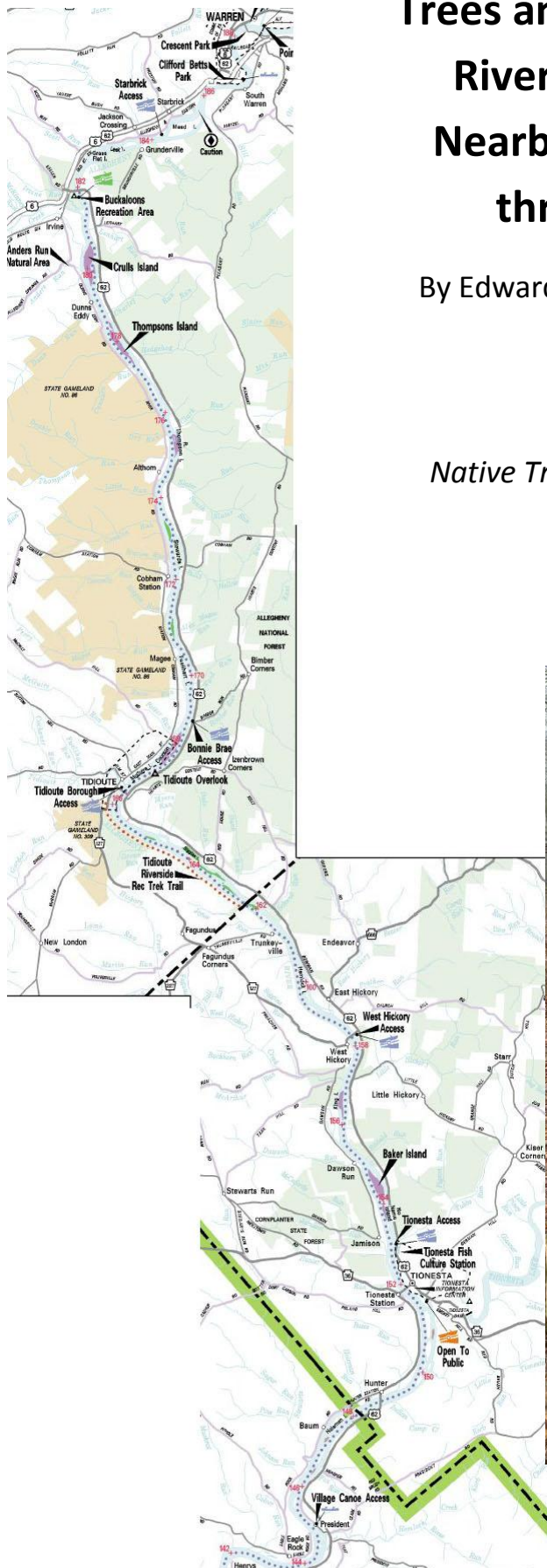


Trees and Forests of the Allegheny River Islands Wilderness and Nearby Islands: Interim Report through December 2011

By Edward Frank, Dale Luthringer, Carl Harting, and Anthony Kelly

Native Tree Society Special Publication Series:

Report #10





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COVER: Map of the study area by the Pennsylvania Fish and Boat Commission and photograph of Carl Harting with a large hackberry tree on Crull's Island.

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Table of Contents

Introduction	1	Fuelhart Island	75
		Courson Island	76
		Courson and McGuire Islands, Tidioute, Pennsylvania	80
Allegheny River	3	Tidioute to White Oak Island	83
Island Development	8	McGuire Island	83
Island Soils	9	Hemlock Island	85
		West Hickory through King Island /King Peninsula	92
Native American Prehistory	9	King Island	94
Mead Island Site	11	King Peninsula	101
Buckaloons Site	12	Dale’s Island	106
Indian Camp No. 1 Site	13	Baker Island	109
Indian Camp No. 2 Site	13	No Name Island	118
Indian God Rock, Franklin, PA	13	Baker and No Name Island to Tionesta	119
		Hunters Island and May’s Island	122
Early European History in NW Pa	14	Sarah Stewart Bovard Memorial Library, Tionesta	124
Celeron de Bienville Expedition	15	Tionesta (Lighthouse) Island	126
David Zeisberger – Moravian Missionary	17	Refugee Islands and Holeman Island	127
Colonel Daniel Brodhead	19	Refugee Island 1	131
General William Irvine	22	Refugee Island 2	133
Irvine Family	25	Holeman Island (Kibbe’s Island Park Campground)	135
Chief Gaiänt'wakê	26		
		Results and Discussion	141
Logging History of the Area	28	Effects of River Flow Changes	158
		Invasive Species	161
Modern Conservation and Preservation Efforts	33	Future Plans/Conclusions	167
		Appendix I: Characteristics of the Upland Forest Communities	168
Project Methodology	35	Appendix II: Hoge Island, Franklin, PA	176
		Appendix III: ENTS Exploration Chronology	178
Field Work		Bibliography	181
Buckaloon Recreation Area	40		
Anders Run Natural Area	44		
Crull's Island	48		
Crull's and Thompson's Islands	57		
Thompson's Island	58		
Clark's Island	67		
R. Thompson's Island	68		
Steward's Island	71		
Millstone Island	74		

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By Edward Frank¹, Dale Luthringer^{1,2}, Carl Harting¹, and Anthony Kelly¹

Introduction

This report compiles the results as of December 2011 for the ongoing project of documenting forests and trees of the islands of the Allegheny River Island Wilderness and nearby islands in the middle Allegheny River in north central Pennsylvania. The islands included in this report are located in a stretch extending from the Buckaloons Recreation Area, seven miles downstream of Warren, Pennsylvania through Holeman Island, four miles downstream of Tionesta, Pennsylvania. This includes all of the islands in the Allegheny River Islands Wilderness, a number of forest service islands, and several private islands. Major islands investigated among others include, Crull's Island, Thompson's Island, Courson Island, Hemlock Island, King Island, Baker Island, and Holeman Island. At the present time some of the islands have been visited multiple times by groups of people, while others have seen only a quick scouting survey, or have not yet been visited.

The initial explorations were made by Dale Luthringer in 2003 (Luthringer 2003a). Edward Frank, Carl Harting, and Anthony Kelly joined the project in 2007 (Luthringer 2007b). This report includes photographs and general descriptions of each island visited during the field surveys. The tree and woody shrub species found on each island are listed. Tree height profiles, Rucker Height Indices, and Rucker Girth Indices are presented for each island where sufficient measurement data was able to be collected. Background information on the geological,

hydrological, archaeological, and historical settings of the individual islands and the study area in general is also included. Future plans include broadening the investigations to include other islands both upstream and downstream along the length of the Allegheny River and conducting more detailed investigations of the under sampled islands within this area.

An overview of the characteristics of the surrounding upland forest is presented as Appendix I. A preliminary scouting of Hoge Island located downstream on the Allegheny River in Franklin, Pennsylvania is presented as Appendix II. A listing of the individual trips made as part of this investigation is presented as Appendix III.



Figure 01: The upper end of Crull's Island, Allegheny River Islands Wilderness (photo by Edward Frank 2009).

¹ Native Tree Society, Eastern Native Tree Society

² Cook Forest State Park

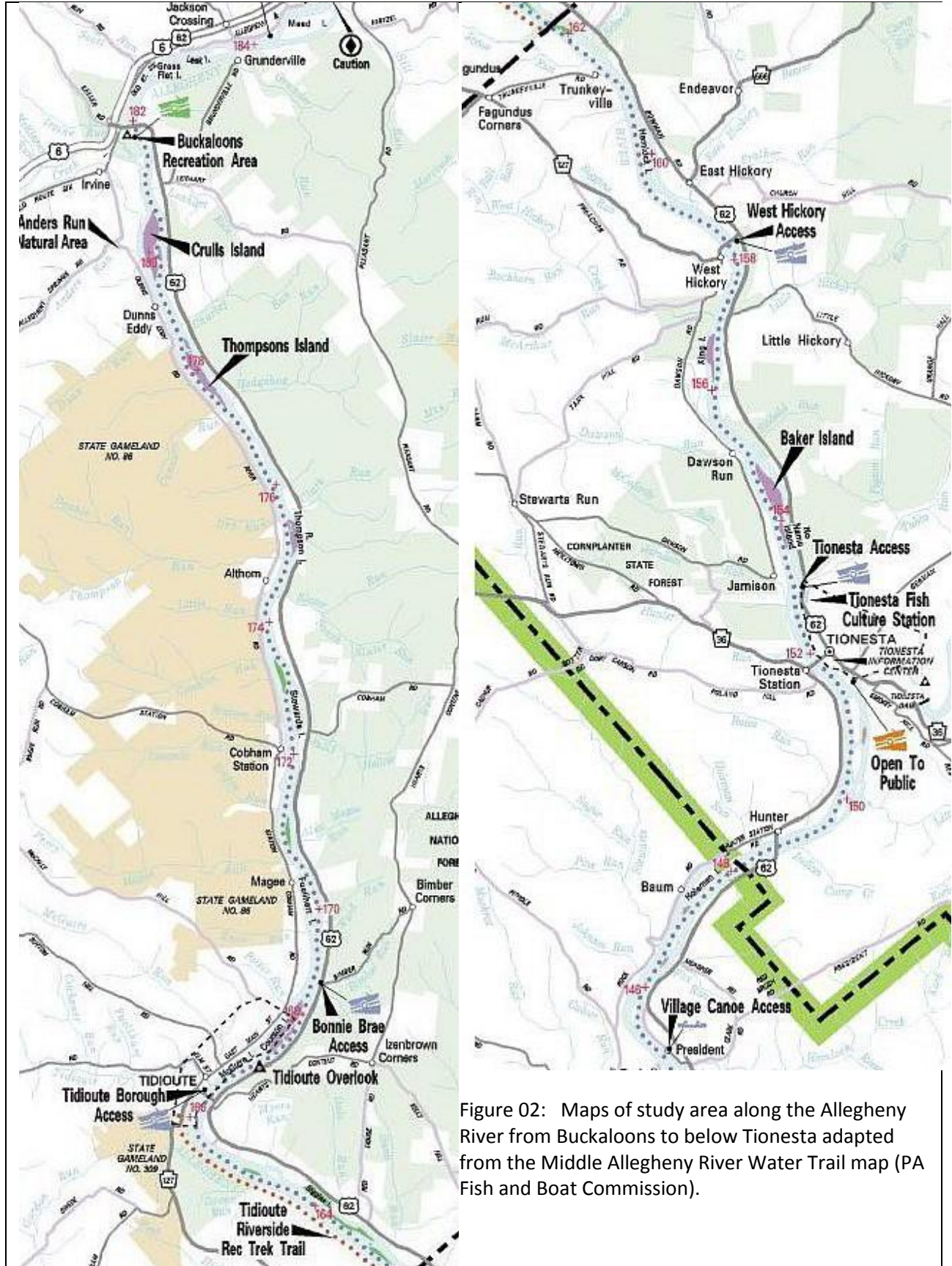


Figure 02: Maps of study area along the Allegheny River from Buckaloons to below Tionesta adapted from the Middle Allegheny River Water Trail map (PA Fish and Boat Commission).

Allegheny River

The Allegheny River begins as a spring in a farmer's field in Potter County in north central Pennsylvania. From there it loops northward into New York State before returning to Pennsylvania at the Allegheny Reservoir in Warren County in northwestern Pennsylvania. The Allegheny River is approximately 325 miles (523 kilometers) long and flows generally southwestward before joining the Monongahela River at Pittsburgh's Point State Park to form the Ohio River. The river drains a dissected plateau 11,580 square miles (30,000 square kilometers) in area in the northern portion of the Allegheny Plateau geomorphic region. This generally rural area forms the northeastern most drainage in the Mississippi River basin. To the west, tributaries of the Allegheny River reach within 8 miles (13 kilometers) of Lake Erie in southwestern New York.

http://en.wikipedia.org/wiki/Allegheny_River

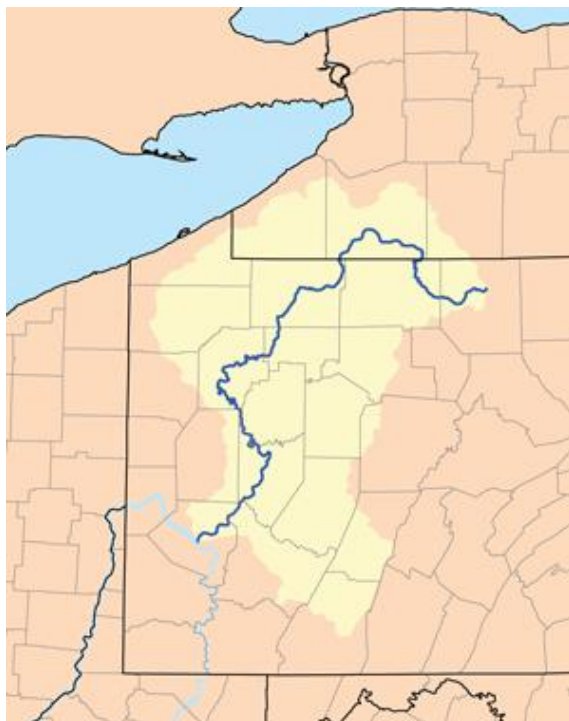


Figure 03: Map of the Allegheny River drainage basin (Musser 2007).

This area of Allegheny Plateau is a maturely dissected plateau characterized by sharper ridge tops and narrower valleys than are found in the glaciated portions of the plateau to the north and west. Broad, low amplitude, northeast-southwest trending folds slightly tilt the horizontal sedimentary layers and lends a slight structure to the topography. The ridge tops typically consist of a harder, coarse grained sandstone unit which restricts downward erosion. The valleys form where this layer has been breached. The valleys then widen by undercutting and eroding this capping layer.

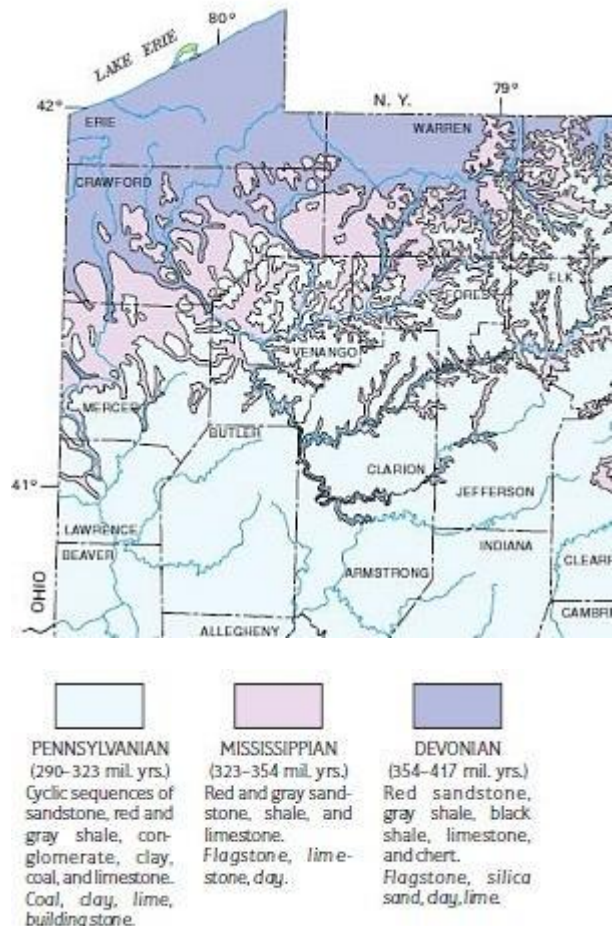


Figure 04: Surface bedrock geology of northwestern Pennsylvania (PADCNR 2007).

Elevation ranges from 1,000 to 2,000 ft (305 to 610 m). Local relief ranges from 100 to 670 ft (30 to 205 m). The drainage pattern is generally dendritic, typical of flat lying sediment. A thin layer of unconsolidated materials overlies bedrock. Beneath these sediments, the Upper Devonian, Lower Mississippian, and Pennsylvanian bedrock is composed of a mixed siliclastic sequence of sandstone, siltstone, shale, conglomerate, occasional limestone, and coal. (McNab and Avers, 1994)



Figure 05: Physiographic Provinces of northwestern Pennsylvania (PA DCNR 2000).

Prior to the Pleistocene, the upper reaches of the Allegheny basin drained to ancestral Lake Erie. In the Pleistocene ice blocked this drainage to the north and the northwest (Kaktins and Delano, 1999). Enormous lakes formed in the stream valleys and finally overflowed. Where these overflows breached the watershed divides, they merged and cut new paths to form a new river. This new river roughly followed the front edge of the continental glacial sheet. (Weigman 2008)

Through this process several sections of the previously existing drainages joined to form the present day Allegheny River. No longer flowing into lake Erie and on to the Atlantic Ocean, these basins are now drain to the Gulf of Mexico via the Ohio and Mississippi Rivers.

Currently the Allegheny River forms a narrow, less than one mile wide, floodplain with a channel that cuts 400 to 700 feet (120 – 215 meters) into the plateau. In the immediate area of the Allegheny River Islands Wilderness (ARIW) generally one river bank rises steeply from the river edge with a narrow floodplain present along the opposite bank, or in some cases both banks, rise steeply from the river's edge with no floodplain present on either side of the river.

Just upstream of Warren, Pennsylvania, and about 16 miles (26 kilometers) upstream of the Buckaloons Recreation area, is the large Kinzua Dam that forms the Allegheny reservoir. This lake is designed for flood control, not navigation.

Kinzua Dam itself is located on the Allegheny River in Warren County, Pennsylvania, approximately 198 miles (319 kilometers) above the mouth of the river at Pittsburgh, Pennsylvania. The huge structure holds back the Allegheny River to form a pool that reaches 24 miles (39 kilometers) in length and extends from Warren and McKean Counties, Pennsylvania, into Cattaraugus County, New York. In Pennsylvania, the reservoir is completely surrounded by the Allegheny National Forest; and in New York State by Allegany State Park and the Allegany Indian Reservation of the Seneca Nation. The dam reservoir was completed 1965. Drainage area above the dam is 2,180 square miles (5646 square kilometers). The Allegheny Reservoir ranges in acreage from a maximum of 21,180 acres (8571 hectares) when full to a normal

summer pool of 12,080 acres (4890 hectares). (US Army Corp of Engineers 2011)

The flow regime within the study area has been altered dramatically with the construction of Kinzua Dam. Formerly with the spring thaw there were high peak flood of relatively short duration that scoured the islands in the river and the shoreline. Since the constructing of the dam, these peaks have been greatly reduced and high flow has been stretched from a few weeks duration to a moderately high flow period extending from March through May. In the late summer and fall the flows are now maintained at a higher volume than was present in the river prior to the construction of the dam.



Figure 06: Allegheny River Watershed adapted from Pennsylvania Environmental Council (2001).

There are three major streams flowing into the Allegheny River just above or within the study

area. Conewango Creek flows into the Allegheny River near Warren, Pennsylvania about seven miles upstream of the study area. The creek's drainage covers much of southeastern Chautauqua County, New York and southwestern Cattaraugus County, New York. The drainage basin of Conewango Creek occupies 896.5 square miles (2322 square kilometers), contains 780.8 river miles (1257 kilometers), and 53 lakes. The largest of these lakes is Chautauqua Lake at 13,000 acres (5261 hectares) which feeds into Conewango Creek through the Chadakoin River. The mean discharge of Conewango Creek is approximately 2,090 ft³/s (59.18 m³/s).

Brokenstraw Creek drains into the Allegheny River from the west at the extreme north end of the study area. The Brokenstraw Creek watershed includes parts of eastern Erie County, northwestern Warren County in Pennsylvania and southern Chautauqua County in New York State. The creek is 37.1 miles (60 km) in length and drains watershed 338 square miles (875 km²) in area. It is a substantial tributary of the northern portion of the Allegheny River. The Brokenstraw Creek flows into the Allegheny River discharging an average of 595 ft³/s (16.85 m³/s).

Tionesta Creek flows into the Allegheny River from the east at the town of Tionesta near the southern end of the study area. The creek flows generally to the southwest from its headwaters draining portions of Forest, Clarion, Warren, McKean, and Elk Counties in Pennsylvania. Tionesta Creek along with West Branch of Tionesta Creek form a stream with a combined length of 61.9 miles (99.6 km) long and draining a watershed is 480 square miles (1,243 km²) in area. Tionesta Lake is a man-made reservoir located 1.25 miles (2 kilometers) upstream of the confluence the Allegheny River and Tionesta Creek created by the construction of Tionesta

Dam in 1940. The average discharge of the creek is quite variable but averages about 1100 ft³/s (31.15 m³/s).

Water flow data is available for the Allegheny River itself from several USGS gauges along the river in the study area. Three gauging station monitor the flow of the Allegheny River in the study area.

