

Environmental Architecture: Features of the North Cascades Environmental Learning Center

1- Classroom/Commons

- ❑ Thoughtful placement of buildings preserved much of the existing vegetation and landscape. Instead of designing the facility with one or two large buildings, we used many smaller ones that could settle into the landscape by stepping down the contours. This greatly reduced the amount of excavation needed. In addition, a survey that included the locations of all the sizeable trees on the property was used to save as many trees as possible. Buildings were also sited on pre-existing building pads as much as possible to leave the undisturbed areas still undisturbed.
- ❑ Excavation was limited to a close perimeter around buildings during construction to protect trees and native vegetation. Bright colored fencing kept construction to 40 feet or less from the building pads. You may notice many established trees that are close to the buildings.
- ❑ The Learning Center is pedestrian friendly. The roads on the site are for guest drop-off and service vehicles. Overnight guests may drive in to the drop off their belongings but after that they are on foot. A network of pathways make travel for pedestrians safe and enjoyable and more in tune with nature.
- ❑ The Learning Center has lighting control systems to further conserve electricity. In the classrooms, photosensors measure the amount of daylight that enters the room and dim the electric lights when there is enough daylight. Occupancy sensors turn the lights on and off automatically.
- ❑ Based on the dollar value, almost 11% of the total materials for the project are recycled. Recycled content materials include:

Cellulose insulation	metal roofing
Trex decking	gypsum wall board
flyash in concrete	ceramic tile
structural steel and rebar	plastic bathroom partitions
rock walls (on-site recycle)	linoleum
- ❑ We tried to get as many *Regional Materials*, or materials that were manufactured and/or harvested within 500 miles of the project site. To support local economies and reduce fuel consumption for shipping, local materials were favored. Based on the dollar value, 53% of the total materials for this project were manufactured Regionally and 57% of these Regional Manufactured materials are made from materials harvested locally.
- ❑ The finished product may not look different, but FSC Certified Wood is grown and harvested in an environmentally friendly and sustainable way, as determined by the Forest Stewardship Council (FSC). These practices are monitored by third party verification. From raw lumber to finished product, each company that harvests, distributes and manufactures wood components must be FSC certified to maintain the chain of custody. The local cabinet maker, *Baywood Cabinets*, became FSC certified just for this project. Most of the wood for the Learning Center is from FSC certified sources. Much of the rough framing, glue laminated beams and columns, cedar siding, flooring, decking wood doors and even the custom casework is certified. Based on dollar value 84% of all the wood is certified.
- ❑ It has been found that students learn better and test scores are 20% higher in buildings with good daylight and views. All the buildings at the NCELC have views to the outside and daylight that enters the rooms.



2 - Dining Hall

- ❑ The new Dining Hall at the Learning Center was previously a restaurant for Bradley's Resort, built in the mid 1970's. The original structure was intact and as much of the materials as possible were preserved. More than 75% of the walls, floors and roofs were maintained.
- ❑ New buildings were designed to be located away from the lake to provide a buffer of vegetation that protects the pristine quality of the water by slowing storm-water runoff and preventing soil erosion.
- ❑ The lake was protected from soil erosion during construction by using with filter fabric fences downslope from building and road excavation and along the lake shore.
- ❑ The ozone layer is not being depleted by the Learning Center. Some air conditioning, fire suppression and refrigeration equipment uses HCFCs or Halons. These chemicals deplete the ozone layer when they enter the atmosphere. The Learning Center doesn't have air conditioning. The fire suppression system uses water, and the refrigeration systems in Dining Hall and other Kitchens don't use HCFCs or Halons.
- ❑ Energy can also be wasted needlessly when the energy consuming systems that heat and operate building functions are not adjusted properly. The state of Washington requires that a Commissioning Agent separate from the Mechanical Contractor adjust these systems. In the design of the Learning Center we went one step further. A Commissioning Agent was hired earlier in the process to take part in the design of these systems to help make them even more efficient and also reviewed them after installed to make sure everything is working efficiently. Training of maintenance staff was supervised by the commissioning agent to help assure efficient operation can be continued.
- ❑ To reduce the amount of waste reaching the landfill, 81% of the waste produced during construction was recycled. Recycled items included:

