

A Survey of the Canals and Water Raceways of New Jersey

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Abstract

Canals and water raceways played an important role in the history and economic development of New Jersey. Much of the early settlement and industrial activity centered on areas with water transportation and water power. But many of these canals and raceways have been forgotten and lost. A small percentage still exist as abandoned waterways. A smaller percentage are still in use, for either their original purpose or for recreation. A new survey of the current and historic canals and water raceways of New Jersey found 171 of them. The locations are available in a GIS shapefile that indicates their current status (active or abandoned) and condition (wet or dry). The shapefile also shows the locations of locks and inclined planes on the Morris Canal and the Delaware & Raritan Canal. The number of mapped historical water raceways in an area directly correlated to the interest and activity of local historians. Undoubtedly many more water raceways remain to be rediscovered. This report will be updated by the New Jersey Geological Survey as additional canals and water raceways are identified and reliably located.

Introduction

Canals and water raceways were significant economic influences in pre-electricity New Jersey. The limitations of the roads, especially in wet weather, meant that water transport of bulk items was cheaper than overland transport. Canals provided an economical connection between a resource and a market. For example, the Morris Canal allowed coal to be moved from the coal mines of northeastern Pennsylvania to the furnaces of New York City. New Jersey's canals, however, were eventually supplanted by railroads, a cheaper method of transporting bulk goods.

Water power was the only major source of power available in pre-industrial New Jersey. Whether for grinding grain, cutting lumber, refining ore, or other forms of processing, water power was an essential component of the economy. Raw material couldn't be economically transported a significant distance over the rough roads of pre-industrial New Jersey. Consequently, small mills were located across the state wherever appropriate stream locations could be found.

With time, however, conditions changed. Railroads replaced canals as the most economical transport method for both bulk goods and passengers. Water power, limited by the necessity of being located next to a source of flowing water and by droughts, was replaced by electric power; mills could then be located anywhere a power line reached.

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Over the twentieth century, many of the canals and water raceways were abandoned, followed in some cases by infilling. Defunct canals were especially subject to infilling in cities with a need for more roads.

A new GIS shapefile shows the location of 171 current and historic canals and water raceways in New Jersey. It includes attributes that give the status of each as either active or abandoned. It also indicates whether each is wet or dry. This shapefile can be used to create maps showing the location of the canals and water raceways.

Definitions

A **canal** is usually built to allow movement between two water bodies. The Delaware & Raritan Canal (which allowed travel between the Delaware and Raritan Rivers) and the Morris Canal (from the Delaware River to Newark Bay) are the most important New Jersey examples. Two additional major canals in New Jersey, the Point Pleasant Canal and the Cape May Canal, are part of the Intracoastal Waterway.

A water **raceway** is a structure built to carry water to and from a water wheel. The **headrace** extends from an upstream reservoir to the water wheel. The **tailrace** extends from the water wheel to a downstream point receiving water. For many water raceways the headrace starts at a pond on a stream, diverts water across a bend in the stream to a mill, and then returns water to the stream downstream of the mill. Some mills have no significant raceways, being built next to a dam on a stream.

Criteria for Inclusion in this map

Humans have modified waterways for a variety of purposes. Six primary criteria were used to determine which waterway modifications were included in this GIS coverage:

- 1) Structures labeled as canals were included if they were intended to assist the movement of ships between waterways.
- 2) Structures labeled as water raceways, or which seemed to be water raceways, had to connect a water source with a mill or industrial facility.
- 3) The structure must have been shown on a current or historic photograph or map with sufficient detail to be mapped on a current aerial photograph. Anecdotal or written information about a canal or raceway without a map or photograph was judged to be too inaccurate for inclusion in this survey.
- 4) Raceways less than 100 feet long were excluded.
- 5) Ditches dug for drainage were excluded. This excluded significant lengths of shallow ditches dug in the wetlands and marshes of New Jersey.
- 6) Channelized streams were excluded unless they were part of a longer canal.

GIS Shapefile

A geographical information system (GIS) stores and analyzes data linked to location. A computer program can overlay and display at various scales GIS data sets. The State of New Jersey has an active program to develop and publicize data in this format. (See <http://www.nj.gov/dep/gis/>.)

