

Biofuels and the Environment: First Triennial Report to Congress

Summary of and Response to Comments Received concerning the June 8, 2011 Draft

Prepared by the

National Center for Environmental Assessment
Office of Research and Development
US Environmental Protection Agency
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Background:

In December 2007, Congress enacted EISA, the Energy Independence and Security Act (Public Law 110-140) to reduce U.S. energy consumption and dependence on foreign oil, and to address climate change through research and implementation of strategies to reduce greenhouse gases. In accordance with these goals, EISA required the U.S. Environmental Protection Agency (EPA) to revise the Renewable Fuel Standard (RFS) program, created under the 2005 Energy Policy Act, to increase the volume of renewable fuel blended into transportation fuel from 9 billion gallons per year in 2008 to 36 billion gallons per year by 2022. Additionally, the U.S. Congress requested a report every three years (Section 204 of EISA) on the environmental and resource conservation impacts of increased biofuel production and use. This report is the first of EPA's triennial reports on the current and potential future environmental impacts associated with the requirements of Section 211(o) of the Clean Air Act. This report reviews environmental and resource conservation impacts identified under EISA, as well as opportunities to mitigate these impacts, at each stage of the biofuel supply chain: feedstock production, feedstock logistics, biofuel production, biofuel distribution, and biofuel use. This first triennial report represents the best available information through July 2010, including input from the U.S. Departments of Agriculture and Energy, with whom EPA consulted during development of this report.

Review Process and Response to Comments:

In July 2011, a draft of the report, dated June 8, was provided to OMB for interagency review. Comments were received from the US Department of Agriculture, the Energy Information Administration, the Federal Highway Administration, Council on Environmental Quality and the Executive Office of the President. With each comment is a description of how EPA responded to those comments. A summary of comments received and the EPA's responses to those comments is provided in this document. Many of the suggestions provided by our reviewers have been incorporated unless, after careful consideration they were determined to be outside of the scope of this first triennial report to Congress. Additionally, other suggestions will be used to inform the development of the next report.

An earlier external review draft of this report was publicly released and a 30 day comment period announced through a *Federal Register* notice published on January 28, 2011 (FRL-9259-5; Docket ID No. EPA-HQ-ORD-2010-1077). At a public peer review panel meeting on March 14, 2011, eleven reviewers summarized their comments on the draft report. Oral and written comments from the public were also received at the March meeting and in the public docket.

Overall, EPA received comments from 11 peer reviewers and 22 individuals and organizations representing academia, trade groups, industry, and public interest groups.

The EPA acknowledges that the biofuels literature is growing quickly. This was confirmed by comments received from peer review panel members, the general public, and other agencies that provided suggestions for additional literature that might be used to inform our assessment. For those references that met EPA's literature selection criteria (i.e., peer reviewed or from a government source and were published prior to July 30, 2010), references were reviewed and where appropriate, new information added to the final draft.

FHWA (Letter Comments)	
Comment	EPA Response to Comment
In summary, FHWA supports the findings of the report and will work cooperatively, within existing authorities, with other federal agencies and industry to develop, implement and monitor best management and conservation practices and policies that avoid, minimize and/or mitigate the potential negative environmental impacts of biofuel production and use.	No change necessary.
The focus of the work on perennial grasses is on two monoculture species. Thus, the research in this area will be incomplete until work is done to examine the advantages and disadvantages associated with using native perennials and native mixtures of grassland plants as compared to perennial grassland monocultures. The report notes some of the issues on page 3-44 (at the end of section 3.3), but this point is important and should be noted at the beginning of section 3.3.	EPA understands the limitations of examining only two perennial grass feedstocks in detail, but has included mention of others, as the reviewer notes, in recognition of their future potential. EPA may consider additional feedstock options in detail in a future report.
[R]isk-based assessments have predicted that some second generation feedstocks, specifically the production of perennial grasses and short-rotation woody crops can become invasive if cultivated without preventive measures.	Agreed. No change necessary.
[T]here is also potential for invasive plant establishment where feedstocks with live seed or vegetative reproductive parts are transported within federal highway corridors. Further, the transport of both feedstock to and biofuel from production facilities may increase risk of fuel and oil spills from transport vehicles on roadways and be considered additive to the nonpoint source pollution from stormwater runoff.	EPA agrees with the reviewer and has already noted the potential for certain perennial grass feedstocks to disperse and invade along transportation corridors. Increased spills or contaminant runoff may logically be implied from an increase in traffic volume, but this is anticipated to be mitigated to some extent by locating conversion facilities close to the feedstock production site and modification of the feedstock to more energy dense forms. EPA prefers not to make a generic statement such as implied in the comment.

