Hello, my name is Janice Goodman and as interior landscaper, I've been increasing building occupant wellness and productivity since 1983. I do this by increasing our occupant's access to nature and stimulating the biophilic responses that are hard-wired into each of us.

There is a lot of research that supports the statement that access to nature increases our health and wellbeing. Some of it was conducted as early as 50 years ago and some of it, especially the economic impacts of increased wellbeing and productivity, is more recent.

I share these research findings and survey results with my clients. And then I take a walk with them, and it is easy for them to see the effect that biophilic design has on people.

To start things off I'd like to share with you the award-winning video clip, ***Nature Rx.***

Photo: Furbish Co. BioWall Design Guide

I'm here representing Green Plants for Green Buildings, actually, I am newly elected fiorst women president of this 501-c3 founded in 2006 and we're dedicated to communicating the aesthetic, wellbeing, and economic benefits of nature in the built environment.

That's a mouthful so we frequently shorten that up to the "AWEsome" benefits of nature in the built environment.

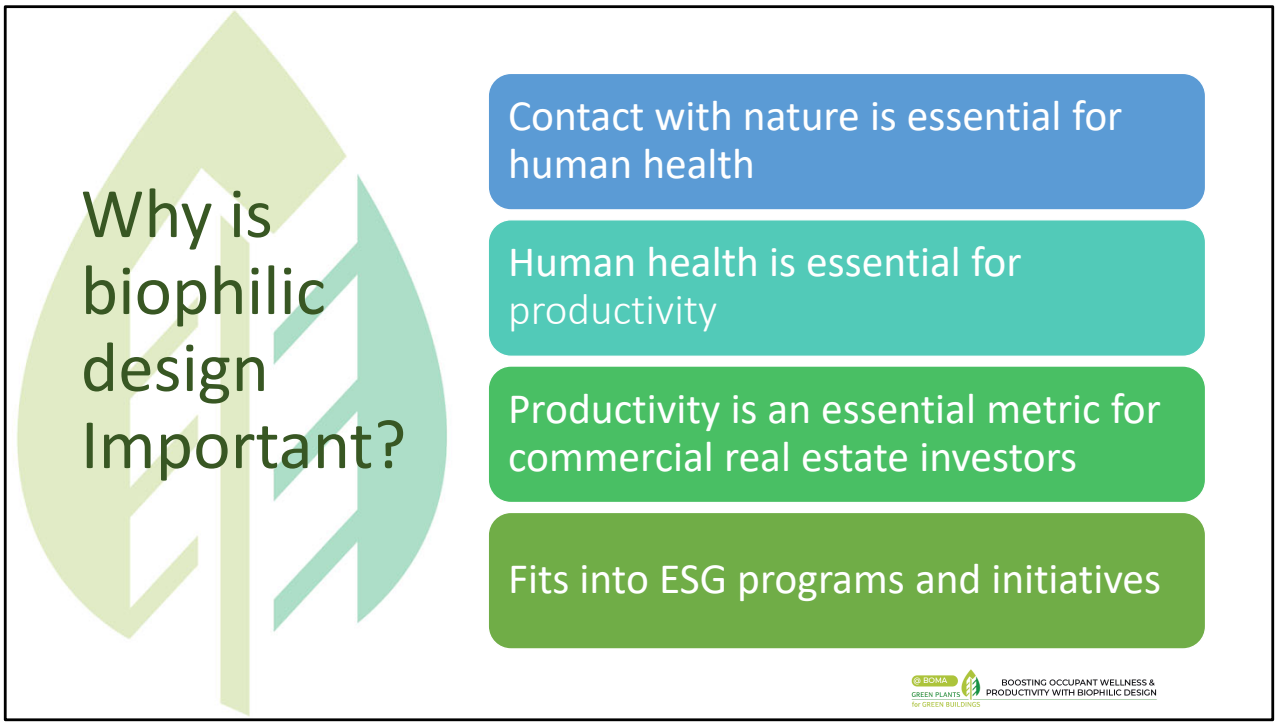
We communicate by hosting a webpage of curated relevant research and articles, by maintaining a robust social media campaign on LinkedIn, Instagram, Twitter, Pinterest, and Facebook, and by writing continuing education curriculum that is credentialed by BOMA, USGBC, AIA and others.

Here's a sample of the research available on the website.

Our social media posts…

LinkedIn, Twitter, Instagram, Facebook, Pinterest, Youtube.

The credentialed continuing education courses we offer.



Why is biophilic design Important?

ESG means using Environmental, Social and Governance factors to evaluate companies on how advanced they are with sustainability.

As of 2007, most human beings **around the globe**, are urban dwellers, despite having spent 95% of our evolutionary history in natural environments. The migration to cities has only occurred within the last 200 years and our bodies and minds have had difficulty adapting to such a drastic environmental change.

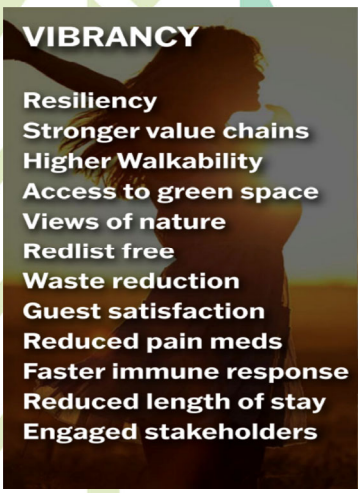
Research has shown that our brains and bodies evolved to respond to natural stimuli in ways that helps our nervous system reset and restores optimal functioning.

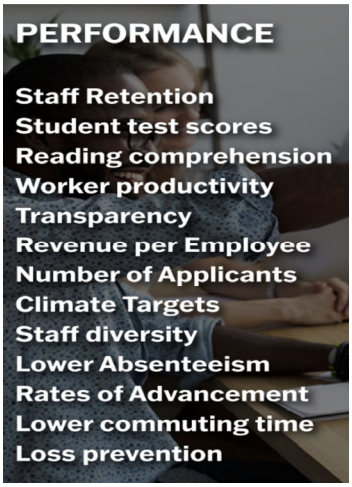
Urbanization has brought with it, higher levels of stress, crime, depression and lower levels of productivity and learning, sometimes in the forms of absenteeism and presenteeism.

Regarding lower levels of productivity, did you know that in the workplace, loss of productivity costs are 10x greater than all other operating expenses combined?

Considering this, we can conclude that incorporating nature into the built environment is not just a luxury, but a sound economic investment for anyone in the business of managing people.

Why is optimizing for wellness and productivity important? Here's the big picture.





BOOSTING OCCUPANT WELLNESS & PRODUCTIVITY WITH BIOPHILIC DESIGN

This is a 2021 survey of global real estate investors conducted by the Center for Active Design (organization that developed and administers Fitwel), United Nations Environmental Program Finance Initiative, and Bental GreenOak, a global RE investment company.

The respondents manage $5.75 Trillion (US dollars) of global real estate assets.

This survey indicated that 87% of those surveyed have experienced a demand for healthier buildings over the past 12 – 24 months, and 89%, almost 90%, of them have plans to enhance their company's health and wellness strategies.

They report receiving a 4.4 to 7% increase in the rent rate per sq ft for their healthy buildings.

61% will use a healthy building certification system.

You can find this and the following survey reports on the GPGB website too at https://greenplantsforgreenbuildings.org/research/.

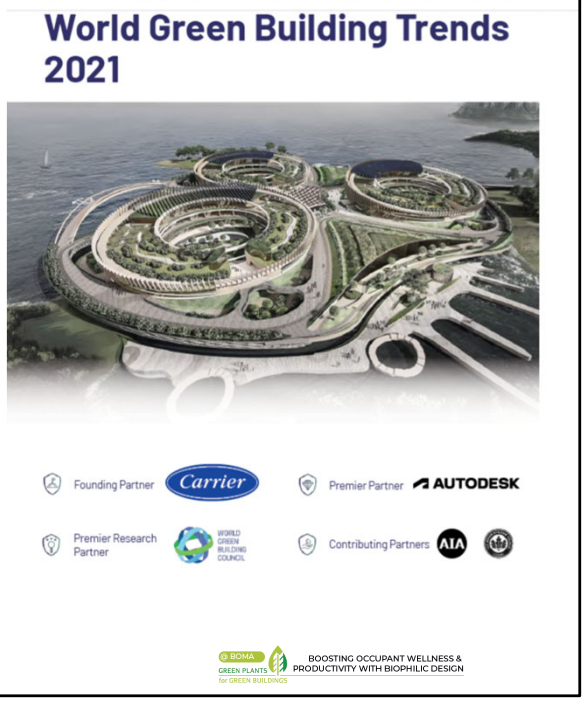
Why is optimizing for wellness and productivity important?

Survey highlights/conclusions include:

•"Owners report that green new buildings and renovation/retrofit projects **increase the asset value of buildings by more than 9%.**

•"a 14-point growth in the share of those who intend to do the majority (more than 60%) of their projects green, up from 28% doing so now in 2021 to **42% who plan to do so in the future"**

•Over ¾ of the respondents rated improved occupant health and well-being, and sustainable business practices as important/very important reasons for building green.