A GIS shapefile of current and historic canals and water raceways is now available.² This shapefile includes fields that indicate whether the canal or raceway is active or inactive. All active entries are additionally coded as being wet. All inactive canals and raceways are coded either as being either wet or dry based on recent aerial photographs. Canals and water raceways which could not be located on recent aerial photographs due to development but which can be accurately located on historical maps are coded as abandoned and dry. The metadata for the GIS shapefile provides additional technical detail on the shapefile.³

The Morris Canal is inactive, but has both wet and dry segments. The GIS shapefile indicates the location of locks on the Morris Canal and the Delaware & Raritan Canal. It also shows the location of inclined planes on the Morris Canal.

Sources of Information

Information on canals and water raceways was developed following six main areas of exploration, listed below. Internet references are given in table 1.

- 1) The four major canals in New Jersey (defined as the Morris, Delaware & Raritan, Point Pleasant, and Cape May Canals) are clearly marked on numerous current and historic maps and have been the subject of several books (see for example Veit's *The Old Canals of New Jersey*).⁴
- 2) The U.S Geological Survey maintains the Geographic Names Information System (GNIS). All entries for New Jersey that contained "canal," "ditch," or "mill" as part of the place name were located on aerial photographs taken between 1930 and 2002. Each location was examined for any visual remnant of a canal or water raceway.
- 3) Information from local historians provided significant data on numerous water raceways. In general, the more active the local historical group, the greater the

² T. Pallis, K. Murphy, and J. L. Hoffman, *Canals and Water Raceways of New Jersey*. Trenton: N.J. Geological Survey Digital Geodata Series 08-1. <http://www.njgeology.org/geodata/dgs08-1.htm> (2008). This is the document that will be updated as additional information becomes available.

³ New Jersey Department of Environmental Protection, Bureau of Geographic Information Systems, 2009; see <http://www.nj.gov/dep/gis/>.

⁴ R. F. Veit, *The Old Canals of New Jersey* (Little Falls, NJ: N.J. Geographical Press, 1963).

number of documented raceways.⁵ This search was combined with an Internet search that grouped 'New Jersey' with "canal," "canals," "raceway," and "mill." Though not comprehensive, this search was productive.

- 4) The New Jersey State Library provides access over the Internet to the Digital Sanborn Maps, 1867-1970 collection. These are a series of maps created by the Sanborn Map Company for fire insurance purposes. Water-carrying canals and raceways were noted on these maps. One set of maps for each town was visually examined for canals and water raceways.
- 5) In 1894, Cornelius Vermeule systematically reviewed New Jersey water power. For each mill he catalogued the owner, stream, location and item(s) produced. This list of mills was cross-referenced with raceways already located. Mills not located were searched for using aerial photography on file with the New Jersey Department of Environmental Protection. Unfortunately, most of the mills listed in Vermeule's report could not be located based on the available data.⁶
- 6) Several published reports were found during the course of research that provided the locations of additional water raceways.⁷

Many of these searches were of aerial photography displayed on a computer monitor. Thus the location accuracy depends on the photograph quality and the observer's visual acuity. Additionally, abandoned but wet water raceways can appear to be natural hydro-logic features, such as partially filled meander loops. This makes visual definition of abandoned raceways difficult in areas where any physical trace of the mill is not apparent on the aerial photograph.

Changing mill ownership presented an additional complication. The available resources refer to some raceways by two or more names. Generally the most recent name was chosen.

Graphics

Figure 1 shows the canals and water raceways of New Jersey located as part of this survey. The index numbers on figure 1 are keyed to entries in table 2. The Morris Canal and the Delaware & Raritan Canal are labeled directly on the figure due to their length. The

⁵ E. T. Lenik, *The Tuxedo-Ringwood Canal*, unpublished 1965 manuscript on file with the North Jersey Highlands Historical Society.

⁶ C. C. Vermeule, *Report on Water-supply, Water-power, the Flow of Streams and Attendant Phenomena: Vol. III of the Final Report of the State Geologist* (Trenton: The John L. Murphy Publishing Co., 1894).

