The rehabilitation of the historic ice pond dams at the Princeton Ice Company Historic District at Mountain Lakes Preserve in Princeton represents extraordinary municipal stewardship of an extraordinary site. The stewardship involved the careful balancing of a complicated mix of historic preservation, conservation, dam safety, environmental, and engineering requirements, and the challenging coordination of the oversight of multiple municipal, county and state agencies.

The owner of a stone quarry and an ice harvesting company created the seven-acre Mountain Lake in 1884 to produce ice for Princeton homes and businesses. He built a Lower Dam of earth from the pond excavation along with a spillway, a drainage basin, retaining walls, and culverts all made of argillite stone from his quarry. In 1902 he built an Upper Dam of stone and concrete to control sedimentation in the lake. The ice harvesting facility included a steam powered ice elevator for loading ice cakes into three ice houses, and it operated into the 1920s, when refrigeration came into use and the ice houses and elevator were demolished.

Fig. 1: Princeton Ice Company, Summer 1910. Historical Society of Princeton.
The Ice Wall along the Lower Dam provided a clean edge for harvesting ice. Workers used the steam powered Ice Elevator, center, to load ice cakes into the Ice Houses, left.
Princeton Township acquired the 80-acre property in 1987 with the support of a Green Acres grant and private funding from the Friends of Princeton Open Space (FOPOS) and other private sources. The Nature Conservancy acquired an easement on the Mountain Lakes Preserve to protect the lake and the surrounding woods in perpetuity from development, and FOPOS took over the easement around 2007. Over the decades much of the lake had silted in and the dams and other original features had deteriorated to the extent that both dams were in danger of failure.

Fig. 2: Princeton Ice Company, Winter c1910. Historical Society of Princeton. The ice men are standing on a pier used to convey ice cakes to the Incline Elevator, right rear, for loading into the Ice Houses, center rear.

Fig. 3: Mt. Lakes Preserve Lower Dam Spillway, 2008 C.W. Zink The lake had silted in since its original construction in 1884, and the Lower Dam Spillway was partially collapsed and in danger of complete failure.
As the first step in planning the site’s rehabilitation, the Township’s Historic Preservation Officer, Christine M. Lewandoski, and the Historic Preservation Commission (HPC) contracted with Hunter Research Inc. in 1990 to assess the site’s historic significance. Hunter Research reported that the property was eligible for the National Register as a rural industrial site and the N.J. Historic Preservation Office concurred with a supporting Opinion in 1991.

In 2004 Ms. Lewandoski secured an Historic Site Management Grant from the N.J. Historic Trust to start preliminary engineering of the dams rehabilitation, to engage a preservation consultant, and to develop preliminary interpretive signage. Robert V. Kiser, Township Engineer, then assembled a project team consisting of Richard Grocholski, a principal civil engineer at French & Parrello Associates PA with experience on historic sites, Joe Skupien of Storm Water Management Consulting LLC for dam safety requirements, Geoffrey Goll at Princeton Hydro LLC for dredging engineering, Jim Lee of Hunter Research Inc, for archaeological monitoring and recording, and Clifford Zink of C.W. Zink & Associates for historic preservation and rehabilitation consulting. Assistant Township Engineer Deanna Stockton managed the project with the participation of the HPC and FOPOS. Ms. Lewandoski oversaw the preservation aspects of the project.

Princeton historian Wanda Gunning researched the history of the property for the HPC, which subsequently nominated it to the State and National Registers and the Princeton Ice Company Historic District was listed on both in 2007. The Township installed preliminary signage interpreting the history of the site in 2008.

![Image of Mt. Lakes Preserve Lower Dam, 2008](Fig. 4: Mt. Lakes Preserve Lower Dam, 2008  C.W. Zink)

*While planning the rehabilitation, the Township installed preliminary signage to interpret the history of the Princeton Ice Company to the many visitors to Mt. Lake Preserve. By this time the Lower Dam was completely overgrown and in danger of overtopping in a severe storm.*
From 2006 to 2009 the Township’s engineering and preservation staff and consultants balanced dam safety, environmental, conservation, engineering and historic preservation requirements that were often in conflict. Dam safety regulations, for example, required increased capacity for both water retention in the lake and for flow over the spillway to meet 100-year flood requirements. The project team developed a compromise design that heightened the Lower Dam toward the lake to preserve the archaeological remains of the ice harvesting facility while providing for additional water storage capacity. The design preserved the remnants of the historic ice wall in situ and erected a replica ice wall along the new southern rim of the raised dam, and it extended the historic spillway to provide more flow capacity. William Pyontek, a principal engineer with French and Parrello, became the chief consulting engineer, and the project team won approval of this compromise design from the HPC, FOPOS, SHPO, and DEP’s Bureau of Dam Safety and Flow Control.

The bidding documents specified that 1) the site is on the State and National Registers and all construction work had to meet the Secretary of the Interior’s Standards for Rehabilitation of historic sites, 2) the general contractor had to have a minimum of five years experience with historic rehabilitation, particularly for stone masonry, 3) historic features and archaeologically sensitive areas had to be protected during construction, 4) all excavation work had to be monitored for the discovery of archaeological remains, and 5) stones from the original construction that had washed downstream had to be retrieved for use in the rehabilitation.

