Summary of Testimony

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Before the
Subcommittee on Rural Revitalization, Conservation, Forestry and Credit Jurisdiction, of the Committee on Agriculture, Nutrition & Forestry, United States Senate
328A Russell Senate Office Building
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Even as we move to control greenhouse gases from the major sources in our economy, it is important that we tap the full range of sources available to us — even if those sources fall outside an emissions cap. While the largest part of our emissions reductions will come from fossil-fuel-based industries, farms, ranches, and forests can make a hugely important contribution to our national goals as we transition to a low-carbon economy. They can do so through new economic activities that offset industrial emissions of greenhouse gases.

"Offsets" are emissions reductions from activities in a sector that is "uncapped" (not covered by a limit on total emissions). Offsets provide an important means for quickly and cost-effectively mitigating global greenhouse gas emissions, which result primarily from combustion of fossil fuels. With the right incentives, farms and forests can offer an immediate, readily available opportunity to reduce emissions domestically and internationally, and they have the potential to substantially shrink companies' costs of complying with a cap-and-trade program without compromising the integrity of a firm emissions cap. A judicious offsets policy can broadly engage farmers, ranchers, and foresters, as well as key major-emitting developing countries, in providing solutions and sharing in the economic opportunities of the transition to a low-carbon economy. Well-designed offsets activities can also provide substantial environmental benefits that are felt well beyond our atmosphere.

This testimony highlights three key points:

Agriculture and forestry activities—at home and abroad—have great potential to provide cost-effective climate solutions that deliver other environmental benefits as well.

Our vast rural land base is one of our great national assets. Though use of climate-friendly farming and forestry practices, farmers, ranchers, and foresters can reduce emissions of the heat-trapping gases that cause climate change (for example, by capturing methane generated by dairy farms) or actually remove greenhouse gases from the atmosphere (for example, by growing carbon-capturing forests on lands currently used for other purposes). Whether in agriculture, forestry, or rangeland management, our rural economies possess tremendous potential for growth in a new industry of climate solutions.

By providing financial rewards for new uses of America's vast rural lands, a carefully-designed offset program can generate new economic opportunities – and new jobs. The vast majority of these jobs will need to be done by workers in the U.S. Building and servicing a methane capture facility on a North Carolina hog farm, for example, cannot be outsourced to workers in another country.

An offset program will also provide major new opportunities for American entrepreneurship. Because there will be money to be made by finding new and better ways to sequester carbon, and to reduce carbon emissions from uncapped sectors, a well-designed offset program will stimulate technical research and business innovation in America's rural economies.

The potential impact of carbon-friendly changes in land-use practices extends far beyond our borders. Globally, the destruction of forests – principally in the tropics – emits massive amounts of carbon dioxide: approximately 20% of global greenhouse gas emissions, or roughly as much each year as all the CO_2 emitted by all the fossil energy consumed in the United States. When forest carbon emissions are included, the third and fourth largest emitters of GHGs *in the world* are Indonesia and Brazil, respectively. We have an opportunity both to engage these major-emitting developing nations and to reap the benefits of these low-cost, high-value emissions reductions through recognition of tropical forest protection activities in our own offsets policy.

It is critical that we seize these opportunities not only because of the climate imperative, but also because of the tremendous impact agriculture and forestry offsets can have on controlling the costs of a transition to a low-carbon economy. Offsets broaden the set of available options for complying with the requirements of climate policy by allowing companies greater flexibility to make GHG reductions wherever they are cheapest across the economic and physical landscape. Agricultural offsets are among the lowest-cost of all the land-use options, and several analyses have shown these offsets to be the "low-hanging fruit." Economic analyses have confirmed the cost-mitigating value of agriculture and forestry offsets. Based on a 2005 EPA analysis of the GHG mitigation potential of domestic forestry and agriculture, about 1,500 million metric tons of CO_2 equivalent could be available from agricultural and forest offsets at prices of under $50 per ton. More recently, the EPA's analysis of S. 2191 concluded that the use of domestic offsets has an enormous potential for reducing the costs of an effective cap-and-trade program.

Because the EPA analyses do not examine the impact of incentives for *tropical* forest protections, Environmental Defense Fund has conducted a simple modeling exercise to explore the cost control potential of an international forest carbon ton provision in federal cap-and-trade legislation. Our results, summarized in this testimony, conclude that allowing international forest carbon credits into the U.S. market could provide important cost-containment benefits for the United States.

A system of quality assurances built in to a cap-and-trade program will substantially mitigate concerns over offset quality.

An offset program can provide real reductions in greenhouse gas emissions only if the offsets are of high quality. Development of a rigorous system of quality assurances is thus critical to ensuring the value of agricultural and forestry offsets to both the rural economies that produce them and the industries that purchase them.

In this testimony, we present a two-part framework of options to meet the need for quality assurances in an offset program at *both* the scale of individual projects *and* the level of the overall program. We outline the potential to improve national and regional accounting so that it can be used periodically to compare *expected* performance from a sector's offsets to *actual* changes in greenhouse gases measured in the national inventory for that sector. We also describe a potential "true-up" process for the forestry sector that could allow use of improved information on changes in land-use practices to assess and adjust, if necessary, the parameters of our offset program.

Policy makers have a time-limited opportunity to simultaneously engage developing nations and reap enormous greenhouse gas benefits through market incentives to reduce tropical deforestation.

A focus on quality allows the U.S. to go global in the search for high-quality GHG mitigation opportunities. While S. 2191 currently allows for some use of provisions for international credits, it provides no role for reductions in tropical deforestation as a category of compliance credits. Tropical deforestation today contributes as much in greenhouse gas emissions as all uses of fossil fuels in the U.S. By structuring the U.S. carbon market to compensate developing countries for emission reductions that lower their *national* rate of deforestation below a historical baseline, Congress can strengthen those nations' climate and biodiversity protection efforts and create a model for engaging developing countries broadly. Inclusion of tropical forest credits will also reduce substantially the overall cost of a U.S. cap-and-trade program.

Emissions reductions from tropical forests are *not* offsets from unregulated sectors in foreign countries that do not have a program to reduce national-level emissions — in our testimony, we discuss at some length the reasons for keeping that sort of offset credit (e.g., Clean Development or "CDM" credits) out of our domestic emissions trading system. Rather, emissions reductions from key tropical forest nations would come from national-level programs to reduce emissions on a major scale. For many developing countries, deforestation is the largest source of their emissions; because of this, a policy to reduce tropical deforestation emissions at the national level ***is*** comparable to a cap on the majority of their emissions.

EDF supports the provisions in the current version of the Lieberman-Warner bill that allocate 2.5% of total emissions allowances to international forest carbon activities. But we also believe that the current provision that allows regulated entities to satisfy 15% of their compliance obligations with credits from international trading systems should be expanded to explicitly include credits for international forest carbon activities. In an attached appendix, we provide a

detailed example of how crediting of such activities could work as part of the U.S. carbon market.

Conclusion

EDF appreciates the opportunity to discuss the important benefits of a well-designed policy for tapping the potential for climate solutions in our rural economies. We believe that judicious use of domestic offsets and international forest carbon credits can serve a crucial role in curbing greenhouse gas emissions and reducing the costs of a cap and trade program – with the additional benefits of valuable ecosystem preservation, job creation, and engaging developing countries in a global climate solution.

Successfully addressing the escalating threat of climate change will require ambitious international action that takes advantage of all credible options for reducing emissions – including the substantial opportunities offered by agriculture and forestry at home and abroad. With the right rules and standards, farms and forests can help achieve that goal.

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Introduction

Thank you, Chairman Stabenow, Ranking Member Crapo, and distinguished members of the Subcommittee, for holding this hearing and for your invitation to provide the views of Environmental Defense Fund (EDF)[1] on "Agriculture and Forestry's Role in Providing Solutions for Climate Change: Incentives for Jobs and Cost Containment." EDF is a vocal advocate for market-based solutions to quickly reduce greenhouse gas (GHG) emissions from all sectors of the economy.

My name is Ruben Lubowski, and I am the Forest Carbon Economics Fellow at Environmental Defense Fund. For five years, I served as an economist at the Resource and Rural Economics Division at the U.S. Department of Agriculture's Economic Research Service (USDA-ERS). In this capacity, I was the agency's Subject Specialist on Land Use and my responsibilities included managing the Major Land Uses database, which provides the only consistent accounting of all major uses of public and private land in the United States. In my academic career, I developed a model of national land use, which has served to estimate the costs of sequestering carbon. Previously, I have analyzed issues of tropical forest management at the World Bank, the Harvard Institute for International Development and the United Nations Development Program.

Even as we move to control greenhouse gases from the major sources in our economy, it is important that we tap the full range of sources available to us – even if those sources fall outside an emissions cap. While the largest part of our emissions reductions will come from fossil-fuel-based industries, farms, ranches, and forests can make a hugely important contribution to our national goals as we transition to a low-carbon economy. They can do so through new economic activities that offset industrial emissions of greenhouse gases.

