

Green Building Trends in Higher Education

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Introduction

Colleges and universities are national leaders in sustainability, especially when it comes to green building standards and policies. The strongest evidence for this is the growing number of green buildings on campuses. A sudden explosion of campus sustainability rating and ranking systems, each with a unique set of criteria for what constitutes green building, has documented this growth.

Yudelson Associates conducted a campus sustainability benchmarking study for a major American university in 2009. During our research we investigated the criteria that these rating and ranking systems use to evaluate green building progress. Extending that research, this white paper investigates the green building trend on college campuses and looks at how campus sustainability evaluation systems measure green building progress. We use a couple examples of campuses that excel in green building to illustrate the overall trend.

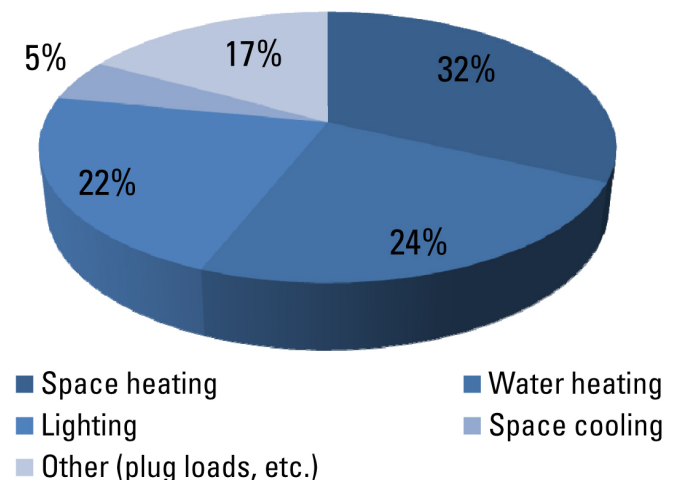
We hope that a thorough understanding of the criteria used to evaluate campus green building standards, along with a few examples from the trendsetters, might inspire every campus to take part in the green building revolution currently sweeping U.S. colleges and universities.

Green Building by the Numbers

Buildings impact the environment in a number of ways, from whether they are built on previously disturbed sites to the materials used in construction. One of the primary areas of focus for reducing building impacts is making them more energy efficient. The first step in using energy more efficiently is to know how energy is currently being used.

Figure 1 below shows how a typical campus building uses energy. It is clear that space heating and water heating are the dominant energy end-uses in most campus buildings. These end-uses, along with lighting and plug loads, are the most important areas of focus for improving efficiency. Cooling loads are relatively low since most campuses operate reduced schedules during the warmer summer months and many buildings have operable windows. Campus buildings also tend to have considerable transient occupancy, further reducing the need for cooling.ⁱ

Figure 1: Energy End-Uses in Campus Buildings



On average, green buildings can reduce energy use by 30% to 50%. Different green building measures reduce different energy end-uses. For example, daylighting can reduce both lighting loads and cooling loads (running fewer lights reduces the need for air conditioning). Solar hot water reduces the amount of energy needed for water heating, and ENERGY STAR® appliances reduce plug loads. Approaches like these can reduce carbon emissions by up to 35%. Other green building measures can also reduce water use by up to 40% and solid waste by up to 70%.ⁱⁱ Of course, reductions

in environmental impacts also produce corresponding operating cost savings, providing a significant incentive for building green on the campus.

