No Name Island

41^0 31.103'N x 79^0 26.699'W elevation 1048 ft.

No Name Island (10 acres) is about half river-bottom trees and half dense undergrowth. It is located immediately downstream of Baker Island at river mile 153.3.

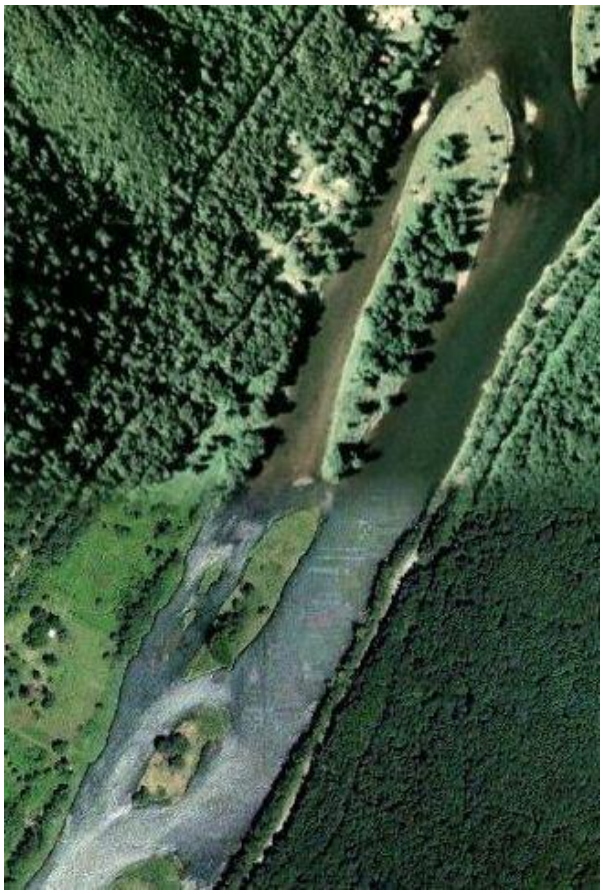


Figure 151: No Name Island (USDA May 27, 2008).

The 1855 map of the river by Babbitt marked this island as the upper of the two Middleton Islands. The name apparently has been lost since the earlier map was published.

On April 20, 2010, Carl Harting and Edward Frank commented on No Name Island (Frank 2010):

> We passed No Name Island – the last of the islands making up the wilderness on our way to Tionesta. None of us had visited the island yet, but from the canoe it can be seen that it is a low lying island. The trees are generally short and do not appear to be young in age. We could see sycamore, silver maple, and black willow. It was getting late and we opted not to stop. There is a highway pullout on Route 62 along the eastern bank of the river with a sign dedicated to environmentalist Howard Zahniser. This pull out lies immediately opposite No Name Island and a canoe can be put in there on a future trip to hit this 10 acre island to complete the last of the wilderness islands.

Frank (2011) scouted No Name Island from shore. He writes:

> No Name Island is lowermost of the seven islands that make up the Allegheny River Islands Wilderness. It is about ten acres in size. We had passed it several times while canoeing, but had not landed because the trees growing on it were rather small. Still, it was part of the wilderness, and we need to visit the island and do some measurements. I could not actually get to the island today, but I wanted to take some panoramas from the shore. There is a commemorative wayside marker along Route 62 dedicated to Howard Zahniser (1906-1964) a wilderness advocate instrumental in getting the Wilderness Act passed in 1964. No Name island lies immediately opposite the wayside marker.

Figure 152: No Name Island Lower End (photo by Edward Frank 2011)

Figure 153: Central portion of No Name Island (photo by Edward Frank 2011)

Figure 154: No Name Island 2 - Middleton island 2 (photo by Edward Frank 2011)

Interestingly the island actually had a name on the 1855 map by Babbitt. He listed three islands found here a the Middleton Islands and a "towhead" for the islands. The uppermost of the Middleton Islands is what is presently called No Name Island. Visible from shore are silver maple, sycamore, and black willow. None are very high.

Figure 155: No Name Island 3 – towhead. (photo by Edward Frank 2011)

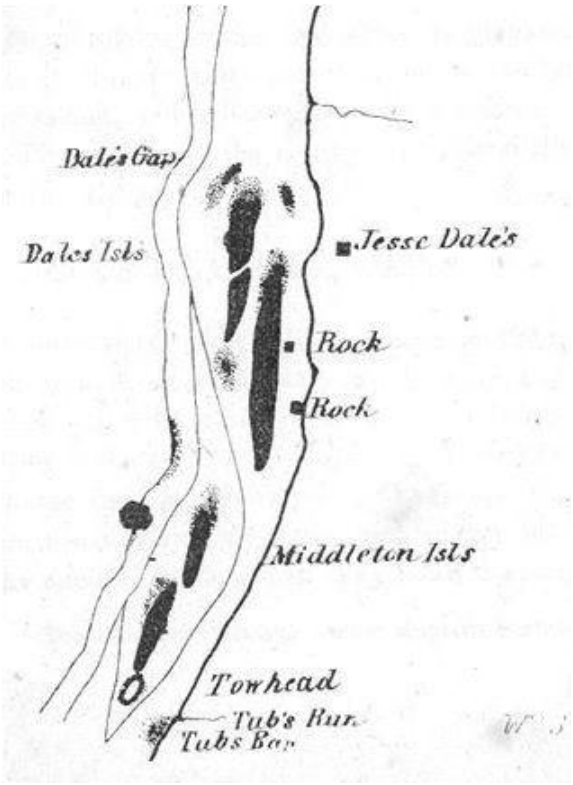
Baker and No Name Island to Tionesta

There are a number of smaller islands and bars found in the river below No Name Island above and within the town of Tionesta. These contain some black willow, sycamore, and silver maple and perhaps a few other species. Most of these islands have little height above the river level and flood frequently. None of them have any lager trees at this time.

In the Babbit (1855, p. 17-18) description present day Baker Island is made up of several smaller islands and is referred to as Dale's islands. No Name Island and the smaller island and towhead below immediately downstream of it are called the Middleton Islands. He writes:

DALE'S ISLAND and GAP

Channel to the right. Keep quite near the right shore around the right point while entering the



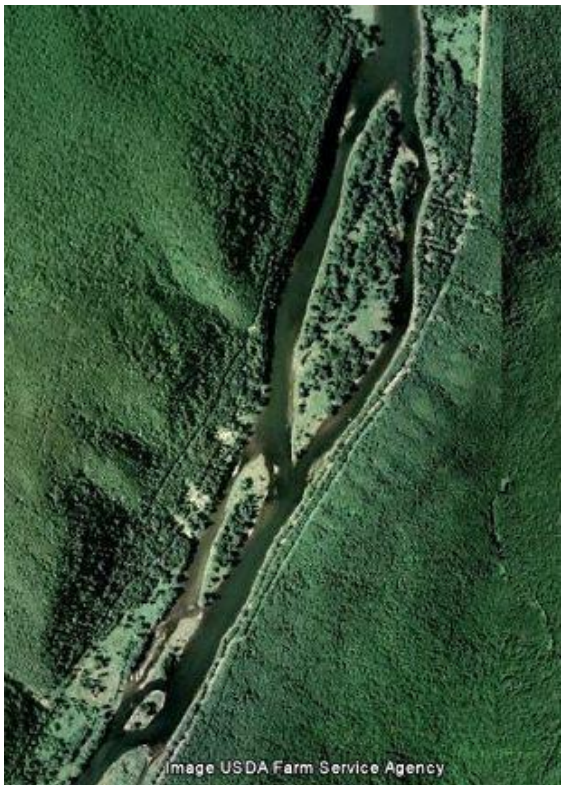


Figure 156 and 157: Side by side comparisons of a section from Babbitt (1855) Allegheny No. 4 map and an aerial photograph from 2008 (USDA Farm Service Agency May 27, 2008) showing present day Baker Island and No Name Island. They are marked on the earlier map as Dale's Islands and Middleton Islands respectively.

> Gap, and when past the large bar near the head of the Island, keep a little to the right of the middle till down to the foot, then turn rather short around the right shore point, to pass the head bar of Middleton's first Island, close by, and keep a little to the right of the middle till about half way down the second Island, which will carry you clear of its head bar, then turn out to the left so as to be close to the tow-head while passing it at the foot of the Island, and when past it work over to the left, so as to pass about midway between Hunter's and May's Island. Turn a little to the left, while going down the riffle, to avoid the large bar on the right below the foot of Hunter's Island. When past the bars, cross over to the right shore to prepare for the Tionesta Islands.
>
> At the present, this track receives the most travel in all stages of water. But in low running it should not be done.
>
> The channel to the left of Middleton Islands is much deeper than to the right, and far better in low water. To run through this channel; while approaching the foot of Dale's Island, work to the left gradually, so as to be quite near the gravel bar at the foot. When past the bar, hold to the left, and pass about midway between the foot of Dale's long left hand Island and the head of Middleton's upper Island. And when down past the head of the second

Middleton Island, incline to the right and run quite near the tow-head at the foot to avoid Tub's Bar, which makes out from the left at the mouth of Tub's Run. Flat boats in very low water should always take this channel. The channel to the right of Hunter's Island has for the last few years pretty generally deserted, and ought to have been many years ago.

It will be seen by the chart, that to the left of Dale's Islands would be like the Paddy's Jordan, -- "A hard road to travel." It is very narrow, besides two rocks being nearly one foot out of the water in a rafting stage, to say nothing of the middle bar at the head of the Island.

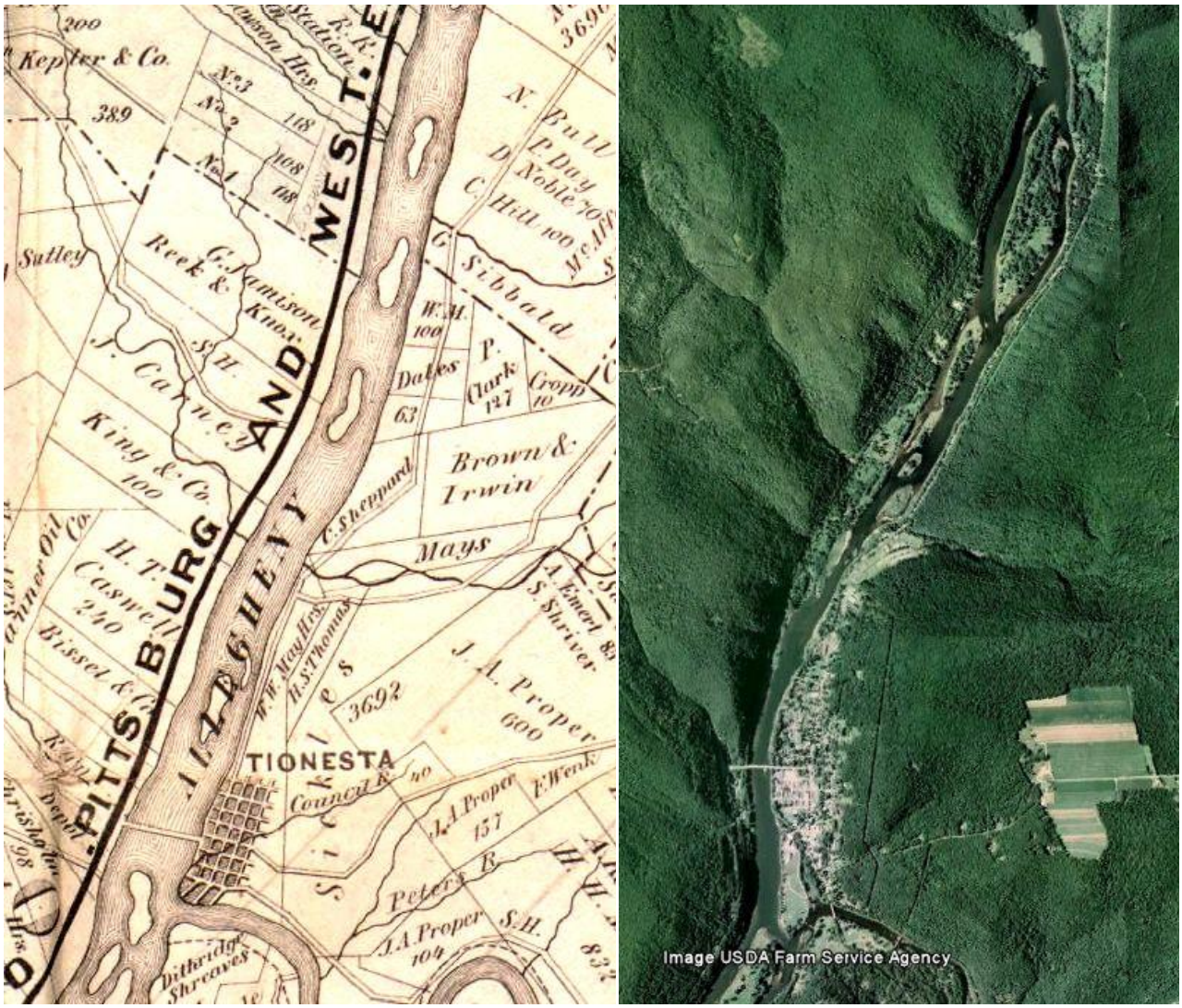
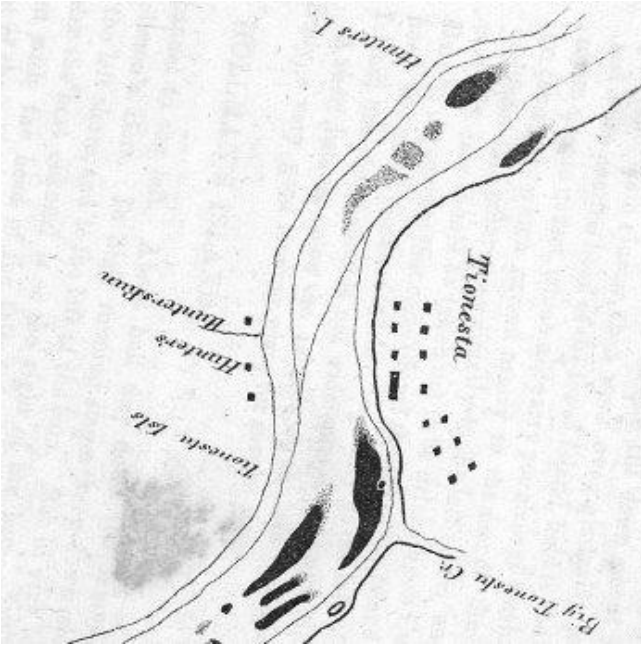


Figure 158 and 159: Side by side comparison between an excerpt from "Irwin's Map of Forest County," published by J. L Smith, 1881 and aerial photo imagery taken on May 27, 2008 (USDA Farm Service Agency).



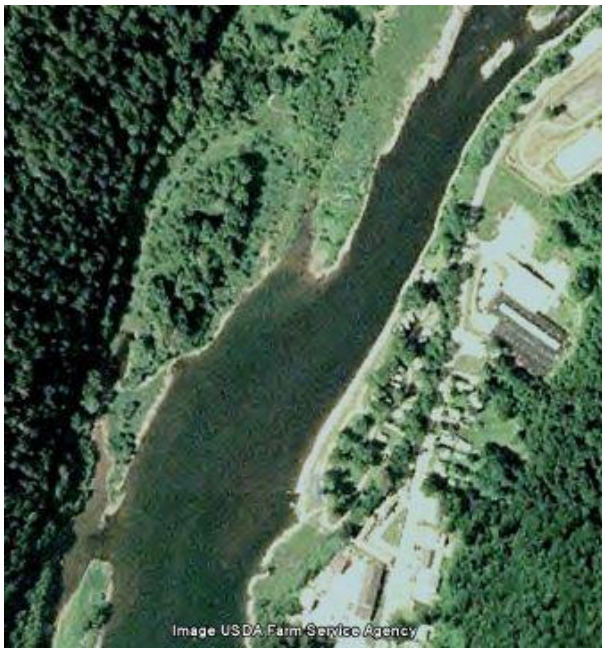


Figure 160 and 161: Views of the Allegheny River immediately upstream of Tionesta. The map on the left shows a section from Babbitt (1855), with Hunters Island marked, while the aerial photo on the right shows a close-up section of these former islands taken in July 2005 (USDA Farm Agency).

Hunters Island and May's Island

Hunters Island is shown on the Babbitt (1855) map as an island on the west side of the Allegheny River. The unlabeled island opposite Hunter's Island adjacent to the east bank of the River is May's Island referred to in the text. Hunter's Island, along the western edge of the river, was still detached from the shore in aerial photos from 1939. May's Island on the eastern edge has already become part of the eastern shore at least during periods of lower flow. At the present time Hunters Island is still undeveloped, although the channel separating it from the western shore was reportedly filled in to allow access by the landowners. Several large trees are visible on the island.

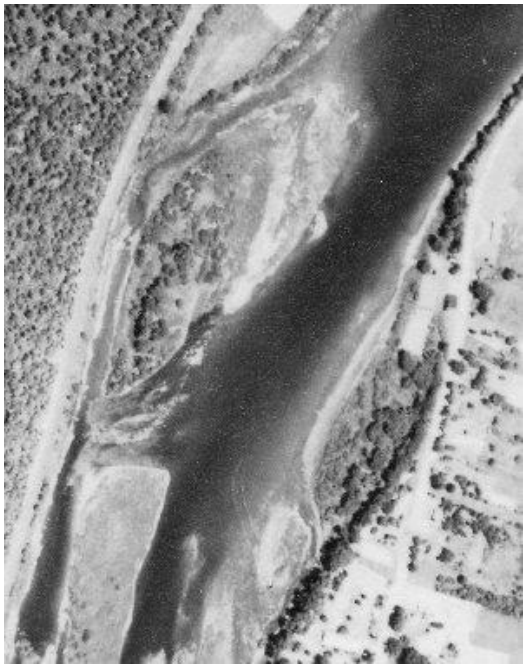


Figure 162: Aerial photo of Hunter's Island and nearby islands taken on June 6, 1939 (Penn pilot). Frank 2011 writes:

Hunters Islands are shown on the Babbitt (1855) map as an island on the west side of the Allegheny River. The opposite Hunters Island on the map is May's Island referred to in the text "then turn out to the left so as to be close to the tow-head while passing it at the foot of the Island, and when past it work over to the left, so as to pass about midway between Hunter's and May's Island.

May's Island is presently completely occupied by the Eagle Rock Campground associated with the Eagle Rock Motel, canoe rental, and kayak rental. The present owner told me that the occasionally flowing very channel that separated the island from the shore proper was filled in when the campground was constructed in 1972. There are few trees left in the campground area. They are almost exclusively silver maple trees. One sycamore is also present. None are of any large size, but should be measured simply for the sake of thoroughness. It is relatively small in size and would not take long to complete. An eagles nest can be found on the far shore in a white pine downstream from the motel.

Hunter's Island could be seen across the river. This is also privately owned. The owner of the campground indicated this former island had also been connected artificially to the shore by its owners. This island is undeveloped. There is one large sycamore that stands much taller than the rest of the trees on the island. It would be worth measuring and likely can be reached during normal flow from the far shoreline without need for a canoe.

Figure 163: May's Island Eagle Rock Campground on May's Island (photo by Edward Frank 2011).

Figure 164: Downstream end of Hunter Island (photo by Edward Frank 2011)

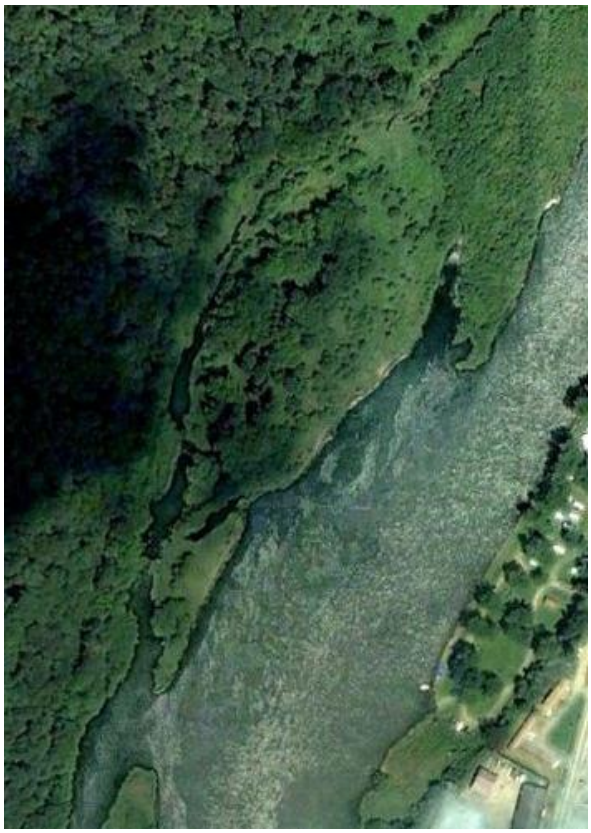


Figure 165: Detail from Aerial photo of Hunters Island (USDA Farm Service Agency 05/27/2006)

Sarah Stewart Bovard Memorial Library, Tionesta

41^0 29.414'N x 79^0 27.344'W elevation 1070 ft.