"Offsets" – as emissions reductions from uncapped sectors are commonly called – are an important mechanism for quickly and cost-effectively reducing global greenhouse gas emissions,

[1]Environmental Defense Fund is a leading national nonprofit organization representing more than 500,000 members. Since 196, we have linked science, economics and law to create innovative, equitable and cost-effective solutions to society's most urgent environmental problems. We have long championed market-based approaches, and helped design the highly successful acid-rain program created in the Clean Air Act Amendments of 1990. See "About Us," www.edf.org/page.cfm?tagID=1475.

which result primarily from combustion of fossil fuels. The benefits of offsets cannot be overlooked: they offer an immediate, readily-available opportunity to reduce emissions domestically and internationally, and they have the potential to substantially shrink compliance costs of a cap-and-trade program without compromising the integrity of a strict emissions cap.

At the same time, judicious use of domestic offsets and international forest carbon credits, primarily those resulting from reduced deforestation emissions, can provide a range of other valuable benefits, both for the environment and for indigenous and other forest-dependent peoples. A well-designed offsets policy can broadly engage farmers, ranchers, and foresters, as well as key developing countries, in providing solutions and sharing in the economic opportunities of the transition to a low-carbon economy.

Effective standards and accounting will be crucial to ensure the quality of offsets and safeguard emissions reduction goals. And, as I will describe below, Congress could consider a periodic program-wide "true-up" for the forestry sector – an insurance policy that offset commitments will be fulfilled – as a further assurance that emissions reduction targets are met.

This testimony will highlight three key points:

1. Agriculture and forestry—at home and abroad—have great potential to provide cost-effective climate solutions that deliver substantial additional environmental benefits.
2. Quality assurances built in to a cap-and-trade program will substantially mitigate concerns over offset quality.
3. Policy makers have a time-limited opportunity to engage developing nations and reap enormous greenhouse gas and other environmental benefits through mechanisms to prevent further tropical deforestation.

A word on terminology

In this testimony, I use the word "offsets" to refer to emissions reductions earned in an "uncapped" sector (a sector, such as forestry or agriculture, which is not covered by a limit on total emissions). More specifically, an "offset" credit is a credit awarded by a governmental authority for reducing emissions below "business as usual" in that sector. We distinguish offsets from emissions reductions achieved in a capped sector, whether at home or abroad. By contrast, the EPA analysis of the Lieberman-Warner Climate Security Act (S. 2191[2]) uses the word "offset" for both reductions in uncapped U.S. emissions or reductions in capped *foreign* emissions. There are many reasons to distinguish between reductions in capped and uncapped sectors, as we explain further below.

Offsets are important to the environment

Offsets generated through climate-friendly farming and forestry practices have multiple benefits, including benefits to ecosystems as well as the climate. They may either reduce

[2]References in this testimony to S. 2191 are to the version reported out by the Environment and Public Works Committee in December 2007.

emissions of the greenhouse gases (primarily carbon dioxide, as well as methane, nitrous oxide, and others) that cause climate change, or actually *remove* such gases from the atmosphere (because plants take up carbon from the atmosphere as they grow and store or "sequester" this carbon in biomass and soils). In agriculture, farmers are adopting a wide variety of innovative practices that enhance uptake and reduce emissions of carbon dioxide or other greenhouse gases. Nationwide, farmers are adopting innovative cultivation techniques such as no-till and ridge-till planting, growing trees along stream banks, precision application of fertilizer, choosing cover crops carefully, and embracing many other agricultural practices that help fight global warming. Livestock and dairy producers are also changing animal feed rations to reduce methane emissions from animals and capping manure lagoons to capture methane and flare it or – better still – use in place of fossil fuels. In 2006 the National Wheat Growers became the first commodity group to publicly endorse market-based climate action, noting that, "…if the climate change issue is to be credibly addressed, it is important that policy makers recognize the real contribution that farmers are now making – and can make on this issue in the future." The concept of "growing carbon" has truly arrived, and farmers are getting organized; for further evidence, look no farther than http://www.agcarbonmarkets.com/, the website for the Agricultural Climate Working Group.

In the domestic forestry sector, opportunities to increase carbon sequestration include afforestation (planting trees on lands previously used for other purposes, such as agriculture), reforestation (planting trees on recently forested lands, such as after a fire), and avoided deforestation (for example, for urban development). In addition, changes in timber management practices that increase carbon sequestration include changes in fertilization practices, improved fire and pest management, modified harvesting practices to reduce carbon losses, and lengthening of the growing interval between timber harvests (the rotation age) to extend carbon accumulation and delay releases.

Our nation's grazing lands also offer a host of opportunities to increase carbon stocks through innovative management, including improved grazing practices and rangeland restoration. All of these activities on our croplands, forests, and rangelands, which collectively comprise the vast majority our national land base, offer the potential to reduce GHG emissions or to remove carbon from the atmosphere, while also furthering important other environmental objectives such as protection of wildlife habitat, water quality, soil conservation, and open space.

The focus on forestry and rangelands can go beyond private lands, as well. Close to 40 percent of our U.S. land base is in some form of public ownership; 42 percent of U.S. forestland is in public ownership, and 33 percent of our grasslands are, as well.[3] In addition to private sector activities, the U.S. Forest Service and other federal lands managers can and should also be encouraged to manage lands in ways that are responsive to the challenge of climate change by ensuring that our National Forests contribute to efforts to stabilize atmospheric greenhouses and are managed in ways that make them more resilient to climate change.

[3] Lubowski, Ruben, Marlow Vesterby, Shawn Bucholtz, Alba Baez, and Michael Roberts. 2006. *Major Uses Land in the United States 2002*. Economic Information Bulletin (EIB-14). U.S. Department of Agriculture, Economic Research Service.

Judicious use of carbon offsets provides the potential to address aspects of our carbon footprint that are impractical or impossible to capture through a nationwide cap. The EPA estimates that S. 2191 would cover about 88% of national emissions. Of the remaining 12%, emissions from agricultural sources account for about half (around 6% of total emissions). Emissions from landfills and petroleum and natural gas process losses are the most significant non-agricultural sources of the final 6%.

Domestic agricultural and forest lands provide an opportunity not only to reduce their own emissions but to augment the other side of the carbon ledger—our "carbon sink." In this country, the net effect of all forestry activities plus agricultural and other land uses (and changes in these uses) is to annually remove around 0.91 billion tons of CO_2 equivalent,[4] which is 12.5% of the nation's total annual emissions. There is great potential to further increase the size of this sink – and to ensure that it does not decline in the future. In fact, a report by the Congressional Budget Office (CBO) indicates that the U.S. could, in theory, roughly double this annual carbon-capturing effect through enhanced agricultural and forestry sequestration.[5]

By driving changes in land use and land management practices, markets for offsets can create substantial public benefits in addition to climate change mitigation. Creating more forests and managing agricultural land to conserve soils and reduce fertilizer inputs would reduce the amount of non-point source pollution entering our waterways – one of the most difficult sources to control with regulation. Research suggests that the "co-benefits" associated with incentives for carbon sequestration would include increased wildlife habitat, better soil erosion protection, and improved water quality in streams and rivers. A domestic market for offsets would increase the incentives for conservation and sustainable management practices, as long as appropriate safeguards were in place. Federal and state conservation programs already provide mechanisms for delivering these services, but incentives for offsets could complement and possibly leverage the impact of these initiatives. These programs are crucial tools in our country's investment in preserving endangered species, reducing the chemical loading that contributes to the Gulf of Mexico "dead zone," retaining the vital productivity of our nation's soils, and maintaining the health of ecosystems we depend upon.

While well-managed agricultural lands and forests sequester large amounts of carbon, loss and degradation of forests, grasslands, and soil carbon in croplands releases that carbon back into the atmosphere. Globally, the destruction of forests – principally in the tropics – emits massive amounts of carbon dioxide: approximately 20% of global greenhouse gas emissions, or roughly as much each year as all the CO_2 emitted by fossil energy consumption in the United States.

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[4]U.S. Environmental Protection Agency. 2008. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006.* http://www.epa.gov/climatechange/emissions/usinventoryreport.html. While carbon dioxide (CO2) is the most common heat-trapping gas, several other gases have heat-trapping properties of varying potency. For example, methane is about 25 times as powerful as CO2, while nitrous oxide (N20) is about 298 times as powerful. CO2-equivalents essentially allow conversion into a single metric for easier comparison.

