

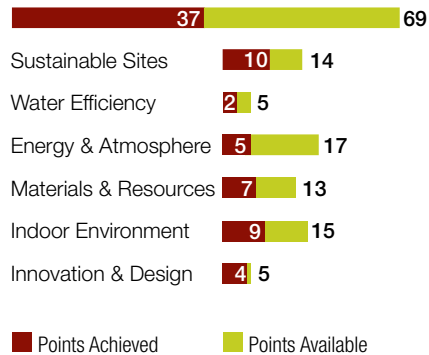
North Cascades Environmental Learning Center Seattle City Light



Photo by Lara Swimmer

Square Feet: 38,582, 1 story
Site: 20.1 acres, 876,000 sq. ft.
Location: North Cascades National Park
Construction Cost: \$295/square feet
Completed: January 2006

LEED Facts - NC Silver



Benefits

- Zero water used for irrigation and zero stormwater runoff
- 20% reduction in energy use – \$5,784 in annual savings
- 84% of wood is FSC-certified from well managed forests
- 52% of products and materials from regional sources
- 100% of occupied areas have outdoor views

Project Overview

The North Cascades Environmental Learning Center (NCELC) is a field-based educational and cultural center, on Diablo Lake in the North Cascades National Park, providing lodging and support services for groups of up to 60.

The facility includes an administration building, a classroom, two teaching labs and a library. Three lodges and three duplexes are located a short distance away, along with a single cabin for one full-time staff member. A dining hall renovation, amphitheater, and

maintenance and recycle buildings complete the campus, for a total of 15 buildings. A learning shelter, boat dock and trails are nearby.

Excepting a full-time staff of one plus one cook, occupancy varies daily and weekly, with more in the summer months. NCELC lodges accommodate over 60 when filled. The dining hall, which is used for all meals and some special events, seats 50. Duplexes are inhabited by 10-12 students in a graduate program hosted by the North Cascades Institute.



Photo: courtesy of NCI

The North Cascades Institute

The North Cascades Institute (NCI) provides all of the educational programming and day-to-day management for the North Cascades Environmental Learning Center (NCELC), serving organized groups of school children and adults as well as visiting individuals and families. Funds for facility maintenance and operation are provided through an endowment set up by Seattle City Light in connection with the construction of the NCELC, and the operation is overseen by City Light and by the National Parks as land owner.

Sedro Woolley-based North Cascades Institute was founded by director Saul Weisberg in 1986, with the mission of conserving and restoring the Northwest environment. On Fourth of July weekend in 2005, the institute hosted its first family program at the NCELC with current director Jeff Muse. Since that summer, North Cascades Institute programming at NCELC has expanded to offer special opportunities for environmental education, along with specialized hospitality and recreation, for diverse groups.

School kids (grades 3-12) come to the NCELC for Mountain School, and high school students participate in North Cascades Wild and Girls on Ice. Teacher education is an important part of NCI's contribution to the larger Northwest regional community, and courses in climate change and nature mapping are part of a masters degree for education in environmental administration program offered by Western Washington University, Bellingham. NCELC also hosts environmental stewardship programs including Eagle Watchers, Mountain Stewards, and Native Plant Stewards.

The North Cascades Institute has won multiple awards for environmental education and advocacy, including the Organizational Excellence Award from the Environmental Education Association of Washington (2006) and the Best U.S. Environmental Protection and Education Group from Charity Navigator (2006).



Photo by David Hall

Sustainable Sites

The North Cascades Environmental Learning Center is located within the upper Skagit River watershed, near one of three dams on the river. These dams provide hydroelectric power serving 25 percent of Seattle's electricity needs.

The 15-building complex is located about 65 miles northeast of Burlington, Washington on a remote site inside North Cascades National Park, near the shore of Diablo Lake above Diablo Dam. North Cascades Park is one of several contiguous protected areas in the North Cascades, extending across the border into Canada.

The first buildings on the site housed construction crews for nearby Ross Dam before becoming part of a small fishing resort. The project grew out of the 1995 federal re-licensing of Seattle City Light's Skagit River dams, and it is intended to mitigate the impact of hydroelectric projects on the Skagit River environment. While the NCELC is owned by Seattle City Light, it stands on public lands managed by North Cascades National Park. The North Cascades Institute supplies, maintains and operates the buildings themselves, offering educational programs for all ages.