260 tons of wood	14 tons of asphalt
83 tons of steel	9 tons of concrete
39 tons of gypsum board	6 tons of plastic
- ❑ To prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS), smoking is prohibited in the buildings.
- ❑ The Dining Hall, as an assembly space, has the potential for indoor air quality to decrease if it is not well ventilated enough. For this reason CO2 sensors monitor and give feedback to the ventilation system. When CO2 levels reach a certain threshold, such as during high occupancy, more fresh air is automatically brought in.
- ❑ Another potential source of indoor air pollutants is carpet. You'll notice that there is very little carpet used at the Learning Center. Where it is used it meets the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program, which limits VOC levels allowed in carpet.
- ❑ Just to the East of the Dining Hall is a Recycling Building that houses two earthtubs for recycling food waste and bins for recycling of paper, cardboard, glass, metal and plastic.



3 - Alder House

- ❑ Buildings use about 30% of the energy in the U.S. Energy consumption contributes to global warming because most sources of energy generation produce CO₂. We are fortunate that the power for the Learning Center comes from a hydroelectric source that doesn't pollute the atmosphere, but nevertheless, the buildings at the NCELC were designed to save energy.
- ❑ The Lodges and Staff Housing buildings were designed to meet the *Built-Smart* requirements, which means they have extra insulation and triple-pane low-e argon windows. Roofs are insulated to R-38 instead of the required R-30 and exterior walls are insulated to R-26 instead of R-19. The U-value of the windows is U= 0.34. This keeps the buildings cool in the summer and warm in the winter, while conserving energy.
- ❑ Using materials that are salvaged keeps them from being put in the landfills and also reduces the need to harvest new materials. Salvaged wood was used for the front gate, service gate, maple flooring in the classrooms and the heart pine flooring in the Staff Housing. The wood trim is salvaged Idaho White pine.
- ❑ Many paints, coatings, adhesives and sealants have high content of volatile organic compounds (VOCs). VOCs are often odorous, potentially irritating, and harmful to the workers who use them, and can also be harmful to the building occupants as these chemicals off-gas into the indoor environment over time. At the NCELC, extreme care was taken to specify products that have low or zero VOC levels. *Adhesives* meet the requirements of the South Coast Air Quality Management District, Rule #1168. *Sealants* meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51. *Paints and Coatings* meet the Green Seal's Standard GS-11 requirements.



4 - Site restoration area

- ❑ NCI Volunteers are restoring all the areas disturbed by excavation before and during construction with native plants. The plants are not only native, but none were imported from other areas. They were all propagated locally or grown from seed collected at the ELC site and grown by the National Park Service during construction. Native plants will hold the soil and perform their part in the natural ecology without the need to irrigate, fertilize, or spray pesticides.
- ❑ Much of the U.S. supply of clean drinking water is used to irrigate landscape plants and lawns grown in areas where the plants are not adapted to the climate. High efficiency irrigation systems can decrease the amount of water needed. However, the Learning Center has the most efficient irrigation technology available. There is no irrigation system. The native plants that were propagated from plants on the site won't require any irrigation at all. Restoration planting by the NCI volunteers was carefully planned to occur when watering won't be needed for establishment. Once established the plants should not need much further maintenance than they do in the wild.