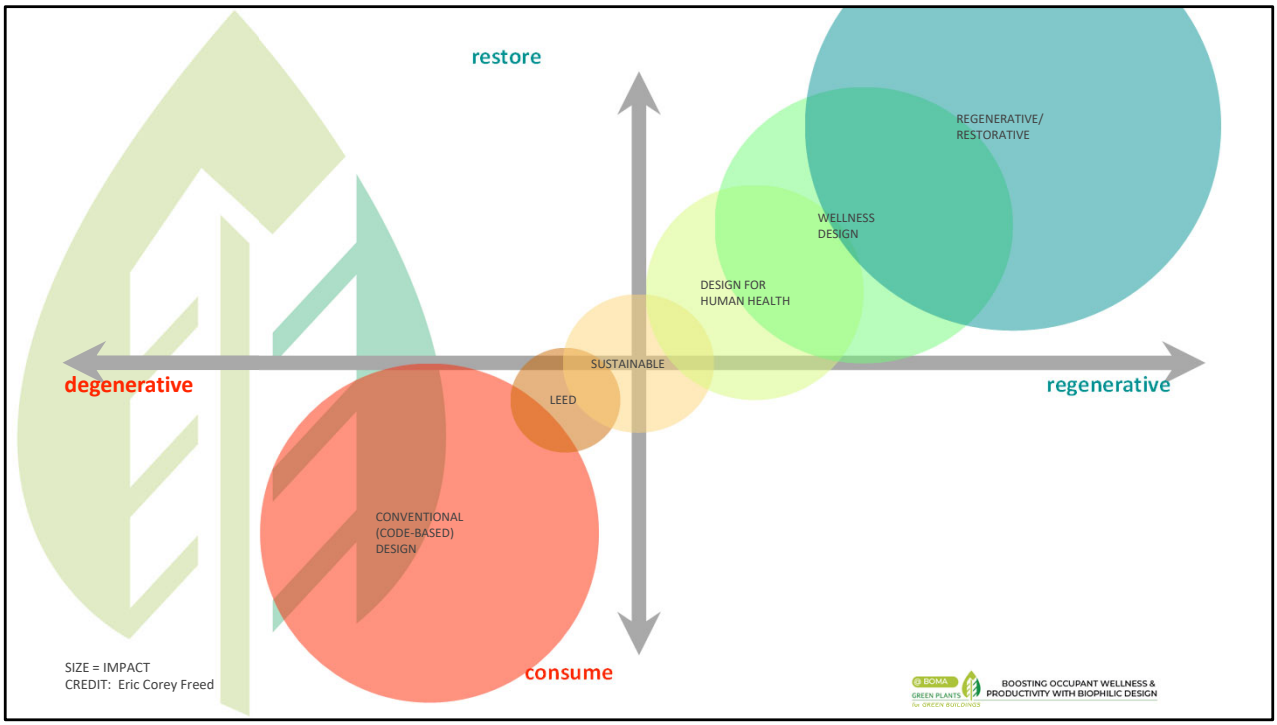


The demand from building owners is growing. This trends report **specifically surveys biophilic design** as a green building feature.

The report contains these insights**:**
•"Owners report that green new buildings and renovation/retrofit projects **increase the asset value of buildings by more than 9%.**

•"a 14-point growth in the share of those who intend to do the majority (more than 60%) of their projects green, from 28% doing so now in 2021 to **42% who plan to do so in the future"**

•And over ¾ of the respondents rated improved occupant health and well-being, and sustainable business practices as important/very important reasons for building green.



Another interesting finding from the 2021 Green Buildings Trend report is this one.
"Since 2018, there has been a significant increase in the share of those who report that "doing the right thing" is one of the top three triggers for increasing their green building efforts. It ranks second among owners/investors, and third among design and construction professionals, just below long-standing important drivers like lower operating costs and client demands, and it even outranks creating healthier buildings as a trigger for new green building efforts.

This finding may be the strongest evidence of the impact of the times in which we live, in which evidence of the impact of **climate change**, such as extreme weather events, is already deeply felt, and in which the need to **manage the risks associated with worsening effects, including increasing the risk of future pandemics,** becomes more influential."

When we incorporate wellness design into our buildings we are participating in a regenerative and restorative design ethic that increases our resiliency to climate change and pandemics.

Thanks to our friend Eric Corey Freed for the loan of this slide that helps us visualize where biophilic design fits into the big picture.

Biophilic design aims to restore natural stimuli in the built environment so our physiological, cognitive and psychological connections to the natural world are maintained, restored, and enhanced.

This design ethic is based on research evidence gathered over the last 50 years.

So what does it look like?

Terrapin Bright Green has long been a leading biophilic design consulting firm and we use their 15 Patterns of Biophilic Design as a framework for describing what biophilic design looks like.

As we look at the case study companies you will hear which biophilic design elements they are using.

The citations for much of the research we mention are found in their publications, which you can download from their website or from GPGB.org.

Three pillar concepts serve as the tenets of biophilic design.

I like to think of it in this way. Within the biophilic design toolbox there are three tools.

The tools are Nature in the Space, Natural Analogs, and Nature of the Space.

A design solution may use one, or all, of these tools in creating or retrofitting a space that connects its inhabitants with nature.

The 1st tool, Nature in the Space refers to the incorporation of light, plants, water and animals into the built environment.

Examples include –

floor to ceiling windows

potted plants

water features

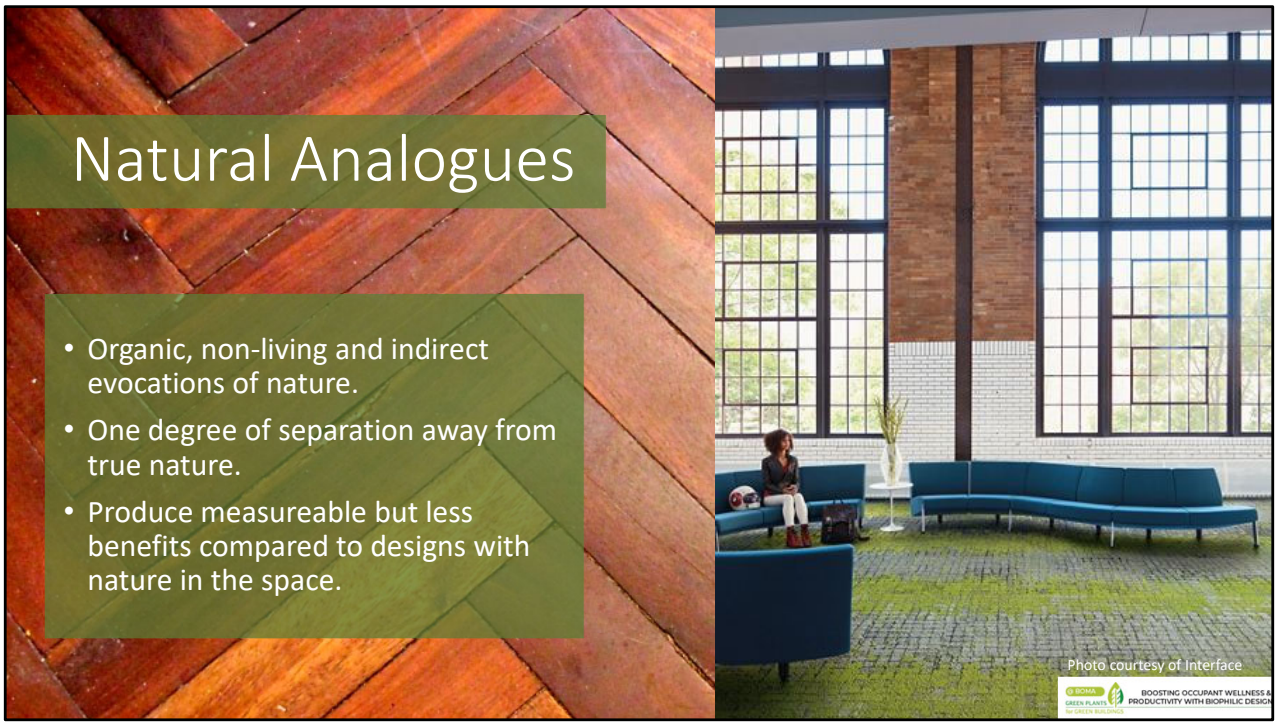
aquariums and courtyard gardens

as well as views to nature from the inside of the building.

Of the three tools, these direct connections to nature—especially dynamic nature that incorporates movement – produce the strongest biophilic reactions.

The very strongest responses were to Nature in the Space designs that included visual and sensory diversity – you'll see this used in the design of the **Uber** building.

Examples include plants at different levels and distances, dynamic movement like those expressed in breezes and water, and sound and aromatic scents.



Natural Analogues

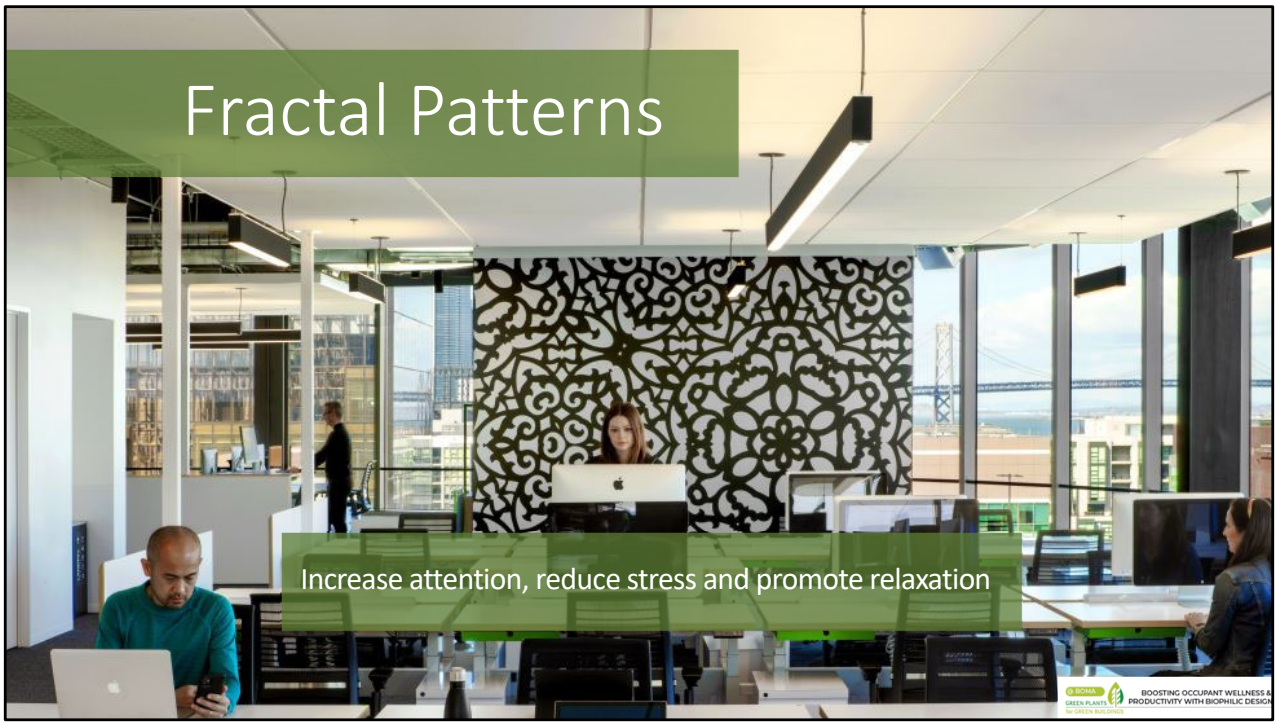
The second tool in the biophilic designer's tool box are Natural Analogues.