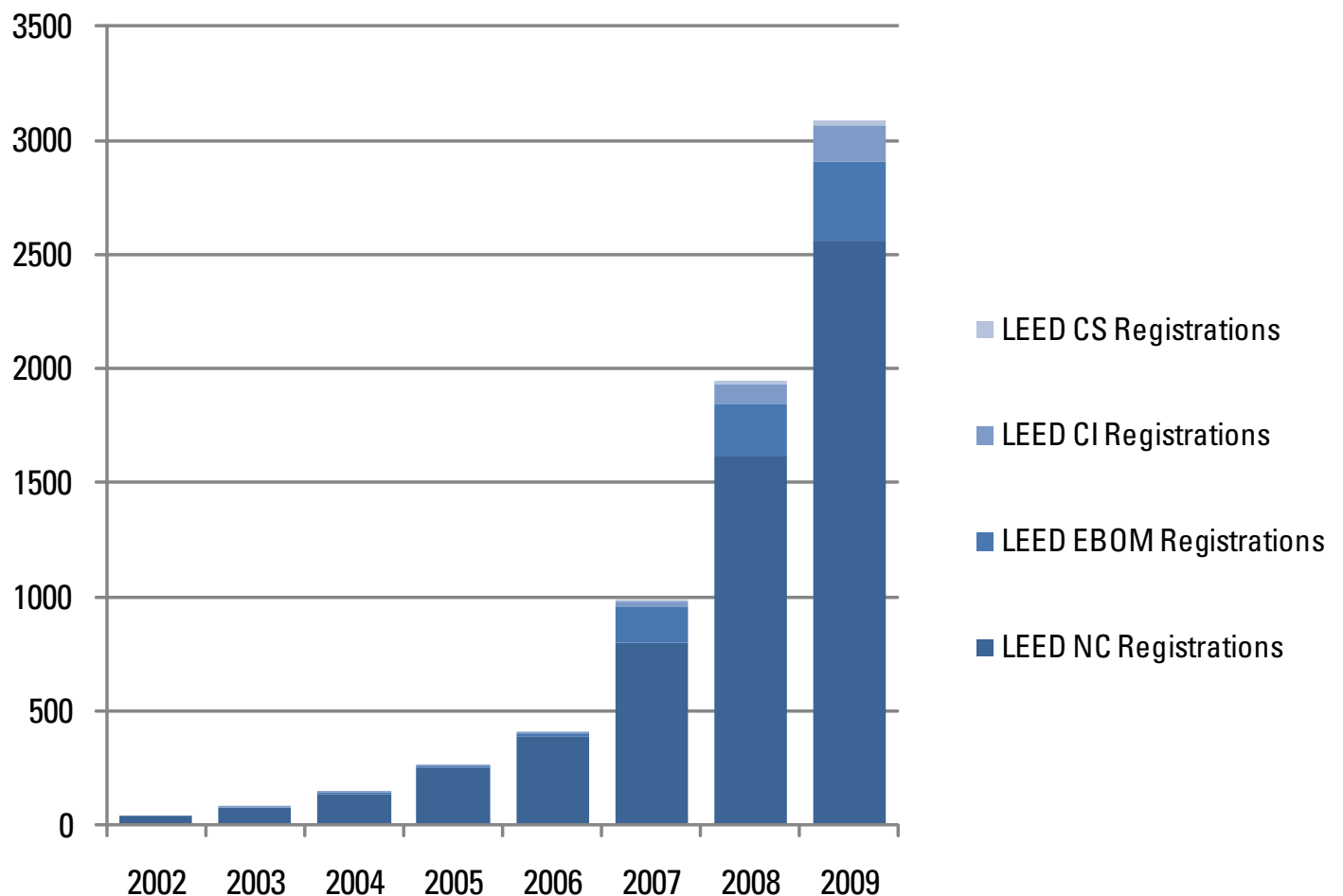
In addition, institutions of higher education don't want to be seen as laggards on climate change. For this reason, there are currently 680 signatories to the **American College & University President's Climate Commitment (ACUPCC)**. Signatories pledge to eliminate their net greenhouse gas emissions by setting up a mechanism to guide the process (e.g., a task force), completing a greenhouse gas inventory, and creating a climate change action plan that establishes a target date and interim steps for achieving neutrality.

The cost savings that green buildings produce over time, along with reduced environmental impacts, are the primary drivers behind the green building trend. There are a number of green building standards, but the **U.S. Green Building Council's (USGBC) Leadership in Energy**

& Environmental Design (LEED) certification is the most widely recognized green building standard. LEED has tailored rating systems for New Construction (NC), Existing Buildings: Operations & Maintenance (EBOM), Commercial Interiors (CI), and Core & Shell (CS) construction. Another system called LEED for Schools was recently released, but this rating system only applies to K-12 schools. Each of these systems has been used at institutions of higher education in the U.S., according to USGBC statistics. LEED project registrations and certifications are a primary indicator of the growth of green building on campuses.

On average, between 2002 and 2009, buildings on college and university campuses accounted for 15% of all LEED project registrations in all four major rating systems. Figure 2 shows the cumulative growth of LEED project registrations in higher education from 2002 to 2009.

Figure 2: Cumulative LEED Registrations on Campuses



By the end of 2009, more than 3,000 projects had registered their intention to seek LEED certification, employing all four rating systems. LEED EBOM registrations have become increasingly popular over the past several years. This is a promising change for the better, as almost all of the building stock on college campuses already exists in any given two to five-year period. Reducing the impacts of existing buildings is critical to meeting carbon emission reduction and green building goals.

