HUMAN MANIPULATION
OF THE
HISTORICAL HUDSON SHORELINE

A Geographical Approach

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ABSTRACT

The Hudson River system is significantly influenced by human activity. Impacts upon the abiotic aspects of the system are many and varied depending on cultural characteristics and technological innovation. Human settlement, development and occupation of the shorelands of the Hudson river, in combination with repeated efforts to improve navigation, have resulted in significant alteration of its shoreline and island outlines. The river has gained shoreland area, lost and gained wetlands due to industrialization and development of the transportation network.

Railroad construction, industrial development and dredge spoil disposal are the primary anthropogenic activities driving the significant shoreline manipulations. Today the railroad almost completely seals off the River from public access as much of the tracking is constructed upon a relatively narrow shoreline extension expressly built to accommodate the railway. Approximately fifty-four percent (54%) of the eastern shoreline and sixty-three percent (63%) of the western shoreline are barricaded by the railroad.

Dredge spoil disposal resulted in nearly 7,000 acres of land along the banks of the Hudson. Much of this land is designated for industrial land-use (over 1,800 acres). Over 300 acres of wetland area have been lost, however, new wetland formation in the same time period has been almost 2,000 acres.

A total of nearly 14,000 acres of shoreland, in various land-use categories, have resulted from and altered by similar economic and political developmental pressures.

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I. INTRODUCTION

This paper serves as an introduction, a preliminary report and summary, to a study of post-human contact with the Hudson River shoreline and island outlines. It is an introduction to a more extensive and cartographically supported Master's thesis undertaken with support from the Tibor T. Polgar summer Fellowship Program, Hudson River Foundation, and in conjunction with the Marine Sciences Institute, University of Connecticut.

Human settlement, development and occupation of the banks of the Hudson River, in combination with continuous efforts to improve navigation have resulted in significant alteration of the Hudson's shoreline and island outlines. Significant processes considered in this paper include: modification of the natural habitats through alteration of the riverbank environment (deforestation; filling of wetlands; turnpike, canal, rail, highway and bridge building); and modification of the stream channel (diking, dredging); erosion control measures and the construction of numerous structures promoting commercial trade.

This paper provides, in text form, the historic (pre-colonization) and present (1980-1988) shoreline of the Hudson River and describes the land-use causation of its physical modifications. The preliminary results of the Master's thesis are presented here in text and tabular form with respect to land lost or gained, land-use causation, and wetland loss or gain. One example of the resulting maps in the more extensive study is included.

METHODOLOGY

The Study Area and Units of Analysis

The study area encompasses the Hudson River shoreline and island outlines from the Federal Dam at Troy to the Tappan Zee. This area spans approximately 150 miles and includes 350 miles of shoreline.

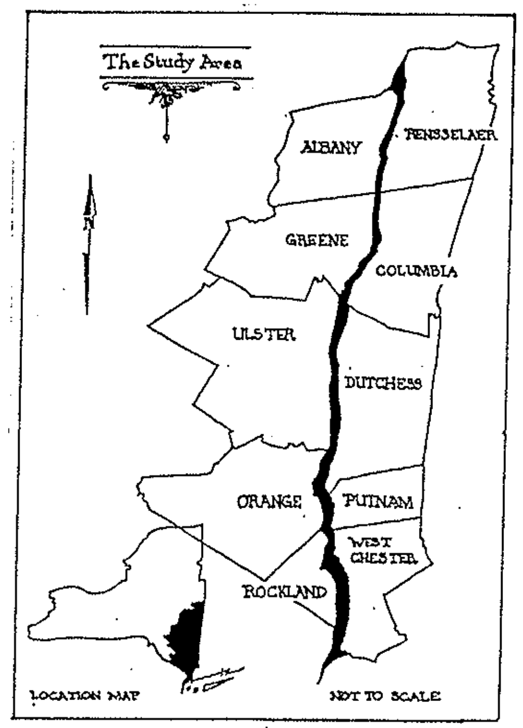

Figure 1

The Federal Dam at Troy, located less than two miles downstream of the confluence of the Hudson and Mohawk Rivers, is the head of navigation and where tidal influence ends. From the head of tidewater, the river travels southward over broad flats which proved treacherous to navigation up to the 1930s when extensive diking was

constructed. From Troy, the River flows almost directly southward with only a few sharp bends near West Point and Bear Mountain in the Highlands Region. At the River's lower end, it discharges into Upper New York Bay, a separate ecological region. The southern boundary for this study was arbitrarily taken to be the southern end of the Tappan Zee.

Data Sources

Utilizing historical cartographic and cultural data in combination with the most recent United States Geological Survey (U.S.G.S.) quadrangle maps, a comparison elucidated significant land changes with respect to landshape and land-use. The earliest cartographic records, the product of Dutch exploration in 1609 and later are archived at the New York State Museum and Library in Albany, New York. The most recent surveys of the region are U.S.G.S. quadrangles updated in 1980 and 1981 from topographic surveys conducted approximately forty years ago. The intervening time period (1609 - 1981) is recorded by numerous field study and survey notes, navigational and railroad charts and land grant maps produced by the various New York State and Federal agencies. Over 200 maps, in combination with charts, field surveys, etc., were used in this study to determine net change in the river shoreline. The intervening documentation present numerous scale and accuracy challenges overcome with the aid of local and regional history publications.