Natural analogues provide an indirect connection with nature and are useful in projects where living natural stimuli are not feasible.

What are they? They are objects, colors, shapes, patterns and sequences, like fractal patterns, which are found in nature. They appear in artwork, furniture, textiles, decor and ornamentation.

The well-being benefits of exposure to natural analogues are measurable and effective although less effective than exposure to the first tool, nature in the space.

Photo courtesy of Interface



This is a picture of fractal patterns being used in one of Uber's new campus buildings. Fractal patterns are powerful.

A fractal is a pattern that we observe often in nature, whenever you observe a series of patterns repeating over and over, at many different **scales**, and where any small part resembles the whole, that's a fractal.

Fractal patterns found in nature can affect human neural activity and parasympathetic recovery.
positively
One study concluded that in environments with many stimuli and patterns, the patterns that are most likely to hold our attention and induce a relaxed response are fractal patterns commonly found in nature (Hagerhall, 2008).

The human brain has evolved to process shapes and forms found in nature and does so with minimal effort. This reduces energy required to process imagery and allows for restoration to take place. This is known as perceptual fluency.

The 3rd tool is Nature of the Space.

This refers to the way humans respond to different spatial configurations.

As mankind developed in the savannahs of Africa, our species' existence among low-growing grasses, clusters of shade trees, and broad vistas have yielded a modern-day affinity for similar spaces in indoor and outdoor environments (Kellert et al., 2008).

This rendering of space at Google's new Manhattan campus, St. John's terminal, works with our innate affinity for visual depth and openness. It was designed by architect Rick Cook, CookFox Architects, a firm that specializes in environmentally responsive architecture.

When **Google** acquired this property in 2021, the $2.1 billion dollar purchase price of this property makes it one of the most expensive office building sales in US history.

Nature of the Space

Prospect and Refuge, two commonly used design approaches, are examples of the Nature of the Space biophilic design tool.

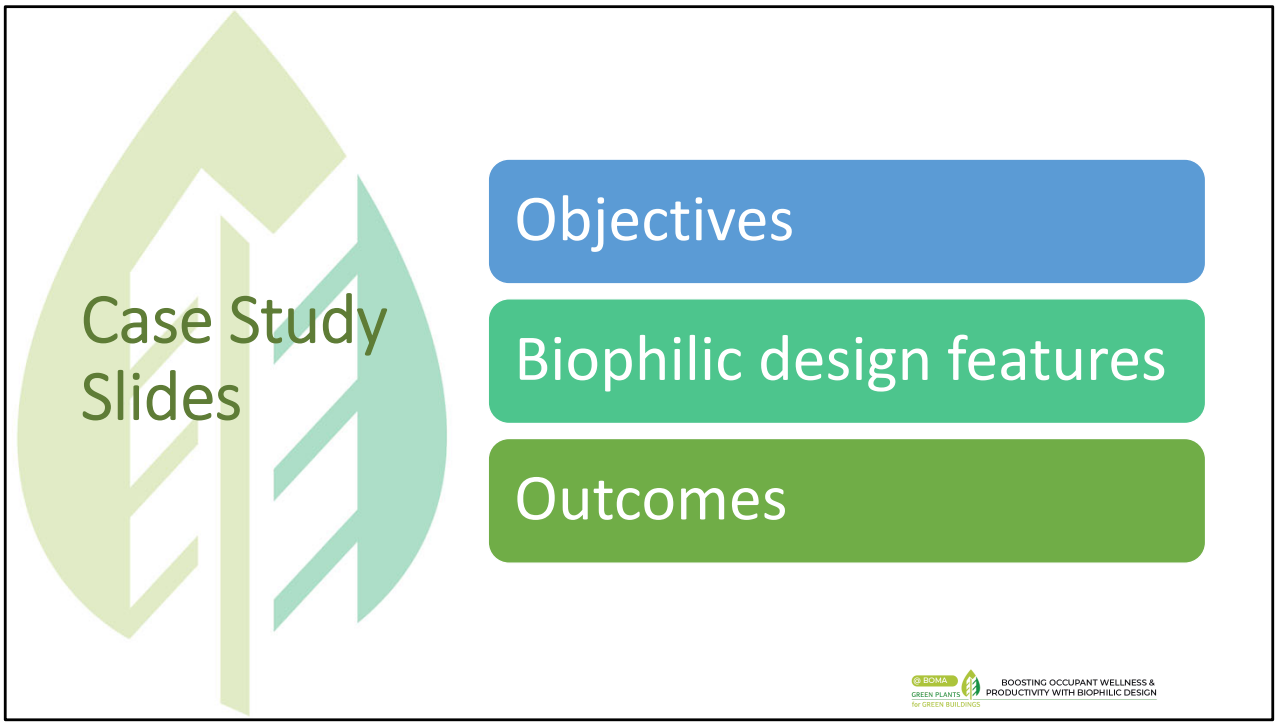
Prospect refers to long views of surrounding settings that allow people to perceive both opportunities and dangers....while refuge provides sites of safety and security.

Both these design features are employed here in the bird's nest shaped meeting space at the upper level inside the **Amazon's** famous Spheres in downtown Seattle.

Refuge

Refuge is also employed as antidote to the intensity and distraction of the open-plan and hot-desking workstation models.

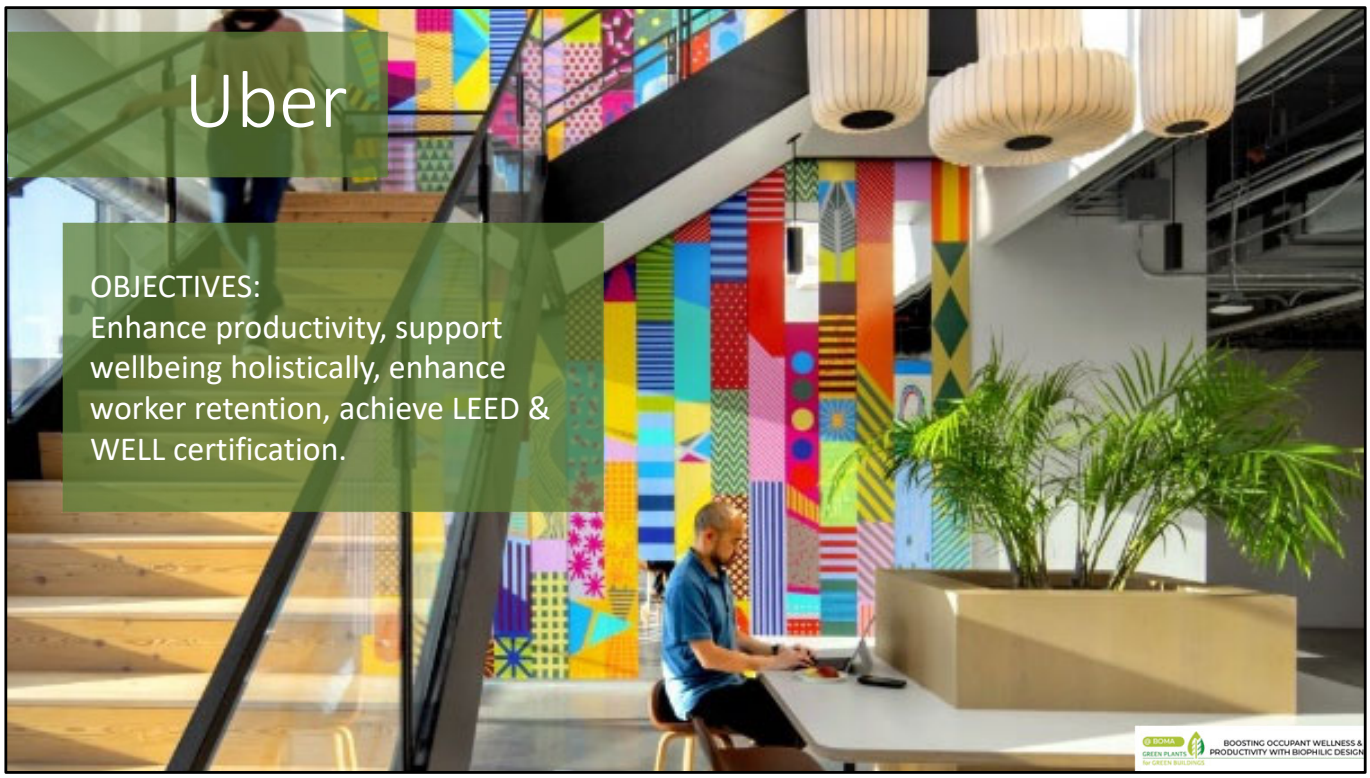
This is a photo of a **Microsoft** employee taking a break in the No-tech lounge at Microsoft headquarters in Redmond, WA.