FHWA (Letter Comments)

Comment	EPA Response to Comment
<p>FHWA supports the report recommendations on the application of best management practices for unimproved varieties of feedstocks. FHWA also concurs with the report recommendations on the development of new perennial grasses and short-rotation woody crops....</p>	<p>No change necessary.</p>
<p>The regulatory framework for the control of invasive plant species on federal highway projects is described in SAFETEA-LU §6006 (b) regarding 23 U.S.C. §329. This section includes a provision that makes activities for the control of noxious weeds and the establishment of native species eligible for Federal-aid funds under the NHS and the STP. (Additional details on eligibilities are provided in §329.) The control of terrestrial noxious weeds and aquatic weeds is commonly done by maintenance districts or contracted crews of each State department of transportation.</p>	<p>No change necessary.</p>

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
<p>In page 10 of the Executive Summary, it states that “current production levels of second-generation feedstocks are negligible and limited by technological barriers.” We suggest rewriting to distinguish between availability of feedstock and availability of technology to convert second-generation feedstocks into biofuels. Corn stover, for example, is considered a second-generation feedstock and is currently available wherever there is corn.</p>	<p>This has been edited for clarity.(see page ix, also page 6-7)</p>
<p>In general, any reference to EIA should read “U.S. EIA” just as references to the EPA read “U.S. EPA.” This includes parenthetical references in the text as well as bibliographic references at the end of the report. Use of the term “EIA” in the text generally without it being a bibliographic reference is appropriate.</p>	<p>EPA accepts this suggestion and has modified the report accordingly throughout and the references have been updated (see page 8-27).</p>

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
<p>Page 2-4 includes a text box that compares Life Cycle Analysis with Net Energy Balance analysis. Both are said to have a role to play in evaluation of biofuels technologies. The Net Energy Balance, however, is problematic. Per the first law of thermodynamics, the net energy flow of any physical or chemical process is zero. Nonzero 'net energy balances' are therefore obtainable only by selectively ignoring flows of energy. As a result, the utility and implications of a 'net energy balance' depend strongly on the choice of which energy flows to exclude. As an example, eliminating biomass inputs for certain processes allows a measure of fossil fuel resource efficiency to be computed, which can serve to compare different biomass based technologies on that metric.</p> <p>A more typical use of the energy balance concept which can be used to compare a wider range of processes is to not exclude any energy flows and calculate the overall thermal efficiency of each process. However, this measure is only useful in combination with the value that society ascribes to the inputs and outputs of the process in question. If, for example, a process has low thermal efficiency but increases the value of the feedstock significantly it may be a better choice than a process with high thermal efficiency that provides only a marginal increase in value. While societal value is somewhat fuzzy, it involves multiple, sometimes competing, concepts, which include but are not limited to resource competition, environmental, economic, and security issues. If the approach described in this report uses only the net energy balance in the denominator and environmental impacts in the numerator, it will effectively be defining the societal value of a process solely based on environmental and energy efficiency concerns. A slight modification to the concept would be to estimate a societal value for inputs and outputs based on general equilibrium prices for process inputs and outputs and to apply the difference to the overall thermal efficiency for use as a basis of the impact. The comparative measure would then include the effects of resource competition on feedstock and product values, rather than simply energy efficiency.</p>	<p>EPA understands the reviewer's concern. However, net energy balance is a concept that appears often in the literature with regard to biofuels, and therefore it was appropriate to include here. EPA believes the description is consistent with the body of literature on biofuels evaluations. In a future report, the strengths and weaknesses of describing environmental impacts on a net energy basis, in addition to other approaches such as the one suggested may be considered.</p>

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
<p>On page 2-9, section 2.3.4, The Section 204 Report is required by EISA 2007, whereas our understanding is that EPA’s Regulatory Impact Analysis (RIA) was required to implement the law. That would suggest that the RIA could be cited as a subset of the Section 204 Report but not the other way around and the sentence should be rewritten to reflect that relationship between the two reports.</p>	<p>Language has been changed to indicate the report’s complementarity to the RIA. (see page 2-9)</p>
<p>Several changes to the description of the approach were suggested in chapter 2, including changes in section 2.3 and 2.3.1.</p>	<p>EPA believes the suggested changes would introduce inaccuracies to the description of the approach. However, subsection 2.3.1 was significantly modified to clarify what the report accomplished. (see pages 2-7 and 2-8)</p>
<p>On page 3-6, the percentage of the corn dedicated to ethanol production is stated as between 35 and 41%. However, DDGS (roughly 1/3 of the bushel by weight) is not mentioned as a potential substitute for corn in the animal feed market. While the substitution is not perfect, DDGS nevertheless mitigates the need for some corn. In fact, for some animals, DDGS may be an improved product over corn due to its high protein content.</p>	<p>EPA recognizes feed replacement is an important consideration, but decided not to include it in Chapter 3 which is a discussion of feedstock production. DDGS, as a bioconversion co-product, and their environmental impacts are discussed in Section 4.3.3.2 (page 4-9)</p>
<p>On page 3-8 a discussion on demand projections for the traditional row crops may be helpful. Land-use changes are a function of supply and demand and it would be helpful to understand what EPA is assuming about future corn and soy demands.</p>	<p>In Section 3.2.3, the report discusses the implications of market demand for corn and soybean as relevant to meeting the RFS2 standards. For this discussion, EPA has referenced USDA projections for changes to meet the biofuel demands. (see pages 3-7 et seq.)</p>
<p>On page 3-13, it appears that the potential effects of a large scale flood have not been considered.</p>	<p>Correct. EPA decided this is a minor issue in the context of this report, but may consider it in future reports.</p>