5 - Cedar Lodge

- ❑ All the buildings have operable windows and are naturally ventilated. Generous overhangs and window shading devices keep the buildings cool in the summer. Because there is no air conditioning, the energy use in the summer is much lower than it would be for a sealed building with central air conditioning.
- ❑ Different heating systems were used for the different building types to help conserve energy. In the Lodges, each room has an individually zoned radiator for heating, and separate fans for ventilation. That way, only those rooms that are being occupied need to be heated or ventilated. All three lodges have a central boiler for better efficiency and reduced maintenance. In the larger open buildings like the Classrooms, Administration and Library, a hydronic radiant floor heating systems was used. This system also has a single boiler. This type of system is more efficient when buildings are maintained at more constant temperature because thermal mass of the concrete slab serves to keep temperatures constant, even when doors are opening and closing throughout the day, releasing heat. In the Staff housing, forced air heating was used in individual units because it can be controlled independently and has a shorter heat-up time. All the heating systems are fueled with electricity because Seattle City Light is subsidizing the power. There are small gas fireplaces in the Lodges Sitting Rooms to provide a cozy atmosphere.
- ❑ Rapidly renewable wheatboard was used for the wainscot in many of the buildings and as the core material for cabinet doors. Wheatboard is considered rapidly renewable because it is made from a crop that takes only one year to grow, unlike wood. Oriented strandboard (OSB) is also considered rapidly renewable because the poplar trees it is made from also have a short life cycle. There OSB used here was also FSC Certified material.
- ❑ By using durable materials and construction practices, the Learning Center is built to last. Many of the new buildings being constructed today are not designed to last more than 10-20 years. When demolished, the construction waste ends up in the landfill, contributing 30-40 percent of the landfill volume. We hope it will last forever, but if the Learning Center is ever demolished, the wood, concrete, and steel that make up much of the Buildings can be recycled. Wherever possible, we avoided materials like composites, asphalt shingles, and vinyl that cannot be recycled.
- ❑ Composite wood, such as plywood, particle board, and oriented strand board commonly have urea-formaldehyde added to the glues. With these products, formaldehyde vaporizes into the indoor environment over time and is an irritant, and potentially harmful. The interior woodwork at the Learning Center has no added urea-formaldehyde. In fact, the cabinets are made with the first ever commercially available FSC hardwood plywood with no-added formaldehyde. When the cabinet maker found this material was not available yet, the architects negotiated with Columbia Forest Products, to make the first production run. Now this FSC plywood with no-added formaldehyde is available commercially.
- ❑ Walk-off grates improve indoor air quality by keeping dirt and contaminants out of the buildings. At the high use entryways, you'll notice metal walk-off grates outside the doors. These capture dirt and particulates, keeping them from tracking as much into the buildings.