In October 2008 Dale Luthringer measured three large trees on the eastern side of the river within the town of Tionesta. Luthringer (2008a) writes:

> On 1/10/08 I measured a few large trees at the public library in Tionesta. Tionesta is one of the small towns along the banks of the Allegheny River. The following trees are located within the grounds of the Sarah Stewart Bovard Memorial Library. The library actually rests on the grounds of a long since demolished church and cemetery. Many of the town's first settlers are buried here that go back to the days of Chief Cornplanter and the Revolutionary War. Many stones are still visible. I only measured the three largest trees on site.

Sarah Stewart Bovard Memorial Library, Tionesta			
Species	CBH (ft)	height (ft)	Date
sycamore	**15.4**	125	1/10/2008
white oak	13.5	84.2	1/10/2008
white oak	13.3	84.1	1/10/2008

Figure 166: Measurement listing from the Sarah Bovard Memorial Library, Tionesta.

> We've now catalogued 27 trees in the 12x100 class along the banks of the Allegheny River.

Species	#12x100's
N. red oak	3
Silver maple	6
Sycamore	18

> We've only scratched the surface. Once all is said and done we'll have many more trees that'll reach this size class for the Allegheny. It will be interesting to see if the species ratio of 1:2:6 will stand as we collect more data.

While these trees are not part of the island systems themselves, they represent the scale type of trees that likely populated the floodplain prior to European settlement and large scale logging in the regions. These values from the library property are not included in any of the Rucker Index calculations or diversity information for the island systems.

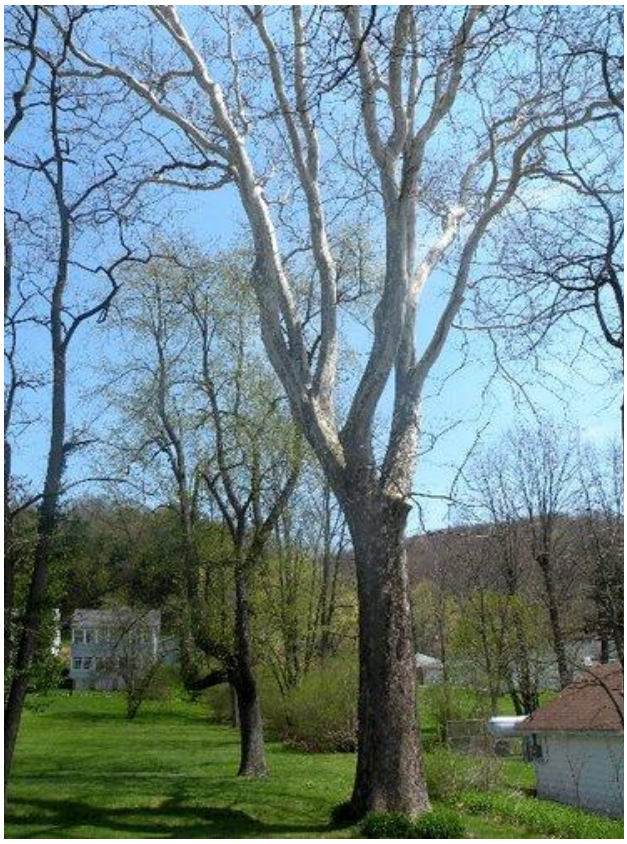


Figure 167: Sycamore, 15.4 feet girth, 125 feet tall at the Sarah Stewart Bovard Memorial Library (photo by Edward Frank 2011)

Figure 168: White oak, 13.5 girth, 84.2 feet tall at the Sarah Stewart Bovard Memorial Library (photo by Edward Frank 2011)

Frank (2011) visited the library site:

> The first stop was at the Sarah Stewart Bovard Memorial Library in Tionesta. In 2008 Dale Luthringer had measured two large white oaks and one large sycamore present on the library and adjacent grounds. I took the opportunity to get photos of two of these trees.

No additional measurements were taken at that time.

Tionesta (Lighthouse) Island

41^0 29.276’ N x 79^0 27.478’ W elevation1054

This 22 acre island is located in the southwestern portion of the town of Tionesta. The island lies immediately above and adjacent to the inflow of Tionesta Creek from the east.

Figure 169: Tionesta Island formed at the mouth of Tionesta Creek as it flows into the Allegheny River (USDA Farm Service Agency July 24, 2006).

The island was scouted by Frank (2011):

> Tionesta Island located in the Allegheny River at the mouth of Tionesta Creek. At least it was the uppermost of the Tionesta Islands in an 1855 map of the region by Babbitt. For many years the island was a gravel mine. Interestingly in 2006 a lighthouse was built on the island: "Tionesta, Pennsylvania recently dedicated the Sherman Memorial Lighthouse in honor of area resident Jack Sherman who designed and built the six-story lighthouse as a permanent tribute to his family’s legacy. The lighthouse sits on the northern end of a 22-acre island that will soon also house the Fishing Museum of Pennsylvania. The lighthouse will serve as a lighthouse museum with a collection of 180 lighthouse replicas on display." Since that time the island has been called Lighthouse Island.

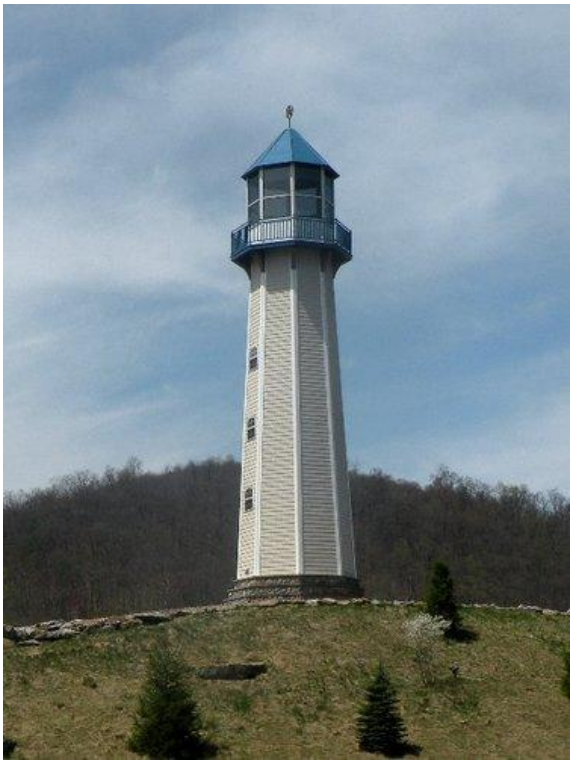


Figure 170: Lighthouse on Tionesta/Lighthouse Island (photo by Edward Frank 2011).

> The channel that flowed along the eastern side of the island has been bridged by a road, likely during the gravel mining phase. It appears, but can't tell for sure during the present high flow, but I believe that some large culverts allows the water to flow under the road. Most of the trees were cut in the recent past and none were of any great size. The

most notable was a large black willow on the eastern channel side of the island near the lighthouse.

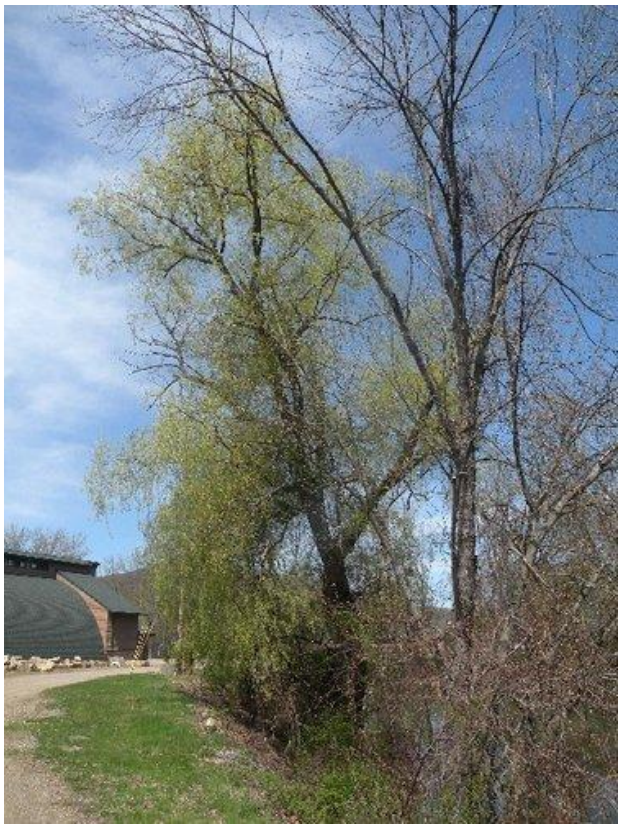


Figure 171: Large black willow near lighthouse on Tionesta/Lighthouse Island (photo by Edward Frank 2011)

> "Presently the island is basically flat on top with only a few trees scattered around the banks on the edge of the island. During a quick recon I found black willow, American Sycamore, red maple, silver maple, black locust, white ash, and a hawthorn sp. I am sure on a return trip we could find enough species to quickly do a Rucker Height Index, but it would not be very high… The uppermost edge of refugee Island #1 visited by Carl Harting and Dale Luthringer on October 8, 2008 lies immediately downstream of the Tionesta island."

Refugee Islands and Holeman Island

Significant changes have taken place in the Refugee (Tionesta) Islands just downstream of the town of Tionesta. These islands were shown on an early map made by Babbitt (1855). He describes the islands and provides a description of the navigation path (below) showing the Allegheny River channel from Tionesta downstream to just past Holeman [Hollman's] Island. Babbit (1855, pp. 18-19) writes:

> TIONESTA ISLANDS - Of these Islands there are thirteen in number and extend down about two miles. Some of them are under a high state of cultivation and are owned by various individuals. Channel to the right. After passing the head of the second Island, keep near the middle till down about half way past the main cluster, then work over gradually to the left and when passing the head of the lower Island, hold to the left so as to run close to its foot, which will carry you clear of Cushon's bars on the right, which extend to nearly the foot of the island; and from this point cross directly to the left shore; and while crossing, care should be taken not to be driven upon Cushon's Bars by the current that comes down the left of the Island. Flat boats and small pieces of lumber frequently go left of these islands, but the channel is not wide enough for wide rafts. A short distance below the islands, on the left is Hollman's Eddy, a very good landing place for several fleets.

Babbit (1855, p. 19) continued:

HOLLMAN'S ISLAND

Channel to the left. About halfway down the Island, is Hollman's Bars. In high running stages keep down close to the left shore, and to the left of the bars. But in very low water the best channel is to the right of the bars. When even with the head of the Island, keep out a little to the right of the middle, and when past the bars, turn back to the left a little above the head of the bar of Hollman's second Island. The water is not as deep by six inches to the left of Hollman's bars, as at Maple Island, although many think Maple Island to be the shallowest place on the river.

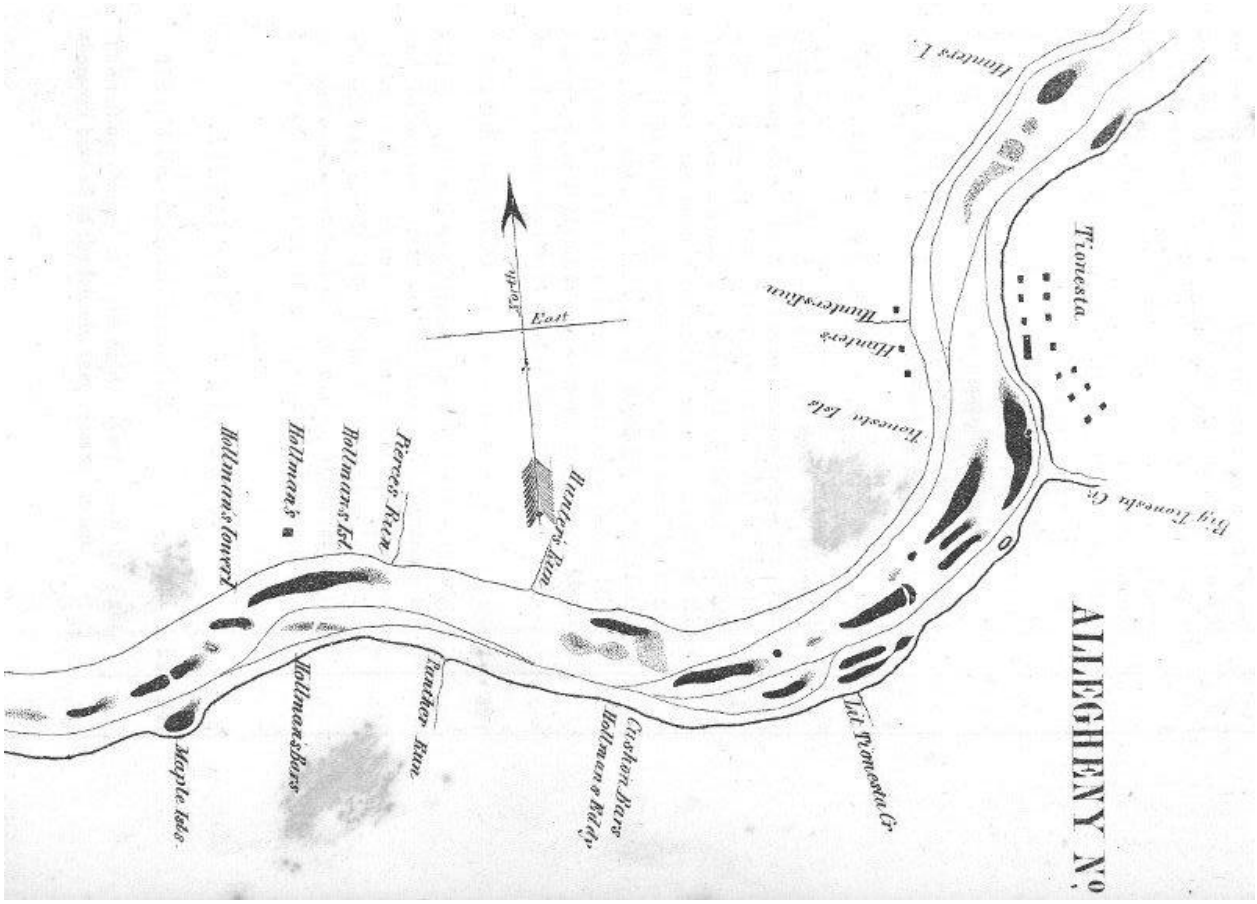


Figure 172: Map by Babbitt (1855) from Tionesta downstream to just past Holeman [Hollman's] Island.

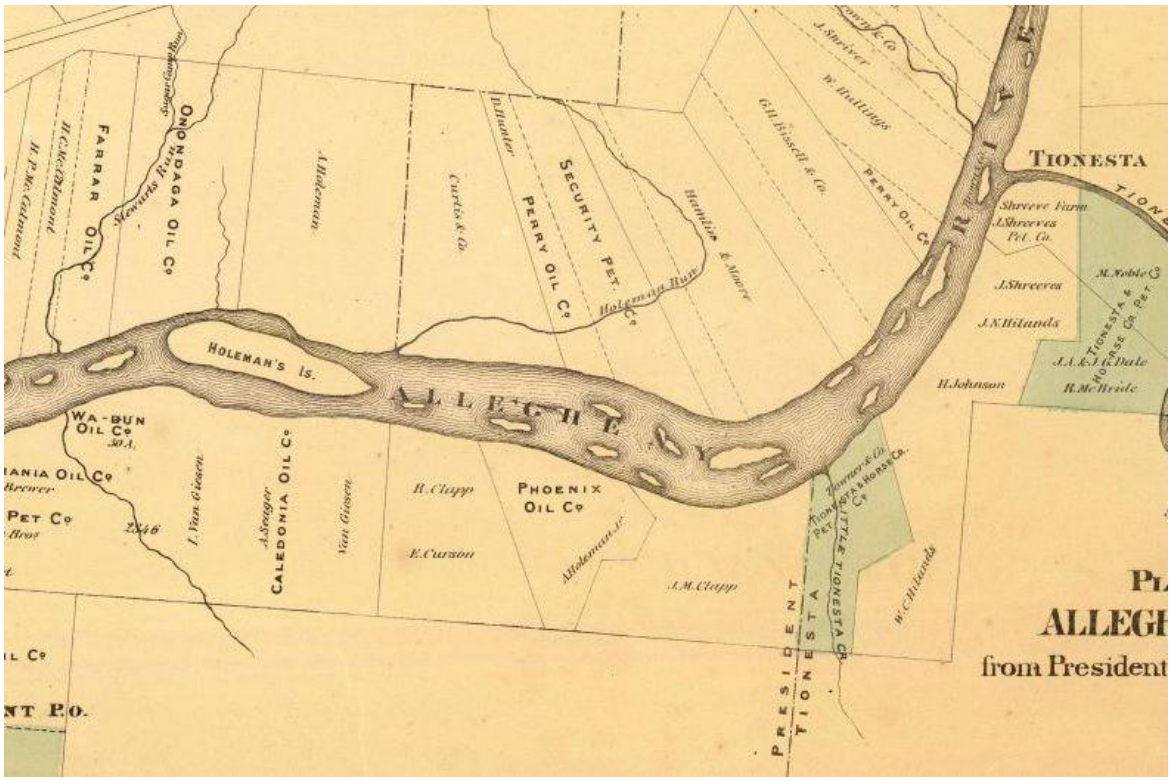
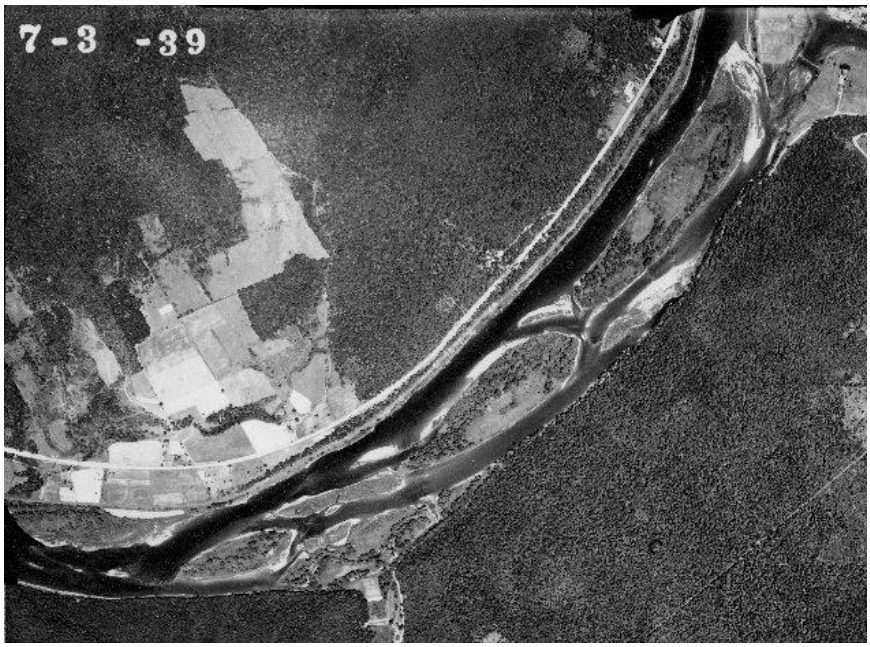


Figure 173: Map segment from Beers (1865) showing the section of the Allegheny River from Tionesta downstream to Holeman Island.

Figure 174: Aerial photos of the Refugee (Tionesta) Island series. (USDA Farm Service Agency May 27, 2008)

As can be seen from the maps, Babbit (1855) and Beers (1865), drawn ten years apart, when compared to the modern aerial photo, a hundred and forty years later, the configuration of the Refugee (Tionesta) Islands has changed in that time. Islands have disappeared; others have merged, formed, enlarged, or migrated downstream. The specific details of the changes can't be determined based upon the maps and photo alone, but that changes have taken place is self evident.