The uppermost of these gauging stations is located in Warren, Pennsylvania: *Allegheny River just below Conewango Creek* [03015310](http://waterdata.usgs.gov/pa/nwis/uv/?site_no=03015310) Drainage Area: 3,131 square miles (8109 square kilometers). Flow is regulated by Allegheny Reservoir 8.7 miles (14 kilometers) upstream since October 1965 and since 1941 by Chautauqua Lake. Extremes outside of the period of record: Flood of March 1865 reached a stage of at least 19.4 feet (5.91 meters), estimated discharge, 90,000 ft³/s (2,550 m³/s), from National Weather Service data. Maximum discharge since construction of Kinzua Dam, 33,600 ft³/s (951.4 m³/s), June 1972, with a gage height of 11.5 feet (3.51 meters).

http://waterdata.usgs.gov/pa/nwis/uv/?site_no=03015310&PARAMETER_cd=00065,00060,00010

The gauging station at West Hickory, Pennsylvania is in the central portion of the study area: *Allegheny River at West Hickory, Pennsylvania* [03016000](http://waterdata.usgs.gov/usa/nwis/uv?03016000) The flow at this station is regulated by the Allegheny Reservoir 39 miles (62.8 kilometers) upstream since October 1965 and since 1941 by Chautauqua Lake.

<http://waterdata.usgs.gov/usa/nwis/uv?03016000> The West Hickory gauging station is located in Forest County, Pennsylvania at latitude 41°34'15", longitude 79°24'29" NAD27, The drainage area above the station is 3,660 square miles (9480 square kilometers). The gage datum is at 1,059.90 feet (323.06 meters) above sea level NGVD29, Hydrologic Unit Code

05010003. A chart of the maximum flows of the Allegheny River at the West Hickory gauging station is presented as Figure 07.

Allegheny River at West Hickory, PA				
Year	Date	Gage ht. (ft)	Flow (cfs)	
1942	3/18/1942	13.44	58,000	
1942	12/30/1942	14.51	66,400	
1946	5/28/1946	12.72	52,800	
1947	4/6/1947	15.97	84,300	
1948	3/22/1948	15.93	83,300	
1956	3/8/1956	17.2	101,000	
1959	1/22/1959	15.6	81,600	
1960	3/31/1960	13.6	61,500	
1961	4/26/1961	13.73	62,400	5
1964	3/6/1964	14.23	67,300	5
Kinzua Dam Completed 1965				
1972	6/25/1972	11.18	42,300	6
1976	3/3/1976	10.89	40,200	6
1989	6/20/1989	10.55	37,500	6
1992	7/21/1992	10.67	38,700	6
1995	2/9/1995	10.56	38,100	6
1996	1/19/1996	11.62	46,500	6
1998	1/8/1998	11.19	43,100	6
2003	7/22/2003	10.5	37,500	6
2004	9/9/2004	10.88	40,600	6
2008	02/06/200	10.52	37,800	6

Figure 07: Allegheny River flow maximums at the gauge in West Hickory, Pennsylvania from 1942 until 2009. The notation (5) indicates the discharge is affected to a unknown degree by regulation or diversion. The notation (6) indicates the discharge is affected by regulation or diversion, primarily the Kinzua Dam constructed upstream of West Hickory in 1965 (USGS).

http://nwis.waterdata.usgs.gov/pa/nwis/peak?site_no=03016000&agency_cd=USGS&format=html

The Franklin Gauging station is on the Allegheny River a few miles south of the study area. It has been included because there is a longer period of

record available for stream flow maximums at the Franklin gauging station than is available for the gauging station at West Hickory, Pennsylvania.

Allegheny River at Franklin, PA				
Water Year	Date	Gage ht. (ft)	Flow (cfs)	
1865	3/17/1865		196,000	1
1913	3/26/1913		191,000	2
1916	3/29/1916		121,000	2
1918	3/15/1918		108,000	2
1920	3/13/1920		138,000	2
1927	3/28/1927		121,000	2
1936	3/28/1936	19.02	118,000	2
1938	1/25/1937	17.93	106,000	2
1943	12/31/1942	18.17	110,000	2
1946	5/28/1946	17.98	107,000	3
1947	4/6/1947	19.05	115,000	3
1948	3/22/1948	20.36	132,000	3
1956	3/8/1956	20.55	134,000	3
1959	1/22/1959	20	126,000	3
1960	3/31/1960	17.9	102,000	3
1964	3/10/1964	18.48	112,000	3
Kinzua Dam Completed 1965				
1972	6/25/1972	15.84	85,400	3
1991	12/30/1990	15.34	80,300	3
1996	1/19/1996	16.64	89,300	3

Figure 08: Stream flows in excess of 100,000 cfs at the Franklin Gauging station on the Allegheny River, and the three highest stream flows recorded since the construction of the Kinzua Dam in 1965. The notation (1) indicates the discharge value is a historic high, (2) discharge is affected to an unknown degree by regulation or diversion, (3) discharge is affected by regulation or diversion (USGS).

Allegheny River at Franklin, Venango County, Pennsylvania. Hydrologic Unit [05010003](https://waterdata.usgs.gov/usa/nwis/uv?03025500). The flow at this station is regulated by Allegheny Reservoir 74 miles (119 kilometers) upstream since 1965, by Chautauqua Lake since 1941, by Tionesta Lake since 1940, by Union City Reservoir

since 1971, and by Woodcock Creek Lake since January 1974. U.S. Army Corps of Engineers has a satellite telemeter at station.

<http://waterdata.usgs.gov/usa/nwis/uv?03025500>

The gauging Station is on right bank at upstream side of Eighth Street bridge on U.S. Highway 322 at Franklin, 1,000 ft (305 meters) downstream from French Creek, and at river mile 124.4 (200.2 kilometers), latitude 41°23'22", longitude 79°49'14". The drainage basin above the station is 5,982 square miles (15,493 square kilometers). The period of record extends from October 1914 to current year. Monthly discharge only for some periods, published in WSP 1305. Gage-height records collected at same site since April 1905 are contained in reports of U.S. Weather Bureau. Datum of gage is 955.84 feet (291.34 meters) above sea level. Prior to September 16, 1932, nonrecording gage, and September 16-30, 1932, water-stage recorder, at present site at datum 2.00 feet (.61 meters) higher. A chart of the maximum flows of the Allegheny River at the West Hickory gauging station is presented as Figure 08.

There is not a direct linear relationship between the flows at the two stations because floodwaters may be derived from different in feeder streams at different flow rates. In general the pre-dam flood peak flows at West Hickory, during this period of record, ranged from 50 to 75% of the flows at the Franklin gauging station, and averaged around 62%. Since the construction of the Kinzua Dam the peak flows at West Hickory have been in the range of 40 to 50% of those measured at Franklin.

The maximum flood stage recorded at the Franklin station was during the flood of March 17, 1865 and reached a stage of 25.0 feet (7.62 meters). A second major flood occurred on March 26, 1913 and reached a stage of 24.6 feet (7.5

meters). Based on gage readings and extrapolating from rating curves extended above 120,000 ft³/s (3398 m³/s), the discharge during these events was calculated to have been 196,000 ft³/s (5550 m³/s) and 191,000 ft³/s (5408.4 m³/s), respectively. At this station flood stage is defined as over 17 feet (5.18 meters). Figure 08 above shows the larger floods that took place at the Franklin station. Listed are all of the discharges greater than 100,000 ft³/s (2832 m³/s) prior to the construction of the Kinzua Dam in 1965, and the two largest flows since that construction.

Island Development

The major islands in the upper Allegheny River consist of coarse gravel deposits that reach upwards of 20 feet (6 meters) above mean river flow level. River islands are dynamic and often ephemeral features of a river system. This can be seen by the appearance, disappearance, and migration of sand bars and smaller islands within the system. This can also be seen in the channels that have dissected many of the larger islands into multiple smaller islands, or seasonally dry channels that cut across them. Spring floods erode clastic materials from the islands and river bottom and move it farther downstream. Then as the floods recede, sand, gravel and other clastic material is redeposited, often resulting the same general topographic configuration as was found prior to flooding. As the sediment is eroded from the upper ends of the island and redeposited at the lower end of the island, river islands tend to slowly migrate downstream over time. Generally the surface deposits on the upper end of the island where erosion is taking place consists of coarser sediment and gravels, while the sediment at the downstream end of the island where deposition is taking place consists of finer sediment. The core of the islands

consists of coarse gravel and cobble deposits that date from the late Pleistocene and likely formed as outwash deposits during the last retreat of continental glaciation 11,000 years ago.

Wyrick (2005) in "On the Formation of Fluvial Islands" provides a good overview of the processes involved in the genesis and development of fluvial islands. He writes: "A fluvial island is defined as a land mass within a river channel that is separated from the floodplain by water on all sides, exhibits some stability and remains exposed during bankfull flow (whereas a bar would be submerged)." He describes eight different processes that can form river islands. Of these, the processes of avulsion, gradual degradation of channel branches, and stabilization of bars or riffles seem to best fit those processes taking place on the Allegheny River Islands with avulsion being the primary agent. Overall the river flow path can be described as one with "frequent" islands where there is infrequent overlapping of islands and with average spacing between islands less than ten river widths. However some stretches are better characterized as "split" with frequent or continuous overlapping of islands creating two or three flow paths. The shape of the island refers to its subaerial planform shape. They are known to have various shapes, and these shapes can be categorized as either (a) irregular, (b) angular, or (c) streamlined. The islands in the Allegheny River typically are streamlined with a lenticular shape. "The persistence of an island refers to the likelihood that the island will remain as an island in the future, and is characterized as either (a) long-term, (b) intermediate, or (c) short-term...The likely persistence of the island is also related to several other categories, such as the type of vegetation, composition of the sediment, and the changes occurring in the system."

Island Soils

Rich soils derived from reworked glacial outwash and recent alluvium from the uplands blanket the islands. The soils vary considerably in texture and drainage category. Soils of the Pope series are found on the higher elevations of various islands including Crull's Island, Thompson Island, R. Thompson Island, and Courson Island. Soils of the Pope series are coarse-loamy, mixed, mesic fluventic dystrochrepts. These well drained soils are on floodplains. They formed in alluvial sediments washed from soils that derived mainly from acid sandstone, siltstone, and shale. The principle associated soils are the moderately well drained Philo soils, the very poorly drained and poorly drained Wayland soils, and the poorly drained Atkins soils. King's Island is almost entirely dominated by the Wayland series consisting of a fine silty mollic fluvaquent. These poorly drained and very poorly drained soil are on the depressed parts of flood plains. They formed in alluvial sediments washed from soils derived from glacial till. The Philo series consists of a moderately well drained, coarse-loamy fluvaquentic dystrochrept. These moderately well drained soils are on flood plains. They formed in alluvial sediment washed from soils that derived mainly from acid sandstone, siltstone, and shale. In the study area this soil tended to be found in elevated floodplains. (Ceruti 1985, Whitney 2001, Williams 2010b).

Native American Prehistory

The prehistory of the northwestern Pennsylvania can be divided into several distinctive phases. The earliest was the Paleoindian Period which extended from 14,000 to 8,000 years ago. This is followed by the Archaic Period from 8,000 B.C. to 1,800 B.C. There was a transitional period from

the late Archaic to the Woodland Period that extended from 1,800 to 1,000 B. C. The Early to Middle Woodland Period extended from 1,000 B.C. until around 1,200 A.D. Late Woodland Period began around 1,200 A. D., and ended around 1550 A.D. with contact with European explorers and settlers.



Figure 09: Eleven thousand years ago, Onondaga chert stone tools were carried by hunters from western New York to Pennsylvania. These ice age peoples are called Paleoindians (Pennsylvania Historical and Museum Commission, 2011b).

The earliest human inhabitants in the Upper Allegheny region first entered the area near the time of the Pleistocene - Holocene transition, about 8,000 to 12,000 years ago during the Paleoindian Period. The climate at that time, near the end of the last ice age, was much cooler and resembled the modern tundra. The early people were migratory hunters and occupied seasonal hunting and fishing camps in the region. They hunted large game such as caribou and moose (McNab and Avers, 1994).

By the beginning of the Archaic Period, around 8,000 B. C., the climate was beginning to warm and the open forests of the area were being replaced by the taiga forests of dense spruce and pine stands. Deciduous trees, such as birch, oak,



Figure 10: Early Archaic chipped stone spear points (Pennsylvania. Historical and Museum Commission, 2011a).

chestnut, and maple were migrating northward as the climate warmed. These species began to reach the upper Allegheny area about 9,000 years ago. Oak-hemlock forests dominated the region. During this time the human population in the region continued to grow. They continued to hunt, fish, and gather wild foods. The game present changed with the changing climate. The amount of game increased and now included white-tailed deer, elk, turkey, and other species adapted to the more temperate climate (Pennsylvania. Historical and Museum Commission, 2011a). The Transitional Period marked the terminal phase of the Archaic. “Around 4,000 years ago, at the beginning of the Transitional Period, there is some evidence of a climatic change to a warm, dry period that may have affected hunter-gatherer strategies.

Transitional Period sites are more frequently located close to water, and some sites along the major rivers appear to have been occupied for longer periods of time than during the Late Archaic. Trade becomes important and stone for making tools is traded over hundreds of miles.” (Pennsylvania Historical and Museum Commission, 2011b).



Figure 11: Illustration of a non-stockaded village of the Monongahela Culture, at Foley Farm, located in rural Greene County. The Monongahela were an agricultural people who lived in small circular houses organized in villages of up to several hundred people. A stockade wall of wood poles frequently surrounded their villages (Pennsylvania Historical and Museum Commission).

The Woodland Period extended from 1000 B.C. to approximately 1550 A. D. “In the Ohio Valley of western Pennsylvania, more dramatic developments took place, including the use of burial mounds and elaborate burial ceremonies. Archaeologists call this the Adena culture, which is part of a regional development that extended from the Upper Mississippi Valley. Adena people lived in round houses clustered in small hamlets. They continued to hunt and fish but they intensified their use of wild plant foods. There is good evidence that they gathered seeds from sunflower and chenopodium (lamb's quarters) and ground them into a flour. There is also some evidence for the use of squash, which was domesticated in Mexico and was gradually transported to Northeastern North American.” (Pennsylvania Historical and Museum Commission, 2011c).

During the latter part of period the Native Americans turned to farming as their primary food source and lived in fortified semi-permanent villages. “Beginning around AD 1000 in the Ohio

Valley, agricultural villages appear in what archaeologists call the Monongahela culture. Initially sites are situated on floodplains, but by AD 1250 they are more often found on upland saddles between hilltops. Houses were usually small, suggesting they were occupied by nuclear families. The houses were arranged in a semicircle or circle around a central plaza. The upland sites were frequently surrounded by a wooden stockade, suggesting that there may have been feuding among villages. By AD 1450, the villages consisted of concentric rings of houses with a large building in the center. Some of the houses had petal-shaped attachments that may have functioned as storage or processing structures (i.e. a smokehouse).” (Pennsylvania Historical and Museum Commission, 2011d) European explorers and missionaries began interacting with the native inhabitants of northwestern Pennsylvania and surrounding regions in the early 1600’s.

In the Allegheny River Corridor there are five documented archaeological sites in the reach from Warren to an area 8 miles south of Franklin. Three sites are actually within the current study area. These sites from north to south are 1) Mead Island in Warren, 2) Buckaloons, 3) Indian camp Run #1 near Tionesta, 4) Indian Camp Run #2 near Tionesta, and 5) Indian God Rock downstream of Franklin.

Mead Island Site

A native village site was excavated on Mead Island on the Allegheny River in Warren, Pennsylvania by a team led by Dr. Stanley Lantz. “Their settlement pattern is characterized by the construction of stockaded villages in the river bottoms. Inside of these villages round houses were constructed as evidenced by post mold

patterns. These houses averaged approximately 8m in diameter and included a rock covered storage pit. The round houses also typically exhibited a centrally located hearth around which other activities occurred. Rectangular subterranean “sweat lodges” are another type of structure that occurs within the stockaded village.” (Meyers 2007)

This island location served as the type locality for the Mead Island tradition defined by Dr. Stanley Lantz in 1989. “The Meade Island Culture was named after an island in the Allegheny River near Warren, Pennsylvania. It was the dominant Early Late Woodland occupation of the Middle Allegheny River Valley from the mouth of the Conewango Creek in Warren, down river to the confluence of French Creek at Franklin and perhaps beyond. Radiocarbon dates range from circa AD1000 to AD1300 or in calendar years from AD1050 to AD 1320. This range within excavated occupations; confirm a pattern of abandonment and reoccupation. The culture exhibits complexity, with domestic structures comparable to those of the Monongahela to the south, however, surface and subterranean features are duplicated in the immediate upriver Allegheny Iroquois occupations. Furthermore, many ceramic attributes are similar to the Fort Ancient and Whittlesey Traditions of Ohio. Also, a degree of ceramic form is recognized with Monongahela.” (Lantz 2004)

“Mead Island ceramics are fairly distinctive and occur in a number of type varieties. It is common for Mead Island ceramics to exhibit a thickened rim strip, add on collars; decoration applied by the edge of a cord wrapped paddle is common as well as a series of undecorated wares. Grit tempered pottery is the most common however shell tempered pottery is commonly found. The examples of pottery shown below are most likely

attributed to the Mead Island tradition. Mead Island projectile types include both Levanna and Madison-like points. Diagnostic of their projectile forms is the very high degree of flint knapping skills.” (Meyers 2007)

Buckaloons Site

Near Buckaloons Recreational Area at the confluence of the Allegheny River and Brokenstraw Creek on the right riverbank lies on the site of a former Native American village. “Prior to European settlement, several cultures occupied the Buckaloons site including the Late Woodland (AD 1000 - 1600) Allegheny Valley Iroquois and the Historic (1600 - 1800) Seneca Iroquois.

Settlement patterns of these groups are generally characterized by base camps on river terraces surrounded by large catchment areas from which raw materials were produced at ancillary sites.

These native groups were semi-sedentary horticulturalists practicing swidden agriculture whereby forests were cleared and burned to create open areas in which sunflower (*helianthus annuus*), maize (*Zea mays*), squash (*curcubita pepo*), and beans (*Phaseolus vulgaris*) were cultivated. Settlements were large, palisaded villages with longhouses and garden plots capable of supporting up to 250-300 people.

Based upon archaeological reconstructions the prehistoric landscape resembled a mosaic pattern of (1) active croplands near palisaded settlements, (2) abandoned clearings with early successional taxa, and (3) open forest stands.” (Ruffner and Abrams, 2002).



Plate 9. IRVINE MOUND 2.

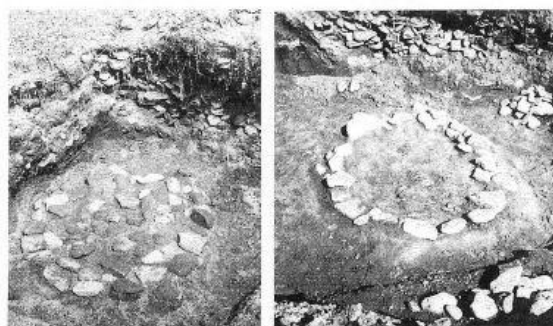


Plate 10. IRVINE MOUND 2: Cobblestone layer covering cremation and burial objects. Note cobblestone circumvallation in trench wall.

Figure 12: Excavation of Irvine Mound #2 at Buckaloons, Warren County, Pa in the 1930's. Photographs taken by Harry Schoff (Meyers 2007).

A description is provided in the next section of several Seneca Indian towns along the upper Allegheny River, including the village at Buckaloons, as they existed in 1779 is provided by Colonel Brodhead. He was the leader of an expeditionary force sent by General Washington to raze these towns in response to Indian attacks on settlements in western New York.

Indian Camp No. 1 Site

Indian Camp Run No. 1 site is located along the east bank of the Allegheny River in Forest County, Pennsylvania, approximately three miles below the mouth of the Tionesta Creek. This location has produced some of the only known buried

Paleoindian deposits found in the entire Allegheny River valley of western Pennsylvania. One whole fluted point, tentatively identified as a Barnes point, was recovered from the site, a type of point which dates to approximately 10,600 rcy B.P. Some of the other tools recovered from the site may relate to later Paleoindian complexes. (Meyers and Meyers, 2007).

Indian Camp No. 2 Site

Indian Camp Run site No. 2 (36Fo66) is located a few miles below the mouth of the Tionesta Creek in Forest County, Pennsylvania. This site is located just east of the larger Indian Camp Run No. 1 site on the adjacent terrace near the confluence of Indian Camp Run and the Allegheny River. The deepest artifacts recovered include a stemmed lanceolate point, a notch, and a utilized flake. The deepest artifact (appears to be a retouched flake. Whether these tools are Paleoindian in age is open for debate. The most significant occupation of the site occurred during Early and Middle Woodland times. The Early Woodland assemblage includes interior cordmarked ceramics similar to Half-Moon ware. This pottery was found to be in direct association with a fireclay pipe perform, a water sorted sandstone cobble replica, and a drilled stone pendant. Early Woodland is represented by ceramic sherds found generally below but also mixed in with the later Middle Woodland ceramics including a number of thick interior cordmarked body sherds. Middle Woodland artifacts have been recovered including Raccoon Notched and Jack's Reef projectiles and numerous flake blades found in association with ceramics decorated along the exterior sublip of the rim by paddle edge impressions. Late Woodland is represented by a smattering of shell tempered ceramics (Meyers 2007a).

Indian God Rock, Franklin, Pennsylvania

Along the Allegheny, about 8 miles south of Franklin, Pennsylvania is a large rock with many petroglyphs carved upon it known as Indian God Rock. It is believed to have been carved at some point after AD 900, but most likely after 1200. The rock is 22 feet in height and composed of hard sandstone with sloping sides. In 1984, Indian God Rock was placed on the National Register of Historic Places.