The Natural Resource Inventory Maps of 1978 produced by the New York State Department of Environmental Conservation, Albany, New York, served as the primary basemap for recordkeeping and analysis. A comparison of these maps with the most recent (1979 - 1981) U.S.G.S. topographic maps showed no significant landshape difference on the representation of the shoreline. The Natural Resource Inventory Maps depict attributes in relation to wetlands, natural habitat and soils land-use, all of which were desired characteristics for analysis in this study, hence the choice was made to utilize these maps as the primary cartographic database.

Location Designation: River Mile Measurement

The geographical unit of observation is the "river mile", a land measure utilized along the Hudson River channel. An east and west line at the latitude of Forty-Second Street in Manhattan is the 0.00 mile mark. This river mile system is a convenient measure established in the early 1900s and used in numerous guidebooks since its inception (Adams, 1981).

The distance from the southern boundary of the study area (River Mile 28.25, Piermont) to the northern boundary of the study area (River Mile 147.75, Troy) is measured along the main steamboat channel, which is not necessarily midstream. As a dynamic river, the Hudson has a continually

shifting channel (Boyle, 1978). Points on the shore are measured by erecting a line perpendicular to the direction of the steamboat channel at that point. If one is travelling upstream, a feature designated for a stated water mileage will be ninety degrees either to the left or to the right.

Measures were originally taken by marking large scale United States Coast and Geodetic Survey Navigation Charts. These distances were then transferred to United States Geological Survey (U.S.G.S.) topographic quadrangles. These intervals were translated to each historical document used and any significant (noticeable at 1:24000 scale) human alteration of the landscape was recorded upon the 1978 Natural Resource Inventory maps prepared by the New York State Department of Environmental Conservation, Albany, New York.

Analysis

The calculated river mile location, landmarks and river mile intervals together with cultural and historical documentation are used for the identification and analysis of post-impact changes to the Hudson River shoreline. It must be kept in mind that the river mile locations are designated by convention. Discrepancies occur with regard to exact location. Distance should not be taken literally but used for differentiation among nearby landforms and