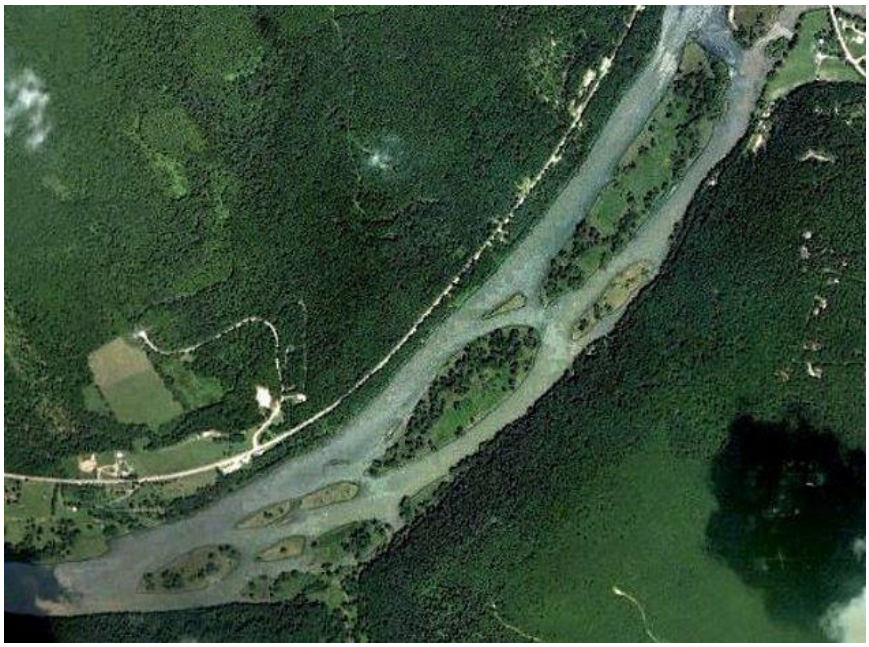


Figure 175 and 176: Comparison of aerial photos of islands immediately below Tionesta taken July 3, 1939 (Penn Pilot) on the left and one taken July 24, 2006 (USDA Farm Service Agency).

Refugee Island 1

41^0 28.905'N x 79^0 27.718'W elevation 1047 ft.

There are a series of smaller islands and two larger islands in the Allegheny River immediately downstream of Tionesta Island and Tionesta. These islands are unnamed on the topographic maps. These islands below Tionesta were explored by Carl Harting and Dale Luthringer in October 2008. Luthringer (2009a) writes:

> On 10/8/08, Carl Harting & I embarked on a short canoe float on the Allegheny River from the Tionesta RT36/62 Bridge, downstream to Hunter at the RT62 Bridge, a distance of 3.2 miles. The mission for the day was to explore the Refugee Islands, a series of 13 islands of varying size, in hopes of finding new big/tall tree records. I call them the Refugee Islands, because there is a historical marker on RT62 due west of their river location that reads:
>
> > "Refugee Towns - This part of the Allegheny was allotted to Munsee and other displaced Indians by the Seneca before 1750. IN 1767-70 Zeisberger worked among these refugee groups, then occupying three towns along the river here." http://www.hmdb.org/marker.asp?marker=39883
> >
> > "David Zeisberger was a Moravian missionary to the Indians during Pontiac's Rebellion and the Revolutionary War periods: http://www.ohiohistorycentral.org/entry.php?rec=428

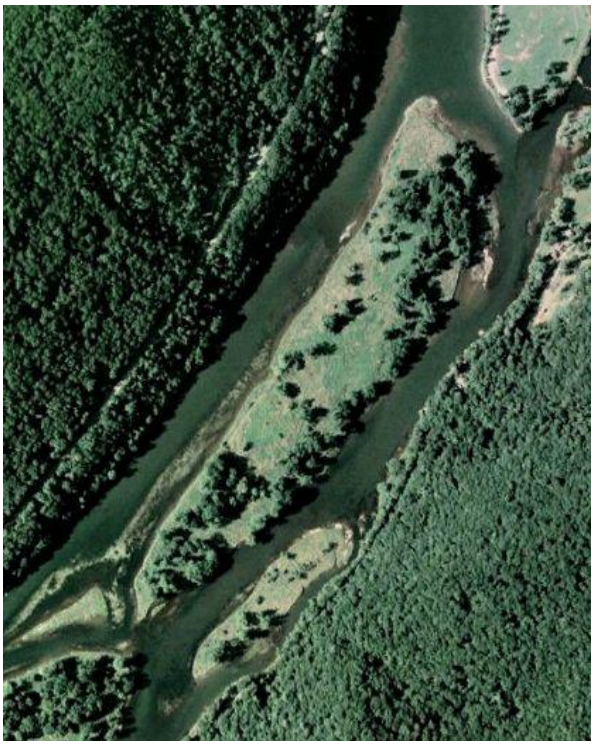


Figure 177: Refugee Island 1, imagery from May 27, 2008 (USDA Farm Service Agency).

> Most of the islands were fairly small in nature, and could be easily surveyed for exceptional trees without leaving the canoe. We decided to hit the biggest as time allowed.
>
> The first island we stopped on, "Refugee Island 1" was the largest at 45 acres. The top end of this island is visible from the RT36/62 Bridge in Tionesta. It wasn't long before we found some decent sized sycamore and tallish silver maples. The tallest trees were on the upstream end of the island. It didn't appear that the downstream end was going to be any better from our vantage point, so we decided to move on. The island in general was fairly open with very little closed canopy.

Figure 178: Sycamore forest on Refugee Island No. 1. Note Carl for scale at the base of the center tree (photo by Dale Luthringer, 2009).

Refugee Island 1			
Species	CBH (ft)	height (ft)	Date
black willow	7.7	80.5	10/8/2008
butternut	3.4	37.5	10/8/2008
silver maple	9	118.7	10/8/2008
silver maple	9	117.3	10/8/2008
silver maple	N/A	110.1	10/8/2008
silver maple	8.3	108.1	10/8/2008
silver maple	13.7	101.4	10/8/2008
silver maple	9.4	97.6	10/8/2008
sycamore	10.7	127.6	10/8/2008
sycamore	13.8	127.1	10/8/2008
sycamore	10.7	120.9	10/8/2008
sycamore	12.8	112.6	10/8/2008
white ash	5.1	75.1	10/8/2008
Rucker Height Index 5		87.88	
Rucker Girth Index 5		8.74	

Figure 179: Measurement Listing for Refugee Island #1.

Figure 180: Sycamore forest on Refugee Island No. 1. Note Carl for scale at the right of the base of the tree (photo by Dale Luthringer, 2009).

Refugee Island 2

41^0 28.512'N x 79^0 28.155'W elevation 1042 ft.

Luthringer (2009a) writes:

> Oct 08, 2008 We hopped back in the canoe and headed down the east side of the island and stopped at the next largest island, 'Refugee Island 2', at 31 acres. This island had much more closed canopy. Carl took off down the center and reconned a good bit of the island taking in some measurements as well.

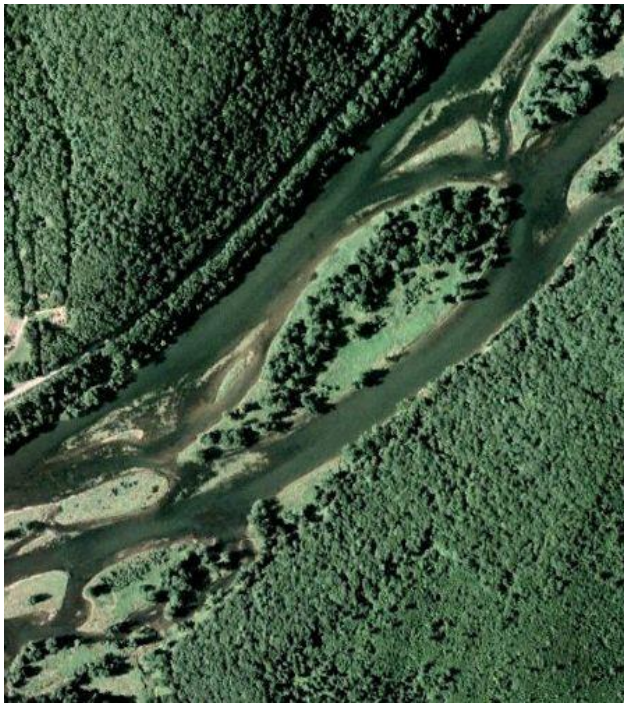


Figure 181: Refugee Island 2, imagery from May 27, 2008 (USDA Farm Service Agency).

> Me, well, I got stuck measuring one tallish silver maple. It took the majority of my time trying to get a good shot and photo. Why a photo you may ask, well, turned out to be a new NE height champ at 6.4ft CBH x 121.9ft high! Then it started to rain... and didn't stop the rest of the day. It's a good thing it was a "warm" rain, because we had a good bit

Figure 182: silver maple trees on Refugee Island No.2. Carl Harting is standing besidethe 121.9 ft. tall Silver Maple. (photo by Dale Luthringer, 2009).

> to go before we'd feel heat again from the car. Another highlight was finding another 140ft class sycamore on the island. By the time we finished with Refugee Island 2, the rain was coming down in buckets. We cruised past the smaller islands. None of them appeared to have anything worth getting out of the canoes in a steady downpour. Another place I wanted to check out though by canoe was where Little Tionesta Creek came into the island complex from the south. I was hoping there might be something worth documenting in this flat. Problem was we couldn't get close

enough via canoe, since the channel became too shallow via mud and choked with logs behind the island we needed to skirt. After being drenched for the previous 2hrs, and viewing what crowns we could see from a distance, we decided that it wouldn't be worth the effort to conduct a thorough "mud run" into the area. So, we continued down to the RT62 Bridge, pulled out at the golf course property, and portaged the next 300 yards to the vehicle. This is NOT a designated canoe access point. It's private property, and we had to secure prior permission to use it. Even though the day turned out to be a soaker, it was still productive along the 'Belle Riviere'.

Refugee Island 2 Species	CBH (ft)	height (ft)	Date
sycamore	10.3	142.1	10/8/2008
sycamore	6.2	132.1	10/8/2008
sycamore	7.9	123.1	10/8/2008
silver maple	6.4	121.9	10/8/2008
sycamore	8.8	119.8	10/8/2008
sycamore	8.3	119.3	10/8/2008
silver maple	10.3	117.3	10/8/2008
sycamore	6.8	109.9	10/8/2008
white ash	9.7	106.6	10/8/2008
white ash	6.9	101.9	10/8/2008
white ash	8.8	101.9	10/8/2008
sycamore	15.7	91.2	10/8/2008
common hackberry	8.1	86	10/8/2008
bitternut hickory	6.9	85.4	10/8/2008
silver maple	16.3	81.1	10/8/2008
Rucker Height Index 5		108.4	
Rucker Girth Index 5		10.41	

Figure 183: Measurement Listing for Refugee Island #2.

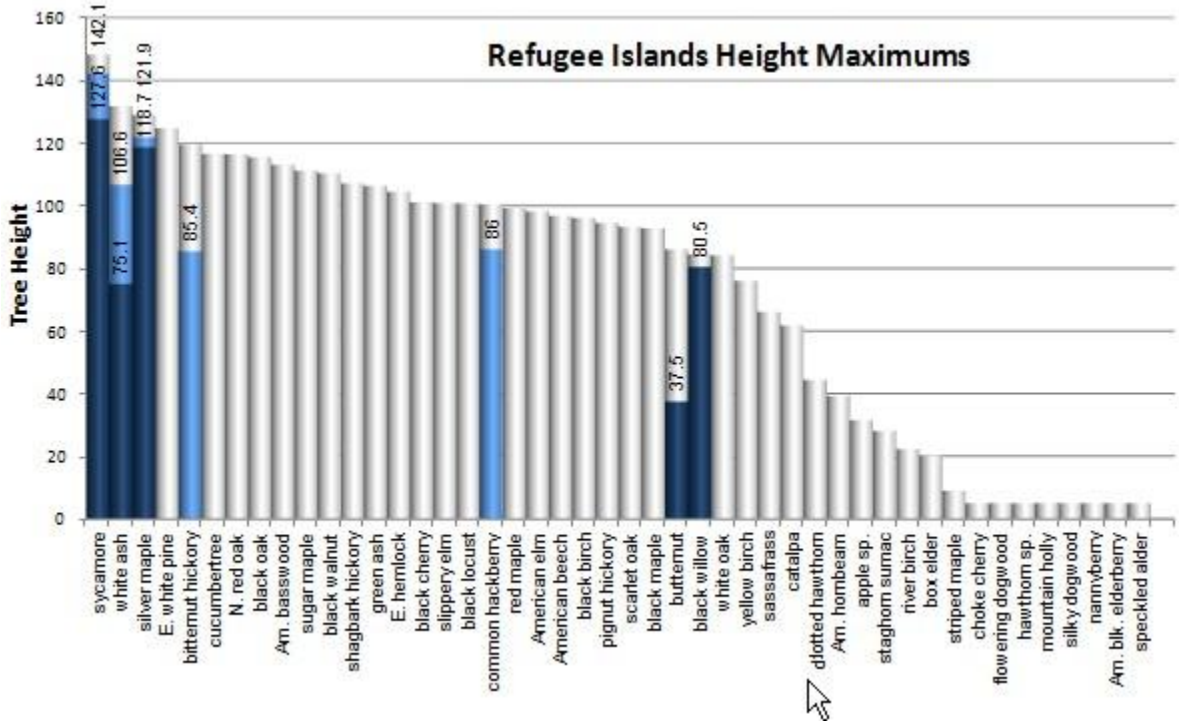


Figure 184: Tree Height Profile for the Refugee Islands. The blue bars represent the maximum height of trees found on the Refugee Islands compared against the light gray background profile for the Allegheny River Islands as a whole. Refugee Island 1 is shown as dark blue, Refugee Island 2 is shown as light blue.

Holeman Island (Kibbe's Island Park Campground)

41^0 28.624' N x 79^0 31.196' W elevation 1037

Holeman Island is a large island, 59.6 acres, lying against the western bank of the Allegheny River a short distance down from the Route 62 Bridge crossing the river. It is located at river mile 148.5. Today it is better known as Kibbe's Island Park Campground – privately owned campground concession.

As noted above Irvine (1785) reported that the island had been previously farmed by native Americans. There is no visible remnants of this farming activity visible today.

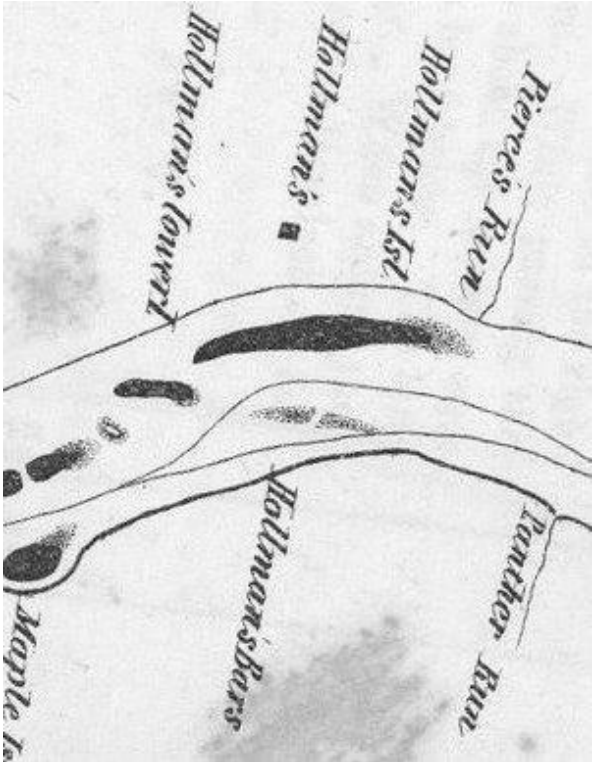


Figure 185: Map of Holeman Island by Babbitt (1855).

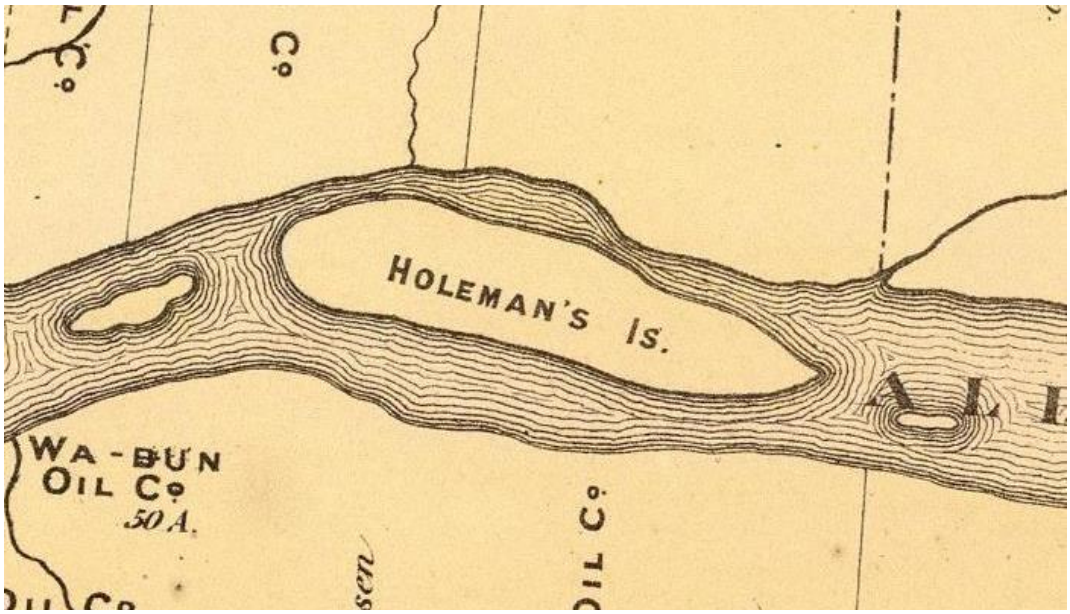


Figure 186: Beers (1865b) map of the Allegheny River showing Holeman's Island.

Figure 187: Aerial photo of Holeman Island, imagery from March 30, 2006 (USDA Farm Service Agency and US Geological Survey).

Dale Luthringer first visited this site in September 2007. He writes (2007d):

> Kibbe's Island Campground is a private place. I had to get special permission to get on it, and had to rush through before they closed up. During very high water, it would be an island, but for the most part it might be better described as a peninsula. I found a beautiful hawthorn downstream below Tionesta a couple of days later on Kibbe's Island Campground that was a solid 5.5ft CBH x 33.9ft high x 45.8ft average spread for 111.4 AF Points. I took leaf, bud, & fruit samples back with me to check. [The hawthorns were identified as dotted hawthorn (*Crataegus punctata*)] Al l the hawthorn we saw had the same characters as this one. This hawthorn was a solid single stem tree. No guesswork as to where to measure CBH on this baby. Also had an immense sycamore here as well to 17.8ft CBH x 109.1ft high. My largest personal sycamore measure... what I was hoping we were going to find on Thompson. They had a lot of nice hackberry here as well. One was another personal largest measure for the species at 10ft CBH x 93.4ft high.

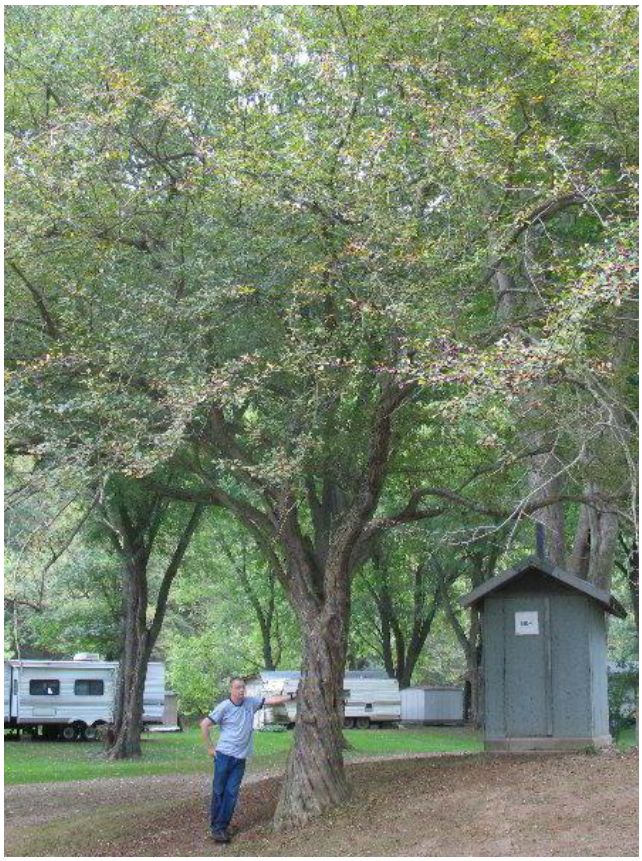
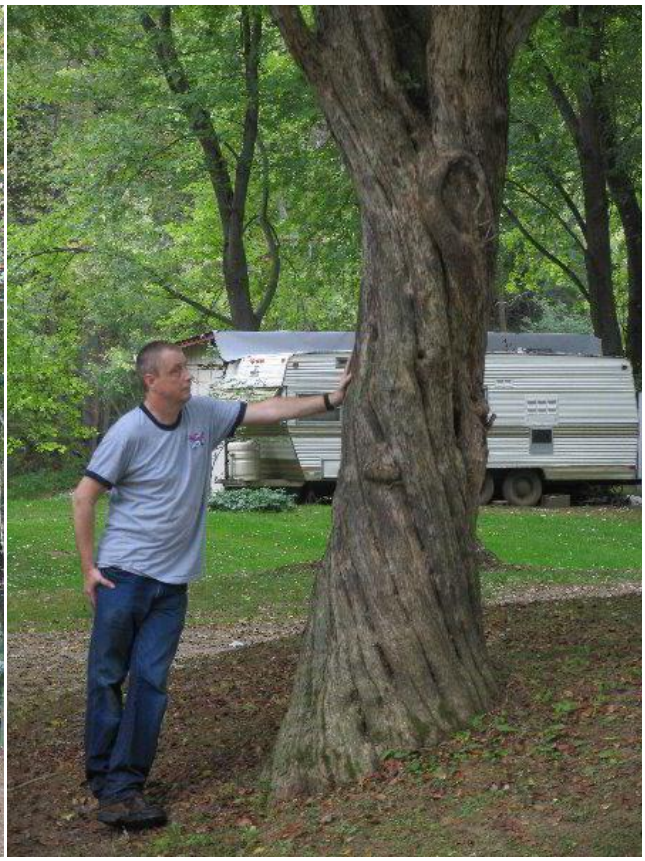



Figure 188 and 189: Large dotted hawthorn. 33.9 feet tall and 5.5 feet in girth, found in Kibbe's Island Park Campground on Holeman Island (photos by Dale Luthringer, 2007).