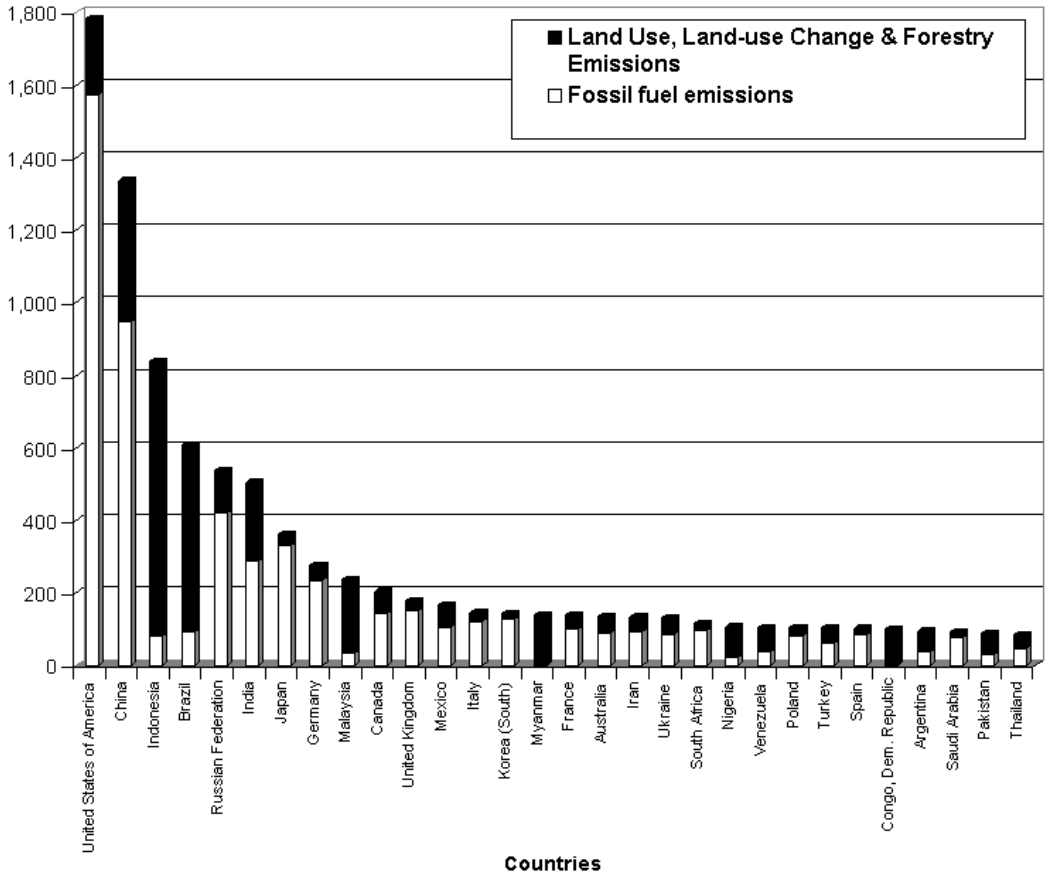
[5] The Congressional Budget Office. 2007. *The Potential for Carbon Sequestration in the United States.* Pub. No. 2931, CBO The Congress of the United States.

Engaging developing countries in cutting their total GHG emissions is essential if the world is to curb climate change. The United States is the world's largest current and historical GHG emitter. Fast-growing developing countries, however, will soon emit more than we do – in fact, in terms of energy sector emissions, there are indications that China may already do so.[6] Global warming cannot be solved unless both the U.S. and large developing countries cut total GHG emissions.[7] As Figure 1 shows, deforestation is the largest source of emissions for many developing countries. In these nations, economic incentives drive the clearing and cutting of living forests and, thereafter, sale of the trees or of products grown on cleared lands (such as soybeans, sugar cane, palm oil, and cattle). When forest carbon emissions are included, the third and fourth largest emitters of GHGs *in the world* are Indonesia and Brazil, respectively. For these countries, the largest share of emissions is deforestation, an amount comparable to total US fossil fuel emissions.

[6]CRS Report for Congress, *China-U.S. Relations: Current Issues and Implications for U.S. Policy*, p. 25 (December 21,
2007).

[7]"Even if emissions from developed regions . . . could be reduced to zero in 2050, the rest of the world would still need to cut emissions by 40% from BAU [business as usual] to stabilize at 550 ppm CO2e. For 450 ppm CO2e, this rises to almost 80%." Stern, Nicholas. *The Economics of Climate Change: The Stern Review* (October 2006), page 537. Available at: http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_Report.cfm

Figure 1. Emissions of top 30 emitters, (Million tons of carbon in 2000)



Source: World Resource's Institute (WRI), Climate Analyis Indicator Tool (CAIT): http://cait.wri.org

Offsets are a key cost containment tool

EDF has long advocated use of offsets in a cap-and-trade system as a cost-effective means for regulated companies to meet their compliance obligations. We believe that the more affordable we can make reductions, the more ambitious we can be in establishing a truly protective climate goal. Offsets broaden the set of available options for complying with the requirements of climate policy by allowing companies greater flexibility to make GHG reductions wherever they are cheapest across the economic and physical landscape. With appropriate rules to ensure the integrity of the reductions, offsets can dramatically lower the costs of complying with any emissions reduction target.

The potential to "bank" allowances and/or offset credits for use in future periods further increases the cost-containment and risk management benefits of offsets. Together with the flexibility of banking, the availability of low-cost offsets not only reduces compliance costs in

the current year, but also increases opportunities for companies to build up reserves of cheaper compliance options that provide a form of insurance, buffering against higher allowance prices or more volatile allowance prices during future periods.

S. 2191 allows companies to meet up to 15 percent of their compliance obligation through domestic offsets, including those from agricultural and forestry carbon sequestration. S. 2191 also allows companies to meet up to an additional 15 percent of their compliance obligations through allowances from comparably capped trading systems in other countries ("international credits" in the terminology of the bill). In addition, S. 2191 allows banking and limited borrowing of allowances, and proposes the creation of a "Carbon Market Efficiency Board"– sometimes referred to as the "Carbon Fed" – which is empowered to adjust carbon market parameters, including limits on offsets, in the event of unanticipated, damaging costs.

These are important cost management tools. The EPA's analysis of S. 2191 considered ten different scenarios for meeting the bill's greenhouse gas reduction targets – embodying different assumptions about the future availability and cost of different technologies, international policy, and the ability of firms to use offsets and international credits for compliance.[8] The report concludes that the use of offsets can dramatically reduce the cost of the program. In particular, relative to a benchmark policy scenario representing the bill as passed out of committee, the EPA found that maintaining the bill's 15% limit on domestic offsets but eliminating international credits increased forecasted prices by an estimated 34% , while eliminating both domestic offsets and international credits raised projected prices by 93% overall. This analysis suggests S.2191 already contains a powerful suite of cost-containment measures to reduce costs throughout the program, and the bill also provides mechanisms for allowing more offsets into the system if needed.

EDF's analysis of the potential impact of international forest carbon credits

The menu of compliance options in S. 2191 could be broadened further to allow companies to meet compliance obligations using international forest carbon credits – that is, emissions reductions or sequestration from forestry activities in the developing world, principally reduced tropical deforestation. To assess the potential cost-control impact of international forest carbon credits, EDF has conducted a simple modeling exercise. Appendix 1 provides details on the methodology and data sources for this study.

Our modeling approach essentially represents a "best-case scenario" for international forest carbon credits. The cost curves we use attempt to capture the economic potential for emissions reductions and sequestration from reduced tropical deforestation, forest management, and afforestation worldwide, with most of the potential coming from developing countries in the tropics. These cost curves do not take into account the needs for institutional capacity building, implementation, transactions costs, and the like. As a result, the results presented here should be

[8]U.S. Environmental Protection Agency, Office of Atmospheric Programs, "The EPA Analysis of the Lieberman-Warner Climate Security Act of 2008 – S.2191 in 110th Congress." March 14, 2008. Available at: http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf

viewed as a "scoping exercise" to convey the potential magnitude of the opportunity from international forest carbon credits.

Our analysis takes into account the interplay of the *supply* of emissions reductions (through abatement and sequestration) and the *demand* for those reductions (driven by government policies). The model explicitly allows "banking" – that is, setting aside offsets for future years – since international forest carbon tons represent a reservoir of low-cost abatement solutions that companies could use as a hedge against unexpectedly high future allowance prices.

The main conclusion from this modeling exercise is that allowing international forest carbon credits into the U.S. market could have a substantial impact on allowance prices in the United States.

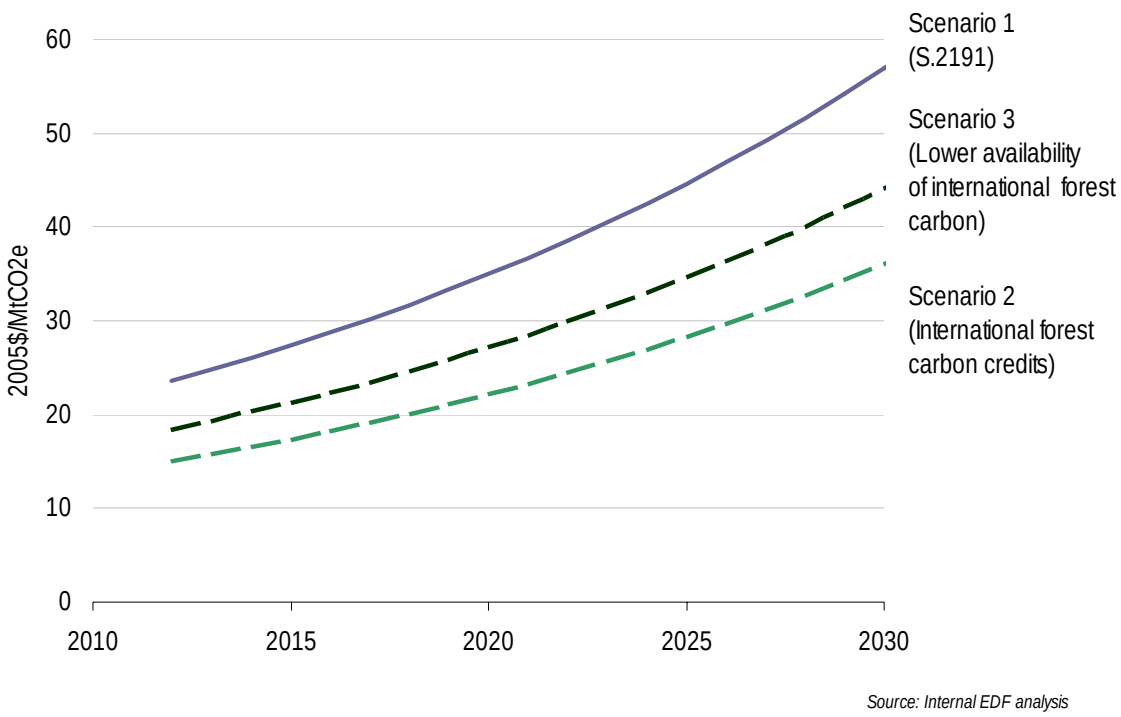
- Compared to the current version of S.2191, allowing international forest carbon credits into the U.S. market could, in principle, reduce projected allowance prices by **33%** (although that impact will decline when various other costs are included).