Fig. 6: Mt. Lakes Preserve Lower Dam Rehabilitation Plan, 2010
The project team developed the rehabilitation plans to preserve the historic features of the Princeton Ice Company while upgrading the earthen dam and its Spillway to meet Dam Safety requirements. Preserved features included the Incline Elevator foundation and chimney, the original Drainage Basin and Stone Culvert, stone retaining walls, and stone and concrete bridges. The Incline Elevator Apron location is now interpreted with posts outlining its dimensions.
The project team devised the rehabilitation plan to meet Dam Safety requirements by raising the Lower Dam toward the lake, thereby preserving historic features below the Dam, including the Retaining Wall and Drainage Basin, left. The original Ice Wall, center, was left in situ and a replica Ice Wall, right, was erected on the lake side to interpret this historic feature (Fig. 1).

Compass Construction Inc., with Glenn Goebel, President, won the rehabilitation contract and began construction in June 2010. After the initial demolition was complete, Hunter Research recorded historic features of the dam for the Historic American Engineering Record with field drawings and large format photography.

Stone masonry work, which included extensive reconstruction, replication and rehabilitation, was carefully monitored throughout the construction for historically appropriate stone laying, and mortar color and finishing. Historic masonry and concrete features discovered during construction were replicated in the work, including masonry.
coursing delineation on the Upper Dam, the use of large toe stones and occasional boulders on the lower dam spillway, and pebble concrete finish on an Upper Dam abutment. When workers uncovered a vein of argillite stone during excavation, the project team specified that the native stone should be harvested and used in the masonry reconstruction, with the result that no stone had to be acquired offsite to complete the extensive masonry work.

The archaeological monitoring uncovered and recorded portions of the original ice wall and building foundations, several well preserved ice tools including an ice plow and guides for marking and scoring ice, and a remarkably intact lower portion of the c1906 Ice Elevator Apron. At Mr. Lee’s suggestion, timbers were installed in the original Apron pier holes to outline its size and location on the finished level of the lake. The project team preserved the ice plow and other ice harvesting tools for future display on site.

![Image of artifacts](image1.png)

*Fig. 8: Princeton Ice Company Artifacts, Mt. Lake Preserve, 2011  C.W. Zink*

Artifacts uncovered during archaeological monitoring included, from top, an Ice Plow, Ice Fork, Ice Pick, and Ice Tong. These and other artifacts have been stored for future conservation and interpretation.

![Image of submerged Apron](image2.png)


Uncovered during archaeological monitoring, the submerged Apron was recorded and interpreted with posts outlining its dimensions.
Upon completion of construction in July 2012, the project’s historic preservation consultant and Fairfax Hutter, a local graphic designer, prepared two additional interpretive signs: Mountain Lakes Preserve Ice Harvesting Archaeology and Mountain Lakes Preserve Rehabilitation 2010-2012. These and the three previous interpretive signs were installed at the east and west ends of the Lower Dam this spring. The overall rehabilitation project cost approximately $3 million, which a local private donor contributed to the Township.

In summary, Princeton Township’s Historic Preservation Commission and staff initiated careful stewardship of the Mountain Lakes site shortly after the property’s acquisition in 1987 with assessments of the site’s historic significance, and its subsequent nomination to the State and National Registers. When the deteriorated condition of the dams and the requirements for Dam Safety compliance necessitated extensive rehabilitation, the Township Engineering Department collaborated closely with the HPC and assembled a project team of well-qualified staff and consultants to ensure that the site’s historic significance would be preserved. The HPC additionally ensured that the ice harvesting history of Mountain Lake would be interpreted through signage at the site. In 2012, members of the project team gave presentations on the project to an engineering group at the Mountain Lakes House and to the public at the Princeton Public Library.
The reconstructed Spillway incorporates a preserved section of the historic stone abutment, left. New features required to protect the channel bank, like the retaining wall, right, were built in concrete to show that they are modern insertions.

The rural industrial history and the artifacts and features of Mountain Lake Preserve are highly unusual in the State of New Jersey, and they could have easily been lost. Instead, Princeton Township took extraordinary efforts to preserve and interpret them while upgrading the dam to meet Dam Safety requirements. The result is an exceptional historic site that preserves and interprets a unique rural industrial landscape for the many visitors to Mountain Lake Preserve.

Mountain Lakes Preserve Dam Rehabilitation Project Team

Robert Kiser, Director of Engineering, Municipality of Princeton, 400 Witherspoon St., Princeton, NJ 08540 – Project Director

William Pyontek, Principal Engineer, French & Parrello Associates PA, 1800 Route 34, Belmar, NJ 07719 – Civil Engineering

Glenn Goebel, Principal, Compass Construction, Inc., Box 191, 31 North Main Street New Egypt, NJ 08533 – Construction Contractor

Jim Lee, Principal Investigator, Hunter Research, Inc., 120 W. State St., Trenton, NJ 08608 – Archaeology

Clifford W. Zink, C.W. Zink & Associates, 54 Aiken Avenue, Princeton, NJ 08540 - Historic Preservation Consultant