Figure 13: Drawing of Indian God Rock made by Capt. Eastman, U. S. A. in 1853, and published in "Safe Harbor Report No. 1" of the Pennsylvania Historical Commission. ."

In the summer of 1749 a French expedition headed by Bienville de Celeron (Pierre J. Celeron) traveled down the Allegheny River and laid claim to the territory for the French. At important locations, lead plates were buried, claiming the lands for the French King. One of the sites selected was the Indian God Rock.

The following entry appears in de Celeron's diary in August 3, 1749: "[We] have buried a lead plate on the southern bank of the Ohio river, four leagues below the Riviere Aux Boeufs [French Creek], opposite a naked mountain and near a large stone on which are many figures crudely engraved, a leaden plate, and have attached in the same place to a tree the arms of the King. (Galbreath 1921)

There are no documented archaeological sites on any of the islands within the study area. However the active presence of native Americans along the banks of the Allegheny River within this same area for 10,000 years suggest that the islands were at least visited by native Americans and likely used as temporary hunting and fishing camps.

Early European History in Northwestern Pennsylvania

Schenck (1887, pp. 22-23) provides an overview of the history of early European exploration and settlement in northwestern Pennsylvania:

During the first quarter of the seventeenth century three distinct streams of emigration, with three attendant claims of sovereignty, were converging toward the region of the Great Lakes. For the time being, however, the French had the best opportunity and the Dutch next, while the English, apparently, were third in the race. The French were the first white men to make explorations in the vicinity of Lake Erie. As early as 1611-12 Champlain ascended the chain of lakes as far as Lake Huron, and from that time forward the Indians were visited by numerous French priests,

on the double mission of spreading the gospel and promoting the interests of their king and nation.

In 1623 permanent Dutch emigration, as distinguished from mere fur-trading expeditions, first began upon the Hudson. The colony was named New Netherlands, and the first governor was sent thither by the Batavian Republic. Two years later a few Jesuits arrived on the banks of the St. Lawrence, the advance guard of a host of representatives of that remarkable order, which was in time to crowd out almost all other Catholic missionaries from Canada and the whole lake region, and substantially monopolize the ground themselves. In 1626 Father de la Roche Dailon, a Recollet missionary, visited the Kahquahs, or Neuter nation, and passed the winter preaching the gospel among them. This active, keen-sighted missionary also found time during his winter's sojourn in the wilderness to visit and describe the oil springs in New York and Western Pennsylvania. In 1627 Cardinal Richelieu organized the company of New France, otherwise known as the Company of a Hundred Partners.

It is well authenticated that when the French first appeared on the stream, flowing but a few miles westward from the western boundary of Warren county—by the Indians known as the "Wenango," by the French as the "River Le Boeuf," and by the English and Americans as French Creek — great numbers of buffalo were found there. For that reason the river was named Le

Boeuf, or Beef River, by the exploring French missionaries, and many years subsequently the fort built on or near the site of Waterford by the French was given the same appellation—Le Boeuf.

At the time of which we are now speaking, the date of the coming of the first French missionaries and traders to these regions, the country bordering the southern shores of Lake Erie, and for a great but unknown distance to the south of it, was in the possession of two strong tribes or nations, known as the Errieronons or Erie or Cat nation, and the Andestiquerons or Kahquah nation. As Eries and Kahquahs they were generally known, and these are the names we have adopted in speaking of them. The greater part of the shore of Lake Erie, however, was occupied by the tribe from which the lake derives its name, the Eries. This name is always mentioned by the early French writers as meaning "cat." On Sanson's map, published in 1651, Lake Erie is called "Lac du Chat," Lake of the Cat."

A number of historical events and historical figures are associated with this stretch of the Allegheny River. Two events in particular are worth special notice. The first of these was an expedition to the area by French explorer Celeron de Bienville in 1749. The second was an encounter between American soldiers led by Colonel Brodhead in 1779 near Thompson Island while on his way to raze the native village at Buckaloons and several others in the region. These events have been recounted repeatedly with varying degrees of accuracy in books, articles, and web pages dealing with the history of the region.

Celeron de Bienville Expedition

The first notable excursion into the upper Allegheny River itself was an expedition led by Celeron de Bienville (also spelled Celeron de Blainville) in 1749. The purpose of the expedition was to renew friendships with local Native Americans and to drive English traders from the Ohio River basin. He was ordered by Comte de la Galissoniere, the highest-ranking French official in North America, to lead an expedition of 250 French soldiers from Montreal to the headwaters of the Ohio, and then to proceed down the Ohio River to bolster French claims to the territory. Celeron De Bienville carried several lead plates with him for the purpose of laying claim to the Ohio Country. Each plate bore an inscription in French that claimed King Louis the XV of France was the ruler of the Ohio Valley region. Where major rivers joined the Ohio, the party stopped and buried one of the tablets and on a nearby tree, placed a second a metal plaque asserting the claims of France and stating that the tablet lay nearby. De Bienville is believed to have buried six plates. Only one has been found intact (Ohio History Central 2005).

The mission began in the summer of 1749. From Montreal Celeron De Bienville followed the southern shores of Lakes Ontario and Erie until he reached a point opposite Lake Chautauqua, "where the boats were drawn up and taken bodily over the dividing ridge, a distance of ten miles, with all the impedimenta of the expedition, the pioneers having first opened a road." (Schenck 1887, p. 61)

Following on down the lake and the Conewango Creek, they arrived on the site of the present town of Warren. In the account below the confluence of Conewango Creek and the Allegheny River is described as the point where the "Ohio and Kanaougou unite." Here the first

plate was buried. These plates were eleven inches long, seven and a half inches wide, and one-eighth of an inch thick.

A translated account of De Celeron's procedure (Schenck 1887, pp. 61-62) reads as follows:

In the year one thousand seven hundred and forty-nine. We, Celeron, Knight of the Royal and Military Order of St. Louis, captain commanding a detachment sent by order of the Marquis de la Galissonniere, Captain General in Canada, and the Beautiful River, otherwise called the Ohio, accompanied by the principal officers of our detachment, have buried at the foot of a red oak tree, on the south bank of the River Ohio, and opposite the point of a little island where the two rivers, Ohio and Kanaougou unite, a leaden plate, with the following inscription engraved thereon:

In the year one thousand seven hundred and forty-nine, in the reign of Louis XV, King of France. We, Celeron, commanding officer of a detachment sent by the Marquis de la Galissonniere, Captain General of New France, to re-establish peace in some Indian villages of these Cantons, have buried this plate at the confluence of the Rivers Ohio and Kanaougou this 29th day of July, as a monument of the renewal of the possession which we have taken of the said River Ohio, and of all the lands on both sides, up to the source of the said rivers, as the preceding Kings of France have enjoyed or ought to enjoy the same, and have maintained themselves there by arms and treaties, and especially by those of Ryswick, Utrecht, and Aix-la-Chappelle.

We have, moreover, affixed the King's arms at the same place to a tree. In testimony whereof, we have signed and drawn up this process verbal." Done at the mouth of the beautiful river, in this twenty-ninth day of July, one thousand seven hundred and forty-nine.

Signed by all the officers.

Celeron.

The burying of this plate was attended with much form and ceremony. All the men and officers of the expedition were drawn up in battle array, while the savages assembled looked on in open-mouthed awe and wonder, when Celeron proclaimed, in a loud voice, "Vive le Roi," and declared that possession of the country was now taken in the name of the king. A plate bearing the arms of France was then affixed to the nearest tree (Schenck 1887).

The same formality was observed in planting each of the other plates: the second at the rock known as the "Indian God"—on which are ancient and unknown inscriptions—a few miles below Franklin ; a third at the mouth of Wheeling Creek ; a fourth at the mouth of the Muskingum; a fifth at the mouth of the Great Kanawha, and the sixth and last at the mouth of the Great Miami. Toilsomely ascending the Miami to its head waters, the party burned their

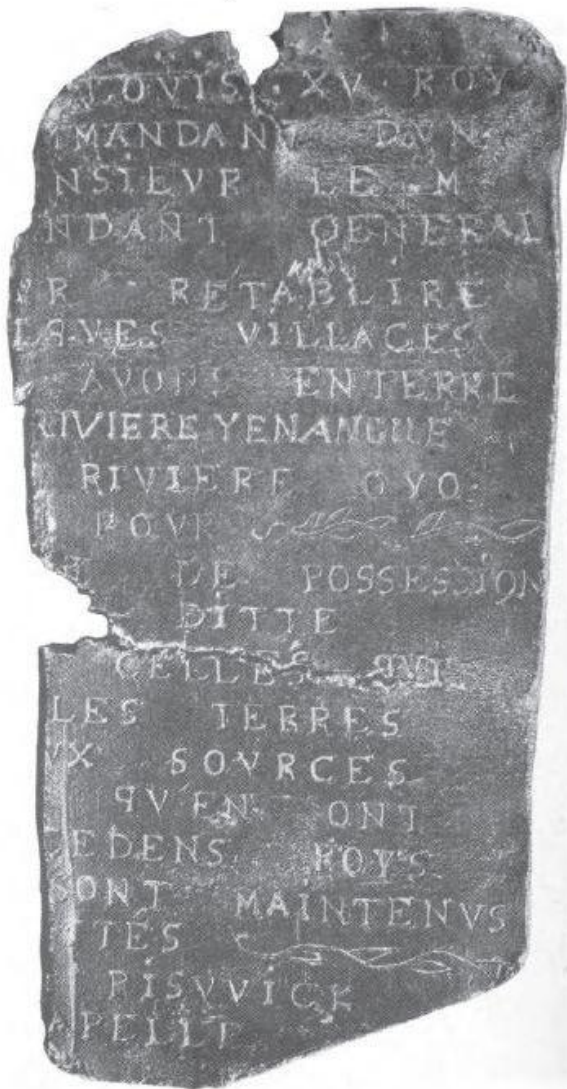


Figure 14: Facsimile of Remnant of Leaden Plate Deposited At the mouth of the Muskingum (Galbreath 1921).

canoes, and obtained ponies for the march across the portage to the head waters of the Maumee, down which and by Lakes Erie and Ontario they returned to Fort Frontenac, arriving on the 6th of November. It appears that the Indians through whose territory they passed viewed this planting of plates with great suspicion. By some means they got possession of one of them, generally supposed to have been stolen from the party at the very commencement of their journey. (adapted from Schenck 1887)

There were many interactions between European settlers, soldiers and explorers with the native populations dwelling in western Pennsylvania and New York State. Some were peaceful, others were not. In general with the settlement of the eastern part of Pennsylvania, the native populations there were displaced and moved westward. Refugees from the Lenape (Delaware) and Shawnee tribes took up residence in many of the Seneca Iroquois villages in western Pennsylvania. The years between 1720-1780 witnessed the greatest displacement of native groups into the Ohio Valley. In the area below east Hickory part of the Allegheny valley was allotted to Munsee and other displaced Indians by the Seneca before 1750.

David Zeisberger – Moravian Missionary

David Zeisberger, a Moravian missionary established an Indian mission named Lawunakhannek near East Hickory in 1767. This was the first Protestant church building west of the Allegheny Mountains. The term is a Delaware word meaning "northerly stream place." Zeisberger worked among these refugee groups, then occupying three towns along the river here. During the period 1767-70 several Moravian missions were established on the upper Allegheny River to help immigrating natives cope with the loss of their lands and life further east.

The later exploits of David Zeisberger as a Moravian missionary as the frontier moved westward among the Indians of Ohio is recounted in his diaries (Zeisberger & Bliss 1885) and his history of northern American Indians (Zeisberger et al 1910).

By 1753 the French had reportedly established an outpost at Buckaloons and although no garrison



Figure 15: Engraving by John Sartain, 1864, depicting David Zeisberger, a Moravian missionary, speaking to Indians gathered around a fire. After an 1862 oil painting by Christian Schussele called *The power of the Gospel: Zeisberger preaching to the Indians* (Free Historical Stock Photos).

structure has ever been unearthed there. There were also three towns established along the Allegheny River in the vicinity of Tionesta consisting of Delaware Indian refugees that fled westward from eastern Pennsylvania and New Jersey as they were displaced by European settlers.

Mulkearn and Pugh, (1953, p. 303) write:

Goshgoshunk, a Indian refuge locale comprising three Indian towns, was known (1767) to David Zeisberger, the Moravian missionary, as the Upper, Middle, and Lower towns...Although its exact location has never been determined, it is probable that the Middle and Lower towns were located in what is now Venango County.

Zeisberger, in his journal of his two missionary trips to these towns, stated that the Middle Town was two miles down the Allegheny from the Upper Town, the Lower, six miles from the Upper. In two instances he gave the mileage between Upper and Lower towns as eight, not six, miles. Also, on one occasion he named the Lower Town - Damascus.

In this missionary's dictionary of the Delaware language he gives "Damascus" as the Delaware equivalent for the English "Muske-Rat." At approximately the distance given by Zeisberger from the Upper Town, there is a small stream - Muskrat Run - flowing into the Allegheny from the west. An editor of the 1887

edition of Zeisberger's dictionary [Zeisberger and Horsford 1887] notes that the Delaware words in it are largely Munsee. These refugee towns were founded by the Delawares of the Munsee Tribe. From this evidence one may assume that the Lower Town was somewhere near the mouth of Muskrat Run, about one-half mile northwest of Eagle Rock School. The Middle Town, which was also on the east bank of the Allegheny and four miles above the mouth of Muskrat Run, was probably somewhere opposite Baum. When Zeisberger came to the Allegheny, he found the Middle Town deserted.

During the (American Revolutionary War) the Seneca supported the British. At this time the Revolutionary War was fought largely by, with, or against Indians west of the Allegheny Mountains. Both the British and the Americans pretended to want only Indian neutrality but secretly they both tried to persuade the various Indian tribes to their individual sides. The British were slightly more successful in persuading the Indians to assist them in the war. There were numerous attacks by bands of Mohawks and Senecas on settlements in New York and Pennsylvania. In 1778 at Cherry Valley, NY "the blood-thirsty Senecas were present in force, together with a body of Mohawks under Brant, and of Tories under Captain Walter Butler, son of Colonel John Butler, and there then was an undoubted massacre. Nearly thirty women and children were killed, besides many men surprised helpless in their homes." (Schenck 1887)

Colonel Daniel Brodhead

By the spring of 1779 the Indian attacks could no longer be ignored. Col. Danl. Brodhead took over at Ft. Pitt and immediately asked General Washington for permission to make a grand sweep up the Allegheny to Ft. Niagara. Washington refused due to a lack of information about the Allegheny River and its territories.



Figure 16: Painting of Daniel Brodhead (Smith 1883).

To remedy this situation Brodhead sent out numerous spies and small parties but they were seldom able to get as far as Franklin.

A June 23, 1779 letter from General Washington finally freed Brodhead to decide on his own course of action while also stating that the main attack on Ft. Niagara would proceed from Easton, Pennsylvania up the Susquehanna, under General John Sullivan. Brodhead, left to his own devices, began to assemble his troops.

An encounter between Colonel Brodhead and Seneca warriors took place at Thompson's Island a few miles south of Brokenstraw Creek while Brodhead's men were on their way to raze the

village at Buckaloons. Thompson's Island is therefore historically significant since it is the site of the only Revolutionary War battle fought in northwestern Pennsylvania.

Colonel Brodhead's report to the commander-in-chief of the Continental armies, made at the conclusion of the campaign, reads in part as follows (Schenck 1887, p. 78-79):

To His Excellency Gen. Washington.

Pittsburg, Sep'r 16th, 1779.

Dear General: I returned from the expedition against the Seneca and Muncy nations the 14th inst. and now do myself the honor to inform you how far I have succeeded in prosecuting it.

I left this place the 11th of last month with six hundred & five Rank & File, including Militia & Volunteers, & one Month's provision which except the live Cattle was transported by water under the escort of one hundred men to a place called Mahoning, about 15 Miles above Fort Armstrong [*Kittaning*], where after four days detention by excessive rains & the straying of some of the Cattle, the stores were loaded on Pack Horses, and the troops proceeded on the march for Canawago on the path leading to Cuscushing ; at ten miles on this side the town, one of the advance guards consisting of fifteen White men, including the spies & Eight Delaware Indians, under the command of Lieut. Hardin of the 8th Penn'a Reg't, whom I have before recommended to your Excellency for his great bravery & skill as a partisan, discovered between thirty and Forty warriors coming down the Allegheny

River in seven Canoes. These warriors having likewise discovered some of the Troops, immediately landed, stripped off their shirts and prepared for action, and the advanced Guard immediately began the attack. All the troops except one column and Flankers being in the narrows between the River and high hill were immediately prepared to receive the enemy, which being done I went forward to discover the enemy, and saw six of them retreating over the River without arms, at the same time the rest ran away leaving their Canoes, Blankets, Shirts, provisions and eight Guns, besides five dead and by the signs of Blood, several went off wounded ; only two of my men and one of the Delaware Indians (Nanouland) were wounded and so slightly that they are already recovered & fit for action. The next morning the Troops proceeded to Buchloons, where I ordered a small Breastwork to be thrown up of felled Timber and fascines, a Capt. And forty men were left to secure our Baggage and Stores, and the Troops immediately proceeded to Canawago, which I found had been deserted about eighteen months past.

Here the Troops seemed much mortified because we had no person to serve as a Guide to the upper Towns, but I ordered them to proceed on a path which appeared to have been travelled on by the Enemy some time past, and we continued marching on it about 20 Miles before any discoveries were made except of a few tracks of their spies. But immediately after ascending a high hill we discovered the Allegheny River & a number of Corn Fields, and descending

several towns which the Enemy had deserted on the approach of the Troops. Some of them fled just before the advanced Guards reached the Towns and left several packs of Deer skins. At the upper Seneca Towns we found a painted image or War post, clothed in Dog skin, and John Montour told me this town was called Yoghroonwago ; besides this we found seven other Towns, consisting in the whole of one hundred and thirty Houses, some of which were large enough for the accommodation of three or four Indian families. The Troops remained on the ground three whole days destroying the Towns and Corn Fields. I never saw finer Corn altho' it was planted much thicker than is common with our Farmers. The quantity of Corn and other vegetables destroyed at the several Towns, from the best accounts I can collect from the officers employed to destroy it, must certainly exceed five hundred acres which is the lowest estimate, and the plunder taken is estimated at 30 m. Dollars ; I have directed a sale to be made of it for the Troops. On my return I preferred the Venango Road, the old towns of Canawago, Buchloons & Mahusquechikoken, about 20 Miles above Venango on French Creek, consisting of 35 large houses were likewise burnt. The greatest part of the Indian houses were larger than common, and built of square & round logs and frame work. From the great quantity of Corn in new Ground & the number of new houses Built and Building it appears that the whole Seneca & Muncy nations intended to collect to this settlement which extends about eight Miles on the

Allegheny River, between one hundred and seventy and two hundred miles from hence. The River at the upper Towns is little if any larger than Kiskamanitis Creek. It is remarkable that neither man nor Beast has fallen into the Enemies hands on this expedition, & I have a happy presage that the counties of Westmoreland, Bedford & Northumberland, if not the whole western Frontiers will experience the good effect of it...

I have the honor to be with the most perfect regard and esteem, Your Excellency's Most Obed't H'ble Serv't, D. Brodhead."

"After this expedition Col. David Brodhead continued to play a role in prosecuting the Revolutionary War. In 1781, some of the Lenape-Delaware ended their neutrality and sided with the British. In retaliation, Brodhead invaded their territory in central Ohio and destroyed the main village of Coshocton in what is now east-central Ohio. As a result of Brodhead's campaign, the Delaware fled from eastern Ohio. He retained command of the Western Department until September 17, 1781, when he was replaced by General John Gibson. George Washington shortly thereafter brevetted him a brigadier general. Brodhead spent the remainder of the war as commander of the 1st Pennsylvania Regiment.

After the war, Brodhead, by then a widower, married Rebecca Mifflin, the widow of General Samuel Mifflin. Brodhead was one of the founders of the Society of the Cincinnati. He later served in the Pennsylvania General Assembly. On November 13, 1789, he was appointed Surveyor General of Pennsylvania and held the post for the next eleven years.

http://en.wikipedia.org/wiki/Daniel_Brodhead

General William Irvine

In 1785 General William Irvine reported on a tour of the land found along the Allegheny River and French Creek.

The relevant portions of that report deal with the stretch of the river between Oil Creek in Franklin and Conewango Creek in Warren (Irvine 1785 in Agnew 18871 pp. 200-203); Schenk 1887, pp. 86-87):

Report of General Wm. Irvine, Agent of the State on the Donation Lands. This Report Accompanied a Letter to his Excellency, John Dickinson, Esq., dated Carlisle, August 17, 1785.

(page 200) From French to Oil Creek is about eight miles. This is not laid down on any map, notwithstanding it is a large stream, not less than eighty or perhaps a hundred yards wide, at the mouth a considerable depth, both of which it retains to the first fork, which is at least twenty miles up, and I am certain, is as (hundred yards wide, at the mouth a considerable depth, both of which it retains to the first fork, which is at least twenty miles up, and I am certain, is as capable of rafting timber, or navigating large boats, as French Creek in the same seasons this high. On the northeast, or upper side of this creek, at the mouth is four or five hundred acres of good bottom, and about a mile up, there is another small bottom on the southwest side, which is all the good land to the first fork.



