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On the Cover: Found throughout eastern North America, a Luna Moth, *Actias luna*, is unmistakable due to its large size and lime-green wings with four eyespots. Here in Massachusetts, this species normally produces only one generation per year (usually emerging in June) and the adults, which have no mouth parts for feeding, typically breed and die in less than a week. This specimen was photographed under the glow of mixed moth attraction lights and a Nikon flash, with a Nikon D300 camera and a 105 macro lens at f:18.

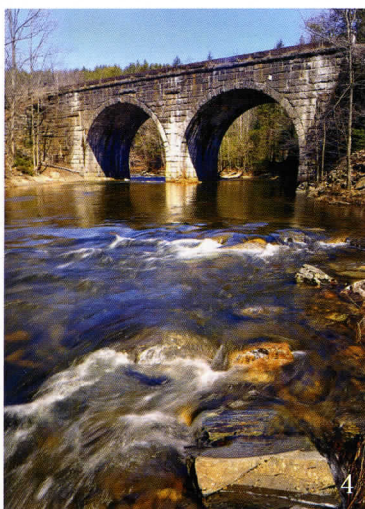
Photo © Bill Byrne

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Photo © Bill Byrne

KEYSTONES

FOR WILDLIFE AND POSTERITY

by Andrew Madden

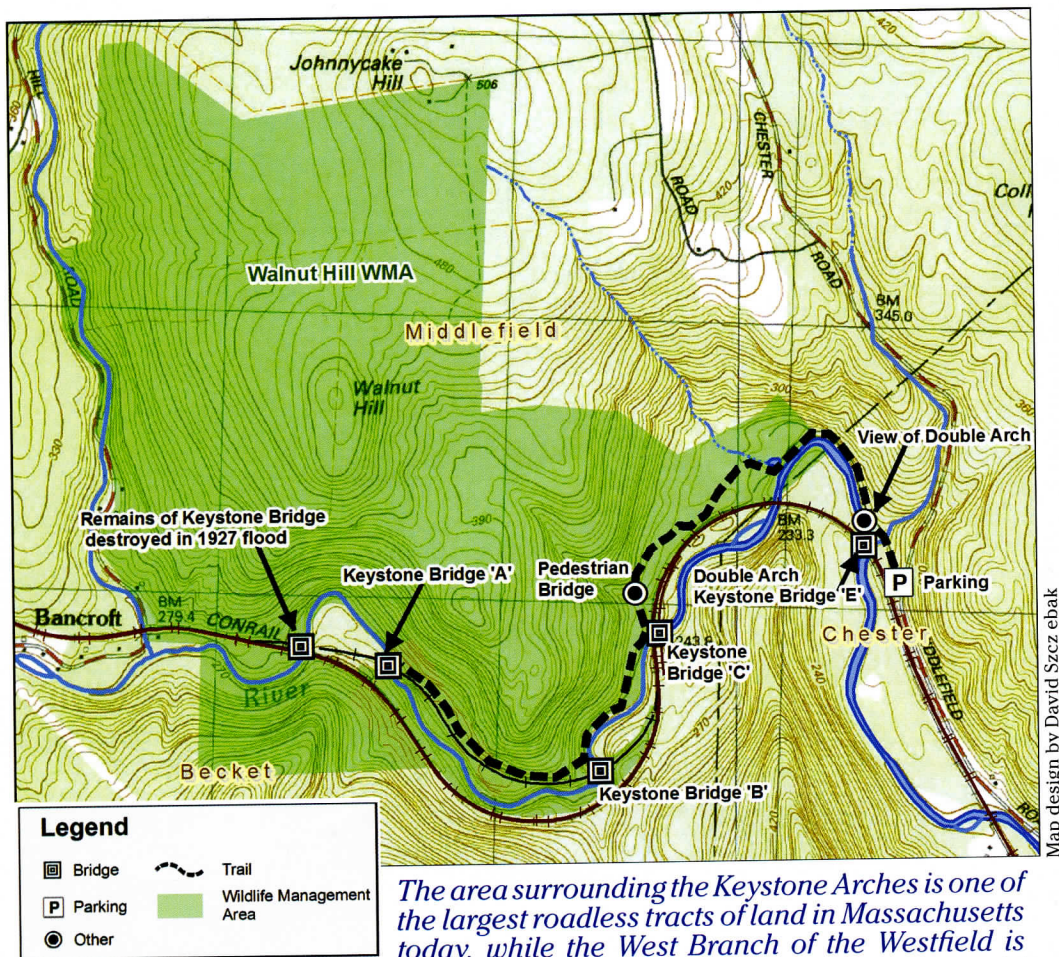
The Walnut Hill Wildlife Management Area was purchased to conserve exceptional examples of riverine and forested wildlife habitat in Massachusetts, but it also encompasses magnificent keystone arches, some of the most remarkable and enduring stone railroad bridges ever constructed...

