

= Quehanna Wild Area =

Quehanna Wild Area is a wildlife area within parts of Cameron , Clearfield , and Elk counties in the U.S. state of Pennsylvania ; with a total area of 48 @, @ 186 acres (75 sq mi ; 195 km2) , it covers parts of Elk and Moshannon State Forests . Founded in the 1950s as a nuclear research center , Quehanna has a conflicting legacy of radioactive and toxic waste contamination , while also being the largest state forest wild area in Pennsylvania , with herds of native elk . The wild area is bisected by Pennsylvania Route 1011 , the Quehanna Highway , and is home to second growth forest with mixed hardwoods and evergreens . Quehanna has two state forest natural areas : the 1 @, @ 215 @-@ acre (492 ha) Wykoff Run Natural Area , and the 917 @-@ acre (371 ha) Marion Brooks Natural Area . The latter has the largest stand of white birch in Pennsylvania and the eastern United States .

The land that became Quehanna Wild Area was home to Native Americans , including the Susquehannock and Iroquois , before it was purchased by the United States in 1784 . Settlers soon moved into the region and , in the 19th and early 20th centuries , the logging industry cut the virgin forests ; clearcutting and forest fires transformed the once verdant land into the " Pennsylvania Desert " . Pennsylvania bought this land for its state forests and in the 1930s the Civilian Conservation Corps worked to improve them . In 1955 the Curtiss @-@ Wright Corporation bought 80 square miles (210 km2) of state forest for a research and manufacturing facility to focus on developing nuclear @-@ powered jet engines . They named their facility Quehanna for the nearby West Branch Susquehanna River , itself named for the Susquehannocks .

Curtiss @-@ Wright left in 1960 , after which a succession of tenants further contaminated the nuclear reactor facility and its hot cells with radioactive isotopes , including strontium @-@ 90 and cobalt @-@ 60 . The manufacture of radiation @-@ treated hardwood flooring continued until 2002 . Pennsylvania reacquired the land in 1963 and 1967 , and in 1965 established Quehanna as a wild area , albeit one with a nuclear facility and industrial complex . The cleanup of the reactor and hot cells took over eight years and cost \$ 30 million ; the facility was demolished and its nuclear license terminated in 2009 . Since 1992 the industrial complex has been home to Quehanna Motivational Boot Camp , a minimum @-@ security prison . Quehanna Wild Area has many sites where radioactive and toxic waste was buried , some of which have been cleaned up while others were dug up by black bear and white @-@ tailed deer .

In 1970 the name was officially changed to Quehanna Wild Area , and later that decade the 75 @-@ mile (121 km) Quehanna Trail System was built through the wild area and surrounding state forests . Primitive camping by hikers is allowed , but the area has no permanent residents . The trails are open to cross @-@ country skiing in the winter , but closed to vehicles . Quehanna is on the Allegheny Plateau and was struck by a tornado in 1985 . Defoliating insects have further damaged the forests . Quehanna Wild Area was named an Important Bird Area by the Pennsylvania Audubon Society , and is home to many species of birds and animals . Eco @-@ tourists come to see the birds and elk , and hunters come for the elk , coyote , and other game .

= = History = =

= = = Native Americans = = =

The Iroquoian @-@ speaking Susquehannocks were the earliest recorded inhabitants of the West Branch Susquehanna River basin , which includes Quehanna Wild Area . They were a matriarchal society that lived in stockaded villages of large long houses . The Susquehannocks ' numbers were greatly reduced by disease and warfare with the Five Nations of the Iroquois , and by 1675 they had died out , moved away , or been assimilated into other tribes . After this , the Iroquois exercised nominal control of the lands of the West Branch Susquehanna River valley . They also lived in long houses , primarily in what is now New York , and had a strong confederacy which gave them power beyond their numbers . To fill the void left by the demise of the Susquehannocks , the Iroquois

encouraged such displaced eastern tribes as the Shawnee and Lenape (or Delaware) to settle in the West Branch watershed .

The Seneca tribe of the Iroquois hunted in much of Pennsylvania and the Quehanna area . The Iroquois and other tribes used the Great Shamokin Path , the major native east - west path connecting the Susquehanna and Allegheny River basins , which passed south of what is now the wild area . The native village of Chinklacamoose (or Chingleclamouche) was on this path at the West Branch Susquehanna River , at what is now Clearfield to the southwest of Quehanna . The Sinnemahoning Path along Sinnemahoning Creek ran north of Quehanna ; as the path with the gentlest grade , it may have been the route the first Paleo @-@ Indians took entering this part of Pennsylvania from the west .

The French and Indian War (1754 - 1763) and the subsequent colonial expansion encouraged the migration of many Native Americans westward to the Ohio River basin . In October 1784 , the United States acquired a large tract of land , including what is now Quehanna Wild Area , from the Iroquois in the Second Treaty of Fort Stanwix ; this acquisition is known as the Last Purchase in Pennsylvania .

Although most of the Native Americans left this area of Pennsylvania , the state 's Native American heritage can be found in many of its place names . The Susquehannocks were also known as the Susquehanna , from which the Susquehanna River and its West Branch obtained their names . In the 1950s the Curtiss @-@ Wright Corporation coined the name " Quehanna " for its nuclear reservation , which it derived from the last three syllables of " Susquehanna " , " in honor of the river that drained the entire region " . Part of Quehanna Wild Area lies in the Moshannon State Forest , named for Moshannon Creek , which means " moose stream " or " elk stream " in the Lenape language . Sinnemahoning Creek 's name means " stony salt lick " in Lenape .

= = = Lumber era = = =

Prior to the arrival of William Penn and his Quaker colonists in 1682 , forests covered up to 90 percent of what is now Pennsylvania : more than 31 @, @ 000 square miles (80 @, @ 000 km²) of eastern white pine , eastern hemlock , and a mix of hardwoods . Scull 's 1770 map of the Province of Pennsylvania showed the colonists ' ignorance of the land north of the West Branch Susquehanna River ; Sinnemahoning Creek was missing and the region that includes Quehanna was labeled " Buffalo Swamp " . This began to change when the land was purchased from the Iroquois in 1784 , and became part of Northumberland County . In 1795 it became part of Lycoming County ; as the new county was divided into more townships , Quehanna became part of Chingleclamouche Township (named for the native village) . Chingleclamouche Township was included in Clearfield County when it was established in 1804 . Later it was divided between at least three counties and many townships , and no longer exists under that name .

