUMMARY

The national decline in wetlands from the 1780's to the 1980's is dramatic. Losses in particular regions of the country are even more startling. For example, the mid-western farm belt states of Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin account for over 36 million acres of wetlands lost since the country was settled. This amounts to roughly one third of all wetlands lost in the history of our Nation. Alaska stands alone as the only state where wetland resources have not been substantially reduced.

Incomplete baseline data on the wetlands in the Nation prevent an accurate appraisal of the "health" of these remaining resources. However, population growth and distribution and agricultural development greatly affect land use patterns that impact wetlands. As evidenced by the data presented in this report, hundreds of thousands of acres have been drained annually, despite increased efforts to conserve wetlands through state and Federal legislation.

Our Nation continually faces the challenge of identifying and reconciling physical and environmental limits with the development of its natural resources. To meet the demand for resource development, the United States develops laws, regulations, and policies to increase the benefits of development while attempting to protect fish and wildlife, environmental quality, and socioeconomic resource values. The stimulus for development of such protective measures is provided by insights regarding environmental trends. While some trends are very subtle, these data on the Nation's wetlands loss provide a clear indication that continued loss will jeopardize a valuable resource. Over a 200-year timespan, wetland acreage has diminished to the point where environmental and even socio-economic benefits (i.e., ground water supply and water quality, shoreline erosion, floodwater storage and trapping of sediments, and climatic changes) are now seriously threatened.

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