Appendix H
Response to Comments

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I Summary

APHIS received 1,293 submissions that supported the use of Roundup Ready® sugar beet (RRSB) and 94 submissions that did not support their use. APHIS also received 9,186 letters that were nearly identical in content and a petition from an organization with 14,592 signatures and associated comments opposed to the use of RRSB. APHIS received 68 submissions from commenters that attached 578 supporting documents. Of the attached documents, 23 were cited in the final environmental impact statement (FEIS), 150 were not cited in the FEIS, and the remaining were court documents related to litigation associated with RRSB or other genetically engineered (GE) crops or duplicate submissions of attachments.

In addition, APHIS conducted 3 public meetings, at which a total of 63 people provided comments.

The text of the form letter submissions (APHIS-2010-0047-4251[1], APHIS-2010-0047-4252, APHIS-2010-0047-4288, APHIS-2010-0047-4292, and APHIS-2010-0047-4293) is included below. Among these form letters, some individuals included additional or alternate text. In instances where the additional or alternate text related to a substantive issue, APHIS' responses are in the subject-related areas of this document.

The text of the form letter with APHIS' response to each issue:

Comment: I am writing to strongly oppose USDA's proposal to allow the deregulation and commercialization of Monsanto's genetically engineered, "Roundup Ready" sugar beets (Docket No. APHIS-2010-0047-3179).

Transgenic contamination is not only likely, but certain, under a full deregulation, and in fact has already occurred. USDA's preferred alternative to fully deregulate GE sugar beets will lead to transgenic contamination of conventional sugar beet seed and conventional and organic table beet and Swiss chard seed. With no mandatory measures in place to keep GE and non-GE fields distant enough to prevent contamination, there will be an increased level of gene flow from GE to non-GE fields resulting in contaminated seed.

This contamination burdens organic and conventional farmers with the cost of testing their product, externalizing a cost of production that should be borne by the producers of the technology. While USDA recognizes that full deregulation of the GE sugar beet seeds will result in increased testing costs for non-GE growers, even forcing some to leave their land because of the costs associated with the threat and likelihood of contamination, the Agency proposes no mitigating measures to protect conventional and organic farmers from this harm, opting instead to promote it by proposing full deregulation of GE sugar beets. This is unacceptable.

Response: APHIS examined the likelihood of gene flow between conventional, organic, and GE beets if the agency were to grant nonregulated status to RRSB; the results can be found in section IV.B.5 of the FEIS. APHIS concluded that under normal growing practices in areas where these crops are typically grown, the probability of gene flow between the crops is very small. In seed-growing areas where there is geographic overlap between sugar beet, table beet, and chard seed production, the probability of gene flow is less than 1 in 10,000 if current isolation practices are

[1] These citations are to public comments submitted to regulations.gov docket APHIS-2010-0047 http://www.regulations.gov/#!searchResults;rpp=25;po=0;s=APHIS-2010-0047.

used. If growers choose to use different practices, the probability of gene flow may increase or decrease. APHIS acknowledges that the H7-1 trait was detected in some vegetable beet seed produced in 2007 and 2008. However, vegetable beet seed that has been tested in subsequent years has tested negative for the H7-1 trait. APHIS has concluded that overall it is unlikely that gene flow will occur between vegetable beet and sugar beet root production.

APHIS examined the potential harm to non-GE beet seed growers (see secs. IV.D.3 and IV.D.4 of the FEIS). While APHIS did not conclude that any non-GE beet seed growers would be forced to leave their land, the agency did conclude that some non-GE growers may be unable to grow beet seed at some locations if their specific growing contracts required certain isolation distances longer than what local practices normally require. In addition, APHIS found that some non-GE growers may opt to grow seeds other than beet seeds if they are at a competitive disadvantage to beet seed producers in other locales (see sec. IV.D.4). In addition, APHIS examines the cost of testing in section IV.D.4.

As APHIS describes in the FEIS, growers who wish to produce crops for GE-sensitive markets are growing specialty crops to attain a market premium. It is the responsibility of the grower who enters into a specific contract to grow a specialty crop to take steps to meet the specialty crop contract's obligations. Restricting the activities of other growers who are not obligated under the specialty crop contract so that the specialty growers can meet their self-imposed obligated market specifications is outside of APHIS' authority under the Plant Protection Act (PPA). APHIS has no legal authority to impose any regulatory requirements, including mandatory isolation distances on H7-1 sugar beet growers, unless APHIS determines that H7-1 sugar beet presents a plant pest risk that can be mitigated by those isolation distances or other regulatory requirements.

Comment: USDA also refuses to seriously analyze other adverse environmental impacts stemming from full deregulation of Roundup Ready sugar beets. USDA's biased assessment touts the advantage of glyphosate displacing other herbicides, but ignores, denies or downplays a range of adverse impacts, including a 20-fold increase in the use of glyphosate, a twofold rise in overall herbicide use on sugar beets, rapid evolution of glyphosate-resistant weeds, and the acquisition of glyphosate resistance by weeds already resistant to other herbicides.

USDA recommends increased use of more toxic herbicides as a mitigating measure for the anticipated emergence of glyphosate-resistant weeds caused by the huge rise in glyphosate use on sugar beet fields, but fails to assess the impacts. Contrary to USDA's bogus claim that resistant weeds require at least five years to develop, two populations of glyphosate-resistant weeds infesting sugar beets have been documented in just the last year, only the 4th year of widespread RR sugar beet cultivation. USDA's cumulative impacts assessment essentially dismisses problems caused by RR sugar beets on the grounds that these problems are not as great as those caused by more widely-planted RR crops that USDA unconditionally approved. By this logic, the Army Corps of Engineers could justify allowing a small town to be inundated on the grounds that it forms a small proportion of the many other towns it had previously failed to protect from the rising floodwaters.

Response: First, APHIS believes that it has analyzed the potential impacts that may result from the full deregulation of H7-1 sugar beet. Second, APHIS has clearly analyzed the effects of changes in herbicide use that are associated with the adoption of H7-1 sugar beet (see sec.

IV.B.1). APHIS has updated the analysis of total changes in herbicide use based on the most recent herbicide use surveys for sugar beet in the Red River Valley (Stachler, Carlson et al., 2012, where more than half of U.S. sugar beet production occurs. The updated analysis compares herbicide use on H7-1 sugar beet with herbicide use on conventional sugar beet, both grown in the Red River Valley. Glyphosate use on H7-1 sugar beets increased about sevenfold over herbicide use on conventional sugar beet. Ethofumesate use as a preplant-incorporated herbicide decreased about 25-fold; clethodim and clopyralid use decreased about 43-fold; quizalofop decreased fifteenfold; and desmedipham, dimetheneamid-p, ethofumesate (as a post emergent herbicide), phenmedipham, and trisulfuron-methyl were no longer used. Overall pounds of herbicide applied decreased about 22 percent on H7-1 sugar beet. Third, APHIS analyzed the selection of glyphosate-resistant (GR) weeds, including those resistant to multiple herbicides. While this comment disagrees with APHIS' analyses, it does not offer any data to support its opposition or its particular claims with regard to quantities of herbicides used on sugar beet.

In addition, with regard to the cumulative impacts analysis, APHIS has updated that analysis to make it clearer that on a national level the changes in production practices associated with the adoption of H7-1 sugar beet do not contribute measurably to the cumulative effects that the sum total of agricultural crops and systems have on the environment. In addition, APHIS has examined the cumulative impacts at the regional and local levels and has concluded that the adoption of H7-1 sugar beet could increase beneficial practices associated with conservation management programs run by USDA's National Resources Conservation Service (NRCS) in some regions, such as the Northwest and Great Plains. In certain areas, the adoption of H7-1 sugar beet may also incrementally contribute to the development and spread of GR weeds in GR cropping systems.

APHIS disagrees with the commenter's characterization that the agency falsely claimed that it takes 5 years for GR weeds to develop when in just 4 years GR weeds are now infesting sugar beet fields. These weeds did not develop from 4 years of herbicide use in sugar beet fields; rather, they developed from at least 15 years of herbicide use in soybean and corn fields that have been rotated into sugar beet. Consequently, the selection of these weeds would occur under any of the three alternatives because of the widespread adoption of GR corn and soybean over the landscape in the Midwest. Models describing how long selection needs to be applied before resistance appears in a population are consistent among several sources and are supported by the observation that GR weeds have not been selected in sugar beet fields in the Great Plains and Northwest after 4 years of H7-1 adoption.

Comment: As a consumer I am harmed by the loss of my right to choose non-GE foods. As concerns about the contamination of conventional foods have grown, consumers are turning to organics as a safe alternative. But under USDA's deregulation proposal, organics are threatened with contamination as well. USDA claims that consumers accept transgenic contamination of organic foods, basing these claims on a thriving organic industry despite the known contamination of organic soy and corn. But there is no tolerance for transgenic contamination in the organic standard or in the market. Allowing commercialization will eliminate my choice to choose non-GE food and threaten vital organic markets and farmers.

Response: APHIS analyzes consumer preference in section IV.D.4 of the FEIS. The commenter has not offered any evidence to contradict that analysis. APHIS does not agree that

consumers will lose the right to choose non-GE food. Almost half of the sugar produced in the United States is derived from sugar cane that is non-GE. Non-GE swiss chard and table beets will continue to be available, allowing consumers to choose non-GE vegetables.

Comment: USDA should prohibit the commercial use and planting of Roundup Ready Sugar Beets, until and unless it can fully protect the environment, farmers, and consumers from its harms.

Response: APHIS has been asked to make a decision on a petition to grant nonregulated status to H7-1 sugar beet. Under title 7, part 340 of the Code of Federal Regulations (CFR), APHIS must base it decision on whether H7-1 sugar beet poses a plant pest risk. APHIS has not found a greater plant pest risk associated with the production of H7-1 sugar beet than other sugar beet. Therefore, APHIS' preferred alternative is to approve the petition. If APHIS determines there is no plant pest risk and grants the petition, there is no basis under 7 CFR 340 to place restrictions on the use and planting of H7-1 sugar beets. The commenter has provided no evidence that H7-1 is likely to be a plant pest.

Comment: The following represents my position in strong disagreement with the draft Environmental Impact Statement (EIS) for RoundUp Ready Sugar Beets, which identifies full deregulation as the preferred alternative.

