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WESTERN RED CEDAR CONTRIBUTES TO BIOPHILIC DESIGN



Halfmoon Bay
Architect: Patrick Warren
Photographer: Ema Peter



WESTERN RED CEDAR CONTRIBUTES TO BIOPHILIC DESIGN

Credits: Nordic Barn | Architect: Bruno Jakobsen Design
Photographer: Bruno Jakobsen, Jakob Lerche

COURSE DESCRIPTION

Biophilic design is an established and vital aspect of architecture today, but it is still a growing field with new research emerging about the importance of reconnecting humans to nature and how this can be accomplished via the built environment. This course will explore the principles of biophilic design, and more specifically how wood materials elicit biophilic responses in building occupants. We will drill down even further into how designers have used a specific species of wood, western red cedar, to accomplish their biophilic design intent.

Learning Objectives

1. Identify the principles of biophilic design and its benefits for occupant health and well-being.
2. Examine the importance of incorporating biophilic design into the built environment.
3. Describe the properties of wood, specifically western red cedar, and how it elicits biophilic responses in building occupants.
4. Explore how designers can use wood in the built environment and case studies where western red cedar contributed to biophilic design.

Learning Objective One

Identify the principles of biophilic design and its benefits for occupant health and well-being.

An Evolution Toward Biophilic Design

Biophilia literally means a love of life or living things and is a personality trait initially described by Erich Fromm, and later E.O. Wilson. Both agree that “biophilia has a biological basis and it is fundamental to develop harmonious relationships between humans and nature.”¹ Fromm used the term biophilia to “describe the psychological orientation of being attracted to all that is alive and vital,” while Wilson used the term biophilia to “describe the traits of evolutionary adaptation that allow us to develop a mental link with the living world and nature.”²

Edward O. Wilson ultimately popularized the biophilia hypothesis, which suggests that humans possess an innate tendency to seek connections with nature and other forms of life, in his book, *Biophilia*. In 1993, Wilson and colleague Stephen R. Kellert published the collection of essays *The Biophilia Hypothesis*, which claims that “the human dependence on nature extends far beyond the simple issues of material and physical sustenance to encompass as well the human craving for aesthetic, intellectual, cognitive, and even spiritual meaning and satisfaction.”³

Introduction to Biophilic Design

Biophilic *design* is design that reconnects us to nature. Nature partially satisfies the psychological need to belong and relate, so activities that involve contact with nature have been shown to improve connectedness, wellbeing, and promote behavior that benefits the environment. Studies show that people tend to behave more altruistically in natural environments and have an increased sense of satisfaction with life. Conversely, disconnecting from nature has detrimental effects on both mental and physical health. Many studies observe that direct exposure to nature, even in brief increments, can offer visible psychophysiological benefits, but due to an increasingly urban lifestyle, our contact with nature has become less frequent. “Unfortunately, modern people, especially children, lack direct and frequent contact with nature and this can have negative consequences on their physical and mental health. Biophilic design, considering the evolutionary roots of this architectural approach, is an effective way of planning/designing interior and urban environments to stimulate the innate biophilia of the individual.”⁴

In 2007, the urban population surpassed the rural population for the first time in human history⁵ and the World Health Organization forecasts that 68% of the population will live in cities by 2050⁶. Without intervention and careful design, people living in cities will have increasingly fewer opportunities to get in touch with nature, so it’s vitally important to create environments that stimulate biophilia as much as possible. Biophilic design can meet this need, with the goal being to create artificial environments as similar as possible to natural ones, to ensure people receive the positive effects of nature on their health and wellbeing.

Physical and Mental Benefits of Biophilic Design

Biophilic design has been shown to reduce stress, which lowers blood pressure and cortisol levels while promoting feelings of comfort and restfulness. It can also improve cognitive function and creativity, which is especially important for education and office settings. In fact, a study of 2,593 schoolchildren in Barcelona, Spain researched how exposure to green space affected cognitive development of school children between the



Named by the Kitsumkalum community, Wii Gyemsi-ga Siwilaawksat translates in Sm’algyax to “Where learners are content or comfortable.” And for Coast Mountain College First Nations students like Kobe Antoine, that’s exactly what this warm inspired space means to him. “It makes me want to put in more effort into my work because I finally have the right workspace to think clearly,” says Antoine. “It makes me feel acknowledged as a student and I just really want to keep learning here.”