The southern part of Quehanna Wild Area is now in parts of Covington , Girard , and Karthaus townships in Clearfield County ; they were incorporated in 1817 , 1832 , and 1841 . The northwest part of Quehanna is in Benezette Township in Elk County , established in 1843 . The northeast part of Quehanna is in Cameron County (incorporated in 1860) in Gibson Township , which was formed in 1804 while part of Clearfield County .

The first European American settlers arrived in Chingleclamouche Township in about 1793 , and the first sawmill in Clearfield County began operating in 1805 . Settlers initially occupied land along the river and creeks , as these provided a means of transportation . Some settlers would harvest timber and float it downstream once a year to make money for items they could not produce themselves , but by 1820 the first full @-@ time lumbering operations began in the region . The white pine was the most sought after tree , yielding spars for ships and timber for buildings . Hardwoods were also harvested , and eventually hemlocks were cut for their wood and their bark , which contained tannins used in tanning leather .

As lumber became an industry in Pennsylvania , the rivers and creeks were declared public highways by the Pennsylvania General Assembly . This permitted their use to float logs to sawmills and markets . Log booms were placed on the West Branch Susquehanna River to catch the floating

timber ; Lock Haven built a boom in 1849 , and Williamsport 's Susquehanna Boom opened in 1851 . Businesses purchased vast tracts of land and built splash dams on the creeks ; these dams controlled water in small streams that would otherwise be unable to carry logs and rafts . For example , in 1871 a single splash dam on the Bennett Branch of Sinnemahoning Creek could release enough water to produce a wave 2 feet (0 @. @ 6 m) high on the main stem for two hours . Mosquito Creek , which drains much of the southern part of Quehanna Wild Area , had at least nine splash dams in its watershed . This was the predominant lumber transport system in the Quehanna region from 1865 to 1885 and after 1850 , five different kinds of lumber rafts could be found on its streams and river .

Much of the timber was too remote to be transported via the streams , and logging railroads were the next development in the Quehanna lumber era . In or around 1880 , these railroads allowed the clearcutting of the remaining forests . The Quehanna plateau was unusual in using standard gauge track for its logging railroads : most such railways were narrow gauge . The logging railroads used special geared steam locomotives , such as the Shay , Climax and Heisler . Nine companies operated logging railroads in what became Moshannon State Forest ; the Goodyear Lumber Company was the largest and cut much of what became Quehanna Wild Area between 1902 and 1912 . The Central Pennsylvania Lumber Company logged land in the northern part of the wild area between 1907 and 1911 .

There were only two major roads on the Quehanna plateau in the 19th and early 20th centuries , both originally turnpikes . The Caledonia Pike ran east ? west from Bellefonte to Smethport , and passed south of what became the wild area , while the Driftwood Pike ran from near Karthaus north to Driftwood on the Sinnemahoning , and passed through the wild area . Wagon trains and railroads brought supplies to the lumber camps in the woods ; some wood hicks set up small farms on cleared land that also provided food . There were at least eight farms in Quehanna , though they were not very productive because of " poorly drained acid soil and a short growing season " .

The lumber era in Quehanna did not last ; the old @-@ growth and second @-@ growth forests were clearcut by the early 20th century . Fire had always been a hazard ; the sparks from logging steam engines started many wildfires , and more wood may have been lost to fires than to logging in some areas . On the clearcut land nothing remained except the discarded , dried @-@ out tree tops , which were very flammable ; much of the land burned and was left barren . The soil was depleted of nutrients , fires baked the ground hard , and jungles of blueberries , blackberries , and mountain laurel covered the clearcut land , which became known as the " Pennsylvania Desert " .

= = = State forests = = =

As the timber was exhausted and the land burned , many companies simply abandoned their holdings . Conservationists such as Joseph Rothrock became concerned that the forests would not regrow without proper management . They called for a change in the philosophy of forest management and for the state to purchase land from the lumber companies . In 1895 , Rothrock was appointed the first forestry commissioner in what became the Pennsylvania Department of Forests and Waters , the forerunner of today 's Department of Conservation and Natural Resources (DCNR) . In 1897 , the Pennsylvania General Assembly passed legislation that authorized the purchase of " unseated lands for forest reservations " and the first of the Pennsylvania state forest lands were acquired the following year .

The state first bought land that became the Moshannon State Forest in 1898 ; the second purchase , and first in the Quehanna region , was 3 @, @ 263 acres (1 @, @ 320 ha) in the Three Runs area , acquired for \$ 1 an acre (\$ 2 @. @ 47 a hectare) in 1900 . Three smaller state forests (Karthaus , Sinnemahoning , and Moshannon) were merged to form the present Moshannon State Forest ; in 1997 , the forest covered 131 @, @ 622 acres (53 @, @ 266 ha) . The first purchase for the Elk State Forest was made in 1900 and , in 1997 , it encompassed 197 @, @ 729 acres (80 @, @ 018 ha) . Forty @-@ six percent , or 22 @, @ 179 acres (8 @, @ 976 ha) , of the total 48 @, @ 186 acres (19 @, @ 500 ha) of Quehanna Wild Area lies in the Elk State Forest . The remainder lies in the Moshannon State Forest .

The state established a tree nursery in the Moshannon State Forest in 1911 , which became the largest in Pennsylvania before it closed in 1980 . In addition to planting millions of trees , in 1913 the state encouraged use of state forest lands by allowing permanent leases for camp sites ; when the state stopped issuing new permits in 1970 , 4 @, @ 500 campsites had been leased . The Pennsylvania Game Commission began purchasing land for state game preserves in 1920 , and , by 1941 , State Game Lands 34 , which is partly in Quehanna Wild Area , had been established . Despite these conservation efforts , major forest fires swept the Moshannon and Elk state forests in 1912 , 1913 , 1926 , and 1930 , and minor fires occurred in other years .