The EIS acknowledges that the threat of contamination to organic seed and crops is real, and risks compromising livelihoods, genetic integrity, and faith in the organic label. This requires the USDA to reject Monsanto's petition seeking a determination of nonregulated status.[2]

Response: In the FEIS, APHIS fully analyzes the effects of three different alternatives on the likelihood of gene flow from H7-1 sugar beet to other *Beta vulgaris* crops; the analysis is in section IV.B.5. APHIS also examined the economic impact of gene flow to growers of other *B. vulgaris* crops (see sec. IV.D.4). The analysis does not identify any plant pest risks that are associated with gene flow between H7-1 and other beet crops. Accordingly, the analysis does not support the commenter's conclusion that APHIS must reject the petition for nonregulated status for H7-1 sugar beet. The commenter has not provided any evidence that H7-1 sugar beet is likely to be a plant pest.

Comment: Sugar beets are wind pollinated and easily cross with vegetable relatives. The species at issue (Beta vulgaris) is one of the few vegetable crop species that is wind pollinated. Some insect pollination occurs in beets, but wind accounts for most pollination events. Furthermore, beets are self-incompatible, meaning each plant must have pollen from a genetically different individual to produce viable seed.

Table beets and chard have large numbers of flowers per plant and produce large amounts of pollen. Crops within the Beta vulgaris species (table beets, chard, and sugar beets) are fully sexually compatible and mating between any two of these crops will occur if they flower in proximity to one another, as pollen from one will readily fertilize any of the

[2] Comment number APHIS-2010-0047-4383 contained a petition that included names as well as individual comments in the field designated "letter." Exactly 7,498 people submitted comments in this field. The majority of the comments consisted of two different form letters and variations of these form letters. APHIS' response to the issues raised in these form letters is in this section. Some individuals made additional comments; APHIS' responses to those comments are included in the subject-specific response sections of this document.

other's flowers, resulting in viable offspring that produce viable seed. Research shows that beet pollen can travel over 12 miles. There's no realistic distance that completely isolates two cross-pollinating crops 100 percent of the time, especially in a highly concentrated seed production location like the Willamette Valley.

Response: APHIS acknowledges the comment and has considered these facts in the FEIS. The FEIS fully discusses the pollination biology of *B. vulgaris*, the different varieties of *B. vulgaris* and cross-pollination between them, and the effect that distance has on the probability of cross-pollination (see sec. III.B.5). APHIS is not aware of any data that shows that a successful cross-pollination between beet species occurs over 12 miles. The greatest distance over which cross-pollination occurs that APHIS is aware of is 6 miles, as described in (Fénart *et al.*, 2007).

Contracts may set thresholds for a maximum allowable percentage of off-types. Growers in areas with highly concentrated seed industries, such as the Willamette Valley, have developed organizations like the Willamette Valley Specialty Seed Association (WVSSA) to cooperatively set standards to help growers meet contract-mandated thresholds for off-types.

Comment: Complete segregation is not possible. Once contamination occurs, farmers can neither detect the presence of a transgenic trait without testing, nor can they remove the foreign DNA sequence from the crop. If contaminated seed is planted unknowingly, contamination will spread. For example: The contaminated seed could be used as stock for a subsequent seed crop. As soon as contaminated seed is in the hands of farmers or gardeners scattered geographically, it could cause a wider distribution of GE contamination, especially if they are in or near seed production areas for any of the Beta vulgaris crops.

Contamination can also spread through unintentional flowering when crops encounter stress - called "bolting" - releasing pollen to other Beta vulgaris populations within pollination proximity. When seed crops from this species are grown during the first year of the biennial cycle they can flower prematurely if exposed to excessive cold temperatures, producing pollen from plots that are not normally considered in calculating isolation distances. "Weedy" sugar beets growing in roadside ditches and other areas not under cultivation can spread pollen with GE traits and further contamination events.
Human error is also a factor, as mistakes regarding the physical mixing of roots in breeding programs spreads genetic traits from one seed lot to another.

Response: The FEIS discusses methods for detecting the 5-enolpyruvylshikimate-3-phosphate synthase (*epsps*) transgene in crops as well as vegetable beet/sugar beet hybrids, methods employed by seed producers to maintain the purity of varieties of beets, and the biology of sugar beets including bolting. Farmers can detect whether vegetable beet seed has the H7-1 transgene when they grow their crop because the only seed with the transgene will be half vegetable beet and half sugar beet and will have a distinct appearance. Such hybrid off-types can be culled to remove the “DNA sequence from the crop.” This is a practical remedy for those growing vegetables as they are normally harvested by hand and are typically inspected at that point. In the case of growing salad mixes that are harvested at a young stage before off-types have developed distinguishing characteristics, seed would need to be tested for the presence of the H7-1 transgene. Weedy sugar beets have not been identified as a problem in roadside ditches, especially in most areas of sugar beet production, because beets do not overwinter in freezing temperatures. While sugar beets can bolt, they rarely do and generally are not grown in

proximity to a flowering vegetable beet crop. APHIS has not identified any information in this section of the comment that requires a change to the FEIS.

Comment: The unwanted spread of GE traits threatens markets and livelihoods. Maintaining the genetic purity and proper isolation distances with these crops is difficult as it is without introducing a novel, engineered trait that is outright rejected by various markets. Cross-pollination between a GE crop and a non-GE crop of the same species causes a number of problems. Contaminated seed will not be acceptable for many farmers' use because:
The contaminated seed cannot be sold into countries that do not allow GE crops or products, regardless of how it was grown.
The contaminated seed will not comply with USDA standards for organic certification, which does not permit GE content in organic seed. It can therefore not be sold as organically certified seed in the U.S. or into any international organic seed market that adheres to the standards established by the International Foundation of Organic Agricultural Movements.

Response: APHIS examined the impacts of each of the three alternatives on markets. When growers choose to produce a crop for a specialty market or a particular buyer, they must determine whether or not they can meet the market or contract demands. Growers within specific areas may agree to keep certain production practices, such as isolation distances, to aid in the production of crops with market-driven standards.

Other countries have their own regulations regarding the use of GE crops, which may include restrictions on the use of GE crops that are not approved for use in their country. They may also require testing of crops. It is exporters' obligation to understand the regulations of the importing country. Section III.B.1 of the FEIS states which countries have approved H7-1 sugar beet.

Detection of H7-1 DNA or the modified EPSPS protein does not necessarily constitute a violation of the National Organic Program (NOP). The preamble to NOP's final rule states: "When we are considering [genetic] drift issues, it is particularly important to remember that organic standards are process based. Certifying agents attest to the ability of organic operations to follow a set of production standards and practices that meet the requirements of the Act and the regulations. This regulation prohibits the use of excluded methods in organic operations. The presence of a detectable residue of a product of excluded methods alone does not necessarily constitute a violation of this regulation. As long as an organic operation has not used excluded methods and takes reasonable steps to avoid contact with the products of excluded methods as detailed in their approved organic system plan, the unintentional presence of the products of excluded methods should not affect the status of an organic product or operation" (65 FR 80556).

Furthermore, NOP's final rule states: "…these regulations do not establish a 'zero tolerance' standard. As with other substances not approved for use in organic production systems, a positive detection of a product of excluded methods would trigger an investigation by the certifying agent to determine if a violation of organic production or handling standards occurred. The presence of a detectable residue alone does not necessarily indicate use of a product of excluded methods that would constitute a violation of the standards" (65 FR 80632).

Comment: GE sugar beets put chard and table beet seed at risk. The integrity of organic seed and food crops and products are at risk. The quality of organic seed is dependent on its genetic purity, including being free of GE contamination. This is particularly a concern

for table beets and chard that are relatives to sugar beets and grown in the same region. Washington and Oregon account for over 80 percent of U.S. chard and table beet seed production, and 50 percent of world chard and table seed production. These crops are valued at millions of dollars. It's not just organic markets that will reject seed with GE contamination. This valley is home to a high value specialty seed trade with buyers in the Pacific Rim and European Union who will also reject contaminated seed. Companies are already looking to produce seed elsewhere, in different U.S. regions and abroad, because of contamination concerns.

Response: APHIS acknowledges the comment. The seed purity of vegetable beets grown in the Willamette Valley was considered in the FEIS, and the likelihood and impacts were fully analyzed. APHIS examined the geographic distribution of the vegetable beet and sugar beet seed growing areas. Traditionally, table beet seeds are grown in western Washington, and sugar beet seeds are grown in the Willamette Valley. Chard seeds are a smaller market and are grown in both areas. Beet seed growers in the Willamette Valley often participate in the WVSSA's pinning program to establish isolation between sexually compatible varieties, which allows them to meet their contractual requirements. Under this system, individual growers may be unable to grow the variety of their choosing in a particular field if another grower has priority under the system for planting his or her variety in a nearby field or if they are unable to meet the contract's growing requirements. However, while individual growers might lose certain contracts, other growers can obtain them. Accordingly, APHIS concludes in the FEIS that there is little effect on the integrity of the organic seed market of the vegetable beet seed industry as a whole under any of the alternatives.

Comment: Organic farmers shoulder the burden of protecting the integrity of organic seed.

The burden of protecting the integrity of organic seeds, agricultural products, and markets is solely on the shoulders of organic farmers. This is an imbalanced and unfair burden. In the event contamination occurs, farmers have no recourse to recoup damages because the question of who is liable has not been determined. They are left with the economic and agronomic costs of detecting and eradicating GE material; losing the genetic integrity of seed on which they rely; taking measures to avoid future contamination; and selling contaminated products into the conventional market, losing a premium for organically produced products.

Response: APHIS fully analyzes the effects of three alternatives on organic, conventional vegetable beet seed, and sugar beet producers in section IV.D of the FEIS. USDA supports the use of all types of agriculture, including organic, conventional, and GE. The decision to grow a crop for a specialty market is an individual choice. Growers consider the risks and the returns when making those decisions. There is a risk to producing an identity-preserved product whether organic, conventional, or GE. The burden of protecting one's product is upon the person growing the seed, regardless of the type of seed.

Comment: Please revise the draft EIS to bring the recommendation in line with the evidence. The only way to prevent genetically engineered sugar beet production from destroying the organic seed market for related crops is to reject Monsanto's petition for deregulation.

Response: The commenter has not provided any evidence that supports revising the FEIS. The FEIS analyzes the impacts of three different alternatives on the human environment. The comment has provided no evidence to support the assertion that the organic seed market for *B. vulgaris* varieties would be destroyed under any of the alternatives. Further, the commenter points to no basis under 7 CFR 340 for denying the petition based on a plant pest risk.

Comment: I am writing to strongly oppose the USDA's proposal to allow the commercial planting and sale of genetically engineered, "Roundup Ready" sugar beets before the agency has completed the court-ordered review of that crop's impacts (Docket No. APHIS-2010-0047).

The USDA's proposal violates environmental laws that are meant to ensure that agencies analyze potential environmental and socioeconomic impacts before they take action, not allow those activities to continue under another name while they undertake that analysis. The proposal also violates the law because it allows commercialization under provisions meant only for research, making an end-run around actually making a commercial approval decision.