¹<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.700709/full>

²<https://www.frontiersin.org/articles/10.3389/fpsyg.2021.700709/full>

³Kellert and Edward O. Wilson. The Biophilia Hypothesis. Washington, D.C.: Island Press, 1993.

⁴Barbiero Giuseppe, Berto Rita. Biophilia as Evolutionary Adaptation: An Onto- and Phylogenetic Framework for Biophilic Design. *Frontiers in Psychology*. Volume 12. 2021

⁵<https://www.worldbank.org/en/news/feature/2007/07/11/more-than-half-the-world-is-now-urban-un-report-says> https://www.who.int/health-topics/urban-health#tab=tab_1

⁶ <https://doi.org/10.1016/j.envpol.2023.122143>



ages of 7 and 10. “This study, based on comprehensive characterization of outdoor surrounding greenness (at home, school, and during commuting) and repeated computerized cognitive tests in schoolchildren, found an improvement in cognitive development associated with surrounding greenness, particularly with greenness at schools.”

Nature can also regulate emotion, mood, and visual preference for a space or goods. For example, in retail and hospitality settings, visual, tactile, and olfactory cues are important and can aid in branding and consumer experience if they are connected to nature. Experiences with nature, whether real or simulated, have also been shown to improve wellbeing and expedite healing. In healthcare, biophilic design can lead to shorter hospital stays, fewer negative comments, and fewer strong analgesics. As you can see, exposure to nature in the built environment is vitally important for the health, wellbeing, and cognitive functioning of building occupants, especially as the world population continues to urbanize. Architects and designers will play a key role in facilitating this connection to the natural world through biophilic design.

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Importance of Resilient Design

It’s now undeniable that climate change is exacerbating the severity, frequency, and duration of extreme weather events such as hurricanes, tornadoes, earthquakes, flooding, wildfires, massive snowstorms, and droughts. While there is a growing global decarbonization effort to lower greenhouse gas emissions that are contributing to climate change, that is a long-term solution, and it will take decades to reverse the environmental harm that has already been done. The reality is that these extreme weather events will continue far into the future and are likely to worsen. In the meantime, the building community must coalesce around efforts to design and build more resilient structures that can withstand high winds, flooding, earthquakes, and fire.



Wood and Wellness

BC Cancer Supportive Care Center

Credit: BC Cancer | Photographer: Chris Rollett

Supportive care experts and allied health professionals are trained in the use of evidence-based approaches to address the physical, psychosocial, and spiritual needs of patients and families facing cancer. However, cancer centers can often be triggering environments for patients because these sites are associated with memories of receiving a difficult diagnosis or being sick. To respond to the unique needs of families facing cancer and provide them with the highest-quality care, The BC Cancer Foundation established a stand-alone Supportive Care Center in Vancouver. This patient-focused environment is distinct from BC Cancer treatment sites and focuses exclusively on patient and family needs.

How do you create a healing environment? More and more studies show that incorporating elements of nature into indoor spaces is key to improving the well-being of its occupants. Biophilic design is proven to provide substantial therapeutic benefits including reducing stress and anxiety. This, in turn, expedites the recovery process. Thus, biophilic design in healthcare has many benefits. Accordingly, many architects recognize that woods, such as western red cedar, are essential when it comes to designing health care facilities. Wood has been used as a building material for millennia, but we're now beginning to understand that it has healing benefits as well. Researchers are finding spaces with natural materials

like wood have been shown to reduce sympathetic nervous activity and blood pressure, stress-related illnesses, and contribute to a patient's health and wellbeing.