Figure 17: General William Irvine 1784. Engraving by J. C. Buttre, after portrait by B. Otis, which was in turn based on a portrait by Robert Edge Pine (Butterfield 1873).

Oil Creek has taken its name from an oil or bituminous matter being found floating on the surface. Many cures are attributed to this oil by the natives, and lately by some whites—particularly rheumatic pains and old ulcers. It has hitherto been taken for granted that the water of the creek was impregnated by it, as it was found in so many places; but I have found this to be an error, as I examined it carefully, and found it spring out of two places only; these two are about four hundred yards distant from [each] other, and on opposite sides of the creek. It rises in the bed of the creek, at very low water, in a dry season. I am told it is found without any mixture of water, and is pure oil; it rises, when the creek is high, from the bottom in small globules; when these reach the surface they break, and expand to a surprising extent, and the flake varies in color as it expands; at

first it appears yellow and purple only, but as the rays of the sun reach it in more directions, the colors appear to multiply into a greater number, more than can at once be comprehended.

From Oil Creek to Cushkushing, an old Indian town, is about seventeen miles. The whole of this way is barren ; high mountains, not fit for cultivation ; the mountain passes so close on the river that it is almost impassible, and by no means impracticable, when the river is high; then travelers, either on foot or horseback, are obliged to ascend the mountain and proceed along the summit.

At Cushkushing there is a narrow bottom, about two miles long, good land, and a very fine island, fifty or sixty acres, where the Indians formerly planted corn. From Cushkushing to another old Indian town, also on the bank of the river, is about six miles; this place is called Canenkai, or Hickory Bottom. Here is a few hundred acres of good land, and some small islands. From hence to a place named by the natives the Burying Ground, from a tradition they have that some extraordinary man was buried there many hundred years ago, is about thirteen miles. Most of this way is also a barren, and very high mountain, and you have to travel greatest part of the way in the bed of the river. To Brokenstraw Creek, or Bockaloons, from the last-named place, is about fourteen miles ; here the hills are not so high or barren, and there are sundry good bottoms along the river. About half-way there is a hill, called by the Indians Paint Hill, where they find a good red oker. Brokenstraw is

thirty yards wide; there is a fine situation and good bottom near the mouth on both sides; but little way up the creek large hills covered with pine make their appearance. From Brokenstraw to Conewago is eight or nine miles; here there is a narrow bottom interspersed with good, dry land and meadow ground all the way, and there is a remarkable fine tract at the month of the Conewago, of a thousand or perhaps more acres, from the whole of which you command a view up and down the main branch of Allegheny, and also of Conewago, a considerable distance. Conewago is one hundred and fifty yards wide, and is navigable for large boats to the head of Jadaque Lake, [Lake Chautauqua] which is upwards of fifty miles from its junction with the east branch of the river. ...

WM. IRVINE, Agent.

The distances presented by Irvine(1785) are very close to the actual distances marked on the Allegheny River Water Trail published by the Pennsylvania Fish and Boat Commission. The distances presented on the water trail map, from Pittsburgh, are shown below:

French Creek	124	0 total
Oil Creek	131.5	7.5 total
Holeman	147.5	23.5 total
Tionesta	151.5	27.5 total
West Hickory	158	34 total
Tidoute	166	42 total
Brokenstraw Creek	182	58 total
Conewago	189.5	65.5 total

Irvine account provides the following location names and distances:

French Creek	0	0 total
Oil Creek	8	8 total

Cuskushing	17	23 total
Canenaki or Hickory Bottom		
	6	29 total
Burying Ground	13	42 total
Brokenstraw Creek	14	56 total
Conewago	8 or 9	65 total

The distance between French Creek and Oil Creek is 7.5 miles and 8 miles respectively. Irvine writes: "At Cushkushing there is a narrow bottom, about two miles long, good land, and a very fine island, fifty or sixty acres, where the Indians formerly planted corn." This places the island at the location of Holeman Island. Anecdotal information suggests that the remains of a native village were uncovered and buried during the construction of a golf course on the shore of the river nearby. There is no mention of the inflow of Tionesta Creek. Either the inflow was bypassed unseen on the trip upriver, hidden by the Tionesta Islands, or it did not strike him as worthy of mention. The Canenaki or Hickory Bottom area is located around the area of Baker Island and the adjacent shore areas. Little Hickory Run flows into the river from the east side in this vicinity, although West Hickory is a couple miles farther upstream. The area called Burying Ground corresponds to the present day location of Tidioute, 42 miles upstream of French Creek by both accounts. The total distances reported by Irvine to Brokenstraw Creek/Buckaloons and to Conewago Creek are both very close to those on the water trail map. The inflow of Conewago Creek is listed as 65.5 miles upstream from French Creek on the water Trails map and 65 miles by Irvine's account. This shows that the locations of particular sites described by Irvine are generally accurate and can be relied upon for use in reconstructing the history of the region.

A report and maps made by the commissioners of the two states defining the boundaries between

Pennsylvania and New York commented on the names of villages in the Warren county area.

Schenk (1887, p. 91) writes:

From these maps we learn that Conewago Creek was then written "Conawango River;" the Kinzua, "Consua," and the Brokenstraw, "Koshanuadeago." No Indian towns were shown within the present limits of Warren county, but just over the line in New York, upon both the Conewago and Allegheny, Indian villages were designated, besides another, termed "Hickory Town," at the point now known as Tionesta.

Sipe (1929) lists a number of Indian towns along the Allegheny in this region:

- Lawunakhanek is a A Moravian mission among the Munsee Clan of Delawares, located a few miles above Goschgoschunk near the mouth of Hickory Creek (p. 750);
- Goschgoschunk. A Munsee Delaware village, also called Goshgoshing, which stood at the mouth of Tionesta Creek, near the present town of Tionesta, Forest County. Called Cushkushing by Col. Brodhead (p. 749);
- Gonewango. A Seneca village, located at the mouth of Conewago Creek, where the town of Warren, Warren County, now stands(p. 749);
- Buckaloons (Buccaloons). A Seneca town at the mouth of Brokenstraw Creek, at the site of the present town of Irvineton, Warren County (p. 749);
- Hickory Town. A Delaware village of the Munsee Clan, situated at the mouth of Hickory Creek, Forest County (p. 749).

It is noteworthy that these different accounts place Hickory Town and the various native refugee towns in slightly different locations. The firsthand accounts by Broadhead and Zeisberger are likely the best references for their true locations.

Irvine Family

A history of the Irvine family, early landowners in the Brokenstraw Creek – Ander Run area is presented in “The Irvine Story” (Wainwright 1964, Ryan 2011). The highlights are summarized below:

- 1795 General William Irvine with a surveyor, Andrew Ellicott, laid out the towns of Erie, Waterford, Warren, and Franklin. His reward for his war time service was 2000 acres known as Irvine’s Reserve.
 - 1797 First son General Callender Irvine built “Brokenstraw Farm,” a log cabin with three acres of corn across the river from the mouth of Brokenstraw Creek.
 - 1804 The last recorded timber cut in the area with many trees 100 plus and some estimated to be 400 years old.
 - 1805 General Callender Irvine built “Brokenstraw Farm” and would visit there often; due to there still being more natives about than whites, he would never really live there. But would have tenants (1805-1825) lease it to work and build it between his visits from Erie, Pittsburgh, Carlisle, and Philadelphia.
 - 1822 General Calender Irvine had a summer home erected on the east side of Brokenstraw Creek.
 - 1825 Dr. William A. Irvine (General William Irvine’s Grandson) moved to his father’s (Callender’s) summer house.
- Near the mouth of Brokenstraw Creek, across from Buckaloons, he erected a sawmill and gristmill.
- 1833 Dr. Irvine married Sarah Jane Duncan and moved her to Irvine.
 - 1838 Te Stone Church in Irvine was built for his wife Sarah.
 - 1839 The very frail Sarah passed away. After her death their three children returned to Philadelphia to live with Sarah’s Aunt Emily.
 - 1841 Stone House “In the Hollow” was one of three houses built for Dr. Irvine’s farmers.
 - 1842 Dr. Irvine moved his son Callender, named after his grandfather, back to Irvine to live.
 - 1850 In the spring of 1850, the then 20 year old Callender accidentally shot and killed himself.
 - 1855 Dr. Irvine’s business ventures: Through the years he built a gristmill, various sawmills, blacksmith shop, foundry, wool factory, tavern, machine shop, warehouse, owned other farming properties of a general store with his cousin. But through bad business decisions and bad debts he eventually had his entire estate seized and was sold in 1855 to the largest creditor, Dr. Stephen Duncan, his father-in-law. Dr. Duncan eventually reverted the real estate back to Dr. Irvine, but Dr. Irvine’s businesses were in the hands of others and the store sold.
 - 1859 Dr. Irvine, with Col. Drake’s discovery of oil, became an oil man. He helped establish a railroad along the Allegheny River and built the Irvine Pipe Line.
 - 1886 Dr. Irvine died.

Chief Gaiänt'wakê (Cornplanter)

A famous personage of this time was the Native American Gaiänt'wakê, more commonly known as Cornplanter. Cornplanter was born c. 1750 of a Seneca mother and a Dutch father. He was raised by his mother.

During the American Revolutionary war there was debate among the native tribes about what they should do. Cornplanter, a Seneca war chief, was hesitant about fighting for either side during the conflict and felt the Iroquois should stay out of the white-man's war. When most of the other leaders voted to support the British, he gave in to pressure and several times helped the British forces. Cornplanter and his forces participated along with Loyalist Lt. Colonel John Butler and his rangers at the 1778 Battle of Wyoming Valley, which came to be known as the Wyoming Valley Massacre. Eventually the Iroquois and British troops were decisively defeated at Newtown.



Figure 18: Chief Cornplanter portrait by Frederick Bartoli, 1796.

After this and other victories by the combined Loyalist and Iroquois forces, General George Washington commissioned Major General John Sullivan to invade Six Nation territory and "destroy" Iroquois villages.

General Sullivan and his army of 5,000 men conducted a scorched earth campaign, methodically destroying Iroquois villages, farms, and animals between May and September of 1779 throughout the Iroquois homeland (upstate New York).

After the defeat of the British in the war, and the establishment of the American government, Cornplanter opted to establish a useful diplomatic relationship with the new American government. He became a negotiator in disputes between the new Americans and the Seneca as well as other indigenous tribes. He even participated in meetings with both Presidents Washington and Jefferson. He was one of the signers of the Treaty of Fort Stanwix (1784). Eventually, after seeing the cost to his native culture resulting from the interaction with the white settlers, Cornplanter became disillusioned with his relationship with the Americans. Eventually he sided with his half-brother Handsome Lake's call that the Iroquois must return to the traditional Indian way of life, take part in traditional religious ceremonies, and turn away from assimilation to white ways. There are many views of Cornplanter. Some see him as a key bridge between the two cultures, other see him as a traitor to his people because of concessions made to the Americans at the cost of native culture and lands. Those who are more reflective realize that the role of Cornplanter was much more complex and not easily categorized.

<http://en.wikipedia.org/wiki/Cornplanter>

One of Brodhead's men Joseph Nicholson, became a friend and interpreter for the Seneca

chief, Cornplanter. On October 29, 1790, the chief Cornplanter petitioned the Supreme Executive Council to reward Nicholson for his services by giving him:

A tract of land six miles square...lying in the Forks of Allegheny River, Broken Straw creek...this being the place where a battle was fought between my people and yours, and where about thirty of my people were beat by him [Nicholson] and 25 of your people, and where he was shot tro' the thigh. (Mulkearn and Pugh 1953)

After the Revolutionary War “the counties of Northumberland and Allegheny were created by act of the Assembly March 27, 1772, and September 24, 1788, respectively, and comprised all of the northwestern part of Pennsylvania. The Six Nations of Indians, at a council held at Fort

Stanwix, Oneida County, New York, October 23, 1784, conveyed this territory to the State of Pennsylvania for \$10,000. By a confirmatory treaty with the Wyandots and Delawares at Fort McIntosh, in Pennsylvania, in January, 1785, formal possession was given to the white people of the vast section from which has been created the counties of Tioga, Potter, McKean, Warren, Cameron, Elk, Forest, Jefferson, Clarion, Butler, Lawrence, Mercer, Venango, Crawford, Erie and portions of Bradford, Lycoming, Clinton, Clearfield, Indiana, Armstrong, Allegheny and Beaver, being known as the "Later Purchase," by the Commonwealth and not by William Penn or his heirs.” (Defebaugh 1907, p. 528) European settlement of the Allegheny River area began after the purchase of northwestern Pennsylvania in 1789.

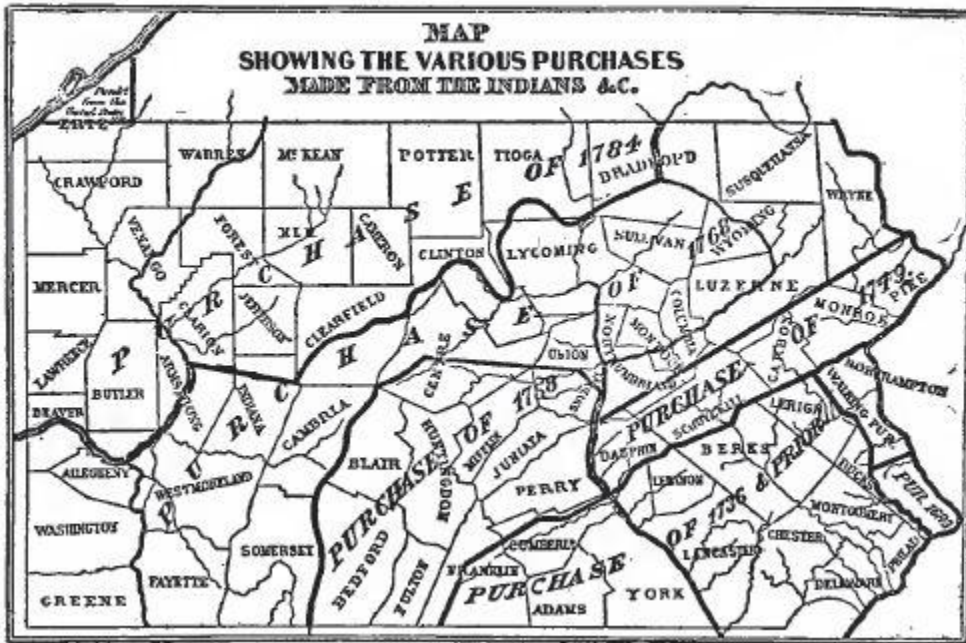


Figure 19: Map showing the various land purchases made from the Indians from Defebaugh (1907, P. 528)

Logging History of the Area

Beginning in 1795, two Colonial surveyors, General Irvine and Andrew Ellicott, surveyed tracts in the area. Irvine purchased parcels along the Buckaloons area which was later developed into a large farm by his son. In 1826 a sawmill was erected at the mouth of Anders Run and white pine in the drainage was cut and processed through the 1880's and sent downstream to the Pittsburgh market.



Figure 20: "Golden Hour at Lumber Camp" from Shoemaker (1914).

The Irvine family maintained the farm into the early 1900s after which Irvine Flats (Buckaloons site) was purchased by the US Forest service and the woodlands in Anders Run were purchased by the National Forge Company. The woodland property was then purchased in 1963 by the Western Pennsylvania Conservancy and later sold in 1989 to the Commonwealth of Pennsylvania as a conservation easement. (Ruffner and Abrams, 2002)

James Elliot Defebaugh (1907, pp. 621-624) in History of the Lumber Industry of America, Volume 2 provides a detailed overview of the early timber history of Allegheny River in Warren and Forest Counties, Pennsylvania:

So important was the lumber industry to Warren County in early times and so great was the lumber supply it contributed to the markets that some special mention of it, though brief, seems appropriate. The city of Warren is practically at the head of navigation of the Allegheny River. Olean, New York, ordinarily has this distinction, but in the days when the rivers were depended upon for transportation, Warren could be reached the year round by boats coming up the Allegheny from Pittsburg and other points, when Olean was cut off by low water.



Figure 21: Constructing a log slide near Corbett, Pennsylvania (Shoemaker 1914).

The Allegheny has a course of about forty-five miles through Warren County, and during the first half of the last century was the scene of an enormous traffic in logs and lumber by raft and barge. The products of the mills higher up the river were added to by those in

Warren County itself and by those which were able to float their products down the important streams emptying into the Allegheny within the county. The most important of these streams were the Conewango, the Brokenstraw, the Kinzua and the Tionesta.



WOMEN LOGGING SCENE

Figure 22: from Shoemaker (1914) showing a logging railroad in northern Pennsylvania, date and location were not specified.

The Conewango, rising in New York, and down which flowed the waters of Casadaga Creek and of Chautauqua Lake, was the ancient northwestern boundary of Allegheny County when that political division occupied all of the extreme northwestern portion of Pennsylvania. Brokenstraw Creek was one of the earliest lumber streams in the entire section. There seems to have been a distinct influx of settlement about the beginning of the Nineteenth Century which utilized these two streams as a source of logging supply. Tionesta Creek was also one of the famous lumber streams of the country in those days; and Kinzua Creek, while smaller than the others, until near the end of the last century furnished a large timber supply.

Other streams which furnished water power for the oldtime sawmills or were sufficiently large to float rafts, are Willow Creek, Sugar Run, Complanter Run (the home of the famous Complanter, the Indian friend of the whites in the last half of the Eighteenth Century), Hemlock Run and Tidioute and West Hickory creeks.



PRETTY GOOD WORK, (MINA, PA.)

Figure 23: Pretty good work, Mina, Pennsylvania (Shoemaker 1914).

Between 1795 and 1805 the county was definitely settled, although there were portions of it that for fifty years longer remained wilderness. As usual, the sawmill accompanied settlement, and, in fact, until the growing population turned its attention more definitely to agriculture, lumbering was the chief business of the people. In the borough of Warren, the county seat, a mill was built by one Daniel Jackson, a pioneer, about 1800, and the sawing of the first board was the occasion for a grand celebration. The first product of this mill was delivered by raft to Pittsburg. It contained 30,000 feet of white pine, and was the first from Warren County to descend the Allegheny. About the same time, Joseph and Darius Mead built a mill on the Brokenstraw, and within the first

ten years of the last century mills had been erected on all the leading streams. Up the Conewango, at what is now Russell, in Pinegrove Township, there was a mill as early as 1801, and in 1803 two more mills were built in that vicinity.

Joseph Gray was supposed to have built a sawmill on the Brokenstraw, where now is the village of Garland, as early as 1800. Jeremiah, Samuel and James Morrison settled in Mead Township before 1800 and soon erected a sawmill. In Farmington Township a sawmill built by William Sheldon is said to have been running before 1803.



Figure 24: A Bark Cabin used by lumbermen (Shoemaker 1914).

Schenck's "History of Warren County," published in 1887, says regarding Deerfield Township, "Pine and hemlock in enormous quantities covered nearly every valley and ridge." Speaking of a sawmill in Sheffield Township, the historian said: "It was then closely surrounded by a forest of lofty pines. One of these trees at the height of eight feet from the ground measured twenty-three feet in circumference; another made

seventeen sawlogs sixteen feet long." The truth of the last statement may well be questioned, but it reproduces a significant tradition. The surface of this township was said to have been almost entirely covered as late as 1848 by a dense growth of pine, mingled with considerable hemlock. Deerfield Township, on the Brokenstraw, had pine as its chief timber asset. Even as late as 1897 a tract of about 4,000 acres of white pine, located near Warren, was cut. It was of virgin growth, soft and clear and had been for years the finest piece remaining in the State."

Perhaps the most interesting part of the early lumber history of Warren County has to do with the rafting and boating of lumber down the Allegheny. As stated above, Brokenstraw Creek led in this work, its first raft going to Pittsburg, but within a few years this trade had extended, until by 1805 the shipment was sent down to New Orleans.



Figure 25: Rafts and Rafting, Allegheny River Timber, Grunderville, Pa., 1900. Square timbers piled on shore, to be formed into rafts and sent to Pittsburgh (Public Library of Cincinnati 2007).

Several trips were thus made during 1805 and succeeding years, and good profits were realized, although at great hazards. The best quality of pine brought in New Orleans what was then the enormous sum of \$40 a thousand feet. The men, who took these flat boats almost to the mouth of the Mississippi, guiding them more than 2,000 miles through the wilderness, were of hardy body and daring mind. Most of them walked all the way back from New Orleans, though some of them managed to obtain transportation around to Atlantic ports by coasting vessels, whence they walked home. Judge Johnson, of Warren County, in an address said: The first foreign traffic in pine lumber on the Brokenstraw of which I have any certain account was a fleet of three boats gotten together at the mouth of the creek in the fall and winter of 1805-6, and started on its perilous voyage to New Orleans on the first day of April, 1806.

The lumber had been gathered from the mills of Long and Ruse, Mead and others, of the best quality, stub-shotted and kiln-dried during the winter while the boats were building, and was owned by Colonel William McGaw and William B. Foster, and brought in New Orleans \$40 per thousand feet. Daniel Horn and Daniel McQuay were two of those on board and they walked back.