Edward Frank and Dale Luthringer revisited the island on Sept 26, 2007, to continue the documentation of the site. Frank (2007c) writes:

> …We decided to visit Kibbe's Island Park Campground a few miles south of Tionesta. This is not part of the wilderness, but represents a comparable ecosystem in the river. The land is a private campground, and not really an island, but a floodplain along the west bank of the river. In times past higher floods would cut off portions of the area forming islands. After getting permission to enter and getting a gate card, we started our measurements. There is a massive Sycamore in front of an equipment barn. It had cbh of around [17.8 feet and measured 109.1 feet high]. The top of this and the other sycamores we measured had been lost due to winds at some time in the past. It had a truly massive trunk.

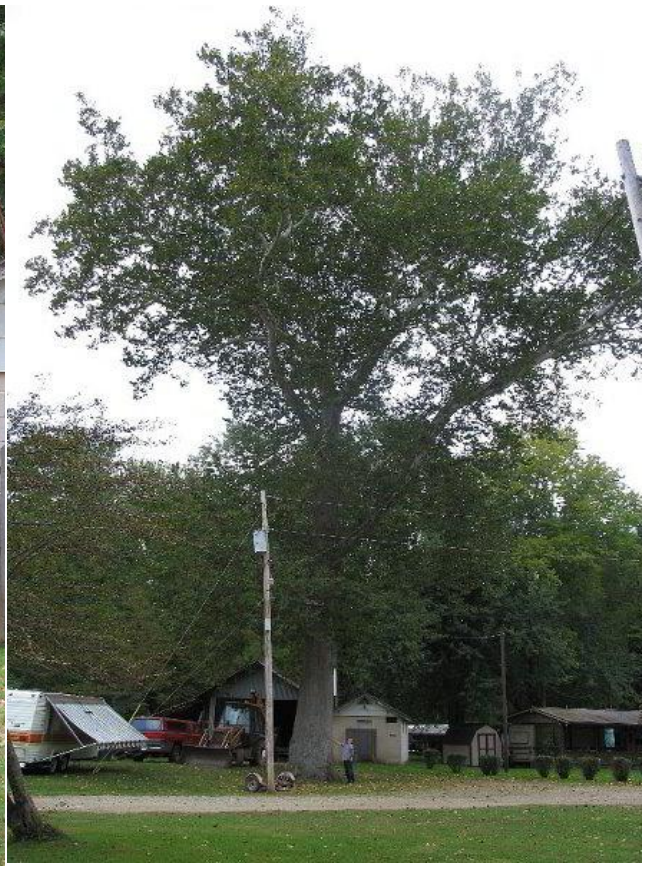



Figure 190 and 191: Massive sycamore tree, 17.8 feet in girth and 109.1 feet in height, found at Kibbe's Island Park campground (photo on left by Edward Frank, 2007, photo on left by Dale Luthringer, 2007).

We went on to measure several more sycamores, a large hackberry, and some hawthorns. One hawthorn measured 3.3 ft cbh, 31.4 feet tall, with a crown spread of 36 feet. It was a very nice tree, but not the largest. Indeed [the largest hawthorn] was a beautiful specimen. We took a series of photos and headed back out. From the looks of the campground, it appears that the owners left all of the big sycamores and large hawthorns in place as they cleared the property. A few silver maples and other species were also present. A few hawthorns at some campsite obviously had been planted as they formed rows, and were of a different species, but there were dozens of really nice large hawthorns scattered about the place. We paused to give the owners the numbers we had found, before leaving I measured one last sycamore at 14.9 feet cbh, and 101 feet tall.

Figure 192: One of the large hackberry trees found at Kibbe's Island Park campground. This specimen was 8.4 feet in girth and 92.4 feet tall (photo by Edward Frank, 2007).

Since the 1865 map was drawn, Holeman Island has changed shape and the channel behind the island has become narrower. There has been little change in the configuration of the island between the 1939, 1958, and present day 2006 aerial photos of the island. Today it is essentially part of the floodplain along the west bank of the river in all but the highest flow periods.

Holeman Island - Kibbe's Island Park Campground			
Species	CBH (ft)	height (ft)	Date
common hackberry	10	93.4	9/10/2007
common hackberry	8.4	92.4	9/10/2007
dotted hawthorn	5.5	33.9	9/10/2007
dotted hawthorn	3.3	31.4	9/26/2007
sycamore	13.6	116.8	9/26/2007
sycamore	15.6	116.5	9/26/2007
sycamore	17.8	109.1	9/10/2007
sycamore	14.9	101	9/26/2007
hawthorn sp.		5	9/10/2007
Am. basswood		5	9/10/2007
bitternut hickory		5	9/10/2007
black cherry		5	9/10/2007

Figure 193: Measurement Listing for Holeman Island.

The aerial photo of Holeman Island from 1939 (Figure 153) shows active fields in the center of the island, with young forests around the perimeter and on the upstream (right) end of the island. The lower photo from 1958 shows one active field in the center of the island with several former field areas growing up in brush. The trees along the perimeter of the island and on the upstream end of the island have grown larger. The old fields and most of the forested areas had been converted to campgrounds by 2006 (Figure 148). The large trees scattered about the present day campgrounds are remnants from trees that grew in these older fields and forests.

Figure 194 and 195: Comparison of aerial photos of Holeman Island between July 3, 1939 (upper photo) and August 23, 1958 (Penn Pilot).

Discussion of Results

From visiting many islands in the Allegheny River, including not only islands in the Allegheny River Islands Wilderness, but on several U. S. Forest Service islands, and private islands, certain assemblages of trees can be expected to be found. The predominant species found on the lower sections of the islands are American sycamore (*Platanus occidentalis*) and silver maple (*Acer saccharinum*). Black willow (*Salix nigra*) and American basswood (*Tilia americana*) are also found in these areas in more limited numbers. These are all species that survive or thrive from the periodic flooding of the river. They often have multiple stems in the lower areas from this flood damage, or in some case continue to grow after they have fallen on their side. Their growth is not limited to these low areas and the largest specimens of each species are often found in higher areas in central portions of the islands. Other species found commonly on all the islands include dotted hawthorn (*Crataegus punctata*), hawthorn (*Crataegus sp*.), bitternut hickory (*Carya cordiformis*), butternut (*Juglans cinerea*), white ash (*Fraxinus americana*), and black locust (*Robinia pseudoacacia*). Species found on most islands, but not all include common hackberry (*Celtis occidentalis*), slippery elm (*Ulmus rubra*), and yellow birch (*Betula alleghaniensis*). Other species found sporadically included northern red oak (*Quercus rubra*), staghorn sumac (*Rhus typhina*), black walnut (*Juglans nigra*), American beech (*Fagus grandifolia*), and black cherry (*Prunus serotina*). White pine (Pinus strobes) was found on three islands that had particularly high areas that rarely flooded, and was absent from all the other lower islands. A number other species were only found on a single island or were only found on Hemlock Island, a private island with a large area much higher above the flow level than any of the other islands visited.

The overall Rucker Height 10 Index for the Allegheny River islands, in the stretch from Crull's Island to Holeman Island, is a respectable 122.57. Of the trees in that total, three species are from Crull's Island, two are from Baker Island, and one is from Thompson's Island. The other four species are all from Hemlock Island. Three of these species, eastern white pine, cucumber tree, and black oak, are absent or rare on the other islands. They are represented on Hemlock Island because it is higher and dryer than the other islands in the series and rarely floods.

This ranks 16th among sites in Pennsylvania out of a total of 78 sites measured so far. This is in spite of the fact that many of the RHI values include exceptionally tall white pines (*Pinus strobus*) or tuliptrees (*Liriodendron tulipifera*). No tuliptrees were found on the islands, and the tallest white pine from Hemlock Island was only 124.7 feet (38 meters) tall.

Of the more common species, there is a potential to find new trees on other islands that are a few feet taller than what has already been found. Combined these taller trees could potentially raise the Rucker Height Index a couple of feet.

The largest potential for raising the Rucker Height Index lies in finding another high island, like Hemlock Island, which rarely floods. Hemlock Island is where the tallest non-flood tolerant species yet documented within the island systems are located. However the maximum documented tree heights of these non-flood tolerant species in the hills surrounding the river are much taller than the maximums documented for these species on Hemlock Island.

Allegheny River Islands Rucker Height Indexes							
Species	CBH (ft)	height (ft)	Location	Date	RI5	RI 10	RI 20
sycamore	9.3	148.3	Baker Island	10/8/2009	148.30	148.30	148.30
white ash	9.8	131.7	Crull's Island	3/26/2009	131.70	131.70	131.70
silver maple	10	128.9	Thompson's Island	4/2/2009	128.90	128.90	128.90
E. white pine	8.6	124.7	Hemlock Island	7/16/2008	124.70	124.70	124.70
bitternut hickory	8	119.5	Baker Island	10/8/2009	119.50	119.50	119.50
cucumbertree	3.9	116.6	Hemlock Island	7/16/2008	130.62	116.60	116.60
N. red oak	9.2	116.4	Hemlock Island	7/16/2008		116.40	116.40
black oak	7.1	115.5	Hemlock Island	7/16/2008		115.50	115.50
Am. basswood	8.9	113	Crull's Island	4/2/2009		113.00	113.00
sugar maple	11.1	111.1	Crull's Island	4/2/2009		111.10	111.10
black walnut	7.7	110.3	Thompson's Island	9/3/2007		122.57	110.30
shagbark hickory	5.7	107.1	Hemlock Island	7/16/2008			107.10
green ash	7.8	106.4	Thompson's Island	4/2/2009			106.40
E. hemlock	7.8	104.4	Hemlock Island	7/16/2008			104.40
black cherry	6.7	101	Hemlock Island	7/16/2008			101.00
slippery elm	6.6	100.8	Crull's Island	4/2/2009			100.80
black locust	4.7	100.72	King Island	4/20/2010			100.72
common hackberry	11.4	100.5	Crull's Island	4/2/2009			100.50
red maple	6.7	99.1	Crull's Island	9/7/2004			99.10
Am. elm	5.8	98.2	Crull's Island	4/2/2009			98.20
Am. beech	6.3	96.8	Hemlock Island	7/16/2008			112.71
black birch	6.4	96.1	Hemlock Island	7/16/2008			
pignut hickory	5.5	94.5	Courson Island	9/4/2007			
scarlet oak	7.4	93.2	Hemlock Island	7/16/2008			
black maple	3.7	92.8	Crull's Island	9/17/2011			
butternut	9.2	86	Courson Island	4/20/2010			
black willow	9.9	84.5	Thompson's Island	9/3/2007			
white oak	4.2	84.1	Hemlock Island	7/16/2008			
yellow birch	2.7	76	Hemlock Island	7/16/2008			
sassafrass	4.8	66.1	Hemlock Island	7/16/2008			
catalpa sp.	5.9	61.7	Courson Island	9/4/2007			
dotted hawthorn	6.3	44.4	Crull's Island	4/2/2009			
Am. hornbeam	1.2	39.2	Thompson's Island	4/2/2009			
apple sp.	3.3	31.5	Crull's Island	4/2/2009			
staghorn sumac	2.4	28	Crull's Island	4/2/2009			
river birch		22.2	Thompson Island	4/2/2009			
box elder	4.7	20.2	Ft. Michaux	9/5/2008			
striped maple	7.5	9	Crull's Island	4/2/2009			
choke cherry		5	Thompson's Island	9/3/2007			
flowering dogwood		5	Hemlock Island	7/16/2008			
hawthorn sp.		5	Crull's Island	4/2/2009			
mountain holly		5	Hemlock Island	7/16/2008			
silky dogwood		5	Courson Island	9/4/2007			
vitus sp.	1.6	5	Crull's Island	3/26/2009			

Figure 196: Overall Rucker Height Index tabulation for the Allegheny River Islands investigated.

By far the highest value in the eastern United States for a Rucker Height Index is that of 163.6 from Great Smoky Mountains National Park in North Carolina and Tennessee. In general most of the tallest sites are found in the southeastern United States. Of all of the sites in eastern United States, four sites in the northeast make the top twenty-five list. Two are from Pennsylvania, one from New York, and one from Massachusetts.

Rucker Height Index Site Comparison

Rank	Site	RHI	County
Eastern United States Sites Comparison (Select examples)			
1	Great Smoky Mountains National Park	170.27	N. Carolina/Tennessee
13	Cuyahoga Valley Area	139.6	Ohio
14	Ridley Creek State Park	139.35	Pennsylvania
18	Cook Forest State Park	138.31	Pennsylvania
19	Zoar Valley	137.3	New York
21	Mohawk Trail State Forest	136	Massachusettes
Pennsylvania Site Comparison (Ranking within PA among 78 sites)			
1	Ridley Creek State Park	139.35	Delaware
2	Cook Forest State Park	137.72	Clarion/Forest
3	Pennypack Park	133.07	Philidelphia
4	Fairmont Park	132.27	Philidelphia
5	Clarion River	130.97	Jefferson/Clarion/ Forest
6	McConnells Mill State Park	130.85	Lawrence
7	Cemetery Run-Meadville, PA	129.23	Crawford
8	Swarthmore College	127.55	Delaware
9	Wintergreen Gorge	127.53	Erie
10	Ricketts Glen State Park	126.29	Luzerene/Sullivan/Columbia
11	Friendship Hill National Historic Site	125.9	Fayette
12	Tyler Arboretum	125.08	Delaware
13	Valley Forge National Park	123.83	Chester/Montgomery
14	Walnut Creek Gorge	123.66	Erie
15	Ryerson State Park	123.6	Green
16	Allegheny River: Crull's Island to Holeman Island	122.57	Warren/Forest
18	Anders Run Natural Area	122.44	Warren
35	Allegheny River Islands Wilderness Area - Hemlock Island	114.75	Forest
43	Allegheny River Islands Wilderness Area - Crull's Island	110.87	Warren
47	Allegheny River Islands Wilderness Area - Thompson Island	109.64	Warren
68	Allegheny River Islands Wilderness Area - Courson Island	95.78	Warren
73	Allegheny River Islands Wilderness Area - King Island	89.92	Forest
75	Allegheny River Islands Wilderness Area - Baker Island	87.98	Forest

Figure 197: Comparison of Rucker Height Indices of select sites around the eastern United States and Pennsylvania (table compiled from Native Tree Society information).

These eastern rankings of site are to a degree subjective. GSMNP occupies a large area of 521,086 acres. In this listing it is represented as a single site, while many of the other sites are much smaller in size. If broken down into smaller subsites, some of these, like the Cataloochee and Big Creek drainages, would likely be both among the top five sites in the Rucker Height Index tabulation.

The situation in Pennsylvania is more straight forward. The sites in Pennsylvania are typically smaller. One of the largest sites is Cook Forest State Park at around 8,500 acres (3440 hectares), including 2,200 acres (890 hectares) of old growth forest. The majority of sites range from a few hundred to a thousand acres. The composite acreage for all of the Allegheny River Islands surveyed thus far totals 579.6 acres (234.6 hectares). The Rucker Height Indices are also presented for each of the islands for which there was sufficient measurement information to generate a ten species Rucker Height Index.

Allegheny River Islands Rucker Girth Indexes							
Species	CBH (ft)	height (ft)	Comments	Date	RGI5	RGI10	RGI20
sycamore	17.8	109.1	Holeman Island	9/10/2007	17.8	17.8	17.8
silver maple	17.7	101.5	King Island	6/21/2005	17.7	17.7	17.7
N. red oak	13.5	102	Thompson's Island	9/3/2007	13.5	13.5	13.5
common hackberry	11.4	100.5	Crull's Island	4/2/2009	11.4	11.4	11.4
Am. basswood	11.3	94.4	Thompson's Island	9/3/2007	11.30	11.3	11.3
green ash	11.2	96.4	Crull's Island	4/2/2009	14.34	11.2	11.2
slippery elm	11.2	87.1	Thompson's Island	4/2/2009		11.2	11.2
sugar maple	11.1	111.1	Crull's Island	4/2/2009		11.1	11.1
bitternut hickory	10.8	105.9	King Island	6/21/2005		10.8	10.8
honey locust	10.4	73	Ft. Michaux	9/5/2008		10.4	10.4
E. white pine	10.3	113	Hemlock Island	7/16/2008		12.64	10.3
white ash	10.3	106.8	Crull's Island	4/2/2009			10.3
black willow	9.9	84.5	Thompson's Island	9/3/2007			9.9
butternut	9.2	86.02	Courson Island	4/20/2010			9.2
black cherry	8.9	75	Crull's Island	4/2/2009			8.9
red maple	8.8	86.8	Thompson's Island	9/3/2007			8.8
E. hemlock	7.8	104.4	Hemlock Island	7/16/2008			7.8
black walnut	7.7	110.3	Thompson's Island	9/3/2007			7.7
Am. beech	7.6	96	Hemlock Island	7/16/2008			7.6
scarlet oak	7.4	93.2	Hemlock Island	7/16/2008			7.4
black locust	7.2	90.1	Thompson's Island	9/3/2007			10.72
pignut hickory	7.2	94.5	Courson Island	9/4/2007			
black oak	7.1	115.5	Hemlock Island	7/16/2008			
dotted hawthorn	6.5	25	Baker Island	9/5/2007			
black birch	6.4	96.1	Hemlock Island	7/16/2008			
yellow birch	6		Baker Island	9/5/2007			
catalpa sp.	5.9	61.7	Courson Island	9/4/2007			
Am. elm	5.8	98.2	Crull's Island	4/2/2009			
shagbark hickory	5.7	107.1	Hemlock Island	7/16/2008			
cucumbertree	4.9	110.1	Hemlock Island	7/16/2008			
sassafrass	4.8	66.1	Hemlock Island	7/16/2008			
apple sp.	4.7		Hemlock Island	7/16/2008			
black maple	3.7	92.8	Crull's Island	9/17/2011			
Am. hornbeam	2.5	35.6	Thompson's Island	9/3/2007			
staghorn sumac	2.4	28	Crull's Island	4/2/2009			
vitus sp.	1.8		Hemlock Island	7/16/2008			
striped maple	0.75	9	Crull's Island	4/2/2009			
choke cherry		5	Thompson's Island	4/2/2009			
flowering dogwood		5	Hemlock Island	7/16/2008			
hawthorn (sp.)		10	King Penninsula	11/2/2009			
mountain holly		5	Hemlock Island	7/16/2008			
river birch		22.2	Thompson's Island	4/2/2009			
silky dogwood		5	Courson Island	9/4/2007			

Figure 198: Overall Rucker Girth Index tabulation for the Allegheny River Islands investigated.

The current Rucker Girth Index, RGI10, for the islands measured so far is a very nice 12.64 feet, with all of the trees included in the measurement exceeding 10 feet (3 meters) in girth. There is only a limited number of RGI calculated for different sites across Pennsylvania and the eastern United States so generalizations about the ranking of this measure are not applicable.