The wooded hills of Western Massachusetts are rich with history. For those of us who take advantage of the tremendous open-space opportunities that surround us, finding evidence of historical land use often enhances the outdoor experience. Generally, I find people much less interesting than wildlife, a perception that is not unique among natural-resource scientists and managers, and which may help explain my chosen profession. Still, there is something gratifying about wandering the woods and happening upon an old stone foundation or a line of large maples marking a long abandoned road. If nothing else, such encounters provide perspective on the passage of time and the ever changing character of our landscape. The convergence of nature and history is common in Massachusetts. In the wilder, less populated parts of the state, the effect is amplified.

Such is the case with the Keystone Arches, a series of nationally significant,

historic railroad bridges juxtaposed against one of the most beautiful waterways in the Commonwealth. Rising 70 feet above the West Branch of the Westfield River, the Keystone Arches date to the 1840s and remain a testament to the ingenuity, skill, and bold vision of the pioneering railroad designers and builders. At the time of their completion, they must have stood proudly in defiance of nature, a statement of the drive of commerce conquering the physical challenges of the Berkshire Hills. Much like the stone walls and long-abandoned cellar holes scattered throughout the New England woods, time has softened the intrusive aspect of the Arches to the point where they now seem to blend with the steep valley walls as an intrinsic part of the region's beauty. The two most impressive bridges are located on the Walnut Hill Wildlife Management Area (WMA), one of the components of MassWildlife's effort to conserve wildlife resources and habitats.





The area surrounding the Keystone Arches is one of the largest roadless tracts of land in Massachusetts today, while the West Branch of the Westfield is among the longest free-flowing stretches of river in the entire Commonwealth. Combined with the presence of the magnificent arches, these factors make a hike, hunt, or fishing excursion in the area a truly remarkable and unique experience.

Land protection is a critical tool for ensuring the perpetual maintenance of biodiversity, a central mission of our agency. Conserving habitats and the wildlife populations that they sustain is our primary consideration when evaluating a potential land purchase or project, but our mission also includes the principle that all lands we manage will be open for the public in perpetuity. It is, after all, the public that truly owns them. Hunters, anglers, trappers, hikers, birders, and other non-motorized recreationists can therefore capitalize on our habitat protection efforts and freely access all of our WMAs.

With more than 200,000 acres statewide under MassWildlife's management, those

who enjoy the outdoors are assured of an incredible recreational asset. Many of our properties contain various relics of past land use – dilapidated farm equipment or the shell of an old truck for example – but significant cultural and historical assets usually fall under the purview of other agencies. However, each conservation project is unique and doesn't always conform to the model. The story of the Walnut Hill WMA and the Keystone Arches is one of fast water, steep hills, innovation, and determination. Anyone willing to do a little hiking can experience some truly spectacular examples of architectural and railroad history while enjoying one of Massachusetts' most impressive rivers.



A mile-long freight train heads west along a track that crosses the upper Westfield River over keystone arch bridges that are nearly two centuries old. Much of the area on the right (north side) is encompassed by the Walnut Hill WMA.



Photo © Bill Byrne

This spectacular double-arch bridge (Bridge E on map, page 6) is not located on public land, but is easily viewed near the Walnut Hill WMA parking area.

The Wild Upper Westfield

The Westfield River's watershed drains over 500 square miles, transitioning from the Berkshire's eastern slopes to the Pioneer Valley. Portions of the Westfield were the first in Massachusetts to be awarded National Wild and Scenic designation. The Upper Westfield consists of three branches (West, East, and Middle) that flow through an area commonly referred to as the Hilltowns. The physical geography of the Hilltowns is characterized by rounded hills and deep stream and river valleys. Rain events and high snowpack can produce incredible flows in the Upper Westfield, among the flashiest (i.e., subject to flash flooding) rivers in the Commonwealth, and over millions of years the flowing water has cut a winding course. The sinuosity of the river is what necessitated so many crossings for a short reach of rail: One bridge was not going to get it done.

The West Branch originates in Becket and flows more than 15 miles to its confluence with the other branches in Huntington. Fast flowing and steep, the river carries water of excellent quality and is a critical habitat feature for a diverse array of wildlife. The United States Geological Service has been tracking flows in the West Branch since the 1930s. The numbers illustrate the explosive water fluctuations that shape the physical and biological aspects of the river: Flows ranging from 20 cubic feet per second (cfs) to more than 20,000 cfs have been recorded in a single 24-hour period! While high flows return to normal levels more quickly than in most other river systems, the force of so much water can instantly change the channel dynamics and alter infrastructure. One has to wonder if the designers of the Keystone Arches would have abandoned or altered their plans if they had the benefit of these modern data.