The pandemic-related upheaval in the workplace has been seismic and nothing in commercial real estate and corporate office management is “business as usual”.

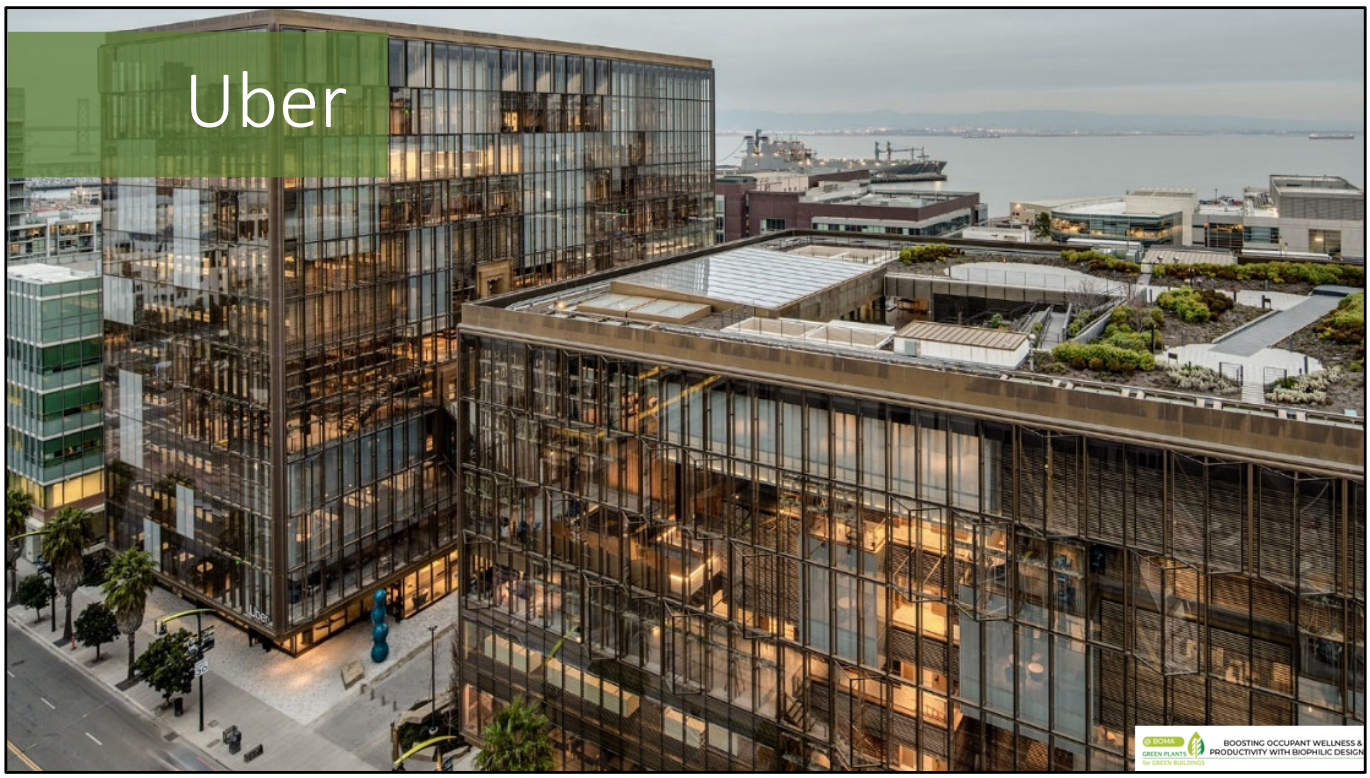
Some leading companies have looked to the science behind biophilic design to help them redesign their offices into spaces that put the focus on their employees’ wellbeing,

And at the same time, strengthen their ESG (environment, social and governance) programs, increase their properties’ value, and build the resiliency of their assets. With the unknown long-term impacts of pandemics and climate crisis, resiliency is highly desirable.



Uber is one such company and its new headquarters in San Francisco, may serve as an inspiring model for the workplace of the future.

OBJECTIVES:
Enhance productivity, support wellbeing holistically, enhance worker retention, achieve LEED & WELL certification.



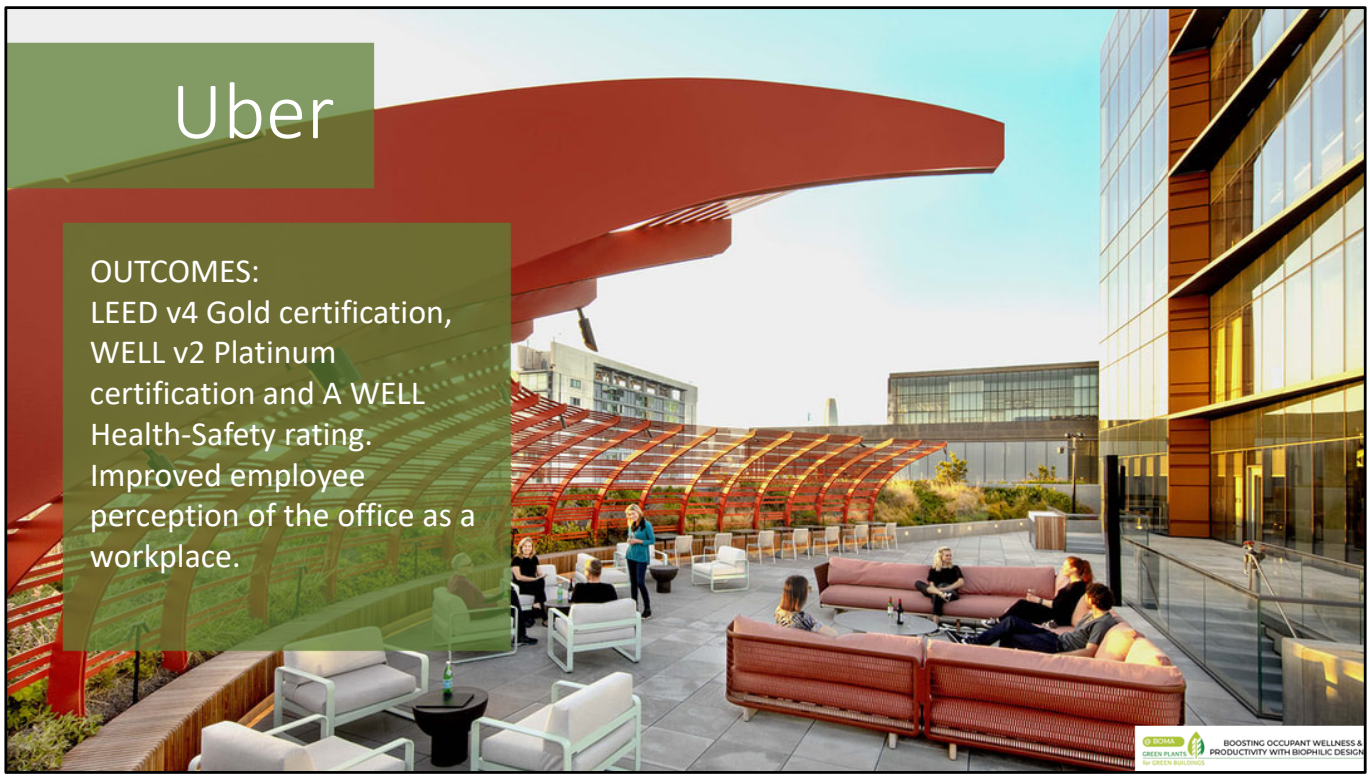
In 2020, Uber completed the addition of two new buildings to an existing two-building campus. The two buildings are designed to support a diversity of employee needs. The 6-story Mission Bay 3 building places the emphasis on spaces that support quiet, heads-down work, and include a library, gym, and meditation room. In addition to supporting wellbeing by providing employees with these opportunities to restore their nervous systems, Uber is offering them access to attractive features similarto what they might find at home.

The 11-story Mission Bay 4 places the emphasis on more active spaces that support collaborative work, socialization, and small and large meetings,. Together the two buildings comprise 584,000 square feet and accommodate 5000 employees. They are linked by two transparent skybridges and a ground level plaza, that connects one side of the block to the other.