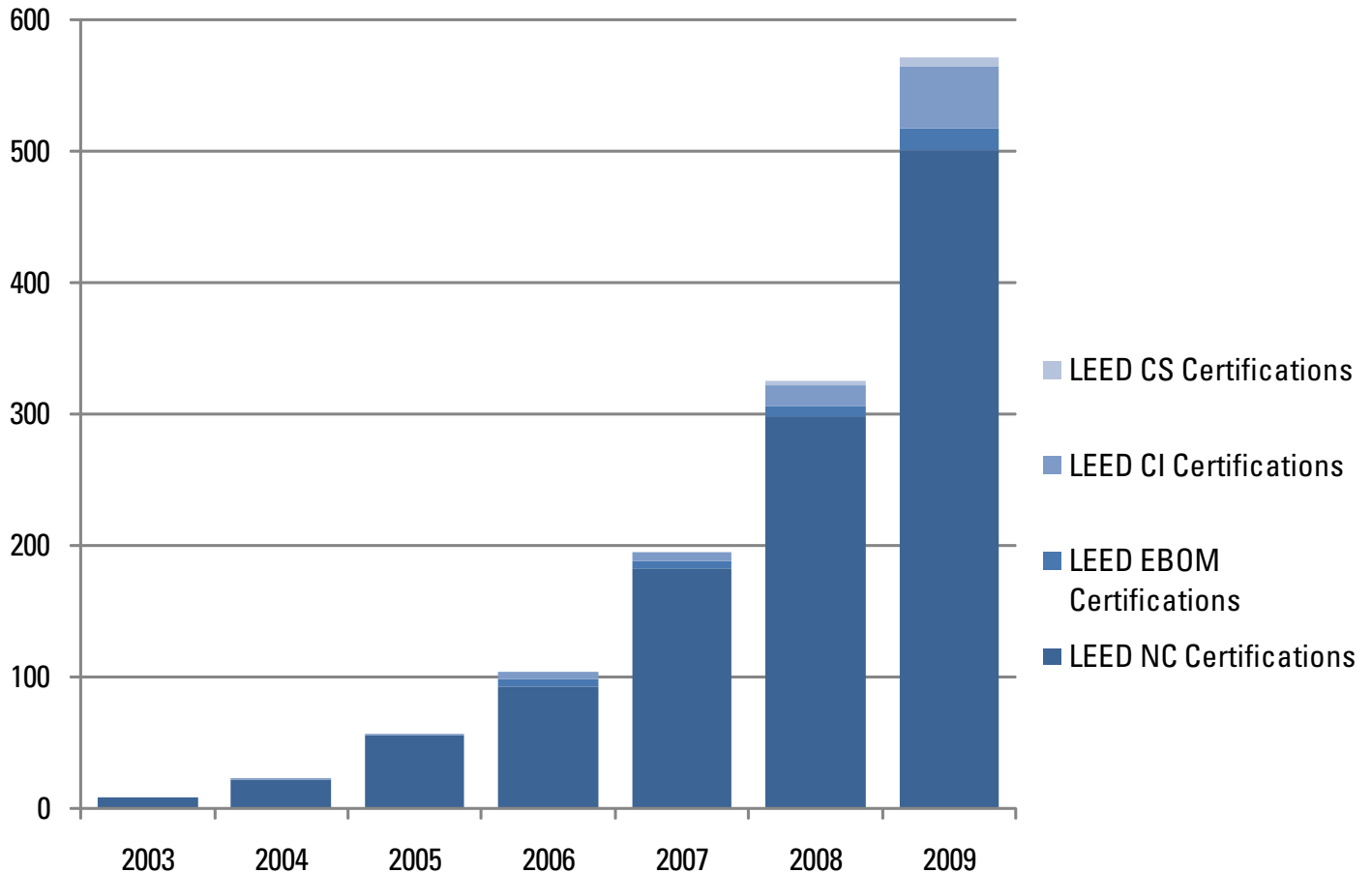
There is always a time lag between LEED project registration and certification. The lag is several years for NC and CS rating systems, as it takes some time to complete a new building project. LEED EBOM and LEED CI certifications typically take less than one year to complete. There is also an issue on many campuses with completing the LEED certification process, owing to time, budget and knowledge challenges. We've often heard that a campus project is "being designed to meet LEED" standards, but won't go through the effort to complete certification. In our

view, this approach is not stringent enough to demonstrate that a campus is committed to sustainability goals, but it is still a prevalent approach in many campus facilities departments.