⁷ For example, see C. S. Boyer, *Early Forges and Furnaces in New Jersey* (Philadelphia: University of Pennsylvania Press, 1931) and R. Hunter, *Power to the City, The Trenton Water Power* (Trenton: N.J. Dept of Transportation and the Federal Highway Administration, 2005).

graph also shows locks and inclined planes for these two canals. Figure 1 is designed to be printed out on a 8 1/2" by 11" sheet of paper.

Figure 2 adds the name of the canal or water raceway to the graphic. This is designed to be printed out on a larger sheet of paper. ISO B1 size (28" x 40") works well.

Conclusion

Canals and water raceways were significant economic influences in the industrialization of New Jersey. A survey of current and historic canals and water raceways found 171 of them in New Jersey. This is based on published documents and reviews of aerial photographs. There are probably dozens, if not hundreds, of additional water raceways that have disappeared due to development.

A new GIS shapefile allows users to locate the canals and water raceways and create maps. This shapefile also shows if the canal or raceway is still active or abandoned, and if it is filled with water or dry.

Table 1. Additional Internet links for canals and water raceways source information

Information Source	Internet Link
Aerial photographs, 1930 and 2002	http://www.nj.gov/dep/gis/depsplash.htm#
Canals and water raceways of New Jersey (shapefile)	http://www.njgeology.org/geodata/dgs08-1.htm
Digital Sanborn Maps, 1867-1970, for New Jersey	http://www.njstatelib.org/Electronic_Resources/subject/history.php
Geographic Names Information System for New Jersey	http://www.nj.gov/dep/gis/stateshp.html

Figure 1.