6 - Below Cedar Lodge

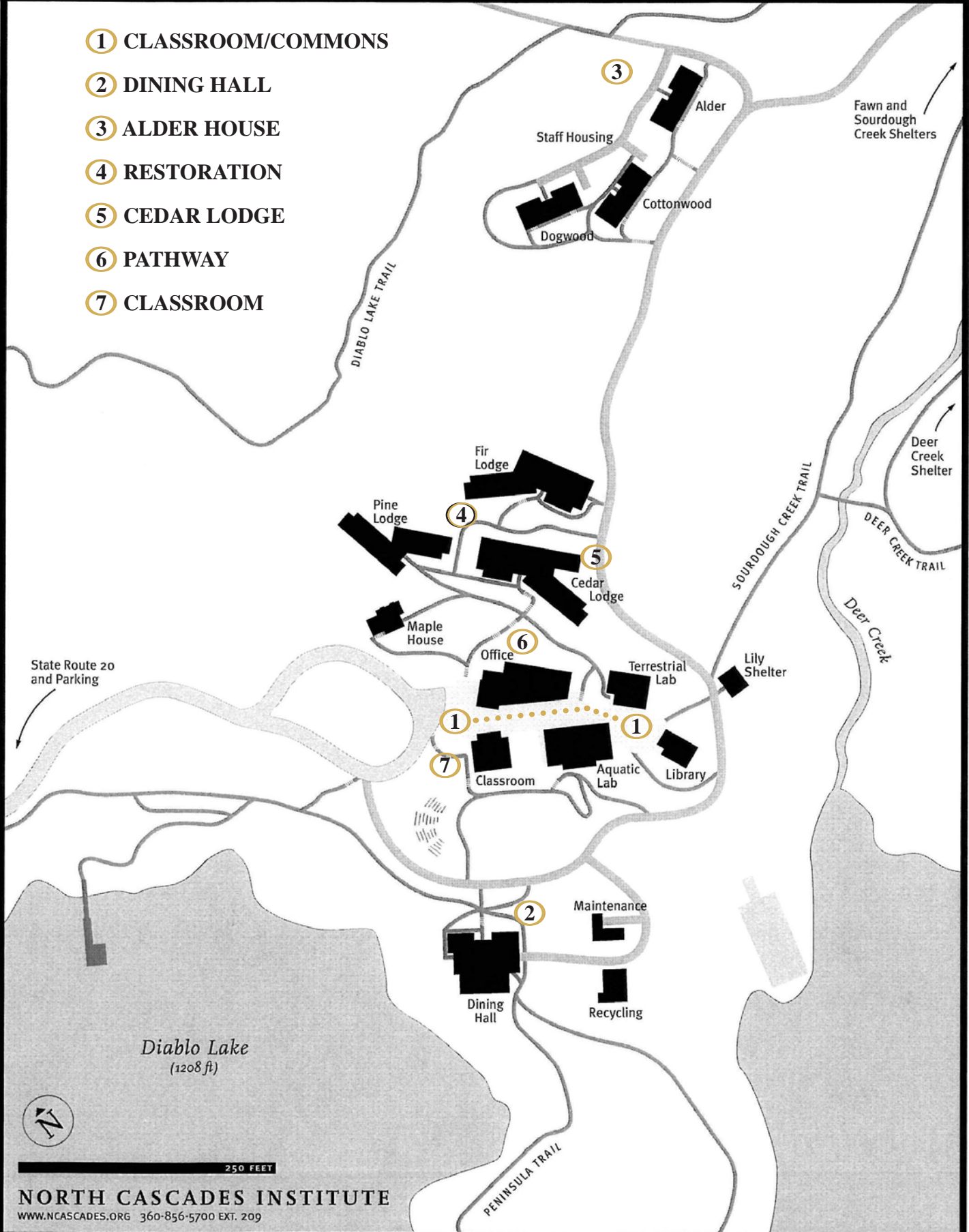
- ❑ Stormwater runoff must be managed to limit pollution of natural water flows. Rainwater that falls on impervious areas such as roadways and roofs flows much more rapidly to streams and lakes than under natural conditions. This rapid flow causes erosion, pollution, and destruction of fish habitat. The Resort that was here prior to the Learning Center had asphalt roads and parking areas. Since asphalt contributes to more rapid stormwater runoff, flooding, erosion and poor water quality, it was removed. This reduced impervious area of the site and new service roads are gravel, which is more porous and allows some stormwater infiltration.
- ❑ Stormwater from roofs, instead of rushing down drains, is allowed to infiltrate the ground where possible to slow runoff and prevent flooding and erosion. Splashpads, swales and rockery areas along the path of stormwater flow were created for this purpose.
- ❑ The heat island effect you may have experienced in cities on hot summer days, may not seem relevant here in the woods, and we want to keep it that way. The many trees on the site that were preserved, provide abundant shade to prevent overheating. In addition the roadways are a light colored/high-albedo material that does not absorb heat and reradiate it into the environment like black asphalt. In addition, roofs can be a heat absorber, so all the roofs are high emissivity Energy Star compliant metal that deduces the amount of heat retained.
- ❑ To improve visibility of the night sky and protect the nocturnal environments, the lighting systems were designed to limit light trespass. Low wattage fixtures on trails are shielded to prevent uplighting. Building lighting is also shielded with large overhanging roofs that prevent light from shining up into the night sky.



- ❑ Perhaps one of the most important sustainable features of the Learning Center is to help visitors learn about sustainability by participating in it. We hope that after your visit here you will come away with more knowledge and ideas about how you can help the environment in your own home.

NORTH CASCADES ENVIRONMENTAL LEARNING CENTER

- ① CLASSROOM/COMMONS
- ② DINING HALL
- ③ ALDER HOUSE
- ④ RESTORATION
- ⑤ CEDAR LODGE
- ⑥ PATHWAY
- ⑦ CLASSROOM



NORTH CASCADES INSTITUTE
WWW.NCASCADDES.ORG 360-856-5700 EXT. 209