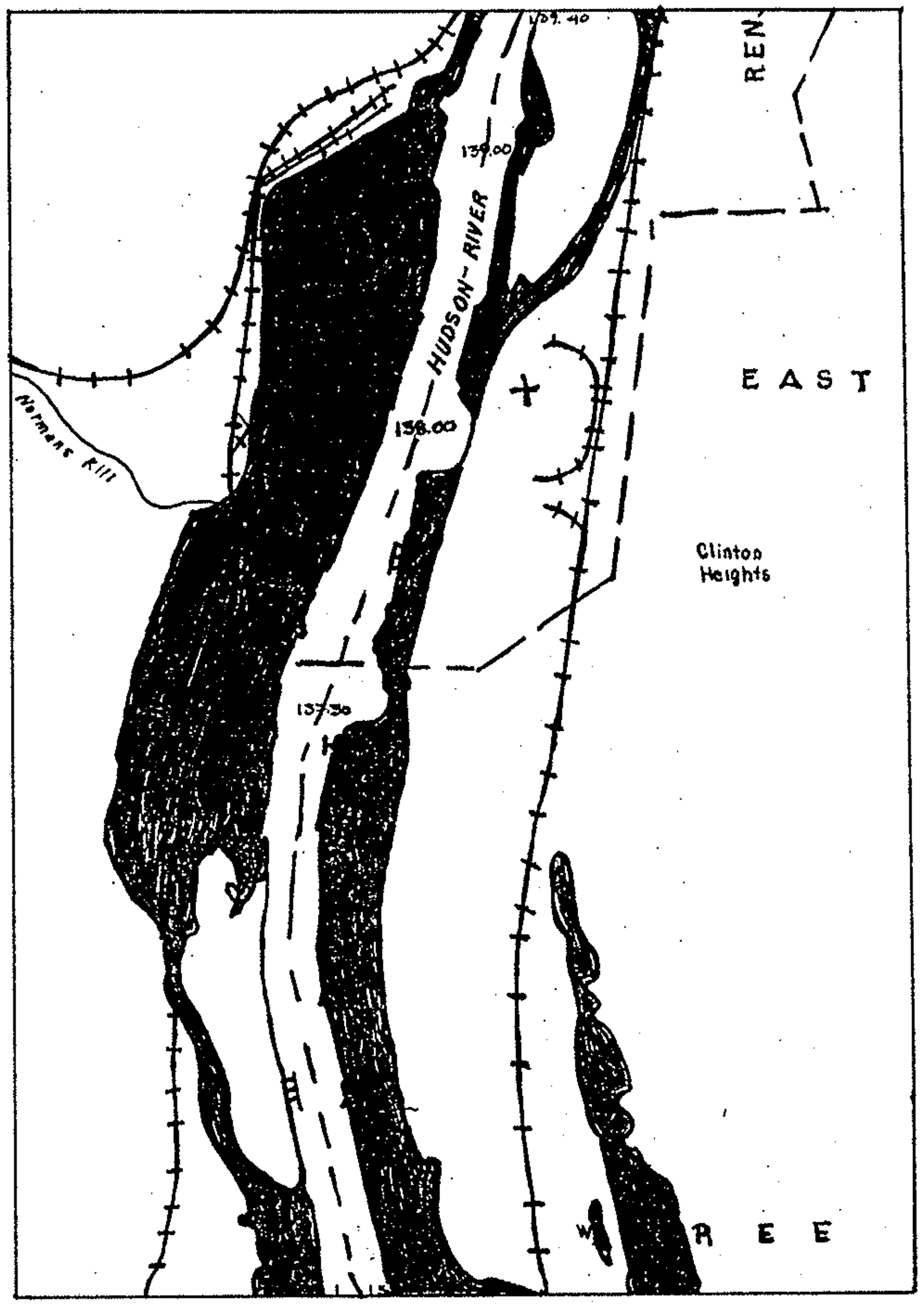

Figure 2. An example of cartographic analysis depicting human - made changes of the Hudson River shoreline. The map was compiled by comparison of historical and present written and cartographic data. scale 1:24,000

features.

Areas identified as "significantly altered" were quantified using a standardized areal dot matrix planimeter. Although use of a polar planimeter would increase precision; given the large size of the study area, the various accuracies and scales of the sources and the magnitude of change encountered, a need for a greater degree of precision or accuracy was not suggested. With river miles delineated and locations of impacted areas defined, net acres of loss and gain of land were calculated for post-impact change. The net impact areas were then recalculated into net loses and gains of wetlands, significant natural habitats and prime agricultural soils.

The calculated areas of impact were recorded in tabular form. The data presented in the tables include: river mile location; east, west or island shoreline designation; land-use category (as defined by the NYS Dept. of Environmental Conservation); and an acreage value representing the impact area of the specified location.

Land-use categories are coded for brevity, the key for these codes is provided preceding each table. In the more extensive study, cartographic support -- the actual mapping of the shoreline -- is included (ie., see Fig. 2). Here, the tables depict the land-use designation and determine the driving force initiating the impact. Further tabular information supplies historical dredging records in the channel and channel control measures initiated by the Army

Corps of Engineers.

RESULTS

Causation of Shoreline Change

Human practices that have significantly effected the shoreline of the Hudson River include respectively: dredge spoil disposal, railroad construction, industrialization development, highway building, recreation, dock erection, housing developments, and wetland filling along with mitigation practices. Each of these categories is described, along with the change imposed on the shoreline as a result of the practice below.

Dredge Spoil Disposal

Dredge spoil disposal is the primary contributor to the land gains in the Hudson River region. Historically, the presence of this sediment was regarded as a nuisance to navigation. Today, dredge spoil is a valued commodity as it results in the opening of new acreage for industrial, recreational, commercial and various other land uses. Dredge spoil has played a significant role in both the loss and gain of wetlands. Spoil has contributed over 2,000 acres of land to the shoreline and island outline areas of the river. Additional acreage in many of the other land-use category may well be located on newly created lands

resulting from dredge spoil deposition.

Railroad Construction

Along much of the Hudson, railroad tracks constitute a major barrier to direct public access to the river. For most of the shoreline in the study area, the railroad completely separates the river and land. There is no land between the railroad and the river for approximately fifty-four percent (54%) of the eastern shore and sixty-three percent (63%) of the western shore. Historical cartographic documentation shows the railroad network development to have contributed over 2,000 acres of land to the Hudson's banks.

Industrialization

Much of this land-use category is the result of "developable" lands opened to industry through the dredge spoil filling of wetlands. However, land gains due to spoil deposition and industrialization are not aggregated here. Industrial development alone has contributed over 1,800 acres of land to the river shoreline. This category, though diverse is largely the result of the demand for oil storage facilities in the northern region of the river (ie., the Port of Albany).

Highways: the Modern Transportation Network

Although major highways were prevented from bordering directly on the Hudson River's shores, primarily because such development is blocked by railway lines, this transportation network has had a significant effect upon the shoreline. Bridge construction has also infringed upon the shoreline and this effect is included in the category "highway" if the bridge is a roadway. The development of the modern highway transportation system is responsible for over 500 acres of additional shoreline development.

Recreation

Americans and the Outdoors: the Legacy, the Challenge (1986) is a report of the President's Commission on documenting a strong public interest in outdoor recreation. Although this is a recent public attitude, it has begun to influence development upon the banks of the Hudson. Along the river nearly 300 acres of new land result from recreational land-use development.

Dock Building

Many docks and landings originally constructed to accommodate the large shipping industry of the 1800s have been obliterated by landfill. Yet, large-scale dock

development for industry as well as recreational marinas have influenced shoreline configuration, contributing over 90 acres to the land-water interface.

Channel Control Measures

This variable designation is concerned with dike construction, erosion control practices, and armoring of the shoreline for other than railroad construction. When referred to, in the text or calculations, it should be recalled that although a dike may have originally been constructed in an attempt to control the channel flow, this same structure has been labelled "bulkhead" if it is now utilized for retaining dredge spoil. If the dike is utilized in this manner it is calculated in the appropriate land use category depending upon its present land-use designation by the New York State Department of Environmental Conservation. Channel control measures have contributed approximately 100 acres of land to the Hudson River shoreline.

