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Note: this paper was amended on 5.26.06. A caption was added to Figure 6 on page 4 and a clarification was inserted on page 5. Additions are indicated in blue text.

INFORMATION

Dealing with Wood and Biobased Materials in the LEED® Rating System

A White Paper to the USGBC Board

***Submitted by Alex Wilson
BuildingGreen, Inc.***

Background and Purpose

At the U.S. Green Building Council (USGBC) Board Meeting on January 27, 2006, the Board addressed the issue of certified wood in relation to the LEED® Rating System. Following a discussion of these issues, the Board created a Wood Task Force to examine wood and biobased credits in the LEED Rating System and consider whether there might be an opportunity for changes to LEED credits that would maintain LEED's integrity and environmental leadership while addressing critiques that the rating system is biased against wood as a generic material and respond to the debate raging between the environmental community and the timber industry. Alex Wilson, of BuildingGreen, Inc., in Brattleboro, Vermont, was asked to chair this effort.

Subsequently, Alex Wilson was commissioned by USGBC to develop this white paper, which was submitted to the USGBC Board of Directors at their New Orleans board meeting on May 4, 2005.

The purpose of this white paper is to review findings of the Wood Certification Meeting held in September, 2005, to examine comments that were received on proposed changes to wood and rapidly renewable credits in the LEED Rating System, and to formulate a proposal for altering the relevant credits in LEED in a manner that is reasonably acceptable to all parties involved. Any proposed changes to LEED would still have to be processed through the comment and balloting steps described in the LEED Foundation Document.

Key Findings from September 2005 Wood Certification Meeting

A special Wood Certification Meeting (previously referred to as the “Wood Certification Summit”) was organized by the U.S. Green Building Council and held in Washington, DC on September 29, 2005. The meeting was facilitated by staff from the Keystone Center and included approximately 30 participants representing five forest certification systems (up to three representatives from each), along with members of the LEED Materials and Resources Technical Advisory Group (MR TAG), the Wood Sub-TAG of the MR TAG, and various staff and leadership from the USGBC.

A report on this meeting was distributed to participants and others on 29 March 2006 and is provided as Appendix A

(http://communicate.usgbc.org/member/2006/AppendixA_Wood_Certification_Meeting.pdf) of this white paper. A very brief summary follows:

The meeting focused on the following question: “How should USGBC evaluate and utilize different certification systems that will continue to evolve over time?” Following broad-ranging discussion, the facilitators focused the discussion on four possible resolutions or scenarios: 1) maintaining the status quo with the Forest Stewardship Council (FSC) standards as the only certification option; 2) developing a new, unified certification approach; 3) establishing criteria for assessing and qualifying certification programs; and 4) maintaining the full LEED credit for FSC certification and awarding partial credit for other qualifying certification systems. Participants generally viewed the third scenario as a reasonable approach as long as it involves stakeholders in the decision-making process and builds on what has been done to date, where appropriate and relevant. It was pointed out that scenario 4 is a possible outcome of pursuing scenario 3, rather than a strategy itself.

The participants broke into small groups to discuss Scenario 3 in greater detail. These discussions focused extensively on the criteria that could be used to evaluate certification systems—how criteria differ from standards, how to fairly involve stakeholders that are often advocacy groups, how to maintain an open and transparent process, and how to tie this process into a broader discussion of USGBC values.

Various next steps were identified by participants, many of them focused around a matrix of criteria that could be used in evaluating forest certification systems.

The efforts of the Wood Task Force and this report are envisioned as being part of the follow-up process identified through the September 2005 Wood Certification Meeting.

Examining the Environmental Basis for Materials & Resources Credit 6 in LEED

An underlying premise in the LEED MR credits is that rapidly renewable materials are beneficial and should be preferentially used in green buildings. Rapidly renewable materials are defined in LEED as agricultural and other natural materials that grow on a ten-year cycle or faster. One of the tasks of this investigation is to examine how reasonable that premise is.

BuildingGreen, Inc. subcontracted to Sylvatica, a life-cycle assessment (LCA) consulting firm based in North Berwick, Maine, to examine the LCA basis for the rapidly renewable credit in the LEED Rating System. The intent of this examination was to determine whether there is environmental justification for a LEED credit (Materials & Resources Credit 6—MRc6) that rewards the use of rapidly renewable

materials over longer-rotation biobased materials (wood), and by extension, whether there is environmental justification for changing MRc6 into a credit that rewards use of longer-rotation biobased materials, including wood.