Land use in the Westfield Watershed has undergone many changes in the time between the construction of the Arches and the present day. In many ways the lands are wilder now than they were during the late 19th and early 20th centuries. The emery mines along the railroad line in Chester are long abandoned. Rivers and streams that were used for power, irrigation, and transport of materials are less disturbed. Forests that were cleared for agriculture have returned and substantial portions of the primitive road network are largely overgrown and impassable by vehicle. In fact, the area surrounding the Keystone Arches is one of the largest roadless tracts in Massachusetts.

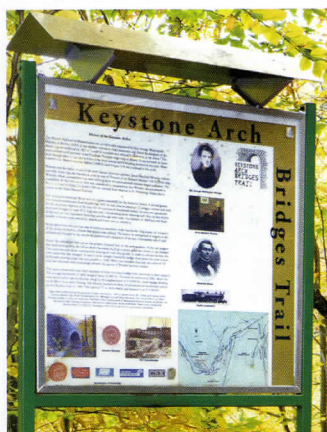
With the return of forestlands, land protection efforts, sound management, and general improvements in water quality, wildlife in the river and surrounding uplands has also changed. Walnut Hill WMA is habitat for wild turkey, deer, moose, black bear, fisher, coyote, and bobcat. Otter and mink hunt along the river bottoms for fish and crayfish. Some animals may spend their entire lives on the property, while most move through

with the seasons and changing food resources.

High-flow events prevent beaver from damming the West Branch, but dispersing individuals follow the river course as they look for a place to set up shop. One spring morning when walking a river bank at Walnut Hill, I came upon a young beaver on its back in the sun with its mouth partially open. When I bent down to flip it over and examine what might have caused the animal's death, it popped up and quickly dove into the river, startling us both. It climbed out on a rock mid-river and shook off the sleep, lucky that I wasn't a predator, the rush of the spring flows having masked my approach.

These wildlife resources are certainly not unique to Walnut Hill. MassWildlife holds fee ownership or conservation easements allowing public access and passive recreation on more than 20,000 acres in the Upper Westfield watershed, each with tremendous and varied natural resources and wildlife populations. What makes Walnut Hill WMA unique is the presence of the Arches.

A footbridge helps hikers negotiate the Keystone Arch Bridge (KAB) Trail (see map, page 6). The trail was constructed and is maintained by the Friends of the Keystone Arches, a group passionately dedicated to the preservation and appreciation of the Arches. Access is located on Middlefield Road (kiosk, left) in Chester.



History

The economic incentive for westward railway expansion must have provided intense motivation to attempt to cross through the Berkshire Hills, which, by 19th century standards, were surely viewed as insurmountable terrain. Crossing the West Branch through the towns of Chester, Becket, and Middlefield was likely the greatest part of this challenge. Despite the logistical and physical obstacles, the Keystone Arches had been completed by 1841, allowing passage along the historically important Western Railroad. Major George Washington Whistler is credited with the design and implementation of the bold plan to extend the rail through the Central Berkshires by spanning the West Branch of the Westfield River in multiple locations.

Much has been written about Whistler. The Friends of the Keystone Arches has compiled an excellent historical summary of the bridges and their designer that is now available on their website, www.keystonearches.com. A compelling historical figure, Whistler amassed an impressive resume, including design and construction work on railroads throughout the Northeast, before settling in Lowell to work in the Merrimack region. Along with his longtime associate, William Gibbs McNeill (whose sister he married), Whistler was a railroad pioneer. Among their accomplishments in Massachusetts is the Canton Viaduct, another historically important arch structure.

Whistler and McNeill were enlisted to design and build the westward expansion of rail to connect Boston with Albany and points west. Crossing the



Connecticut River was a challenge, but it was the steep grades and elevations of the portion through the Berkshires that presented the greatest obstacles. Whistler drew on his engineering education at West Point in his decision to utilize an arch design to cross the Westfield River. He and his team managed to make the cut and construct the arches in just 2½ years, without the use of dynamite. Whistler went on to design and build rail lines in Russia, including the line from St. Petersburg to Moscow, until his death at the age of 49. Although he was one of the most prominent engineers of his time, Whistler was surpassed in fame by his son, American painter James McNeill Whistler, best remembered for a painting of his mother, titled *Arrangement in Grey and Black No. 1* (but better known to most as *Whistler's Mother*).



