

U.S. Fish and Wildlife Service Moves toward Net-Zero Buildings

First they had a vision: welcome people into a building embracing environmental stewardship on land that is steeped in history. The designers of the U.S. Fish and Wildlife Service took this vision and designed a new energy-efficient and environmentally friendly visitor center for the Assabet River National Wildlife Refuge located in Sudbury, Massachusetts.

The design team's goal was to create a sustainable building that used green construction techniques and products to conserve energy. The environmental conservation elements of this new building also adhered to the purpose of the refuge, which is to conserve migratory birds and provide environmental education opportunities to visitors while also respecting the location's sacred history. Native Americans hunted and fished on this piece of land, located 20 miles from Boston. Today,



The visitor center uses PV-powered trash compactors, like the one in the above photo, which reduces energy use by lessening the number of trips needed to the landfill. *Photo from Big Belly*



The Assabet River visitor's center moves the U.S. Fish and Wildlife closer to net-zero energy use. Its design has become standardized in the agency and will be used in other areas to help reduce energy. *Photo from U.S. Fish and Wildlife*

the refuge showcases wetland areas and forests that are home to a myriad of migratory birds and other wildlife.

The design team's vision became a reality when the new visitor's center opened its doors in 2010. The 5,879-square foot building provides a starting point for visitors to learn about the wildlife on the refuge. The facility also houses hands-on exhibits, office and classroom space, and a nature-themed store. "The design of this visitor center exemplifies the U.S. Fish and Wildlife's commitment to lowering our carbon footprint," said Libby Herland, Project Leader, Eastern Massachusetts National Wildlife Refuge Complex. "We want this center to help promote the importance of environmental stewardship and connect the public with the beauty of the outdoors and nature." Funding for the \$3.2 million dollar facility was appropriated by Congress to the U.S. Fish and Wildlife Service. An additional \$700,000 from the American Recovery and Reinvestment Act of 2009 was used to fund the exhibits and the photovoltaic (PV) system.

The design team integrated all design, construction, systems, and operation standards with the Leadership in Energy and Environmental Design (LEED) rating system to achieve the vision and energy-efficiency goals of this new visitor's center. The innovative design also achieves the sustainable goals of Executive Order 13514, and it also encompasses the Assabet River National Wildlife Refuge's conservation vision and mission. In fact, the visitor's center geothermal and PV systems are expandable to make it a net-zero facility.

Energy Savings

A diverse portfolio of renewable-energy technologies contributes to the production of heat and electricity at the visitor's center. The U.S. Fish and Wildlife Service's Northeast Region has successfully constructed geothermal systems at other facilities and decided to utilize this technology again, however the team wanted to go a step further and designed a PV system to provide the power for the geothermal heat pump. The building is heated and cooled by a closed-loop, 12.5-ton geothermal pump and a net-metered, 6.3 kW roof-mounted, solar PV system provides power for the geothermal heat pump, as well as for the building.

In addition, three PV-powered lights of approximately 1.2 kW illuminate a nearby parking lot. Passive solar architecture also reduces the heating and cooling loads on the building, as well as the operating costs of the heating, ventilation, and air conditioning system.

Best practices at the Assabet River visitor's center also included the purchase of off-the-shelf energy-efficient products in accordance with the Federal Acquisition Regulation. These included:

- **Lighting:** Energy-efficient fluorescent LED lights and occupancy sensors were placed throughout the facility to reduce energy use.
- **Roofing:** Cool roofing material was installed to reflect the sun, reducing heat transfer.
- **Windows:** Low-e glazed windows were used to reduce energy demand.
- **Plumbing:** Low-flow faucets and waterless urinals were installed to save water within the facility.
- **Landscaping:** Drought-tolerant native plants were installed to save water.

- **Flooring:** Radiant floor heating was installed to also save energy.

Sustainable Design

The Assabet River visitor's center design team took a sustainable design approach by integrating the surrounding land and wildlife with renewable energy technologies and energy efficient products. Sustainable design best practices included using recycled newspapers for the visitor center's super-insulated building envelope. In addition, an energy management control system monitors and tracks energy performance for the heating, ventilation, and air conditioning system, which also allows for remote access.

The design team also used LEED-based green construction methods outlined in the feature box to honor its sustainable design approach. Green construction methods help to conserve energy and water and reduce construction waste. The team used recycled products for the carpet, ceiling tiles, wallboard, and insulation. Construction debris was also recycled wherever possible. An existing stone wall, which ran along the edge of the building site, was salvaged and recycled

for use around gates. Re-using this material saved disposal transportation costs, which also translates into environmental benefits. Furthermore, the team also elected to use non-toxic building materials.

Water Savings

The visitor's center saved water by installing U.S. Environmental Protection Agency's WaterSense conservation technologies and implementing innovative storm-water management techniques. The WaterSense technologies included low-flow or waterless outputs. The use of native vegetation that doesn't require much water also achieved significant water savings.

Stormwater management techniques, such as porous pavement sidewalks, parking lots, and drought-tolerant grass were used to improve storm drainage and minimize erosion. The site does not require an irrigation system because of these enhanced storm-water techniques and saves water compared to facilities that use sprinkler systems to maintain their grounds. As a result of these conservation efforts, the building's water use is 20% less than conventional buildings due to the use of EPA WaterSense technologies, native vegetation, and storm-water management techniques, saving about 3,000 gallons annually.

Saving water and energy at the Assabet River visitor's center contributes to the U.S. Fish and Wildlife Service's goal of reducing its carbon footprint and becoming carbon neutral by 2020. In fact, the Long Island National Wildlife Refuge Complex recently completed a building with a geothermal and PV system similar to those at the Assabet River visitor's center.

Green Construction Materials

The Assabet River visitor's center features a variety of cost-effective and easy-to-obtain green construction materials. They include:

- Paperstone countertops made of 100% recycled paper.
- Lavatory partitions made from recycled milk bottles.
- Cellulose insulation that contains at least 80% recycled material.
- Recycled glue-laminated columns and beams.
- Composite decking materials.
- Cabinets were made of strawboard to help lower the building's environmental footprint.
- Concrete floors and fiber cement siding that reduce long-term maintenance.