On average, between 2002 and 2009, buildings on college and university campuses accounted for 13% of all LEED project certifications in all four rating systems. There are many LEED registered projects that never make it to certification, so the overall certification numbers are considerably below the registration totals in Figure 2. Figure 3 shows cumulative LEED project certification growth from 2002 to 2009.

By the end of 2009, 571 LEED projects on campuses had achieved certification. Although the number of EBOM certifications grew each year between 2007 and 2009, the overall number of CI certifications remained higher. This is in contrast to same proportions in Figure 2, where EBOM registrations clearly outnumber CI registrations between

Figure 3: Cumulative LEED Certifications on Campuses



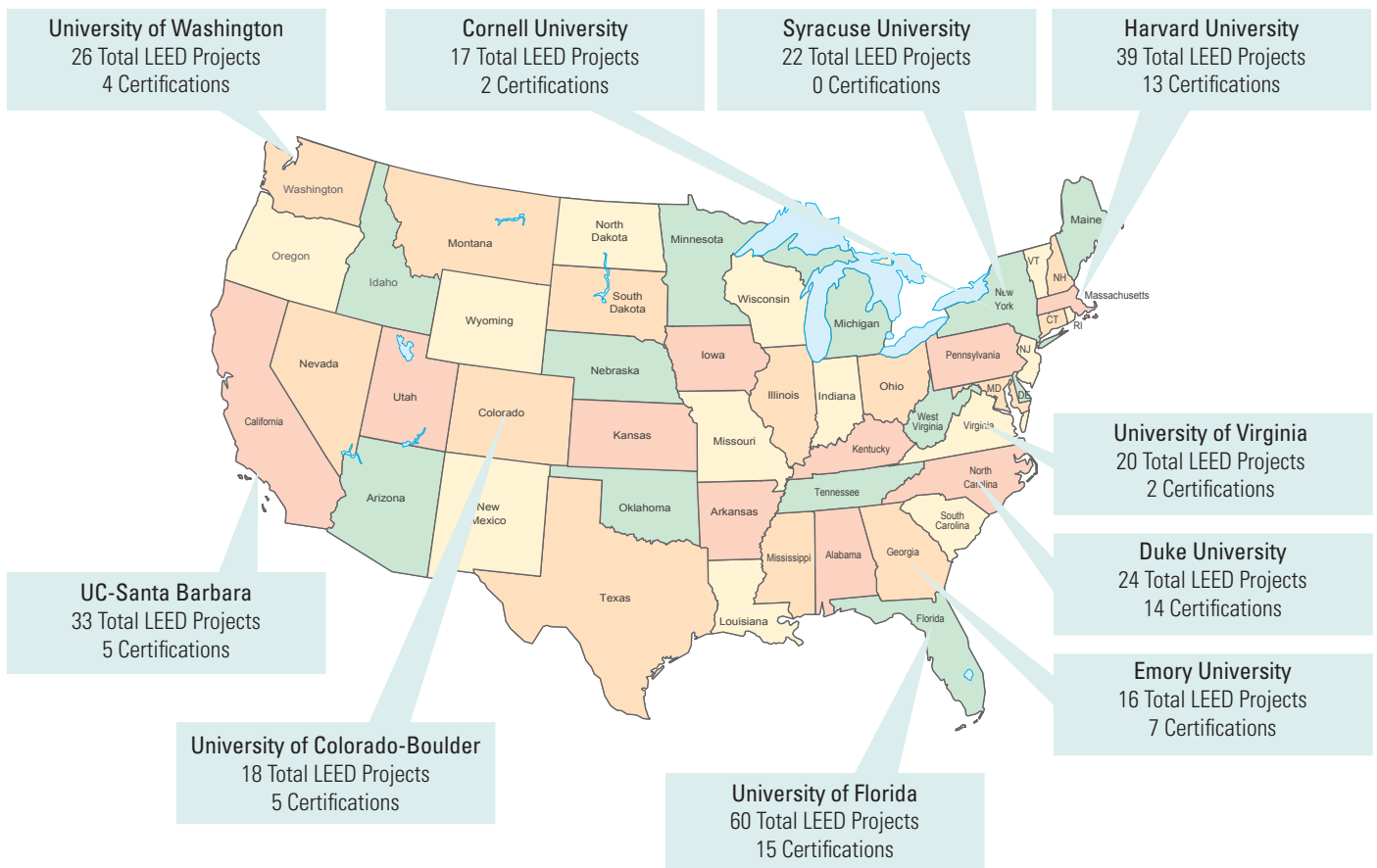
2007 and 2009. One reason for this is the fact that the EBOM certification process is much more challenging than the CI certification process. Campuses are becoming more focused on greening their existing building stock, which is reflected in the registration numbers. However, because the process of completing LEED EBOM certification is more involved, the registration growth seen in Figure 2 won't be reflected in cumulative certification numbers for a few more years.