Photo © Tony Gola

The keystone-arch design dates back to Roman times. According to the Friends of the Keystone Arches, the bridges over the Upper Westfield River represent the largest cluster of such arches in the country, and remain some of the oldest keystone rail arches in the nation. The bridges were drylaid, meaning that no mortar was used in their construction. The weight of the stone and the shape of the arch give the bridges their structural integrity.

The stonework was overseen by Alexander Birnie, a Scottish born stone mason from Stockbridge. Birnie worked steadily on rail lines contracts in the Northeast before settling along the Hudson River. Thousands of recent immigrants, primarily Irish, comprised the bulk of the labor force on the Western Railroad. The original rail line had 10 bridges crossing the Westfield. In 1910, the line was rerouted to accommodate modern locomotives, leaving many of the bridges unused and abandoned. Two bridges were removed by the railroad and three were lost to the floodwaters of 1927. The remaining five bridges that have survived for more than 170 years over the fast-flowing Westfield River are a credit to the engineers, craftsmen, and laborers who built them. The most impressive of the arches are the two abandoned bridges on the Walnut Hill WMA.

The View from Below

Standing atop the bridges provides a wonderful perspective up and down the river. For my money, however, the most interesting view is from below. Looking up at the underside of an arch (see photo, page 4), one can truly appreciate the craftsmanship and skill of the stone masons. It is difficult to comprehend how the construction was accomplished without the use of cranes and modern machinery. To think that the stones were moved and placed by horse, oxen, and manpower is remarkable.

The angle of the bridge construction has influenced river flow. It is difficult to know

In addition to the Arches, the West Branch of the Westfield offers outstanding scenery and trout fishing. The river supports its own reproducing trout populations and is also stocked with thousands of hatchery trout every spring.

A testament to the value of conserving habitat, this Crooked Stem Aster is one of several rare species that can be found on the Walnut Hill WMA. A plant of river and stream banks, look for it there and along the sides of trails with little canopy and lots of sun.

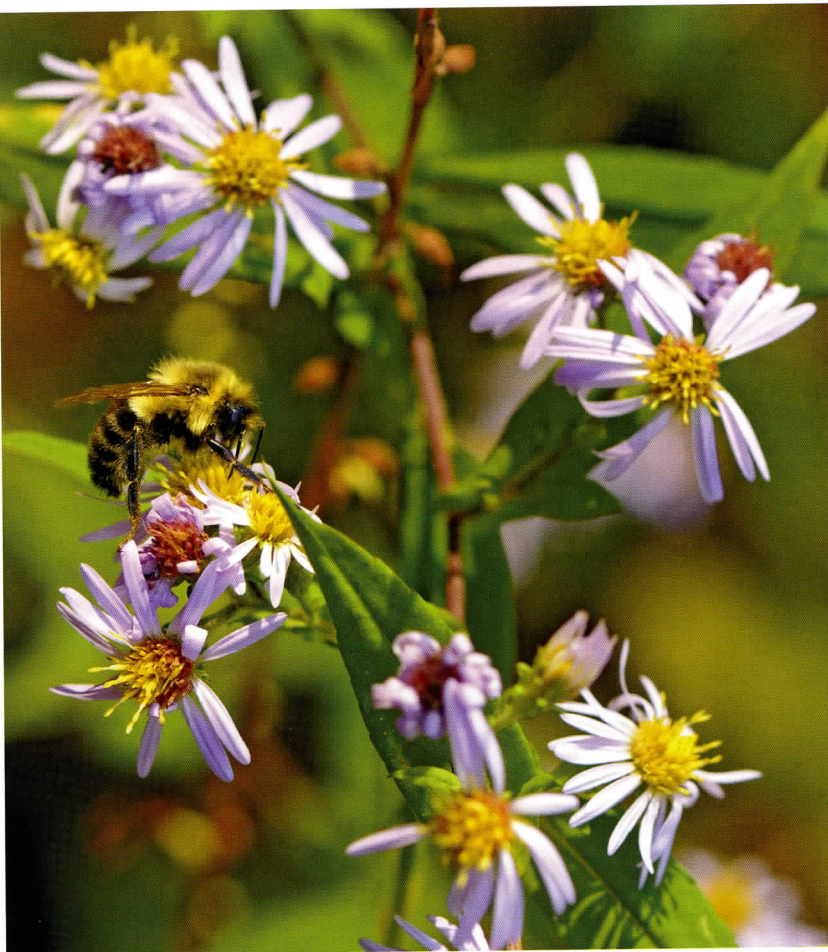


Photo © Bill Byrne

how much this has changed over the years as the channel has shifted locations, but the result is the formation of deep pools beneath each of the bridges. Because the flow is directed at the bridge

abutments, the force at high water is extreme. It may be that the engineers failed to appreciate the river's power when redirecting flow, and that the three collapsed bridges failed as a result. Even so, the remaining bridges have withstood extreme events for 170 years, which says a lot about the quality of the construction and design.