With that in mind, the BC Cancer design team built the Supportive Care Center to include western red cedar features within the reception area, waiting room, and main corridor, as well as two boardrooms to provide warmth and healing elements that helps patients, and their loved ones focus on their wellness. This way, families facing cancer feel the calming effects of warm, soothing cedar throughout the building. And by decreasing nervousness and anxiousness, patients and their loved ones are more receptive to the many healing services the center has to offer—including physical, psychological, and spiritual. From the time of diagnosis and up to 18 months after treatment, patients can receive support by the center's dedicated healthcare professionals.

By promoting wellness, finding practical solutions, and supporting patients in a welcoming and calming environment, BC Cancer has become a leader in holistic cancer care, resulting in improved outcomes and quality of life for British Columbians. The clinic covers counseling, psychiatry, and other allied health services normally done in the main center. Spaces include meeting rooms, consult rooms, phone rooms, reception areas, offices, and a wonderful patio.

⁷ <https://www.realcedar.com/blog/biophilic-design-in-healthcare/>

Learning Objective Two

Examine the importance of incorporating biophilic design into the built environment.

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Biophilic Quality Index

Until recently, “green” architecture, or sustainable design, has focused on the energy performance of buildings and their impact on the environment but doesn’t consider how incorporating natural elements into building design and could impact occupants. “Sustainability does not really push architects to go beyond form and scale design to encompass the wellbeing and quality of life of users, which should be among the most important architectural considerations today.” But this is changing with more recent programs such as The WELL Building Standard and The Living Building Challenge that take a more holistic view of sustainable design and its impact on occupant health and wellbeing. In their publication *The Biophilic Quality Index: A Tool to Improve a Building from “Green” to Restorative*, the authors discuss a reliable instrument they have developed that can be used to calculate to what extent a building is biophilic. They call it the Biophilic Quality Index (BQI) and posit that to achieve a balance between sustainability and biophilia, a paradigm shift from “green” to “restorative” is needed to really accomplish biophilic design. “The BQI can be used both as a guide to follow for a building-to-be, and as a rating system for an existing building, where the final score (a percentage) represents the room for improvement. The BQI will help architects integrate nature in design and promote understanding that to plan restorative environments is not only an aesthetic need but a necessity for human being’s efficient cognitive functioning.”¹⁰

Growth of the “Wellness Real Estate” Market

Beyond professionals in the architectural community that have been moving toward a holistic view of sustainability and wellness in building design, consumers are increasingly aware of how their lifestyle and external environmental factors impact their health and wellbeing. They are seeking solutions to enhance their health and wellness and are looking directly to the real estate industry to align with these expectations. According to the Global Wellness Institute (GWI), wellness real estate is defined as “the construction



Credit: Kayak Point | Architect: Christopher Wright Architecture
Photographer: Anna Spencer

“We recently surveyed homeowners and single-family renters with household income of \$50K+, and we found that almost all (93%) say that wellness is important to them. While less than half (43%) of respondents said health impacts were a factor in choosing their current home, 73% say it will be a factor in selecting their next home. The only ‘must-have’ wellness feature at the mid-priced real estate level are a connection to the outdoors.”

- Mikaela Arroyo, New Home Trends Institute director at John Burns Real Estate Consulting

¹⁰<https://www.univda.it/wp-content/uploads/2018/11/2017-VfS-8-38-45-BQI.pdf>



Kayak Point | Architect: Christopher Wright Architecture
Photographer: Anna Spence

of residential and commercial/institutional (i.e., office, hospitality, mixed-use/multi-family, medical, leisure, etc.) properties that incorporate intentional wellness elements in their design, materials, buildings, amenities, services, and/or programming.” Wellness real estate now represents a key industry within the global economy and was a \$275 billion industry in 2020.¹¹

Boston University’s School of Hospitality Administration notes, “It can be anticipated that such developments will likely become the norm, progressively transforming residential neighborhoods and cities. Such a transformation would benefit populations and the environment, and result in higher profitability and returns for all stakeholders. Although wellness real estate represents a small portion of the real estate industry, the benefits it brings are expected to generate a rising interest from stakeholders globally.”

Important design details for wellness real estate in individual facilities are orientation and form; materials; and biophilic design.