The findings of this investigation are included in Appendix B (http://communicate.usgbc.org/member/2006/AppendixB_LifeCyclePerspectives.pdf) of this white paper; a brief summary is provided as follows:

The LCA methodology that Greg Norris of Sylvatica used examines three areas of concern: impacts on human health, depletion of resources, and impacts on ecosystem health. Of these three categories, the most significant for many biobased products, but the one for which there has been the least data gathered to date, is the impact of land use and land cover change on biodiversity within the category of impacts on ecosystem health. Only one of the leading life cycle impact assessment methods in use internationally explicitly addresses this: EcoIndicator 99.¹ This impact assessment method incorporates empirical data that robustly and clearly shows that agricultural land uses have a far greater negative impact on species diversity than does conversion to a managed mixed-broadleaf forest. These results are summarized in the table below (note results highlighted in red):

Land use category	Potentially Disappeared Fraction (PDF)
Continuous urban	96%
Discontinuous urban	80%
Industrial area	70%
Rail area	70%
Green urban	70%
Conventional agriculture	91%
Integrated agriculture	91%
Organic agriculture	82%
Intensive meadow	89%
Less intensive meadow	70%
Organic meadow	70%
Mixed broad-leafed forest	10%

Source: EcoIndicator 99 methodology report, version 17 April 2000, Table 5.6, page 67.

In Norris's words: "conventional and integrated agricultural land uses tend to reduce species diversity by 91% relative to natural levels, while organic agriculture reduces species diversity by 82%. By comparison, mixed-broadleaf forest reduces species diversity by 10% relative to the natural state."

However, as Norris explains in his report, the factors in the table above are on a per-acre-year basis, while an LCA comparison of different materials needs to normalize the impacts by equivalent units of product function provided to the product user, so

¹ Earlier versions of the US EPA's TRACI methodology for life cycle impact assessment did include a basic approach to this issue, but it was removed from more recent versions of TRACI.

that we are comparing apples to apples. One challenge Sylvatica faced was coming up with pre-existing data, in the only database containing inventory data for land-use impacts on species diversity that is consistent with the EcoIndicator99 method (the European EcoInvent database), for a building application in which the functional needs could be met either with an agricultural product or with a wood product. We chose to compare natural linoleum flooring (produced with linseed oil from the agriculturally produced flax plant) with hardwood flooring, derived from a managed, mixed-hardwood forest. More specifically, a 2.5 mm thickness of linoleum was compared with 3/4-inch-thick hardwood flooring. Because the hardwood flooring has roughly twice the expected life as the linoleum, the impacts were scaled accordingly.

The findings of the wood and linoleum LCA comparisons, based on the EcoIndicator99 impact assessment method, are shown in a number of graphs in the Sylvatica report, with one chart reproduced here. Hardwood flooring is shown in the left bar, softwood flooring on the right, and linoleum flooring in the center (using rapeseed production as a proxy for flax production). Segments of the bars below the zero line are supposed to indicate “negative” impacts—or benefits. The blue segments below the zero-line, for example, indicate climate change impacts, which are negative due to carbon sequestration. The sizeable red segment for carcinogens below the zero-line in the linoleum bar are due to the fact that the EcoInvent database for crop growth shows phytoremediation (the uptake of heavy metals by rapeseed). Thus, these benefits to the agricultural soil environment need to be evaluated along-side modeling of the eventual fate of the product (in this case linoleum made with linseed oil possibly containing traces of heavy metals) and the possibility for human exposures to the metals.