- Even if we assume that only half as many tons would be available at any given level of marginal cost, international forest carbon credits have the potential to reduce projected allowance prices by **25%** (again, not taking into account a variety of transaction and implementation costs).

- Finally, even in an analysis with unlimited international forest credits, estimated allowance prices remain at $16 per ton in 2012, rising at 5% per year. Moreover, in our analysis, domestic offsets (from agriculture, forestry, and other sources) are still used up to the maximum 15% limit under S. 2191.

These results are depicted in Figure 2.

Figure 2. EDF Analysis of Potential for International Forest Carbon Credits



Source: Internal EDF analysis

In practice, transaction costs and implementation delays would mean that fewer credits would be available in early years than indicated in this scoping analysis. Nonetheless, the magnitude of this opportunity suggests that a carefully-designed forest carbon program could provide calibrated cost containment in the near to medium term.

In our projections, with or without a regulatory ceiling on how many credits could be used, the great majority of those credits are banked for use in later years — particularly the years after 2035, when developing countries have also taken on mandatory and binding emissions targets. Such a bank would provide an important cushion against short-run price volatility. Indeed, the results presented so far suggest that even a relatively limited use of forest carbon credits could play a significant role in containing costs.

As a result, given the major potential of these forest carbon credits to both reduce costs and leverage the power of the market to stanch deforestation, along with the other significant cost-containment opportunities already in S.2191, any "safety valve" that sacrifices environmental goals for price certainty would be a terrible mistake.

A note on the "voluntary" market for offsets

Our focus here is on how agriculture and forestry can help reduce the costs of climate legislation within a cap-and-trade system in which companies have mandatory obligations to reduce their emissions. However, it is important to acknowledge that a dynamic voluntary market for "offsets" has recently emerged to enable companies and individuals to reduce GHG emissions on a voluntary basis. As a newly emerging voluntary market operating in the absence of government oversight, there has been a proliferation of different standards and concerns over the environmental validity of some of the produced credits. At the same time, the voluntary sphere has seen robust innovation and development of new project types that might be otherwise be ineligible in a compliance market. This voluntary market could continue to be used as a means for individuals to invest in personal offsets, in parallel to an offset market that companies can use for meeting mandatory obligations. (This dual system is what has happened in the U.K., where commercial emitters are already part of the EU compliance market.) In future years, the voluntary "offset" sphere may require either standard-setting or governmental oversight. Those issues, however, are not the focus of today's testimony.

Agriculture and forestry provide key cost-controlling options "beyond the smokestack"

Economic analysis shows that rural economies have a powerful contribution to make through agriculture and forestry activities that control GHGs. In a 2005 analysis of the GHG mitigation potential of domestic forestry and agriculture, the EPA concluded that 1,500 million metric tons of CO_2 equivalent could be available from agricultural and forest offsets at prices of under $50 per ton, with about 20 percent of this total from agriculture and the rest from forestry.[9]

While the total estimated potential of agricultural offsets is smaller than the forestry opportunities, the agricultural opportunities appear to be the lower cost options. In the EPA analysis, 75%s of the agricultural offsets examined were available for under $15 per ton compared to just 30% of the forest sector opportunities.[10] In other words, the bulk of agricultural offsets will likely be "low hanging fruit" that will be purchased first under a market system. The specific numbers in the EPA study depend on the details of their modeling, but independent analyses by McKinsey & Co.,[11] the U.S. Department of Agriculture, [12] and the academic literature have reached similar conclusions.[13]

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[9]This figure excludes biofuels-related mitigation opportunities considered in EPA's analysis, as these are likely to be treated differently than other agriculture and forestry activities. See: U.S. Environmental Protection Agency. 2005. *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture.* EPA 430-R-06-006.

[10] As noted earlier, these estimates exclude biofuels-related opportunities considered by EPA, as these will likely be accounted for differently than the forestry and agriculture offsets discussed here.

[11]*Reducing US Greenhouse Gas Emissions: How Much at What Cost*?, conducted by McKinsey & Company and published jointly with the Conference Board in December , 2007 is available at: http://www.mckinsey.com/clientservice/ccsi/greenhousegas.asp

[12] Lewandrowski, Jan, Mark Peters, Carol Jones, Robert House, Mark Sperow, Marlen Eve, and Keith Paustian. *Economics of Sequestering Carbon in the U.S. Agricultural Sector*. Technical Bulletin No.1909. U.S. Department of Agriculture, Economic Research Service.

[13]See for instance: McCarl, Bruce A., and Uwe A. Schneider. 2001. "Greenhouse Gas Mitigation in U.S. Agriculture and Forestry." *Science* 294, p.2481-2482. See also the review of studies in: The Congressional Budget

A variety of sources, including the Intergovernmental Panel on Climate Change (IPCC), indicate that the cost of forest protection in some parts of the world is far less than the cost per ton of more expensive means of reducing CO_2 emissions given today's technologies.[14] Opening America's carbon market to tropical forest tons could thus significantly reduce U.S. companies' compliance costs in the near and medium term, and send a powerful economic signal for tropical forest countries and investors to position themselves to participate in our carbon market. On the other hand, if the world waits a decade or two before creating powerful incentives for compensating those who protect tropical forests, the forests – and the approximately 300 billion tons of carbon they hold – will already be gone. This would be a devastating blow to the goal of reducing global emissions of greenhouse gases, as well as a tragic loss of biological diversity.

Agriculture and forestry offer a large reservoir of lower-cost emissions reductions opportunities in the near and medium term, which can be credited and potentially banked for future use under a cap-and-trade program. These opportunities provide an important bridge strategy while technology innovations are developing that will drive down the costs of CO_2 control in the energy sector in the future. Additionally, measures to engage agriculture and forestry through a market for offsets credits will encourage further innovation and faster adoption of new agricultural and forestry technologies and methods that are cheaper and more effective than current practices. We recognize that some of the physical carbon stocks associated with forest and agricultural practices may not be permanent—and, as a result, would later need to be recouped—but this does not diminish their importance as a source of near-term opportunities for emissions reductions during the period of economic and technological transformation to the low-carbon future. We also acknowledge that some recognition for early adoption of carbon-friendly land-use practices may be appropriate, not only to reward early action but also to avoid creating perverse incentives to change land-use practices in order to qualify for compliance offset credits.

A well-run offset program for domestic agriculture and forestry will create new opportunities and jobs

By providing financial rewards for new uses of America's vast rural lands, a carefully-designed offset program will generate new economic opportunities – and new jobs. A project to capture (and potentially to use as fuel) the methane that is currently emitted by a dairy or hog

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Office. 2007. *The Potential for Carbon Sequestration in the United States.* Pub. No. 2931, CBO The Congress of the
United States.

[14] Intergovernmental Panel on Climate Change, *Climate Change 2007: Mitigation of Climate Change, Summary for Policymakers* (4 May 2007), page 21. Available at: http://www.ipcc.ch/SPM040507.pdf.

farm, for example, will require skilled workers to design and build the necessary equipment and to operate and maintain the equipment once installed. Planting of new forests on land currently used for other purposes will likewise require trained workers. And the crucially important task of ensuring the quality of offsets will call on the talents of another set of trained and skilled workers.
The vast majority of these jobs will need to be done by workers in the U.S. Building a methane capture facility on a North Carolina hog farm, for example, cannot be outsourced to workers in another country.

An offset program will also provide major new opportunities for entrepreneurship. Because there will be money to be made by finding new and better ways to sequester carbon, and to reduce carbon emissions from uncapped sectors, a well-designed offset program will stimulate technical research and business innovation in America's rural economies.

A focus on quality is essential to ensure environmental and economic benefits from offsets

The emissions reduction performance of offset projects must be carefully measured and monitored to ensure the environmental integrity of the cap. In turn, this environmental integrity is fundamental to building confidence in the offsets market and protecting the investments of offsets developers and purchasers.

The main concern with offsets is that they may not generate the expected reductions of net emissions. Some concerns about the integrity of offsets, including the need for managing risk and uncertainty and accurate monitoring and enforcement, also apply to emissions reductions under the cap. However, the challenge of ensuring the integrity of offsets based on land management has received special attention, including recognition of the importance of a clear scientific understanding of how carbon builds up in agricultural and forest system and how they affect the climate, as well as of managing the risk of emissions "reversals." For example, a field that has been converted to no-till cropping may be turned back to conventional tillage, releasing soil carbon. Similarly, a forest specially planted to sequester carbon may be harvested prematurely or burned down, releasing the credited carbon.