Orientation and Form

This entails positioning and designing the form of the buildings to maximize use of environmental resources (e.g., light, air, views, cross-ventilation) to create comfort and optimize energy consumption.

It’s important to prioritize natural, durable, and functional materials requiring minimal maintenance to create a sense of warmth with surfaces that are soft to touch. To limit the carbon footprint, these materials should be locally sourced. Such materials include natural stones, wood, and textured tiles and should naturally blend with the shapes and tones of the local landscape.

Wood is one such material that is natural, durable, and functional and requires minimal maintenance, particularly when used in interiors. Bill Browning of Terrapin Brightgreen, when interviewed in the Biophilic Solutions podcast, notes that wood has the ability to patina with age versus wear down, necessitating less frequent replacement. This is important for project types such as hospitality, which typically replace furnishings on a 7-year rotation.

Biophilic Design

Incorporating nature into the building can increase the sense of connectedness to the natural environment. This can be achieved with vegetation walls (internal/external), designs mimicking natural forms and patterns, and water features.

⁹ <https://www.univda.it/wp-content/uploads/2018/11/2017-VfS-8-38-45-BQL.pdf>
¹⁰ <https://globalwellnessinstitute.org/what-is-wellness/what-is-the-wellness-economy/>
¹¹ <https://www.bu.edu/bhr/2022/03/29/a-guide-to-developing-wellness-real-estate/>
¹² <https://www.bu.edu/bhr/2022/03/29/a-guide-to-developing-wellness-real-estate/>

15 Patterns of Biophilic Design¹⁴

Terrapin Bright Green, an environmental consulting and strategic planning firm, is the leading authority on biophilic design and notes that experiences of nature in the built environment tend to fall into three broad categories, which can be further broken down into 15 patterns of biophilic design. The three categories are Nature in the Space, Natural Analogues, and Nature of the Space. This is just a brief overview of the 15 patterns of biophilic design, which Terrapin leaves to the designer to interpret, but we will discuss specific patterns as they relate to wood a bit later in the course.

Nature in the Space

Nature in the Space refers to having direct, physical experiences with nature in the built environment. These can include views of landscapes, plant life, water, and animals, as well as breezes, sounds, scents, and other natural elements. Terrapin says, “The strongest Nature in the Space experiences are achieved through the creation of meaningful, direct connections with these natural elements, particularly through diversity, movement, and multi-sensory interactions.”

Nature in the Space encompasses seven biophilic design patterns:

- Visual Connection with Nature
- Non-Visual Connection with Nature
- Non-Rhythmic Sensory Stimuli
- Thermal & Airflow Variability
- Presence of Water
- Dynamic & Diffuse Light
- Connection with Natural Systems

Natural Analogues

Natural Analogues refers to indirect experiences of nature in the built environment. These include collinear (points in a straight line) and biomorphic forms, natural materials, and a level of complexity and order through materials or patterns, such as fractals. Terrapin says, “Objects, materials, colors, shapes, sequences, and patterns found in nature can manifest as artwork, ornamentation, furniture, décor, and textiles in the built environment. For example, mimicry of shells and leaves, furniture with organic shapes,

and natural materials that have been processed or extensively altered (e.g., wood planks, granite tabletops), each provide an indirect connection with nature. While they are real, they are only analogous of the items in their ‘natural’ state.”

Natural Analogues encompasses three patterns of biophilic design:

- Biomorphic Forms & Patterns
- Material Connection with Nature
- Complexity & Order

Nature of the Space

Nature of the Space addresses spatial configurations in nature. This includes our innate and learned desire to be able to see beyond our immediate surroundings (distant views through a space); our fascination with the slightly dangerous or unknown; obscured views and revelatory moments; and sometimes even phobia inducing properties when they include a trusted element of safety. It should be noted that Pattern 15—Awe, was added in 2020 and is not included in Terrapin’s 14 Patterns of Biophilic Design, published in 2014.

Nature of the Space encompasses four biophilic design patterns:

- Prospect
- Refuge
- Mystery
- Risk/Peril
- Awe

Of the 15 patterns of biophilic design, wood falls most clearly into Biomorphic Forms and Patterns—Pattern #8 and Material Connection with Nature—Pattern #9.