Species Diversity Listing		Allegheny River Islands	Crull's Island	Thompson's Island	Courson Island	Hemlock Island	King Island	Baker Island
Common Name	**Species**	**height (ft)**						
sycamore	*Platanus occidentalis*	148.3	133.7	140	136.5	121.1	136.1	148.3
white ash	*Fraxinus americana*	131.7	131.7	111.1	113.6	114	81.1	107.9
silver maple	*Acer saccharinum*	128.9	110.8	128.9	123.2	116.4	114.3	84
E. white pine	*Fraxinus americana*	124.7	94.8			124.7		
bitternut hickory	*Carya cordiformis*	119.5	104.2	104.4	108.1	111.6	108	119.5
cucumbertree	*Magnolia acuminata*	116.6				116.6		
N. red oak	*Quercus rubra*	116.4	103.8	102		116.4		
black oak	*Quercus velutina*	115.5				115.5		
Am. basswood	*Tilia Americana*	113	113	105.1	90.6	98.2	90.1	72.1
sugar maple	*Acer saccharum*	111.1	111.1	x		x		78
black walnut	*Juglans nigra*	110.3		110.3		50		
shagbark hickory	*Carya ovata*	107.1		x		107.1		
green ash	*Fraxinus pennsylvanica*	106.4	96.4	106.4				
E. hemlock	*Tsuga canadensis*	104.4				104.4		
black cherry	*Prunus serotina*	101	84.1	88.9		101	x	
slippery elm	*Ulmus rubra*	100.8	100.8	87.1	69.1	95.9	94.7	59.3
black locust	*Robinia pseudoacacia*	100.7	90.1	90.1		86.4	100.72	72
common hackberry	*Celtis occidentalis*	100.5	100.5	83.3				81.6
red maple	*Acer rubrum*	99.1	99.1	86.8		74.8		
American elm	*Ulmus americana*	98.2	98.2					
American beech	*Fagus grandifolia*	96.8		81.5		96.8		
black birch	*Betula lenta*	96.1				96.1		
pignut hickory	*Carya glabra*	94.5		90.9	94.5	80.7		
scarlet oak	*Quercus coccinea*	93.2				93.2		
black maple	*Acer nigrum*	92.8	92.8					
butternut	*Juglans cinerea*	86	68.8	71.3	86	29.4	69.1	54
black willow	*Salix nigra*	84.5	24.4	84.5	74.5	x	60.1	57.1
white oak	*Quercus alba*	84.1				84.1		
yellow birch	*Betula alleghaniensis*	76	x			76		x
sassafrass	*Sassafras albidum*	66.1				66.1		
catalpa	*Catalpa sp.*	61.7			61.7			
dotted hawthorn	*Crataegus punctata*	44.4	44.4	34.9	42.5	x	39.3	25
Am. hornbeam	*Carpinus caroliniana*	39.2	29.5	39.2		34.3		
apple sp.	*Malus sp.*	31.5	31.5			x		
staghorn sumac	*Rhus typhina*	28	28	x	20			
river birch	*Betula nigra*	22.2		22.2				
box elder	*Acer negundo*	20.2						
striped maple	*Acer pensylvanicum*	9	9					
choke cherry	*Prunus virginiana*	x		x		x		
flowering dogwood	*Cornus florida*	x				x		
hawthorn sp.	*Crataegus sp.*	x	x	x	x		x	x
mountain holly	*Ilex montana*	x				x		
silky dogwood	*Cornus amomum*	x			x	x	x	
nannyberry	*Viburnum lentago*	x				x		
Am. blk. elderberry	*Sambucus canadensis*	x					x	
speckled alder	*Ulnus incana*	x				x		
Total species		43	25	25	14	35	14	14

Figure 199: Species Diversity Listings for the major river islands. The species marked in pink were listed by Walters and Williams (1999) but not noted on the single trip to the island during this investigation. The x indicates the species was present but not measured. The islands are arranged beginning at Crull's Island, the furthest upstream island, and proceeding downstream in order to Baker Island.

Heights of Common Trees of the Allegheny River Islands							
		Allgheny Islands		Pennsylvania Tallest		National Tallest	
Name	Species	Height	Island	Height	County	Height	State
sycamore	*Platanus occidentalis*	148.3	Baker Island	150.5	Greene	162.2	GSMNP
white ash	*Fraxinus americana*	131.7	Crull's Island	143.9	Delaware	167.7	GSMNP
silver maple	*Acer saccharinum*	128.9	Thompson's I.	128.9	Warren	128.9	PA
bitternut hickory	*Carya cordiformis*	119.5	Baker Island	140.7	Delaware	156.3	GSMNP
Am. basswood	*Tilia americana*	113	Crull's Island	127.1	Lawrence	128.7	NY
slippery elm	*Ulmus rubra*	100.8	Crull's Island	131.5	Crawford	141.2	SC
common hackberry	*Celtis occidentalis*	100.5	Crull's Island	114.2	Chester	114.2	PA
butternut	*Juglans cinera*	86	Courson I.	106.4	Lancaster	144.6	GSMNP
black willow	*salix nigra*	84.5	Thompson's I.	102.1	Erie	102.1	PA
dotted hawthorn	*Crategus punctata*	44.4	Crull's Island	45.4	Warren	45.4	PA

Figure 200: Comparison of the height of the ten most common tree species found on the Allegheny River Island with maximum heights for those species across Pennsylvania and in the eastern United States (table compiled from Eastern Native Tree Society information).

Some trees found on the Allegheny River islands in the study area are exceptional in size for their species. The American sycamore (*Platanus occidentalis*) that measured 148.3 feet (45.2 meters) tall is one of the tallest sycamores in Pennsylvania. The one taller example in Pennsylvania was found at Ryerson State Park in extreme southwestern Pennsylvania at 150.5 feet (45.87 meters) tall (Halow 2011). Several more tall sycamores have also been documented in northern Ohio. The tallest sycamore in Ohio is 154.5 feet (47.1 meters) tall and is located in Everett Woods in Summit County (Galehouse 2011).

The 131.1 foot (39.96 meter) tall white ash (*Fraximus Americana*) found on Crull's Island is among the taller of the species found in Pennsylvania. Few specimens exceed 130 feet in height. The Pennsylvania height record for white ash at 143.9 feet (43.86 meters) was documented in November 2010 within Ridley Creek State Park in Philadelphia (Fieo 2011).

The 128.9 foot (39.29 meter) tall silver maple (*Acer saccharinum*) on Thompson's Island is the tallest known example of the species in the United States. In fact the four tallest measured trees of the species are all found on these river islands.

The dotted hawthorn (*Crataegus punctata*) from King Island, measured to be 39.3 feet (12.98 meter) tall, have 6.4 foot (1.95 meter) girth and have a 43.5 foot (13.26 meter) crown spread, is the current national champion for the species in overall size. The tallest of the species in the ENTS database is 45.4 feet (13.84 meters) from Buckaloons Recreation Area immediately upstream of Crull's Island. In general this species has not been extensively measured.

The heights of the American Basswood, common hackberry, butternut, and black willow from the Allegheny River islands all compare favorably to the tallest known examples from Pennsylvania and in the United States. The specimens of slippery elm (*Ulmus rubra*) and bitternut hickory (*Carya cordiformis*) are both substantially shorter than specimens found elsewhere. These are both trees that grow well on drier sites and are also common to these periodically flooded island sites.

Measurement Summary									Species
Island Name	Acreage	Tallest	RHI5	RHI10	RHI20	RGI5	RGI10	RGI20	Diversity
Crull's Island	96	133.7	120.1	110.9	92	12.52	10.89	8.05	25
Thompson's Island	67	140	119.3	108.9	88.5	12.54	10.63	8.08	25
R. Thompson's Island	30	131.3							7
Upper Steward's Island	19	85.3							6
Fuelhart Island	25	115							4
Courson Island	62	136.5	115.2	95.78		11.02	9.21		14
Hemlock Island	42	124.7	119	114.8	103	11.26	9.63	7.63	35
King Island	36	136.1	110.3	89.35		11.52	8.56		14
King Peninsula		123.3	96.56						7
Baker Island	67	148.3	108.3	87.98		10.64	8.82		14
Refugee Island 1	45	127.6	87.88			8.74			5
Refugee Island 2	31	142.1	108.4			10.14			5
Holeman Island	59.6	116.8							7
Allegheny River islands	579.6	148.3	130.6	122.6	113	15.06	13.09	11.02	46

Figure 201: Data summary for the islands on the Allegheny River Islands within the study area.

The age of these islands is reflected in the age of the trees found growing on them. Some of the bark and physical characteristics of individual specimens indicate they are old. The old character ancient slippery elm on Thompson Island and Butternut on Baker jump out in that regard. The sycamore and silver maple have reached immense size. Some of the islands in the stretch have been more stable over time than others. These are the islands where older trees have the potential to be found. On some other islands a large portion of the island differs in the modern aerial photo from what is shown on the maps from the 1800s. In certain cases a smaller island can be seen on the old maps that form the core of the modern island. The trees in these old sections of the islands could have the potential for old trees.

In each of these cases the lumbering history and agricultural history of the island must be considered. If the island was timbered in the early 1800s and left untouched since, then there is potential for old trees on that island. If it had been subject to more recent timbering or agricultural production then most of the trees are not likely to be old. There still may be a few old specimens that were left behind by the timbering operation or left at the field edges. Given this background, many of the large trees presently growing on these islands may actually be relatively young in spite of their size.

If we assume a set of islands are similar in age then we can expect certain patterns in the species diversity found on the islands: 1) larger islands would be expected to have more species diversity than smaller islands; 2) islands with greater elevations would be expected to have a higher diversity; 3) islands with longer periods of stability would be expected to have a greater diversity. The second factor that will dramatically affect the diversity noted is the thoroughness with which the islands are examined for different species. The data from islands visited for short scout trips reflect a lower diversity than those examined in more detail. This is an artifact of the sampling and does not reflect true diversity, just that observed by visitors.

Often as the trees are battered by floodwaters and debris the stems are damaged. Multiple stem specimens of these species are very common or even typical in the case of silver

Figure 202: Flood scars on a multitrunk silver maple on King Island. These were formed from either flood debris or ice chunks (photo by Dale Luthringer, 2007).

Figure 203: Multitrunk silver maple mass on King Island (photo by Edward Frank 2007).

maple and sycamore. One large multi-stem silver maple included at least 7 trunks fused together to form a basal mass 24 feet (7.32 meters)in girth.

Williams (2010b) summarized a series of surveys conducted over a period of ten years looking at the composition of woody trees and herbaceous plants within the Allegheny River Island Wilderness. The table shows the number of sites of a particular riparian community type in which the listed species were found.

This listing of common woody species for the islands matches the qualitative observations made as part of this survey. The major difference between the observations by these authors and that on the William table is the presence of green ash (*Fraxinus pennsylvanica March*). This species was not identified in our surveys. The tall trees measured as part of our investigations were clearly white ash. Future trips will examine the ash tree present in more detail to clarify the white ash versus green ash identification issue.

Riparian Community Type		FS	AP	PCU	All Types
	Native Woody Species	Occurrence (% of sites within community)			
American Sycamore	*Platanus occidentalis L.*	36.4	66.7	40	47.7
Silver Maple	*Acer saccharinum L.*	18.1	73.3	30	40.5
Silky Dogwood	*Cornus amomum P. Mill.*	42.9	27.8	50	38.1
Slippery Elm	*Ulmus rubra Muhl.*	45.5	20	40	35.2
Bitternut Hickory	*Carya cordiformis (Wang.)*	-	60	40	33.3
Butternut	*Juglans cinerea L.*	9.1	33.3	10	17.5
Hawthorn sp.	*Crategus L. sp.*	-	26.7	20	15.6
White Ash	*Fraxinus americana L.*	-	13.3	30	14.4
Green Ash	*Fraxinus pennsylvanica Marsh*	18.1	6.7	10	11.6
American Basswood	*Tilia americana L.*	-	13.3	20	11.1
Black Willow	*Salix nigra Marshall*	18.1	13.3	-	10.5
Common Hackberry	*Celtis occidentalis L.*	9.1	-	20	9.7
Staghorn Sumac	*Rhus typhina L.*	-	26.7	-	8.9
Northern Red Oak	*Quercus rubra L.*	-	-	10	3.3
Black Locust	*Robinia pseudoacacia L.*	-	-	10	3.3
Sugar Maple	*Acer saccharum Marshall*	-	6.7	-	2.2
FS = Floodplain Scour Community					
AP = Acer saccharinum-Platanus occidentalis floodplain savanna community					
PCU = Platanus occidentalis-Carya cordiformis-Ulmus rubra floodplain savanna community					
All Types = Percentage in all communities					

Figure 204: Table of species found in the Allegheny River Island Wilderness by riparian community type. Table adapted from Williams (2010b).

Cowell and Dyer (2002, p. 193), in a paper examining the human impacts of the Kinzua Dam on the riparian environment, collected a variety of data using transects across the upper end of Crulls' Island. They also collected age data from trees in various portions of the island. This was used to construct a multivariate ordination plot of the tree data. They write:

> The CCA ordination of the transect quadrats suggests that five vegetation types can be recognized: closed canopy forests occupying the (1) floodplain, (2) low terrace, and (3) upper terrace; (4) a more open canopy edge habitat forest, transitional between the terrace forest and (5) an old field with scattered trees.

Two primary geomorphic surfaces are present on Crull's Island: a floodplain ranging between 0 and 110 m (0 to 360 foot) wide and an interior terrace that rises a maximum of 3 meters (10 feet) above the channel banks. A steep slope divides these two surfaces in most places, although a more gradual transition at the upstream end of the island creates a lower terrace of intermediate elevation. In this analysis the floodplain was essentially the younger deposits shown on the 1939 photo and a long a thin band around the perimeter of the upper portion of the island. The low terrace lies at approximately the same elevation but was populated by older trees. The terrace forest lies in the transition zone between the old field area and the low terrace just to the northeast of the

field edge. The terrace old field is the open area in the photograph dominated by reed canary grass and scattered hawthorns, and the terrace edge are the trees found bordering the old field on the upper terrace. Dyer and Cowell (2008) provided a simplified version of the analysis consisting of two landforms: floodplain and terrace in an article looking at the distribution of invasive species on the island. In this simplified classification the floodplain and low terrace were combined to form the floodplain category, while the other three were combined into the terrace category.

The tree species varied by landscape patch. The low elevation floodplain and low terrace forest were dominated by sycamore, silver maple, white ash, and American elm. The terrace forest, or transition zone, was dominated by basswood, black maple, and hackberry. The terrace edge included sycamore, bitternut hickory, slippery elm, and hawthorn. The terrace old field included slippery elm, hawthorn, and butternut. This is consistent with what we found on the island. The notable difference is that the Cowell and Dyer (2002) report identified the maple species as black maple, while we identified them as sugar maple.

Their dates of establishment for various landscapes also produced some interesting results. The Kinzua Dam was completed in 1965. The earliest establishment date through most of the floodplain patch is 1964. This area is dominated by sycamore and silver maple. After that date the annual floods ceased to rework those areas every year. The oldest trees in the small zone of scrubby vegetation in the generally bare 1939 air photo date to the early 1940's. Within the low-terrace, terrace-forest, and edge-forest patches the oldest canopy forming species became established in the late nineteenth century. The dominant sycamores of the low terrace date principally to the 1890s. On the upper terrace the oldest trees consistently date to the period between 1870 and 1890. This is consistent with historical accounts that report that agriculture in this section ended following the massive 1865 flood. The highest ground occupied by the old field landscape remained in production until around 1930. This area was colonized by hawthorn soon after the fields were abandoned (Cowell and Dyer 2002). These values are consistent with the age estimates suggested by Luthringer (2004c).

G. L. Walters and C. E. Williams (1999, p. 84) looked at the composition of the forest and herbaceous layer on two islands in the Wild and Scenic River corridor on the upper Allegheny River, King Island and Hemlock Island. Both are part of this study.

> The forest canopy at Hemlock and King Islands was sampled from May to September 1994… Twelve species were recorded from the large tree stratum in Hemlock and King Island riparian forest (Table 2). *Acer saccharinum* and *Platanus occidentalis* were leading dominants on both islands with *Fraxinus americana*, *Carya cordiformis*, and *Salix nigra* of secondary importance. Sixteen species were recorded from the small tree stratum of both islands: 15 species occurred on Hemlock Island and 8 species occurred on King Island… Dominant small tree species included *Fraxinus americana*, *Carya cordiformis*, and *Salix nigra*. Similarity in tree species composition (stems ≥2.5 cm dbh) between Hemlock and King Islands was 69.0%.

Williams (2009) further describes the plant communities on the islands:

The floodplain scour community is typically associated with low-lying heads, toes, and flanks of islands where flooding and scour are common disturbances. Tree cover in this community is sparse to absent, resulting in a relatively open, light-rich environment. The silver maple–sycamore floodplain forest and the sycamore–bitternut hickory–slippery elm communities generally occur on more elevated geomorphic surfaces, such as low terraces, that are located above high-energy scour zones. Tree cover is moderate in these two communities, creating medium to light shade.

Comments on Specific Tree Species

American Sycamore (*Platanus occidentalis)*: Sycamore and silver maple are the dominant tree species on the floodplains and low lying areas of all of the islands surveyed with sycamore trees making from 25% to 55% of the species present (Walters and Williams 1999, Cowell and Dyer 2002). American sycamore is widespread in the eastern United States, from Texas to Nebraska, Iowa, and Wisconsin and into southern Ontario, Canada; apparently extirpated in Maine. It also occurs in the mountains of northeastern Mexico. It is a major pioneer species in the floodplains of large rivers and occurs on a variety of wet sites. These sites include shallow swamps, sloughs, and wet river bottoms where soil is saturated 2-4 months during the growing season. Water dispersal often results in seed deposition on muddy flats highly conducive to germination because seed dispersal occurs when water is receding after spring floods (Nesom 2002). American sycamore is among the largest deciduous trees in the Northeastern US. In open settings the trees tend to form a relatively short tree with a fat trunk and broadly spreading branches. In a forest setting they are among the tallest trees that can be found. Historically some enormous sycamore specimens have been reported.

George Washington, as part of surveying trip, while traveling down the Ohio River from Pittsburgh in a large dugout canoe with other travelers looking at potential settlement areas for soldiers, describes a large specimen he encountered near present day Point Pleasant, WV.

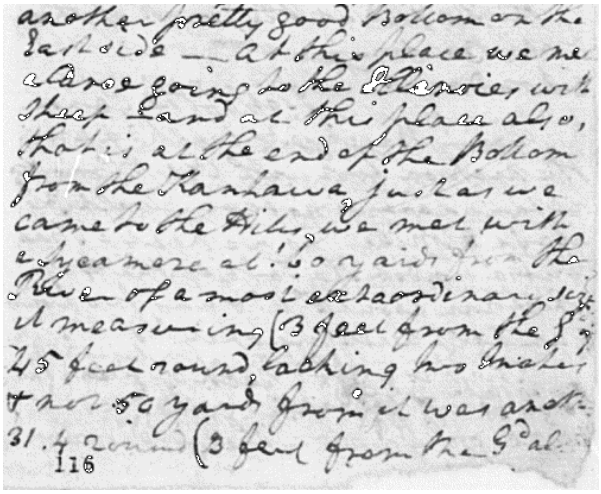


Figure 205: Section from George Washington's journal November 4, 1770 describing a pair of large sycamores encountered along the Ohio River near present day Point Pleasant, WV (Washington 1770).

The large sycamore he describes below was near the junction of the Ohio & Kenhawa Rivers:

> November 4th, 1770
>
> After passing these hills, which may run on the river near a mile, there appears to be another pretty good bottom on the east side, - At this place we met a canoe going to Illinois with sheep, and at this place also, that is, at the end of the bottom from the Kenhawa, just as we came to the hills, we met with a

> sycamore about 60 yards from the river, of a most extraordinary size; it measuring 3ft from the ground, and 45ft round, lacking 2 inches; and not 50 yards from it was another, 31ft around. After passing this bottom, and about a mile of hills, we entered another bottom and encamped. This bottom reaches within about a half mile of the rapid, at the point of the Great Bend.

Robert Ridgway (1882, p. 74-75) an ornithologist and curator of the National Museum, reported on a specimen he encountered in Mt. Carmel, IL near where he grew up:

> The decaying prostrate remains were found in the bottoms of Gibson County, Indiana, a short distance below Mount Carmel, of a huge sycamore, which must have been much larger than any tree that I have measured. The space covered by the crumbled base was 60 feet in circumference. The three upright forks, found lying near together, two of them still united, the other broken off, were each 5 feet in diameter, and careful measurements of them indicated a circumference of about 63 feet, below their ramification, which took place some 20 feet from the ground, and the base of the tree. Each of the three trunks, which were still intact, though much decayed exteriorly, was 70 feet long, but the branches were, of course, entirely decayed. When standing in its full vigor, this tree must have been a grand one, indeed.