In June of last year, Duke University Press published *Harnessing Farms and Forests in the Low-Carbon Economy: How to Create and Verify Greenhouse Gas Offsets,* a technical guide, commonly known as the "Duke Standard," for farmers, foresters, ranchers, traders, and investors. Duke's Nicholas Institute for Environmental Policy Solutions developed the guide in collaboration with Environmental Defense Fund and with scientists from Texas A&M, Colorado State, Rice, Princeton, Kansas State and Brown Universities, as well as other experts. It is a step-by-step, "how to" manual for generating high-quality offset tons in agriculture and forestry, while avoiding project-level pitfalls that could reduce true greenhouse gas benefits.[15]

In themselves, uncertainty and risk in offset projects do not necessarily threaten environmental integrity of an offset, but there must be clear management of uncertainty and risks

[15]See www.nicholas.duke.edu/institute/ghgoffsetsguide/ghgexerpts.pdf

through monitoring, verification, and enforcement rules. To deal with the problem of reversibility, for example, the Duke Standard has a chapter on systems of verifying and registering offsets. Combined with system to detect unexpected reversals, offset purchase contract provisions can assign responsibility for any reversed reductions (*e.g.*, through conservative provisions for self insurance, maintenance of reserves or via third-party insurance) during the contract period as well as to assign responsibility to the buyer to renew or otherwise replace offset tons at the end of the contract term (if limited term contracts are being used, as in the case of most current sequestration projects).

Other technical issues arise in the case of offsets because crediting occurs at the level of individual projects that, by definition, occur in an uncapped sector – *i.e.*, a sector that does not have any restriction on overall sector-wide emissions. This raises the important issues of additionality (whether the emissions reductions from a project would have occurred anyway) and leakage (whether emissions are simply shifted to another location).[16] The Duke Standard provides detailed guidelines for setting baselines, and adjusting them over time given changing conditions, to evaluate additionality for different types of agricultural and forestry projects. Similarly, the manual describes methods to account for leakage or off-site emissions caused by different types of agricultural and forestry projects.

Researchers have estimated that leakage could range from 10% to over 90% for different forest carbon sequestration activities in the U.S.[17] EPA has estimated 24% leakage for domestic afforestation (planting trees on previously non-forest lands) versus 6% for soil carbon projects.[18] Why the disparity? Because most soil-carbon projects take place on soils that are already in agricultural use, for example, they simply involve a change in tillage practices, with relatively small reductions in agricultural output (indeed, they may improve it over time), creating small incentives for crop production to relocate elsewhere and potentially raise emissions. By contrast, if newly forested land otherwise would have been used for agriculture or buildings, overall demand for land for that purpose does not disappear – it just relocates.

Importantly, leakage in itself is not a threat to environmental integrity if it can be quantified with sufficient confidence. Once the Duke Standard protocols or other methods are applied to quantify the amount of leakage ifor a project, environmental integrity of an offset can be preserved by subtracting the leakage amount from the total number of reductions that are eligible for crediting as offsets. Another potent remedy is to make the offsets program as inclusive as possible, reducing the number of unmonitored sectors and minimizing the possibility

[16]Making all national emissions subject to a cap would solve the leakage problem within a single country, but emitting activities could still potentially relocate internationally to countries without similar restrictions, an issue known as "international leakage." The potential for leakage, however, is likely to be largest within an uncapped sector within a single country where emissions-producing activities (such as timber harvesting) may be shifted with greater ease from one location to another.

[17]Murray, Brian C., Bruce A. McCarl, and Heng-Chi Lee. 2004. "Estimating Leakage from Forest Carbon Sequestration Programs." *Land Economics*, Vol.80, No.1, pp.109-124.

[18]U.S. Environmental Protection Agency. 2005. *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture.* EPA 430-R-05-006. Washington, DC.

that reductions in emissions in one area or sector are displaced undetected to another area or sector.

Quality assurances in practice

Some advocates contend that the issues described above are essentially insurmountable, and demand strict quantitative limits on the use of offsets. In our view, the critical issue is ensuring that offsets are of high quality. If offset quality is unacceptable, *any* use of offsets may be too great. On the other hand, if high-quality offsets are available, quantitative limitations may prelude legitimate and needed carbon reductions from coming to market.

In the absence of clear federal guidance on these questions, experts on all sides of these issues have poured time and energy into proposals to address quality concerns. And while no one idea has emerged to universal acclaim, a survey of the field suggests a menu of very solid, detailed approaches to the quality question at both the project and national program level.[19] We suggest thinking about these policy questions at both levels.

A two-part framework would ensure the integrity of the offsets program at *both* the scale of individual projects *and* the level of the overall program. This process would ensure the highest possible quality at the level of the individual project, as well as a way to track progress at the national level and assess the stringency of quantitative limits over time.

Part 1. At the project level, stringent protocols for certification, verification, monitoring, and enforcement.

The first round of necessary assurances requires stringent measurement, verification, and permanence requirements via the application of rigorous methodologies and protocols for certifying and monitoring emissions reductions at the level of individual projects. This is the approach embodied in S. 2191, which calls on the EPA, most likely in coordination with USDA and other relevant agencies, to establish standards and guidelines for the certifying, accounting, and monitoring individual offset projects through approved independent third-party verifiers. The Duke Standard provides detailed and practical guidance on each step of this process.

In general, EDF urges the EPA and other implementing agencies to develop protocols to ensure that every certified offset project be:

- Real (actually achieve GHG reductions)
- Additional (beyond an established baseline such that the reductions would not have occurred otherwise under business as usual)
- Measurable (subject to accurate measurement and monitoring)

[19]See for example, "Designing offsets policy for the U.S.: Principles, challenges, and options for encouraging domestic and international emissions reductions and sequestration from uncapped entities as part of a federal cap-and-trade for greenhouse gases." published in May, 2008 by the Nicholas Institute for Environmental Policy Solutions, Duke University.

- Verifiable (by disinterested third parties)
- Serialized and tracked on a registry (to allow demonstration of ownership and prevent double counting)
- Enforceable (in a court of law).

Projects in which unexpected reversals are a risk should assess the risks, maintain monitoring mechanisms to detect and estimate unexpected reversals, and maintain insurance or other contract provisions to guarantee that emissions reductions will be recouped in the event of an unexpected reversal. In addition, we urge consideration of a "rental" option – that is, a class of emission reduction projects that are explicitly designed as time-limited projects. We also recommend establishing explicit requirements for independent reproducibility of any methodologies or standards adopted for the certifying process.

While these requirements are challenging, the good news is that, as condensed in the Duke Standard, there is a large body of accumulated experience in developing standards and protocols to address these issues from the voluntary carbon market, international programs, and state and regional programs here in the U.S. We encourage the EPA and other relevant regulatory agencies to learn lessons from existing methodologies and standards already developed, recycling their successful provisions and steering clear of their pitfalls when developing an offsets program for the U.S. carbon market. We also recognize the relevant experiences and information already gathered by DOE, EPA, USDA, and other agencies under voluntary emissions reduction and registration programs, such as Section 1605(b) of the 1992 Energy Policy Act. For example, the USDA's Natural Resources Conservation Services has developed the Voluntary Reporting of Greenhouse Gases-Carbon Management Evaluation Tool (COMET-VR), which allows individuals to estimate annual GHG emissions and carbon sequestration under different agricultural and rangeland management practices.

Part 2. At the national level, comprehensive accounting and periodic "true-up."

Accounting of carbon stocks in agriculture and forestry nationwide. Combined with clear rules for enforcement and systems to monitor and track emissions at the level of individual projects, the project level assurances described above will go far towards ensuring that credited offsets deliver the stated reductions. Nevertheless, federal offset rules should include provisions for data collection and scientific review to assess overall program performance. This would provide a stream of information to enable methods and protocols to be revised over time, as well as provide more robust assurance that the program is delivering the expected emissions reductions in uncapped sectors. All Annex 1 countries that are part of the United Nations Framework Convention on Climate Change, including the U.S., are required to provide national-level accounting of greenhouse gas emissions. Since 1990, the EPA, together with USDA and other agencies, has compiled this annual national inventory, including estimates of net emissions from forestry and land-use sources. As part of the process of ensuring a well-functioning offsets market, EDF encourages building on this existing inventory to develop a more accurate, detailed, and frequently updated national-level accounting framework for tracking changes in carbon stocks in both the agriculture and forestry sectors.

The proposed measurement and monitoring program would require a more integrated and coordinated effort across different federal and state agencies to measure and track overall national, as well as regional, changes in carbon emissions and sinks in various carbon pools within these sectors. This program would naturally build on existing on-the-ground surveys to monitor land-use changes and natural resources, such as the Forest Inventory and Analysis program of the U.S. Forest Service, as well as remote sensing programs from USDA, U.S. Geological Service, and other public and private sources. Tracking nationwide adoption of (and changes in) different farming practices would also require more accurate, detailed, and frequent surveys of farm management practices than those currently conducted by USDA's National Agricultural Statistics Service (NASS) and other agencies.