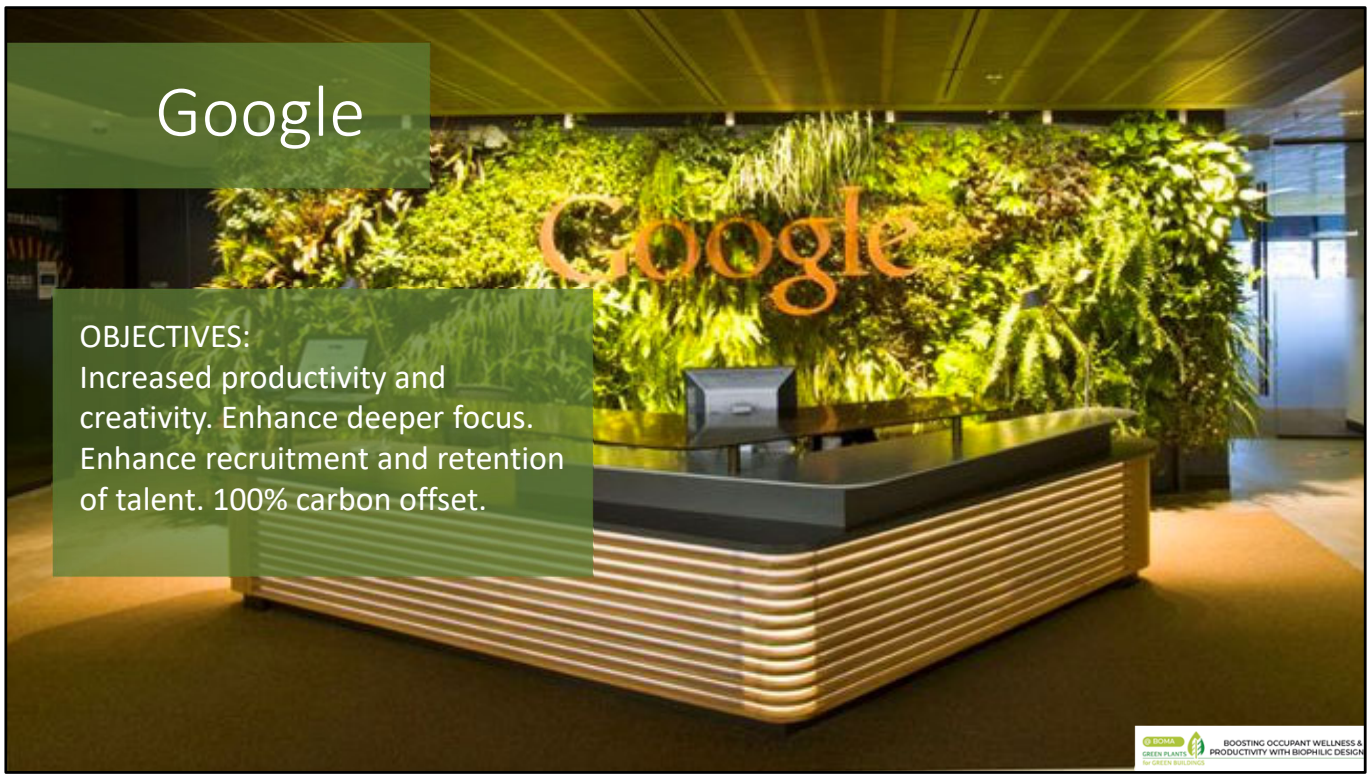
In this picture you can see “nature in the space” at work. There are views to dynamic nature (the bay), a green roof, and daylight flooding the buildings.

One of the most innovative aspects of these buildings is the “skin”. The 180 operable windows are programmed to open and shut automatically throughout the day, allowing for natural air flow and temperature regulation, an important biophilic design element. Additionally, each 14 ft high window allows for building occupants to experience variable daylight. Both are biophilic design elements that keep the building occupants connected to what is going on in nature around them. And there is the additional benefit of lowering the HVAC system’s workload.

Other biophilic design features employed include
Views and access to nature, including the dynamic nature of Mission Bay.
Living and moss walls. Interior landscaping. Green roofs and landscaped patios.
Natural analogs (carpet with natural and fractal patterns, choice of natural building materials, natural furnishings).
Nature of the place (choice of planting materials).



OUTCOMES:
LEED v4 Gold certification,
WELL v2 Platinum certification and A WELL Health-Safety rating.
Improved employee perception of the office as a workplace.



Google is, to quote Michele Neptune, from Google's sustainability team, "looking to create workplaces that reduce stress, improve cognitive function, enhance creativity -- all of these make our employees healthier, happier, and more engaged in their work". She says "It's something Google believes in... and it's something we invest in."

They are also looking to support their goal of 100% carbon offset.

Which is "By 2022, we're committed to offering 1 billion people new ways to live more sustainably via our core products. 20,000 clean energy jobs will have been supported by Google's carbon-free energy contracts, clean technology partnerships, and other steps taken to achieve 24/7 carbon-free energy by 2030."

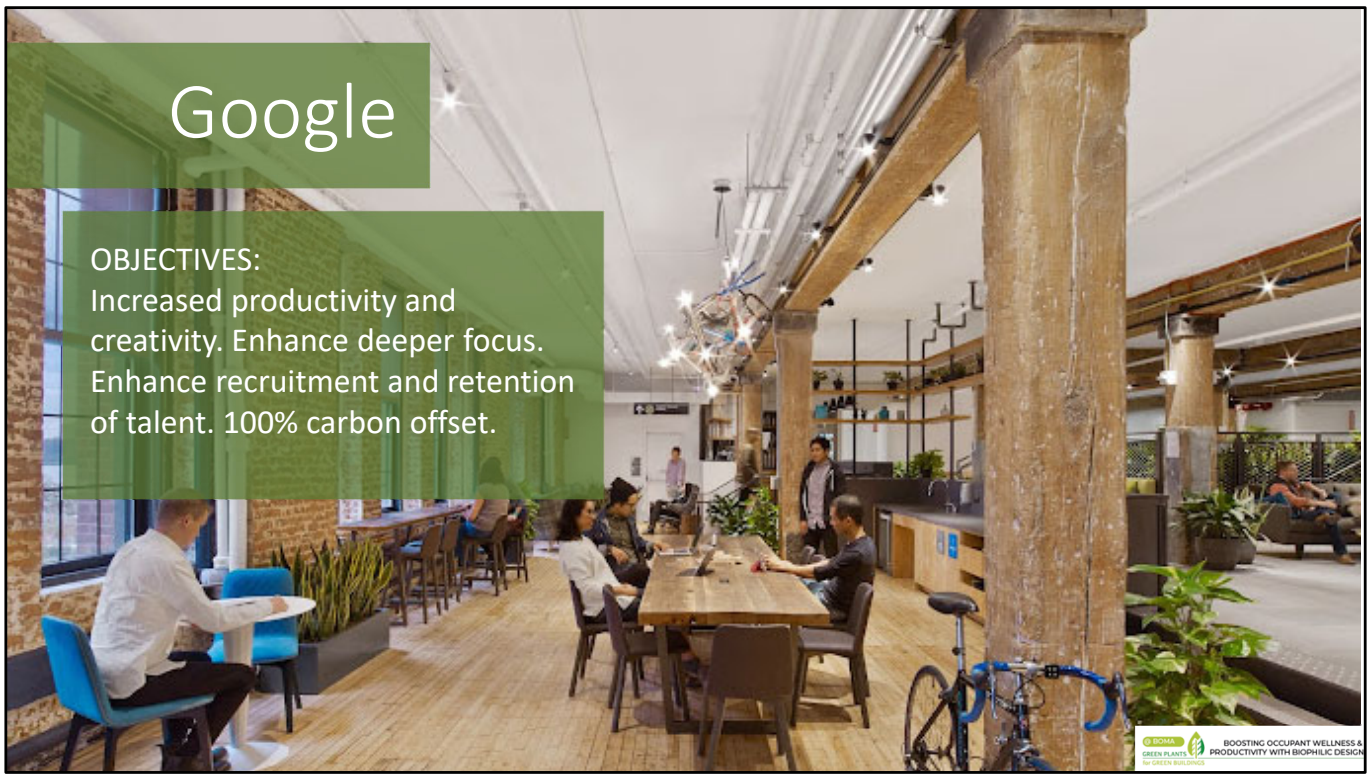


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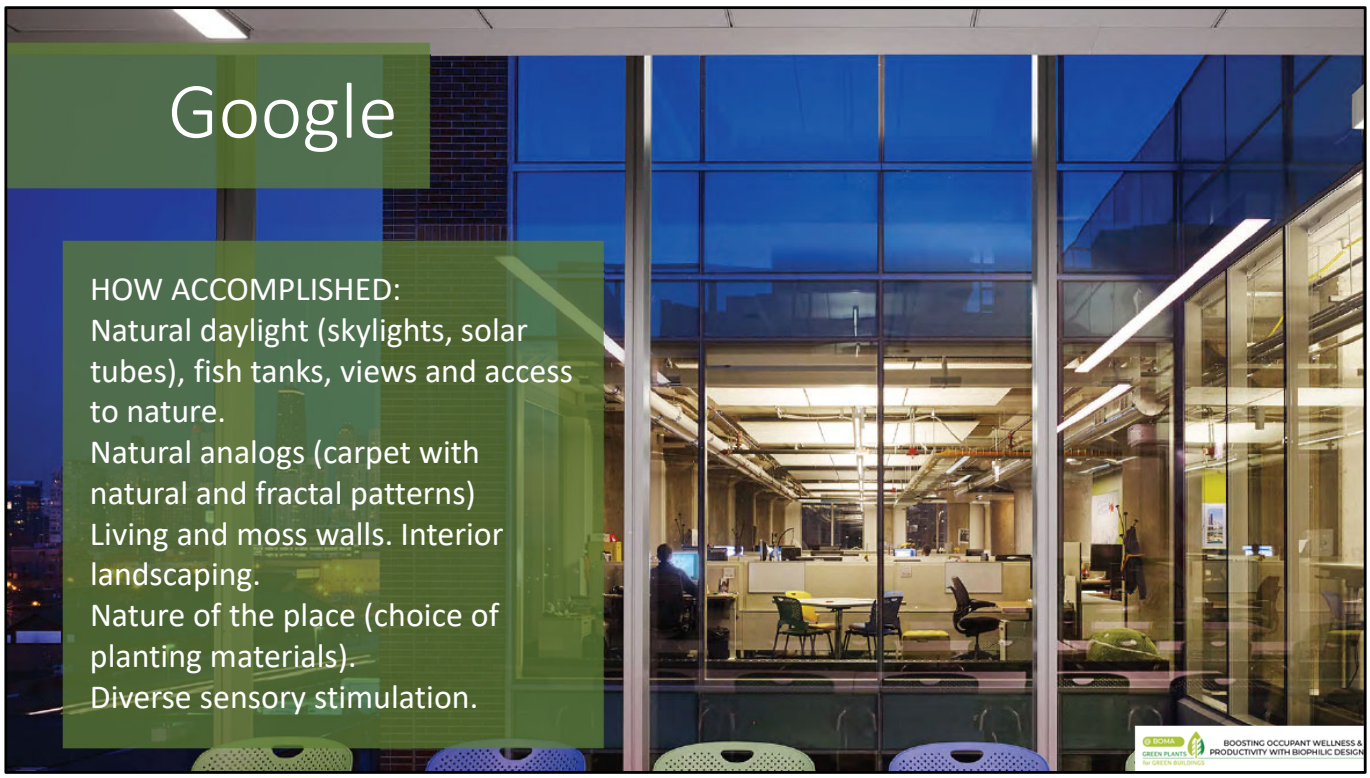
Photo: Google careers website, NYC