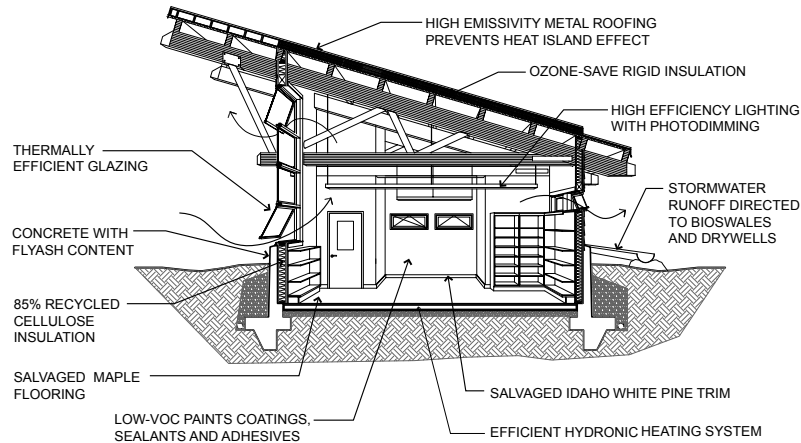
In their unique partnership, the North Cascades Institute, National Park Service and City of Seattle are supported by the North Cascades Conservation Council, Upper Skagit Tribe, Swinomish Indian Tribal Community, Sauk-Suiattle Tribe, USDA Forest Service, Washington Department of Fish and Wildlife and the Office of the Superintendent of Public Instruction.

The footprints of NCELC buildings cover the pads of previous cabins, and the design for the campus includes the renovated restaurant associated with the old resort. Existing roads and paths were reused, with some pavement replaced by gravel. The campus is now virtually car and pavement free. Buses and cars drop off visitors and gear, then park off-campus. Gravel paths serve entries, outdoor common spaces and terraces.

Designing a complex of 15 smaller buildings instead of a few larger ones minimized excavation and ground disturbance. New buildings are set into the rocky mountainside, taking advantage of the site contours to provide forest and mountain views, while respecting the sensitivity of the lake shore. Building footprints follow the vertical rise of the site, well buffered from both an existing creek and the possibility of future creek debris flow.

The administration building, classroom, teaching labs and library form the heart of the campus. Three lodges and two duplexes are located uphill and at a short distance in order to minimize shoreline impact. Despite an 80-foot rise in the slope of the site, all buildings in the complex are ADA accessible.

Tree-like concrete columns and steel struts support cantilevered overhangs that mimic the forest canopy, and provide protection from the elements. Wood structure is expressed throughout interiors. Buildings, trails and walkways enhance the experience of the natural environment.



Photos above and top middle by Lara Swimmer, middle lower photo by David Hall, and drawing above by HKP Architects

All sizeable trees were inventoried and saved where possible, some coming within a few feet of roof edges. The landscape plan went beyond reliance on native plant species. All plantings in the project were actually propagated locally or grown from seed collected on the site itself and held until construction was completed.

Because of the remoteness of the site and its scenic beauty, the threat of light pollution and heat island effects are important. Light pollution is controlled with low-footcandle light bollards for path lighting. Large overhangs bounce interior lighting back down to the ground, also.

Abundant shade from the many mature and preserved trees helps to prevent heat from escaping the site. In addition, all the roofs are high-emission ENERGY STAR compliant metal, reducing the amount of heat retained.

Water Efficiency

Stormwater from roofs is channeled, slowed and filtered at the ground level so that it can infiltrate rather than leave the site. Splashpads, rockeries, swales and drywells are placed strategically along the path of the flow. Traditional gutters are precluded because of snow loads in the area. Instead, on the uphill sides of large buildings, specially designed ground troughs catch runoff and channel it around the foundation, adding a pleasant water feature to the NCELC.

High-efficiency fixtures minimize potable water use indoors. No potable water is used for irrigation as the native plants do not require additional watering once established.

Energy & Atmosphere

The unique position of the NCELC in a forested location near a source of non-polluting electrical power makes it an ideal site for demonstrating energy efficiency. The projected, combined energy performance for all buildings exceeds ASHRAE 90.1 by 20 percent. This amounts to \$5,784 in annual energy savings and over 100,000 kilowatt hours of electricity per year, enough to serve the entire complex for over three months in the summer.

Lodges and staff housing meet Seattle City Light's Built-Smart standards, with extra insulation and triple-pane low-argon windows. Roofs are insulated to R-38 instead of the required R-30 and exterior walls to R-26 instead of R-19. The U-value for windows is 0.34.

To help conserve energy, different heating systems were used in different building types. In the large lodges, each room has an individually zoned radiator, controls and separate fans for ventilation. All three lodges share a central boiler, for reduced maintenance. Main service buildings, with people opening doors frequently, are heated with a hydronic radiant floor system, also with a single boiler. The thermal mass of the floor helps to keep temperatures constant. Forced air heat is used in staff housing for independent control and fast heat up. Forced air is also used in the dining hall.

The entire complex is naturally ventilated and cooled. Generous overhangs and window shading help to keep rooms cool in summer, and prevent heat gain.

High, operable windows provide stack ventilation. Along with abundant cross-ventilation, this precludes the need for air conditioning, and heat gain is limited.

In classrooms, photo-sensors measure natural light levels and dim lights accordingly. Occupancy sensors turn lights on and off.

Materials & Resources

Based on dollar value, approximately 11 percent of all the construction products for the project are made with recycled materials. Those with recycle content include cellulose insulation, Trex decking, flyash in concrete, structural steel and rebar, metal roofing, gypsum wall board, ceramic tile, plastic bathroom partitions, and linoleum. Rocks from the site are used in retaining walls.

Again based on dollar value, 53 percent of total materials were manufactured within 500 miles of the site, and 57 percent of those were made from materials that were harvested locally.