Response: APHIS will make a determination on the petition for nonregulated status after completing the FEIS, namely the court ordered review referenced by the commenter, and publishing the record of decision (ROD). APHIS is not taking an action on the petition for nonregulated status in the absence of completing this FEIS.

The commenter appears to be referring to the interim measures imposed by APHIS while the FEIS has been conducted. This comment more appropriately refers to the action APHIS took in response to the request for partial deregulation of H7-1 sugar beet submitted by Monsanto and KWS on August 9, 2010, not the action APHIS plans to take in response to the petition for nonregulated status that is the subject of the FEIS. Nevertheless, in responding to the earlier action, APHIS has not violated the National Environmental Policy Act (NEPA) or any other environmental law. In a similar case involving Roundup Ready® alfalfa, the Supreme Court ruled that "if the agency found, on the basis of a new EA, that a limited and temporary deregulation satisfied applicable statutory and regulatory requirements, it could proceed with such a deregulation even if it had not yet finished the onerous EIS required for complete deregulation" (United States Supreme Court, 2010) [pg. 17]. Clearly the agency acted within the law when it imposed specific conditions for the partial deregulation of H7-1 sugar beet during the preparation of the EIS.

We presume that the commenter's statement claiming that APHIS has somehow violated the "law prohibiting commercialization under provisions meant only for research" is referring to APHIS' part 340 regulations. We certainly disagree with the commenter's interpretation of our part 340 regulations. Our part 340 regulations do not make any reference to or distinction between field trial tests for "research" or "commercialization." Thus, we disagree with the commenter's inference that the part 340 regulations are for the approval of research-only field tests.

In reference to making its determination regarding that petition for nonregulated status, APHIS has appropriately complied with NEPA and the District Court's order specifically requiring APHIS to prepare an environmental impact statement (EIS) that fully considers the potential effects on the human environment that may result from that determination prior to making its final determination on that petition. Consistent with 7 CFR 340.6, a GE organism is no longer

subject to the regulatory requirements of 7 CFR 340 when APHIS determines that it is unlikely to pose a plant pest risk. Accordingly, APHIS would have no regulatory jurisdiction or basis to place any restrictions on the production of H7-1 sugar beet if the agency determines that it does not pose a plant pest risk. Once APHIS determines that H7-1 sugar beet does not pose a plant pest risk after a full plant pest risk analysis, the agency would make the determination that it would be appropriate for H7-1 sugar beet to have nonregulated status.

Comment: As a consumer I am harmed by the loss of my right to choose non-GE foods. The harm to me happens because the sugar made from biotech beets is made by a production system that I know is harmful to the environment and farmers, regardless of the differences between biotech-derived sugar and other sugars. These harms include the risk of transgenic contamination of organic and non-GE crops, the creation of resistant "super weeds" from the overuse of Roundup, and the impacts of Roundup on biodiversity and protected species. Allowing commercialization to continue will not only eliminate my choice to choose non-GE food, but it will prejudge the agency's forgone conclusion to eventually commercialize again.

Response: The FEIS provides an analysis of consumer preferences in section IV.D.4, which does not support the assertion that consumers will lose the right to choose non-GE foods from the production of H7-1 sugar beet. The FEIS also analyzes the impacts of the adoption of H7-1 sugar beet on the environment, including the risks of gene flow and the indirect effects of gene flow on growers; the development of herbicide-resistant weeds; and the effects of changes in herbicide use on the environment (see secs. IV.B.5, IV.D, and IV.C.3). The analysis in the FEIS does not support the assertion that the use of H7-1 sugar beet is more harmful to the environment than conventional sugar beet production.

Comment: The USDA has proposed an unprecedented scheme with measures it claims will ensure harm such as transgenic contamination won't happen. But those measures have never been analyzed by our government for any biotech crop. They are the same measures that the Federal Court refused to adopt in August of this year. These measures should not be adopted now, at least not without a full Environmental Impact Statement analyzing their efficacy.

Response: The commenter appears to be referring to the interim measures imposed by APHIS while the FEIS has been conducted. This comment more appropriately refers to the action APHIS took in response to the request for partial deregulation of H7-1 sugar beet submitted by Monsanto and KWS on August 9, 2010, not the action APHIS plans to take in response to the petition for nonregulated status that is the subject of the FEIS. Nevertheless, in responding to the earlier action, APHIS has not violated NEPA or any other environmental law. In a similar case involving Roundup Ready® alfalfa, the Supreme Court ruled that "if the agency found, on the basis of a new EA, that a limited and temporary deregulation satisfied applicable statutory and regulatory requirements, it could proceed with such a deregulation even if it had not yet finished the onerous EIS required for complete deregulation" (United States Supreme Court, 2010) [pg. 17]. Clearly the agency acted within the law when it imposed specific conditions for the partial deregulation of H7-1 sugar beet during the preparation of the EIS.

The EIS considers and analyzes three alternatives in detail. It is unclear which scheme or measures the comment is referencing. The preferred alternative, to approve the petition, would not place restrictions on the cultivation of H7-1 sugar beet.

Comment: Additionally, the USDA's track record at overseeing biotech crops in field trials is abysmal, as numerous government reports have concluded (GAO 2008, USDA IG 2005). The failings of the USDA's field trial oversight have led to dozens of contamination episodes and billions of dollars in lost markets and businesses, such as with genetically engineered rice and corn. The USDA's actions belie its rhetoric of concern for non-GE crop growers, and continue to undermine its credibility. The USDA refused to disclose to the public a major contamination episode that came to light just a few weeks ago when GE bentgrass was discovered to have contaminated at least 20 square miles in eastern Oregon. GE bentgrass is not commercially approved and the contamination is believed to have spread from a field trial that ended more than five years ago. Congress even required USDA to improve its oversight of field trials in the 2008 farm bill, an order USDA has ignored.

Response: The comment does not raise any issue with any of APHIS' analyses of environmental impacts or other topics covered in the draft environmental impact statement (DEIS). Nevertheless, we will address the comment. APHIS strongly disagrees with the commenter's assertion that APHIS' oversight of field trials of biotech crops is abysmal. Quite the contrary, APHIS believes it has had and continues to have a very longstanding, reliable, and effective regulatory oversight of thousands of biotech field trials under its jurisdiction. APHIS has conscientiously taken into account the 28 recommendations from USDA's Office of Inspector General (OIG) 2005 audit report and reached management decisions with OIG on all 28 of the recommendations. APHIS reached closure on all but 3 recommendations with the Office of the Chief Financial Officer (OCFO). Of the remaining three recommendations, one pertaining to shipping requirements is with the OCFO for closure, and the remaining two recommendations were to be incorporated into APHIS' 7 CFR 340 regulations, which have not been finalized at present.

The General Accounting Office (GAO) had two primary recommendations for action that were applicable to APHIS in its 2008 report. The recommendation relevant to sugar beet is as follows: "USDA, EPA, and FDA should develop a coordinated strategy for risk-based monitoring of (deregulated) GE crops that are marketed, which should identify crops that warrant monitoring, such as those that produce pharmaceutical or industrial compounds, and include criteria for determining when monitoring is no longer needed." In situations where a GE crop plant is partially deregulated, APHIS has the legal authority to consider the plant pest risk of the partially deregulated GE crop and to determine what would be the appropriate mitigation conditions and monitoring of the GE crop in reference to the potential plant pest risk. Under Alternative 3, which is the partial deregulation alternative, APHIS would require growers to force sprouting of seed remaining after harvest and continue monitoring sites where H7-1 sugar beet had been planted for 3 years. Any crops planted at the site would need to be visually distinct from sugar beet during the monitoring period to avoid facilitating persistence of H7-1 sugar beet.

In addition, APHIS disagrees with the commenter's assertion that it had ignored the 2008 Farm Bill. APHIS has by no means ignored the 2008 Farm Bill. Under the Farm Bill, APHIS was given new authority to subpoena evidence, including samples of GE crops, and increase penalties for willful violations of permit conditions and performance standards applicable to avoiding unintended releases into the environment. In response, APHIS initiated numerous affirmative processes and actions to comply with the mandates and recommendations of the 2008 Farm Bill.

APHIS amended its guidelines for civil penalties for violations of its part 340 regulations. The Farm Bill also encouraged design of an electronic database for permits to facilitate tracking, and APHIS implemented the ePermits system to accomplish this request. In addition, the Farm Bill directed APHIS to enhance its protocols for conducting molecular forensics. In a memorandum of understanding with the Agricultural Marketing Service and the Grain Inspection, Packers and Stockyards Administration, APHIS addressed how it would secure sampling and testing of crops when necessary. Congress also asked APHIS to ensure that its separation distances for confined field trials reflect the latest science for appropriate separation distances. As such, APHIS has worked with the industry standard-setting organization, the Association of Official Seed Certifying Agencies, to develop these. Standards for audits of compliance were mandated, and APHIS has begun a Biotechnology Quality Management System pilot program with technology developers to implement them. In addition, APHIS addressed a number of the Farm Bill's points by revising and proposing new biotechnology regulations. The revision of 7 CFR 340, which was published as a proposed rule but has not been promulgated, contains provisions addressing many of Congress' concerns, including those regarding the quality and completeness of records, the maintenance of identity and control in the event of an unauthorized release, corrective actions in the event of an unauthorized release, clarity in contractual agreements, and the need for a system of risk-based categories to classify each regulated article. Finally, the Farm Bill asked APHIS to impose certain requirements on permit holders, including requiring them to maintain a positive chain of custody, maintain records, conduct periodic audits, and provide contingency and corrective action plans. APHIS addressed these concerns in the provisions of its proposed rule and continues to develop management plans for technology providers and to require better performance in the specified areas.

Comment: Now the USDA is claiming that its system of field trials is sufficient to contain an entire industry across the country. The measures should not be adopted at least without a full EIS.

Response: APHIS will make a determination on the petition for nonregulated status of H7-1 sugar beet after completing the FEIS and publishing the ROD for the FEIS. APHIS will not issue its final determination on the petition for nonregulated status of H7-1 sugar beet until after it has issued the FEIS and its ROD is effective.

Comment: The companies claiming economic harm from the failure to plant biotech beets in 2011 - Monsanto, Syngenta, and other agro-chemical giants - have not disclosed what conventional seed stock they have to plant if they cannot plant biotech beets. Any claims of economic harm to them are speculative and a result of their own gambling, since these companies have known since 2008 that they should plan to revert to conventional beets since it was likely biotech beets would again be illegal.

Response: APHIS used information obtained from the 2011 growing season to update the analysis in the FEIS. Based on public comment and herbicide use surveys, it appears that 10 to 15 percent of sugar beet growers in some regions decided to plant conventional sugar beet during the 2011 growing season. The FEIS analyzes the difference in costs between growing H7-1 sugar beet and conventional sugar beet, the availability of seed for the 2013 growing season and beyond under the different alternatives, and the loss of investment into research and development under Alternative 1 (see sec. IV.D).