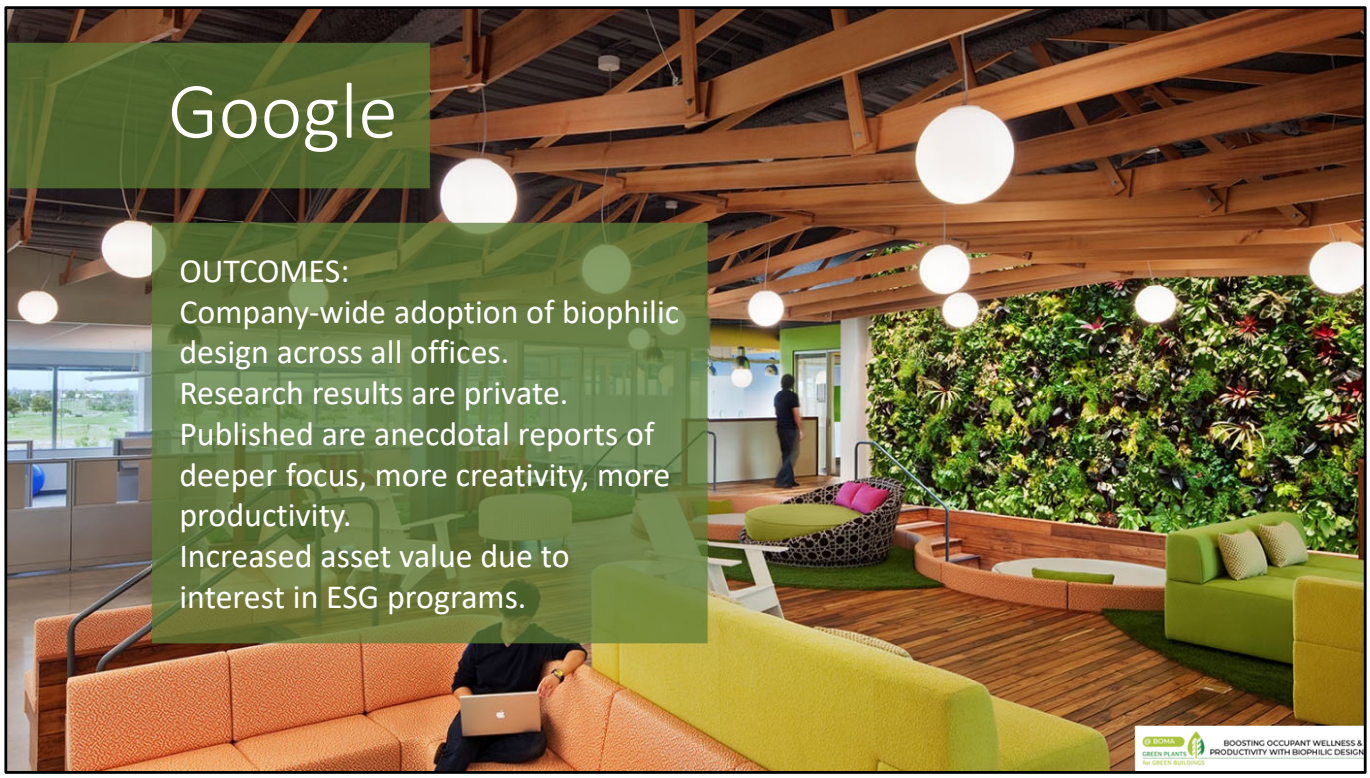
Google has been researching the affect biophilic design has on its employees since 2015 when coders volunteered to wear light meters with dataloggers around their necks while they worked in different spaces.

Based on the results of their in-house research and the scientific literature, Google now has a design guidebook they use when retrofitting existing buildings and building new buildings.

This is a picture of their Chicago office. Unlike the New York property you saw a slide of earlier, Google leases this property so they had to figure out, with the limitations of it being an existing space, what they could do to make it more biophilic. Some of the biophilic design features incorporated include access to natural light, a multi-story atrium, adjustable color-temperature on desk lamps, views to nature and the historic neighborhood outside the building, biomorphic forms, interior plants including edible plants.

This is the slide you saw earlier of Google's new building at St. John's terminal in NYC. Repurposed railyard warehouse at the end of the Highline.

HOW ACCOMPLISHED:
Nature of the space. Dynamic nature, daylighting, Views to nature from within the building. Connection with nature (honey bees & honey harvest, edible plants). Natural analogs (furnishing using natural materials and with fractal patterns) Interior landscaping.
Nature of the place (indigenous plants).
Diverse sensory stimulation.



Their research results are private but Google is using the results to make new guidelines for office design. According to Anne Less, with Google's environmental team, Google has "launched actionable performance metrics for biophilic design, which are now used by Google's design and construction teams to implement biophilic design that is in line with Google's goals," The goal "is to provide enough guidance to be able to evaluate performance success, but still encourage creativity in design."

Additionally, Google's RE team perceives that buildings that are not ESG-conscious are of fundamentally lesser value and sees an increase in their buildings' value due to ESG program criteria being met.

The next organization we'll look at is ASID, the American Society of Interior Designers. There are several aspects of this project that resonate with trends in commercial real estate today. ASID downsized from 17,000 SF to 8,500 SF. They took at look at their organization's needs and sold the building they were in (too much space and too costly to update) and invested in a 10-year lease on new office space in downtown Wash DC.

Here's the backstory:

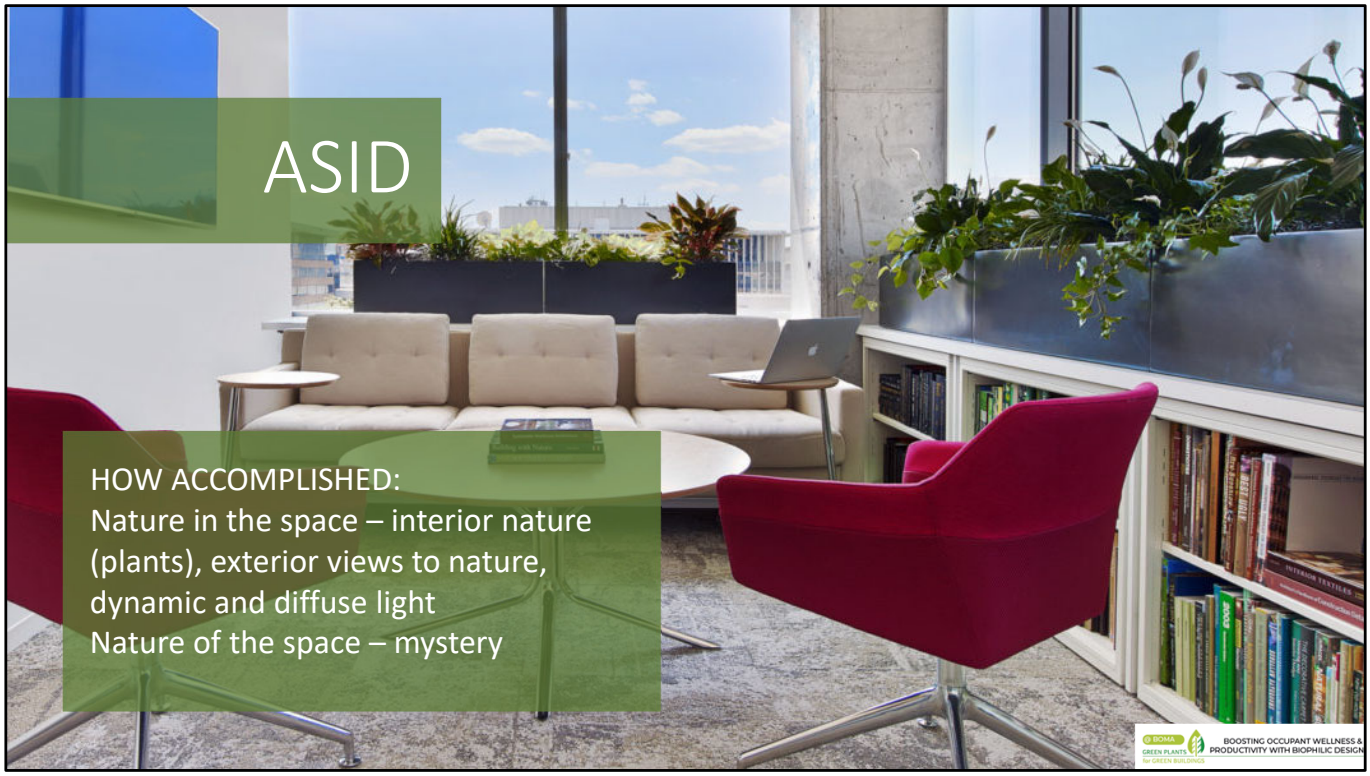
•In May 2016, ASID moved into its new corporate headquarters, designed by Perkins+Will, designed to be a living laboratory for the design community. ASID had previously occupied a three-story, single occupant building on Capitol Hill. The building had an abundance of space. The high-partitioned cubicles afforded acoustical and visual privacy; however, did not support collaboration. Upon reviewing the financial costs for undergoing another renovation, the ASID National Board of Directors decided to sell the property and move to a new space. The property sold before acquiring a new office space, leading ASID to temporarily occupy a co-working site for over a year before finally moving into its new headquarters office, a leased space in downtown Washington, D.C. The co-working site was where some of the pre-occupancy research data was collected.