¹³<http://www.terrabinbrightgreen.com/wp-content/uploads/2014/04/14-Patterns-of-Biophilic-Design-Terrapin-2014e.pdf>

¹⁴Ikei H, Song C, Miyazaki Y. Physiological Effects of Touching Wood. *Int J Environ Res Public Health*. 2017 Jul 18;14(7):801. doi: 10.3390/ijerph14070801. PMID: 28718814; PMCID: PMC5551239.

¹⁵<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8472742/>



The Nordic Barn House Project

Aarhus, Denmark

Credit: Nordic Barn | Architect: Bruno Jakobsen Design
Photographer: Bruno Jakobsen, Jakob Lerche

Set on a hilly, forested plot of land, this spa-like compound is all about communing with nature. Every structure on the property is situated in such a way that all the existing deciduous trees remain untouched and can be experienced from the inside. This was especially important for the architect, Bruno Jakobsen, who designed the home for his family. Being both client and architect gave him the opportunity to explore his creativity and raise the bar on innovative ways to harmonize with the surrounding ecosystem. “I allowed myself to play and test new ways of thinking about housing and architecture,” explains Jakobsen. “The project had to benefit the surrounding nature 100%. It was important that everyone in the family should have the pleasure of looking at nature, regardless of where in the house they stay.”

The result is two contemporary longhouses connected by a glass atrium in the middle, along with a workshop, studio, sauna tower, outdoor soaker tub and a goat shed surrounding the wooded landscape. All of which are clad in beautiful sustainable western red cedar. As are the floating overhangs on both sides, which break up the facades, an architectural detail that gives something completely unique to the whole project. “It was the plan from the start - I’m a big fan of western red cedar,” says Jakobsen of nature’s most versatile building material. “The choice of cedar has clearly moved the project up a level. Cedar creates an expression that other materials can’t imitate.”

Learning Objective Three

Describe the properties of wood, specifically western red cedar, and how it elicits biophilic responses in building occupants.



Add photo credits: Wii Gyemsiga
Architect: hcma
Photographer: Brit Kwasney

Biophilic Responses to Wood

According to Terrapin Bright Green's 2022 publication, *The Nature of Wood – An Exploration of the Science on Biophilic Responses to Wood*, “Designing elements of nature into the built environment can have health benefits including stress reduction, improved cognitive performance, enhanced moods, and increased preference for spaces. These benefits are often referred to as ‘biophilic responses’ and we have a particularly strong biophilic response to wood, more than almost any other material.” These biophilic responses include the haptic response, olfactory experience, and visual experience. Wood can also have a thermal response on the body and sound absorption qualities that can make a space more pleasant to inhabit, but there have been fewer studies about these biophilic responses to wood.

Haptic response

The haptic response, or our sense of touch, is elicited by the tactile feel of wood. In a blindfolded experiment that aimed to clarify the physiological effects of touching wood with the palm, in comparison with touching other materials on brain activity and autonomic nervous activity, participants placed their palm on a panel of stainless steel, tile, marble,

or white oak. Touching the oak panel led to increases in activity of the parasympathetic (rest and calming) portion of the nervous system that did not occur with the other materials. The study says, “These results may be due to wood having lower thermal conductance than metal or stone, and therefore feels closer to the perceived ambient temperature of a space.”

Olfactory experience

Smell has a way of quickly and powerfully eliciting memories and a physiological response to these olfactory experiences. The natural smell of cedar and other woods can elicit a biophilic response that is calming and triggers neuropathways similar to anti-anxiety drugs. It can also level blood pressure and heart rate. For example, a study of the respiratory response and heart rate among participants who slept in a bed made of fragrant stone pine showed significant physiological improvements compared to those in a bed made of chipboard covered in melamine. The researchers attributed this outcome to the conifer resins, including limonene. *It should be noted that the natural scent of wood will dissipate over time, so the olfactory experience should not be heavily relied upon in biophilic design.