Housing (Residential)

Residential development upon the Hudson's shores has been a priority since the first attempts of settlement by the Dutch in the late 1600s. Increased activity in residential and commercial waterfront development created great pressures along the river, whose "landspace" is limited, to land made for development. The result has been primarily, but not exclusively, condominium development upon approximately 100 acres of "made-land".

Wetlands

The definition of coastal wetlands is fragmented by the complex terminology of tidal and freshwater wetland types and by State statutes. This study records only the freshwater wetlands impacts, for salt marsh vegetation does not occur north of the Piermont Marshes. In New York State, the freshwater wetland act affords protection only to wetlands that meet its definition and which exceed twelve and four tenths (12.4) acres or are identified as "regionally unique". The result of this selective protection is the loss of over 300 acres of wetland to dredging spoil deposition. Further results of spoil disposal, in what once were stream channels separating islands from the Hudson shoreline and deposition in coves cut off from the river by the railroad, have been the growth of an additional 2,000 acres of new wetland in the region.

Summary

Variable land uses (commercial, recreational, and residential) technical capabilities (dredging, channel control mechanisms, dock construction) and development of the transportation network; in combination with political

concerns and economic trends have caused the creation of over 13,000 acres of land on the shoreline of the Hudson River.

CONCLUSION

Although there are many ways in which human influence has contributed to the shoreline change evident along the Hudson River -- for example, by direct channel manipulation, modification of watershed characteristics, urbanization, and development of the transportation network -- the first of these is of particular importance (Mrowka, 1974). Direct channel manipulation involves the construction of dikes, embankments, levees, and floodwalls to control floodwaters; and improving the ability of channels to transmit floods by enlarging their capacities, through straightening, widening or smoothing.

Channel improvements, designed to improve water flow may have undesirable effects. For example, the more rapid movement of water along an improved channel section can aggravate flood peaks downstream and cause excessive erosion facilitating further construction of erosion control mechanisms.

As early as 1797 New York State began appropriations to install pile dikes in the Hudson in an attempt to improve navigation (Whitford, 1906). From the late 1700s New York State Statutes continually passed with the intention of improving the channel for navigation. Although the United States Government assumed charge of the river in 1891 (Whitford, 1906), it was not until the 1930s that extensive diking was initiated to control the channel. These dikes are still in place, and the land change as a result of this construction is large - scale (Fig.3).

When one turns to the Hudson River, as an estuary, the possible effects of another human impact, dredging, can be complex (La Roe, 1977). Dredging and filling are widespread. Dredging may be performed to create and maintain canals, navigation channels, turning basins, harbors, and marinas; any and all of which are visible on the Hudson's shores. Further, dredging is practiced and used to obtain source material for fill and construction. Filling is the deposition of dredge material to create new land (La Roe, 1977).

The earliest records of dredging in the Hudson are dated 1800; Commissioners were appointed at this time to improve the river, Lansingburg to Waterford and Troy to Albany (Whitford, 1906). From this initial action, dredging of the Hudson has been excessive. Dredge spoil is a valued commodity facilitating development, as a result it is perpetually harvested from the Hudson in amounts which total over five-million cubic yards per year.

The process of urbanization, in combination with the development of a transportation network along the river shore, has a considerable hydrological impact. One of the