ASID wanted to explore the degree to which design fluences human and building performance. Believing in research-based design and decision-making, ASID leadership saw their transition into a new building as an opportunity to design studies to measure the impact of innovative workplace design including biophilic design, on behavior and performance, and the impact of design on human, organizational, and environmental sustainability.

ASID worked in partnership with Cornell University, Delos, and the Innovative Workplace Institute.

Research was conducted through a series of in-depth interviews and employee surveys, sociometric data culled from badges worn voluntarily by employees, and environmental metrics from the building and measured within the office.

Data was collected pre-occupancy will employees were still in the old, co-working HQ building and post-occupancy after they had moved into the new building.



•Biophilic design strategies were employed throughout the space to reduce stress and trigger elevated levels of cognitive and emotional performance in occupants. Referencing the 15 patterns of biophilic design by Terrapin Bright Green, LLC, natural materials, dynamic architectural forms, and patterning that evokes natural sequences, and spatial configurations that evoke feelings of mystery and refuge were all employed to resonate with occupants on a subconscious level and improve their experience in the space.

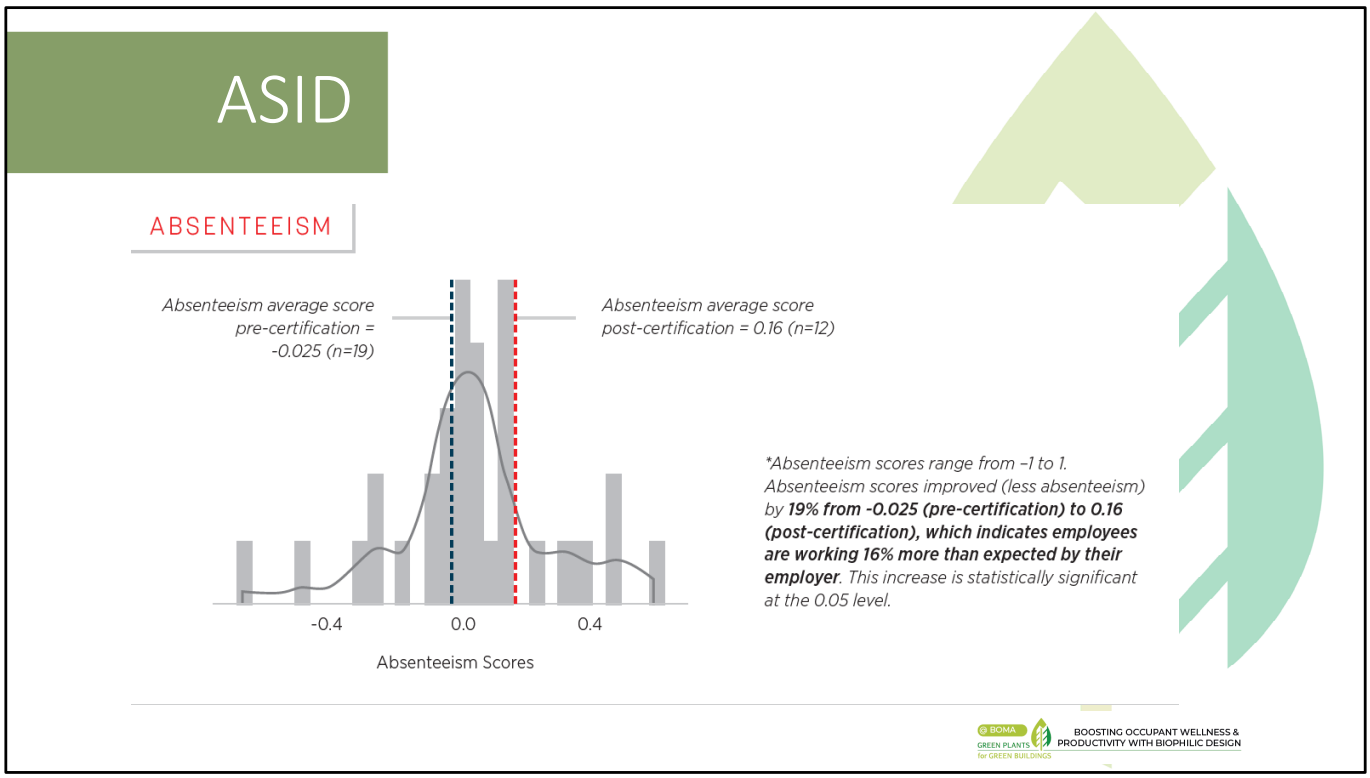
•Examples of nature in the space include: interior nature (plants), a visual connection to exterior nature (rooftop gardens and the biodiversity of plant species used), and dynamic and diffuse light (daylighting from multiple angles experienced throughout the day), and lastly thermal comfort.

•Examples of nature of the space include: mystery created by an entry sequence designed like a curved path that gradually reveals views to the office suite

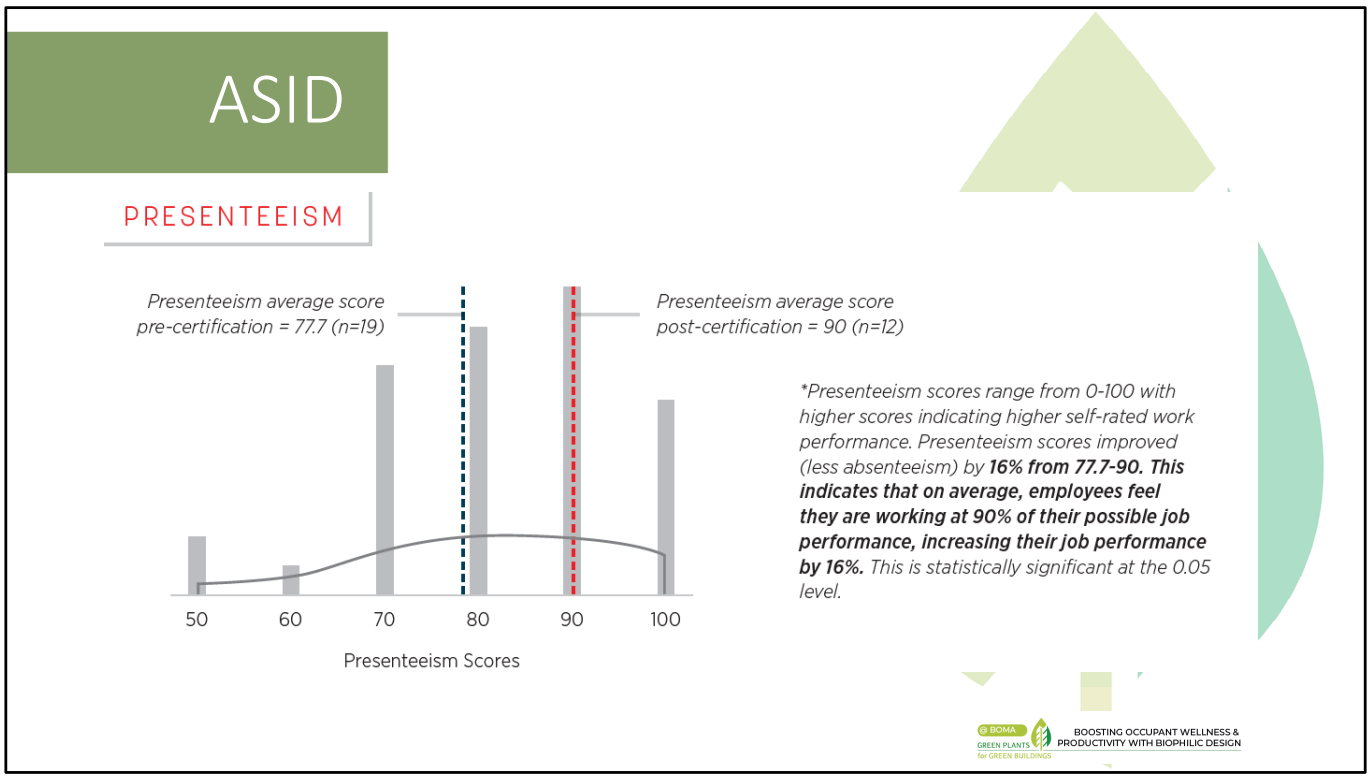
•Natural analogues employed include: the use of natural materials, biomophic forms, fractal patterns, for example the pattern of the exposed structure of dragonfly wings embedded in the window film in the entry corridor is an abstract reference to natural fractal patterns.

They installed lighting technology that employs biophilic design principles of working with employee circadian rhythms. 25% of employees attribute the circadian lighting at the office to their enhanced sleep quality. They sleep an average of 49 minutes longer.

•Earned two 3rd party certifications - WELL Platinum and LEED Platinum. At the time this was the first building to do so.
•Collaborative work increased 9%
•Physical health and mental health scores improved
•Productivity increased 16%, yielding an estimated increase of $694,000 financial impact to the Society's bottom line during the first year of occupancy (expected to yield a $7M increase in financial impact during the total 10-year lease agreement, given a consistent improvement rate)
•Energy savings amount to $7,636, and more importantly, 38.2 ton of coal not burned, and 72.9 ton of CO2 not emitted, during first 15 months of occupancy. These figures may be extended out for the 10-year lease also, but given the current climate crisis, the value of these last two appear to be constantly escalating.