These exceptionally large numbers cannot be confirmed but are not unreasonable. In the ENTS database the tallest recorded specimen is found in the Big Creek basin in Great Smoky Mountains National Park at 162.2 feet (49.44 meters) tall and a girth of 9.75 feet (2.97 meters). The 148.3 foot (45.2 meter) tall, 12.2 foot (3.72 meter) girth specimen documented within the study area from Baker Island compares favorably with this Big Creek tree. The specimen with the largest girth was the recently fallen Webster Springs Sycamore at 27.4 feet (8.35 meters) in girth and 142.6 feet (43.46 meters) tall. The fattest specimen in the study area was a 17.4 foot (5.3 meter) girth, 109.2 foot (33.28 meter) tall tree found on Holeman Island. A slightly larger specimen (Frank 2008a) was found at a residence in Warren, Pennsylvania a few miles upstream of the study area. This tree was 20.6 feet (6.28 meters) in girth and 119 feet (36.27 meters) tall. Crown spreads for sycamores can be quite large with many exceeding 120 feet (36.6 meters). The broadest crown spread recorded in the ENTS database is located in Linglestown, Pennsylvania at 165.5 feet (50,44 meters). There were no trees with exceptionally broad crowns as the specimens on these river islands were typically in a forested setting.

Of particular interest were several specimens found on the lower end of Baker Island. These sycamore trees had fallen over and their branches continued to grow upward from the fallen trunk. This would seem to be a temporary state until the attachment of the original trunk and bark to its roots was severed by decay. However in several examples new roots were found to be growing from the bark along the bottom of the trunk below these upright branches connecting the new branch/trunks directly to the soil.

Silver maple: Silver maple and American sycamore are the dominant tree species on the floodplains and low lying areas of all of the islands surveyed with silver maple trees making

from 30% to 40% of the species present (Walters and Williams 1999, Cowell and Dyer 2002).

"Silver maple is a native tree usually with a short, thick trunk and spreading, open, irregular crown of long, curving branches with pendulous branchlets turning up at the ends... Silver maple grows over most of the eastern half of the United States and immediately adjacent Canada, except along major portions of the Gulf and Atlantic coastal plains. Silver maple is found on stream banks, flood plains, and lake edges where it grows best on better-drained, moist alluvial soils... Silver maple can grow on sites where soils are usually saturated most of the growing season. Seedlings have survived 60 days of continuously saturated soils. In the upper Mississippi River valley, silver maple trees survived 1 year of constant inundation (due to reservoir formation) but died after the second. It ranges from moderately shade-tolerant (good sites) to intolerant (poor sites). Silver maple dominance is usually in forest types that are pioneer to intermediate in succession and maintained only with management or disturbance, particularly flooding. It will quickly invade abandoned agricultural clearings and other cutover areas." (Nesom 2000)

Silver maple is not a particularly tall species. The only specimens recorded over 120 feet (36.6 meters)in height in the ENTS database are all located within the focus area. The tallest known silver maple is 128.9 feet (39.29 meters) tall, 10 foot (3.05 meter) girth tree located among the knotweed jungle on Thompson's Island. The largest girth for a silver maple is from a tree located in Granby, CT with a girth of 19.8 feet (6.04 meter) and a height of 92.6 feet (28.29 meters). Within the study area the fattest silver maple was a tree found on King Island at 18.1 foot (5.52 meter) girth, and 104.3 feet (31.8 meters) tall. There is a strong tendency for silver maple to form multitrunk trees where the original trunk has been damaged or broken by flooding and flood debris. The largest multitrunk specimen was found on the downstream end of Thompson's Island. The tree consisted of a merged mass of 7 to 9 trunks to a height of 8 to 9 feet high with a combined circumference of 24 feet (7.32 meters), and a height of 108 feet (32.92 meters). Several other large multitrunk specimens were located elsewhere within the study area.

There has been some question about the future regeneration of sycamore and silver maple on the islands. Dyer and Cowell (2008, p. 95) write:

> Although the cohort of sycamore, silver maple, and other floodplain species that have established after flow regulation will likely maintain its dominance for decades, it is unlikely to be self-replacing in the absence of newly scoured sites. These early successional riparian species are intolerant of shade, and their establishment is tied to open sites created by flood disturbance. Reed canary grass and especially Japanese knotweed, however, are well suited to this modified environment.

Areas of the islands are still being flooded annually and scoured to some extent. Some of these areas will be examined on a future trip to see if there are young sycamore and silver maple seedlings growing and establishing themselves there. It is possible that these species will still be able to reproduce on the islands in the future in spite of the changes in river flood patterns, but will do so across a much more limited area.

American Basswood (*Tilia americana*) was found on most of the islands surveyed. It is typically a

single trunked tree, but forms multiple stems on occasion. One example on Baker Island had a small trunk snaking across the ground before curving upward to form an upright trunk.

Figure 206: A snaking basswood located on Baker Island (photo by Edward Frank, 2007).

A short basswood with a 10 foot (3 meter) plus circumference was also found on Baker Island. When later viewed from the canoe it could be seen that the tree was on the edge of the tornado damaged area and the top had been blown off at a height of about 70 feet (21.34 meters).

Black willow (*Salix nigra* Marsh.) is a member of the Willow Family (Salicaceae), It is typically a small to medium-sized tree 30 to 60 feet high (10 to 20 meter) and about 14 inches (0.34 meter) in diameter with a broad, irregular crown and a superficial root system. Black willow ranges from New Brunswick to Manitoba, south to Florida and Texas. This species is usually found on moist or wet soils along banks of streams, lakes, swamps around farm ponds, and pasture sloughs. Within the islands of the study area it was most commonly found along the river's edge or along wet sloughs that cut through the island.

Figure 207: A black willow found on Baker Island (photo by Edward Frank, 2009).

Black Willow is also found growing on many of the smaller bars and low relief islands typically inundated by spring flooding or during other high water stages. The largest black willow found in the study area so far is from Thompson's Island at 84.5 feet (25.76 meters) tall and 9.9 feet(3.03 meters) in girth. The tallest recorded specimen in the United States is 102.1 feet (31.12 meters) tall in Erie County about 50 miles (80 kilometers) to the northwest of Thompson Island.

Walter and Williams (1999) cited peachleaf willow (*Salix amygdaloides*) as being present on these islands. It is difficult to distinguish this species from black willow. The study area is on the very edge of the known range for the species. Normally it is found farther north and west of this area. There were a couple of different looking willows along the shore of the river noted while canoeing, but these were not examined, and none were noted on the islands themselves. Perhaps a more detailed examination would show that some of the willows encountered were peachleaf willow, but for now the best identification is that of black willow.

Butternut (*Juglans cinerea*) was noted in Walter and Williams (1999) as a component of the flora of King Island and was also present on Hemlock

Island. This investigation found it to be present on every major island in the system; however it was generally a secondary species that only occurred in limited lumbers.

Butternut appeared most prominently in open areas growing among the reed canary grass. The single largest butternut located was found on Courson Island at 86 feet (26.2 meters) tall and 9.2 feet (2.8 meters) in girth. It was growing in an area of hawthorn with a groundcover of reed canary grass near the lower end of the island. Much of the southern end of Baker Island had been hit by a tornado in 1985. At that time most of the trees present in the area were blown down. Now this area is covered by reed canary grassland with patches of trees.

Figure 208: Butternut on King Island (photo by Dale Luthringer, 2007).

Scattered about this grassy area are mounds of young butternut trees, very reminiscent in form to sumac clumps. These appear to be root sprouts from larger trees downed by the tornados. One of the clumps of butternut on Baker Island had a broken trunk approximately 7 feet (2.1 meters) girth at its base, but otherwise seemed to be younger growth. It appeared that these trees were present prior to the tornados and accompanying winds, and were broken off during the storms. They since have re-sprouted from stumps or roots that previously existed. The grass has prevented other species from re-establishing in these areas.

Similarly on several other islands there are large grassy areas that could be the result of past large scale floods, wind disturbance, or previous agriculture and grazing. Butternut trees are growing within these open areas. The islands as a whole can be best described as an open savannah setting dominated by sycamore and silver maple. There were patches of natural grasslands formed by natural processes on the islands prior to any human alteration. These natural grasslands and old fields have for the most part been replaced by reed canary grass.

Most of the older butternut specimens located within the study area had signs of being infected by butternut canker. This infection is caused by the fungus *Sirococcus clavigignenti-juglandacearum* and is accompanied by a secondary infection of another fungus *Melanconis juglandi*. Symptoms of infection include dying branches and the formation of cankers on the branches of the lower crown. Tree tops and branches killed by girdling by the canker do not resprout. Generally diseased trees die within several years. The younger trees are also likely infected, but have yet to exhibit the signs of the canker. Trees in open areas tend to survive longer than those in a closed setting. The open field setting where many of the specimens

on the islands are located may be helping the trees survive longer after the onset of the infection.

Hawthorn (*Crataegus sp.*) is a large genus of shrubs and trees in the rose family, Rosaceae, native to temperate regions of the Northern Hemisphere in Europe, Asia and North America. The number of species in the genus depends on taxonomic interpretation. Some botanists in the past recognized a thousand or more species, many of which are apomictic microspecies. It is estimated that a reasonable number is 200 species (Wikipedia). Hawthorn is a common pioneer species in old field settings and is also associated with abandoned apple groves. The dominant species found on the islands within the study area is the dotted hawthorn (*Crataegus punctata*). A specimen found on King Island with a girth of 6.1 feet (1.86 meters), height of 39.3 feet (11.98 meters), and a spread of 43.5 feet (13.26 meters) totals 122 big tree points using the American Forests system, making it the largest specimen of the species known. On several of the islands a second species of hawthorn is also present and can be distinguished by a differing branch form from that of dotted hawthorn. The specific species has yet to be determined.

There also is some question about whether the hawthorn trees are a) currently invading the reed canary grass fields, or b) whether they were present prior to the establishment of that grassland are not currently encroaching on the grassy areas. Frank (2009d) suggested that the hawthorns were encroaching upon the reed canary grass fields.

> Underneath one of the smaller trees in the midst of the canary grass was a darker patch of grass, smaller in size. The thick mats of downed canary grass were absent. This could be an example of chemical alleopathy on the part of the hawthorns and could explain why they have been able to colonize into the reed canary grass while other species have not.

Dyer and Cowell (2008, p. 95) by contrast write:

> "By and large, the hawthorns that are present today are visible on a 1939 air photo; succession has not proceeded within this pasture with the cessation of grazing, and a distinctive boundary still is evident between the maple–basswood terrace forest and the old field with its scattered hawthorns. The old field is still dominated by reed canary grass, which was likely planted for forage in the late nineteenth or early twentieth century. Not only is this invasive species precluding the establishment of other species, it also seems to be spreading into the adjacent forested area."

The only way to resolve the differences in these interpretations will be to core date a selection of hawthorns within the old field setting and determine when they began to grow.

Black maple (*Acer nigrum*) was listed by Cowell and Dyer (2002) as being present on Crull's Island. Other reports by Dyer and Stoudt (2002) and Dyer and Cowell (2008) also included that species identification. This species made up 32.9 percent of the larger tree species found in their "Terrace Forest" area of the upper island. Black maple is found with sugar maple over a large part of its range. In the cooler, moister eastern section, sugar maple is better adapted to the climate. Initially the maple trees in this area were tentatively identified as sugar maple, but further investigations in September 2011

(Luthringer 2011) determined that both black maple and sugar maple are present on Crull's Island in the terrace forest area. It will require another trip to better sort out which specimens are black maple and which are sugar maple. The two species can be best distinguished by differing bark characteristics and pubescence on the underside of the black maple leaves and the absence of hairs on the underside of sugar maple leaves. As of now, we consider the 111.1 foot (33.86 meters) tree measured on April 02, 2009 to be sugar maple, and the 92.6 foot (28.22 meter) tall black maple measured on September 17, 2011 to be the tallest of that species.

Large specimens of northern red oak *(Quercus rubra)* were found on Crull's Island, on Thompson's Island, and Hemlock Island, but the species was not found on any of the other islands in the study area. At the same time large examples of the species could be seen along the shore of the river. It is not clear whether this species is absent from the other islands because it does not grow well in areas that are periodically flooded. or whether it had once been more widespread at one time on the islands but had been logged, and has not reestablished since. Three of the specimens on Thompson Island were over 12 feet (3.66 meters) in girth and 100 feet (30.5 meters) in height, making them exceptional for the species. In good soils and lighting conditions the species grows exceptionally well. These specimens in spite of their size likely date to less than 150 years and represent second growth trees after logging in the early to mid 1800s.

White pine *(Pinus Strobus)* was found to occur on only three islands: Crull's Island, Fuelhart Island, and Hemlock Island. Crull's Island is part of the Allegheny River Islands Wildernss, while the other two islands are privately owned. Two specimens were discovered growing on the southwestern end of Crull's Island. The taller of two specimens was 94.8 feet (28.9 meters) tall and a girth of 9.1 feet (2.77 meters). Another white pine was located on Fuelhart Island. This tree was measured to be approximately 115 feet (35 meters) tall from a canoe, as we did not land on the private island. White pines were abundant on Hemlock Island. Hemlock Island had the highest surface above the river level and the forest assemblage there most closely resembled that of the forests of the surrounding landscape and hillsides.

Yellow birch (*Betula alleghaniensis* Britton) has been found on three of the islands so far; Crull's, Hemlock, and Baker Islands. The largest, or what had once been the largest, yellow birch was found on the far downstream side of Baker Island. It was a triple stemmed tree that had been broken off at a height of around twenty feet. Each of the three stems were approximately 1 foot (30 cm) in diameter.

American elm *(Ulmus americana)* and slippery elm *(Ulmus rubra)* are present on many of the islands in the study area. One specimen on Thompson's Island shows branch form and bark characteristics of significant age, possibly 150 years or more. The population of elm in the islands was likely much higher prior to the 1970's. Cowell and Dyer (2002, p. 197) report on some downed logs on Crull's Island:

> Several snags and the many downed logs distributed throughout the terrace probably date to this event, although they were too decayed to successfully extract usable increment cores. Wood and bark of these dead trees suggest that many are American elms. Although prevalent in small size classes, this species rarely occurs at diameters greater

than 40 cm [15 inches] on the island. Such evidence is in keeping with the impacts of Dutch elm disease, and it was at about the time of the late 1970s that the fungus affected this region (S. Stout, personal communication via email, December 1999).

White Ash *(Fraxinus americana)* is found on most of the islands in the study area with the tallest specimen at 131.7 feet (40.14 meters) located on Crull's Island. This is the second tallest tree of any species found on in the study area. The species tends to form groves of trees on moderately higher areas of the islands rather than appearing as single isolated specimens. The species is difficult to distinguish from green ash. The range of the two species overlap and their niches overlap as well. Green ash is listed as more of a wetland species, and white ash is more of an upland species, but both can be found together on wetter sties. The trees on the islands were identified by Walters and Williams (1999) Cowell and Dyer (2002), and Dyer and Cowell (2008) as white ash. Williams (2010b) however, identifies green ash as being present in the floodplain scour communities. This identification issue will be revisited on future trips to the islands.

Effects of river flow changes

Islands in rivers are by nature ephemeral. They come and go. Rivers are dynamic. This can be seen in rivers like the Mississippi where remains of paddlewheel boats have been found in open field's miles from the present river course. In rivers like the Allegheny the situation is somewhat different. It isn't just that the river is much smaller in scale, but it is incised into the landscape and not free to wander about a broad floodplain. Thompson Island is known from historical accounts dating from the Revolutionary War period.

The islands do show signs of the dynamic nature of their environment. Along the shores bank erosion can be seen. Sand bars are building in the river channels. In the islands themselves are remnants of water channels that still flow during high water and cut the larger island mass into smaller segments. In drier times these channels contain inlets and isolated oxbow lakes and swamps. Some of the smaller island fragments occasionally rejoin and separate from the larger islands over the course of time as separating channels infill and are opened again. The longer term effects of the Kinzua Dam and the Allegheny Reservoir on the stability of the islands in the wilderness are still not fully known.

An obvious question is how has the Kinzua Dam, completed in 1965, affected the islands farther downstream? In general, islands tend to form in areas downstream of dams when they are constructed. Lower flows result in greater stability of the islands. They are not eroded by high floods, nor do they migrate downstream as fast as they do in areas with natural flow. Two other factors that have changed are: 1)the size of particles being eroded by the flood waters, and 2) the size of particles being carried by the flood waters. Larger gravel and cobble sized rocks in the stream bed may not be eroded as quickly or at all by lower flows. Similarly clay sized particles may not be eroded to the same degree that takes place in larger floods. Sediment being carried from areas above the dam is now being trapped within the reservoir rather than being carried farther downstream. This material is no longer available for deposition on the lee end of the islands. How these changes in the sediment budget will affect the islands in this stretch of the river in the long term is not known. The most

likely scenario is that the islands will tend to grow larger in the area below the dam.

The larger floods also served to keep some of the back channels between the islands and the river bank open. With lower flood flows some of these lower flow, shallower, back channels will likely fill with sediment and some of the islands will become attached to the river bank as part of the flood plain. In the past this has happened at several areas along this stretch of the river. Portions of the King Peninsula were former islands that are now part of the river flood plain. King Island is separated by only a shallow channel from the larger floodplain on the western bank of the river. It easily could become attached by this process. A similar attached island can be seen along the west bank of the river immediately above Courson Island. Holeman Island is at least in the process of becoming an attached floodplain, if it has not done so already, through both natural processes and human alterations. Similarly R. Thompson Island has a good potential to become attached to the eastern bank of the river. In the stretch of the river from Tidioute to West Hickory, Siggias Island is close to becoming attached to the eastern bank of the river as are several unnamed islands nearby.

Kinzua dam was constructed in 1965. Since that time the flow of the Allegheny River has been regulated by the dam. The net annual flow of the water is essentially unchanged, but its distribution over the year has changed. The spring floods have been decreased in magnitude and depth and are spread out over a longer period of time. The flows in the late summer and fall are generally higher than they were in the pre-dam era.

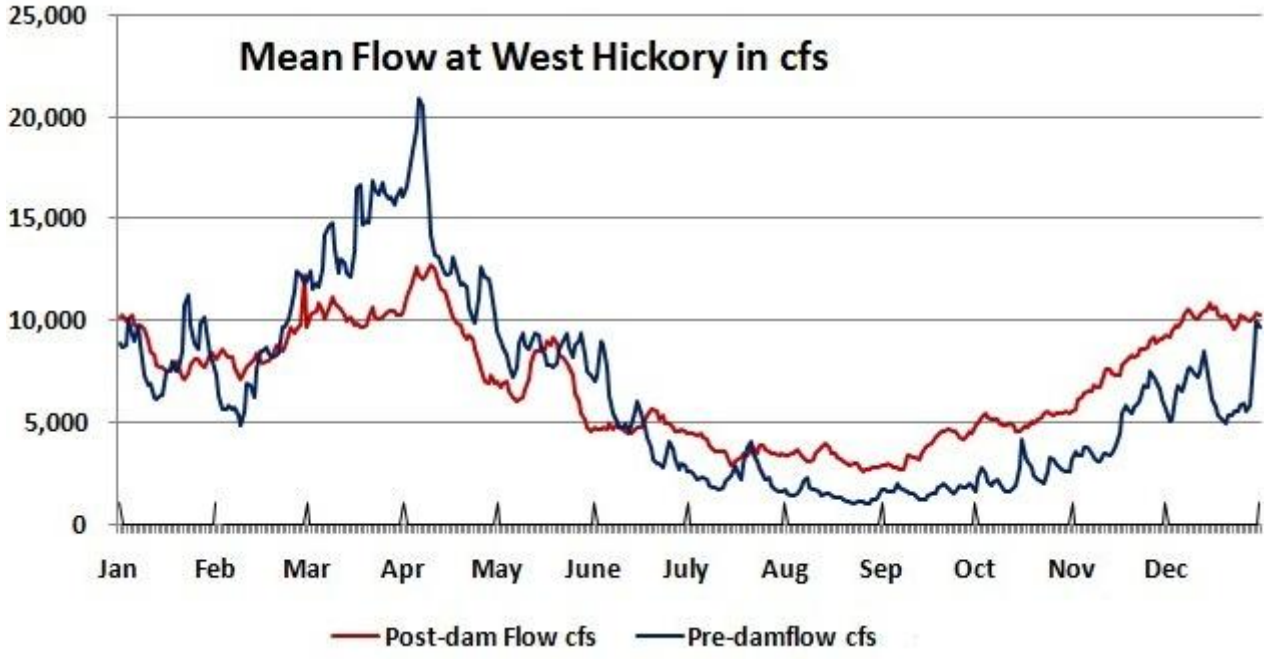


Figure 209: Graph of the mean water flow of the Allegheny River as measured at the West Hickory Gauging Station. The blue line represents the mean daily flow from October 1941 through September 1964, prior to the regulation by Kinzua Dam, while the red line represents the period from October 1965 through September 2010 while under flow regulation by Kinzua Dam. It should be noted the actual annual peak flows are higher the mean flows (data from USGS).