During the Great Depression , the Civilian Conservation Corps (CCC) established ten camps in Moshannon State Forest , and ten in Elk State Forest . The young men of the CCC planted trees , blazed new trails , built roads and bridges , and fought fires , which continued to be a problem . In 1938 a fast @-@ moving fire in the Elk State Forest , north of Quehanna , killed eight firefighters . The CCC also built structures and established or improved many of the state parks , including Parker Dam and S. B. Elliott State Parks on the western Quehanna plateau . The United States ' entry into the Second World War ended the CCC , and all its camps were closed by the summer of 1942 . The Quehanna Trail System passes near or through the sites of several former CCC camps .

Other Depression @-@ era public works projects shaped the area . The Works Progress Administration (WPA) had at least two camps for World War I veterans in the Quehanna area , and built the Karthaus emergency landing field for airmail planes , similar to those that became Mid @-@ State Regional Airport and Cherry Springs Airport . The 3 @, @ 700 @-@ by @-@ 1 @, @ 800 @-@ foot (1 @, @ 100 by 550 m) airfield was built in 1935 and 1936 along Hoover Road (the old Driftwood Pike) , just north of what is now Wykoff Run Natural Area . During World War II the landing strip was blocked to prevent enemy planes from secretly landing there .

In 1946 the Mosquito Creek Sportsmen 's Association was founded to promote conservation in the region . One of the Association 's initial concerns was the acidification of streams , which they originally attributed to tannic acid from the trees used by the beavers to construct their dams . With the assistance of Pennsylvania 's Department of Forests and Waters , Game Commission , and Fish and Boat Commission , they dynamited 79 dams . Afterward , they discovered the water was acidic upstream of the dams too , and eventually realized that the problem was caused by acid rain , not the beavers . The Association has operated several stations to reduce the acidity of Mosquito Creek and its tributaries , with technical assistance from the Pennsylvania State University (Penn State) .

= = = Atoms for Peace = = =

In a December 8 , 1953 , speech to the United Nations , President Dwight D. Eisenhower announced a new Atoms for Peace policy , and the United States Congress enacted his program into law the following year . Atoms for Peace " made funding accessible to anyone who had the imagination , if not the ability , to harness the atom 's power for peaceful purposes " . Under the new program , the airplane manufacturer Curtiss @-@ Wright Corporation sought a large isolated area in central Pennsylvania " for the development of nuclear @-@ powered jet engines and to conduct research in nucleonics , metallurgy , ultrasonics , electronics , chemicals and plastics " . Curtiss @-@ Wright worked closely with the state and , in June 1955 , George M. Leader , the Governor of Pennsylvania , signed legislation that authorized the construction of a research facility at Quehanna . The Commonwealth of Pennsylvania sold Curtiss @-@ Wright 8 @, @ 597 acres (3 @, @ 479 ha) for \$ 181 @, @ 250 (\$ 22 @. @ 50 an acre , \$ 55 @. @ 60 a hectare) , and gave the company a 99 @-@ year lease on the remaining 42 @, @ 596 acres (17 @, @ 238 ha) at \$ 30 @, @ 000 a year . Curtiss @-@ Wright controlled 51 @, @ 193 acres (80 @. @ 0 sq mi ; 207 @. @ 2 km²) in a regular 16 @-@ sided polygon , which was easier to fence than a circular area .

The state constructed \$ 1 @. @ 6 million of roads to the area ; the Quehanna Highway was built on parts of an old CCC road , which followed an earlier logging railroad grade . Pennsylvania also canceled 212 camp site leases to help ensure security for the installation . Curtiss @-@ Wright built three facilities on its land . The first was a nuclear research center with a nuclear reactor and six shielded radiation containment chambers for handling radioactive isotopes , referred to as hot cells ,

at the end of Reactor Road . The second was for jet engine trials and had two test cells with bunkers just north of Quehanna Highway , about 0 @. @ 5 miles (0 @. @ 8 km) apart . The northern test cell was at the center of the 16 @-@ sided polygon ; even if a jet engine broke its moorings , it could not leave the polygonal area . Both of these were on the land which Curtiss @-@ Wright had purchased , which was a regular octagon surrounded with a 24 @-@ mile (39 km) fence built by forest rangers , supervised from three guard houses on Quehanna Highway and Wykoff Run Road . The third installation was an industrial complex at the southeast edge of the polygon , in Karthaus Township , on the Quehanna Highway . At this site , a Curtiss @-@ Wright division manufactured Curon foam for furniture and household products and used beryllium oxide to make high @-@ temperature ceramics for application in the nuclear industry .

In 1956 Curtiss @-@ Wright began isotope work at the facility , and The New York Times published two stories on the new nuclear research laboratory that year , followed by a November 1957 report that the one @-@ megawatt nuclear reactor was completed . In 1958 , the corporation received a twenty @-@ year license from the United States Atomic Energy Commission (AEC) to operate a four @-@ megawatt pool @-@ type nuclear research reactor , and received permission from the Pennsylvania Sanitary Water Board to dispose of some radioactive waste in Meeker Run , a tributary of Mosquito Creek . The project was billed as " the greatest thing that ever happened in North Central Pennsylvania " , and was expected to employ between 7 @,@ 000 and 8 @,@ 000 people . Curtiss @-@ Wright spent \$ 30 million on the project , and developed a community for its scientific and technical staff at the village of Pine Glen , southeast of Karthaus in Centre County .

By 1960 the Air Force had decided not to pursue nuclear @-@ powered aircraft , and the federal government canceled \$ 70 million in " high @-@ altitude testing contracts " with Curtiss @-@ Wright . By June 1960 , the reactor was on standby and only 750 employees remained , 400 of which were in the Curon foam division ; many engineers and scientists had already left . On August 20 , 1960 , Curtiss @-@ Wright announced that it was donating the reactor facility to Penn State and selling its Curon foam division ; the remaining 235 employees lost their jobs . Penn State , located about an hour south of Quehanna , had its own nuclear reactor , but intended to use the Quehanna facility for research and training .