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
<p>Atmospheric deposition in waterways of nitrogen from fertilizers is discussed on page 3-13. “Nitrogen” is shorthand for compound(s) of nitrogen. It is unclear which compounds play a role in the deposition process.</p>	<p>EPA has clarified which nitrogen compounds play a role during atmospheric deposition. (see pages 3-13)</p>
<p>[Re page 3-18] Removal of corn stover in cooler, wetter climates has several implications that should be mentioned. The potential corn yield increase multiplies the effect of stover utilization on the quantity of ethanol that can be produced from an acre of land. On the other hand, this suggests that stover removal is more profitable in cool, wet locales, which may give economic incentives to convert more land in these places to corn production.</p>	<p>The literature linking stover demand and land use change is sparse. EPA believes it has given it appropriate consideration relative to presence in the literature. Additional considerations such as the effect of stover remover in cooler, wetter climates on yields have been mentioned. (see pages 3-19)</p>
<p>Also on page 3-18, there is a list of mechanisms by which water is lost from crops to the atmosphere. One mechanism seems to be missing: the direct evaporation of irrigation water before the plants ever absorb it. This is especially likely with the use of water sprinklers for irrigation.</p>	<p>Efficiency of irrigation (maximizing uptake of water applied) is already represented in the average irrigation applied per acre of crop. With less efficient irrigation, more must be applied.</p>
<p>The water utilization to grow the crops to produce a gallon of ethanol or a gallon of biodiesel is compared on page 3-19. But the comparison is for all corn acres, not all of which are irrigated, and irrigated soybean acres. The distinction is very clearly mentioned, but some additional analysis should be done to compare corn- and soybean-based biofuels on water use for all acreage, irrigated or rain-fed.</p>	<p>EPA agrees that consistency would be best, but such comparisons were not available in the literature and it did not undertake any new quantitative analyses for this report.</p>
<p>The carbon loss of cultivating undisturbed soils is cited as 20 to 40% during the first 5 to 20 years of conventional tillage. (Page 3-22) What happens if conservation tillage is used from the beginning instead?</p>	<p>Additional information has been added to address carbon loss in soils under conservation tillage. (see pages 3-22)</p>

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
Diesel use per acre, primarily for tillage, is given as 14 gallons per acre. (Page 3-23) What mix of tillage techniques is assumed?	The referenced citation was from a non-peer reviewed website, and the sentence has been deleted.
Energy use for grain drying is mentioned (Page 3-23) This seems like an excellent application for solar energy, since fairly low temperatures are needed.	This comment is an observation on the potential use of solar energy. No response is necessary.
Page 3-26 should read “4-percent increase.” In general, make sure hyphen use is consistent. For example is it end-use or end use? Both have been written.	Agreed. EPA has edited for consistency.
The effects of accidental release of engineered algae into the environment are not known. Genetically-engineered varieties selected for high productivity are of special concern. (Page 3-59) However, so far, the most productive strains appear to be weaker than wild algae.	EPA is reporting what was found in the scientific literature and has emphasized uncertainty of this impact.
Wind blowing across open ponds is cited as a mechanism of algae propagation. (Page 3-60) Don’t forget the ducks and geese!	EPA agrees there are multiple means for dispersing algae from open ponds.
On page 3-62 section 3.6.2 is accurate, as written, but may be misinterpreted. We do not think that the vast majority of the EIA-identified biogenic MSW is eligible for use as a transportation fuel. The quote that MSW “could be a significant source for biofuel” is rather vague and could be misinterpreted as being a readily available feedstock using technologies in use.	The word “significant” was changed to “contributing.”
The graphic on page 6-4 is a very succinct presentation of results. It should appear in the executive summary.	Given the length constraints for an executive summary, EPA has chosen to leave figures from chapter 6 where they originally appear.

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
Table 5-1: Lists the source as EIA. I'm not sure what EIA source this comes from.	The reference list clearly lists the source as EIA websites.
Figure 5-2: Are these net or gross imports? Also, if these are EIA projections, the word "projection" should be used rather than "prediction."	These are annual figures converted from data on the referenced cite. The text explaining the source of the data was modified to make this clear. (see page 5-4)
Table 3-2: The Vegetable Oil input totals don't quite match up with Table 3 of the EIA Biodiesel Report. See http://www.eia.gov/cneaf/solar.renewables/page/biodiesel/biodiesel.html	Agreed. Edits have been made. (see page 3-7)
<p>Page 5-1: Second paragraph: Brazil is the only significant exporter of ethanol. No longer true with US exporting more than any country the last few months, and likely to continue this year.</p> <p>Page 5-5: Again, exports are no longer far outweighed by imports. U.S. is net exporter for over a year now. (probably due to timing of report, but not really considered anywhere in the report)</p>	EIA rightly points out the dynamic nature of export/import markets and recent changes that are not reflected in the report. As with all reports of this nature, it is necessary to decide on a final reference point in time realizing that situations will change. EPA believes the report is accurate through July of 2010.
Page 5-4: Discussion about reduction in U.S. imports from Brazil: Reduction in imports into US from Brazil also due to increased U.S. supply	EPA has accepted the suggested changes. (see page 5-4)
Page 5-9: Much of Brazil follows the 1 cow per hectare rule, which gives it ample opportunity to intensify its production using current pastures. This should be noted if the study did not mention it.	This, along with many other activities that are ongoing in Brazil, are known to us anecdotally, but the commenter offered no citable reference that we might use to verify them.