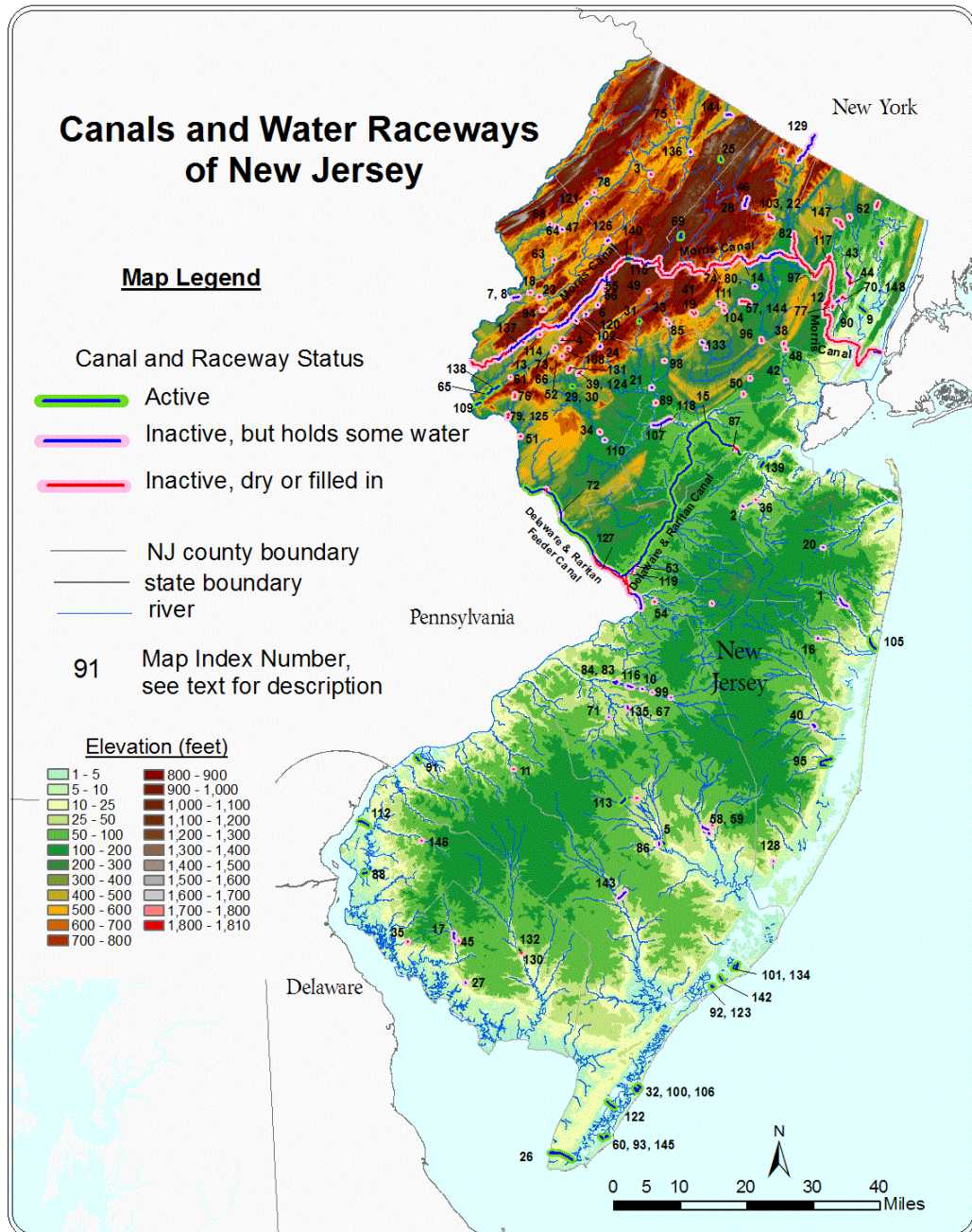


Table 2. Key to map index numbers for the canals and water raceways of New Jersey.

1 - Allaire Canal	41 - De Voe Raceway
2 - American Snuff Company Raceway	42 - Delaware & Raritan Canal
3 - Armstrong Flour and Grist Mill Raceway	43 - Diamond Mill Paper Raceway
4 - Asbury Graphite Mill Raceway	44 - Dorland Grist Mill Raceway
5 - Atsion Raceway	45 - Double Trouble State Park Mill Raceway
6 - Batsto Village Raceway	46 - Dover Iron Works Rolling Mill Raceway
7 - Beattystown Mill Raceway	47 - Droescher Mill Raceway
8 - Belvidere Lower Raceway	48 - Dundee Canal
9 - Belvidere Upper Raceway	49 - Dundee Raceway
10 - Berrys Creek Canal	50 - Eastlake Mill Raceway
11 - Birmingham Forge Raceway	51 - Echo Lake Channel
12 - Blackwood Raceway	52 - Eden Paper Mill Raceway
13 - Bloomfield Saw Mill Raceway	53 - Electric Light Station Raceway
14 - Bloomsbury Raceway	54 - Fandango Mills Raceway
15 - Boonton Raceway	55 - Flanders Mill Raceway
16 - Bound Brook Raceway	56 - French's Flour Mill Raceway
17 - Brandts Paper Mill Raceway	57 - Frenchtown Mills Raceway
18 - Bricksburg Iron Company Raceway	58 - Glen Gardner Flour & Grist Mill
19 - Bridgeton Raceway	59 - Goldens Grist Mill Raceway
20 - Bridgeville Raceway	60 - Goodall Rubber Company Raceway
21 - Brook Olyphant & Co. Raceway	61 - Granite Linen Company Raceway
22 - Brookside Main Street Raceway	62 - Groveville Cotton Mill Raceway
23 - Brookside Mill Raceway	63 - Gruendyke Grist Mill Raceway
24 - Bucks Mill Raceway	64 - Hackensack Water Co Intake Canal
25 - Burnt Mills Raceway	65 - Hackettstown Water Wheel Raceway
26 - Butler Hard Rubber Company Raceway	66 - Hanover Cotton Mill Raceway
27 - Butz's Mill/Axford Mill Raceway	67 - Harper Hollingsworths & Darby
28 - Califon Mills Raceway	68 - Harrisville Water Power Canal
29 - Canistear Reservoir Feeder Canal	69 - Harrisville Water Power Raceway
30 - Cape May Canal	70 - Hoffman Canal
31 - Cedarville Raceway	71 - Hoffman Mill Raceway
32 - Charlottesburg Raceway	72 - Ho-Ho-Kus Bleachery Mill Raceway
33 - Clinton Grist Mill Raceway	73 - Hope Grist Mill Raceway
34 - Clinton Red Mill Raceway	74 - Huff Grist Mill Raceway
35 - Connett Saw Mill Raceway	75 - Hughesville Canal
36 - Cooper Mill Raceway	76 - Imlaydale Mill Raceway
37 - Cornell Harbor	77 - Irick Raceway
38 - Cramer Saw Mill Raceway	78 - Jacksonburg Mill Raceway
39 - Darts Mill Raceway	79 - Jefferson Canals
40 - Davis Mill Raceway	80 - Kerman Carpet Cleaning Raceway

Table 2. Key to map index numbers for the canals and water raceways of New Jersey. (cont).