Comment: Biotech beets are illegal and they threaten the environment through transgenic contamination and weed resistance, and consumers by inhibiting the fundamental right to choose.

Response: APHIS acknowledges the commenters allegations of harm. APHIS has fully considered and analyzed issues such as cross-pollination, weed resistance, and consumer choice. At the time that the DEIS was published, the importation, interstate movement, and release into the environment of H7-1 sugar beet was regulated under 7 CFR 340 and partially deregulated under the PPA. The sugar beet themselves are not illegal.

Comment: Of those that support the use of the technology, the majority (828) were growers that currently use RRSB or plan to use it in the future. Those who currently use the technology cited the use of less cultivation, use of less herbicide applications, and good weed control as their primary reasons for adopting and continuing the use of the product. Some commenters mentioned improved quality of life as a reason to use the technology. These individuals felt that fewer applications of herbicides and fewer cultivations to remove weeds benefited their family life. Others cited reduced petroleum fuel use, less fertilizer use, and less water use as advantages. Many growers provided anecdotes about their particular experiences with RRSB. Some told of improved yields; others wrote about the poor weather and late planting that resulted in 2011. They explained that using RRSB offered them more flexibility in weed management because glyphosate could be applied at times that other herbicides could not. Some growers who planted conventional beets wrote to tell of the difficulty in hiring workers to hand-weed fields. They cited both the expense and reliability of the workers as issues.

Several growers and extension agents also explained that the requirements in alternative 3 created a burden, but did not give specific examples of the additional costs. Several growers were also concerned that the unavailability of RRSB would make the growing of sugar beet less profitable because the use of H7-1 sugar beet reduced the overall cost of beet production for these growers. Some of these growers suggested that if H7-1 sugar beet was not available, they would no long grow sugar beet because they could not make a profit growing conventional sugar beet.

Response: The analysis in the EIS is consistent with these comments.

Comment: Nine state and local government officials also commented in support of Alternative two. These officials cited the importance of sugar beet to their economies and the high adoption of RRSB among their constituents as reasons for supporting the adoption of Alternative two. Several also cited the use of agricultural production practices that reduce wind and water erosion as benefits to their local environments.

Response: The analysis in the EIS is consistent with these comments.

Comment: Eight academic scientists and extension agents wrote in support of Alternative two. Some cited a safe history of use of GE organisms in agriculture and the need for good weed control in sugar beet. Some presented specific comments about weed control and isolation distances.

Response: The specific details of those comments and APHIS' response are provided in the appropriate subject-related sections below.

II Purpose and Need for Agency Action

Comment: APHIS also ignores the agency's noxious weed mandate under the PPA. APHIS must undertake its statutorily mandated obligation to investigate whether RRSB poses noxious weed risks, and consider whether or how to address noxious weed harms resulting from the agency's approval action. The PPA imposes on APHIS the duty to consider whether plants under its authority create "noxious weed" or "plant pest" harms, and grants it the authority to address these harms.

The agency has broad statutory power to prohibit or regulate plant pest harms, as well as noxious weed harms. The statutory definition of "noxious weed" is very broad, and include many of the types of harms noted in these comments including transgenic contamination to other crops from RRSB and the resulting public health risks, damage to crops, the environment, and the interests of agriculture, for example.

Exercising APHIS's noxious weed authority is particularly important here because the approval of RRSB and the glyphosate use associated with the Roundup Ready crop system will promote the rapid evolution and spread of noxious weeds tolerant of or resistant to glyphosate herbicide, in violation of the PPA's noxious weed provisions. Glyphosate-resistant weeds are noxious because of their manifold negative impacts on the interests of agriculture, human health, the environment, and farmers' welfare. Because RRSB will directly and indirectly foster and cause these significant negative noxious weed impacts, APHIS must apply its noxious weed authority to RRSB.

APHIS's overly narrow application of its statutory authority here violates the PPA, and is an arbitrary and capricious abdication of authority. APHIS should at a minimum delay any decision on RRSB and any other GE crop until it revises its admittedly outdated regulations to make clear that its noxious weed mandate applies to GE crops.

Response: APHIS disagrees with the commenter's statement that APHIS has arbitrarily and capriciously abdicated its noxious weed authority under the PPA as well as the commenter's claim that APHIS applies and uses its PPA statutory authorities narrowly. The PPA provides APHIS with the authority to regulate both plant pests and noxious weeds under two distinct mechanisms and procedures. Section 7711 of the PPA covers plant pests and prohibits any unauthorized movement (e.g., importing, exporting, moving interstate, mailing, shipping, and releasing into the environment) of plant pests without specific regulatory permission under general or specific permits unless APHIS determines that no permit is necessary. Section 7712 of the PPA covers noxious weeds, plants, plant products, and biological control organisms and provides APHIS with the authority to prohibit or restrict their movement. Section 7712(f)(1) specifically allows APHIS to publish, by regulation, a list of noxious weeds that are prohibited or restricted from entering the United States or subject to restrictions on interstate movement.

Pursuant to these different PPA authorities, APHIS has promulgated specific and distinct regulations for plant pests and noxious weeds. While there are numerous APHIS regulations concerning the importation or interstate movement of plant pests and/or articles that can transmit or carry plant pests, 7 CFR 340 specifically concerns only those GE organisms that are plant pests or for which there is reason to believe that those GE organisms are or may be plant pests. APHIS' regulation of GE organisms under 7 CFR 340 derives from section 7711 of the PPA. APHIS does not regulate noxious weeds pursuant to the plant pest regulations including 7 CFR

340; rather, APHIS regulates noxious weeds under separate regulations, namely 7 CFR 360. APHIS' authority to regulate noxious weeds under 7 CFR 360 derives from section 7112(f) of the PPA. In accordance with those part 360 regulations, a party may petition APHIS to designate a plant or plant product as a noxious weed.

Pursuant to 7 CFR 340, a petition for nonregulated status for RRSB was submitted to APHIS, and the developer of RRSB based its petition for nonregulated status on the claim that RRSB does not pose a plant pest risk. Therefore, APHIS must evaluate RRSB and determine whether it should be granted nonregulated status based on its potential plant pest risk. APHIS conducts a thorough plant pest risk assessment (PPRA) in order to make its scientific and regulatory determination on whether or not RRSB poses a plant pest risk. APHIS does not need to evaluate whether or not RRSB is a noxious weed because part 340 does not evaluate a GE organism based on whether or not it poses a noxious weed risk; the part 340 regulations only require APHIS to evaluate a GE organism solely based on its potential to pose a plant pest risk. It is very important to note that APHIS' long history and experience of regulating noxious weeds has never considered any typical agricultural crop—whether conventional, organic, or GE—to be a weed, much less a noxious weed. Thus, APHIS would not consider H7-1 sugar beet a weed, much less a noxious weed. Moreover, APHIS is fully aware of the fact that neither RRSB nor any other GE or non-GE cultivar of sugar beet, nor any other GE crop that APHIS has regulated or deregulated, has ever been included on APHIS' regulatory list of noxious weeds in part 360. Additionally, no one has ever petitioned APHIS to include RRSB or any other GE or non-GE cultivar of sugar beet on the noxious weed list.

As APHIS described in its proposed rule for the revision of 7 CFR 340 "federally listed noxious weeds are plants that are likely to be aggressively invasive, have significant negative impacts, and are extremely difficult to manage or control once established" (USDA-APHIS, 2008). Clearly, H7-1 sugar beet has none of these characteristics. Contrary to the commenter's assertion that APHIS must regulate H7-1 sugar beet under the noxious weed provisions of the PPA because it will promote the rapid evolution and spread of noxious weeds tolerant of or resistant to glyphosate herbicide, it should be noted that herbicides have been widely used on crops for over 70 years, herbicide-resistant weeds have been selected over this entire period, and the agency has never interpreted its noxious weed authority to cover herbicide use on crops. Furthermore, in considering what constitutes a noxious weed, APHIS has never designated a weed a noxious weed solely because it is GR (or resistant to any other herbicide).

Regarding the commenter's assertion that APHIS needs to make clear that its part 340 regulations should include the agency's noxious weed authority, APHIS wants to emphasize that as of now it has not made a final decision on whether or not it will in fact use its PPA noxious weed authority to regulate GE organisms that are regulated currently only in regards to a plant pest risk under part 340.

Comment: Although NEPA does not mandate any particular results, its main purpose is to foster informed decision-making by agencies. See 42 USC 4321; 40 CFR 1501.1(c). Here, the decision to deregulate RRSB has already been determined. APHIS has concluded, based on its 10-page PPRA, that it must deregulate RRSB. APHIS has the process backwards: the NEPA process is meant to inform agency action, not create paperwork after a decision is made. APHIS cannot use the already finished PPRA to short-circuit and prejudge the NEPA analysis.

Response: APHIS disagrees with this comment because it has not in any manner short-circuited or prejudged its NEPA analysis for the petition for nonregulated status for H7-1 sugar beet. Pursuant to 7 CFR 340, a petition for nonregulated status for H7-1 sugar beet was submitted to APHIS, and the developer of H7-1 sugar beet based its petition on the claim that this sugar beet does not pose a plant pest risk. Thus, once the petition was submitted, APHIS is required to evaluate the petition; however, clearly APHIS has not yet made its full and final determination regarding the submitted petition. APHIS must scientifically evaluate H7-1 sugar beet to determine whether it poses a plant pest risk before the agency can make a final regulatory decision regarding whether or not it is appropriate that H7-1 sugar beet has nonregulated status.

In evaluating whether or not RRSB poses a plant pest risk, the scientific analyses in the PPRA provides APHIS with information about the biological aspects and characteristics of H7-1 sugar beet. While APHIS' part 340 regulations require the agency to conduct a PPRA in order to have a sound scientific analysis of whether or not H7-1 sugar beet poses a plant pest risk, the scientific analyses in the PPRA do not in any manner short-circuit or prejudge APHIS' analysis under NEPA regarding potential environmental impacts that may result from the reasonable alternatives for making a determination on the petition for nonregulated status that were fully evaluated and analyzed in the DEIS and FEIS.