Visual experience

Most of the research around our biophilic responses to wood center around the visual experience. Nature-made and human-made objects and environments are processed differently in the brain, with humans typically preferring the former. The brain visually identifies and processes images by association, subconsciously separating things as living or non-living. Terrapin Bright Green says, “While wooden objects are crafted by humans—a process that is often considered manufactured or unnatural—the wood itself is still considered to be ‘natural,’ which may

“The feel of the cedar is just special,” explains project architect Claes Cho Heske Ekornås. “It’s extra soft compared to some other materials. And tactility is important when it’s so much wood, to physically touch the walls and ‘feel’ and experience the house.”

– Claes Cho Heske Ekornås

“The backdrop of western red cedar in both vertical and horizontal lengths looks and smells wonderful in all four seasons.”

– Andrew Noseworthy, Homeowner

“My designs result from an interplay of details, textures, form, and place. I’m particularly interested in the experiential quality of architecture, motivated by how space, texture, light, and materials feel. Cedar has a rich experiential quality that contributes to the atmosphere of beauty and natural presence I seek to create. It is a friendly and flexible material that suggests warmth and a connection to nature. It has a tactile quality, smells good, provides excellent acoustics, and has a particular psychological effect on us—a calming and restful effect. Being surrounded by cedar makes us feel good. It is also a material with thousands of possibilities for use. On a small scale, it has endless possibilities for exquisite detailing. On a larger scale, cedar has great potential to create serene structures intimately connected to the landscape. Structures clad in cedar seem to have a unique ability to appear as if naturally growing out of their surroundings.”

– Christopher Wright, *Cedar Book XV*

hint at why research suggests we like having wood around us in buildings. Wood has been used in the construction of shelters and artifacts for thousands of years in cultures around the world. It historically has been a plentiful resource that is readily shaped by simple tools.”

The visual presence of wood in a room leads to perceptions of warmth and comfort, which lowers blood pressure levels and heart rates and activates the parasympathetic nervous system, which restores the body to a calm and composed state. People visually identify natural objects by their surface characteristics, which for wood includes the color, grooves, knots, and grain. Regarding color, people tend to prefer untreated wood in the red to yellow spectrum, which evokes warm feelings and calm. Think of western red cedar. The Nature of Wood states, “When the brain looks at wood, it is (almost) instantaneously identifying the curves of the wood grain and surface appearance to determine the type of material. Whether the object is a chair, guitar, spatula, beam, or sheet of plywood, it is identified as wood by the patterns on the surface.”

Collinear, contour, curvilinear, parallel, and radial patterns are ubiquitous in nature, so when people see these recognizable patterns in the built environment it makes visual processing easier. Likewise, fractals are layered self-repeating mathematical patterns that occur frequently in nature (e.g., snowflakes, fern leaves, waves, and dappled light from a tree canopy) and create a biophilic response when viewed. They are so common in nature that when we see fractal patterns, even in man-made objects, it is easy for the brain to process the image and measurably lowers our stress level—this is called fractal fluency.

People have visual preference for patterns with mid-range complexity, which can elicit restoration and relaxation. But highly complex patterns cause stress. Similarly, lines running in the same direction are easier to process, while lines running in multiple directions take more effort. “The brain will follow curvatures and contours, and even connect short segments of lines to discern a longer curving pattern. These pattern conditions occur frequently in nature and our brains, it could be argued, are predisposed to easily decipher them.” In the built environment, wood grain that features collinear lines and nested fractal patterns (layered oval shapes in the wood grain) is easy to process and therefore desirable, making it a strong driver of biophilic design. Because we see these patterns so often in nature, they elicit a response when we see them in wood.

Why Use Western Red Cedar in Biophilic Design?

Western red cedar is an optimal wood species choice for biophilic design. The wood’s rich tonal range and beautifully pronounced grain immediately connects people to nature. It’s also a top-performing building material that will enhance the wellbeing of occupants for decades to come. Western red cedar comes in a wide range of sizes, grades and profiles, which gives design teams flexibility in creating their desired look.