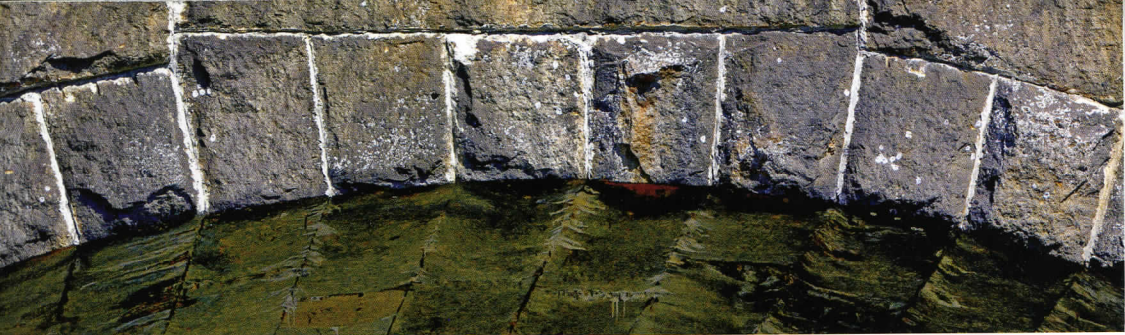
MassWildlife acquired the Walnut Hill Wildlife Management Area in 1987. The primary conservation and recreational focus was the river. Among the longest free-flowing stretches of river in the entire Commonwealth, the West Branch and its tributaries are home to reproducing trout and other coldwater fishes. Each spring we stock the river with thousands of trout, and the deep pools beneath the Arches retain cool water, helping to sustain trout through the dry, warm summer months. The quality of the fish,

combined with the spectacular setting, provides one of the most rewarding coldwater-fishing experiences to be found anywhere in the Commonwealth.

Recognizing the historical and cultural significance of the arches, MassWildlife has allowed the development of the Keystone Arch Bridge (KAB) Trail, including a walking path and informational signage to educate visitors about the bridges. The trail was constructed and is maintained by the Friends of the Keystone Arches, a group passionately dedicated to the preservation and appreciation of the Arches. Access to the trail is from Middlefield Road in Chester.

Other Attractions

In addition to the Arches, hikers should take note of other historical features in the immediate area. The rail cut between the two bridges is particularly notable,



as one can clearly see the drill holes for the black powder blasting charges and recognize the persistence it must have required to penetrate the ledge (on a hot day there is a noticeable difference in temperature at this spot). The property is first and foremost a Wildlife Management Area, however, so visitors should expect a primitive setting, which further enhances the effect when one encounters the first arch.

Recreational boaters take advantage of spring and fall flow events to paddle the Class II and III waters under the bridges. Not for novice paddlers, the section of river from Bancroft through the Arches has a following among fast-water enthusiasts. Publicly held lands such as WMAs present challenges for managers, and Walnut Hill is no exception. Illegal off-road-vehicle (ORV) use is the primary problem facing the area today, but vandalism, illegal camping, and dumping have all been issues. Striking a balance between use and overuse, while also maintaining the rustic character and wildlife habitats, can be difficult.

Strong advocacy from groups such as the Friends and the Westfield River Wild and Scenic Advisory Committee have brought public attention to the

bridges. Currently listed on the Register of Historic Places, efforts are underway to nominate the Arches for designation as a National Historic Landmark. Advocates hope that funding opportunities will arise from this recognition because, despite the incredible construction of the arches, restoration actions will likely be necessary to ensure their continued integrity. Attempts to begin restoration actions have been made over the years, but funding and access complications have, so far, always derailed such efforts.

MassWildlife's land mission to protect wildlife habitat has been remarkably successful, conserving hundreds of thousands of acres to protect the biodiversity of our state and the rights of hunters, anglers, and other passive recreationists to enjoy the outdoors. At Walnut Hill WMA, the land comes with a spectacular added benefit, which is sure to be appreciated by all who visit.



Andrew Madden has been MassWildlife's Western District Manager since 2006. He lives in Worthington with his family, and he hunts, fishes, and wanders throughout the region. An earlier, less detailed version of this article appears in our current 2014 Guide to Hunting, Fishing, and Trapping.



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