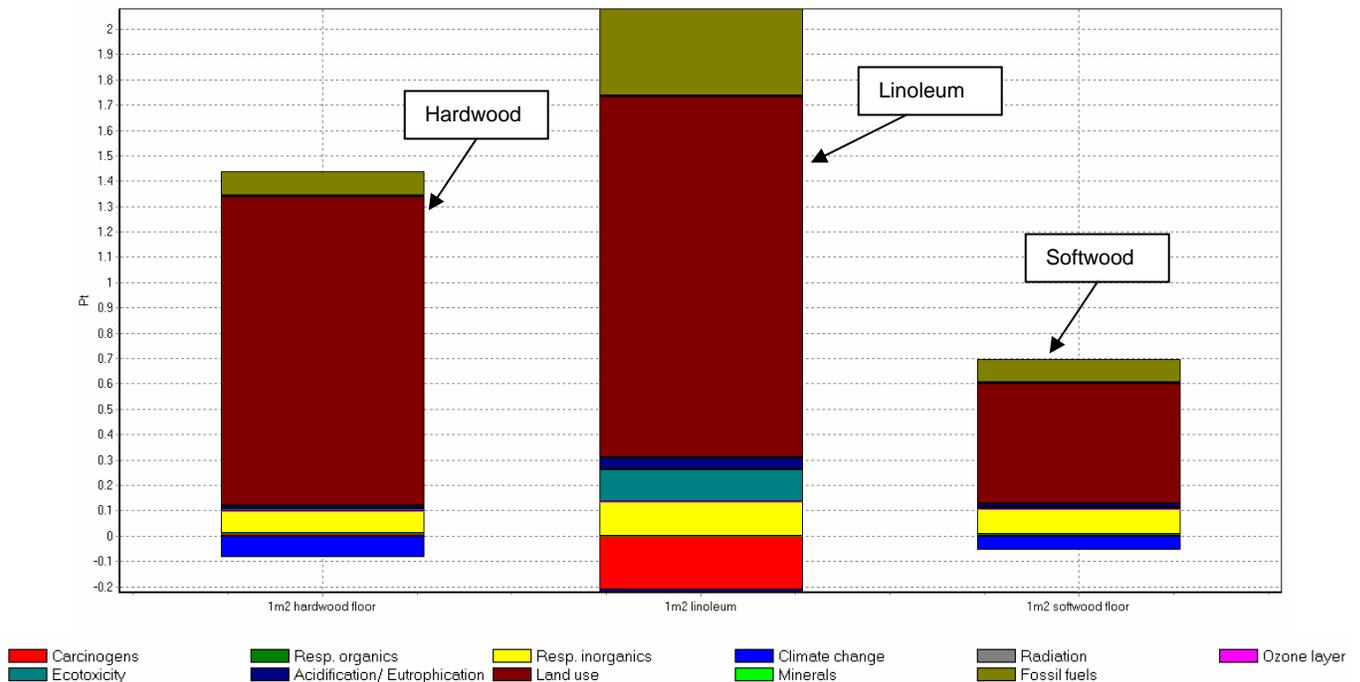


Figure 6: Comparison of hardwood flooring and linoleum production (with rapeseed production used as a proxy for linseed production) based on BEES 3.0 data for production of “generic linoleum,” using EcoInvent data and the EcoIndicator 99 method: **Total Weighted Scores** (Note: Total weighted scores from this simple analysis are shown to relate the land use impacts to other impacts from one possible summary perspective (that embodied in the EcoIndicator 99 method), but NOT to make any comparative assertion whatsoever about whether one material is “better overall” than another.)

The purpose of the LCA investigation was to explore the importance of land use impacts within the context of other impact categories, for a product use in which both bio-based and wood-based materials are relevant. It was NOT intended to provide, and does not serve, as a claim about whether wood flooring or linoleum is superior in an overall sense. Such a claim would need to be backed up by more extensive analyses, with peer review, and would also need to avoid the weighted aggregation step which has been used here to place the land use impacts in context with other impacts from one possible point of view.

The first general conclusion to be drawn from these results is the relative significance of land-use impacts (the large dark brown segments of the graphs) compared with other impact categories. The overall heights of the bars shows the comparative total LCA impacts of these different materials per functional unit of material. A much smaller volume of linoleum is needed to provide the flooring function, compared with wood, yet the total impacts of the linoleum are larger.

Given the evidence presented earlier that land-use impacts of agriculture are eight or nine times as great as forest impacts on a per-acre-year basis, the differences in the environmental performance of wood and linoleum flooring might seem less significant than expected. The reasons for the less than eight-fold difference in total impacts per functional unit (e.g., per square meter-year of flooring) are the facts that the linoleum is thinner than the flooring so that it requires fewer acre-years of production per square meter-year of flooring. Follow-up LCA comparisons of other applications that could be served by either agricultural or wood resources would be very useful, if the data could be found. For example, a comparison of cotton fabrics with rayon fabrics (derived from wood cellulose) used for upholstery might provide a better apples-to-apples comparison. Another possibility might be a concrete form-release agent derived from soybean oil with a such a material derived from pine rosin (if there were such a product).

The bottom-line conclusion drawn from this (fairly limited) investigation is that there may not be a scientifically valid justification for rewarding rapidly renewable materials in LEED over conventional wood products. Clearly, further investigations would be beneficial.