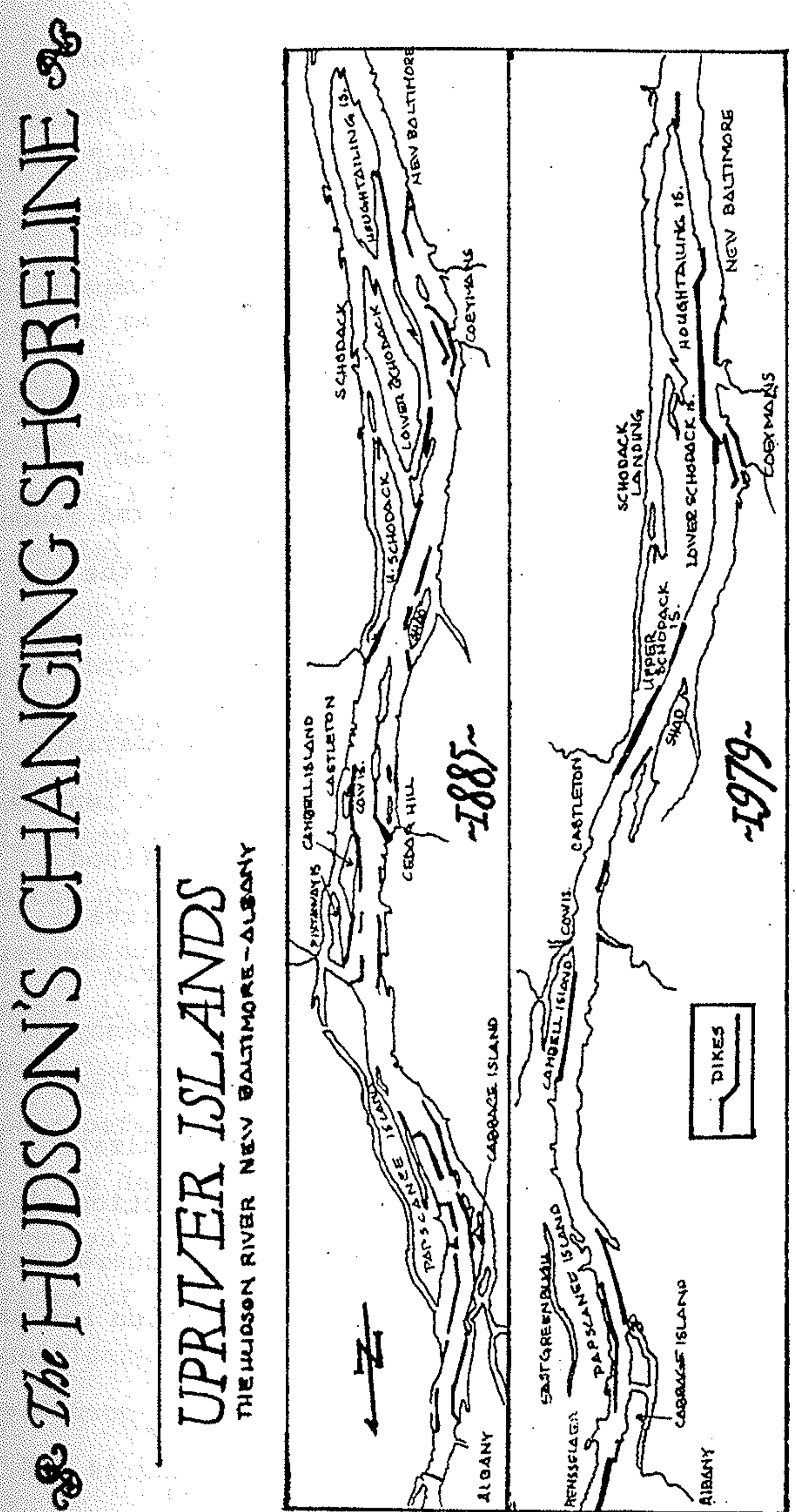

Figure 3. This figure represents change made to the Hudson River shoreline as a result of dike construction by the U.S. Army Corps of Engineers between 1885 and 1979. This map depicts an area which stretches north from New Baltimore, New York to Albany, New York.

most important effects is the way in which urbanization effects flood runoff. Research in both the United States and Britain showed the urbanization process extended impermeable surfaces such as concrete, increased the tendency for flood runoff in urbanized areas in comparison with rural sites (Leopold, 1977).

New York is considered to be a highly urbanized state. Yet, only 10% of its land area is in urban land-use, including the transportation network (Richardson and Tauber, 1979). The land region directly interfacing with the Hudson River have a slightly higher percentage of urban land-use due to influence of the Capital region.

A geographic effect of urbanization is considerable hydrologic impact (Goudie, 1986). One of the most important effects is the way in which urbanization effects flood runoff. Research in both the United States and Britain showed the urbanization process extended impermeable surfaces, such as concrete, and increased the tendency for flood runoff and erosion in comparison with rural sites (Leopold, 1977). Consequentially, increased urbanization is associated with erosion control mechanism construction (ie., bulkheads, dikes, floodwalls and armoring of the shoreline). Each transportation medium facilitating urbanization has had an impact on the Hudson River's geography.

The importance of the Hudson River system for transportation and commerce was the basis for the development of an elaborate canal network, which included

the Erie Canal, in the 1700s and early 1800s. The significant effects the canal era had on the Hudson's shoreline shape was not the original ditch digging. With canal development, particularly the Erie, commercial trade expanded considerably along the entire length of the Hudson. Increased numbers of trade ships and barges necessitated the building of numerous docks, wharves, commercial trade and storage facilities. River communities such as Newburgh, Kingston, Poughkeepsie, Hudson and Albany flourished. Commercial structures and facilities changed the shape and make - up of both east and west shorelines in an attempt to accommodate commerce.

Railroad construction along the Hudson began in the late 1830s and for the next twenty years both canals and rail lines were under construction. Because the Erie Canal was the premier of the area elaboration of the already surrounding water systems feeding the canal was of primary concern in the State of New York. The railroads began developing in a piecemeal fashion, along both sides of the Hudson before a system emerged in the 1850s.

The determination of location, size, and shape of causeways, dikes, bulkheading, and other structures for the purpose of manipulating riverflow and directing drainage is significant when considering the effects of the railroad on the Hudson shoreline. Other modifications along the river -- 54% of the eastern shoreline and 64% of the western shoreline -- caused by railroads include construction to control flood flows and water - borne materials in streams and fill to enable the railroad to transverse coves. These features were constructed without engineering determinations of environmental concerns because their importance was based on the safety, economy and continuation of railroad operation during flood periods.

Attesting to a close relationship between transportation and river systems, roads and highways were incorporated into the established trade network. The effects of roads became more pervasive as a result of increased traffic levels, vehicle speed and road width (Oxley, 1974). In 1916 the first federal highway construction program was launched. Although highways bordering directly on the shoreline are infrequent, today there are an estimated 76,200 miles of streets and highways in the Hudson Basin. Highways continued to grow as the number of automobiles rapidly increased; a consequence was the proportionally rapid deforestation, filling and contouring of the shoreline to facilitate highway and bridge construction.