Accordingly, both types of analyses and data (the regulatory PPRA plant pest risk analyses and the potential environmental impact analyses in the DEIS and FEIS) are and must be prepared to inform the APHIS decisionmaker in order to reach a full and final determination regarding the submitted petition. The PPRA is the scientific plant pest risk assessment and evaluation that will be used in order to make APHIS' ultimate and final regulatory decision on whether or not H7-1 sugar beet poses a plant pest risk. The DEIS and the FEIS are the environmental analyses on the reasonable and viable alternatives for APHIS' ultimate and final regulatory decision on the petition. The ROD constitutes the Agency's decision on the FEIS. The PPRA, DEIS, and FEIS have their own specific and distinct purposes, goals, topics and scope. None of them undermine or prejudice the others. Rather, all of them are necessary and required in order to properly inform and provide the APHIS decisionmaker (as well as the public) with the required regulatory, scientific, and environmental analyses and information needed to make a final determination on the petition for nonregulated status. The APHIS decisionmaker cannot make the final determination on the petition for nonregulated status of RRSB until after he has reviewed, evaluated, and considered all of the information, analyses, and conclusions presented by the PPRA, DEIS, and FEIS.

The final regulatory decision on the petition is issued by the APHIS decisionmaker in the form of the agency's determination of the appropriate regulatory status of H7-1 sugar beet, as requested by the submitted petition for full deregulation of it. Thus, the APHIS decisionmaker has to make the final regulatory determination either that H7-1 sugar beet has to continue to be regulated under part 340 or that H7-1 sugar beet should have full nonregulated status and no longer be subject to the regulatory requirements of part 340 or the PPA.

III Alternatives

Comment: In conducting this assessment, weed susceptibility to glyphosate should be regarded as the resource to be conserved. If glyphosate offers the benefits claimed for it by APHIS, and conventional sugar beet herbicides are as toxic as APHIS says, then loss of glyphosate's benefits is contrary to the interests of agriculture, while conserving them fosters those interests. The EPA has taken a similar approach to that recommended here with the insect-resistant Bt crops under its jurisdiction. EPA regards Bt toxins as less toxic than chemical insecticides, and therefore regulates to preserve their efficacy and forestall the increased use of chemical insecticides that would be entailed by evolution of Bt resistance in insects. The longer-term environmental benefit of conserving insect susceptibility to Bt toxins is "paid" for by modest restraints on the use of Bt crops in the short-term, via mandated "refuge" of non-Bt crops that forestall insect pest resistance to Bt toxins. APHIS should formulate an alternative that similarly places reasonable restraints on RRSB cultivation.

Resistance is not, as APHIS has it, an inevitability – an "unavoidable impact." To the extent that it is likely in APHIS's three alternatives, this merely underscores the need for APHIS to formulate another alternative with conditions designed to prevent weed resistance.

Response: The proposed alternative does not meet the purpose and need as defined in the FEIS. In accordance with 7 CFR 340, APHIS is and must make a regulatory decision on a petition for nonregulated status based on the plant pest risk, if any, associated with the regulated article for which the petition is requesting nonregulated status. Maintaining the long-term efficacy of glyphosate or any other herbicide is both outside the scope of the FEIS and outside the legal jurisdiction of APHIS. The U.S. Environmental Protection Agency (EPA) regulates the use of pesticides and specifically defines the amounts of each pesticide that can be applied to sugar beet and other crops during the growing season. In addition, it should be noted that herbicide resistance is often a dominant trait, so maintaining a refuge would not achieve the desired result. APHIS discusses agricultural practices that can contribute to resistance management in the FEIS (see sec. IV.C.3).

Comment: As explained above, the DEIS fails to meaningfully consider any alternative other than the Preferred Alternative because the decision is predetermined: in the agency's (erroneous) view, the plant pest assessment for RRSB precludes any action other than full deregulation; thus any other alternative is illusory rather than meaningful. However, APHIS must meaningfully consider the "no action" alternative, as well as all reasonable alternatives.

Response: APHIS disagrees with this comment because the agency has meaningfully included and considered the "no action" and all other reasonable, viable alternatives in the DEIS and FEIS; appropriately defined the "purpose and need" of the DEIS and FEIS; and correctly explained to the public APHIS' regulatory options as determined by applicable statutory and regulatory authorities. The commenter fails to understand that the DEIS and FEIS are used to evaluate the potential environmental impacts resulting from the reasonable and appropriate regulatory options that APHIS has to respond to in order to make a determination regarding the submitted petition requesting full deregulation of H7-1 sugar beet. APHIS' regulatory options to make a determination on the submitted petition for nonregulated status for H7-1 sugar beet are

limited, and our NEPA analysis and evaluation do not expand our statutory and regulatory authorities to regulate H7-1 sugar beet. Thus, APHIS prepares its NEPA analyses and evaluations to inform the agency's decisionmaker of the potential environmental impacts resulting from the reasonable and appropriate regulatory options available to the agency to respond to the petition for nonregulated status for H7-1 sugar beet. However, such NEPA analyses and evaluations do not add or subtract from the part 340 regulations and the PPA authorities that APHIS must use to make a final determination on the petition for nonregulated status.

One of NEPA's primary purposes includes informing the agency's decisionmaker and the public. APHIS' DEIS and FEIS for the H7-1 sugar beet petition carefully consider and provide a full and fair discussion of the potential environmental impacts that may result from the reasonable alternatives, which will inform APHIS' final determination regarding the petition for nonregulated status. Namely, APHIS must make a scientific determination on whether or not H7-1 sugar beet poses a plant pest risk before the agency can make its final regulatory decision regarding whether it should or should not designate H7-1 as having nonregulated status. APHIS must prepare a PPRA in order to determine H7-1 sugar beet's potential plant risk, but the PPRA by itself is not the agency's final determination regarding the regulatory status of H7-1 sugar beet. The PPRA is absolutely necessary and required to inform the APHIS decisionmaker of the potential, if any, that H7-1 sugar beet has for posing a plant pest risk and of what regulatory determination is appropriate for the request for nonregulated status.

At the same time, as part of APHIS' process to make a final determination on the petition for nonregulated status, APHIS must prepare the appropriate NEPA analyses and evaluation. Thus, APHIS' NEPA review process—like every other Federal agency's—is integrated with its decisionmaking process related to the proposed action (in this case, APHIS' regulatory determination of whether or not H7-1 sugar beet should have nonregulated status pursuant to the requirements of part 340).

For the NEPA environmental analyses and evaluations that APHIS provided in the DEIS and FEIS, the agency determined the reasonable and viable alternatives that were appropriate to be analyzed in order to make its regulatory determination on whether or not H7-1 sugar beet should have nonregulated status. As with any NEPA analysis, APHIS considered many different factors—including environmental, aesthetic, socioeconomic, technical, and other factors as well as the agency's legal ability to fulfill its statutory mission and responsibilities—to determine the reasonable and viable alternatives. In an effort to be transparent to the public, APHIS has identified and explained in many of its responses to different comments what its regulatory authorities are, their limitations, and how its statutory and regulatory authorities would and could be carried out under the DEIS' and FEIS' alternatives.

APHIS fully understands its NEPA responsibilities. The environmental analyses APHIS has prepared and provided in its DEIS and FEIS thoroughly analyze the potential environmental impacts that are likely to result from the reasonable alternatives considered for its regulatory determination. APHIS' regulatory and scientific analyses—and ultimately its final determination—of the RRSB petition are specifically and legally pursuant to the PPA and part 340, and thus are limited by APHIS' statutory authorities and jurisdiction.

The PPA and the NEPA are separate Federal statutes with different legal obligations and responsibilities, and each has its own specific purposes and goals. Pursuant to part 340, APHIS must determine whether RRSB is or is not likely to pose a plant pest risk. Once APHIS has completed both its PPRA and its NEPA analyses with its respective decision, the agency can and must make a final regulatory decision on the RRSB petition for nonregulated status.

Comment: The DEIS acknowledges in several places that the environmental risks of RRSB are more acute in certain regions than in others. For example, risks stemming from the presence of feral beet populations—including, but not limited to, transmission of the H7-1 trait to wild beets from RRSB bolter pollen—are higher in California's Imperial Valley than elsewhere. Also, in light of the known contamination incidents in the Willamette Valley—where most sugar beet seed production occurs and where RRSB and other *Beta* crop growers are in close proximity—it would be reasonable to consider a deregulation alternative that placed geographical restrictions on RRSB planting. Such an alternative could otherwise resemble APHIS's Preferred Alternative (i.e., complete deregulation). However, such an alternative is not mentioned anywhere in the DEIS, much less rigorously analyzed.

Response: Alternative 3 is similar to the alternative described by the commenter because Alternative 3 proposes to impose geographic restrictions on RRSB planting.

Comment: There are other alternatives the agency should consider to limit the likelihood of contamination. For instance, the DEIS fails to consider, much less rigorously analyze, any alternative that would require use of RRSB seed crop pollinators not carrying the H7-1 transgene (i.e., "male sterile" technology). Consideration of this alternative is reasonable in light of APHIS's previous admission that it would reduce the risk of contamination. Nor does the DEIS consider a partial deregulation alternative with any isolation distances other than the 4-miles already in use by industry. Although the effectiveness of a 4-mile isolation distance is at best controversial (and contradicted by the evidence discussed *infra*), the DEIS fails to consider requiring any other isolation distance.

Response: APHIS disagrees with the commenter's suggestion that a 4-mile isolation distance is ineffective. APHIS chose the 4-mile isolation distance based on its demonstrated ability to meet market standards. Distances greater than 4 miles would decrease the number of people that could grow any type of *Beta* seed crop in an area without creating greater protections for growers, as there is no evidence that greater isolation distances would decrease the extremely rare cross-pollination events that may occur under current conditions. APHIS did not consider an alternative that only allowed male-sterile plants because breeding scenarios typically require some male fertile plants to carry the trait during the multigenerational breeding programs needed to create new varieties. Therefore, this restriction is not practical or realistic, and such an alternative would not be a viable, appropriate alternative to consider in the EIS. In addition, APHIS has not found any plant pest risk associated with the natural process of cross-pollination between H7-1 sugar beet plants and other varieties, so restricting breeding programs by prohibiting male fertile lines from carrying the GE trait and possibly even delaying the development of improved or disease-resistant lines would be imposing a mandatory regulatory requirement even though APHIS finds no potential whatsoever for any plant pest risk.

Comment: Nor does the DEIS consider an alternative that would require monitoring of commercial RRSB production, but otherwise resembled the Preferred Alternative. Such

an alternative would be reasonable given the paucity of data regarding transgenic contamination incidents and the myriad disincentives to reporting contamination incidents (including, but not limited to, retaliation by state/local authorities and harassment of the type documented in *Monsanto vs. U.S. Farmers*).