The Curtis @-@ Wright reactor was dismantled and its fuel returned to the AEC . Martin Company , which soon became Martin Marietta , leased the hot cells , intending to use them in the manufacture of small radioisotope thermoelectric generators . Curtiss @-@ Wright warned Penn State " that the radiation involved in Martin 's operations would be ' extremely high ' and of a type that posed a particular risk to human health " , but Curtiss @-@ Wright itself had left both solid and liquid radioactive waste in the facility . Some of the Curtiss @-@ Wright waste was contaminated with toxic beryllium oxide . Penn State had acquired the reactor license and with it came legal responsibility for the nuclear waste on the site ; its plan with the AEC called for the release of 90 percent of the liquid radioactive waste into the environment and the burial of most radioactive solids on site . Items coated with beryllium oxide dust " were covered in plastic and buried out in the woods " , where some were subsequently unearthed by black bears and white @-@ tailed deer . Once jet engine testing stopped , the bunkers at the test cells were used " to store hazardous and explosive material " .

In 1962 Martin Marietta began to manufacture Systems for Nuclear Auxiliary Power (SNAP) thermoelectric generators under a contract with the AEC ; their AEC license allowed them to have up to 6 million curies of radioactive strontium @-@ 90 in the form of strontium titanate , which powered the SNAP generators . A SNAP @-@ 7 reactor made at Quehanna was used in the world 's first nuclear @-@ powered lighthouse , the Baltimore Harbor Light , from May 1964 to April 1966 . In early 1963 , Curtiss @-@ Wright still owned or leased all of Quehanna and sublet land along Quehanna Highway to a firm that recovered copper from wire by burning off its insulation , a procedure that contaminated the soil . On July 12 , 1963 , Pennsylvania Governor William Scranton announced the termination of Curtiss @-@ Wright 's lease on 42 @,@ 596 acres (17 @,@ 238 ha) ; the state paid the company for the roads it had built , and Curtiss @-@ Wright donated six of the eight buildings in the industrial complex to the state . In 1965 the state legislature passed an act declaring the former leased area a wilderness area , and Maurice K. Goddard , secretary of the

Department of Forests and Waters , named it the Quehanna Wilderness Area .

Although Martin Marietta completed its AEC contract and its lease expired on December 21 , 1966 , it had to stay at the reactor site " until radiation contamination was brought to acceptable levels " . Martin Marietta partially decontaminated the site and , in April 1967 , undertook a joint radiological survey with Penn State and the AEC . The survey found " licensable [sic] quantities of strontium @-@ 90 stayed behind as structural contamination and residual radioactivity in piping and tanks , estimated at about 0 @. @ 2 curies " . This met the standards for that day , although Penn State did raise questions about the contamination remaining . Strontium is chemically very similar to calcium (both are alkaline earth metals) and can be absorbed by the body , where it is chiefly incorporated into bones . Strontium @-@ 90 decays by beta decay and has a half @-@ life of 29 years ; when it is in the body , its radioactivity can lead to bone cancer and leukemia .

Many in the conservation movement urged the state to buy back the land , especially after the Curtiss @-@ Wright lease was canceled . In April 1967 Penn State vacated the site and gave the reactor complex to the state . Martin Marietta departed in June 1967 , and early in that same year , Pennsylvania bought the remaining land back from Curtiss @-@ Wright for \$ 992 @, @ 500 , about \$ 811 @, @ 000 more than they had sold it for in 1955 . Various usage plans for the area were proposed , including : a vacation resort with a large artificial lake , motels , golf courses , and honeymoon resort ; a Penn State game preserve stocked with exotic animals like bison and boar ; a large youth camp for several hundred children ; and a radioactive waste disposal site . By November 1967 , all of the land was back in the state forests and state game lands .

= = = Protected area and reclamation = = =

= = = = Reactor facility = = = =

In 1967 , Pennsylvania leased the reactor complex to the Nuclear Materials and Equipment Corporation (NUMEC) , which already had a federal license to work with nuclear materials . NUMEC , which soon became a subsidiary of Atlantic @-@ Richfield Corporation (ARCO) , set up a large irradiator in what had been the reactor pool . The irradiator contained over 1 million curies of cobalt @-@ 60 to produce intense gamma rays , which were used to sterilize medical equipment and irradiate food and wood . In the spring of 1967 the state had concluded that radiation contamination at the Quehanna site " could never be completely cleaned up " , and so was glad to find a tenant with nuclear experience .

A group of NUMEC employees discovered that irradiating hardwood treated with plastics produced very durable flooring . In 1978 they formed PermaGrain Products , Inc. as a separate company from ARCO , and purchased the rights to the process as well as " the main irradiator , a smaller shielded irradiator and related equipment " . PermaGrain sold the flooring for use in basketball courts and gymnasiums , and was the longest occupant of the Quehanna facility , operating there from 1978 to December 2002 . PermaGrain also let Neutron Products , Inc . , a Maryland company , do cobalt @-@ 60 work in its hot cells , which required an amendment of their license from the Nuclear Regulatory Commission (NRC , the successor to the AEC) .

In 1993 , strontium @-@ 90 contamination in the reactor facility led the NRC to require PermaGrain to begin decontamination work , and the Pennsylvania DEP commissioned a " site characterization study " . In 1998 , a firm named NES began the cleanup work ; they changed their name to Scientech in 1999 and to EnergySolutions in 2006 . The cleanup was originally estimated to take six months ; by 2006 it had taken 8 years and cost \$ 30 million . According to the Pennsylvania Department of Environmental Protection 's (DEP) Bureau of Radiation Protection : " Inadequate characterization of the site and the presence of ongoing industrial operations resulted in many project delays and increased costs . " The hot cells proved to have more radioactive sources than originally thought . In October 1998 a Scientech worker doing decontamination cut a tube in hot cell number 4 , which accidentally released strontium @-@ 90 into PermaGrain 's work area . As a result , a robot had to be constructed to remove 3 @, @ 000 curies of cobalt @-@ 60 in two of the hot cells

, dismantle cell 4 , and decontaminate the rest remotely .

After the accidental release , another radiological survey was performed and the state government concluded that PermaGrain needed to be relocated . The DCNR made the policy decision that Quehanna Wild Area would be closed to industrial uses . After looking at multiple sites with Clearfield County development authorities , a new site for PermaGrain Products was purchased , and the company submitted its plans for a new building and license to the NRC in October 2001 . In order to approve the move to the new site , the NRC required PermaGrain to provide an inventory of all their cobalt @-@ 60 sources , dispose of a damaged source , and dispose of any other sources not mechanically certified . However in late December 2002 , PermaGrain filed for bankruptcy under Chapter Seven . PermaGrain had employed 135 people in 1988 and 80 in 1995 .