Physical manipulation of the Hudson's banks post World War II occurred at least in part because of the region's spectacular growth during the two decades following the war. In the years from 1950 to 1969, population in this region grew by 29% (adding more than four million people); housing units increased 43%; electricity consumption more than tripled; and the number of motor vehicles nearly doubled.

In the 1970s the public became aware of a markedly different development scenario in the Hudson Basin, a scenario that pointed to a less expansive future. Average rates of change in key indicators, such as development, for the region have declined significantly from the 1950 - 1969 period. Population growth has slackened, employment is virtually static and indicators such as personal income and electricity consumption are increasing at much slower rates (Richardson and Tauber, 1979).

It is possible to recognize distinct phase shifts in the intensity of the total of geographical change brought about by human societies. The complexity, frequency, and magnitude of impacts originally increased, partly because of steeply rising population levels and partly because of a general increase in per capita consumption (Goudie, 1986). It seems evident that while humans have imposed many undesirable and unexpected changes by significantly altering the physical environment, they also have the capacity to modify the rate of such changes, or reverse them.

V. TABLES

Table 1.

The following table is a summary of the geographical effect humans have had on the Hudson River shoreline configuration. The data were compiled from cartographic and written historical information dating from 1609 through

1981. The location of change is defined by river mile interval in the first column of the table and the change is identified as an eastern or western bank occurrence in the second column of the table. Each heading represents a specific land - use driving shoreline manipulation (see abbreviations below). Numerical values in each column indicate a land gain (#) or loss (-#). The unit of measure is acre. No value (a blank) indicates an interval which has not been significantly altered by direct human action, at least not under the land - use category under which it appears. The column marked "Total" is the net sum of change for each interval.

The following are abbreviations used in the table 1 headings.

Location	River Mile Location or Interval Location
E / W	Eastern or Western Shoreline Location
R R	Area Effected by Railroad Construction
I	Industrialization Land-Use Impact Area
S D	Spoil Disposal; "Human - Made Land" Acreage
H W Y	Highway; Road - Transportation Network
E	Recreational Land-Use
D	Dock / Landing Construction
C / C	Channel Control Measures Impacts (Dikes, Armoring of Shoreline)
H	Housing, Residential Development
WETLANDS	Wetland Areas Significantly Influenced

River Mile Location	Bank	RR	I	SD	HWY	E	D	C/C	H	Wetlands		Total
27.00-29.50	E	68	57							-11		114
29.60-34.65 Croton Point	E	34								-81	30	-17
31.50-34.50 Haverstraw	E		80							-43		37
35.00-	E	27	29	11		26	29				111	233
35.00-35.75	W		52	27					24	-76		27
38.25-41.50 Indian Point	W	36	66	79						-69	259	371
41.75 Doodletown	W	7		4						-3	4	12
42.10 Bear Mtn.	W		13									13
42.40 Bear Mtn.Bge.					14							14
Yacht Club	W	3				7						10
Mantitou	E	20		11					11	-20		22
45.70-46.40 Beverly Dock	E	10		29						-39		
46.40-48.20 Gees Point	E	22					4					26
46.40-48.60 Constitution	E	95	57	22						-16		158
46.50-48.60	W	30	9	53								92
48.60-49.30	E	14		14			4					32
49.30-49.60 Cold Spring	E	7	24									31
49.60-50.50 Phillipstown	E	7					16					23
50.50-51.55 Storm King	E	23										23
51.60-52.80 Fishkill	E	23										23
48.60-51.60	W	50										50
52.80-54.90	E	7						7			19	33
52.80-54.90	W	42	13	82								137
54.90-57.00	E	16		96						-42	73	143

River Mile	Bank	RR	I	SD	HWY	E	D	C/C	H	Wetlands	Total
56.00-57.20 Beacon	E	17	32		42						91
56.00-57.20 Beacon	W	6	30					6			42
57.20-59.25	E	4	34								38
58.50-62.00	E	7	4								11
62.00-63.80	E	6	6	9							21
58.50-62.00 Danskammer	W	43	75	8							126
62.00-63.80	W	24								4	28
63.80-66.00 Barnegat	E	56	14	30							100
63.80-66.00	W	32		12							44
66.00-68.00	E	26	20	4							50
66.00-68.00	W	16	2								18
68.00-69.70 Poughkeepsie	E	32	7								39
69.80-70.50 Incl.Bridge	E		40		16						56
70.50-72.52 Incl. Bridge	E	16	16								32
70.52-72.75	E	13	24			3					40
70.52-72.75	W	28					3				31
72.50-76.30	E	29	14				7			21	71
72.50-76.30	W	9									9
76.40-77.75 Hyde Park	E	33		19						3	55
76.40-77.75 Hyde Park	W		7								7
77.75-79.75 Bard Rock	E	47	17	22						35	121
77.75-79.75 Bard Rock	W						4				4
79.50 Esopus Island								12			12
80.00-83.00 Straatsburg	E	16	4	29							49
80.00-83.00	W							14			14
80.30-82.00	E	11	4	19							34