Shoreland Overlook

Squam Lake, New Hampshire

When building on a slope that leads down to renowned Squam Lake, minimizing your environmental impact is paramount. That's because the pristine, clear waters are a nesting site for loons, eagles, and great blue herons. It's also home to many fish species, including bass, pickerel, perch, trout, and salmon. And then there's the surrounding forest, an intricate ecosystem in and of itself but also a crucial component to protecting the marine habitat below.

"As one moves through the home," says lead architect Tom Murdoch, "spaces and views unfold, allowing the site's natural features to reveal themselves through an architectural framework of linked vantage points and framing devices. This is most heightened at the entry breezeway and covered bridge, where these elements join the disparate architectural geometries of the adjacent buildings." As well as an innovative

Architects: Murdough Design Architects: Tom Murdough, Jenny Tjia, Robert Potish, Ben Tulman
Photographer: Clayton Boyd

building program, choice in materials played a major role in creating a seamless connection between structure and site. With that in mind, Murdough opted to use naturally beautiful, sustainable western red cedar extensively throughout. "The building's exterior is restrained and camouflaged in the wooded site with dark stained cedar siding favoring the shadows and glazing either disappearing or reflecting the surroundings," says Murdough. "Inside, western red cedar was used to create a warm and calm environment that intentionally highlights the natural landscape beyond."

"Beyond the performance advantages, we select western red cedar for most of our projects for its clean and quiet grain pattern and its warm, soft coloration." - Tom Murdough, AIA

Learning Objective Four

Explore how designers can use wood in the built environment and case studies where western red cedar contributed to biophilic design.

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Design Considerations for Using Wood in the Built Environment

Wood provides warmth and richness that contrasts well with more modern materials such as concrete, steel, and glass. When using wood in the built environment, it's key to prioritize the wood grain and contour lines by making them readily visible rather than hiding the grain with paint or a stain that is so dark that it hides the grain. The number of grooves and knots is also an important consideration. The look of knotty cedar may be desired, as it adds texture and contrast, enhancing the symbiotic dynamic between a home's interior and exterior. Occasional knots do not distract from the contour lines, but too many knots can “negate the stress reduction characteristics of the collinear and contoured patterns in wood.”

It's also important to consider the amount of wood used in a space—too much wood can have a negative effect on physiology and psychology, while too little won't elicit a response.

The number of building products on the market today that attempt to simulate the color, grain, and texture of wood is astounding, but synthetic wood products don't hold a candle to real wood. Wood creates an immediate and seamless connection to natural surroundings that no synthetic wood can replicate. This is because wood was alive and has a cellular structure that is present even after harvesting. Light bounces off those cells, giving wood a reflective quality that is unique to the material. “This can make both the grain pattern and surface color appear to change. Fake wood does not have a cellular structure and thus far cannot replicate this visual experience.” Nature still knows best—despite all efforts at imitation, no man-made product can match the beauty, performance, and longevity of western red cedar.

A Note About Finishing Wood

To maximize the biophilic effect of wood it's ideal to maintain the rich beauty of western red cedar's natural color versus finishing with an opaque coating such as solid stain or paint. This natural color can be enhanced or modified by applying any number of commercial finishes such as transparent or semi-transparent stains. If left in its natural state, some darkening or graying of the wood can be expected as it ages and the color variation will become less pronounced. Western red cedar is pitch and resin free, so it takes stains and oils very well. What's more, there are some stunning new ways to finish western red cedar now on the market. Products like bleaching stains and weathering products create the gorgeous silvery gray look of aged cedar and provide water repellency.

Exterior finishes

Transparent and semi-transparent stains let the incredible natural luster of the wood shine through and highlight the grain. Sometimes referred to as water-repellant preservatives, transparent stains do not alter the appearance of the cedar because they only slightly modify the color (tone) of the wood. Transparent stains are similar in composition to semi-transparent stains, but they contain fewer or no pigments. Solvent borne semi-transparent stains contain pigments that provide color—including cedar tones—and greatly increase the durability of the finish by partially protecting the cedar surface from the damaging effects of the sun's ultraviolet rays.