When PermaGrain went bankrupt , about 100 @,@ 000 curies of cobalt @-@ 60 were abandoned at the reactor facility , which was now under the control of Pennsylvania 's government . The DEP assumed responsibility for the NRC license and legacy contamination . The United States Environmental Protection Agency , working with the NRC and state , removed the cobalt @-@ 60 from the site for disposal at the low @-@ level radioactive waste facility in Barnwell , South Carolina , in September 2003 . Sciencetech continued decontamination work and demolished the hot cells ; much of this work was done robotically , with financial aid from the United States Department of Energy .

The cleanup was thought finished , so a final survey was done in December 2004 , and a Final Status Survey Report was filed in February 2005 . However , when the NRC and scientists from the Oak Ridge Institute for Science and Education surveyed the facility in May 2005 , they found many areas of contamination above the legal limits . According to the NRC 's Quehanna Site Status Summary , strontium @-@ 90 had contaminated the " buildings as well as ... surface and subsurface soil " but was not in groundwater . More cleanup work was done in the summer of 2005 , but the site still did not meet NRC regulations . DEP concluded that " some type of migration of radioactive material [was] taking place in the concrete at the facility " , and changed its disposal plan . The new plan called for demolition of the building without completing decontamination , and disposal of the above ground material in a regular landfill . This plan was approved by the NRC in October 2006 , and a December 2006 survey showed " that the above grade structure met the release limits " of the disposal plan . The former reactor structure was demolished and on May 13 , 2009 the NRC released the state from its license for the site . As of 2011 , a small octagonal " restricted area " around the reactor site is still shown on official DCNR maps .

== == Contamination and cleanup == ==

On September 20 , 1967 , two Bureau of Forestry employees attempted to remove a metal ladder from a 20 @,@ 000 @-@ US @-@ gallon (76 @,@ 000 l ; 17 @,@ 000 imp gal) metal storage tank for jet fuel at the northern jet engine test cell . Both were killed in an explosion when the acetylene torch cut through the tank wall and ignited fumes inside it . A tract within the Elk State Forest at the northern edge of the wild area is known as Noble @-@ Chambers Memorial Forest in their memory . Although Fergus reports entering a bunker in his 2002 book , and Young describes a bunker 's slit windows in his 2008 book , as of 2010 the southern bunker is covered with earth , while the northern bunker is still completely intact and enter @-@ able .

In 1986 , former Curtiss @-@ Wright and Martin Marietta employees testified about hazards and waste disposal practices before a hearing of the Pennsylvania House of Representatives . A former employee told how a night watchman walked through a spill in the reactor complex without knowing it ; the man 's car and the carpets in his house had to be destroyed as a result of the contamination . Others told about burying hundreds of drums of unknown waste from the reactor facility and digging a trench 125 by 25 feet (38 @.@ 1 by 7 @.@ 6 m) and 12 feet (3 @.@ 7 m) deep for waste drums north of Wykoff Run Road . The locations of some sites , which included radioactive waste , beryllium oxide , and other toxic compounds , were not recorded . A forest ranger testified that he had dismantled a CCC @-@ built drinking water fountain fed by a spring because it was downhill from the reactor and he feared people might drink contaminated water from it .

In 1964 , drilling revealed that the Quehanna Wild Area 's geology and hydrology made it unsuitable for burying waste . However , according to Seeley 's Great Buffalo Swamp , a history of the Quehanna region , there are 180 contamination sites in the wild area . Waste has been found at the former air field , within the Wykoff Run Natural Area , near the industrial complex , at the former Lincoln Farm , and at the copper wire @-@ burning site on the highway . These last three waste sites were cleaned in 1991 at a cost of \$ 187 @,@ 698 . At the wire @-@ burning site 150 short tons (140 t) of contaminated soil were removed from 3 acres (1 @.@ 2 ha) , with clean earth and grass seed placed on top of the area . The waste was also removed from the farm site , but at the industrial complex the waste was covered with 2 @,@ 500 cubic yards (1 @,@ 900 m3) of soil on 4 acres (1 @.@ 6 ha) and fenced off .

= = = = Piper complex and boot camp = = = =

The industrial complex covers about 100 acres (40 ha) on both sides of Quehanna Highway at the southeast edge of the Quehanna Wild Area . Although the industrial complex lies within the historic 16 @-@ sided polygon , it is no longer part of the wild area . After Curtiss @-@ Wright 's lease ended and it donated six of the eight buildings in the complex to the state in 1963 , Pennsylvania formed the Commonwealth Industrial Research Corporation to administer and lease the Quehanna facilities , which it did until 1967 . Over the years a series of tenants have occupied parts of the industrial complex . One company manufactured logging trailers there from 1967 to 1971 , while another processed frozen meat from 1968 to 1970 . In 1968 Piper Aircraft established a plant to make metal and plastic parts for airplanes . The complex was renamed from Quehanna to Piper , a name it retains . Piper employed up to 1 @,@ 000 people , but moved its operations from Pennsylvania to Florida in 1984 .

The Young Adult Conservation Corps was also based at Piper from 1977 to 1982 . This federally funded program employed up to 45 young people for local conservation projects in the state parks and forests and on state game lands . In addition , Sylvania Electric Products used two buildings in the industrial complex as warehouses for light bulbs until 1993 . In 1992 , the Pennsylvania Department of Transportation began a heavy equipment training school at Piper , which is still in operation .

In 1992 the Pennsylvania Department of Corrections opened the Quehanna Motivational Boot Camp at Piper as the state 's " first military @-@ style motivational boot camp " . The minimum security program for non @-@ violent , first @-@ time offenders has accepted both male and female inmates from the start . Originally designed to house 200 , the Department of Corrections expanded the facility in the late 1990s to a capacity of 500 on about 50 acres (20 ha) . The inmates spend six months in a military @-@ style program that offers opportunities for education and builds positive life skills ; they also are offered drug and alcohol therapy . Those who successfully complete the boot camp program , which is considered an alternative to prison , are released on parole . The boot camp began to receive men and women from the " general population of state prison inmates " in 2005 and 2006 , respectively . At the end of June 2009 , the facility had 494 inmates , 61 percent of whom were in the boot camp program , and cost just over \$ 17 million a year to operate .