Response: At no time and under no circumstances does APHIS have any regulatory or statutory authority to impose monitoring and testing on growers of non-GE vegetable beet in order to determine if they have cross-pollinated with H7-1 sugar beet. Growers can and may choose their production methods based on their tolerance of off-types. APHIS did not identify any plant pest risks associated with cross-pollination between H7-1 sugar beet and other *Beta* varieties. If individuals growing non-GE *Beta* varieties are concerned about the amount of cross-pollination taking place with H7-1 sugar beet, they are free to take steps to ensure prevention of any cross-pollination. For example, they can use longer isolation distances between their crops and H7-1 sugar beet crops and/or to test for any potential cross-pollination. However, APHIS has no legal authority to impose any regulatory requirements on any grower of any type of crop, whether GE or non-GE, when there is no plant pest risk associated with cross-pollination resulting from the growing of the crop. Cross-pollination is a natural process, and the biological and physiological aspects of that process do not in themselves create or establish any plant pest risk. Moreover, there are extensive data and well-established methods for limiting and reducing the potential for any cross-pollination. Isolation distances utilized by beet seed growers are established based on this information.

Comment: Finally, as noted above, the DEIS fails to consider any alternatives that regulated RRSB pursuant to the agency's broader statutory authority under the PPA.

The unconditional deregulation of RRSB poses significant risks to the quality of the human environment. For example, the significant likelihood of gene flow from RRSB to non-RR sugar beets poses risks to the livelihood of organic and conventional farmers as well as the environment. The potential for APHIS to reduce these significant impacts by adopting one or more of these ignored alternatives must be fully and meaningfully analyzed. APHIS's nominal (and illusory) consideration of *some* alternatives does not satisfy NEPA.

Response: APHIS disagrees with this comment. Once APHIS has determined that H7-1 sugar beet root and seed crops do not pose any plant pest risk, completes its environmental analyses related to its final determination regarding the nonregulated status of H7-1 sugar beet, and makes its final determination that H7-1 sugar beet should have nonregulated status, then the agency does not have any regulatory authority to impose any mandatory requirements on H7-1 sugar beet. Thus, APHIS has no legal authority to impose an alternative on growers of H7-1 sugar beet that would require mandatory regulatory conditions to be met in order to be allowed to grow H7-1 sugar beet. In its DEIS and FEIS, APHIS has thoroughly analyzed the impacts of H7-1 sugar beet on conventional and organic sugar beet growers as well as vegetable beet growers (see secs. IV.D.3 and IV.D.4). In addition, APHIS has fully and meaningfully considered and analyzed the three reasonable and appropriate alternatives in reference to it making a determination of the petition for nonregulated status, including one alternative that does specifically put restrictions on where and under what conditions H7-1sugar beet can be grown. This alternative has geographic restrictions and mandatory isolation distances pursuant to APHIS' regulatory and statutory authorities.

IV Agronomic practices

Comment: Weed control was the most important problem for sugarbeet growers since beets were first grown in Europe and later in the United States. An annual sugarbeet survey conducted for North Dakota and Minnesota showed that weeds were considered as the most important problem from the 70s until 2008 (when Roundup Ready sugarbeet planting became widespread). In 2009 through 2011, weed control was not considered as a major problem. Instead, Rhizoctonia and Aphanomyces root rot were considered as the major problem. Should USDA/APHIS decide on 'Alternative 1', growers will have to contend with managing weeds using conventional herbicides, which are not as effective as glyphosate, use tillage to assist in weed control which will likely lead to more Rhizoctonia root rot (as a result of throwing infected soil into crowns of plants), and the sugarbeet industry will not have the opportunity to utilize genetic engineering to help manage diseases such as Rhizoctonia and Aphanomyces root rot. In addition, timely application of a fungicide such as Quadris (azoxystrobin) for control of Rhizoctonia root rot will be hindered since it cannot be mixed with conventional herbicides and must be applied three or more days prior to or after conventional herbicide application. One grower in Minnesota successfully produced no-tilled Roundup Ready sugar beet in a rocky field that would not have been economically feasible with conventional sugar beet. In Nebraska, many farms with sprinkler irrigation have successfully adopted no-till or reduced tillage using Roundup Ready sugar beet. Reduced tillage will help to conserve wildlife, reduce erosion, and improve the economics of sugar beet production. (APHIS-2010-0047-3259)

Response: APHIS has updated the FEIS to incorporate the information in this comment regarding root rot and its management. The FEIS is consistent with the conclusion that tillage for weed control would be higher under Alternative 1.

Comment: A major thrust of the work of this Committee was to establish isolation maps for the numerous specialty crop species grown in the Willamette and Tualatin River valleys. Large, detailed wall maps were posted at the county offices of Linn and Marion counties where the great majority of these crops were grown. Postings of plantings and intentional plantings followed a long establish procedure agreed to by the fieldmen group and were made twice a year (spring and fall) by certain deadlines. This provided an orderly method of preventing contamination by insect or wind cross pollination.

The Committee also established an arbitration procedure by which disputes could be resolved, if intended plantings, or established plantings were discovered which might have resulted in contamination and if the seed companies involved were not able to resolve the dispute among themselves.

The Committee was also involved in providing educational meetings to their growers about seed production dealing with issues about pollination, weed, insect and disease control, good practices in transportation of seed crops and disposal of seed cleaning waste so as not to create contamination problems. They conducted research to develop pesticide registration for weed control in some crops.

Isolation issues in the production of sugar beets, table beets (red and yellow beets) and various types of chard as well as heirloom cultivars have been worked out over the years. This same protection from genetic contamination has been afforded these small-

acreage crops as is afforded to the predominantly grown large-acreage commercial crops. Production of organic chard or organic table beets (or any other seed crop for the organic crop market) can similarly be easily resolved among willing cooperators, so long as the historically established field isolation mapping procedures are adhered to. The Willamette Valley is a large production area and can easily accommodate various types of production.

Seed companies in the Willamette Valley are proud of the quality of specialty seeds being produced and have even published a pamphlet advertising the attributes of the Willamette Valley and its producers as a quality seed production area. As a result a number of European and Japanese seed companies produce specialty seed in the Willamette Valley through local seed companies.

Genetically modified Roundup Ready sugar beets have been produced without problems since they were cleared for production by the U.S. Department of Agriculture in 2005. To my knowledge, there have been no known incidents of contamination of conventional table beets or chard, nor organically produced table beets or chard or other crops for the organic specialty crop market. There is no reason to believe this would change, provided producers of these crops work cooperatively in the future and maintain the Willamette Valley as a unique and quality seed production area. (APHIS-2010-0047-3217)

Response: APHIS acknowledges your comment regarding the role of the WVSSA Fieldman Committee. While the description does not change the analysis presented in the FEIS, it does provide information about the role of this committee in an area that grows a diverse variety of seeds.

Comment: If roundup had not been available for weed control for the 2011 crop I would have lost 30% of my production due to weeds. Because of wet conditions my crop was planted late and the application of conventional herbicides would not have been able to have taken place in the window of time that they need to be applied. My crop was only 2/3 of my 10 year average with the use of roundup, but 30% of my acerage would not of been harvestable without roundup. (APHIS-2010-0047-3709)

Response: APHIS understands based on public comment that many sugar beet growers value access to H7-1 sugar beet and feel that it is an important part of their sugar beet operations. The comment is consistent with the analysis in the FEIS.

Comment: Simply put, compared to conventional sugarbeets, RRSB are better for the environment, public, and farmer.

I have experienced these benefits first hand. Weeds are the most difficult factor in producing a viable sugarbeet crop in our region. In Amalgamated's region and on my own growing acres, we have to irrigate. Irrigation exacerbates weed problems because weed seeds are always getting reintroduced through irrigation. Prior to using RRSB, I had a labor intensive herbicide regimen that required using a number of more toxic herbicides. Before planting, my farm would spray with either RoNeet or Nortron. Before the sugarbeets emerged, I would spray Roundup. After the sugarbeet crop emerged, I sprayed Betamix once and a mix of Progress, UpBeet, Stinger, and grass herbicide up to four times thereafter. Manual hand labor, which became increasingly scarce and very expensive, was then needed to remove any remaining weeds. In contrast, with RRSB, I spray the fields twice and obtain near-complete weed control.

RRSB provides my farm with other benefits. Unlike conventional seed, RRSB growth is not stunted by its herbicidal regimen, and my other crops suffer less damage. I obtain better yields, quality, and storage in the pile with RRSB. I till my fields less, which saves labor and time. I run machines less, leading to less wear and tear, uses less natural resources, and generates fewer emissions. (APHIS-2010-0047-3874)

Response: APHIS understands based on public comment that many sugar beet growers value access to H7-1 sugar beet and feel that it is an important part of their sugar beet operations. The comment is consistent with the analysis in the FEIS.

Comment: Herbicide application under a conventional chemical regimen was a managerial balancing act. Too heavy of a chemical rate damaged beets and cut into yields incredibly, but to light of a rate didn't get the weeds killed. On the average acre we would come in with a pre-plant herbicide like Nortron during bedding. Then once the beets emerged we would hit them with a tank mix of Betamix and Upbeet, followed five days later with a tank mix of Betamix, Upbeet, and Stinger, followed by a spraying of Select a week later for grasses, and then we would cultivate them twice and, if it was flood irrigated, we would have to re-make the corrugations. If they were under sprinkler irrigation we would chemigate on some Outlook (Pre-emergence broadleaf herbicide) to get us to canopy closure where the beets could try to shade out the late germinating weeds. Now the hand labor would come in and try to keep us clean enough to allow for a fairly clean harvest. It was an incredible amount of work, money, fuel, and chemical to get only marginal weed control. It was the highest hurdle of the sugar beet race.With Roundup Ready Sugarbeets we have and effective affordable method to broadcast spray for weeds. Equally important, now we can Strip-Till. (APHIS-2010-0047-4233)

Response: APHIS understands based on public comment that many sugar beet growers value access to H7-1 sugar beet and feel that it is an important part of their sugar beet operations. The comment is consistent with the analysis in the FEIS.

Comment: This past year we planted both conventional sugar beets and roundup ready sugar beets. The conventional beets were sprayed 5 times with a total of 220 oz of chemical per acre and the roundup ready beets were sprayed 2 times with a total of 44 oz of chemical per acre. The conventional beets had 176 more oz of chemical per acre applied, and some of the chemicals have very long soil residual. Some of the conventional chemicals actually stay in the soil for more than a year. With the extra chemical you also have the 3 extra trips across the field which means spending more time and using more fuel. If we are trying to be more efficient and farm cleaner more trips across the field is not the way to do that.

The conventional fields also had weeds left to go to seed which means that we will have to use more chemicals in next years crop to control the new weeds.

The yield on the conventional beets was about 4 tons per acre less and over 1% less sugar content. The total sugar per acre was 1731 pounds less. This means that we need more acres of conventional beets to produce the same amount of sugar and more conventional acres means even more chemicals used. (APHIS-2010-0047-4426)

Response: APHIS understands based on public comment that many sugar beet growers value access to H7-1 sugar beet and feel that it is an important part of their sugar beet operations. The comment is consistent with the analysis in the FEIS.