In the spring of 1807 another fleet of seven boats freighted with seasoned lumber owned by Joseph Mead, Abraham Davis and John Watt started for the same destination—New Orleans. The owners returned by sailing vessels to

Philadelphia, the pilots and hands finding their way back as best they could. McQuay and others are said to have made several return trips on foot.

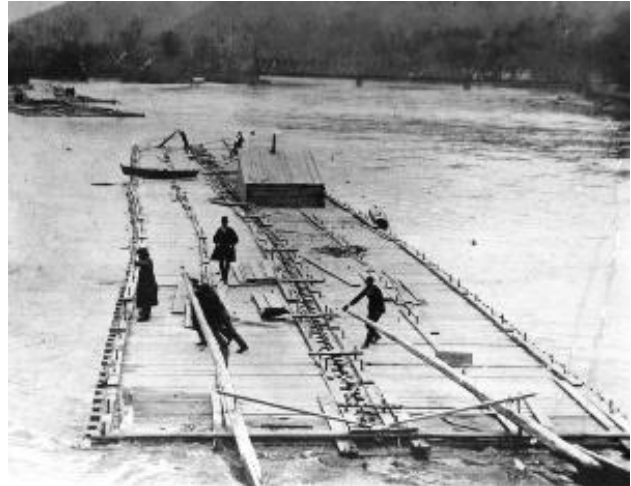


Figure 26: Rafts and Rafting, Allegheny River raft, Warren, Pa., 1883-1890. Taken from the suspension bridge looking upstream. The railroad bridge was built in 1883 (Public Library of Cincinnati 2007).

As the lumber business developed, the rafting business increased with it, until it reached its greatest magnitude in the third decade of the century. Some of these rafts were of enormous dimensions. One owned by Captain Warren, when it passed Cincinnati, Ohio, contained 1,500,000 feet of boards. It covered an area of nearly two acres, and, it was asserted, was the largest raft ever seen on the Ohio River. Warren County did not furnish by any means all the lumber that went down the Allegheny, but it supplied an important part of it and was the scene of concentration for the smaller rafts that came down the tributary streams and from the upper waters of the Allegheny. The lumber business is not entirely extinguished in Warren County, but it has been of

declining importance for forty or fifty years. The pine was largely cut away during the first half of the Nineteenth Century, and then after a time hemlock came to the front. Now this, too, is largely gone.



Figure 27: from Heck (1916), the caption reads: "The Black Forest after the Lumbermen Wrecked It – Shall it be permitted to remain as it now is, "a wilderness of slash, a panorama of ugliness, a land of destruction?"

Modern Conservation and Preservation Efforts

Since the 1960s, Western Pennsylvania Conservancy has worked to protect the Allegheny River, its tributaries and wildlife and has played a role in the preservation of a number of these river islands. Over the decades, the Conservancy has protected 22 river islands totaling more than 500 acres (202 hectares) and has also conserved 19,500 acres (7890 hectares) of shoreline, floodplain, valley slope and tributary watersheds. In addition, WPC has protected 10,800 acres (4370 hectares) of land near the river, supporting our conservation goals for the watershed. The river islands extend from the islands near Warren, Pennsylvania to Nine-Mile Island, so named because it is nine miles from Pittsburgh. (Western Pennsylvania Conservancy 2007b)

In 1984, Congress designated seven National Forest islands that extend 56 miles between Buckaloons and Tionesta as part of the National Wilderness Preservation System, to preserve vestiges of unique riverine forests. The islands are mostly vegetated with fine riverine forests of sycamore, silver maple, shagbark hickory and green ash. The Allegheny River Islands Wilderness, consisting of seven islands in the Allegheny River, totaling 368 acres (149 hectares), is one of the smallest components of the Wilderness System in the United States. The USDA Forest Service, Allegheny National Forest, is the federal agency responsible for managing both the Wild and Scenic River and Wilderness Islands (Pennsylvania Fish Commission- Middle Allegheny River Water Trail).

All of the islands are alluvial in origin, which means they were formed by water-carried deposits of sand, mud and clay. They are

characterized by river bottom forest trees such as willow, sycamore and silver maple. The islands are located between Buckaloons Recreation Area and Tionesta, Pennsylvania. They are:

- Crull's Island (96 acres, 39 hectares) has large old river bottom trees.
- Thompson's Island (67 acres, 27 hectares) The only Revolutionary War battle in northwestern Pennsylvania occurred on this island. It has an exceptionally fine riverine forest.
- R. Thompson's Island (30 acres, 12.1 hectares)
- Courson Island (62 acres, 25 hectares) The Island may be viewed from the Tidioute Overlook.
- King Island (36 acres, 14.6 hectares) has good riverine forest with many trees 35-50 inches in diameter.
- Baker Island (67 acres, 27 hectares) stood in the path of one of the two tornadoes which crossed the Forest on May 31, 1985. Most of the trees were blown over in the storm.
- No Name Island (10 acres, 4.04 hectares) is about half river-bottom trees and half dense undergrowth.

(USDA Forest Service 2006)

In 1992, three sections of this river trail, totaling 86.6 miles (139.4 kilometers), were designated a component of the Wild and Scenic Rivers System by Congress. This exclusive list of rivers was established to recognize outstanding examples of the nation's free-flowing rivers and to raise public awareness of how important and fragile America's river resources are. The Allegheny was given a recreational classification under the Wild and Scenic Rivers Act to reflect the relatively high

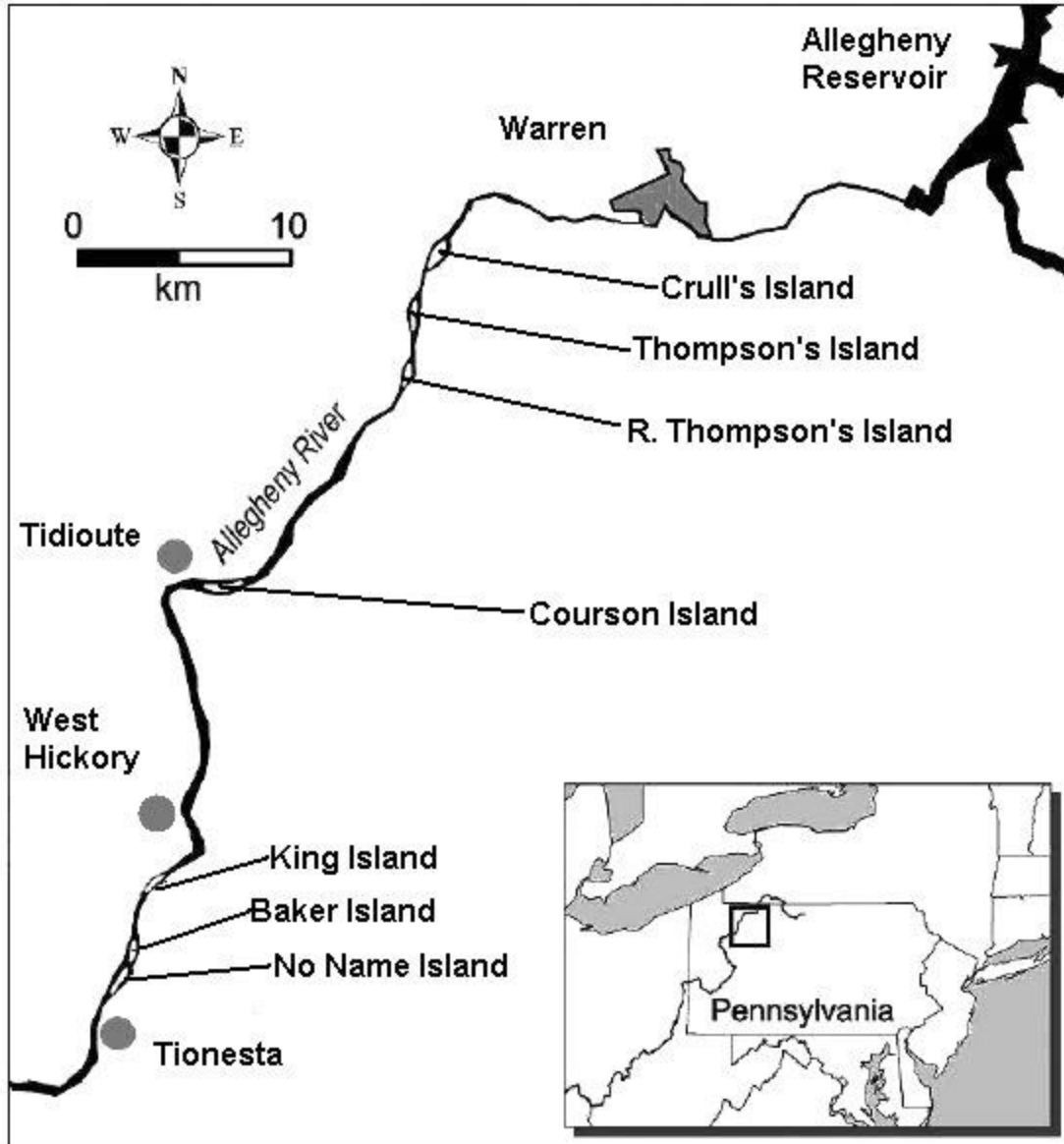


Figure 28: Map of the islands included in the Allegheny River Islands Wilderness (Adapted from Cowell and Dyer 2002, Williams 2010b).

level of accessibility and development, when compared with other rivers in the Wild and Scenic Rivers System. (Pennsylvania Fish Commission - Middle Allegheny River Water Trail). The reach includes: 1) From Kinzua Dam downstream to the U.S. Route 62 Bridge. 2) From Buckaloons Recreation Area at Irvine downstream to the southern end of Alcorn Island at Oil City. 3) From the sewage treatment plant at Franklin to the refinery at Emlenton. Named "La

Belle Riviere" by French explorers, this stretch of the Allegheny River flows through areas of narrow forest valleys, wilderness islands, and broad, rural landscapes rich with the early history and culture of the region. Good public access and few hazards make this an ideal river for novice and family canoeing. Fishing for muskellunge, walleye, rainbow trout, and smallmouth bass is popular. (National Scenic and Wild Rivers 2007)

Project Methodology

This report compiles the results as of December 2010 for the ongoing project of documenting forests and trees of the islands of the Allegheny River Island Wilderness and nearby islands in the upper Allegheny River in north central Pennsylvania. At this time the individual islands surveyed or scouted as part of this research project within the upper Allegheny River include, from upstream to downstream, Crull's Island, Thompson's Island, R. Thompson Island, Steward's Island, Fuelhart Island, Courson Island, Hemlock Island, King Island, Baker Island, Refugee Island 1, Refugee Island 2, and Holeman Island. In addition scouting and measurement trips were made to several sites onshore in the floodplain of the river including: Buckaloon's Recreation Area, Anders Run Natural Area, King Peninsula, and Tionesta.

Height and girth measurements were taken of the larger trees of each species located on each island as a part of documenting the forests growing on those islands. In addition a site description of each island was made, GPS measurements were taken, and photographs were used to further document select individual trees and island features found as part of the island survey. Several sites in the river floodplain along the river banks were also examined and trees measured for comparison purposes. The initial measurements made as part of the project were made by Dale Luthringer in 2003 (Luthringer 2003a). Individual measurement trips were made by either a single individual or as a small group. The islands were reached via canoe, a small rubber raft, or in some cases by wading the shallow water. All of the participants in the project are members of the Native Tree Society (NTS) <http://www.nativetreesociety.org> and most of the trip reports were first reported in that

group's discussion list and BBS. A summary of all the measurement and scouting trips taken to various islands are presented as Appendix III: ENTS Exploration Chronology.

Locations referenced by river miles are keyed to Middle Allegheny River Water Trail map by the Pennsylvania Fish and Boat Commission. The mileage numbers represent the distance upstream from the confluence of the Allegheny River and the Monongahela River at Point State Park in Pittsburgh to form the headwaters of the Ohio River proper. GPS, or Ground Positioning system, data was obtained using portable GPS instruments while in the field, or from latitude and longitude data obtained from air photos of the sites.

Tree height, crown spread, and girth measurements were conducted using the methodology outlined in "Tree Measuring Guidelines of the Eastern Native Tree Society" by Will Blozan, President, Eastern Native Tree Society (Blozan 2004, 2006, 2008). This height measurement method, called the ENTS Method or the sine-top/sine-bottom method, uses a laser rangefinder and a clinometer to determine tree heights. The distance to the top of the tree is measured with the laser rangefinder and the angle to the top of the tree is measured using the clinometer. The height of the tree top above eye level is $\sin(\text{inclination}) \times \text{distance}$.

The same procedure is used to measure the extension of the base of the tree above or below eye level. The total height of the tree is the value of the top measurement minus the bottom measurement. If the base of the tree is below eye level, then the sine of that angle is negative, and the calculated height value is negative. Essentially the length of the tree below eye level is being added to the value for the portion of the tree above eye level. This process is

independently repeatable and the resulting height measurement is generally within 1 foot of the actual height of the tree. The procedure avoids the pitfalls of the standard distance from the base/inclination measurements generally taught as part of most forestry courses which commonly result in errors in excess of twenty feet. Errors in this older method are a result of the top of the tree not being directly over the base, sloping ground surfaces, and misidentification of the true top of the tree.

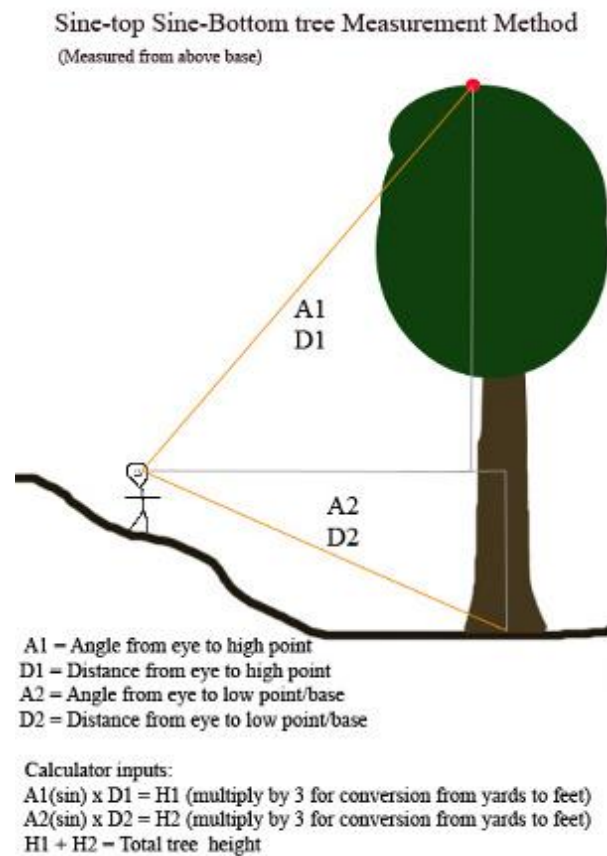


Figure 29: Illustration of a common tree height measurement scenerio using the sine-top / sine-base measurement method (adapted from Jeff LaCoy 2009).

Comparisons are made between the islands as they appear now and how they are described and shown on maps from the 1800s. There have

been dramatic changes in many of the major islands examined as part of this study in this stretch of the Allegheny River. Some islands have disappeared, others have formed, and some have merged together, and have changed shape or migrated downstream since early maps were made in the mid 1800s. They have undergone gradual reworking from annual spring floods and more dramatic changes as a result less frequent major floods.

These observations are based upon published maps of the river along the reach from Buckaloons to below Tionesta and comparable aerial photos taken through 2008. The specific references used include:

1. Babbitt, E. L. 1855. The Allegheny Pilot: containing a complete chart of the Allegheny River showing the islands and bars and low water channel, from Warren to Pittsburgh.
2. Beers, F. W. 1865. Plan of oil territory, in Warren County. (with) Plan of Tidioute, Warren County.
3. Beers, F. W. 1865a. Plan of Allegheny River from President to Warren Co. line.
4. Smith, J. L. 1881. Map of Forest Co. Pennsylvania compiled from records and official surveys by S. D. Irwin, Tionesta, Pennsylvania, a later issue of the 1876 map.
5. Pennsylvania Department of Conservation and Natural Resources-PAMAP/USGS. 2005. Aerial photos of the area.
6. USDA Farm Service Agency or Pennsylvania Department of Conservation and Natural Resources. 2005-2008. Aerial photos from the area.

7. Penn Pilot Historical Aerial Photo Library. Aerial photos of the area from 1939 and 1958.

Personal observations by the authors are included as appropriate within the descriptions. In general the Babbitt 1855 map which deals specifically with the islands and river course provides the best historical reference. Both of the Beers 1865 maps provide more detailed illustrations of the islands in the Allegheny River than does the Smith 1881 map, but the island details and shapes still appear to be stylized and are of questionable accuracy. The exception is the detailed map of the Tidioute area. The Smith 1881 map focuses more on land ownership than island details. The largest recorded flood of the Allegheny River took place in March 1865. It reached a stage of at least 19.4 ft, and an estimated discharge of 90,000 ft³/s measured for the Allegheny River just below Conewango Creek in Warren. Additional flow from Brokenstraw Creek also fed into the Allegheny River just upstream of Crull's island. The map survey for the 1865 map was in all probability completed before the major flood, but that flood may have changed the shape of many of the islands in the river at that time.

A measurement analysis protocol used here is the Rucker Height Index (RHI). The concept was first introduced by Colby Rucker in 2004 (Rucker 2004). The metric was described as "They are listed according to the average height of the tallest examples of the ten tallest species found at each site. This index, often called the "Rucker Index" provides a numerical evaluation of both maximum height and diversity of the dominant species. High index values are the result of many factors, including climate, topography, soils, and a lack of disturbance." An expanded discussion of the metric was provided by Frank (2008).

The Standard Rucker height index consists of ten species (RHI10) and is appropriate for most of the forests in the eastern United States. However some other variations of the standard ten species may be appropriate for certain situations. In areas with a low diversity a RHI5 might be more appropriate consisting of the average heights of the tallest example of each of the five tallest species on the site. It is also useful as a metric for sites where there has been only a limited amount of measurements taken. The ten species index is designed to represent the height of trees making up the canopy layer of the forest. If there are only a limited number of measurements, then some of the trees included at the lower end of range likely represent trees in the understory. Their inclusion in the calculation would give a falsely depressed value for the Rucker Index.

At the other extreme for forests that are particularly diverse and have a large number of canopy species or for compilations of Rucker Indices across a wider area and RHI20 is useful. The RHI20 average includes the tallest specimens of each of the tallest twenty species present in the area. In this project a RHI5 Index and a RHI10 index was calculated for every island where there was sufficient measurement information to do so. In addition a RHI20 Index was calculated for Hemlock Island, the island with the highest diversity yet measured as a part of the project, Crull's Island, and Thompson's Island, and a RHI20 Index was calculated for the entire island project as a whole. As might be expected, as the number of species included in the index increases the index value decreases.

The Rucker Index concept can be applied to other measurements. A standard Rucker Girth Index is the average of the largest girth example of each of the ten species having largest measured girth for a site. A ten species Rucker Girth Index,

RGI10, has been calculated for those islands with an adequate number of measurements. For those islands with girth measurements of five or more species but less than ten species, a five species Rucker Girth Index, RGI5, was calculated. A twenty species Rucker Girth Index, RGI20, was also calculated for Crull's Island, Thompson's Island, Hemlock Island, and for the overall islands system in the study area. The Rucker Girth Indices include only girths trees with single trunks and exclude multitrunk trees from the calculations.

Diversity can be expressed in any numbers of ways. There is at least a half different mathematical formulas that are commonly used to calculate a diversity index in any number of different fields of study. In this study an informal, simple definition is used to describe diversity as the data set collected is not structured to more rigorously calculate this specific statistic. Diversity is defined as the number of different woody shrubs and tree species on each island and within the study area as a whole. It is expressed as two numbers: 1) number of species, and 2) acreage of the island or study area.

Diversity is a complicated concept and generally the more a site is explored and the more measurements that are taken, the higher the diversity index. In general it can be expected that those islands containing the greatest number of different ecological niches will generally have a higher diversity. Growth on many of the islands is reflective of the patchwork history of the island itself in terms of erosion, flooding and deposition. Islands that have areas that are only rarely flooded, and also have low lying areas that flood regularly would be expected to have a greater diversity than islands that are entirely low lying where the entire island is flooded regularly.

Islands that are larger will generally have more variation in growth niches than smaller islands and should be expected to typically have a higher diversity than smaller islands. The more trips that have been made to an island and the more time spent documenting the species present on that island, the greater the chance that more different species will be found. The low diversity index values on many of the islands reflect the limited amount of measurement time and number of trips spent documenting the species on that island. All of these considerations will impact the diversity value listed for a particular island. Crull's Island, Thompson's Island, and Hemlock Island were measured extensively and the diversity values listed are likely representative of the actual diversity of these islands.

A Tree Height profile was created for the entire study area in the form of a bar graph. The tree species were arranged from tallest to shortest species along the x-axis, with heights represented on the y-axis. Profiles for individual islands were each overlaid on top of the bar graph for the entire study area. In this way the order and position of each tree species displayed on an island graph was consistent from graph to graph to better facilitate comparisons between islands.