= = = = Wild area = = = =

In December 1970 the state forest commission officially changed the designation from Quehanna Wilderness Area to Quehanna Wild Area , making it the first state forest wild area in Pennsylvania . Elk and Moshannon state forests jointly administer Quehanna 's 48 @,@ 186 acres (75 @.@ 3 sq mi ; 195 @.@ 0 km2) ; for comparison , this is over three times larger than the 23 @-@ square @-@ mile (60 km2) area of Manhattan , making Quehanna the largest of the 16 wild areas in the state . According to the Pennsylvania Bureau of Forestry , " a wild area is an extensive area , which the general public will be permitted to see , use and enjoy for such activities as hiking , hunting , and fishing . No development of a permanent nature will be permitted in order to retain the undeveloped character of the area . These areas will be administered according to the principals of forest

protection ... " .

Consequently , within a wild area , no new permanent camp leases , mines , wells , roads , or rights @-@ of @-@ way for utility lines are allowed , although existing camps , roads , and rights @-@ of @-@ way may remain . Vehicles are allowed only on public roads ; trails are limited to hikers , bicyclists , equestrians , and wheelchairs , and only primitive camping by backpackers is allowed . Quehanna has two paved roads open to vehicles , and is crossed by rights @-@ of @-@ way for three electrical power lines and two natural gas pipelines . It is one of the largest areas in Pennsylvania without permanent inhabitants .

The state forest system also has natural areas , with more restricted usage . According to the Bureau of Forestry , " A natural area is an area of unique scenic , historic , geologic or ecological value that will be maintained in a natural condition by allowing physical and biological processes to operate , usually without direct human intervention . " Quehanna Wild Area contains two state forest natural areas : the 1 @,@ 215 @-@ acre (492 ha) Wykoff Run Natural Area in the center , and the 917 @-@ acre (371 ha) Marion Brooks Natural Area on the northwest edge . Marion Brooks Natural Area , known for its 22 @-@ acre (8 @.@ 9 ha) stand of white birch , was formerly known as Paige Run Natural Area ; in 1975 it was renamed for Marion E. Brooks , a pioneering environmentalist from Elk County . Quehanna Wild Area also has two wildlife viewing areas with blinds for observing elk and other animals : Beaver Run Dam 's pond and wetlands and Hoover Farm 's fields and feeding plots .

The Quehanna plateau is home to the Quehanna Trail System , a 75 @-@ mile (121 km) loop hiking trail , 33 @.@ 6 miles (54 @.@ 1 km) of which are in Quehanna Wild Area . The trail was built in 1976 and 1977 with help from a federally funded jobs program , the Young Adult Conservation Corps , and the Pennsylvania Conservation Corps . As of 2010 it is maintained by the Quehanna Area Trails Club . Parts of the trail have been moved , away from damage caused by the 1985 tornado , to avoid pipelines , to circumvent the Piper Boot Camp , and to pass closer to streams . The wild area also has six shallow ponds for waterfowl and other wildlife , the result of dams built on marshy areas in the 1970s . In 1997 the whole Quehanna Wild Area was declared Pennsylvania Important Bird Area # 31 by the Pennsylvania Audubon Society . In 2003 , the Bureau of Forestry proposed expanding the Quehanna Wild Area by incorporating more of the surrounding Elk and Moshannon State Forests .

Despite efforts to restrict use , some environmentalists criticize Quehanna 's administration . Christopher Klyza , author of *Wilderness Comes Home : Rewilding the Northeast* , notes that the Pennsylvania wild areas are not true wilderness areas . He is especially critical of the continued use of roads through the wild areas and limited logging allowed " for forest health and wildlife habitat improvements " .

= = Geology and climate = =

Quehanna Wild Area lies at an elevation of 1 @,@ 896 feet (578 m) on the Allegheny Plateau . The area falls into portions of two distinct geological physiographic provinces , with all but the northernmost part in the Pittsburgh Low Plateau , known for its coal and mineral deposits , and characterized by steep @-@ cut stream beds . The northernmost part of the wild area , including Marion Brooks Natural Area , is in the Deep Valleys section , home to some of the most remote and wild areas of the state ; streams here have cut deep valleys with steep @-@ sided slopes . In the southern part of Quehanna Wild Area , the Mosquito Creek gorge is up to 500 feet (150 m) deep , while the Red Run gorge in the north is almost 900 feet (270 m) deep .

The Allegheny Plateau formed in the Alleghenian orogeny some 300 million years ago , when the part of Gondwana that became Africa collided with the landmass that became North America , forming Pangaea . In the dissected plateau , years of erosion have cut away the soft rocks , forming the valleys , and leaving the hardest rocks relatively untouched . The land on which Quehanna Wild Area sits was part of the coastline of a shallow sea that covered a great portion of what is now North America in the Pennsylvanian subperiod . The high mountains to the east of the sea gradually eroded , causing a buildup of sediment made up primarily of clay , sand and gravel . Tremendous

pressure on the sediment caused the formation of the rocks that are found today .

At least five major rock formations from the Devonian and Carboniferous periods are present in Quehanna Wild Area . The youngest of these , which forms the highest points on the plateau , is the Pennsylvanian Allegheny Formation , which has clay , coal , limestone , sandstone , and shale . Below this is the Pennsylvanian Pottsville Formation , a gray conglomerate that may contain sandstone , siltstone , and shale , as well as anthracite coal , and which forms much of the Quehanna plateau . The next formations are found in the valleys and gorges which the creeks have eroded over time . The first of these is the Mississippian Pocono Formation , which is buff colored with shale , coal , and conglomerate inclusions ; parts of this formation are also known as the Burgoon Sandstone . Below this is the late Devonian and early Mississippian Huntley Mountain Formation , which is made of relatively soft grayish @-@ red shale and olive @-@ gray sandstone . The lowest and oldest layer is the red shale and siltstone of the Catskill Formation .