EDF encourages focusing resources to improve the accuracy of national and regional scale accounting so that it can be used periodically to compare *expected* performance from a sector's offsets to *actual* changes in greenhouse gases measured in the national inventory for that sector. Subject to the range of statistical confidence that is achieved by this accounting, this would provide a direct progress report of domestic mitigation activities in the forestry and agriculture sectors more broadly.

Improved data collection on agricultural and forest carbon stocks would also allow methods and protocols to be refined over time as information on actual program performance becomes available. For example, if actual leakage were much greater than accounted for in advance—for example, with more timber harvesting shifting across the country—actual gains in terms of forest carbon stocks would be less than anticipated and could be smaller than the amount of issued forest management credits. This would suggest that estimates for leakage may need to be raised going forward. However, if the estimates of expected leakage used in crediting these projects were too high, actual forest carbon stocks might increase by more than anticipated, and leakage estimates could be revised downward in the future. National accounting would also provide valuable information to allow the program to evolve with changing conditions. For example, depending on changing practices, technologies, timber and crop output and input prices, activities counted as additional may need to be adjusted to reflect new business-as-usual practices.

It is critical that the data collected by the government is made publicly available in a comprehensive, timely, user-friendly manner. Public access to high quality data on forestry and agriculture carbon would help offset project developers to improve their methodologies and make it cheaper, simpler, and faster to develop high quality offset projects. For example, establishing accurate baselines will require data on similar lands within the region of each project. Likewise, leakage calculations require data on activities on non-project lands. As a result, better data will lower the costs of creating and certifying offsets by making it easier to calculate baselines, leakage, and other measures of offset performance. For example, such data could feed into look-up tables or modeling tool like USDA's COMET-VR that provide estimated offset amounts for specific practices based on particular soil types, weather, economic parameters, and other factors. Such tools could provide greater upfront certainty for landowners and investors, increasing participation in offset projects by farmers and foresters.

Public access to data would provide a transparent method for public evaluation of the performance of the program. Data collection and scientific review could also inform decisions about adjusting quantitative limits on offsets, based on their success in achieving outside-the-cap GHG emissions reductions.

True-up against aggregate inventory data: an option for forestry. Ensuring environmental integrity is vital to creating a large and well-functioning offsets market that inspires investor and buyer confidence and can provide credits that would be freely interchangeable with emissions allowances. Concern over integrity is likely to be highest in the early years of a program, when protocols and methodologies are being refined. If, despite the project-level assurances built into the program, the total amount of offset tons that were credited over a given period fell outside the range of actual emissions reductions identified, with a reasonable degree of statistical confidence, under the national-scale accounting effort, the implementing agencies could require a "true-up" as a last resort to cover any estimated shortfall. This mechanism would involve ensuring that the estimates used for crediting are rectified over time with aggregate inventory data.

Below we describe how this could be done in practice for the forestry sector. Given the greater difficulty in monitoring agricultural soils (compared to forests) and establishing accurate baselines for carbon in the sector, a range of approaches should be considered to achieve the goal of incentivizing farmers to provide greater emissions reductions and carbon sequestration. A number of options are under discussion in the academic and advocacy communities. One such approach establishes offset "trading ratios," which would attach a discount to agricultural offset tons which could change in response to new information or along a pre-specified schedule. Another approach would be to create an "insurance" pool of carbon offsets, which stands by unused as a backstop while new accounting methodologies are being assessed.

For the forestry sector, EDF recommends consideration of a "true-up" mechanism to reinforce the integrity of offsets. The forestry sector is a potential candidate for a true-up mechanism given the monitoring technologies available and the potential reassurance this could provide to market participants. Forest areas can be monitored from space and the U.S. already has a comprehensive forest inventory program. Furthermore, at least in early years of the program, leakage concerns could be greatest for forestry projects relative to offset projects related to agriculture and other sectors. In addition, the forest sector is estimated to be the greatest overall source of domestically-available offset tons, particularly from forest management activities that are relatively more difficult to account for, though we expect this should quickly become easier as better data becomes available. Forest offsets are also estimated to be of greatest significance at higher allowance prices, which is precisely when the need for cost management is greatest.

In practice, a forestry true-up could work as follows. The EPA and other implementing agencies would estimate a national-level baseline which would indicate how changes in forest carbon stocks are expected to change under business as usual. For example, the estimate could be that net carbon uptake from the sector is likely to continue at about 750 million metric tons of

CO2 equivalent for the next five years. The estimated baseline and methodology for calculating this baseline would be made public at the start of the period such that it could be independently replicated by disinterested third parties using the best available data at the time of the true-up. Calculating additionality for projects requires establishing a baseline at the project level. A good start for developing such baselines at the national level would be the forest and land-use projections conducted by the U.S. Forest Service under its Resource Planning and Assessment program.

Let's say that based on the protocols certified by EPA, 150 million tons of forestry offset projects are credited each year for the next five years based on the presumption that they will increase annual sequestration beyond business-as-usual by 20 percent. After five years, a detailed national accounting determines, with reasonable statistical certainty given its sampling methods and other procedures, that the total forest sink increased by a range of only 140 to 145 million tons per year. This could have occurred because leakage proved greater than predicted in the calculations used to certify projects. This would then leave a shortfall of up to 10 million metric tons per year, or 50 million tons in total over the 5-year period, which would need to be recouped to maintain the environmental integrity of the cap.[20]

Various arrangements could be made for funding this national-level true-up. To avoid disrupting high-quality offsets projects and to support good faith efforts on the behalf of offset project developers, EDF recommends that a true-up contingency fund or offsets reserve be funded through a private-public partnership. The government's contribution could simply involve retiring allowances from a government reserve explicitly held back for this eventuality. A contribution of funds could also be levied from the offsets market or from private insurance that could be required to cover the potential need for a true-up.

Conversely, if overall levels of sequestered forest carbon increased (relative to the baseline) by an estimated 50 to 60 million tons more than the offset credits issued over the 5-year period all or part of this excess (using the more conservative lower bound) could be banked by the government as part of the reserve that would be used to fund any true-ups that might be required later.

Over time, information gathered through the national accounting system would enable more accurate leakage estimates and other fine-tuning of protocols. As a result, offset quality will improve, and less true-up would be required going forward.

Of course, while this accounting proposal would provide information on the forest sector within the U.S., it would not measure leakage at international levels (for example, if timber harvesting relocates to other countries). Our solution is to engage the global forest sector in reducing emissions and increasing sequestration through well-designed incentives provided by our carbon market. This would also help mitigate against unintended consequences overseas,

[20] All the numbers in this example are simply intended for the purposes of illustration and do not necessarily reflect our expectation of either the magnitude of carbon stock changes under a forestry offsets program or the potential precision of forest carbon measurements under a national accounting system.

such as the changes in land use that have occurred in response to the surge in demand for biofuels.

A focus on quality allows the U.S. to go global

In addition to recognizing the opportunity presented by judicious use of domestic offsets, EDF believes that similarly careful use of high-quality international offsets can serve as a valuable cost management device in the context of U.S. cap-and-trade legislation. However, it is important to understand one key fact with respect to emissions reductions from abroad: not all "international tons" are equal. EDF believes that the selection of international offsets *must* be driven by the necessity to achieve global greenhouse gas reductions that avert catastrophic climate change. As a result, if the U.S. does its part with comprehensive climate change legislation, international offsets should be allowed into the U.S. carbon market only if they are part of a program that significantly reduces national-scale emissions of greenhouse gases from the country of origin to help meet global reduction targets. S. 2191 currently allows for some use of international credits, but provides no role for the major opportunity that currently meets these requirements while offering the potential for low-cost near-term emissions reductions: crediting tropical nations that reduce deforestation-related emissions.

Were Congress to structure the U.S. carbon market to compensate developing countries for emission reductions that lower their rate of deforestation nationwide below a historical baseline, Congress would strengthen those nations' climate and biodiversity protection efforts and create a model for engaging developing countries broadly.

A forest carbon ton program differs from project-based forestry credits (e.g., credits awarded through the Clean Development Mechanism of the Kyoto Protocol (CDM) in at least two important respects. First, on the question of additionality, **t**he use of nation-wide historical baselines means no further proof of additionality is needed. Second, on the question of leakage, the use of national baselines means that no proof of within-country leakage is needed, as shifts in deforestation within a country would be netted out. However, on this latter point, it should be noted that inter-country leakage (the possibility that deforestation relocates to other countries) will remain an issue whenever less than all nations have emissions caps. The solution to this problem is to invite more and more nations to participate in cap-and-trade. By systematically addressing the questions of additionality and leakage, a carbon forest ton program would not require additional discounts or other means of addressing these two important concerns.

It is important to note a key distinction with forest carbon emissions reductions credited below a historical national baseline. These are *not* offsets from unregulated sectors in foreign countries that do not have a program to reduce national-level emissions. Rather, because deforestation is the largest source of emissions for many developing countries, such a program would involve trading between a developed country cap and a developing country with an emissions-reductions program that covers a major share of national emissions.

We believe that carbon market compensation for tropical countries that stop or reduce deforestation is a critical component of a U.S. cap-and-trade regime. For the last year, EDF has

been working with Sustainable Forestry Management, the Nature Conservancy, Conservation International, Defenders of Wildlife, and the Wildlife Conservation Society as well as a number of major companies, including Shell, American International Group (AIG), Pacific Gas and Electric (PG&E), American Electric Power (AEP), and Duke Energy, as part of a Forest Carbon Dialogue (FCD) that seeks to include domestic and international forest carbon provisions in U.S. climate legislation.