Comment: The Willamette Valley is world renowned for high quality, consistent production of many seed crops. The purity of these crops is guaranteed by the Oregon State University Certification system. We have to adhere to standards of crop rotation, isolation distances and weed tolerances. This is common practice for seed growers in the Willamette Valley. For crops not covered by the system, there is a stringent protocol in place for how to decide which crops can be grown where. This protocol has worked well for a number of years resulting in uncontaminated seed crops of similar types and species being produced within this one geographic area. We follow guidelines of isolation distances, rotation schedules, cultivation practices, and herbicide use - all for the specific purpose of avoiding cross contamination.

This is especially true for sugar beet seed. In many ways much of our cropping rotation revolves around the placement of this crop. We plan four to five years out in order to have fields available that meet isolation requirements as well as crop history and herbicide history. During the growing season we are careful not to accidentally transfer any pollen or mature seeds out of the field. At harvest time we have to load our seed into boxes withing the field boundary. Again, not to let any viable seeds escape. The whole load is throughly tarped before transport. After harvest the seeds that have spilled on the ground are allowed to sprout and then killed before a new crop is planted. We do not plow under any viable seeds which could then sprout later on. The fields are scouted for a few years after beets have been produced to make sure no volunteer plants appear, and if so, they are removed.

Meeting these requirements is not easy, but the rewards for doing so make it well worth the effort. Sugar beet seed will often be our highest returning crop and in many cases worth twice as much as wheat, corn or grass seed. It is a very unique crop in that the value of it remains consistent regardless of the follies of Wall Street or the fluctuations of the grain market. Beet seed remains a stable, high value crop and its husbandry and harvest is done with minimal additional equipment over and above what a typical seed producer would have on hand. It is also a great rotation for grass seed, allowing us a chance to control unwanted grass weeds by moving to a broadleaf crop. (APHIS-2010-0047-3485)

Response: Thank you for explaining production practices used on your farm. The comment is consistent with the analysis in the FEIS.

Comment: There is little likelihood of gene drift if the crop is grown within some parameters such as bolter control. There is no other effective method of controlling one specific weed which is wild beets (beta macrocarpa). Wild beet (beta macrocarpa) is a prolific seed producer with a very long term of viability. Imperial Valley soils vary from sandy loam to heavy clay. The following methods of weed control have been found to be ineffective or economically unfeasible. Hand weeding at the stage of growth when this needs to be done the wild beets are very hard to discern from sugarbeets. When the wild beets are large enough to differentiate from sugarbeets, most of the damage has already occurred and removal is physically and economically unfeasible because of the biomass that has been generated. Crop rotation requires too long for rotation to any crop produced

her to have any effect. The viability of wild beet seed is in the realm of 15 years or more. Other available herbicides are not effective. Cultivation will only remove the wild beets in the furrow. (APHIS-2010-0047-4009)

Response: APHIS understands based on public comment that many sugar beet growers value access to H7-1 sugar beet and feel that it is an important part of their sugar beet operations. The comment is consistent with the analysis in the FEIS. APHIS analyzed the effects of the use of H7-1 sugar beet in the Imperial Valley of California.

Comment: The DEIS's discussion of transgenic contamination fails to consider several important factors that APHIS has been confronted with time and again. Additionally, the DEIS lacks any meaningful discussion of the consequences of transgenic contamination.

Contamination Is Likely

The DEIS fails to objectively evaluate the likelihood of environmental and intertwined economic harm from transgenic contamination, as Congress intended and as NEPA mandates. As comments to this docket will show, transgenic contamination is likely and will happen by a variety of means if APHIS deregulates RRSB. Transgenic contamination occurs through a variety of pathways. Pollination of non-genetically engineered plants by genetically engineered plants, mixing of genetically engineered seed with non-genetically engineered seed, improper seed cleaning or equipment cleaning, weather events, and human error all lead to transgenic contamination.

As noted above, APHIS's analysis of gene flow and contamination ignores *Sugar Beets I* and *II* evidence documenting extensive contamination in the Willamette Valley at distances far greater than 4 miles. This evidence demonstrates, *inter alia*, that not only is contamination through gene transfer possible, but that within three years of RRSB commercialization, contamination had begun. The DEIS's omission of any discussion of this vital evidence from *Sugar Beets I* and *II* renders APHIS's conclusions about gene flow and transgenic contamination arbitrary and capricious.

Response: APHIS disagrees with this comment. APHIS extensively analyzed cross-pollination and concluded that while gene flow could occur, overall levels would be below the level of detection for sensitive DNA-based assays. APHIS does not agree that the presence of the H7-1 trait in vegetable beet seed above these levels is likely. This analysis is based on the best scientific studies, modeling, and a history of the production of physically distinct *Beta* seed crops whose hybrid off-types would be visually distinguishable should they occur. APHIS thoroughly reviewed the evidence from the Sugar Beets I and II litigation and disagrees that there is evidence that documents extensive cross-pollination at distances far greater than 4 miles. APHIS disagrees with the commenter's interpretation of an anecdotal observation that runs counter to a bevy of controlled scientific studies and modeling predictions. Mechanical mixing between sugar beet and vegetable seed production is unlikely because no farms grow the same seed crop in the same year and harvesting and cleaning equipment are not shared between vegetable beet seed and sugar beet seed producers (see sec. III.B.1.b.(11)). Vegetable beet and sugar beet seed are also not cleaned and processed in the same facilities. In addition, APHIS considered the economic consequences of cross-pollination should detectable levels occur (see sec. IV.D.3-4).

Comment: Several recent reports further call into question APHIS's conclusion that transgenic contamination is "not expected." For example, a 2008 Government

Accountability Office (GAO) study analyzed several major transgenic contamination incidents from the past decade, noting the billions of dollars in economic damages associated with them. After reviewing both APHIS's and the industry's capacity for oversight, the GAO concluded that "the ease with which genetic material from crops can be spread makes future releases likely." In the Union of Concerned Scientist ("UCS") report, "Gone to Seed," UCS found that about 50% or more of the certified non-GE corn, canola, and soybean seed has been contaminated with transgenes. The level of contamination was typically 0.05%-1.0%, far greater than the minimum levels that can be detected. "Gone to Seed" demonstrated the frequency and levels of contamination of soybean seed was found to be about as high as for corn. Soybeans are largely self-pollinating (do not pollinate other soybean flowers very often), while corn is highly out-crossing. Therefore, the contamination of soybean seed is likely to be largely from causes other than cross-pollination. Such causes could include seed mixing or human error, and suggests that these sources may be at least as important as cross-pollination.

Another report, "A Growing Concern: Protecting the Food Supply in an Era of Pharmaceutical and Industrial Crops," Union of Concerned Scientists (UCS) analyzed whether GE pharmaceutical-producing crops could be kept out of food. This report demonstrates how difficult this is, even for pharmaceutical crops that would be grown on small acreage and under stringent confinement, to avoid contaminating food. The authors of this report examined confinement methods, such as field separation, cleaning of farm equipment, segregation of seed, and others, and found that it would still be difficult to ensure the absence of contamination. The experts felt that contamination might be prevented by taking heroic means, such as geographical isolation from food crops. UCS concluded that even though it may be theoretically possible to prevent or mitigate contamination, it would not be economically feasible.

The DEIS does not address concerns articulated in these materials or explained why they should not alter the agency's conclusions.

Response: APHIS disagrees with this comment. APHIS is well aware of these documents and their conclusions. These reports are not relevant because they deal with crops grown for grain and not crops such as sugar beet and vegetable beet, which are harvested prior to flowering. When a crop flowers, there is an opportunity for neighboring crops to cross-pollinate with each other. In contrast, vegetable beet and sugar beet crops do not flower unless grown for seed, so no gene flow can occur between neighboring crops on the vast majority of acreage (more than 99 percent) used to produce these crops. Furthermore, in the case of the grain crops mentioned above, there is a GE-sensitive market for each crop. However, there is not a GE-sensitive market for sugar beet. No organic sugar beet industry exists in the United States. Moreover, the small amount of conventional sugar beet that is produced is not identity-preserved from GE sugar beet. The stakeholders concerned about cross-pollination to H7-1 sugar beet are those producing vegetable beet seed, which is a visually distinct crop from sugar beet. This fact is significant because in the case of the crops studied in the GAO report or Union of Concerned Scientists reports, unwanted cross-pollination or commingling of seed is often not visually apparent. In contrast, hybrids between sugar beet and vegetable beet are easily detected after the crop is grown. The transgene can be removed from the crop through culling of the hybrid off-types. Furthermore, hybrids between different beet crops are unwanted regardless of their GE status, so seed producers take "heroic measures" as a matter of course. They normally use large isolation

distances to minimize detectable cross-pollination between different seed crops because all parties are harmed when their seed contains hybrid off-types. "Heroic measures" are feasible because the total vegetable beet seed and sugar beet produced in the United States is less than 1,000 and 5,000 acres, respectively, while corn production is 90 million acres, and soybean production is 75 million acres. It is much simpler to find 4-mile isolation distances between farms totaling 1,000 acres than between farms totaling 100 million acres. These points are discussed in much greater detail in the FEIS (see secs. IV.D.3, IV.D.4, and IV.B.5).

V Biological

Comment: APHIS asserts that none of the herbicides considered in the impact assessment have acute or chronic toxicity effects on mammals, birds, reptiles, fish, amphibians, or invertebrates at application rates used in H1-7 sugar beet production. However, glyphosate has been observed to have synergistic mortality effects on aquatic species at levels well below environmental exposure limits created by the EPA and other agencies (citing (Kelly *et al.*, 2010). Continuous exposure to a toxin over an extended period of time, often measured in months or years, can cause irreversible effects. Glyphosate has been shown to trigger early development and cause congenital malformations in frog and chicken embryos at sub-lethal doses.

Furthermore, studies have shown glyphosate to be a mammalian endocrine disruptor, which may be toxic to human placental cells, and induce reproductive problems at doses below agricultural dilutions. Of further concern are recent studies that indicate "inert" ingredients in Roundup, such as polyethoxylated tallow amine (POEA), have been shown to significantly increase the toxicity of glyphosate formulations for both acute and chronic exposure. In evaluating the potential effects of H1-7 deregulation, APHIS needs to consider the likely health consequences of increased glyphosate use, on animals and humans likely to be affected by exposure.