In addition the heights of trees from each island are directly compared with those of the island group as a whole. If a species was noted as present, but no height measurements were made, that species was assigned a placeholder height of five feet so that it could appear in the tree height profile graphs.

Within this stretch the Allegheny River generally flows from the north to the south southwest. The individual islands and sites surveyed are described individually below.

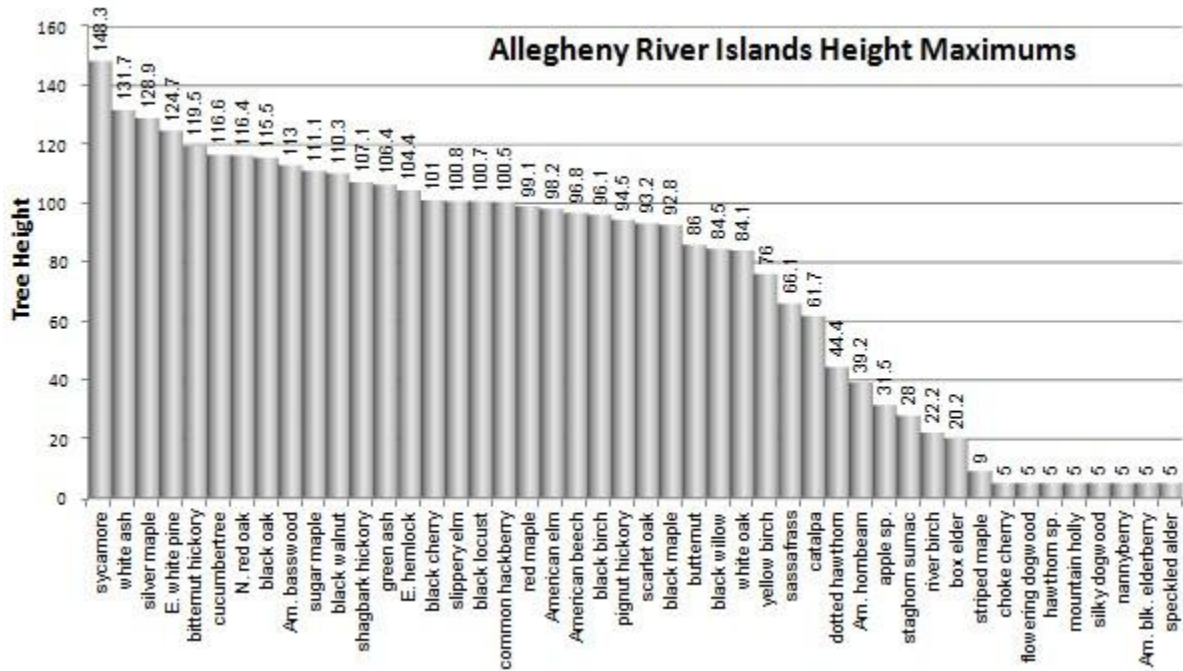


Figure 30: Tree Height Profile graph of all of the tree species documented in the study area of the Allegheny River Islands project.

The island and shore descriptions begin with the northernmost site at Buckaloons Recreation Area and ends with Holeman Island, the southernmost island in the study area. For the sake of consistency the descriptions all start with the upstream end of the island and proceed to the downstream end. The west side of the island in the descriptions refers to the side of the island facing the west bank of the river rather than the cardinal direction itself. The descriptions from individual trips to each island are presented in the order they were taken. They are edited versions of the original trip reports in which extraneous remarks, unrelated references, typographical errors, and the like were removed or corrected to bring better focus to the individual island descriptions.

Buckaloons Recreation Area

41° 50.272'N x 79° 15.550'W elevation 1160 ft.

The Buckaloons Recreation Area sits on the banks of the Allegheny River immediately upstream and adjacent to the confluence of Brokenstraw Creek and the Allegheny River. Buckaloons rests on the site of a former Indian village, on the banks of the Allegheny River. Individual sites located both within the campground area, in the field adjacent to Brokenstraw Creek and farther downstream along the banks of the Allegheny River itself.

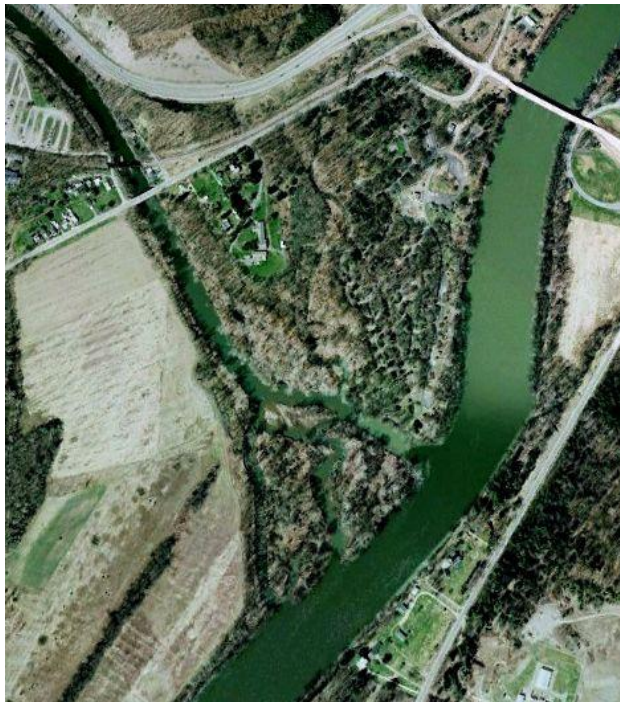


Figure 31: Buckaloons Recreation Area and the mouth of Brokenstraw Creek. Image 03/31/2005 Pennsylvania Department of Conservation and Natural Resources – PAMAP-USGS.

The Buckaloons Historic Area (Management Area 8.4 – 306 acres) sometimes referred to as “the Irvine Flats area” is located on the north side of the Allegheny River adjacent to Brokenstraw Creek (USDA Forest Special Places -accessed 2011):

It is managed for preservation and protection and contains some of the most significant archaeological resources in northwestern Pennsylvania. Management emphasizes the maintenance of at least 15 prehistoric archaeological sites that span thousands of years of prehistoric use and occupation. Equally significant are the historic archaeological remains present on the property. The French explorer Celeron de Bainville, recorded the existence of an Indian village at this location in 1749 and held council with the Senecas. The village was recorded again in 1767 when David Zeisberger, a Moravian missionary, visited its inhabitants. After the Revolutionary War, General William Irvine (who earned great fame on the national stage before, during and after the Revolution) acquired several warrants, including the present area. His son and grandson expanded and developed the property between 1797 and 1840, erecting homes, tenant houses, barns, mills, and other structures. The Irvine family built the town’s church, raised money for the school, persuaded the railroad to come to Irvine, and influenced the building of a wagon road to Franklin.

Buckaloons provides an outstanding and accessible example of Northern Riverine (river bottomland or floodplain) Forest. Tall, stately Eastern Sycamore trees are abundant and are joined by other very large specimens of trees near where Brokenstraw Creek adds its flow to the Allegheny River. They include Northern Red Oak, Black Cherry, Shagbark Hickory, American Basswood, and White Ash (Rodger Tory Peterson Institute of Natural History 2008).

Buckaloons Recreational Area represents the northern boundary of the Allegheny River Islands Project. It is ideal as a starting point for surveys of Crull's Island, the farthest upstream island in the Allegheny River Island Wilderness, about a mile downstream of Buckaloons.

The first measurement trip to the site was part of an ENTS fieldtrip in 2005 (Luthringer 2005a). One of the unusual specimens documented was a moss cypress measured at 83.5 feet tall, 6.1 feet in girth, and a crown spread of 24 feet. Will Blozan estimated the age of the tree to be 150 years. Speculation was that the tree was planted by the descendants of General Irvine.

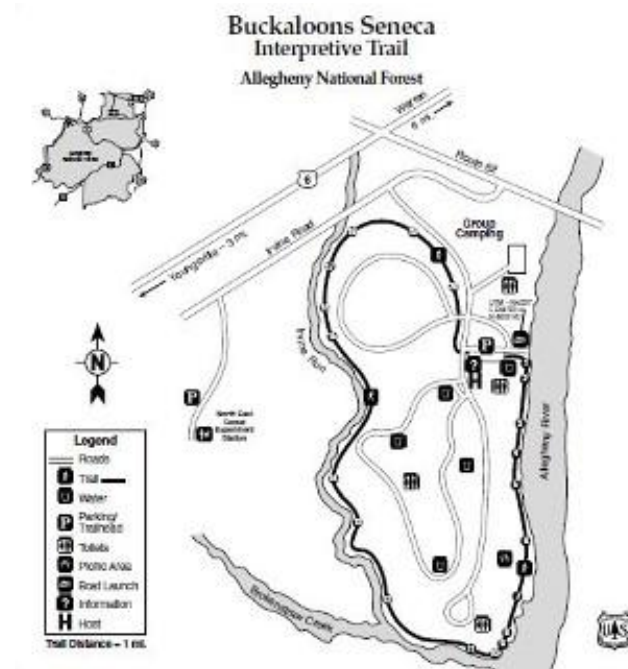


Figure 32: Buckaloons Seneca Interpretive Trail Map The trail is a one mile loop trail around the picnic area and campground. (USDA Forest Service 2001).

Other notable trees measured on that trip included a European larch at 7.4ft girth x 110.5ft high, a honey locust at 4.3 ft. girth x 85 ft. high, and a massive red oak across Brokenstraw Creek. This tree likely was an old fused double at 17.9 ft.

girth x 104.3 ft. high. In 2007 the site served as a campground for a three day excursion to various islands in the area (Luthringer 2007a, 2007b, 2007c).

The campground area itself is cut into a patch of large dotted hawthorns. One specimen located at campsite 23 had in 1996 been nominated and listed as the state champion specimen at 32 feet tall, 54 inches in girth, and crown spread of 41 feet. This specimen was remeasured on September 7 2007 by Dale Luthringer to a height of 40 feet and girth of 54 inches.



Figure 33: Buckaloons Area from June 6, 1939 aerial photo (PennPilot).

A second hawthorn on site 16 was measured to have a 3.1ft girth and 45.4 ft. tall. This was easily a new state height record, possibly a new Northeast U.S height record as well.

A trip in April 2011 (Luthringer 2011a) documented a number of other trees within the broader Buckaloon's Area and Brokenstraw Creek:

Buckaloons Recreation Area			
Species	CBH (ft)	height (ft)	Date
Am. Hornbeam	2.7	33	
bitternut hickory	5	75.1+	
bitternut hickory	12	108	
black cherry	9.1 (2x)	84.1+	
black locust	6.6	85	
black walnut	7.6	101.5	
black willow	7.8	78.5	
dotted hawthorn	1.8	45	
dotted hawthorn	3.1	45.4	site 16
	tallest known in NE		
E. hemlock	6.2	96	
Eur. larch	7.4	113.5	
E. white pine	11	108	
E. white pine	10.8	127	
E. white pine	9.2	135	
green ash	6.2	78.1+	
hackberry	4.8	76.5	
moss cypress	6	87.7	
	was 5.9 x 86.4 on 4/02/09		
N. red oak	7.1	107	
shagbark hickory	6.6	89	
shagbark hickory	5.6	89.5	
silver maple	8	84	
sugar maple	8	84	
sugar maple	9.8	84	
sycamore	13.7 (2x)	118.5	
sycamore	N/A	123.1	
sycamore	N/A	129	
sycamore	N/A	129	
sycamore	N/A	129.1	
sycamore	N/A	131.5	
tuliptree	10.2 (2x)	98	
tuliptree	9.9	108.5	
white ash	12.6	109	
white oak	14.4 (2x)	88.5	
white oak	8.8	102.5	
Rucker Height Index 5		118.4	
Rucker Height Index 10		108.8	
Rucker Girth Index 5		11.1	
Rucker Girth Index 10		9.6	

Figure 34: The 130ft class white pine and sycamore where nice surprises at Buckaloons. I had no initial intention of getting a Rucker Index for the site, but the further we progressed along

Irvine Run into the "tallish" sycamore stand along the creek it was apparent we'd have enough data for an RI.

The 1939 aerial photo of the campground shows the area to be open fields with a few scattered trees. It is possible that the largest hawthorns are those trees that appear on the photo, but chances are they are not. In any case the majority of the hawthorns present in the campground today began growing after 1939 and after farming ceased in these fields. The old trees are limited to the area near the mouth of Brokenstraw Creek which shows as forest on the older aerial photo.

Babbit (1855, pp. 9-10) provides a description of area of Brokenstraw Creek and Brokenstraw Island:

BIG BROKENSTRAW CREEK

This creek rises in Erie County, Penn, and after receiving the waters of Coffee, Hair, Spring, Mullengar, and the Little Brokenstraw Creeks, empties into the Allegheny, seven miles below Warren. The Little Brokenstraw takes its rise in Chautauqua County, not far from the head-waters of French Creek, and empties into the Big Brokenstraw, seven miles above its mouth. The lumbering business is extensively pursued on all the tributaries. Several millions of feet of lumber, together with an immense amount of shingles, yearly leave this point, and find a market throughout the country. Brokenstraw Eddy is a few rods below the mouth of this creek, upon the right side, forming a very excellent place for preparation for lumbermen.

The village and the land for a considerable distance around is owned by Dr. Wm. A. Irvine, grandson of Gen. Wm. Irvine, of the Revolutionary army, and who was for several years Commissioner of the State, in superintending the survey of lands northwest of the Allegheny, under a law of 1792.

Dr. Wm. A. Irvine inherited this land from his father, the late commissary Gen. Calendar Irvine, who came to this place in 1795, erected a cabin, and placed it in charge of a faithful negro servant, by way of perfecting an "actual settlement."

...The traveler in passing thorough the vicinity will notice a neat little stone Church, situated in a beautiful grove, and also a stone School House on the opposite side of the road. These, we are told, were erected at the expense of Mrs. Dr. Wm. A. Irvine, who possessed an ample fortune of her own.

One can easily form some idea of the taste and refinement of this amiable lady, when we view the scenery around this place, for she has chosen one of Nature's most inviting retreats, and one every way calculated to draw the thinking mind from nature up to nature's God.

BROKENSTRAW ISLAND.

Here we have the channel to the right. The island is about three-fourths of a mile long, and contains 63 acres of cultivated land.

From the head of the island, in low water, keep near the middle. When approaching Dr. Irvine's house, incline to the right, to avoid the bar on the left, about opposite the house. After passing the bar, keep a little to the right of the middle down to the foot of the Island. The water is always deeper along the right shore.

On the map of this area (Figure 47), William A. Irvin's House (Dr. William A. Irvine) is located adjacent to Irvin's Run (Ander's Run) just downstream of where it flows into the Allegheny River. Brokenstraw Island is now known as Crull's Island. Dr. Irvine's house is located on the west bank of the Allegheny River immediately opposite Crull's Island. A mill race is also shown on the map immediately downstream of the mouth of Brokenstraw Creek.

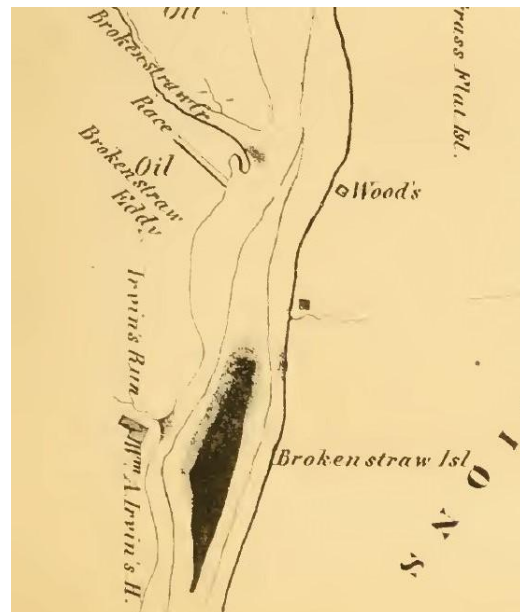


Figure 35: Babbitt (1855) provides a description of area of Brokenstraw Creek and Brokenstraw Island. The map shows present day Anders Run marked as Irvin's Run.

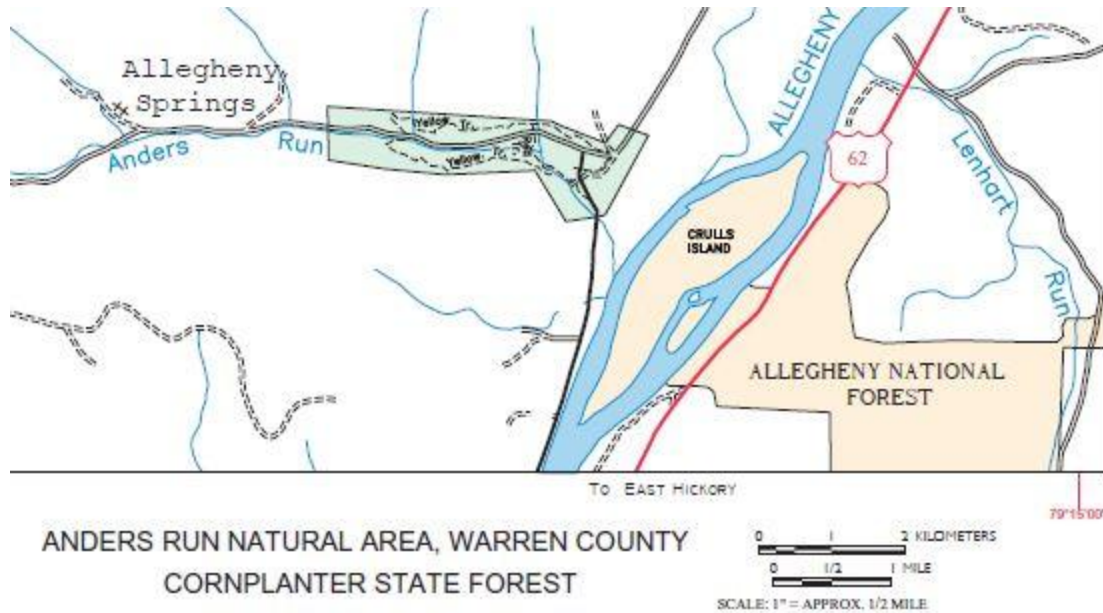


Figure 36: Location map of Anders Run State Natural Area, Cornplanter State Forest (PA DCNR Cornplanter State Forest).

Anders Run Natural Area

41° 49.351'N x 79° 16.503'W elevation 1161 ft.

Anders Run is a small stream valley located adjacent to Crull's Island along the western shore of the Allegheny River. An area surrounding the stream within Cornplanter State Forest has been designated by the state as Anders Run Natural Area. The site has a history dating back to the formation of Warren County. "The Anders Run Natural area is 96 acres, but it contains many old-growth white pines, some over 4 feet in girth... Like other accessible timber stands in the upper Allegheny River watershed, the original forest cover was logged sometime in the first two decades of the 1800s. Growth ring counts of wind-thrown trees indicated an age between 200 and 225 years. There is a walking trail system almost two miles long through the area. There is a native trout stream and several fine stands of wildflowers. There is an historic residence on the

property built in 1841, known as the "Little Stone House." (PADCNR Anders Run Natural Area)

Davis (2003) reports in "Old Growth in the East: A Survey" that approximately 50 acres of old growth is located in the southern end of the 97-acre Natural Area below the road in and along the ravine is unlogged old growth. White Pine and Eastern Hemlock are the most conspicuous trees. Kershner and Leverett (2004, p. 47) report:

One colossal, 300-year-old white pine, 54 inches in diameter and 163 feet in height, rises above the trail, and at least two other pines reach 150 feet." This pine was named the Cornplanter Pine and was the largest volume pine known to be standing in all of northeastern United States. However the tree has since died and the standing snag lost much of its top. They further note: "Although state forest officials claim this is second-growth site logged in the early 1800's, our annual ring counts show this site is

mostly original forest. We have found 400-year-old hemlocks, 20 to 45 inches in diameter, and 300-year-old growth acreage in the ravine. Other old-growth trees in this forest are red and white oak, sugar and red maple, black and yellow birch, and the uncommon cucumber magnolia.

A small stand of oaks within the lower end of Ander's Run Natural Area were examined as part of a dendrochronological study by Ruffner and Abrams (2002, p. 251). They write:

We learned of a 426 year old stand of white oaks immediately adjacent to the Seneca Iroquois village site at Buckaloons, along the upper Allegheny River in northwestern Pennsylvania. This small stand (2.5 ha) of old trees presented a rare opportunity to document the disturbance history of a Native American site using dendrochronological methods... Because the old-growth remnant is so small (2.5 ha or 6.2 acres) with just a few trees spanning the last 400 years of the site, only a reconstruction of the stands disturbance history was attempted via radial growth analysis. Within the remnant 17 trees were cored at stump height for age determination and radial growth analysis... Cores from the oldest white oak specimens were used to develop a master chronology spanning 426 years.

Ruffner and Abrams (2002, pp.255-258) go on to conclude:

The disturbance regime of Ander's Run oak site has changed through the history of the stand. The Seneca Iroquois period

(1600 - 1800) is characterized by frequent, low intensity disturbances, while the Colonial European period (1800-1996) experienced, high intensity disturbances .