81 - Kirbys Mill Raceway	121 - Point Pleasant Canal
82 - L. E. Carpenter Raceway	122 - Powerville Felt Roofing Company Raceway
83 - Lambertville Water Power Canal	123 - Prallsville Mills Current Raceway
84 - Lanes Rag Grinding Mill Raceway	124 - Prallsville Mills Historic Raceways
85 - Liondale Bleach, Dye & Paint Works Raceway	125 - Princeton Harbor
86 - Little Foundry & Machine Shop	126 - Raritan Water Power Canal
87 - Little York Mills Raceway	127 - Red Mill Raceway
88 - Lobsitz Mills Raceway	128 - Riegel Paper Company Canal
89 - Long Pond Ironworks Furnace Raceway	129 - Rockafellows Mill Raceway
90 - Marthas Furnace Raceway	130 - Rockaway Iron Works Raceway
91 - Middleville Raceway	131 - Salem Canal
92 - Milford Mill Raceway	132 - Saltars Ditch
93 - Miller & Mott, Saw & Grist Mill Raceway	133 - Sherred-Eckels Grist Mill Raceway
94 - Morris Canal	134 - Shippenport Forge Raceway
95 - Morris Canal Pompton River Aqueduct	135 - Smithville Canal
96 - Mt. Holly Bypass Channel	136 - S.U.M. Raceway
97 - Mt. Holly Mill Race	137 - Speedwell Lake Raceway
98 - Nesbitt Mill/Tiger Distillery Raceway	138 - Star Grist Mill Raceway
99 - Nescochague Canal	139 - Star/Murry Rubber Company Raceway
100 - New Brunswick Raceway	140 - Stephensburg Mill Raceway
101 - New Cut	141 - Stillwater Mill Raceway
102 - New Lisbon Raceway	142 - Stone Harbor Canal
103 - North Branch Saw and Grist Mill Raceway	143 - Sunset Canal
104 - Nutley Memorial Park Raceway	144 - Taylor Iron Works Mill Pond and Raceways
105 - Old Canal	145 - Thomas Grist and Feed Mill Raceway
106 - Orient Canal	146 - Tranquility Mill Raceway
107 - Osbornes Mill Raceway	147 - Trenton Water Power Canal
108 - Ottens Canal	148 - Troy Grist Mill Raceway
109 - Oxford Grist Mill and Furnace Raceway	149 - Tuckerton Raceway
110 - Oyster Creek Intake Canal	150 - Tuxedo-Ringwood Canal
111 - Park Ridge Electric Generating Raceway	151 - Union Canal
112 - Parrot Mill Raceway	152 - Union Furnace Raceway
113 - Passaic Valley Water Intake Canal	153 - Union Lake Canal
114 - Peapack Brook Grist Mill Raceway	154 - Van Dorans Mill Raceway
115 - Pemberton Raceway	155 - Vandeweghe Tannery Raceway
116 - Pennsylvania Harbor	156 - Venice Lagoon
117 - Penrose Canal	157 - Vincentown Raceway
118 - Penwell Mills Raceway	158 - Wallkill Roller Flour Mills Raceway
119 - Pequannock Valley Paper Company Raceway	159 - Warnes Grist Mill Raceway
120 - Pocahontas Mills Raceway	160 - Warren Glen Canal
	161 - Washington Canal
	162 - Waterloo Grist and Saw Mills Raceway

Table 2. Key to map index numbers for the canals and water raceways of New Jersey. (cont).

- 163 - Wawayanda Canal
- 164 - West Canal
- 165 - Weymouth/Makepeace Canal
- 166 - Whippany Paper Company Mill
Raceway
- 167 - Wildwood Canal
- 168 - Woodstown Roller Mills Raceway
- 169 - Wortendyke Grist Mill Raceway
- 170 - Worthen & Aldrin Mills Raceway
- 171 - Wostbrock Embroidery Works
Raceway