These numbers were taken from the USGBC Higher Education database. Although only 68% of the higher education projects in this database make their campus and owner information public, the trendsetters clearly stand out. The University of Florida "LEEDs" the pack with 60 total LEED projects; 15 of which have completed

certification. Duke and Harvard have almost the same number of certifications, but far fewer registered projects. Only projects on the main campus were counted, LEED projects at remote sites are not tallied below. Figure 4 lists the top ten universities with the highest number of LEED registrations across all four rating systems:

The recent influx of campus sustainability rating and ranking systems has added a number of new ways to look at the green building trend. For the most part, these systems go beyond LEED numbers and look at a wider array of green building criteria. Although LEED registrations indicate a serious intent to green campus buildings, there are broader approaches, like green building policies, energy efficiency, and water conservation, which can be used to measure green building progress.

Figure 4: Top Ten Universities in Terms of LEED Projectsⁱⁱⁱ



Evaluation Systems

Currently, there are eight major campus sustainability rating and ranking systems. Some take a comprehensive look at various aspects of sustainability performance while other focus on specific activities. Table 1 lists the organization responsible for establishing the evaluation criteria and the actual rating or ranking system:

Table 1: College Sustainability Evaluation Systems

Parent Organization	Evaluation System
Association for the Advancement of Sustainability in Higher Education (AASHE)	Sustainability Tracking and Rating System (STARS)
Sustainable Endowments Institute (SEI)	College Sustainability Report Card or Green Report Card
National Wildlife Federation (NWF) Campus Ecology	Campus Environment 2008
Princeton Review	Green Honor Roll
Sierra Club	Cool Schools
Climate Culture	America's Greenest Campus
Hobart Center for Foodservice Sustainability (HCFS)	Sustainability Grant
College and University Recycling Council	RecycleMania

AASHE's STARS is the most comprehensive evaluation system; it is a voluntary, self-assessment tool that allows colleges and universities to rate their own sustainability performance. Green Report Card, Campus Environment 2008, Green Honor Roll, and Cool Schools establish rankings by comparing relative performance among institutions across a range of criteria. America's Greenest Campus evaluates greenhouse gas reduction activities, the HCFS Sustainability Grant rewards dining services, and RecycleMania ranks waste management results.

Only the first four of systems listed above contain green building criteria. There are nine categories of green building criteria common to across these evaluation systems. STARS, the Green Report Card, and Campus Environment address most of these criteria while the Green Honor Roll only looks at whether or not a campus has LEED certified buildings. Table 2 shows the nine basic green building categories and which systems address them:

Table 2: Green Building Categories used in the Evaluation Systems

	LEED Certified Buildings	Green Building Standards or Policies	ENERGY STAR®	Indoor Air Quality	Energy Efficiency	Water Efficiency	Green Building Materials	Construction & Demolition waste diversion	Building meters and sub-metering
STARS	■	■	■	■	■	■	■	■	■
Green Report Card	■	■	■	■	■	■	■	■	■
Campus Environment 2008	■	■	■	■	■	■	■	■	■
Green Honor Roll	■	■	■	■	■	■	■	■	■

The STARS rating tool contains a series of credits organized into categories, much like the LEED certification system. A campus can assess and rate its sustainability performance by documenting the credits for which it is eligible. Points are earned for credits that are adequately documented and reported through the STARS online reporting tool. STARS scores are computed by averaging the percentage of points earned in each category. There are 100 possible points in each of the three categories:^{iv}

- Education & Research
- Operations
- Planning, Administration & Engagement

Building, energy, and water credits within the Operations category overlap with six of the green building categories noted in the STARS row in Table 2.

AASHE launched the first complete version of the STARS rating system (version 1.0) in January 2010 (pilot versions were developed between 2007 and 2010). About 130 campuses have registered for STARS so far. Currently STARS is not reporting any campus green building data as campuses have a full year to document and report their activities.^v

Unlike STARS, the Green Report Card is an independent evaluation of campus sustainability performance. The Sustainable Endowments Institute, the organization that publishes the Green Report Card, evaluates colleges and universities in the U.S. and Canada that have at least \$160 million in endowment assets. Sustainability information published on these school's websites, within sustainability or environmental reports, or through media coverage is taken into account. SEI then compiles their initial findings into a survey and emails it to the president and sustainability officer (if one exists) at each campus. Campus officials then have the opportunity to add to, update, or correct the survey. The survey contains 43 indicators organized into nine categories. Several survey indicators overlap with six of the green building categories noted in the Green Report Card row in Table 2.