Fredrick Way Jr. (1942, pp. 96-99) colorfully describes the variation in the seasonal flow of the Allegheny River:

> The Allegheny has never been classified as "an excellent waterway of commerce." [It is] "likely to be frozen solid from December until March, with ice piled in great packs and jams at perhaps thirty localities - piled mountain high with great ice blocks thrown into the most jagged contortions by reason of the grinding pressure brought to bear; then comes the annual "spring thaw." ... it is a frightening spectacle to behold...melting snow and drizzling rains which riles all the creeks to flood tide and cause a never-ending roar from each gully and ravine, The river stirs uneasily at first, winces, then flotsam and jetsam, trees, logs, houses, barns...all of this hodgepodge starts moving to the tune of thunderous cannonading of ice jams breaking, and one jam swoops down upon another, and with a continued crashing and rending the mighty discharge is on its way...
>
> All summer long, with a few notible historic exceptions, the Allegheny River is a big, overgrown creek, spilling out its contribution of crystal-clear water to the Ohio River. The long, slender, rolling gravel bars come out for air, and the catfish have to stand on their heads to keep their gills wet."

Cowell and Stoudt (2002) suggest the principal effect of downstream reductions in spring flows as a result of the Kinzua Dam is a decline in the extent of floodplain scouring by floods and ice. Under typical pre-dam conditions the river was frozen during the winter and the coming of spring resulted in a massive ice-packed flood which scoured the river bottom and the islands. During the summer, when the pre-dam upper Allegheny flow was very low and the bed of river became essentially an overgrown creek. The floodplain typically contained numerous deposits of coarse sediment and temporary pools of varied depths. The consistent, higher flows of the post-dam period maintain the channel closer to bank-full levels throughout the growing season .

Portions of the river islands still flood in the spring, but not to the extent they once did prior to the construction of Kinzua Dam and the filling of the Allegheny Reservoir. Large ice jams no longer form in the area below the reservoir. Cowell and Stoudt (2002, p. 187) found:

> "In general, hydrologic responses to large storage dams include decreased magnitude of flood peaks and increased low flow levels; these typically induce alterations of channel morphology, reductions in downstream sediment transport, and increases in vegetative cover on formerly uncolonized floodplain sites…

An overall increase in the number and size of the islands has been found to take place after the construction of large dams. A reasonable supposition would be that some of the near shore islands will become attached to the river banks as floodplains and point bars absent the larger floods which interfere with the attachment process. The attachment process has at least been accelerated by the presence of the dam father upstream.

Invasive Species

The change in river flow as the result of the construction of Kinzua dam has and will continue to affect the geomorphic evolution of the river islands downstream of the dam. The changes in the vegetative communities on the islands have been even more profound than the physical changes exhibited by the islands themselves. Prior to the construction of the dam the islands represented a riparian forest that was recovering from logging operations from the 1800s and subsequent agricultural utilization. In the United States the extent of riparian forest has decreased by more than 80% due to floodplain development (Noss et al. 1995), and further declines in riparian biodiversity may be anticipated from increased modification of fluvial processes. The major impact on the island vegetation communities has been the promulgation of invasive plant species that are replacing the native plant populations. Riparian ecosystems are adapted to and dependent upon the disturbances generated by periodic scouring and flooding of the floodplain and islands within the river.

This investigation found many of the islands to be heavily overrun by invasive plant species. The three most prominent and pervasive invasive species found on the islands were Japanese knotweed, reed canary grass, and multiflora rose. In the fall large areas of many islands were impassible because of the masses of Japanese Knotweed. Large areas of the understory are covered by multiflora rose bushes that extend upward of 15 or more feet into the trees. Open field areas are completely covered by reed canary grass and it appears to be encroaching into the adjacent forest areas.

While this investigation is primarily concerned with the trees and forests found on the islands in the Allegheny River, the effect of the invasive species must be considered. The understory and herbaceous layer plants, including the various invasive species, are important as they relate to the overall plant communities on these islands and how the presence of these invasive species is affecting the regeneration, the growth, and the long term stability of these forested systems. The nature of understory species, including herbaceous plants, graminoids, and various non-native invasives has been sufficiently addressed by other researchers who have investigated the islands and will not be dealt with in detail in this investigation. Most of the papers by different authors describing the conditions on the islands of Allegheny River also discuss the widespread presence of large numbers of invasive plants growing on the islands that has at least partially been caused by changes in flow below the Kinzua Dam.

> Disturbance-favored pioneer plant species typically become more spatially restricted as flood peaks are restricted, while other communities mature and in some cases decline. Hydrologic modifications coupled with these alterations of vegetative communities may then facilitate the invasion of exotic species, as well as affect wildlife habitat." (Cowell and Stoudt 2002, p. 194)

Cowell and Dyer (2002, p. 189) examined the vegetation dynamics for Crull's Island to assess how the ecological processes of a riparian preserve has been affected by the construction of the Kinzua Dam in 1965. They echo this same theme:

> Research on natural riparian sites has emphasized the role of floods as a

disturbance that generates early successional habitat. Here, however, moderation of the hydrologic regime has shifted the impact of floods from disturbance to stressor. Peak flows are no longer sufficient to open sites for colonization, while the duration of flooding has increased. Without flood disturbance, later stages of succession become more widely represented, and species regeneration occurs in the context of competitive-rather than open-sites. The altered disturbance regime thus favors species with life history characteristics atypical of the predam environment, including nonnative species, resulting in altered composition and vegetation dynamics. Managerial expectations that natural successional processes will eventually restore degraded riparian habitats in these modified settings are therefore unlikely to be fulfilled.

Figure 210: Field of reed canary grass on Crull's Island in the early spring (photo by Edward Frank 2009).

Within the islands there are patch sized openings to larger open fields consisting of tens of acres that are completely covered by reed canary grass. These fields are essentially a monoculture with no other species present aside from a few trees that may predate the spread of the reed canary grass. The grass prevents the establishment of other species in these areas and appears to be spreading into adjacent wooded areas beyond.

Reed canary grass (*Phalaris arundinacea*) is a particularly aggressive invasive species:

> Reed canary grass (Phalaris arundinacea) is a tall, perennial grass that commonly forms extensive single-species stands along the margins of lakes and streams and in wet open areas, with a wide distribution in Europe, Asia, northern Africa and North America...In many places, reed canary grass is an invasive species in wetlands, particularly in disturbed areas. When reed canary grass invades a wetland, it suppresses native vegetation and reduces diversity. The grass propagates by seed and rhizome, and once established, is difficult to eradicate. http://en.wikipedia.org/wiki/Reed_canary_grass

Multiflora rose is generally considered to be an invasive species in eastern North America:

> Multiflora rose (*Rosa multiflora*) is a species of rose native to eastern Asia, in China, Japan and Korea. It is a scrambling shrub climbing over other plants to a height of 3–5 m, with stout stems with recurved thorns (sometimes absent)." http://en.wikipedia.org/wiki/Multiflora_rose

> Multiflora rose is extremely prolific and can form impenetrable thickets that

exclude native plant species. This exotic rose readily invades open woodlands, forest edges, successional fields, savannas and prairies that have been subjected to land disturbance…

Figure 211: Multiflora Rose (NPS photo).

Multiflora rose has a wide tolerance for various soil, moisture, and light conditions. It occurs in dense woods, prairies, along stream banks and roadsides and in open fields and pastures… Its tenacious and unstoppable growth habit was eventually recognized as a problem on pastures and unplowed lands, where it disrupted cattle grazing. For these reasons, multiflora rose is classified as a noxious weed in several states, including Iowa, Ohio, West Virginia, and New Jersey. http://www.nps.gov/plants/alien/fact/romu1.htm

Japanese knotweed (*Polygonum cuspidatum*) grows as dense masses of plants that form all but impassible barriers.

Figure 212: Japanese knotweed from Courson Island (photo by Edward Frank 2009).

Japanese knotweed (*Polygonum cuspidatum*) is a large, herbaceous perennial plant, native to eastern Asia in Japan, China and Korea. In the U.S. and Europe, Japanese knotweed is widely considered an invasive species or weed... It is listed by the World Conservation Union as one of the world's 100 worst invasive species... It is a frequent colonizer of temperate riparian ecosystems, roadsides and waste places. It forms thick, dense colonies that completely crowd out any other herbaceous species and is now considered one of the worst invasive exotics in parts of the eastern United States. The success of the species has been partially attributed to its tolerance of a very wide range of soil types, pH and salinity. Its rhizomes can survive temperatures of −35 °C (−31 °F) and can extend 7 meters (23 ft) horizontally and 3 meters (9.8 ft) deep, making removal by excavation extremely difficult. The plant is also resilient to cutting, vigorously re-sprouting from the roots.

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

> Japanese knotweed spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent. Japanese knotweed spreads primarily by vegetative means with the help of its long, stout rhizomes. It is often transported to new sites as a contaminant in fill dirt seeds, sometimes distributed by water, and carried to a lesser extent by the wind. http://www.nps.gov/plants/alien/fact/faja1.htm

Exploration of the southern end of Thompson's Island in the fall of 2007 was impossible because of a massive field of Japanese knotweed that formed a densely packed wall that extended upward of twelve feet in height. Clearly native plants were displaced and likely cannot, grow, reproduce, or reestablish themselves within the area occupied by this invasive mass. Large areas of other islands were similarly found to be impassible because of the infestation by Japanese knotweed.

Whitbeck, Hartman, and Brenner (1997) conducted a botanical survey of two small, low lying islands in the Allegheny River in Venango County from May through September 1995. The islands were both similar in size between 1.5 and 2 ha (3.7 and 5 acres) in area. Minkey Island showed no evidence human disturbance, while Evault's Defeat Island was impacted by campers and other visitors who trampled and disturbed approximately 10% of the islands vegetation. They write (p. 3)

> The plant communities on both islands are distributed according to the severity of flooding along a gradient of elevation. Except for three species, the distribution and abundance of the species was similar between the two islands. The reason for the differences in the distribution of Japanese knotweed (*Fallopia japonica*), stinging nettle (*Urtica dioca*) and the yellow lily (*Lilium canadensis*) may be due to human disturbance and/or the flooding frequency of flooding between the two islands.

Walters and Williams (1999) examined the riparian structure of the forest overstory and the underlying herbaceous layers in King and Hemlock Islands. They found the following within their study plots of the herbaceous layer:

> Fifty-three species occurred on Hemlock Island and 41 species occurred on King Island. Of this total, 2 species were ferns (3.4%), 8 species were graminoids (grasses and sedges; 13.6%), 35 species were forbs (broad-leaved, erect, herbaceous perennial, biennial, and annual plants; 59.3%), 5 species were woody or herbaceous vines (8.5%) and 9 species (15.3%) were upright shrubs or tree seedlings… Ten non-native species (17% of the total flora) were recorded in the herbaceous layer of both islands. *Alliaria etiolata* and *Lysimachia nummularia* were frequently encountered. Two other species, *Polygonum cuspidatum* and *Rosa multiflora*, were infrequently encountered in sample plots because of their patchy distributions but were

> relatively widespread in open habitats of both islands (p. 84).

C. E. Williams has authored a series of reports and articles dealing with invasive plants across many of the islands in the study area. The results of a series of surveys conducted between 2000 and 2007 are summarized in "Alien and Invasive Species in Riparian Plant Communities of the Allegheny River Islands Wilderness, Pennsylvania (C. E. William 2009)." His work provides the most comprehensive overview of the state of the natural vegetation and invasive species found on these river islands. He writes (p. 20):

> A total of 41 alien and invasive plant species was tallied from the 42 sample sites across the seven islands of the ARIW. Alien and invasive species accounted for 17.8% of the total surveyed flora. The floodplain scour community supported the greatest number of alien and invasive plant species (36 species; 18.9% of the community flora), followed by the silver maple–sycamore forest community (23 species; 16.8% of the community flora), and the sycamore–bitternut hickory–slippery elm forest community (14 species; 12.4% of the community flora). Ten alien and invasive plant species (24.4% of the alien and invasive flora) occurred across all three of the community types… Five of the eight most widespread alien and invasive plant species differed significantly in frequency of occurrence across the three river island communities. Reed canary grass (*Phalaris arundinacea*) and climbing bittersweet (*Solanum dulcamara*) occurred most frequently in the floodplain scour community; reed canarygrass was also prevalent in the silver maple–sycamore forest community. Both dame's rocket (*Hesperis matronalis*) and garlic mustard (*Alliaria petiolata*) occurred most frequently in the two floodplain forest communities. Multiflora rose (*Rosa multiflora*) was most prevalent in the sycamore–bitternut hickory–slippery elm forest community. Japanese knotweed (*Polygonum cuspidatum*), touch-me-not bittercress (*Cardamine impatiens*), and creeping Jenny (*Lysimachia nummularia*) were present but were not significantly associated with any specific river island plant community.

Williams (2010, p. 142) writes with regard to the large diversity of both invasive and native species in the flood scour communities:

> The floodplain scour community was also the only community in which alien and native plant species richness was significantly and positively correlated. Two factors in particular may have facilitated the greater accrual of alien plant species by the floodplain scour community: disturbance regimen and light availability. Relative to the two floodplain forest communities of more elevated geomorphic surfaces, the floodplain scour community is more frequently and intensely disturbed by seasonal flooding and scouring. Frequent disturbance can create a wealth of establishment sites for both alien and native plant species perhaps explaining in part the greater richness of both alien and native plant species in the floodplain scour community. Also, the open, light-rich environment associated with the

> floodplain scour community could favor a greater number of alien plant species with a range of light requirements compared to the medium to lightly-shaded environments of the floodplain forest communities.

Dyer and Cowell (2008, p. 98) in "Invasive Species and the Resiliency of a Riparian Environment" examines the spread of the invasive species Japanese knotweed and reed canary grass on Crull's Island. They suggest that the pre-dam stable state of the plant community may have been irrevocably altered by the changes in the river flow regime. They write:

> On Crull's Island, it would appear that the invasive species represent a new functional group—the competitor strategists. Reed canary grass and Japanese knotweed possess adaptive traits that enable them to be superior competitors when compared with native species. Once established, these species are able to aggressively maintain a site and spread into adjacent areas. Thus, internal feedbacks are established which would make returning this system to its preshift condition extremely difficult without major inputs; merely restoring the predam flood regime may be insufficient to return the island to its previous state. Moreover, floods large enough to disturb the floodplain forest on Crull's Island are unlikely to be permitted due to their adverse economic impact.

One of the questions that need to be answered is how the "wilderness" is fairing with the building of the Kinzua Dam in 1965. With the normal flooding cycles being removed from the process is the species composition of the islands changing? Species helped by periodic flooding, such as willow, sycamore, silver maple, are being replaced by invasive species that are less disturbance tolerant but are more aggressive. There is some question about whether the willow, sycamore, and silver maple are actively reproducing on the islands at the present time. If they are doing so, it certainly is within a much more limited area. Certainly the ecosystems of the islands are drastically compromised by the massive invasions of Japanese knotweed, multiflora rose, Japanese barberry, garlic mustard, reed canary grass and tatarian honeysuckle. Natural vegetation is not reproducing in areas dominated by these species. It is clear that within the channels which are occasionally flooded, these invasive species have not managed to obtain as strong a foothold as they have on higher areas. In addition they tend to be less prolific at the upper ends of the islands which are also more prone to occasional flooding.

At this point it is politically unlikely that these islands could be periodically subjected to large floods to remove the exotic species and allow the native species to again flourish. Since the construction of the dam much of the shoreline of the river has been built up with series of camps and some small businesses. Many of these properties would also be flooded in any attempt to flood the islands. It also appears that even if the political situation would allow annual higher stage floods to resume, that the natural ecosystems present on the island may have already been altered to the point that the pre-dam site conditions could not be reestablished.

Future Plans

The overall future goal of the investigation is to continue to explore and document additional islands along the Allegheny River and to collect additional data on the islands already visited. Within the study area outlined in this report, extending from Buckaloons recreation Area in the north to Kibbe's Island Park Campground in the south there are several issues that still need to be addressed.

1) Peachleaf willow was described as being present on several islands, while we have yet to find the species, or distinguish it from black willow.
2) There are at least two distinct species of hawthorn present on Crull's and Thompson's Islands. One has been identified as dotted hawthorn, the other is yet unidentified.
3) Age determinations need to be made to see if the hawthorn trees are currently encroaching into the fields of reed canary grass on many of the islands or if they predate the establishment of the reed canary grass.
4) There is a question about the degree to which sycamore and silver maple are regenerating since the construction of the Kinzua dam in 1965. Observations will be made to see if these species are regenerating or not, and if so in what areas is this regeneration taking place.
5) There are a number of islands within this stretch of the river that have yet to be examined or for which there has only been a short scouting visit. These need to be explored in more detail. Specifically
    a. In the stretch between Thompson's Island to Tidioute are a series of islands that have been only minimally scouted or not investigated at all. These include Clark Island, R. Thompson Island, Stewards Islands, Millstone Island, Fuelhart Island, and McGuire Island.
    b. The stretch between Tidioute and Hemlock Island has not been investigated. Islands in this stretch include Tidioute Island, Irvine's Islands, Siggias Island, McGill Island, and White Oak Islands.
    c. The stretch between Baker Island and Tionesta, No Name Island and the low islands immediately downstream of it have not yet been investigated.
    d. There are several smaller islands in the Refugee Islands group, downstream of Tionesta, that have not been investigated.
6) On any island visited we will continue to look for larger examples of trees than we currently have documented and attempt to locate any additional undocumented species that might be present.

There are many islands up and down the Allegheny River from the present focus area. There are a series of islands in the vicinity of Warren Pennsylvania, including Verbeck Island, which has been proposed by the Friends of the Allegheny Wilderness to be considered as a new wilderness island. There also are many islands farther downstream from the current focus area. The long term goal is to explore and document the trees and forests on as many of these islands as possible.

Appendix I: Characteristics of the Upland Forest Communities

There is a marked difference between the tree and forest communities on the islands and those found onshore. The trees and forests on the islands consist of those that can survive periodic flooding. They also must be species whose seeds can successfully reach the islands through the air across the river waters, or that will survive being transported by the river and still successfully sprout. The numbers of species that meet these criteria are much fewer in number than the number of species that can seed and colonize areas on the river shore and surrounding hills. These descriptions are provided as a baseline for comparison with forests found on the various islands investigated as part of this research project.

Frank (2010) wrote of the scene paddling from King Island downstream to Baker Island:

"On the paddle down to the island the stark contrast could be seen from trees on the river shore and those on the islands themselves. In the forest onshore the trees consisted of a large percentage of hemlocks. White pines were also present and the dominant deciduous tree was red maple. Here and there were scattered bright white flowering juneberry and black cherry in the understory. On the forest floor itself we had found areas just covered with white flowered trilliums and ferns.

All of these species were absent or very uncommon on the islands. A scene of the island shorelines included sycamore, silver maple, and maybe some willow and hawthorn. There were open areas of invasive reed canary grass and the remnant stems of Japanese knotweed. There was a completely different character between the two areas."

Figure 213: The eastern shore of the Allegheny River taken April 20, 2010 (photo by Edward Frank 2009).

The tree species we have typically found on the islands have been described and listed extensively above. In contrast to these island communities are the upland forest communities found in the surrounding countryside. The forests of the Allegheny High Plateau have been described in detail by a number of authors. Currently the best examples of pre-logging natural forest found in the surrounding area are several remnant patches of old-growth forest. One patch mentioned already is found at Anders Run Natural Area, adjacent to the study area. Patches of old growth forest are also found at Tionesta Scenic Area, the Tionesta Research Natural Area, Heart's Content Scenic Area located just east of the study area, and at Cook Forest State Park found ~30 miles (50 kilometers) south and east of the study area.

The pre-European state of the forest is described in the Pennsylvania Natural Heritage Program, Warren County Natural Heritage Inventory (Western Pennsylvania Conservancy 2009, p. 7):

> At the time of European settlement of this area, the forests of Warren County were mostly American beech (*Fagus grandifolia*) and hemlock (*Tsuga canandensis*), with some oak-dominated forests on the drier ridges (Whitney 1990). The forest vegetation of the upland has been profoundly modified over time and therefore bears little resemblance to the pre-settlement forest. After nearly complete deforestation in the late 1800s and early 1900s, forests regenerated into Allegheny hardwood forests, characterized by black cherry (*Prunus serotina*) and red maple (*Acer rubrum*), with smaller amounts of sugar maple (*Acer saccharum*), hemlock, American beech, ash (*Fraxinus spp*.), and birch (*Betula spp*.) (Whitney 1990). This forest type makes up more than half of Warren County's forests, while oak-hickory forest makes up approximately a fifth of the total forest (FIA 2009). Other forest types in Warren County include northern hardwoods (dominated by American beech, sugar maple, and birches), hemlock forest, and mixed hemlock-hardwood forest (Smith et. al. 2009).