Wood is used extensively in NCELC construction, and 84 percent, by dollar value, is certified by the Forest Stewardship Council (FSC) as grown and harvested in sustainably, well-managed forests. Wood includes rough framing, glue laminated beams and column, cedar siding, flooring, oriented strand board, decking, wood doors and custom casework.

A total of 411 tons of construction waste was recycled and diverted from landfills. Separated at the site, 260 tons of wood, 83 tons of steel, 39 tons of gypsum board, 14 tons of asphalt, 9 tons of concrete and 6 tons of plastic were saved.

An existing restaurant near the shoreline was renovated for the NCELC, retaining or reusing 75 percent of the structure and recycling 87 percent of the construction waste. A recycling building near it houses two earthtubs for recycling food waste and bins for sorting and recycling paper, cardboard, glass, metal and plastic.

Salvaged wood was used for the front gate, service gate, maple flooring in classrooms and heart pine flooring in staff housing, and some trim. Rapidly renewable, regionally sourced wheatboard was used for the wainscot in many of the buildings and as the core material for cabinet doors.

Indoor Environment

Several measures support excellent interior air quality at NCELC. Only low emitting paints and finishes were used on the campus. Cabinets are made with plywood that has no added formaldehyde. In the dining hall, CO² sensors monitor and give feedback to the ventilation system. During high occupancy, more fresh air is automatically brought in.

Every building has multiple operable windows on more than one side, and some are very high, so as to provide a chimney effect in warmer weather. Cross ventilation and ample insulation make air conditioning unnecessary. Natural light reaches 85 percent of the building area, and all of the occupied areas have outdoor views.

Walk-off grates at entryways improve indoor air quality by keeping dirt and contaminants out of buildings.

Innovation & Design

- Education Program
- Organic & Local Foodshed Program
- Exemplary Performance in Locally Manufactured Materials
- Exemplary Performance in Locally Harvested Materials

Lessons Learned

A project team with very high environmental goals and ambitious standards for LEED certification must

mesh LEED criteria, environmental goals specific to the site, standard contract language, and contractor orientation. In the case of the NCELC, the remote site and low-bid contract environment both added enormously to the challenge. Required courses in sustainable construction methods for potential bidders, now offered through several agencies and institutions, could help to head off similar conflicts in the future.

When building in a highly sensitive and remote site, in-the-field activities must be carefully planned and confined, including concrete mixing and storage of materials. Concrete mixing at the remote site had to be done in small batches.

Use on-site guides to confine construction activities. Bright colored fencing was used to keep excavation and other construction activities within 40 feet of building pads. As a result, many important trees stand very close to new building walls, even though the contractor was inexperienced in tree conservation.

Match construction waste categories with the actual opportunities for recycling within the immediate area. Some pre-sorted materials at the NCELC construction site had to be recombined because county recycling centers would not process them separately.

When considering an electrified heating system for a campus of separate and sporadically occupied buildings, consider the efficiencies of infrared panels with separate controls and metering. The electrified boiler system at the NCELC has made heat control for individual buildings problematic.

Although the cost may be surprisingly high for pioneering projects, setting environmental goals can begin to transform the market. Setting a goal of 100 percent FSC-certified wood for the project was ultimately unattainable—despite the strong commitment of the project team. However, as a result of the project the local supply and manufacture chain for sustainable wood products was enhanced. One local cabinet maker, Baywood Cabinets, became FSC-certified for the project. The architects negotiated with Columbia Forest Products to make what is believed to be the first plywood produced with no added formaldehyde.

Rating & Awards

US Green Building Council LEED® for New Construction Silver Rating

2005 Merit Award, American Institute of Architects Northwest Washington Chapter

2006 Designing and Building with FSC Award, Forest Stewardship Council

The Team

Owner

Seattle City Light
www.seattle.gov/light

Architect

HKP architects
www.hkpa.com

Landscape Architect

Richard Haag Associates
www.richhaagassoc.com

Mechanical Engineer

Berona Engineers
www.beronaengineers.com

Civil Engineer

SvR Design Company
www.svrdesign.com

Structural Engineer

Martens/Chan, Inc.
www.ahbl.com

Electrical

Path Engineers/Travis, Fitzmaurice & Associates
www.patheng.com
www.travisfitzmaurice.com

Lighting

Radiance Lighting & Design
www.radiancelightingdesigninc.com

Landscape Restoration

Springwood Associates

General Contractor

Dawson Construction
www.dawson.com

To Learn More

City Green Building promotes green building through education, technical assistance and incentives. www.seattle.gov/dpd/greenbuilding

Seattle City Light provides stable, competitively priced and environmentally sound electricity to customers. www.seattle.gov/light

North Cascades Institute inspires a closer relationship with nature and conserves and restores Northwest environments through education. www.ncascades.org

LEED® is the national benchmark for high performance green buildings developed by the US Green Building Council. www.usgbc.org

US Environmental Protection Agency and US Department of Energy ENERGY STAR Program helps citizens and businesses save money and protect the environment through energy efficient products and practices. www.energystar.gov