The FCD partners firmly believe there is a clear and compelling economic case for including deforestation in the climate regime. This is a low-cost mitigation option available now, as both the Stern Report and the IPCC have noted.[21] Accordingly, we should be developing mechanisms to take advantage of these reductions and use them as a bridge as we work toward the fundamental transformation of our energy system. From the U.S. domestic perspective, recognizing credits for reduced emissions from deforestation in our own cap-and-trade system could therefore provide significant cost-control benefits and much-needed flexibility to regulated entities in the U.S., and U.S. As a result, consumers would benefit from lower prices for the goods and services produced by these U.S. companies. Forest carbon is a critical part of the effort to control compliance costs in a U.S. cap-and-trade system.

Recommendations for including international forest carbon credits

The U.S. Congress has a real opportunity to lead on the deforestation issue by including provisions that recognize credits for reduced emissions from deforestation in developing countries. Both of these actions—fossil fuel reductions by developed countries, combined with reductions in deforestation by developing countries—can help keep us on a path to avoid dangerous climate change.

EDF supports the provisions in the current version of the Lieberman-Warner bill that allocate 2.5% of total emissions allowances to international forest carbon activities. But we also believe that the current provision that allows regulated entities to satisfy 15% of their compliance obligations with credits from international trading systems should be expanded and opened up to explicitly include credits for international forest carbon activities. In Appendix 2, we provide a detailed description for how crediting of reduced emissions from deforestation and forest degradation (REDD) could be put into practice under U.S. cap-and-trade legislation similar to S.2191. This would allow regulated entities in the U.S. to tap into the cost-control benefits of these activities, thereby reducing the overall costs of a cap-and-trade program to the U.S. economy. All of this would also give a huge boost to the effort to protect and restore tropical forests in developing countries and encourage those countries to participate in a global climate protection effort.

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[21] Intergovernmental Panel on Climate Change, *Climate Change 2007: Mitigation of Climate Change, Summary for Policymakers* (4 May 2007), page 21. Available at: http://www.ipcc.ch/SPM040507.pdf.
Stern, Nicholas. *The Economics of Climate Change: The Stern Review* (October 2006), page 537. Available at: http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_Report.cfm

We hope, therefore, that the members of this committee will embrace the concept of incorporating reduced emissions from tropical deforestation in U.S. cap-and-trade legislation. U.S. leadership on this issue would send a powerful message to the international climate treaty talks, where the deforestation issue has languished for years and is only recently gaining positive attention.

A word about offsets from the Clean Development Mechanism (CDM)

Earlier, I distinguished between emissions reductions obtained in the context of an emissions cap, and those coming from uncapped sectors or nations. Before my concluding comments, I would like to return to this point.

As comprehensive legislation moves forward, some are advocating that Congress allow credit for carbon tons generated in nations without an emissions cap. Many of these projects would qualify to enter the global market through the Clean Development Mechanism of the Kyoto Protocol (CDM). Advocates for inclusion of "CDM tons," or emissions reductions from uncapped nations, suggest this as a means of engaging developing nations while doing something good for the planet. While Environmental Defense Fund strongly advocates incentives for engaging developing nations, bringing unrestricted CDM credits into our carbon market is not a good idea.

Why? Simply put, emissions reductions from uncapped nations are not necessarily emission reductions – unless, of course, these nations have some other comprehensive national emissions-reduction program, such as crediting nationwide reductions in deforestation emissions below a historic baseline. While Kyoto caps *industrialized nations'* emissions, it allows developing countries to earn emission credits from individual projects, even if those countries have not created a national-level program to cap or otherwise reduced those emissions, and to sell those credits to entities in developed countries to use in complying with their caps. These are CDM projects. The CDM has given participating countries valuable experience, on a project-by-project basis, with reducing GHG emissions. But overall, those projects do not necessarily reduce emissions nationwide. That is because under the CDM, an emission reduction earned in a developing country can be credited to an industrialized country's emissions account, but no corresponding permanent debit is made from the developing nation's emissions account, since its emissions are uncapped and can thus continue unchecked. The net result of the CDM transaction is to, at best, keep global emissions at the same levels they would have been had emissions continued to increase unabated in the developing country, even while the industrialized country is still able to use CDM credits to reduce the costs of meeting its target.

While this might provide a valuable learning opportunity for the participating nations, the science is clear: the climate can only be stabilized if there is effective emissions abatement in both industrialized and developing countries. Consequently, to achieve the global emissions reductions needed, all major emitting nations should eventually graduate from CDM projects toward national GHG management programs. Let me stress "eventually" – we recognize the value these projects currently represent to the countries that have them.

We understand that S. 2191, as reported out of the EPW committee, does not specifically include CDM credits, and states that, to be allowable, foreign credits must come from a capped country. EDF supports the direct exclusion of CDM credits from the U.S. carbon market and believes that Congress has more environmentally-sound cost containment options at its disposal as well as more effective ways of engaging developing countries. If, however, Congress opens the U.S. carbon market to CDM credits earned in major emitting uncapped nations, it should do so subject to restrictions designed to ensure that the CDM credits actually contribute to reducing overall global emissions. Here are some potential ways to bridge the gap:

- Impose progressively tighter limits on major emitting countries' credit sales until such time as they cap their total emissions.
- Apply a mandatory "multiplier" to project-based carbon credits from uncapped nations. Under the multiplier approach, Congress would require U.S. emitters to tender such credits on a 1.1:1, or 1.5:1, or even 2:1 basis for compliance with their domestic emissions caps. The additional tons of credits generated by the multiplier could then be permanently retired from the system, thereby ensuring that such projects deliver globally real reductions.
- Address the situation in which CDM credits could come into another country's cap-and-trade program, and then be switched out for that country's national emissions allowances, which could then flow into the United States under the 15% for international credits provision, for example, by closing the U.S. market to such international credits unless the other country adopts parallel multiplier provisions for CDM credits coming into its market.
- At the same time, Congress could instruct US delegations at future sessions of the UNFCCC to negotiate for inclusion in the next international climate treaty a sunset provision of CDM crediting for major emitting countries. Such a provision, structured together with incentives for the early adoption of national greenhouse gas management programs, would encourage uncapped major emitters to move more quickly towards capped trading. If such an approach is not politically realistic in the near term, the US delegation could also negotiate for a multiplier provision on CDM credits from major emitting countries to be adopted at the point of issuance by the CDM Executive Board, thus avoiding the possibility of credit laundering noted earlier.

Concluding remarks

EDF appreciates the opportunity to underscore the important benefits of a well-designed policy to harness the cost-effective emissions reduction and carbon sequestration potential offered by agriculture and forestry. We believe that domestic offsets and international forest carbon credits can serve a crucial role in curbing greenhouse gas emissions and reducing the costs of a cap-and-trade program – with the additional benefits of valuable ecosystem preservation and engaging developing countries in a global climate solution.

Successfully addressing the escalating threat of climate change will require ambitious international action that takes advantage of all credible options for reducing emissions – including the substantial opportunities offered by agriculture and forestry at home and abroad. With the right rules and standards, domestic offsets and international forest carbon credits can help achieve that goal.

We hope our ideas and analyses will prove useful as you consider the role of offsets in an effective national climate change policy. Thank you and I will be happy to answer any questions you and the committee may have.

Appendix 1.
Internal EDF analysis: Modeling the cost control potential of international forest carbon

Overview

We model a global carbon market in which the price of credits is determined by the interaction of demand and supply, and banking is explicitly taken into account. Demand is driven by the limits established by government on greenhouse gas emissions. We assume that the United States implements the caps proposed in the current version of S. 2191. With respect to the stringency of international policy, we follow the scenario used by EPA in its analysis of S.2191. In particular, we assume that the European Union continues its greenhouse gas emissions trading system and extends it beyond 2012, in accordance with recent announcements; that other industrialized countries follow suit; and that large emitters in the developing world agree to mandatory caps on their emissions beginning in 2025 and tightening in 2035. While these assumptions were followed to provide comparability with EPA's analysis so as to focus attention on the cost-containment potential of international forest carbon, they do not necessarily represent EDF's preferences or expectations for the post-2012 policy regime.

We assume that the European Union allows regulated entities within its Emissions Trading Scheme to use unlimited international offsets for compliance, including forest carbon ton allowances as well as energy-related CO_2 reductions from the developing world (i.e., CDM credits). This assumption does not reflect current reality: at the moment, the EU-ETS imposes strict limits on offsets (and indeed has not recognized tons from tropical deforestation). However, we view the assumption as a reasonable benchmark assumption for the post-2012 period studied here. Moreover, we hold this assumption constant throughout the analysis, so that it does not affect the magnitude or direction of the difference in U.S. allowance prices under different U.S. policy scenarios.

Policy scenarios and results

We consider the following set of policy scenarios for the United States:

Scenario 1 — Benchmark policy scenario representing S. 2191. International credits and domestic offsets are each limited to 15% of compliance. Importantly, we assume that within the category of international credits, *only* allowances from capped countries are permitted, following the current approach in S. 2191. Given the modeled scenario for international policy, this means that industrialized countries are the only source of international credits for the period 2012-2024.