U. S. Energy Information Administration (Letter Comments)

Comment	EPA Response to Comment
GHGs should be depicted in Figures 6-1, 6-2 and 7-3.	Because the RFS2 Regulatory Impact Analysis was comprehensive in its projections of GHG emissions and because GHGs were not included in the list of topics for consideration in Section 204 of EISA, EPA did not include extensive discussion of them in this report. Consequently, GHGs were not included in the synthesis tables.
Scenario C presented in 7-6 does not appear to be a feasible outcome. It is doubtful that corn stover would ever need to supply 100% of the advanced biofuels in the mandate. If nothing else comes to fruition, the mandate will probably just be changed, as provided for by the law, instead of relying solely on stover.	EPA didn't devise the scenarios for feasibility alone, but to illustrate a wide variety of trends. An "all conventional feedstocks" scenario is meant to be one end of the spectrum. Table 7-6 is intended to be illustrative of what might be done for future report and is not a conclusion of this report.
In Scenario A, if technology develops at a reasonable pace, wouldn't you get less ethanol from conventional sources? As the report notes, switchgrass has much less of a negative environmental effect, so we doubt the upper limit on corn would still be exhausted.	Again, scenarios are meant to be illustrative of the kind of analyses that might be done for future reports.
The report makes frequent reference to the LCA analysis done in a document referred to as EPA2010a. Yet, there is no apparent document that matches in the bibliography. If the document is listed in the bibliography by its authors, it should also be referenced in the report by author so that the reader can find it in the works cited by the chapter.	EPA believes it has correctly referenced the RIA from the RFS2 in the text and this reference is cited in the bibliography with an active link.
It is pointed out in several locations that cropland that was not being used in 2007 is not eligible to grow feedstocks to meet the RFS. But what happens when an energy crop (or corn or soy) displaces another traditional crop which then displaces another crop which then displaces hay which will then displace pastureland or cropland? This seems a very likely scenario and a focus on this instead of such an exaggerated focus on CRP lands may be more useful.	EPA agrees that indirect changes in land use are a possibility and has stated so. In the last sentence of section 3.2.3, for example, the model results (e.g., FASOM) represent direct <u>and</u> indirect land-use change.

EOP (Track Change Comments)

Comment	EPA Response to Comment
<p>Comments on the air quality text box:</p> <ol style="list-style-type: none"> 1. “Upstream” is unclear in this context. Please provide a reason for the increase in NOx emissions, and connect that to biofuels. If the edit is wrong please correct. Thanks. 2. When did EPA add ethanol to the list of air toxics pollutants? It was added to MOVES in 2011, which is why I inserted that date. 3. Please correct me if I’m wrong, but it seems hard to believe that national average ambient EtOH concentrations will rise 10 to 50 percent. Shouldn’t this say EtOH emissions? If in fact it is national average ambient EtOH concentrations, we should provide the actual concentration that we’re talking about, relative to any levels of concern. In other words, why would it matter if the concentration of EtOH in an urban area increased from 5 E-9 g/mL to 10 E-9 g/mL? 4. Why would there be high on-road emissions of EtOH? From a spill? 5. I moved up the last paragraph, because it is important to first give the reader an understanding of what the RIA assessed in terms of air toxics impacts, before discussing individual pollutant concentrations. 	<p>The text box was converted into a separate section, 6.2.3. (see pages 6-5 and 6-6)</p> <p>“Upstream” has been deleted.</p> <p>Several agricultural practices (e.g., burning, combustion for energy), feedstock transportation, and biofuel production processes increase NOx emissions. NOx emissions also increase from end use. In short, throughout biofuel production, distribution and use. Other emissions also increase. This is documented throughout the report in the appropriate sections, whereas this text box is focused on ambient concentrations. Therefore this comment is rejected.</p> <p>The text has been re-written to focus on ambient concentrations of ozone; NOx emissions changes have been deleted so the comment is moot. (see pages xxx)</p> <p>Text has been re-written to separate air toxics and ethanol results and to address comment 2</p> <p>Point 3: EPA believes this comment is incorrect. The air quality modeling results found that EtOH concentrations (not emissions) rose 10-50 percent over much of the country. EPA has separated the ethanol discussion from air toxics so that it is not necessary to address levels of concern.</p> <p>Point 4: This comment is incorrect. The text is concentrations, not emissions.</p> <p>Point 5: EPA accepts the re-ordering suggestion.</p>

USDA (Letter Comments)

Comment	EPA Response to Comment
<p>USDA does not oppose EPA’s report and feels strongly that the international and ILUC discussion need to be improved. In addition, we would like to offer the following general comments.</p>	<p>No change necessary.</p>
<p>Although EPA drew from a significant number of peer review studies and federal documents available up until July 2010, the report does not reflect the current status of the rapidly emerging and evolving biofuels sector.</p> <p>USDA encourages EPA to set a process in place to methodically identify information needs and discuss how USDA data can be applied towards development of the second RTC. USDA, ERS, ARS, NASS references are found in the report but are not comprehensive. The BRDI report is mentioned just once, and the USDA Regional Roadmap to Meeting the Biofuels Goals of the Renewable Fuels Standard by 2022 was not located. By construction the analysis of the report is limited to July 2010 data/information and misses some more recent ERS reports. A comprehensive 2009 GAO report on biofuel expansion impact is not referred to.</p> <p>USDA’s Climate Change Program Office suggests additional literature accompany the EPA report.</p>	<p>The USDA Regional Roadmap is an interim report and conclusions have not been finalized. The GAO 2009 report does not add information not already included in our Report. We have augmented use of the BRDI report where appropriate.</p> <p>EPA recognizes that use of literature only before July 2010 is not up-to-date, but the cutoff date was a necessary limitation. However, EPA will use updated information in future reports.</p>
<p>USDA has many years of expertise and data to inform how the above mentioned factors influence environmental outcomes, and should be consulted in development of the next RTC. USDA is, in many instances, taking a regionally specific strategic approach in enabling development of sustainable feedstock production systems, recognizing the importance of these factors and how they vary regionally.</p>	<p>This current Report was developed in consultation with USDA. We look forward to working even more closely with USDA on future Reports.</p>