Recommendations for Changes to the LEED Rating System

Based on input from participants of the USGBC's Wood Certification Meeting and input from the LCA investigation conducted by Greg Norris of Sylvatica, the following recommendations are offered to the USGBC Board:

1. Change MRc6 from a Rapidly Renewable Credit to a Biobased Credit

Background

The current LEED credit, MRc6, rewards building materials derived from rapidly renewable materials. The intent with this credit is to encourage the use of resources that are regenerated in less than ten years and are thus highly renewable. The following products can be used to attain this credit: cork flooring (derived from bark of the cork oak, *Quercus suber*, which grows in the Mediterranean and can be sustainably harvested on a nine- or ten-year cycle); bamboo flooring (derived from a species of bamboo, *Phyllostachys pubescens*, that reaches maturity in 4-6 years and regenerates from the root system), sisal wallcoverings, wool carpeting, cotton insulation, and a wide range of building materials that are derived from agricultural

products, including cotton insulation, soy-based polyurethane foam insulation, plant-oil-based concrete form-release agents, natural linoleum (made from linseed oil and other natural ingredients), and fabrics made from corn-derived polylactic acid (PLA).

Compared with products derived from *non-renewable* resources, such as petrochemical feedstocks and mined minerals, there is probably good justification to have a credit that rewards renewable materials.

Problems with the Existing Credit MRc6

The limitation of LEED credit MRc6 to *rapidly* renewable materials may not be justified from an LCA standpoint. The intent is to reward renewable materials that use solar energy (photosynthesis) to grow and are regenerated on a fairly rapid cycle (less than ten years). While there are some materials that satisfy this criteria quite well (e.g., cork, bamboo, and sisal), some other biobased materials carry fairly heavy environmental and health burdens.

Products derived from corn, soybeans, cotton often carry significant environmental burdens from fertilizers, pesticides, energy use in farming and processing, and soil runoff. Such materials may still be very good alternatives to conventional materials, particularly those derived from fossil fuels and mined minerals or metals, but the investigations carried out by Sylvatica suggest that the environmental and health burdens associated with agriculture may not be adequately addressed. Sylvatica's preliminary research comparing agriculture and forestry land uses suggests that the justification for rewarding rapidly renewable products over wood-derived products may not be justified. In short, there may be little scientific justification for continuing to preferentially reward rapidly renewable biobased products over forest-derived biobased products in LEED.

Recommendation for Modifying MRc6

It is recommended that MRc6 be expanded to include all biobased materials—including wood—as long as those materials meet certain minimum levels of environmental certification or are grandfathered in as acceptable rapidly renewable materials. We suggest that wood and rapidly renewable (short-rotation) biobased products should be addressed differently in MRc6, as follows:

Until LEED v.3 is released, all rapidly renewable biobased materials (materials that currently comply with MRc6 in LEED 2.2) will be grandfathered into this credit and automatically approved. This includes bamboo, cork, sisal, coir, and all agricultural products.

With wood products, it is proposed that MRc6 will designate two levels of forest certification: Tier 1 and Tier 2 certification. To achieve the MRc6 credit, wood products may carry either Tier 1 or Tier 2 certification. Tier 1 certification systems are considered to be less rigorous than Tier 2 certification systems. Tier 1 certifications will eventually need to be approved for MRc6 based on criteria that will be developed and maintained by USGBC based on stakeholder input, as per the Wood Certification Meeting report summarized at the beginning of this report. It is proposed that certain Tier 1 certification systems would be grandfathered into this approval until the release of LEED v.3, by which time the USGBC will have completed the process of designating acceptable Tier 1 and Tier 2 wood certification systems. The intent of MRc6 would be to approve all wood products that have undergone some level of certification that ensures that they are not derived from illegal logging. Likely certification systems would be the Sustainable Forestry Initiative (SFI) certification with third-party

verification, the Canadian Standards Association (CSA) wood certification, and the American Tree Farm System (ATFS).

Tier 2 wood certification systems also satisfy requirements for MRc6; these are more rigorous than Tier 1 systems. Initially, only one such (Tier 2) wood certification system would be recognized by the USGBC and LEED: that of the Forest Stewardship Council (FSC). For more discussion of Tier 2 wood products certification, see discussion below relating to MRc7.

The threshold levels of these biobased materials needed to satisfy MRc6 are not addressed in this report; there is no current recommendation to change these levels.