The Allegheny Plateau has a continental climate , with occasional severe low temperatures in winter and average daily temperature ranges (the difference between the daily high and low) of 20 ° F (11 ° C) in winter and 26 ° F (14 ° C) in summer . Quehanna Wild Area is part of the Mosquito Creek and Wykoff Run watersheds , where the mean annual precipitation is 40 to 42 inches (1 @, @ 016 to 1 @, @ 067 mm) . Weather records are not available for Quehanna Wild Area , but they are known for the nearby village of Karthaus . The highest recorded temperature at Karthaus was 106 ° F (41 ° C) in 2011 , and the record low was ? 22 ° F (? 30 ° C) in 1994 . On average , January is the coldest month , July is the hottest month , and June is the wettest month .

= = = 1985 tornado = = =

On May 31 , 1985 , an outbreak of 43 tornadoes struck northeastern Ohio , western and central Pennsylvania , New York , and southern Ontario , killing 88 people . The Storm Data Center of the National Weather Service rated the outbreak " the 12th most ' significant ' tornado event of all time " . Pennsylvania was struck by 17 tornadoes that Memorial Day , including the only F5 tornado on the Fujita scale in the state 's history . The tornadoes caused 65 deaths in Pennsylvania and were not dissipated by the state 's mountainous landscape , " forever putting to rest the myth that such terrain can deter them " .

An F4 tornado passed through Quehanna Wild Area ; its path of destruction crossed the Quehanna Highway at the Clearfield ? Cameron county line . It traveled over 69 miles (111 km) of mainly dense forest and wilderness in central Pennsylvania , and damaged or destroyed buildings early in its life , including a CCC @-@ built lodge at Parker Dam State Park . The damage path from this storm was estimated to be at least 2 @. @ 2 miles (3 @. @ 5 km) wide . Its winds ? 200 to 260 miles per hour (320 to 420 km / h) ? ripped up small and medium sized trees and shrubs , tore leaves and limbs from some of the big trees , and snapped others like matchsticks . As it headed west through Moshannon State Forest in Clearfield and Centre counties , Gregory S. Forbes , then a meteorology professor at Penn State , said the debris from the tornado was visible on his WSR @-@ 57 radar scanners . The reactor building was just north of the tornado 's path and suffered \$ 200 @, @ 000 in damage , but no radiation leaks occurred .

The tornado outbreak injured more than 1 @, @ 000 people and caused \$ 450 million in total damages and destruction . Moshannon State Forest lost an estimated \$ 8 million in lumber to the tornado that hit Quehanna ; after the storm , \$ 2 million in timber was salvaged in the state forest . In the ensuing years , the affected forest at Quehanna , though younger and smaller than the surrounding woods , has partly recovered . The official map for the Quehanna Trail is labeled " tornado zone " where the twister passed through the wild area .

= = Ecology = =

= = = Flora = = =

The virgin forests of what became Quehanna Wild Area were different in composition and quality than those of today . Eastern white pine and eastern hemlock were more common , often found on shady slopes and damp areas on plateaus . Chestnut oak and pitch pine favored slopes that were sandy or rocky , and the forest had a mixture of hardwoods , including ash , beech , birch , chestnut , maple , and yellow poplar . Each acre (0 @. @ 4 ha) of these virgin forests could produce up to 100 @, @ 000 board feet (236 m3) of white pine and 200 @, @ 000 board feet (472 m3) of hemlock and hardwoods . For comparison , the same area of forest today produces a total of 5 @, @ 000 board feet (11 @. @ 8 m3) on average . The virgin forests cooled the land and streams . Centuries of accumulated organic matter in the forest soil caused slow percolation of rainfall into the streams , so they flowed more evenly year @- @ round .

The clearcutting and repeated fires changed all of this . New growth was often composed of different plants and trees than had originally been there . Near Beaver Run in Quehanna there are wetlands that were originally hemlock forest . Hemlocks transpire large amounts of water and once they were gone the soil was too wet to support most trees ; the bracken and ferns that replaced the hemlocks altered the soil qualities to discourage trees as well . Within the Quehanna Wild Area 650 acres (260 ha) are wetlands . Fires and erosion removed nutrients from the soil , and in some areas the soil was so poor in nutrients that only white birch , a pioneer species , would grow there . Marion Brooks Natural Area has the largest stand of white birch in Pennsylvania and the eastern United States . These trees are now 80 to 90 years old and reaching the end of their lifespans .

Besides forest fires and tornado damage , there have been other threats to Quehanna 's forests in the 20th century . Many trees were lost when chestnut blight wiped out the American chestnut trees by 1925 ; in the Quehanna area , this species constituted between one @- @ quarter and one @- @ half of the hardwoods . In the 1960s , white and chestnut oak trees had high mortality from pit scale insects and associated fungi . Larvae of oak leaf roller moths , which defoliate oaks , first appeared on 8 @, @ 200 acres (3 @, @ 300 ha) of Quehanna Wild Area in the late 1960s ; at their peak in the late 1960s and early 1970s they had defoliated 234 @, @ 700 acres (95 @, @ 000 ha) of Moshannon State Forest and 110 @, @ 000 acres (45 @, @ 000 ha) in Elk State Forest , with moderate to heavy tree mortality . A similar pest , oak leaf tier , stripped 375 @, @ 000 acres (152 @, @ 000 ha) of oaks in Elk State Forest by 1970 . The gypsy moth defoliated over 156 @, @ 000 acres (63 @, @ 000 ha) of deciduous trees in the 1970s and 1980s . The forests within the Quehanna Important Bird Area are 84 percent hardwoods , 4 percent mixed hardwood and evergreens , less than 1 percent evergreens , 7 percent transitional between forests and fields , and 3 percent perennial herbaceous plants . As well as trees , the forests have blueberry and huckleberry bushes and thickets of mountain laurel and rhododendron .