USDA (Letter Comments)

Comment	EPA Response to Comment
<p>Although EPA drew from a significant number of peer review studies and federal documents available up until July 2010, the report does not reflect the current status of the rapidly emerging and evolving biofuels sector.</p> <p>Congress was also fairly prescriptive on what to include and exclude in this report, and therefore, as stated by EPA, it is not a comprehensive report that considers all factors that would affect behaviors or outcomes.</p>	<p>This Report comprehensively reflects the literature through July 2010; however, we do recognize that biofuels is a rapidly expanding field of study, and therefore we will incorporate more recent literature in future Reports.</p>

USDA (Track Changes)	
Comment	EPA Response to Comment
This first Report does not present environmental impacts relative to petroleum-based transportation fuels; such a comparison is recommended for the next Report.	EPA has added this as a recommendation for the next Report in the Executive Summary and in our Conclusions chapter. Additionally, in multiple places throughout the Report, EPA emphasizes that the report is not a comparison to fossil fuels.
Include additional discussion of greenhouse gas emissions in Chapter 5 and Chapter 6.	EPA did not focus on greenhouse gas emissions in this Report; rather, this document is complementary to the Regulatory Impact Assessment (RIA) of the Renewable Fuel Standard (RFS2), which addressed GHGs extensively. We refer the reader in many places to the RIA. In Chapter 5, we have added an additional discussion of recent data suggesting a declining rate of deforestation in Brazil. We note the potential importance of this trend in regards to GHG emission estimates.
This Report should note the potential ecological benefits of utilizing woody biomass produced from wildfire reduction treatments.	EPA has added this to the woody biomass section in Chapter 3. It has also been noted that harvesting woody biomass from overgrown, fire-prone forests may increase streamflow and water availability.
This report should note that the adoption of cellulosic feedstock could provide incentive to reduce the conversion of forest land to other land uses.	EPA has noted that future prices for cellulosic feedstocks may directly or indirectly affect land-use change.
Comment in Chapter 2: Why is there no consideration of regulatory authorities of States, many of which will be critical to good environmental outcomes? For example State-governed water appropriation law will drive many water availability impacts. See comments in water use section. Land use policy and practices are also regulated by the States, which also is highly influential to land use environmental impacts, particularly in regards to the impacts of woody biomass use.	Regulatory authority and policy considerations were not a focus of this report, particularly in regards to State actions. However, EPA has added text in Chapter 2 noting that State regulations can be particularly important and provide an example of water withdrawals. The importance of best management practices and how they vary in practice and implementation among States is noted in the woody biomass section.

Council on Environmental Quality (Track Changes)

Comment	EPA Response to Comment
<p>This report does not quantify impacts in a manner sufficient to indicate a magnitude. At best, some of the studies indicate likely changes in factors like nutrient loadings, but do not translate changes in loadings into environmental impacts. In some cases relatively small changes in loadings could have severe environmental impacts, while in others large changes in loadings may not be very important. In the synthesis section, the authors recognize these limitations by qualifying the consensus impact as ‘plausible’ rather than ‘probable’. To state ‘moderate’ in the executive summary may convey the false impression that the authors have conclusively found that the environmental impacts are not that bad.</p>	<p>In the particular section to which this comment is addressed, EPA is not talking about future impacts, but impacts to date. An increase in loadings is a negative impact, but given the size of the change relative to corn production, effects are limited. EPA has revised the text in the abstract in response to this and other comments to now read: “negative impacts to date are limited in magnitude and largely due to diversion and intensification of existing corn production”</p>
<p>EISA requires this report to analyze the impacts of the RFS under Section 211(o). By basing the report on existing literature (given the time constraints), this report provides information on the impacts of biofuels generally, but does not isolate the impacts of the RFS program specifically. Given the fact that EIA had projected over 12 BG of corn ethanol prior to the passage of EISA, all of the impacts discussed in this report cannot be attributed to the RFS program alone. This caveat should be more explicit throughout the report.</p>	<p>EPA generally agrees with the comment. For this first report, EPA decided on a literature review approach. This facilitated a qualitative assessment of the impacts of RFS2 in the more general context of what we know about the impacts of biofuel production and use. Future reports will more specifically and quantitatively address impacts of RFS2, as more information and analytical tools become available. To better reflect this, EPA has added a sentence to the Executive Summary as follows: “The information included here is considered foundational for future efforts to quantitatively compare the environmental impacts of alternative scenarios for meeting the goals of the RFS2 program.”</p>
<p>A significant amount of corn ethanol would likely have been produced even in the absence of the RFS program (e.g., to meet air quality standards). Attributing all of the potential environmental impacts of increased corn ethanol to the RFS program overstates the impacts of the RFS. Although the baseline issue is discussed much later in section 2.3, it would be helpful to have some reference upfront.</p>	<p>EPA acknowledges that setting a baseline is key for assessing the impacts of the RFS2. We have used baselines established by the Agency (for example, those established for air quality in the RFS2 Regulatory Impact Analysis), but we have also reviewed results in the peer-reviewed literature that vary in their assumptions. In order to be inclusive of this valuable literature, we have undertaken a qualitative assessment of the impacts of RFS2 in the more general context of the scientific information about biofuel production and use. See previous response for new language we have used to reflect this.</p>