Hough and Forbes (1942) identified three major forest associations in the virgin forests of the High Plateaus of Pennsylvania. The first is the white pine-hemlock association of virgin forest. It has a slightly greater variety of species among the dominants and is dominated by pine. Pine may be absent from the understory, suggesting this is not a climax forest. The second is the hemlock-beech association which they describe as dominated by two species which have most of the characteristics of a climax species. "Beech is not only the most ubiquitous species of the High Plateau, but appears most invariably in the underwood of virgin stands." (p. 319) The third association of the virgin forest is the beech-maple association. In some areas the beech-maple association is being invaded by hemlock and may best be described as a local non-climax variant of the hemlock-beech association. The composition of cutover forests differs from that of their virgin prototype chiefly in having much less hemlock and more black cherry, yellow birch, red maple, and sweet birch, the seeds of which are widely disseminated by wind or birds. Second-growth white pine forests also have an increase in the percentage of the heavy seeded oaks and a corresponding decrease in chestnut.

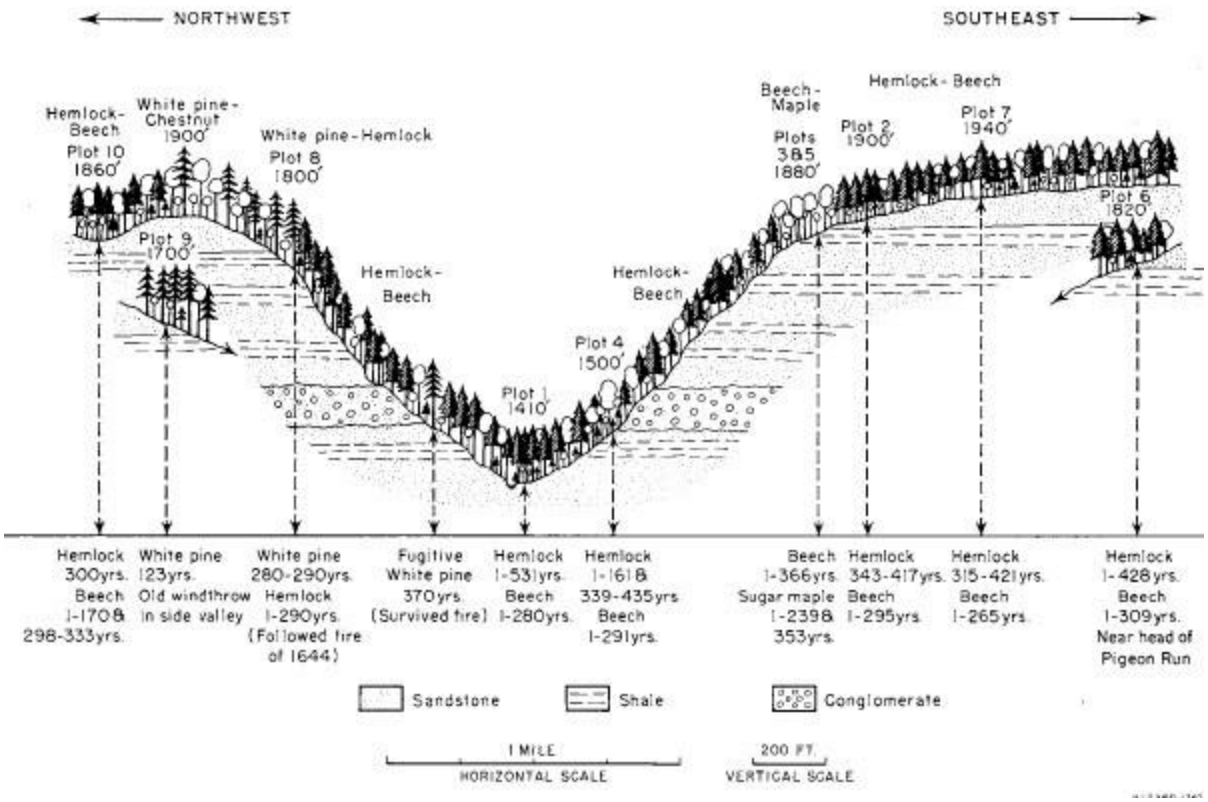


Figure 214: Cross-section of Tionesta Creek Valley from Hough and Forbes (1942) showing some of the typical forest characteristics of the uplands area.

TABLE 1. Species composition of virgin forest stands by percentages of plot basal areas.

Species[1]	Plots Containing White Pine (32 plots)			Plots Without White Pine (77 plots)		
	Average percent	Range[3] Minimum percent	Range[3] Maximum percent	Average percent	Range[3] Minimum percent	Range[3] Maximum percent
Species confined mainly to the white pine type						
Eastern white pine	41.1	1	81	0	0	0
American chestnut	15.7	0	71	0	0	0
Red maple	7.3	0	22	1.3	0	6
Oaks[2]	1.0	0	6	0	0	0
Total	65.1	..	..	1.3	..	..
Species confined mainly to the non-pine type						
American beech	4.4	0	20	39.6	0	100
Sugar maple	0.1	0	1	15.9	0	59
Black cherry	0.5	0	3	3.6	0	25
Yellow birch	0	0	0	3.0	0	16
American hophornbeam	0	0	0	0.2	0	1
American basswood	0	0	0	0.2	0	4
Total	5.0	..	..	62.5	..	..
Species found in both white pine and non-pine types						
Eastern hemlock	27.9	0	74	34.3	0	100
Sweet birch	1.4	0	7	1.1	0	7
Yellow poplar	0.2	0	3	0.2	0	4
Cucumber magnolia	0.2	0	2	0.1	0	3
Total	29.7	..	..	35.7	..	..

[1] Minor species of low average percentage are striped maple and pin cherry, found in both associations; white ash, American hornbeam, and bitternut hickory, found chiefly in the non-pine association.
[2] Includes Eastern red oak (*Quercus borealis maxima*) and white oak (*Q. alba*).
[3] Not actual, but based on three times the standard deviation from the mean.

TABLE 3. Species composition of hemlock-beech and beech-sugar maple virgin forest associations, by average percentages of plot basal areas.

Species[1]	Plots Containing Hemlock[2]			Plots Without Hemlock[3]		
	Average percent	Range[4] Minimum percent	Range[4] Maximum percent	Average percent	Range[4] Minimum percent	Range[4] Maximum percent
Species characteristic of hemlock-beech association						
Eastern hemlock	61.4	6	100	1.7	0	14
Yellow birch	4.2	0	19	1.5	0	10
Sweet birch	1.7	0	9	0.4	0	3
Red maple	1.6	0	8	0.8	0	4
Yellow poplar	0.3	0	6	0	0	0
Cucumber magnolia	0.2	0	4	0	0	0
Total	69.4	..	..	4.4	..	..
Species characteristic of beech-sugar maple association						
Sugar maple	4.8	0	22	29.2	0	71
Black cherry	2.3	0	17	5.3	0	32
Pin cherry	0	0	0	0.3	0	3
Total	7.1	..	..	34.8	..	..
Species found in both associations						
American beech	22.4	0	58	60.3	20	100
White ash	0.3	0	2	0.1	0	1
American basswood	0.3	0	5	0.1	0	3
Total	23.0	..	..	60.5	..	..

[1] Minor species of low average percentage include striped maple, American hornbeam, American hophornbeam, and bitternut hickory.
[2] Based on 53 plots.
[3] Based on 24 plots.
[4] Not actual but based on three times the standard deviation from the mean.

Figure 215 (Table 1): Species composition of virgin forest stands by percentages of plot basal area.
Figure 216 (Table 3): Species composition of hemlock-beech and beech-sugar maple virgin forest associations by average percentage of plot basal areas (from Hough and Forbes 1942).

The Pennsylvania Natural Heritage Program (Western Pennsylvania Conservancy, Warren County, 2009, p. 194) provides descriptions of the forests presently found at Heart's Content Scenic Area:

> Hearts Content Scenic Area, a 300 to 400 year old hemlock-white pine-beech stand of forest in the Hickory Creek Wilderness Area, a congressionally designated wilderness in the Allegheny National Forest. Heart's Content Scenic Area is characterized by older growth eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and American beech (*Fagus grandifolia*). American beech (*Fagus grandifolia)* and eastern hemlock (*Tsuga canadensis*) are the dominant canopy species within this site. Codominant canopy species include sugar maple (*Acer saccharum*), red maple (*A. rubrum*), yellow birch (*Betula alleghaniensis*), black cherry (*Prunus serotina*), suppressed American beech, and striped maple (*Acer pensylvanicum*) make up the understory. Common

> herbaceous species include northern wood-sorrel (*Oxalis acetosella*), Canada mayflower (*Maianthemum canadense*), jack-in-the-pulpit (*Arisaema triphyllum*), hay-scented fern (*Dennstaedtia punctilobula*), and intermediate woodfern (*Dryopteris intermedia*).

The Pennsylvania Natural Heritage Program (Western Pennsylvania Conservancy Warren County, 2009, p. 156) also provides descriptions of the forests presently found at Heart's Content Scenic Area, the Tionesta Scenic Area, and the Tionesta Research Natural Area:

> Tionesta Scenic Area and the Tionesta Research Natural Area within the Allegheny National Forest, which were added to the National Registry of the Natural Landmarks Program in 1973. Combined, these Natural Areas contain a 4,131-acre remnant of old-growth hemlock (white pine) – northern hardwood forest. This is the largest remaining old-growth forest in the mid-Atlantic region. This site sits on the boundary between Warren and McKean Counties. American beech (*Fagus grandifolia*) and eastern hemlock (*Tsuga canadensis*) are the dominant canopy species within this site. Codominant canopy species include red and sugar maple (*Acer rubrum*, *A.saccharum*), yellow birch (*Betula alleghaniensis*), and black cherry (*Prunus serotina*), and suppressed American beech (*Fagus grandifolia*) and striped maple (*A. pensylvanicum*) make up the understory. Common herbaceous species include northern wood-sorrel (*Oxalis acetosella*), Canada mayflower (*Maianthemum canadense*), jack-in-the-pulpit (*Arisaema triphyllum*), hay-scented fern (*Dennstaedtia punctilobula*), and intermediate wood fern (*Dryopteris intermedia*).

While this is characterized as a hemlock (white pine) – northern hardwood forest, white pine is completely absent in most of this area.

This point is bought out by Bjorkbom and Larson (1977, p. 8):

> Surveys were made in 1930 and 1933 of the plant and animal life in a 14,000-acre (5, 666 hectare) tract of climax forest extending from the valley of the East Branch of Tionesta Creek south to and including the present Tionesta Scenic and Research Natural Areas. Some small areas of second-growth forest along the edges of the climax forest were also included. All the climax forests outside the Tionesta Areas have since been cut.
>
> At the time of these surveys, hemlock and beech ranked first and second in frequency in the dominant tree cover-trees at least 70 feet (21.3 meters) tall-on the plateau and slopes. Hemlock was the most common species along Cherry Run and both branches of Fork Run. Other tree species varied according to topographic position . Species such as oak, white pine, and chestnut were of minor importance and, when present, were most likely to be found on the warmer and drier south-facing slopes. Neither white pine nor red oak has ever been reported in the Tionesta Areas.

The Pennsylvania Natural Heritage Program (Western Pennsylvania Conservancy, Forest County, 2007) provides descriptions of three

distinct old growth areas within Cook Forest State Park:

> Forest Cathedral Natural Area, designated as a National Natural Landmark by the Secretary of the Interior in recognition of its ancient white pine and hemlock forests. Hemlock (white pine) forest covers roughly the northern half of the site. The canopy here is dominated by mature eastern hemlock (*Tsuga canadensis*), with individuals of yellow birch (*Betula allegheniensis*), American beech (*Fagus grandifolia*), and white oak (*Quercus alba*) scattered throughout. The southern half of the site is covered by hemlock (white pine) – northern hardwood forest. This differs from the hemlock (white pine) forest in the greater importance of deciduous hardwoods, but canopy species importance is somewhat variable within the area. In much of the area, mature American beech trees are dominant, with eastern hemlock forming an understory layer. In some areas red oak (*Quercus rubra*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*) are also present and may contribute significantly to canopy coverage. Throughout the site, the shrub and herbaceous layers are extremely sparse, and in many areas are completely lacking. Rhododendron (Rhododendron maximum) and witch-hazel (*Hamamelis virginiana*) occur occasionally in the shrub layer, and hay-scented fern (Dennstaedtia punctilobula), sedge (*Carex sp*.), and Indian pipe (*Monotropa uniflora*) occur very occasionally in the herbaceous layer." (p. 36)

"The Henry Run Conservation Area takes in a remnant of old-growth hemlock (white pine) – northern hardwood forest remaining along Henry Run and adjacent uplands. The upland portion of the site has a closed canopy dominated by white pine (*Pinus strobus*) and eastern hemlock, with American beech (*Fagus grandifolia*), yellow birch, oak (*Quercus alba, Q. rubra, Q. montana*), hickory (*Carya sp.*), black gum (*Nyssa sylvatica*), and ash representing the hardwood component of the canopy. The canopy is relatively open within the riparian zone of Henry Run and the abundance and diversity of herbaceous species here is much greater than in the upland forest. There is a general lack of tree regeneration in the openings along the stream, suggesting overbrowsing by deer. (p. 36)

The Swamp Forest Natural Area is the second of two Natural Areas designated within Cook Forest State Park. A perched water table has given rise to an old-growth hemlock palustrine forest that covers much of the Natural Area and extends beyond the park boundary along the southern and northeastern edges of the Natural Area. Eastern hemlock dominates the canopy almost exclusively, with occasional black birch (*Betula lenta*), yellow birch, and black gum (*Nyssa sylvatica*). Rhododendron and mountain laurel (*Kalmia latifolia*) form a moderately dense shrub layer. The forest floor is carpeted with *Sphagnum spp*. Herbaceous species are typical of those commonly occurring in hemlock palustrine forest, and include: cinnamon fern (Osmunda cinnamomea); sensitive fern (*Onoclea sensiblis*); teaberry

(*Gaultheria procumbens*); swamp dewberry (*Rubus hispidus*); jewelweed (Impatiens sp.); tearthumb (*Polygonum arifolium*); and bugleweed (*Lycopus sp.).* The supporting landscape extends to the boundary of the immediate watershed hydrologically linked to the wetland. (pp. 36-37)

The present day upland forest across the region is constantly changing as a result of various diseases and invasive species as well as human activities. Hough and Forbes (1942) report that upwards of 71% of the basal area of tree species in some plots were American chestnut. In some areas the basal area may have been as much 90%. Those dominant chestnut stands are now gone because of the chestnut blight that passed through this region in the 1930s. There still are American chestnuts growing in our forests, but these are typically young saplings that are growing as root sprouts from trees whose trunks died eighty years ago. These rarely grow large enough to produce nuts before succumbing to the blight, and those few that manage to reach maturity usually do not produce viable nuts on their own. A similar fate is befalling the eastern hemlock today. Vast forests of hemlock in the south are all but skeletal forests because of the hemlock wooly adelgid – an invasive insect from Asia. The mortality for the hemlock in areas the insect has reached is close to 100%, with perhaps a few young shoots surviving until the next wave of infestation.

Other threats face many of the tree species present in the upland forests. Dutch elm disease has devastated the American elm populations. The invasive beetle called emerald ash borer is killing ash trees as it moves across the country. American beech is dying from beech bark disease. This is a death as a result of a combination of a boring insect and a fungal infection. The beech as a species is surviving, but it is no longer a dominant "climax" species in much of its range. There is the threat of Sudden Oak Death which may lead to the loss of oak species. The flowering dogwood has been decimated across much of its range in eastern United States from Dogwood Anthracnose. Butternut trees are being attacked and killed by Butternut canker. Across much of its former range it is listed as a threatened species as the canker kills off the tops of the tree and prevents regrowth of lost branches, until the tree dies. There are many more direct threats to mature trees.

At the other end of the spectrum are things which affect or prevent the reproduction of new trees. Many invasive species not only out-compete the native vegetation, but they may also prevent seedlings from sprouting, thus eliminating the next generation of trees. For example, on the Allegheny River Islands reed canary grass and Japanese Knotweed produce monoculture jungles that prevent the growth of new trees. These species are encroaching on existing forests and crowding out the next generation of trees in the understory. Changes in the balance of the predator-prey ratios in our forests has led here in Pennsylvania has led to a drastic overpopulation of white tailed deer which are eating the forest floor bare in many areas, again preventing the establishment of new trees in the understory.

Invasive earthworms are changing the characteristics of the litter and soil layers on the forest floor. This process may prevent the establishment of new trees; the worms may actually eat the seeds, or bury them to depths where they will not successfully sprout, as well as compacting the soil to make it harder for seedlings to grow. This is on top of the

competition from invasive plants. (Hale et al, 2006)

Human activity plays a major role. We are altering the species composition of the forest by our lumbering practices. Urban sprawl, home development, and farming are encroaching into forest areas and also fragmenting the forest itself. Mining and gas drilling is affecting the integrity of the native forests.

The study of our present day forests should be conducted with an acknowledgment and consideration of the changes in composition that have already happened in the past few hundred years. We should consider the threats these forests are currently facing and ongoing changes that are taking place right now. We need to also consider the changes that will happen in the near future.

Figure 217: An artist's rendition of the French Fort Machault and the barracks erected nearby. (Pennsylvania State Archives) http://www.explorepahistory.com/displayimage.php?imgId=1664 http://www.eriemaritimemuseum.org/maritime_museum/History/War_for_Empire.htm

Appendix II: Hoge Island, Franklin, Pennsylvania

On 9/5/08 Dale Luthringer visited Franklin, Pennsylvania and took the opportunity to scout the old Ft.Machault site and Hoge Island. Ft. Machault was one of the original French forts built on the Allegheny River drainage during the French & Indian War (Erie Maritime Museum 2009):

> In the spring of 1753, French forces departed Montreal to establish a chain of forts in the Ohio country. Originally ordered to go to the Chautauqua area, they received new orders changing their destination to Presqu'ile (modern day Erie, Pennsylvania). The French force arrived at Presqu'ile on May 3, 1753. They began work preparing the site for the fort on a bluff overlooking the peninsula and Lake Erie, near Mill Creek. The French proceeded to build another fort at La Riviere au le Boeufs (present day Waterford, Pennsylvania). From this spot the French could transport their supplies by la riviere au Boeufs (also known as French Creek) to Fort Machault (Venango) and the Ohio River where they would build Fort Duquesne (present day Pittsburgh)."
>
> "1754 -The French reinforce their forces in the Ohio via lakes Ontario and Erie and build Fort Machault (present day Franklin, Pennsylvania) and Fort Duquesne (Pittsburgh).
> -Washington Surrenders Fort Necessity.

There is no visible structure of Ft. Machault today. Luthringer (2008c) writes:

> Just up-river from the confluence of French Creek and the Allegheny River is Hoge Island. I wasn't able to get on the island, but was able to observe some of its tree species, mainly silver maple. Small stature silver maple was located on the lower terrace, with larger silver maple
> dominating the upper terrace. From a distance, it looked like the silver maple on the upper terrace would not have significant heights. Other species visible on the island include sycamore and black willow with Japanese knotweed on the

river edge.

The old Ft. Machault site was a nice walk, but invasive species were evident: Japanese knotweed, privet, tree of heaven. It was nice to measure two new species for our Allegheny River drainage tally: boxelder, fire cherry. Tree of heaven played games with me in terms of its ID. I never saw them this big before (medium tree sized). The Simaroubaceae [tree-of-heaven] were quite distinctive. I wanted to call them black walnut something fierce, but there were no nuts, and they certainly didn't have the bark.

Thankfully, I haven't seen these yet at Cook Forest. I didn't measure any, since they were heavily guarded by poison ivy on the ground and crawling up their trunks, but they were decent in size, say ~14" DBH x ~60ft high. Next time I'm in the area I'll try to be a little more persistent and see if I can get a decent height for one of these. Also thought I'd add a fire cherry to our Pennsylvania list at 0.9ft CBH x 24.3ft high.

Here's the day's tally:

Hoge Island - Ft. Michaux			
Species	CBH (ft)	height (ft)	Date
sycamore		98.8	9/5/2008
silver maple	20 2x	91.1	9/5/2008
sycamore		90.9	9/5/2008
silver maple		87.1	9/5/2008
honey locust	10.4	73	9/5/2008
butternut	8.8 at 3 ft	72.1	9/5/2008
fire cherry	0.9	24.3	9/5/2008
box elder	4.7	20.2	9/5/2008
tree of heaven		5	9/5/2008
Rucker Height Index 5		85.18	

Figure 218: Measurement listing for Hoge Island and Ft. Michaux.

Appendix III: ENTS Exploration Chronology

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