From the tree ring record, it appears that the Anders Run stand experienced a severe disturbance sometime between 1835-1845 which caused considerable damage in the stand followed by a series of releases into the 1870s. This growth suppression-release sequence typifies a residual stand's response following logging disturbances.



Figure 37: Base of the Cornplanter Pine (photo by Dale Luthringer 2004).

Of particular relevance to the tree surveys on the islands were explorations of the on-shore river

floodplain within Anders Run Natural Area. Anders Run itself crosses this floodplain flowing into the Allegheny River across from Crull's Island. Dale Luthringer reported on several trips to the floodplain area in 2004 and in 2005. Luthringer (2004a) writes:

Apr 14, 2004... I spent the rest of the day checking out the flat marshy area down by the Allegheny River. I started my search of the river flat from a trail that starts from the parking area located at the intersection of Anders Run and Dunns Eddy Road. The trail starts east from the parking area then turns north heading adjacent and upstream along the Allegheny River. I soon came across a nice river bank N. red oak to 17.6ft CBH x 86.9ft high. After about another couple hundred yards from the fat N. red oak, the tall spruce came into view. .. I then turned back west and skirted the edge of a wetland. Turns out there are a few relic oak species in there along the edges. There are some old swamp white oaks, a large wolf white oak and black oak (both have a very gnarled and burl'd base). The tallest swamp white oak went to 10.4ft CBH x 111ft high, not bad.

Swamp white oak	8.7	94.2
Swamp white oak	9.7	95 ancient tree
Swamp white oak	8.4	102.8
Swamp white oak	11.4	107.6
Swamp white oak	10.4	111 tallest NE?

Here's a rough visual estimate on some of the old growth species that can be found throughout the Anders Run N.A.

Species	Est. Age
Black gum	150
Black oak	200
E. white pine	350 (many 250+)

E. hemlock	350
N. red oak	150
White oak	200+
Swamp white oak	200+

I was very impressed with the old, fairly large, and tall swamp white oaks. This is the first decent stand of swamp whites that I've been able to survey. A number of them went over 100ft. Luthringer (2004b) writes: "June 08, 2004 I measured a swamp white oak down on the flat near the Allegheny River to 10.4ft CBH x 111ft high. If our ENTS tall tree list is up to date, it appears that this tree



Figure 38: Large swamp white oak (photo by Ron Buschr 2004).

might be the tallest so far documented in the Eastern U.S. Luthringer (2004d) writes: December 9, 2004. I also measured a few more trees on the flat adjacent to the river... These were right on the river terrace edge. I had a nice sycamore here to 12.9 ft CBH x 107.8 ft

high. Also [measured was a]... silver maple height at 8.7 ft CBH x 116.1 ft high and a taller white ash than previously found at this site to 11.5 ft CBH x 118.4 ft high.

Luthringer (2011a) writes:

On 4/13/2011 Carl Harting, Steve Hallow and I met for a measuring trip to Ander's Run Natural Area and Buckaloons Recreation Area in Warren County, Pennsylvania. It was great to get together with everyone. Even though we couldn't get on the river (the Allegheny is still too high), we got a lot done. Here's the stats for 4/13/11:

Ander's Run N.A.

Species	CBH	Height	Comments
E. larch	10.8(2x)	115.2	was 10.8(2x) x 114.8 on 3/5/09, 2nd tallest known in Pennsylvania
Nordmann fir	7.3	96	was 7.2 x 95.5 on 3/5/09, 194 AF points, cored 117 rings slightly missed center, 3.5ft up from base
Noway spruce	10.5	137.4	was 10.5 x 135.2 on 10/18/06, cored 141 rings to center, 3.3 feet up from base
white pine	7.1	133.8	Twisty Top
white pine	10	151	was 9.8 x 144.9 on 4/16/03
white pine	N/A	160	Burl Queen, was 11.6 x 155.8 on 3/23/04, tac 419,
white pine	11.4	160.2	was 11.3 x 159.6 on 3/23/04 tac 415

Ander's Run now has 2, 160ft class pines, and 7, 150ft class pines. If the old state champ Cornplanter Pine was still alive, that'd make 3 living pines in the 160ft class. Ander's is the 3rd best place in the state to see tall pines. 1st Cook Forest, 2nd Heart's Content, 3rd Ander's Run.

The majority of these trees are not within the floodplain of the Natural Area but farther upstream along Ander's Run itself.



Figure 39: Ander's Run Natural Area white pine at 11.4 feet girth, 160.2 feet tall.

Crull's Island

41° 49.661'N x 79° 16.372'W elevation 1207 ft

Crull's Island is located at mile point 181, about a mile below the confluence of Brokenstraw Creek and the Allegheny River. Crull's Island is the upstream most island of the Allegheny River Islands Wilderness. It is approximately 96 acres

in size and was described by the USDA Forest Service as having large old river bottom trees. Babbitt (1855, p. 10) on his navigation map of the Allegheny River listed the island as Brokenstraw Island. He reported, "This Island is owned by Dr. Wm. A. Irvine. It is about three fourths of a mile long, and contains 63 acres of cultivated land."

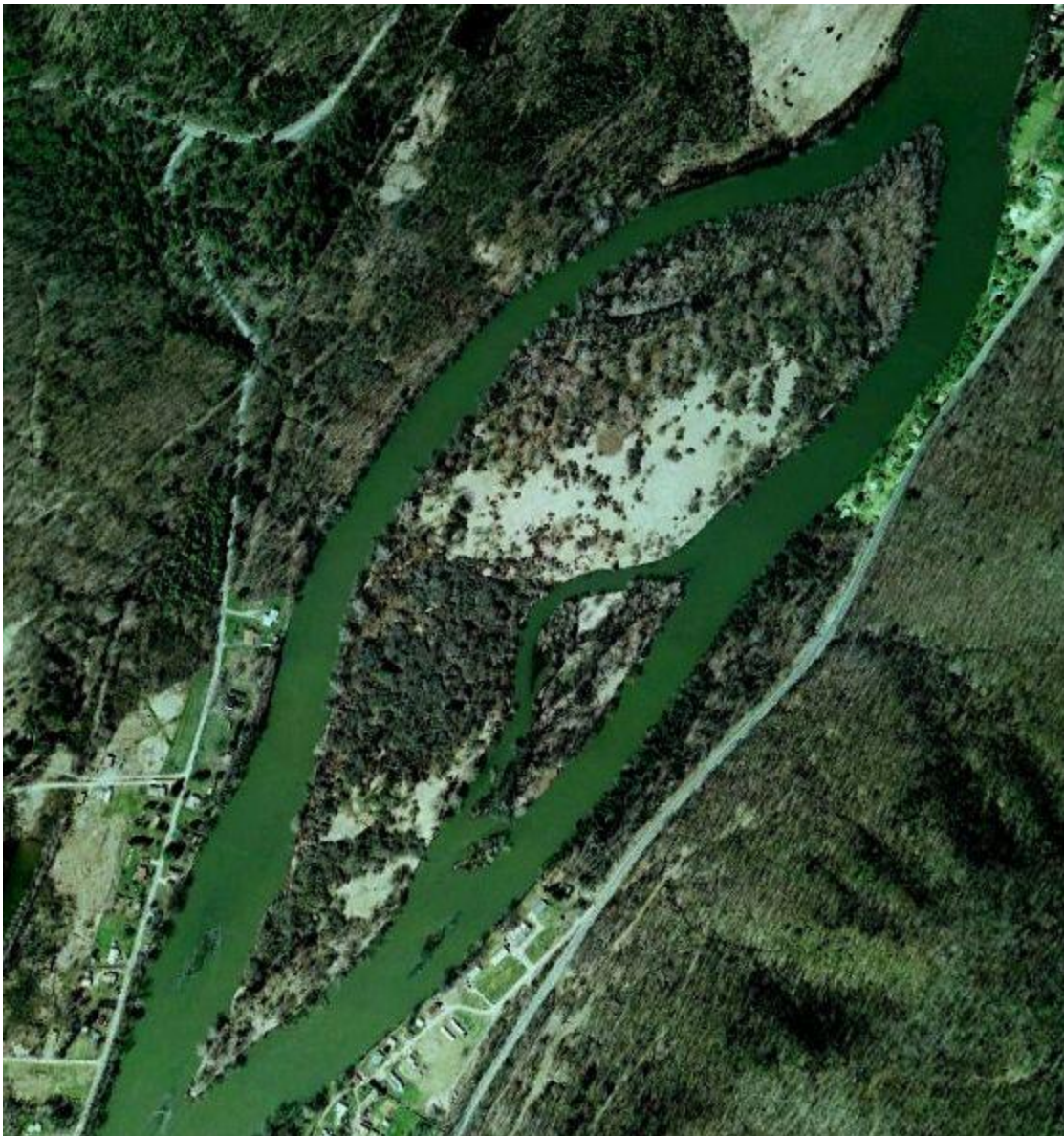


Figure 40: Crull's Island taken on 03/31/2005 (Pennsylvania Department of Conservation and Natural resources – PAMAP-USGS).

(Cowell and Dyer, 2002, p. 191) reported, "The Crull family purchased the island in the nineteenth century... The flood of 1865 destroyed several buildings on the island, which were never rebuilt, but agricultural use of the island-including livestock grazing-continued into the early twentieth century." The old-field patch in the center of the island is dominated by reed canary grass which was widely planted throughout North America for pasturage. The old field remained cultivated or pastured until approximately 1930. Seneca Indian cultivation of nearby floodplain and river island sites is documented, and probably also occurred on Crull's Island.

The island has been visited three times as part of this project. The first scouting/measuring trip was by Dale Luthringer on September 27, 2004 (Luthringer 2004c), the second by Dale Luthringer, Edward Frank, and Carl Harting on March 26, 2009 (Frank 2009a), and the third by Dale Luthringer and Edward Frank on April 2, 2009 (Frank 2009a). On Crull's Island a low terrace is found on the upper end and eastern side of the island that floods with the spring high water. Farther down the island the land surface rises to form a second higher terrace at an elevation of 5 to 10 feet above the mean flow level of the river. Much of the eastern side of this raised terrace in the middle portion of the island is covered by canary reed grass marking the extent of old field cultivation. A border of trees grows along the western side of the terrace and on the downstream half of the island. Nearer the downstream end of the island on the eastern side is a continuation of the reed canary grass open fields. The species growing on the low terrace consisted of sycamore, silver maple, sugar maple, and white ash. Hawthorns grow among the reed canary grass patches. The tallest white ash and

sycamores grow along the western edge of the lower terrace. Hackberry, basswood, and sugar maples grow in the transition zone between the lower and upper terrace. Northern red oak, bitternut hickory and most of the less common species are also located either in this upper terrace or in the transition zone from the lower to upper terrace.

Luthringer (2004c) writes:

I beached my canoe on the north side of the island and started inland. Decent sized sycamores jumped into view almost immediately. Most ranged from 7-9ft CBH with heights that maxed in the upper 120's. I was also delighted to measure my first naturally grown silver maples in the state. I continued downriver in the middle of the island and soon found a very nice sycamore (13.4ft CBH x 123.7ft high) and some respectable sugar maples. There was a small section of old trees showing old growth characters: (stag-head branching, balding and deep fissured bark characters, some large CWD). There was a slippery elm here that had such deep furrows that I first thought it was a cottonwood. I'd put some of the hackberry and slippery elm here to over 100 years. Select Northern red oak, white ash, sycamore, and sugar maples probably went over 150 years old. They appeared to be growing fast in such rich depositional soils.



Figure 41: Hackberry on the northern end of Crull's Island (photo by Edward Frank, 2009).

Luthringer also reported some impressive hackberry trees from the first trip. One was 9.8 feet in girth, 76.7 feet tall and was judged to be fairly old. The tallest was one measured at 99.1 feet tall, and was likely taller. "The understory was full of exotics or other similar pests; loaded with poison ivy, Japanese barberry, Japanese knotweed on the edges along with multiflora rose and stinging nettle. Mayapple, sensitive and cinnamon fern, hawthorn, and blackberry made up the rest. There also were black flies and mosquitoes.



Figure 42: Detail of bark on black maple trees on north end of Crull's Island (photo by Edward Frank 2009).

The second trip took place on March 26, 2009 (Frank 2009a). Carl Harting, Edward Frank, and Dale Luthringer put the canoes in at Brokenstraw Creek for the short trip down the Allegheny River itself to Crull's Island. He writes:

We put in at the top of Crull's Island. The very top of the island had been flooded recently. Debris had been swept from the surface leaving a muddy flat interspersed by some channels and pools. Underlying the mud is a layer of harder coble sized rocks deposited when the island was affected by the full flow of the river, prior to the construction of the Kinzua dam a short distance upstream...



Figure 43: Flooded area on the upper end of Crull's Island (photo by Edward Frank, 2009).

One of the goals of this trip was to remeasure some large hackberry trees first documented by Dale in 2004. The tallest he found at that time was measured at 99 feet tall, and we wanted to get a new measurement to see if we could find a sprig over 100 feet. Also on the earlier trip Dale had not been able to explore the entire island, parts of the downstream end still needed to be explored. We started to measure some magnificent trees. There were American Sycamores measured to heights of over 130 feet. Carl Harting found an exceptional white ash (*Fraxinus Americana*) at 131 feet tall, by far the



Figure 44: Field of Reed Canary Grass knocked down after a long winter with interspersed hawthorns (photo by Edward Frank, 2009).

tallest found on any of the islands. We measured a variety of other species. I was impressed by the jungle like quality of some hawthorn thickets on the island. While Dale and Carl hunted big trees I measured some of the miscellaneous species found scattered about the island. I measured a couple nice hawthorn trees – the tallest was 38.9 feet. In the central portion of the island was a large open area that in the summer would have been a field of reed canary grass...

In the midst of this field of canary grass are patches of hawthorn, with hawthorn encroaching on the open area. There is a dearth of other species present in these

open areas dominated by canary grass. They are filling in around the edges behind the hawthorn. Hawthorn seems to be the only pioneering species that is capable of overgrowing the reed canary grass. I added butternut, staghorn sumac, and some others. In the midst of an impressive patch of hawthorns we found some apple trees and some fat grape vines.

One [grape vine] measured 1.3 feet in girth. I managed to measure a nicely formed black cherry, 8.75 feet in girth and 75 feet tall with a thick fork about ten feet up.



Figure 45: Grape vines entangling an apple tree on Crull's island (photo by Edward Frank, 2009).

Another interesting tree was a white ash 11.2 feet in girth and 96+ feet tall. The tree forked a dozen feet off the ground to

make two equal size trunks. Between the two forks the lower trunk split all the way to the ground. Looking in the crack it appeared that the tree was a single trunk with the break splitting the base vertically and not a double trunk tree.



Figure 46: Two white pine trees on the lower end of Crull's Island (photo by Edward Frank, 2009).

Near the far end of the island we found a pair of white pines. In our explorations of all the other islands of the wilderness area, these were the first white pines we found anywhere. It was on the higher downstream end of the island above most of the flood waters. [On a previous trip] while canoeing past Fuelhart Island, a privately owned island a few miles farther downstream, we did see a white pine growing, but did not stop to measure it as it was on private property.

We also found some white pine on another privately owned high island – Hemlock Island farther downstream. It was raining harder than ever by now. We could no longer use our instruments in the rain. It was miserable, so we abandoned the rest of the trip and paddled downstream to our take-out point across from Thompson Island.

The third exploration trip to Crull’s Island took place on April 2, 2009 (Frank 2009a). He writes:

We again put in at Brokenstraw Creek and paddled down the river, this time in the morning sunlight. The first stop was again Crull’s Island. There were a couple of loose ends we needed to finish, and we also needed to explore the downstream tip of the island. On the first trip I had photographed a nice musclemwood (*Carpinus caroliniana*) but had not measured it. The first order of business for me was to relocate that tree. Once found we looked for the tall white ash Carl had found on the previous trip. I wanted to take some photos and to confirm the height of it and some of the tall sycamores. Rain can play tricks on the rangefinder. We found the trees and confirmed their heights.” The white ash was confirmed to be 131.7 feet in height.

Looking at the hawthorn trees in the reed canary grass field, two distinct forms could be seen. If the branches had not been still bare, likely they would have been [all but] indistinguishable. One species of hawthorn had previously been identified as dotted hawthorn. The second species has not yet been determined. This area was generally



Figure 47: White ash tree, 131.7 feet in height, on Crull’s Island (photo by Edward Frank, 2009).

open with a ground cover of reed canary grass. Silver maples grew along the river bank. The tallest topped out at 110.8 feet. One fat silver maple had a girth of 15.8 feet, but was only 76.7 feet tall.

Once we reached the point, Dale and I split up to explore a bit more. I started measuring hawthorns in a thicket along the right bank. They were tall for the species, but I could not break 40 feet. Then pay dirt! I found a 44.4 foot tall hawthorn. From here I swung back up the island to where the pair of white pines were located.



Figure 48: Silver Maple, 15.8 feet in girth on the lower end of Crull's Island (photo by Edward Frank 2009).

Absent the rain I was able to get a better height of 94.8 feet for the taller of the two trees... I had hoped to find a yellow birch sighted on the first trip in the pouring rain, but somehow missed it. We had previously only found one other [yellow birch] on Baker Island in our explorations of the wilderness islands. There were many waterfowl on and around the island, and three white-tail deer scooted across the island as we explored.

The largest white pine can be seen on aerial photos of the area, from websites like Google Earth, at 41° 49.093'N x 79° 16.466'W. It can be seen from the road along the west bank of the river as well.

On September 17, 2011, as part of an environmental education program he was conducting, Dale Luthringer was able to revisit Crull's Island. He was able to confirm that both sugar maple and black maple are present on the island.

Crull's Island			
Species	CBH (ft)	height (ft)	Date
sycamore	9.8	133.7	3/26/2009
white ash	9.8	131.7	3/26/2009
sycamore	13.5	126.8	4/2/2009
Am. basswood	8.9	113	4/2/2009
sugar maple	8.9	111.1	4/2/2009
silver maple	9	110.8	4/2/2009
white ash	10.3	106.8	4/2/2009
bitternut hickory	5.4	104.2	9/7/2004
N. red oak	7.1	103.8	4/2/2009
N. red oak	10.7	101.9	9/7/2004
slippery elm	6.6	100.8	4/2/2009
common hackberry	11.4	100.5	4/2/2009
red maple	6.7	99.1	9/7/2004
Am. elm	5.8	98.2	4/2/2009
green ash	11.2	96.4	4/2/2009
E. white pine	9.1	94.8	4/2/2009
black maple	3.7	92.8	9/17/2011
slippery elm	8.2	92.5	9/7/2004
black locust	5.2	90.1	9/7/2004
black cherry	7.3	84.1	9/7/2004
silver maple	15.8	76.7	4/2/2009
black cherry	8.9	75	4/2/2009
butternut	3.2	68.8	4/2/2009
dotted hawthorn	6.3	44.4	4/2/2009
apple sp.	4	31.5	4/2/2009
Am. hornbeam	1.9	29.5	4/2/2009
staghorn sumac	2.4	28	4/2/2009
black willow	1.6	24.4	4/2/2009
staghorn sumac	3.5	22.5	4/2/2009
striped maple	0.75	9	4/2/2009
hawthorn sp.		5	3/26/2009
yellow birch		5	3/26/2009
vitus sp.	1.4		3/26/2009
Rucker Height Index 5		120.06	
Rucker Height Index 10		110.87	
Rucker Height Index 20		91.97	
Rucker Girth Index 5		12.52	
Rucker Girth Index 10		10.89	
Rucker Girth Index 20		8.05	

Figure 49: Rucker Indices and Maximum Height Table for Crull's Island.

Luthringer writes(2011b):

The long & short of it is that there is black and sugar maple on Crull's Island. The one black maple I measured came in at 3.7ft CBH x 92.8ft high. It was up on the high plateau of the island near the upstream end and VERY close to the fat sycamore located at 41 49.378N x 79 16.092W. The fat sycamore was 13.5 x 126.3, it is now 14 x 126.3. The black maple was not tall enough to make it into the Crull's Island, ARIW, or Allegheny River RI's.

Some of the existing measurements for sugar maple may in fact be black maple. A return trip with leaves present will be required to sort the two species out.

Crull's island is the largest island in the Allegheny River Island Wilderness at 96 acres. It has a range

of elevations from low floodplains to higher terraces, and it has been explored three times as part of this investigation. As might be expected it has one of the higher species diversities documented of any of the islands. Twenty-four tree and shrub species have been identified as being present at this point. Of those species identified, several are species uncommon on the other islands. Some of these less common species include white pine, red oak, red maple, and yellow birch.

The following species on Crull's Island were found to have the largest girth of their species found on any of the islands within the survey. These species include: black cherry, common hackberry, green ash, sugar maple, white ash, American elm, and striped maple. Overall Crull's island had the largest girth index for any island in the series with a RG10 of 11.05 feet.