Council on Environmental Quality (Track Changes)

Comment	EPA Response to Comment
<p>The “negative but modest” conclusion is based on the “plausible” scenario. CEQ suggests that it be made clear in this sentence that this is without the implementation of conservation practices et.al. CEQ realizes that this information is in the third paragraph below, however, a more prominent position in the conclusion should make it clear that while there are negative but modest environmental impacts under conventional cultivation methods, these impacts can be mitigated through implementation of conservation practices.</p>	<p>Negative but “limited in magnitude” (which is the new language now in the report) is consistent with the “plausible” impacts given a set of reasonable assumptions about current and/or future land use and cultivation practices, and also with information elsewhere in the report. Our third major conclusion emphasizes that conservation and best management practices will enhance positive environmental outcomes.</p>
<p>What “other land” conversions is this referring to? CRP to perennial grasses? CEQ suggests using a “for example”. Using the term “other land use” conversions could imply conversion of native prairie if not qualified up front in the document. Although this report covers only land in ag production prior to Dec 2007, somewhere it needs to be made clear that “sodbusted” acres or land converted from native prairie for the sake of biofuel production is different than conversions from land previously cropped.</p>	<p>EPA has edited the sentence to be clearer. It now reads, “In comparison [to CRP converted to corn or soybeans], other land use conversions, for example CRP to perennial grasses, would have more moderate environmental impacts.” EPA has made the point elsewhere that prairie converted to agricultural production, even though not an allowable conversion under RFS2 would have different impacts than the other conversions highlighted in the Executive Summary.</p>
<p>[With regard to water quality summary] Does this mean that greater production of second generation feedstocks will lead to improvement in water quality? Or that there are opportunities to improve existing production techniques so they are more beneficial to water quality – i.e. policy change will be needed to produce the positive benefits?</p>	<p>EPA has clarified that water quality improvements can be achieved with second generation feedstocks relative to first generation feedstocks.</p>
<p>CEQ suggests making it more clear that woody crop production can have either a positive or negative impact on ecosystem health depending on where and how it’s produced.</p> <p>Based on the information in the report, it seems a key conclusion is that the impact of woody biomass production and harvest will vary depending on multiple factors. This comment tries to make that clear.</p>	<p>EPA believes this section reflects overall conclusions derived from evidence reviewed in the report. More specific information about the influence of various factors on all of the environmental impacts in the Executive Summary can be found in the body of the report.</p>

Council on Environmental Quality (Track Changes)

Comment	EPA Response to Comment
<p>What about support for more second-generation biofuels? Since the report finds that the environmental impacts of second generation biofuels is often positive, neutral or at least easier to mitigate, it seems reasonable to recommend that federal policy promote new technology that can make second-generation biofuels more viable.</p>	<p>Promoting a particular feedstock or technology is not within the scope or intent of the report.</p>
<p>CEQ suggests including the Food Security Act of 1985 as amended. The conservation compliance regulations specifically address soil loss tolerances, requires that a conservation system is applied to agricultural lands, and that practices are implemented that meet specified soil loss rates. While this is “voluntary”, it is tied to ag producers ability to continue to receive certain USDA benefits and a majority of ag producers comply with this regulation. This definitely has an impact on implementation of conservation practices which will reduce negative environmental impacts.</p>	<p>EPA has considered this suggestion. However, to include it would require some judgment on how effective the Act has been in accomplishing its intended goals and such a discussion is beyond the scope of this report.</p>
<p>This statement [“Agricultural conservation practices may be used to reduce or minimize the impact of row crop agriculture on the environment.”] should be used throughout the document where appropriate to qualify that the negative impacts can be mitigated or are less when conservation practices are implemented.</p>	<p>EPA has used this statement where appropriate in the report and accepted the advice of USDA when referring to best management or conservations practices.</p>

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Comment	EPA Response to Comment
<p>CEQ wants consistency in the terminology used when referring to land being converted and a definition of land use terms included in the glossary. What is meant by pasture? Is that native land or tame pasture that has a cropping history? Here “other land” is referred to as “idle ag lands”, on page 6-8 it is referred to “abandoned agricultural land” and there is another reference to marginal lands. There is a significant difference between these terms depending on whether they refer to land with a cropping history or not. “Idle” land may not have a cropping history, while “abandoned” ag land may. The extent of environmental impacts will be significantly different depending on the definition. Many “idle” acres are in sensitive areas such as riparian areas, on steep slopes or intermittent stream courses and have not been cropped. The conversion of this land would have significantly different environmental impacts than the conversion of CRP (non-sensitive areas), tame pasture, or abandoned ag land all with a cropping history.</p>	<p>EPA agrees that land use history affects current and future environmental impacts. We have attempted to use terminology from the sources of studies discussed and to give some explanation about what it means in terms of land use history. Many of the observations made by CEQ are discussed in studies more recent than the publication cutoff date for the report and should be addressed in future reports.</p>
<p>[Re. p. 3-10] When these generalizations are made throughout the document, CEQ suggests continuing to qualify these statements in regards to conservation practices. This point is well made on page 3-3. The likelihood of the increase in loading will depend upon the implementation of ag conservation practices which can minimize the effects on the environment. Throughout the document, it is important to compare apples to apples. Production of corn and soy beans, regardless of whether they are being grown for biofuel or not, will have significantly different impacts on the environment depending upon the use or non-use of conservation practices. When statements like this are made, it is important to note whether conservation practices are being used or not.</p>	<p>EPA agrees that conservation practices, including conservation and best management practices, will influence environmental impacts of biofuel production, and we believe that the report’s content accurately and consistently communicates this fact.</p> <p>EPA agrees it is important to know whether conservation practices are being used, but also how effective they are. Evidence of this is quite limited, but EPA did make extensive use of the USDA’s CEAP report where appropriate.</p>