2. Modify MRc7 to Establish a Basis for Adoption of Certification Systems but Maintain the FSC Certification Requirement for Wood Products at this Time

Background

The current LEED credit, MRc7, rewards wood-based building materials and products that carry third-party Forest Stewardship Council (FSC) certification. FSC, an international, nonprofit organization, does not actually certify products; rather, FSC accredits independent bodies that carry out such certifications. Currently there are two FSC certification organizations in North America that carry out the vast majority of FSC certifications in the U.S. and Canada: the SmartWood Program of The Rainforest Alliance, a nonprofit organization based in New York City; and Scientific Certification Systems, Inc. (SCS), a for-profit company based in Oakland, California.

The framers of the LEED Rating System recognized that FSC offered the most robust system for ensuring that wood products came from well-managed forests. A highly sophisticated chain-of-custody certification process was created by FSC to make sure that wood specified for a particular project actually came from the well-managed FSC-certified timberlands.

In the ensuing years since FSC was launched (1992) and the LEED Rating System was launched (2000), there has been a great deal of attention paid to the issue of forest certification. FSC has streamlined its certification process to make compliance easier and to permit FSC certification of products containing less than 100% FSC-certified wood fiber. And other forest management certification systems, such as the Sustainable Forestry Initiative (SFI) have been improved to make them more rigorous. The North American forest products industry has been seeking to broaden MRc7 to allow non-FSC certification system to meet the credit.

Recommendation for Modifying MRc7

It is recommended that MRc7 be modified to establish criteria for "Tier 2" certification systems that satisfy the intent of LEED MRc7, while not changing the actual requirements of MRc7 at this time. The argument is that other certification systems could be developed that are equivalent to FSC, or that are even more rigorous. The expectation is that participants of the Wood Certification Meeting held in September 2005 will continue to assist USGBC in its effort to define a set of minimum criteria that any certification system would need to meet before being approved as a MRc7 referenced standard. Until that process is complete, there would be no change in the FSC certification requirement for wood products in meeting MRc7.

In addition, it is recommended that waste agricultural materials, such as particleboard made from wheat straw (stems left after harvesting the grain), be approved *by definition* for MRc7. Such materials currently satisfy both the recycled-content credit (MRc4) and the rapidly renewable credit (MRc6); if also approved by definition for MRc7, they could satisfy three different credits—thus providing a strong incentive for their use in LEED projects.

The threshold levels of these biobased materials needed to satisfy MRc7 are not addressed in this report; there is no current recommendation to change these levels.

Possible Future Direction for Wood and Biobased Credits in LEED and for Other Materials

In the future, MRc7 could be expanded to include other biobased materials that meet robust certification standards, such as certification of bamboo flooring and USDA Certified Organic standards. The requirement for rigorous Tier 2 environmental certification programs for biobased materials in order to satisfy MRc7 could be a strong incentive for respective producers to develop certification programs for such materials as bamboo and cork—which would provide a way for specifiers and users to distinguish among different products in the marketplace.

The recommended changes to MRc6 and MRc7 proposed herein represent the first step of what could be an eventual merging of these two credits. Under such a scenario, there might be a single credit for biobased materials with one or two points available depending on the level of certification of those materials. The first point would be earned for biobased materials earning Tier 1 certification or that meet certain prescriptive criteria (cork and bamboo, for example, might be accepted with no certification). The second point could be earned only for products that achieve Tier 2 certification, including FSC-certified wood, other non-FSC wood certification systems that meet USGBC requirements, agricultural products carrying organic certification, and so forth.

Beyond wood and biobased materials, this approach for awarding points in LEED based on certification that is built on a platform of life-cycle assessment could be extended to other raw materials. While very challenging, it is conceivable that a multi-tiered approach, such as suggested here, could be used in awarding LEED points for mined and quarried materials, such as metals and minerals. A certification system for aluminum, for example, could address environmental issues and the welfare of indigenous cultures relative to the mining of bauxite and production of aluminum—thus rewarding environmentally and socially responsible operations.

Making the Changes to MRc6 and MRc7 Outlined Herein

The following process is proposed for vetting and approving this proposal (several of these steps are envisioned as occurring concurrently):

1. Endorsement by the USGBC Board or Executive Committee of the Board of this general approach to modify LEED MRc6 and MRc7.
2. Presentations to USGBC Chapters and members to explain the proposed changes and seek buy-in.
3. Communication about the proposed changes to the green building community and mainstream building industry seeking understanding and consensus.
4. Review and modifications of the proposal by the MR TAG, with input into that process by the Wood Sub-TAG.
5. Review and modifications of the MR TAG-approved proposal by the LEED Steering Committee.
6. Review and modifications of the LEEC SC-approved proposal by the USGBC Board of Directors.
7. Solicitation of public comments and balloting by USGBC membership of the changes to LEED MRc6 and MRc7.