River Mile	Bank	RR	I	SD	HWY	E	D	C/C	H	Wetlands	Total
80.30-82.00	W				7			3			10
82.00-83.40 Jones Island	E	23									23
82.00-83.40	W				4						4
83.50-85.60	E	26	7								33
83.50-85.60	W							4			4
85.60-86.70 Kingston	E	33	4							-3	34
85.60-86.70 Kingston	W		10	172						-59	123
87.00-88.20	E	33									33
87.00-88.20	W		11	67							78
82.20-90.10	E	32									32
82.20-90.10	W		12	7						3	62
Kingston-Rhinecliff Bridge					30						30
90.10-91.50 Goose Island	E	23		32						7	62
90.10-91.50	W		4								4
91.50-92.35	E	19	11								30
92.35-93.50 South Bay	E	38		9							47
92.35-93.50	W		8								8
93.75-95.30 Cruger	E	46		355							401
93.75-95.30	W		10								10
95.30-96.80	E	11									11
95.30-96.80 Esopus Creek	W			108							108
97.25-100.75 Clermont	E	16		4							20
97.25-100.75	W		9								9
97.50 Island				3							3
101.1-101.5	E	9	3								12
101.1-101.5	W		10								10
101.5-102.45	E			7							7
Island				1							1

River Mile	Bank	RR	I	SD	HWY	E	D	C/C	H	Wetlands	Total
102.45-104.45	E	10		10							20
Dewitt Point Duck Cove	W		34	248						43	325
103.5-104.5 Inbocht Bay	W							6			6
Spoil Island	W			51							51
Green Point	W		6								6
105-107.2 Incl. Spoil Isl.	E	52	15	25						13	105
105-107.2	W		19	18						4	41
108-109	E	22		30						20	72
108.1 Spoil Island				4							4
Rip Van Winkle Bridge					17						17
Rogers Island				142						9	151
109 Spoil Island				3							3
109.25 Spoil Island				6							6
109-112	E	20		96						64	180
110.5 Spoil Island				4							4
111	W			90						90	180
112-113	E	22	4	46						40	112
113-115	E	33		96						85	214
115-115.75	E	14		22						11	47
113.00 MiddleGround	W			35						11	46
112-115	W		23	30						13	66
114.65 Spoil Island				1							1
114.75 Spoil Island	W			6							6
114.85 Spoil Island	W			4							4
115.5	W			67						67	134
115.75-116.6	E	33		170						93	296
115.75-116.6	W			11						11	22

River Mile	Bank	RR	I	SD	HWY	E	D	C/C	H	Wetlands	Total
116.60 MdlGrnd Island				166						7	173
116.6-118.25 Nutten Hook	E	50		182				17		48	297
116.6-118.25	W			3							3
118.25-120	E	61		302				4		77	444
118.25-120	W		37							7	44
120-122	E	33		70						34	137
120-122	W			57						7	64
122-123	E	16		23							39
122-123	W			210						36	246
123-124	E	49		36						29	114
123-124	W			284						30	314
124-125	E	52		83						65	200
124-125	W			163							163
125-126.30	E	8		7							15
125-126.30	W			16							16
126.3-126.5 Stuyvesant	E	7		215						83	305
126.5-127.75	E			252						70	322
126.5-127.75	W			114			11	11		24	160
127.75-128	E			113						20	133
127.75-128	W						3				3
128-129 Schodack	E			194							194
129-130.5	E			97						10	107
Shad Schermerhorn	W			257						98	355
Bridge					11						11
130.5-131.75	E	13	10								23
130.5-131.75	W			301						98	399
132.35-134	E	24		54						7	85
132.35-134	W			40						7	47
134-134.75	E	62		192				29		58	341
134-134.75	W			17				16			33

River Mile	Bank	RR	I	SD	HWY	E	D	C/C	H		Wetlands	Total
134.75-135 Van Wies	E	20		211			9				110	350
135-135.5	E	16		125							95	236
135-135.5	W		26									26
139.4-140.5	E	26	94								2	122
139.4-140.5	W				119							119
140.5-141.5	E	17	23		16						4	60
140.5-141.5	W								71			71
141.5-142.5	E			54							10	64
141.5-142.5	W				67	29					14	110
142.5-143.8	E			87							15	102
142.5-143.8	W				96	112					42	250
143.8-144.25	W			38	30	46					38	152
144.25 Bridge					14							14
144.25-145.6	E	20	80									100
144.25-145.6	W				33	20						53
145.6-146.35	E		29									29
146.35 Center Island				12							1	13
145.6-146.35	W		433		30	23						486
147-147.75	E		34									34
147-147.75	W	29	87	26							9	151
147 Cntr/Stony				19							1	20
147.75 Troy Lock				16								16
> Troy	E			16								16
> Troy	W	13		49							23	85
TOTALS		2043	1803	6665	542	266	90	129	106	-332	2192	13504

Table 2.

Table 2 illustrates some of the historical dredging projects contracted in the study area in an attempt to improve navigation. Much of the spoil dredged under such contracts contributed to filling of the Hudson's shores. Location designation is by river mile. "Pay Quantity" refers to the amount of material (in cubic yards) dredged from the river. These data were compiled from archived contracts of the U.S Army Corps of Engineers.