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Comment	EPA Response to Comment
CEQ suggest noting whether this is with consideration of any conservation practice implementation or not? As NRCS noted above 38% of all cultivated cropland acres in the Upper Mississippi River basin are using the full suite of nutrient management practices. How does this impact the results? Was it considered?	Each study has many details as to how it was implemented. It would be impossible to cover all of the details of each study cited, i.e., this is beyond the scope of this synthesis. As simulations are based on existing data, any existing management practices should be captured.
[Re. p. 3-14] This study does not appear to be a peer-reviewed journal article so we suggest deleting. In addition, there are many good reasons why farmers aren't already applying fertilizer at agronomic rates (See Sheriff, G. Efficient Waste? Why Farmers Over-Apply Nutrients and the Implications for Policy Design Review of Agricultural Economics (2005) 27(4): 542-557.)	The reference has been removed.
[Re. p.3-15] Whether corn is grown for biofuels or not, pesticides are an issue. The point here is that corn production may contribute to pesticide impaired waters, but what is the significance in relation to biofuel production? CEQ suggests moving the paragraph noted below up just under this paragraph to lend a better tie.	EPA agrees and had made the suggested change. (see pages 3-15 and 3-16)
[Re. p-3-16] CEQ suggests that if more recent data can not be found, that this reference be deleted or qualified. With the encouragement of IPM as an enhancement in both the Conservation Security Program as well as the more recent Conservation Stewardship program, the use of IPM as an accepted practice may have risen considerably since 2000.	EPA notes that the study is from 2006 and that a more recent reference was not located. The point here is that while farmers scout for weeds, insects, diseases on half their acreage, they only make adjustments on 20%.

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Comment	EPA Response to Comment
<p>[Re. p. 3-19] CEQ suggests including a statement regarding over-adjudicated watersheds and water rights (especially in the west) and the role they may play in bringing new land under irrigation. If it wasn't irrigated before and there were no water rights associated with the land, this may hinder bringing new land under irrigation. If it wasn't irrigated before, there may have been feasibility or cost-effectiveness of irrigating this land. Without these considerations, CEQ is unclear why "the greatest" concern is "likely" to come from conversion to irrigation. Please support the statement with statistics if possible.</p>	<p>EPA has clarified this statement to read, "For example, land conversion to irrigated corn from typically non-irrigated pasture, marginal, or CRP land could create more demand for water, adding to existing water constraints and potentially creating new ones in places like the Great Plains states." We note elsewhere (4.3.3) that water rights can play a role in how much water can be withdrawn for any particular use and that laws vary from state to state.</p>
<p>[Re. p. 3-20] What is the correlation to biofuel production? There doesn't appear to be a distinction between irrigation that occurs under current crops and increased irrigation impacts under increased biofuel production. Can a distinction be made between what has been going on and what is likely to happen with increased biofuel production?</p> <p>Whether they are growing corn and soybeans for biofuel or not, won't the existing irrigation continue to have the same impacts unless they convert to corn and soy bean production from other uses such as wheat or from soybeans to corn?</p>	<p>EPA noted on p 3-19 that biofuel feedstock production may require groundwater withdrawals and reduce water availability if it expands in areas where irrigation is generally necessary, such as the Great Plains, and replaces other non-irrigated crops/land-uses.</p>
<p>[Re. p. 3-29] Throughout the key findings of the document, CEQ suggests referencing the C-1 tables for the appropriate feedstock. Those tables clearly describe the conditions for maximum potential positive environmental impacts and those conditions should be made clear in the text as well.</p> <p>In section 6 of this document, there are statements which indicate that "Conservation practices, if widely employed, can mitigate these impacts". CEQ suggests including such statements in the "key findings" as appropriate and or reference the C-1 tables as suggested in comment above.</p>	<p>The tables in Appendix C were constructed for a specific purpose, i.e., to summarize the information providing the basis for figures 6-1 and 6-2 in the report, and reflect only a small portion of the information relevant in our key findings. Where EPA had sufficient information to make conclusions, the mention of conservation practices is included in our key findings sections.</p>