Almost half (44%) of the institutions included in the Green Report Card have at least one LEED certified building or are in the process of constructing one, but only 13% were given an "A" in the green building category.^{vi}

The National Wildlife Federation's (NWF) Campus Environment 2008 documented the findings of their national survey on campus sustainability. NWF conducted

their first campus sustainability survey in 2001, so the 2008 report also compared survey results and showed significant trends and changes. The survey questions were organized into three categories:

- Management
- Academics
- Operations

The survey questions overlap with five of the green building categories noted in the Campus Environment 2008 row in Table 2.

NWF found that 31% of the institutions they surveyed have campus-wide energy efficiency standards for new buildings or retrofits and that 12% have campus-wide LEED certification standards. One of the report's key findings was that more schools are reporting HVAC, lighting, and water efficiency upgrades than in 2001.^{vii}

The Princeton Review's Green Honor Roll rates campuses on a scale of 60 to 99 according to survey data they collect. Their survey contains just one question about green building; specifically "Are new buildings required to be LEED Silver certified or comparable?" This question overlaps with one of the green building categories in Table 2. The Princeton Review and USGBC recently teamed up to produce [The Princeton Review's Guide to 286 Green Colleges](#). The guide contains in-depth profiles of the campuses that earned a rating of 80 points or higher on the 2009 Green Honor Roll. Two of the schools included in this guide, the University of Florida (UF) and the University of California at Santa Barbara (UCSB), are well known for their green building standards.

Trendsetters

The University of Florida committed to LEED early on. In 2001 the UF campus adopted this standard for all new construction and renovation projects and recently strengthened its commitment by insisting on LEED Gold certification at a minimum. UF currently has 32 buildings enrolled in the LEED EBOM certification process. To date, buildings on the UF campus have achieved the following levels of certification:^{viii}

- One Platinum
- Two Gold
- Two Silver
- Ten Certified

UCSB is home to the most LEED certified buildings in the entire UC system. In fact, the Bren School of the Environment building was just the second building in the country to achieve LEED Platinum certification, as rated by the LEED-NC 1.0 pilot program. All new buildings on campus must meet LEED Silver certification at a minimum. Like UF, UCSB is a pioneer in enrolling a large number of buildings (25) for LEED EBOM certification. The Bren School achieved Platinum certification for EBOM.^{ix}

Conclusion

Colleges and universities across the U.S. are quickly embracing green building standards. This trend is growing because of a strong motivation to cut operating costs and to reduce environmental impacts, especially greenhouse gas emissions. Many campus sustainability rating and ranking systems, primarily AASHE STARS, the Green Report Card, Campus Environment 2008, and the Green Honor Roll, take a critical look at green building practices and provide additional impetus for making progress in this arena. Drawing on our experience in campus sustainability, Yudelson Associates has developed straightforward and practical methodologies for advancing green building practices and outcomes at colleges and universities. In this white paper, we've shared some background information and essential resources to get the ball rolling.

About Yudelson Associates

Based in Tucson, Arizona, Yudelson Associates provides leading edge consulting, research and training programs in green buildings, green development and sustainability. Recognized as one of the country's leading experts on green buildings, firm principal Jerry Yudelson has written 12 books on the subject since 2006. Jaimie Galayda holds a PhD in Ecological Economics from Rensselaer Polytechnic Institute and is research director at Yudelson Associates. For more information on the company and its services, please visit www.greenbuildconsult.com.

Endnotes

- i McGraw Hill Construction, Education Green Building Smart Market Report, 2007
- ii <http://www.usgbc.org/ShowFile.aspx?DocumentID=5485> accessed April 15, 2010
- iii <http://www.usgbc.org/ShowFile.aspx?DocumentID=7169> accessed April 13, 2010.
- iv http://www.aashe.org/files/documents/STARS/STARS_1.0_Technical_Manual.pdf accessed April 16, 2010.
- v <http://stars.aashe.org/> accessed April 16, 2010.
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- vii <http://www.nwf.org/Global-Warming/Campus-Solutions/Resources/Reports/~//media/PDFs/Global%20Warming/CampusReportFinal.ashx> accessed April 16, 2010.
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