- Drilling more deeply into the productivity increases as revealed in the Delos survey:
- Absenteeism scores improved 19%.
- Presenteeism scores improved 16%



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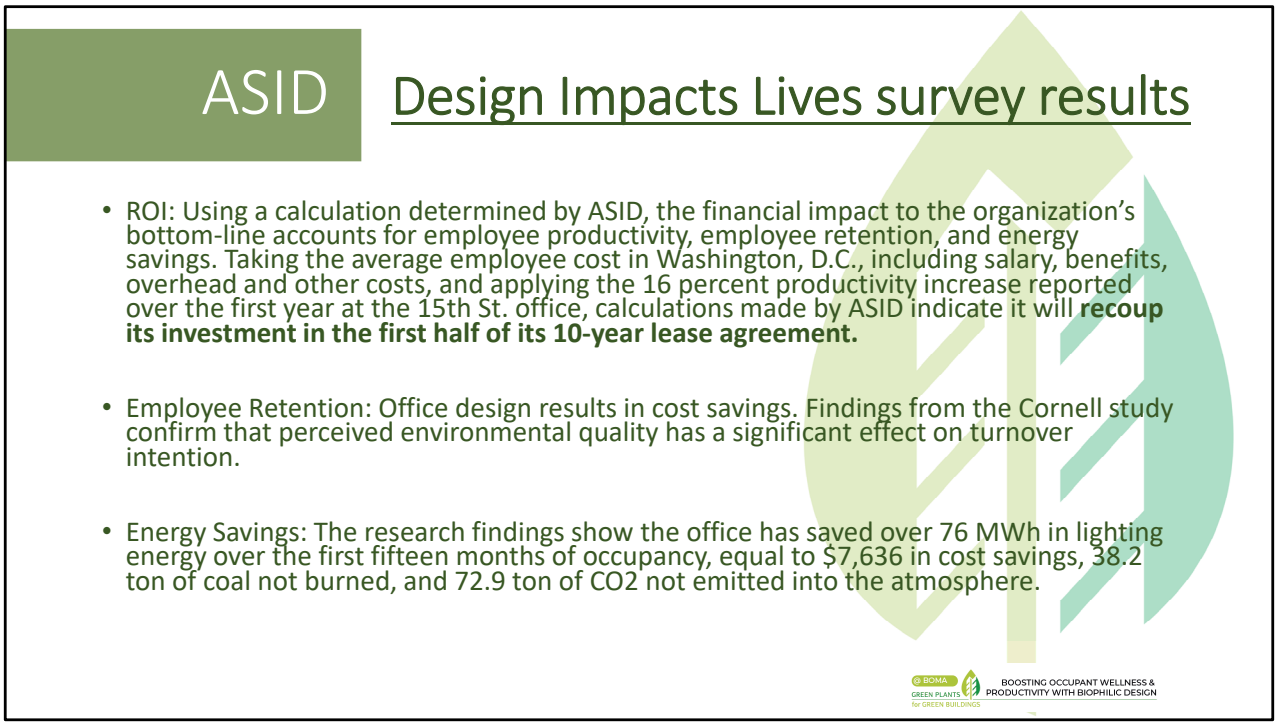
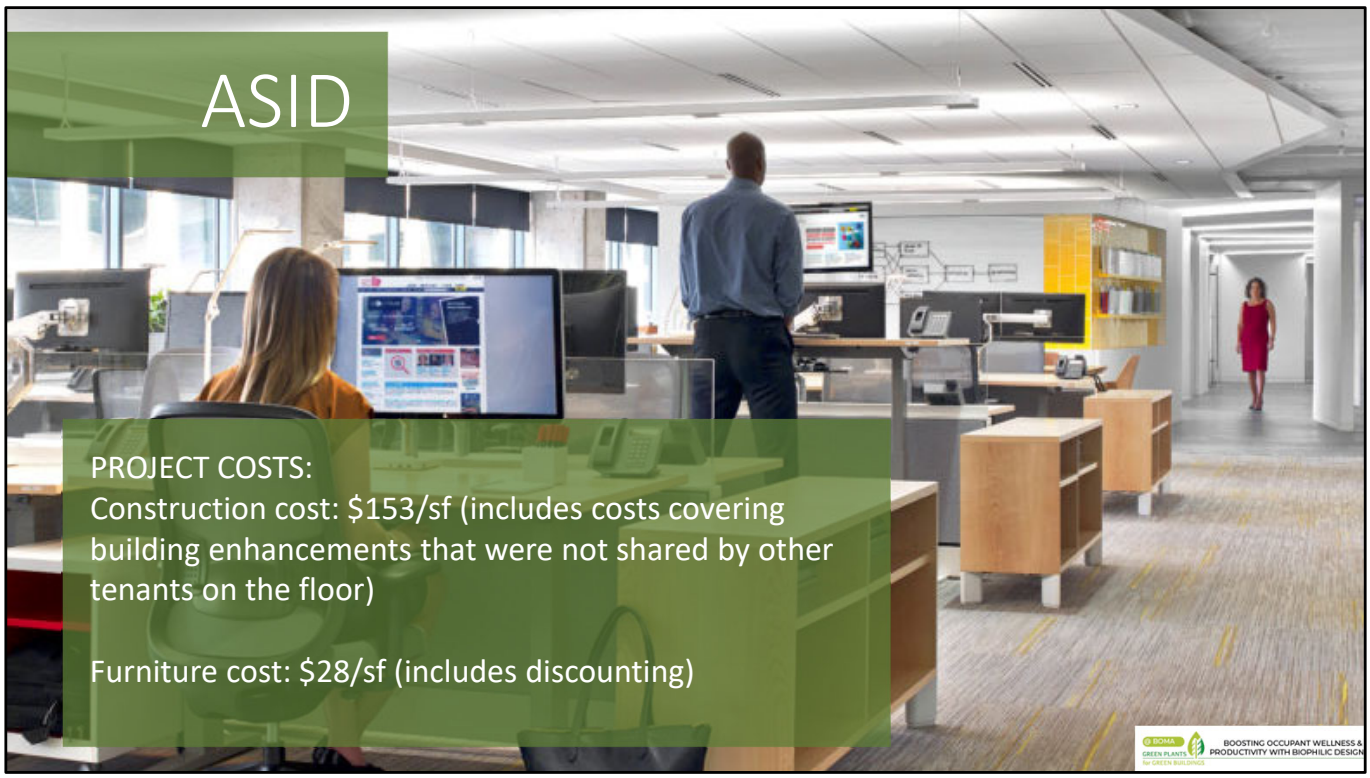


From the survey results published in Design Impacts Lives

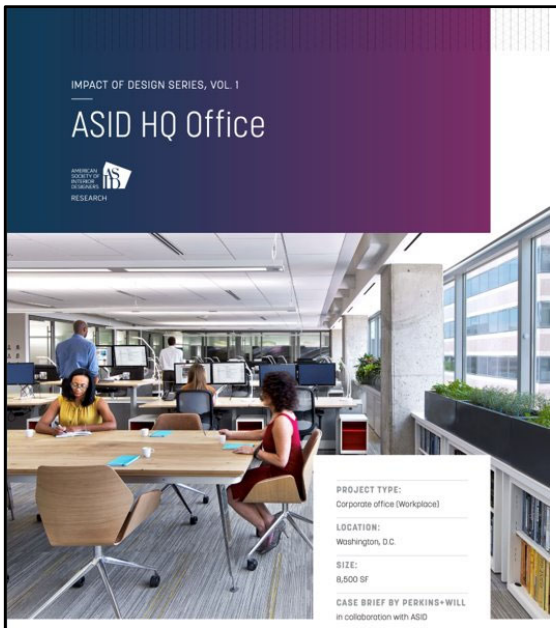
ROI: The impact of design resonates beyond the individual and to the organizational bottom line. Using a calculation determined by ASID, the financial impact to the organization's bottom-line accounts for employee productivity, employee retention, and energy savings. Taking the average employee cost in Washington, D.C., including salary, benefits, overhead and other costs, and applying the 16 percent productivity increase reported over the first year at the 15th St. office, calculations made by ASID indicate it will **recoup its investment in the first half of its 10-year lease agreement.**

Employee Retention: Office design, especially when job demands or the office culture supports the messages communicated through the design, results in cost savings. Findings from the Cornell study confirm that perceived environmental quality has a significant effect on turnover intention.

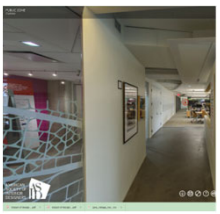
Energy Savings: The research findings show the office has saved over 76 MWh in lighting energy over the first fifteen months of occupancy, equal to $7,636 in cost savings, 38.2 ton of coal not burned and 72.9 ton of CO2 not emitted into the atmosphere.



Because it is always interesting to look at the costs.
And remembering that this space is 7,500 sf.



https://www.asid.org/lib24watch/files/download/3911



•Humans have evolved and progressed alongside nature and its systems.
•Because of this, the human mind and body function with improved efficiency when natural elements are present.
•This statement is supported by research from neuroscience and endocrinology which shows the crucial role that experiencing nature has for our physiological well-being.
•Biophilic design optimizes productivity, healing time, learning functions, and community cohesion as the perfect partnering mechanism for business vendors, hospital owners, school administrators, contractors, and city planners alike who are seeking to reap maximum value through development and design.

•Implementing biophilic design into our workplaces, healthcare system, educational environments and communities is not just a nice amenity. It has profound economic benefits. It is now imperative that we bring nature into our built environment.