River Mile	Location	Date	Pay Quantity (Cubic Yards)
135.25	North Van Wies-Bear Isl Light	4/19/27-7/21/28	2,370,591
	South Greenbush-North Van Wies	12/19/27-8/6/30	3,085,383
	North Hudson River Central Railroad Bridge-South Coeymans Dock	4/19/27-10/1/27	2,345,516
	North Van Wies-North Bear Island	8/25/28-5/25/31	152,224
	North Bear Island-North Hudson River Central Railroad Bridge	8/27/28-10/16/29	3,411,724
127.50	North Mulls Dike-Coxsackie	8/22/28-6/19/30	254,851
	Coxsackie Ferry		6,308,240
127.50-111.25	Coxsackie-Hudson Lite	6/12/29-11/8/30	3,359,202
125.50	New Baltimore-Stonehouse Landing	4/16/30-6/30/32	103,918
136.30-139	Opposite Island Creek-Opposite Port Albany-Opposite Cedar Hill	4/29/30-4/3/31	86,262
127.50	East channel from 900 feet north to 2,650 feet south of Mulls Dike	9/11/30-6/25/32	276,211
135.25-117.35	East Channel Opposite Van Wies Point Opposite Bear Island North Fitches Warf	7/1/31-9/20/34	277,973
103.00-91.00	North Germantown Heath	4/14/31-6/26/31	414,154
126.60	Barren Island-New Baltimore	9/3/32-11/12/32	768,007
124.30	West Side-Matthews Point	11/12/32-10/7/33	57,040
133.20-129.8-125.5	Parda Hook-Castleton Bridge-New Baltimore	2/9/33-6/8/33	1,656,548
136.35-132.35	Beacon Island-Cow Island	8/19/35-12/9/35	916,696
147.20-135.25	East Channel-Van Wies	6/6/30-9/28/34	58,020
135.25-104	West Channel Van Wies-Nine Mile Tree	6/6/30-9/28/34	105,100
86.30	Rondout Harbor	9/11/38-11/27/38	53,500
135.25-104	West Volman Kill-Nine Mile Tree	8/7/36-10/10/36	55,424
125.50	New Baltimore	5/26/39-9/5/39	474,336
146.25-139.4	Troy-Menands Bridge-Dunn Memorial Bridge	3/8/40-11/14/42	411,700
124.00	Houghtailing	6/19/43-10/9/43	65,843
139.5-112	Albany-Hudson	9/16/47-11/10/47	286,681
139.5-139.4	Albany-Rensselaer-Dunn Church Bridge	9/15/48-12/20/48	348,497
129.00	Schodack Creek	12/21/60-5/28/62	1,637,777
139.5-135.25	Albany-Van Wies	2/2/62-11/19/62	925,733
121.45-105.25	Stuyvesant-Lithingo	7/28/63-	1,965,741
134.35-133.80	Staats Point-Bear Island	11/6/62-	1,757,870
131.0-127.50	Schermerhorn Island-North Coeymans	5/4/63-	1,005,973

River Mile	Location	Date	Pay Quantity (Cubic Yards)
127.5-98.5	Coeymans-Malden	5/11/64-11/22/65	1,271,129
139.5-135.25	Albany-Van Wies	7/29/63-11/13/63	818,024
135.25-133.2	Van Wies-Padra Hook	2/28/64-8/25/65	1,182,209
133.2-131.0	Padra Hook-Schermerhorn	5/26/64-12/17/64	965,352
136.5-127.5	Castleton Dike-North Coeymans	6/11/65-10/21/65	650,936

Table 3.

Table 3 lists the historic channel control features (dikes) constructed in the Capital District. This area exhibits significant channel modification and shoreline growth. Data were compiled from early contracts produced by the U.S. Army Corps of Engineers.

NAME (mile)	LENGTH (feet)	DATE (year)	TYPE	PURPOSE (control measure)
Papscanee Dike 135.00	1,643	1903-4	crib held in place by round piles stone filled, partially filled in back.	to direct current to main channel
Van Wies dike @135.25	2,407	1913-14	double row piles dredged stone filled superstructure: concrete slab paving now revetment. ------------- further construction was to build a dike b/w Staats Point and Van Wies dike.	to direct currents at Staats Point
Cambell Island Dike @133.70	1,874	1894-95 replacing single pile dike built in 1879	double row of round piling, stone filled now filled in back of dike.	to direct current and prevent erosion of the east bank
	5,725	1913-14	row of round piling with concrete slab superstructure second row of piling channelward of footing with stone fill now a revetment.	protect east bank
Cow Island dike	2,170	1868	double row of round piling, stone filled in back of dike.	to connect Cambell and Cow Islands -------------- erosion control
Castleton dike @135.40	384	1863-4	double row of round piling, stone filled now filled in back.	to cut off back channel and direct current over over Nine Tree crossover
	2,958	1863-4	double row of round stone filled superstructure concrete slab paving revetment.	as above
	927	1869-70	double row of round piling, stone filled filled in back.	erosion control
Nine Mile Tree dike @104.00	710	1869	double row of round piling, stone filled.	erosion control
Upper Schodack Island dike @129.75	1,735	1891	double row of round piling, stone filled.	erosion control
Schodack Island Half dike	670	1869-70	double row of round piling, stone filled now filled in back.	to close Hellgate channel to Schodack Creek and direct current on Mulls crossover
Schodack dike	859	1866-67	double row of round piling, stone filled in back.	as above
	2,094	1867-68	double row of round piles, superstructure concrete pavement grouted stone on wooden platform now revetment.	as above
	500	1872	double row of round piling, stone filled revetment.	as above

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