Advantages and Disadvantages of the Proposed Changes to MRc6 and MRc7

Advantages:

1. The proposed MRc6 change would more accurately reward environmentally responsible practices—meaning it will make LEED more environmentally robust. The findings suggest that there is not an environmental justification for rewarding conventional agriculture over relatively standard forestry. MRc6 currently makes the value judgment that rapidly renewable materials are better, from an environmental standpoint, than longer-rotation biobased materials (wood), and this does not appear to be justified by the science.
2. The recommendations find opportunity for improving the environmental performance of the LEED rating system in the intense conflict that has existed over MRc6 and MRc7, and thereby address the chief concern of the timber industry (that LEED is “biased against wood”). This advancement in the rating system may therefore redirect the significant resources that have been aimed against LEED and green building — hostility that is having a negative impact on the advancement of green building practices.
3. The recognition of SFI and other wood certification systems in LEED *might* lessen timber industry opposition to FSC. It could do this by opening up dialog between the environmental community and the timber industry and reducing the adversarial relationship that currently exists. If SFI, CSA, and other certification schemes were allowed to be part of LEED—to participate with the environmental community in this rating system—the companies in the timber industry and the trade associations serving that industry might feel less of a need to actively fight FSC. Members of the

American Forest & Paper Association (AF&PA), for example, might become freer to dual-certify their timber holdings.

4. The change would ramp up the recognition of wood in LEED overall—from one potential point that can be earned to two points. This would improve the competitive position of wood compared with other building materials.

5. FSC-certified wood (clearly the most robust certification system) would be eligible for two points, compared with only one point that is achievable in the present LEED rating system.

6. The change in MRc6 and MRc7 may open the door to other much-needed certification systems for other biobased materials, such as bamboo.

7. For the timber industry, removing the opposition to LEED from their policy agenda might be seen as a significant cost-saving opportunity.

Disadvantages or risks of these changes:

1. This change would open the door to recognition of SFI in LEED—giving significant recognition to a certification system that is less robust than FSC. FSC has played a tremendously important role in transforming the timber industry, both internationally and in the U.S. The fact that FSC certification is the *only* way to get a point in LEED for using wood has given a great deal of attention to FSC. Without FSC, it is clear that SFI and other industry certification systems would not be nearly as strong as they are today. By opening the door to other wood certification systems in LEED, such as SFI, there is risk that FSC will lose some of the market transformation value that it has provided.

2. Some could spin these modifications to LEED as caving in to timber industry demands. This could result in hostility or conflict within the USGBC membership.

Final Thoughts

It is my opinion that the changes outlined in this report make sense and are the right thing to do on many levels. From an environmental standpoint, the changes would correct a problem in the existing LEED Rating System that rewards short-rotation agricultural products more than standard wood, while increasing the overall recognition of wood compared with non-renewable materials. Wood is a building material whose primary input in production is sunlight, whose production sequesters carbon dioxide from the atmosphere, whose production can support biodiversity as well as the biophilia benefits of natural areas, and that can be salvaged for reuse at the end of its intended life and is ultimately biodegradable.

From a political standpoint, the proposed changes have the potential to build bridges to an important segment of the building products community and, in the process, gain wider buy-in to the USGBC's vision of green building. With greater recognition of wood and with a mechanism for other-than-FSC-certified wood to be recognized in LEED, the timber industry's support of less-robust alternatives to LEED might be reduced. As an ally, the wood products industry could help to further *robust* green building initiatives.

From a fiduciary standpoint, the proposed changes have the potential to reduce expenditures that are needed to counter efforts by the timber industry to block the use

of LEED by federal and state agencies. These changes could also improve LEED's competitive advantage in the green-building-program marketplace. Wider adoption of LEED would increase revenues to the Council and further its mission to advance green building.

Achieving the changes outlined in this report will not be easy, however. The arguments will have to be clearly and honestly articulated to the USGBC membership, to the environmental community (which the USGBC cannot afford to alienate), and to the timber industry. The delivery of this message will have to be carefully planned and implemented.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Andy Wilson". The signature is fluid and cursive, with a long horizontal stroke at the end.