Wood and other elements of nature can be incorporated into any type of residential, commercial, or institutional project to bring nature indoors and promote wellbeing, reduce stress, and improve mental health for occupants. An increasing number of architects and their clients are starting to appreciate cedar's stunning appearance and ability to beautify interior spaces. Western red cedar introduces warm, natural beauty into interiors and will last the lifetime of the building if cared for properly. Bringing cedar inside is the best way to add visual appeal and create a greater connection to nature. There are myriad interior uses, from ceilings and soffits to feature walls, wood paneling, exposed posts and beams, louvers, furniture, and cabinets.

As for ceilings and soffits, western red cedar paneling is a showstopper that works well in both contemporary and traditional homes—especially when it’s fanned out in a natural range of colors. Cedar beams with a hint of wrought iron can infuse an urban edge, while cedar soffits can carry from the exterior to the interior for a look that connects the indoors to the outside. Whether it’s just one dramatic feature wall

“We often find that use of wood indoors also naturally helps warm up the space, especially in the case of modern designs where much of the interior is streamlined and focused on views beyond.”

– Jake Weber, Weber Architects

in a strikingly modern setting or an entire room with rustic charm, tongue-and-groove paneling, feature walls, and room dividers will elevate the beauty and vivacity of the space. Like all cedar products, tongue-and-groove is incredibly versatile. For example, you can specify tongue-and-groove paneling with a rough face for a more

textured look or smooth face for a more polished look. The pieces can be joined with V-shaped, flush, reveal, or radial joinery and the desired shadowing effect can be achieved by combining one of these joinery techniques with select surface textures.

Exterior Applications

While it might not have quite the dramatic biophilic response as interior applications, there are many reasons to use wood on the exterior of buildings for siding, trim, soffits, decking, as well as cedar shingles and hand split shakes. Western red cedar siding provides a wealth of options to provide the perfect look for a building, as it can be finished to complement all styles of architecture from modern to traditional to rustic. It comes in both clear and knotty grades, a variety of surface textures, and a spectrum of profiles and patterns, which can create very different styles for a home or building. These profiles can be installed vertically or horizontally and will create different shadow and line effects once on the wall.

“The cedar application in this design was intended to serve as a visual transition and connection to the surrounding natural setting—a way to connect the inhabitant to nature seamlessly through design,” says Whisenhunt. “So, in this way cedar helped us meet our biophilic design goals.”



Nordic Barn | Architect: Bruno Jakobsen Design | Photographer: Bruno Jakobsen, Jakob Lerchea



Kayak Point House Stanwood, Washington

Using naturally warm building materials and design innovation, the Kayak Point House is all about creating calming spaces and making occupants feel at one with nature. Prior to working with Christopher Wright Architecture, the homeowners enjoyed their waterfront property in its natural state for years. They cherished the views and the trees so much, they only wanted to develop if they could preserve the land's inherent beauty. So, when Wright came onboard, the biggest challenge was placing the house among all those beloved trees without removing any or disrupting their root systems.

The solution? The central section of the house was not given a foundation. Instead, Wright designed two large steel beams to span and suspend the entry and study, creating a bridge between the bedroom wing and the living, dining, and kitchen areas. The clients also wanted a single level home to better disappear into the texture of the land. The result is a modest and simple but finely detailed house. "The house is not large but has a great variety of spatial experiences with a mix of high and very low ceilings," explains Wright. "There is a balance of intimate and expansive spaces. One can almost reach up and touch the cedar ceilings in much of the house."

As a long-time practitioner of biophilic design, Wright knows how important Western Red Cedar paneling is when it comes to increasing connectivity between occupants and the natural world. "From the beginning, a primary goal was to create calming spaces rooted in the site," says the award-winning architect. "We used cedar for its tactile quality and beauty and to reflect the immediate surroundings and expansive windows to bring natural light throughout the day. The color and feel of the cedar changes throughout each day and season, providing a wonderful sense of sensory variability."

His appreciation of cedar's ability to enhance a home's look and feel extends to exterior applications as well, which is why he opted for western red cedar siding. And he's glad he did. "The cedar makes the house what it is," he says. "I can't imagine it clad in any other material."