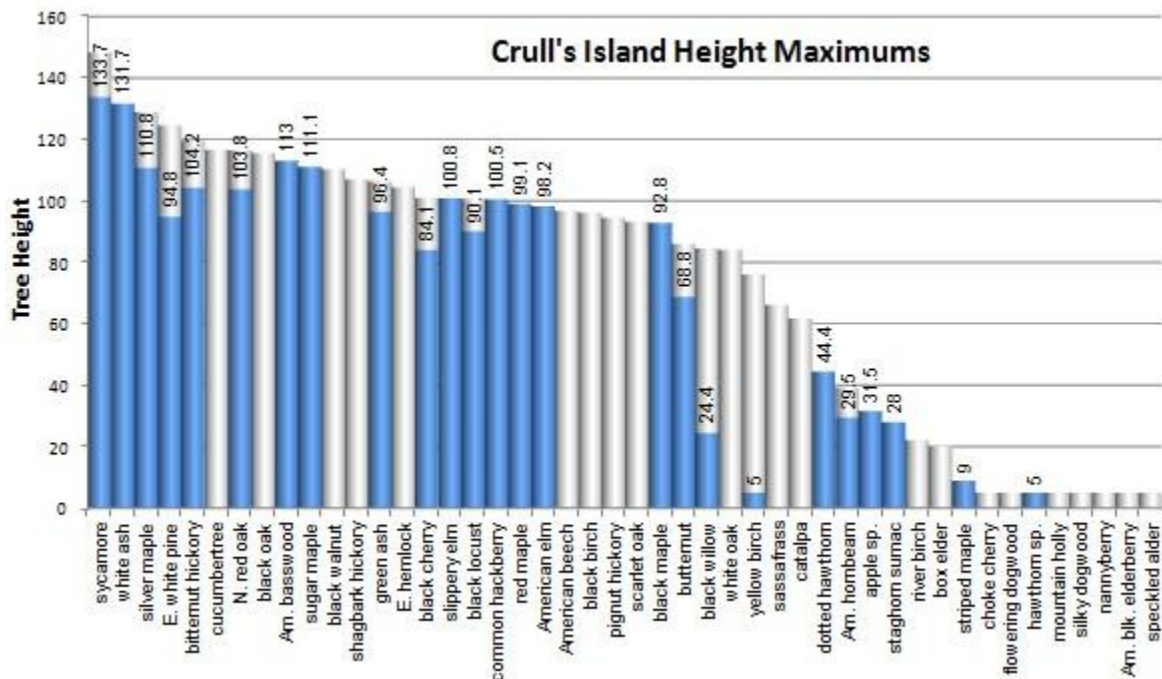


Figure 50: Tree height profile for Crull's Island. . The light blue bars represent the maximum height of trees found on Crull's Island compared against the light gray background profile for the Allegheny River Islands as a whole.



Figure 51: USDA 1938 Aerial photograph of Crull's island, Warren County, Pennsylvania

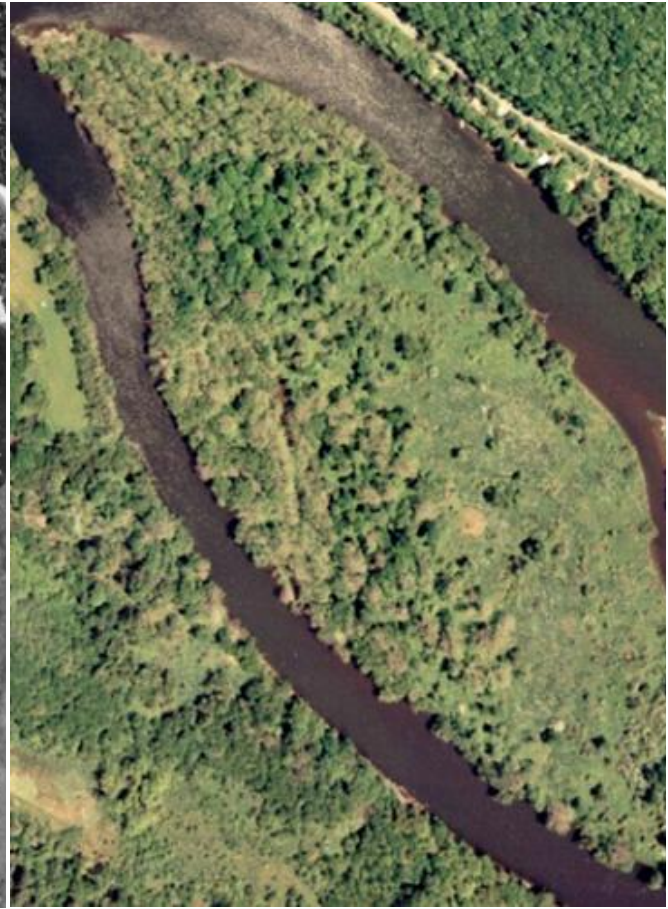


Figure 52: USDA 1994 aerial photo of Crull's Island, Warren County, Pennsylvania.

The following species on Crull's Island were found to be the tallest of their species found on any of the islands within the survey. These species include: These included white ash, American basswood, sugar maple, slippery elm, common hackberry, black maple, red maple, dotted hawthorn, apple, staghorn sumac, and striped maple. Crull's Island had the second tallest height index of any island in the survey with a RHI10 of 110.87 feet.

Tree establishment on these islands is patchy and relate to the flood history of the islands. Pieces of the island are washed away and others are formed as a result of these floods. An aerial

photo from 1939 (figure 51) shows a bare, newly formed piece of island on the upstream western side of the island. On the present day aerial photo of the island (figure 52) the bare area is now covered by American sycamore and silver maple dominated forests.

This change between the 1939 bare scour surface and the present day forested area is discussed in more detail by Cowell and Dyer (2002) and Dyer and Cowell (2008).

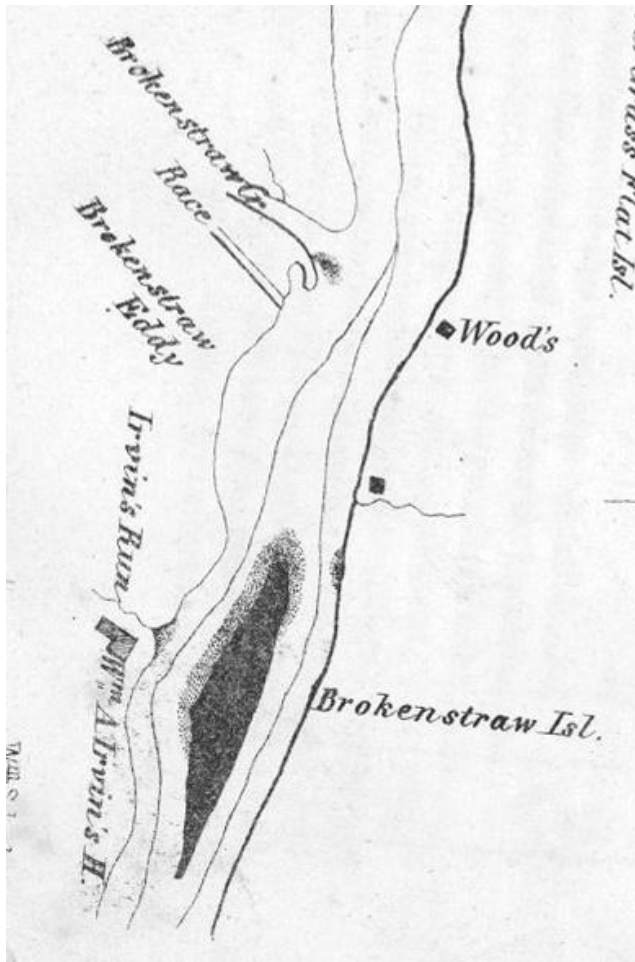


Figure 53: Map of Brokenstraw (Crull's) Island from Babbitt's (1855) Allegheny No. 1 map.

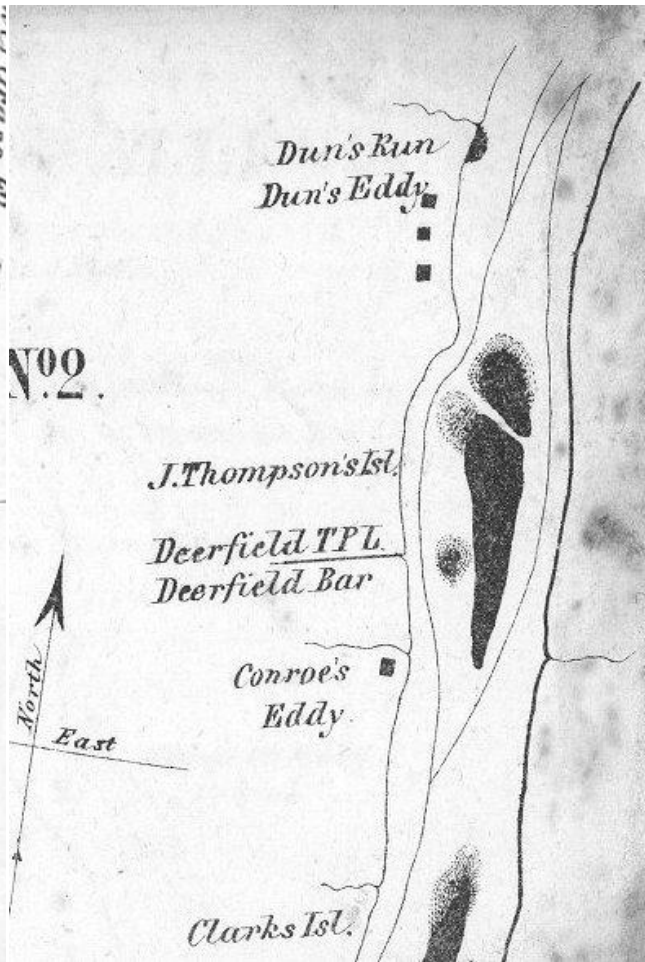


Figure 54: Thompson's Island in the upper Allegheny River from Babbitt (1855) Allegheny No. 2 map.

Crull's and Thompson's Islands

Crull's Island and Thompson Island are relatively unchanged in appearance when the present day aerial photo is compared with a map (Beers et. al.) from 1865. Crull's island appears to be much larger in the present day than it appears on the Smith 1881 map, but the position is essentially the same.

Thompson's Island is narrower on the 1865 map than it appears on the modern aerial photo (Figure 46). These differences are most likely errors in the drafting of the 1865 map. The older 1855 map by Babbitt shows the island to have pretty much the same plan view as is seen today.

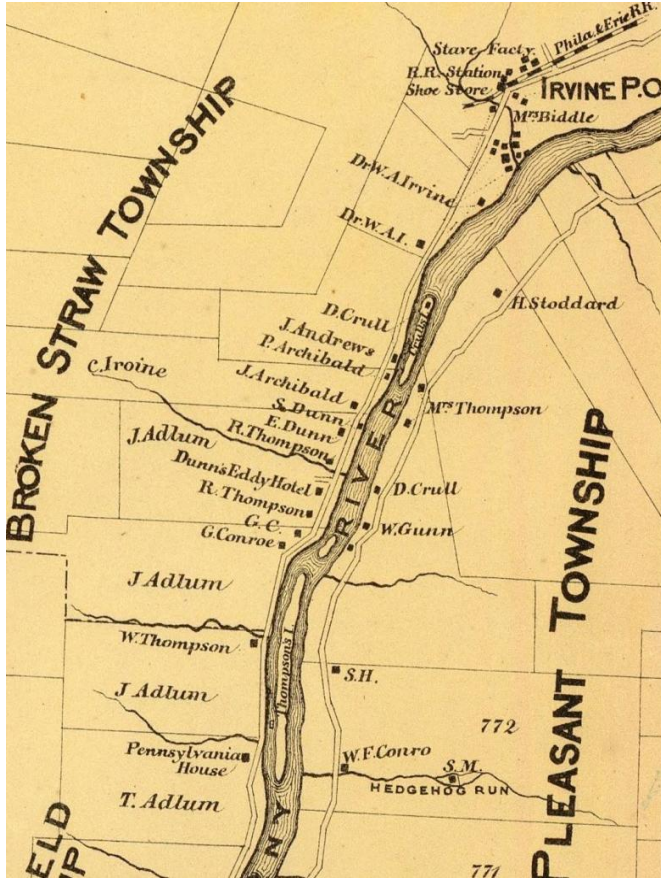


Figure 55: Comparison of map from Beers (1865a) with an aerial photo from May 27, 2008 (Figure 53) showing Crull's island and Thompson's Islands

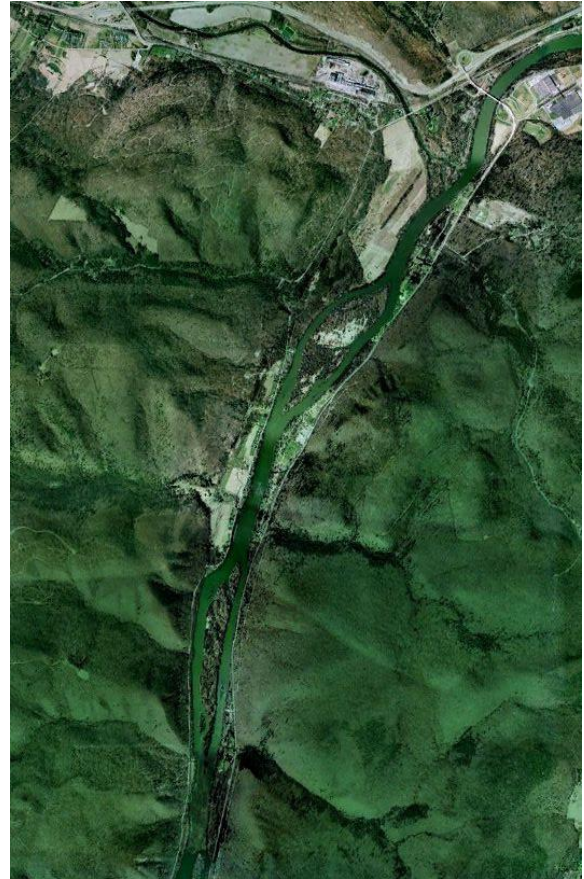


Figure 56: Aerial photo from May 27, 2008 showing Crull's and Thompson's Island (USDA Farm Agency).

Figure 52: Comparison of map from Beers (1865a) with an aerial photo from May 27, 2008 (USDA Farm Service Agency) showing Crull's island and Thompson's Islands.

Thompson's Island

41° 47.681'N x 79° 17.065'W elevation 1138 ft

Thompson's Island is the first island downstream from Crull's Island. It is located at river mile 178. Thompson's Island is one of the longest islands on the Allegheny River that tops out at just over 1 mile long and 228 yards at its widest point. This doesn't count another ¼ mile long island just upstream separated from the main island by a small diagonal side channel. This channel is

intermittent and is dry during periods of low flow. The USDA description (2006) lists it as follows: "Thompson's Island (67 acres). The only Revolutionary War battle in northwestern Pennsylvania occurred on this island. It has an exceptionally fine riverine forest." On the Babbitt (1855) map the island is marked as J. Thompsons Island. He writes in the text that the island is owned by Mr. James Thompson and that it is over a mile long and contains 57 acres of cultivated land.



Figure 57: Aerial photo of Thompson's Island from May 27, 2008 (USDA Farm Service Agency).



Figure 58: Aerial photo of Thompson's Island from August 5, 1939 (Penn Pilot).

Examination of the aerial photo from 1939 shows that there were two open areas, likely indicating farming or grazing was taking place on the island

at that time. These areas have become more overgrown in the 2008 photos. In addition the photos show that two bars on either side of

downstream end of the island in the 1939 photo are now fully fledged islands complete with trees on the 2008 photos.

Dale Luthringer (2003a, 2003b) made some initial measurements of large sycamores on the island from the western shore, but the first measurement trip to the island itself took place on September 3, 2007. That trip was made by Dale Luthringer and Edward Frank. Luthringer (2007a) writes:

Sept 3, 2007: We woke up early the next morning and made our way past Anders Run Natural Area, down river to Thompson Island. It was so foggy we couldn't see across the river. It was so foggy when we got down to the put-in point, that I couldn't tell whether we even had the right island or not. Thankfully, I took GPS readings a couple of years ago when I measured some decent sycamore from the road that was on the river's edge. We were across the river in no time and pulled the canoe up the bank.

It just so happened to be near the base of an Am. basswood, which was the largest I had ever personally measured, at 11.3 ft CBH x 94.4 ft high. We then started to pick our way through the multiflora rose barbwire undergrowth on our way towards the center of the island, looking for a new Pennsylvania sycamore and new northeast United States hackberry height records. I had earlier measured a sycamore to 135.3ft a couple of years earlier, but had never been able to set

foot on this island. It appeared there were slightly taller ones in the center, and we were not disappointed. We hadn't gone far when we came upon what appeared to be a very old slippery elm with deep furrowed bark, twisted branching, and heavy lower trunk moss layer to 11.2 ft CBH x 87.1 ft high x 35.9 ft average spread for 231 AF Points.

Then, that's when Ed started getting the eye for fat & tall hawthorns... the little-big trees that most of us tend to breeze past. Nearby was a fat double branching hawthorn we measured to 5ft CBH on the largest branch. The skinniest point below the major branch was 6.1ft at 1.5ft up from the ground. The tree went to a respectable 5ft CBH x 34.9ft high x 46.5ft average spread for 107 AF Points. We reached the center of the island and starting working our way up-river and into a nice riverine sycamore forest where we were quickly getting into numerous sycamore in the upper 120 to low 130ft height class. Ed was first to strike pay dirt when he found a new state height record for sycamore at 10.6ft CBH x 140ft high. There were a number of other nice sycamores in the area, but we weren't able to find another to top it... on Thompson Island, that is... We found more hackberry on the island, but weren't able to find a new height record for the species.



Figure 59: Old Slippery Elm on Thompson's Island (photo by Edward Frank, 2007).



Figure 60: Japanese knotweed jungle covering most of the lower end of Thompson's Island (photo by Edward Frank, 2007).

We then worked our way downstream on the island trying to find our way through a 6-8ft wall of multiflora rose barbwire fence which then turned into an impenetrable knotweed forest. We ran into a solid wall of Japanese knotweed that ran virtually the entire width of the island at about 10-15ft high. I could hear a quiet hum that I couldn't figure out exactly what it was at first, and then it dawned on me... multitudes of bumble bees were busily pollinated the knotweed flowers above us. This section of the island was dominated by tall sycamore and silver maple, probably making it into the 130ft and 115ft classes respectively.

We did our best to break into the knotweed jungle, but were thwarted at every attempt. We attempted an 'end run' which led us to a couple of old high water stream bed channels that cut 6-10 ft deep swaths into the sediment through the knotweed forest. There were nice N. red oaks on the river's edge, but we couldn't get far into the interior of the knotweed. We did manage to chop a short swath in on the edge of one of the old streambed channels, to the base of a very nice sycamore that went to 14ft CBH x 122.1ft high... just a taste of what possibly might lay in the interior.

Ed found a channel that worked our way out the bottom end of the island, where we bushwhacked back up-river to the canoe, while estimating sycamore & silver maple heights from the river's edge into the knotweed jungle. Most sycamore on the bottom end of the island would go to the upper 120ft class, with some going

just over 130ft. It is very possible there were taller ones in the bottom center of Thompson Island, but this will have to wait for a spring trip after the snow and ice had given a proper beating to the knotweed... Common understory trees were small white ash, slippery elm, bitternut hickory, and ironwood. Black locust, black walnut, Am. Basswood, and northern red oak were dominant on the fringe, but sycamore was clearly the canopy dominant species where present. Other species that were present but not measured were choke cherry and shagbark hickory.

Frank (2007a) added some additional comments:

I was extremely impressed by the hawthorns. They had an impression of being very old. Typically these are little bushes, but these were simply a few of many that were tree sized with trunks of often over a foot in diameter and twenty to thirty feet high and very gnarled. As for the red oaks – all of these were found on the eastern shore of the island.

The largest tree found was a multi-stemmed monster of a silver maple. I found it along one of the water channels cutting through the knotweed forest covering the southern half of the island. The tree consisted of 7 to 9 trunks forming a merged wooden mass to a height of 6 to 9 feet high. The circumference of this merged trunk was 24 feet. The tree was measured to a height of 108 feet plus, but could be taller as I could not get a good top shot from underneath. It was a very impressive tree.



Figure 61: Multitrunk silver maple near the downstream end of Thompson's Island (photo by Edward Frank, 2009).



Figure 62: Multitrunk silver maple in the knotweed jungle near the downstream end of Thompson's Island (photo by Edward Frank 2007).

Another tree found was a three stemmed sycamore. Each of the stems was a mirror image of the others and over 8 feet in circumference. The tallest was in the upper 120's.

A return trip to the island was made on April 2, 2009 with the goal of investigating the area covered in the late fall by the Japanese knotweed jungle. Frank (2009a) writes:

From Crull's Island we headed down to Thompson Island. An immature bald eagle flew ahead of us as we paddled. We had explored the upper portion of the island previously, but the lower third was

impassible due to a thick mass of Japanese knotweed, a nasty invasive species, up to ten feet tall that formed a dense thicket. After the winter the knotweed had died back and we could see into the area and force our way through it. We managed to measure a number of big sycamores and silver maples in the midst of what had been the knotweed thicket. Of particular note was a tall silver maple we measured at 128.9 feet. This makes it the tallest of its species known in the Northeastern US. [It turns out this is the tallest silver maple yet documented by ENTS anywhere.]