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Comment	EPA Response to Comment
<p>[Re. p. 3-29] See Schlenker, W. and Roberts, M.J. 2009. Nonlinear temperature effects indicate severe damages to U.S. crop yields under climate change. <i>Proceedings of the National Academy of Sciences USA</i> 106: 15,594-15,598.</p>	<p>While the impact of climate change and increased CO2 on yields is legitimate (i.e., not just hot temperatures as suggested here), it is beyond the scope of this report. Nor is it clear why this source of uncertainty about future yields is singled out (as opposed to say a plant disease or pests). In general, uncertainty about future corn and soybean yields, regardless of cause, will affect environmental impacts.</p>
<p>[Re. p. 3-35] Please provide clarity here. In 3.3.4.2 below, data shows that increased sediment loads are not expected. Is the nutrient loading increase due to the method of conversion from CRP to perennial grasses? In Table C-1 you describe two different methods for conversion and the impacts to water quality. Will nutrient loading increase because of conversion using conventional tillage? What about no-till? CEQ suggests making this distinction if it exists. Also this appears to contradict 3.3.6.1.</p> <p>[Re. p. 3-38] This contradicts the last paragraph of 3.3.4.1 which says “. If perennial grasses are grown for biomass on CRP acreage nutrient loading to waterways will likely increase.” CEQ suggests providing clarity.</p>	<p>EPA has edited the sentence noted to say switchgrass or Giant Miscanthus cultivated on CRP “may increase” nutrient loadings due to conversion from a less managed land cover to a relatively more managed, cultivated use with nutrient inputs.</p> <p>EPA has added this sentence to clarify: “Switchgrass intensively managed for biofuel feedstock production, however, may increase nutrient losses relative to switchgrass plantings intended as erosion control.”</p>
<p>[Re. p. 3-39] What is the significance of the land being “eligible” for CRP enrollment? The cropping history vs one that has been recently sobusted? Please explain.</p>	<p>EPA changed the text to clarify the reference is to former cropland.</p>
<p>[Re. p. 3-40] It is not clear what the term “unmanaged” means. Please clarify. All general sign-up CRP contracts must have some form of periodic management whether it is fertilizing, disking, burning, or mowing. How will CRP land be harvested for switchgrass? Other than managed harvesting of biomass, will current CRP policy allow harvesting of switchgrass on a regular basis for use as a feedstock? “</p>	<p>EPA made editorial changes to clarify the text. (see pages 3-40 and 3-41)</p>

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Comment	EPA Response to Comment
<p>[Re.p.3-50] Wouldn't the risk of increased evapotranspiration rates be very low since SRWCs are only considered renewable biomass if they are cultivated on previously managed forest lands or existing forest plantations? So conversion of natural pine savanna or low-intensity pasture wouldn't count, right? CEQ suggests clarifying that the existing RFS standard keeps the risk low.</p>	<p>EPA has modified the text in accordance with the suggestion. (see page 3-51)</p>
<p>[Re.p.3-66] CEQ suggests identifying the specific legislation. The Food Security Act of 1985 as amended in 1996 states that any land where the hydrology is altered to make the production of an ag commodity possible is subject to the wetland provision? No size distinction is made and there are penalties.</p>	<p>EPA notes that this only affects lands enrolled in the program, but has cited the relevant portion of FSA (i.e., Swampbuster).</p>
<p>Aren't the US biofuel import volumes more dependent on the price at which the US can produce biofuels versus the price at which other countries can import into the US (taking into account the net effect of tariffs, tax credits, shipping costs, and RIN prices)? See previous comment.</p>	<p>EPA agrees with the comment, where costs will be determined by domestic production capacity, including the efficiency of the domestic ethanol-producing sector and the yields attained. The text was modified. (see page 5-3)</p>
<p>[Re. p. 6-4] These figures show the most plausible scenario but also the one with the most negative impacts. Table C-1 shows the conditions for maximum potential for positive environmental impacts. CEQ suggests another footnote on these charts referring to C-1 for the cultivation practices having a maximum potential positive environmental impact. CEQ also suggests an addition to this "figure" showing the impacts with conservation practices implemented as identified in the C-1 tables.</p>	<p>The information described in Table C-1 was considered in its entirety to construct the synthesis figures. This included the full range of potential impacts, including the potential for positive environmental outcomes and implementation of conservation practices.</p>

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Comment	EPA Response to Comment
<p>[Re. p. 6-7] This outcome is highly unlikely without a massive change in EPA, USDA policy. What this seems to be saying is that biofuel won't cause negative environmental impacts if the agricultural nonpoint source pollution problem is solved.</p>	<p>EPA did not speculate on the likelihood of compliance with conservation practices, but notes in its conclusion the relevant caveats (i.e. "if existing conservation and best management practices are widely employed, concurrent with advances in technologies that facilitate the use of second-generation feedstocks"). The outcome of any eventual change of policies and practices remains to be seen, but the biofuels related impacts are a smaller part of agricultural production in general which is not the focus of this report.</p>
<p>[Re. p. 6-9] Is the term "unregulated wetland" coming from Section 4040 of the Clean Water Act? Please clarify. Conversion of ANY size area determined to meet the definition of wetland that makes the production of a commodity crop possible is regulated under the Food Security Act of 1985 with penalties in loss of certain USDA payments should the producer convert these areas. Some mention or clarification is needed here.</p>	<p>The USDA program is voluntary and not regulatory. Although there are some losses in payments and benefits to farmers who convert small wetlands that do not fall under CWA Section 404, these losses have not been a substantial deterrent. Conversions of these types of wetlands are still occurring.</p>
<p>[Re. p. 7-7] CEQ suggests explicitly stating the uncertainty that comes from the need for technology advances to make second generation feedstocks commercially viable.</p>	<p>EPA made the recommended changes. (see page 7-8)</p>