= = = Fauna = = =

Some animals , previously present in abundance , have disappeared , or the populations declined , through habitat loss . By 1912 , after the forests had been clearcut , Quehanna was covered by " vast expanses of brush , created when the root systems of cut @- @ off trees sprouted up through the discarded tops and limbs of the logged forest " . Once the forest fires were controlled , this brush offered habitat for many game species . By the early 1940s , the CCC had thinned brush in many areas , and the forest had matured . Shade from the canopy decreased brush in the understory . By the early 21st century , many of the trees in Quehanna were 80 to 100 years old , and the maturation of the forests led to the disappearance of species like bobwhite quail , ring @- @ necked pheasant , and snowshoe hare , while white @- @ tailed deer , ruffed grouse , black squirrel , and cottontail rabbit all became less common than they had been . Efforts by the Mosquito Creek Sportsmen 's Association (MCSA) to reintroduce bobwhite quail , ring @- @ necked pheasant , and snowshoe hare have been unsuccessful .

Other animals became locally extinct through overhunting . The last elk in Pennsylvania was killed in Elk County in 1867 . The Pennsylvania Game Commission brought 177 animals from the Rocky Mountains to the state from 1913 to 1926 ; today the elk herd of over 600 animals can often be seen in Quehanna Wild Area . Between 1906 and 1925 , Pennsylvania became so concerned about

declining numbers of white @-@ tailed deer that it imported nearly 1 @,@ 200 animals from Michigan to re @-@ establish the species , and made it the official state animal in 1959 . In the early 21st century , over @-@ grazing by deer threatens plant diversity . By the early 20th century , the fisher , a small mammal similar to the European polecat or American marten , was hunted to extinction in Pennsylvania . Between 1994 and 1998 , 190 animals were released in five sites in the northern part of the state , including 23 animals along Quehanna 's Wykoff Run in 1995 . Breeding populations of fisher appear to have been reestablished .

Still other animals seem to thrive regardless of the maturity of the forest or the presence of the understory . Common animals found in Quehanna include chipmunks , porcupine , and beaver , omnivores such as the black bear and raccoon , and predators like bobcat , red fox , and coyote (which has been in Pennsylvania since the 1930s) . Many of the streams in Quehanna Wild Area are known for trout (brook , brown and rainbow) ; some populations are wild and others are stocked by the Pennsylvania Fish and Boat Commission and Mosquito Creek Sportsmen 's Association . The wild area is also home to timber rattlesnake , eastern garter snake , and spring peeper (a type of frog) , as well as butterflies like great spangled fritillary , monarch , red @-@ spotted purple , and black , eastern tiger , and spicebush swallowtails . Any of these mammals , especially the white @-@ tailed deer , can carry ticks , and such tick @-@ borne diseases as Lyme disease are a health concern for hikers .

As an International Bird Area , Quehanna 's forests are recognized as a " large , unfragmented tract with exceptional diversity of woodland species " and are home to 102 species of birds . Common birds include American crow , black @-@ capped chickadee , blue jay , broad @-@ winged hawk , common raven , hermit thrush , house sparrow , northern waterthrush , starling , whip @-@ poor @-@ will , and wild turkey . Quehanna Wild Area includes a variety of forest , riparian , and wetland habitats that support a diversity of animals . The shrub and scrubland areas left by the 1985 tornado and cleared for elk to feed in are home to indigo bunting and prairie warbler , while ponds and wetlands attract waterfowl such as hooded merganser and wood duck , and wading birds like great blue heron . The birch forest of Marion Brooks Natural Area is home to downy , hairy , and pileated woodpeckers , the oak forest of Wykoff Run Natural Area has black @-@ throated green warbler , red @-@ eyed vireo , and white @-@ breasted nuthatch , and its aspen groves have woodcock . In addition to the commonly seen red @-@ tailed hawk , other raptors include the northern goshawk and the golden and bald eagles .

= = Recreation = =

According to the DCNR , Quehanna Wild Area is for the public " to see , use and enjoy for such activities as hiking , hunting , and fishing " . The main hiking trail on the Quehanna plateau is the Quehanna Trail , a 75 @-@ mile (121 km) loop trail that passes through the wild area and Moshannon and Elk State Forests . The main trailhead for most hikers is at Parker Dam State Park to the west of the wild area . From there the trail , which is blazed in orange , heads east to the southern part of Quehanna Wild Area , skirts Piper and the Boot Camp there , then turns north , crosses Wykoff Run and turns west again . After passing through Marion Brooks Natural Area , the trail leaves the wild area and completes the loop back at Parker Dam . The Quehanna Trail is considered a strenuous hike not just because of its length , but for its 9 @,@ 700 feet (2 @,@ 957 m) of changes in elevation . Two blue @-@ blazed connector trails add 30 miles (48 km) to the system , and there are many side trails and small trails off the Quehanna Highway . Most trails are open to cross @-@ country skiing in the winter . According to the DCNR , the Quehanna Trail " passes through some of the most wild and beautiful country Pennsylvania has to offer " .

Susan Stranahan 's Susquehanna : River of Dreams reports that before Curtiss @-@ Wright took over the area in 1955 , Quehanna was considered " some of the best hunting land in the state " . While no hunting or fishing were initially allowed on the leased land , by July 1959 fishing on Mosquito Creek was allowed again , as was limited hunting to help control the deer . In October 1963 hunting resumed throughout the wild area , four years before the state purchased the land back from Curtiss @-@ Wright . As of 2010 , the Pennsylvania Game Commission allows hunting of

the following species found in Quehanna Wild Area : American crow , beaver , black bear , black squirrel , bobcat , bobwhite quail , cottontail rabbit , coyote , elk , house sparrow , raccoon , red fox , ring @-@ necked pheasant , ruffed grouse , white @-@ tailed deer , wild turkey , and woodcock . The Mosquito Creek Sportsmen 's Association has sponsored an annual coyote hunt each winter hunt since 1992 . The club has also provided food plots for deer and elk , fed game animals in winter , planted and pruned fruit trees , stocked fish , and treated streams for acid rain . Fishing is primarily for trout .

The Quehanna Wild Area is also seen , used , and enjoyed by bird watchers attracted by its status as an Important Bird Area . Audubon Pennsylvania and the DCNR have prepared the Susquehanna River Birding and Wildlife Trail guide which lists three sites in Quehanna : Wykoff Run , Beaver Run Wildlife Viewing Area , and the whole wild area . The DCNR has published a guide to Elk Scenic Drive which lists 23 attractions , four in Quehanna : Marion Brooks and Wykoff Run Natural Areas , and Beaver Run and Hoover Farm Wildlife Viewing Areas .