Scenario 2 — Same as Scenario #1, but with no limit on credits from international forest carbon, including emissions reductions from reduced deforestation, afforestation, and forest management.

Scenario 3 — Same as Scenario #2, but assuming that only half as many international forest carbon tons are available at any given price (i.e., multiplying the quantity by 0.5).

Table A1 presents our key results.

Table A1: Results from EDF analysis of forest carbon credits

Scenario	Policy assumption	Price in 2012 ($/MtCO2e)	% change
1	Benchmark L-W	$24	—
2	International forest carbon credits	$16	-33%
3	International forest carbon credits (lower availability)	$18	-25%

In Scenario 2, 23% of the projected emissions reductions achieved under the policy come from international forest carbon, calculated on a cumulative basis over the entire period 2012-2050. Stated as a fraction of cumulative *emissions*, this amounts to 35%.[22] In Scenario 3, forest carbon accounts for 15% of projected emissions reductions (22% of cumulative emissions). In both scenarios, these reductions in forest carbon are concentrated in the first two decades of the program, with many of the resulting credits being banked for later use. Just over half comes from reduced tropical deforestation.

It is worth emphasizing that this exercise is meant only to demonstrate the *potential* for using forest carbon tons as a cost containment tool. We have modeled a scenario allowing unlimited forest carbon credits because such a scenario provides information on the magnitude of the opportunity, while recognizing that in practice, Congress could choose to establish limits on the use of forest carbon tons, which would dampen the impact of those credits on allowance prices.

Note on methodology and sources

As noted above, demand for allowances is driven by the emissions caps imposed by government policy. International policy assumptions follow the EPA's analysis of S.2191:

- Group 1 countries (European Union and the rest of the industrialized world, except Russia) continue reducing emissions roughly in line with the current Kyoto Protocol; emissions in these countries fall to 50% below 1990 levels by the year 2050.
- Group 2 countries (rest of the world) follow a three-stage path: no emissions limits through 2024; reductions to year-2015 levels for the period 2025-2034; and reductions to year-2000 levels for 2035-2050.

Note also that the model incorporates banking, as described below. As a result, in addition to *current* demand in each period (driven by current compliance obligations), in early periods there is also demand for banking.

[22]Total allowable emissions under S.2191 are 146.4 gigatonnes of CO2-equivalent, while total emissions projected under the EPA's reference scenario are 371.2 GTCO2e; the difference, or 225 GTCO2e, equals cumulative abatement. Hence the ratio of abatement to allowable emissions is 3:2.

The supply of credits comes from abatement and sequestration activities throughout the world. We use EPA's marginal abatement cost curves for energy-related and non-CO2 emissions reductions in industrialized and developing countries, and for non-CO2 abatement in the United States.[23] The estimates of U.S. energy-related abatement supply curves are taken from an analysis by researchers at the Massachusetts Institute of Technology, using the EPPA model.[24] Finally, for international forest carbon activities we draw on estimates by Brent Sohngen of Ohio State University.[25] These marginal abatement cost curves shift over time, reflecting assumed changes in technology and underlying conditions (e.g. baseline rates of deforestation).

The model solves for an intertemporal equilibrium in which two conditions are met in every year: (1) the present value of the international credit price is equal in every period (i.e., the price rises at the market rate of interest, assumed to be 5%); and (2) the market clears (i.e. the quantity of credits demanded at the current price, including banked tons, equals the quantity supplied at that price). To do this, we use the banking macro included in the Offset Market Tool program developed by the EPA and made available in the Data Annex to its analysis of S.2191.

Limits on certain types of credits and offsets are modeled as follows.

- In the EU, energy-related credits from uncapped countries — here, developing countries before 2025 — are limited to 10% of total compliance. This is roughly in line with current EU practice limiting tons from the Clean Development Mechanism (CDM). This limitation is relatively easy to model, since under our policy assumptions those tons are *not* permitted directly into the United States.

- In the United States, the 15% limit on domestic offsets is modeled by expanding the cap by 15% (as in the MIT analysis of S. 2191). This approach (which simplifies the analysis considerably) amounts to an assumption that domestic offsets in the United States will be sufficiently inexpensive that the limit will always be met. This may not be true in practice: for example, the EPA's analysis of S.2191 finds that the quantity of domestic offsets supplied will be below the 15% limit for the first few years of the program. As a result, our approach means that we may be slightly underestimating the allowance price. However, our focus here is on the impact of international forest carbon tons. Because our treatment of domestic offsets is held constant throughout our scenarios, it is unlikely to affect our main conclusions.

[23]These estimated marginal abatement cost curves are included in the technical materials provided by the EPA in its Data Annex to its report on S.2191, available at http://www.epa.gov/climatechange/downloads/DataAnnex-S.2191.zip.

[24]We derive energy-related marginal cost curves from the results of MIT's modeling of U.S. climate policy presented in Sergey Paltsev, John M. Reilly, Henry D. Jacoby, Angelo C. Gurgel, Gilbert E. Metcalf, Andrei P. Sokolov, and Jennifer F. Holak, "Assessment of U.S. Cap-and-Trade Proposals,"' MIT Joint Program on the Science and Policy of Global Change Report No. 146 (April 2007), 66 pp.

[25]We use Sohngen's curves from the Energy Modeling Forum 21 based on rising carbon price scenarios, which are the most internally consistent with our model structure. These data are available at: http://www.stanford.edu/group/EMF/projects/group21/EMF21sinkspagenew.htm

- Finally, our model estimates that international credits other than forest carbon would amount to just under 15% of total U.S. demand even in the absence of any constraints imposed by government. As a result, the 15% limit on international credits in S.2191 is not binding, and does not require explicit modeling.

Appendix 2.
Low-Cost Reductions of Greenhouse Gas Pollution and Saving Tropical Forests: How Reducing Emissions from Deforestation and Forest Degradation (REDD) Can Work in the United States

Environmental Defense Fund believes that carbon market compensation for tropical countries that stop or reduce deforestation should be a critical component of a U.S. cap and trade regime. The concept is simple. Any nation that reduces deforestation below a baseline based on average national historic deforestation rates would be eligible for compensation, receiving emissions allowances tradable in the U.S. market. The compensation would be awarded *post-facto*, successful countries would receive compensation after 2012 *after* real reductions were concretely measured. Two key conditions would help ensure the environmental integrity of the program:

- **A real and verifiable historical (i.e., not business as usual) baseline.** Satellite data, readily available, should be required to provide robust historical baselines of deforestation in most developing countries.

- **Accurate measurement.** National remote sensing programs, supplemented by on-the-ground surveys, should be required to provide rigorous measures of actual deforestation.

At least one tropical forest nation, Brazil, has begun to demonstrate that it is possible, with serious and committed effort, to reduce deforestation through the application of these principles. The following steps show how such a system can be put into practice, once Congress passes and the President signs national cap-and-trade legislation:

1. The EPA Administrator will establish a scientific panel on emissions reductions from tropical deforestation, including the Department of State, US Forest Service, independent scientific research institutions and the private sector. The panel establishes criteria for monitoring and measuring deforestation and setting deforestation baselines, consistent with accepted international standards, in particular, the IPCC Good Practice Guidelines for Agriculture, Forestry, and Other Land Uses. The panel will establish the time period over which deforestation reductions are to be measured and credited. Creditable reductions must represent an average of at least five years to compensate for annual fluctuations. In addition the panel will establish criteria for the independent certification of reduced deforestation, and evaluate and accredit independent certification bodies. The panel will further elaborate standards for tracking and measuring international leakage, using robust regional deforestation and economic modeling. The panel will finally formulate options for what percentage of certified emissions reductions must be held in reserve and not used to meet compliance obligations to insure against possible future reversal of reductions, and assignment of liability between buyer and seller.

2. The Secretary of State, in consultation with the Administrator of the EPA, and the scientific panel on emissions reductions from tropical deforestation will negotiate a deforestation reduction baseline with a tropical nation that has installed capacity to monitor deforestation and measure. The baseline establishes the national deforestation rate below which reductions can be credited.

In the case of Brazil, the average annual deforestation rate for the 1990s, 20,000 km^2, or about 250 million tons C per year would be a reasonable option. Initially (at least for the first five year period), to simplify certification and monitoring, only clearcutting, not forest degradation from selective logging or forest fires, could be considered in the formulation of baselines and in awarding credit. The seller will create a national forest carbon registry in order to uniquely identify each forest carbon tons to be traded. The parties to the negotiation will agree that certified reductions in average emissions below the baseline achieved over a period of at least five years will be tradable in the US cap-and-trade system, by a forest carbon brokerage to be established by the seller. The parties will further negotiate the terms of a forest carbon insurance reserve.

3. The tropical nation will reduce average annual deforestation below the baseline over a period of at least five years, and reductions will be certified by an accredited independent certifier. Only annual reductions achieved and certified can enter the market, not forest carbon stocks. If, for example, Brazil were to take a baseline of 20,000 km^2 (equivalent to 250 million tons C) and incrementally reduce deforestation to zero over a period of ten years, it would be awarded credit for the reductions below 250 million tons C per year until year ten. Thereafter, as long as deforestation remained at zero, Brazil could market 250 million tons C per year (although as a precautionary measure, actual credit might still only be awarded every five years.) over a compliance period to be negotiated at the Copenhagen meeting in 2009.