Response: EPA, not APHIS, regulates the use of glyphosate and has the legal authority to control the use of glyphosate. Since glyphosate registration and use is under EPA's legal jurisdiction and control, EPA obviously has the expertise and experience in analyzing and evaluating the likely health consequences of increased glyphosate use. APHIS has relied on EPA's analyses and evaluations of glyphosate use in its DEIS and FEIS evaluating the potential effects resulting from its regulatory decision on the petition for the deregulation of H7-1 sugar beet. Accordingly, the potential environmental effects resulting from the considered alternatives for APHIS' regulatory decision on the petition for nonregulated status is the focus of its FEIS. As APHIS describes in section V, glyphosate use has been increasing over the last two decades, and its regulatory decision on the petition (whether it determines H7-1 sugar beet should or should not have nonregulated status) will not materially change that trend. APHIS examines the effects of changes in herbicide use under the three alternatives on human health in section IV.F. Endocrine disrupters are discussed in section II.C.1. In addition, APHIS has expanded the discussion on amphibians in section IV.C.1. The paper referred to by the commenter above (Kelly *et al.*, 2010) is irrelevant because it discusses fish, which reside in aquatic habitats that have glyphosate measurements that are so diluted that effects are negligible. APHIS discusses in the FEIS similar synergistic effects on amphibians as these organisms are more likely to inhabit shallow surface waters that could potentially have measurable levels of herbicide above an effects threshold. The commenter warns that continuous exposure to a toxin over an extended period of time can cause irreversible effects. While this may be true, glyphosate is not a toxin that organisms are likely to be exposed to over months or years. As described in the DEIS and FEIS, glyphosate has a short half-life in the environment. It either rapidly metabolizes or is sequestered by tightly binding to soil, which is why even sensitive crops can be planted within days of spraying fields with glyphosate. APHIS disagrees with the assertion that glyphosate has been shown to be an endocrine disrupter. As described in the DEIS and FEIS, EPA has initiated an Endocrine Disruptor Screening program to investigate whether chemicals released into the environment are endocrine disruptors. Assays are still being developed to make this

determination. As this program has not advanced to the point of categorizing chemicals as endocrine disruptors, it is premature to draw a conclusion that glyphosate is indeed an endocrine disruptor. APHIS discusses the toxicity of inert ingredients in the FEIS.

Comment: APHIS has failed to properly analyze the environmental impacts of transgenic contamination, including the super weeds epidemic.

In preparing an EIS, an agency must take a "hard look" at the impacts of the proposed agency action so that the agency may "make decisions that are based on understanding of environmental consequences." The EIS must also include a full and fair discussion of the proposed action's effects and their significance. Relevant effects may be "ecological aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative." H7-1 sugar beets will genetically contaminate other crops and cause significant environmental impact. The DEIS understates the potential for transgenic contamination from H7-1 sugar beets and inaccurately states that this will not be a significant harm.

Response: APHIS disagrees with this comment. Throughout the FEIS, APHIS "took a hard look" by extensively analyzing the potential for cross-pollination between sugar, vegetable, and wild beets and the direct, indirect, and cumulative impacts of cross-pollination between these species. APHIS also describes the cultural and biological factors that influence the potential for cross-pollination.

Comment: The Weed Science Society of America, North Central Weed Science Society, and the Western Society of Weed Science commented: One specific edit- please delete the following sentence (bottom pg. 241, top of pg. 242): "*Two options for resistance management are: (1) use the desired herbicide until resistance occurs and then change to an alternative; and (2) rotate control methods to delay the on-set of resistance*." This statement appears out of context and we are strongly opposed to the first option. (APHIS-2010-0047-4530)

Response: APHIS has removed the first option from the discussion of management options to mitigate weed resistance.

Comment: The Weed Science Society of America, North Central Weed Science Society, and the Western Society of Weed Science commented: Mitigating the evolution of herbicide resistance depends on reducing selection through diversification of weed control techniques; minimizing spread of resistance genes and genotypes via pollen or propagule dispersal; and eliminating additions of weed seed to the soil seedbank. Effective deployment of such a multi-faceted approach will require shifting from the current concept of basing weed management on single-year economic thresholds.

Herbicide resistance management programs must consider utilization of all cultural, mechanical, and herbicide options available for effective weed control in each situation and employ the following best management practices (BMPs):

1. Understand the biology of the weeds present.

2. Use a diversified approach to weed management focused on preventing weed seed production and reducing the number of weed seeds in the soil seedbank.

3. Plant into weed-free fields and then keep fields as weed free as possible.

4. Plant weed-free crop seed.

5. Scout fields routinely.

6. Use multiple herbicide mechanisms of action that are effective against the most troublesome or herbicide-resistance-prone weeds.

7. Apply the labeled herbicide rate at recommended weed sizes.

8. Emphasize cultural practices that suppress weeds by utilizing crop competitiveness.

9. Use mechanical and biological management practices where appropriate.

10. Prevent field-to-field and within-field movement of weed seed or vegetative propagules.

11. Manage weed seed at harvest and post-harvest to prevent a buildup of the weed seedbank.

12. Prevent an influx of weeds into the field by managing field borders.

The long-term economic benefits of avoiding additional costs associated with managing herbicide resistant weeds are clear. Nevertheless, widespread adoption of these BMPs must overcome several real barriers, in particular growers' focus on immediate economic returns, which when combined with the belief that evolution of herbicide resistance in weeds is unavoidable and that continued availability of novel herbicide technologies will solve the problem.

While many U.S. soybean, corn, and cotton growers employ at least some BMPs, a significant proportion of growers are not practicing adequate proactive herbicide resistance management. Two key recommendations in particular must be more widely implemented: diversifying weed management practices and using multiple herbicide mechanisms of action. Sugar beet growers need to be educated about mechanisms of action and made aware that discovery of new herbicide chemistries is rare, that the existing herbicide resource is exhaustible, and that indiscriminate herbicide use leading to rapid evolution of herbicide resistant weeds may result in the loss of herbicide options for all. (APHIS-2010-0047-4530)

Response: APHIS has updated the FEIS to include the information in this comment.

Comment: In addition, the microorganisms resulting from "Roundup" leaching into the soil are resistant to most current antibiotics. You are allowing the creation of more MRSA bugs. What will you do when someone you love contracts one of these organisms? Prevent them NOW! I am a former microbiologist. (APHIS-2010-0047-4292)

Response: APHIS disagrees with the comment. There is no credible evidence that glyphosate selects for microorganisms that are resistant to antibiotics. The comment provides no such evidence.

Comment: Let's not put all our beets in one basket! Variety is nature's method of assuring survival of beets to any virus or pest. If only one GE beet existed and succumbed to some virus or pest, it could threaten our food system. Would the desire for profit from a monopoly over the beet market drive some to risk the very survival of our species? (APHIS-2010-0047-4288)

Response: The commenter appears to be implying that the H7-1 sugar beets available to growers are all genetically identical, which is not the case. The H7-1 trait has been bred into

many different varieties of beets that are adapted to various growing regions. Disease pressure, weed pressure, and cultivation practices vary by region. All of these factors influence the success of a beet variety in a region. As such, beet varieties that are successful in one region may not be in others. Each sugar beet cooperative works with sugar beet breeders to test varieties in the targeted region before they are approved for use by growers in the cooperative. Therefore, the adoption of H7-1 sugar beet does not change the likelihood that a single virus would affect sugar production or the Nation's food supply when compared to conventional sugar beet varieties. Sugar beet breeding and variety testing are described in the FEIS.

Furthermore, USDA coordinates a national system of plant germplasm called the National Plant Germplasm System (NPGS). USDA established the NPGS to preserve the genetic diversity of crop plants and encourage its use in research, education, and breeding. The NPGS preserves, multiplies, evaluates, catalogues, and distributes germplasm. At present, the NPGS's germplasm banks effectively safeguard the genetic diversity of thousands of species, including beets and Swiss chard, and distribute these worldwide and free of charge and restriction on use.

USDA maintains a germplasm bank of *Beta* crops at the Western Regional Plant Introduction Station in Pullman, Washington. As of April 29, 2010, the *Beta* collection contained 1,722 accessions of cultivated beet crops, which included table beets, Swiss chard, fodder beets, and sugar beets. Each accession was either a unique cultivar or a plant collected in the wild that is considered genetically unique. There were 83 accessions of cultivated beet that are used as leafy vegetables, 162 accessions that are used as table beets, 105 accessions that are used for fodder, and 714 accessions that are used for sugar extraction (sugar beets). In addition, there were 21 accessions categorized according to the end use "biomass," probably meaning that they produce much vegetation or large roots that could provide the raw material for energy production. There were also 637 cultivated beets in the genebank that were not yet classified according to a particular end use or were wild *Beta vulgaris subsp. vulgaris*. The NPGS's *Beta* collection is highly diverse. For example, as of April 29, 2010, the bank contained 572 accessions of *Beta vulgaris subsp. maritima*, a taxon that readily crosses with cultivated beet and is currently being used by USDA's Agricultural Research Service (ARS) scientists as a source of resistance to disease. There were 10 other *Beta* taxa, represented by 175 accessions, which were also included in the *Beta* collection.

Comment: Herbicide resistant (HR) weeds have long been a serious and underappreciated obstacle to development of a truly sustainable agricultural system. HR weeds are both the result of an unsustainable fixation on exclusively chemical means of weed control, and also the occasion for still greater dependence on herbicides. Table 1 (provided as an attachment to the comment) shows that GR weeds have increased dramatically in geographic extent over just the past four years, with an average of 3.1 million acres added each year over that period. The average annual gain over each of the past four years exceeds the overall acreage that became infested in the entire eight years from the time the first RR crop-associated GR weed emerged in 2000 (horseweed in Delaware) through 2007. As portrayed graphically in Figure 1 (provided as an attachment to the comment) with finer-grained data, GR weed emergence has been increasing exponentially over the past four years. (APHIS-2010-0047-4351)

Response: APHIS acknowledges that GR weeds are rapidly becoming more prevalent. However, APHIS disagrees with the numbers presented in table 1 and figure 1, as submitted by the Center for Food Safety (CFS). These numbers are based on a misinterpretation of data on the

weedscience.org Web site curated by Dr. Ian Heap. On this site, weed scientists and extension agents have reported a range of acreage that may be infested with herbicide-resistant weeds. The CFS commenter noted that "ISHRW organizer Dr. Ian Heap made a point estimate of 10.4 million acres infested with GR weeds in May of 2010, when the maximum acreage infested was 11.4 million acres," and therefore concluded that the upper-bound estimates more closely approximate real-world conditions. APHIS asked Dr. Heap to comment on the CFS's analysis. In his reply to APHIS, Dr. Heap stated, "their [CFS'] conclusion that 'This suggests that the upper-bound estimates more closely approximate real world conditions' is wrong. I believe that when researchers put in values of 1-2 million acres infested there is a tendency to overestimate the actual number of acres. Some researchers are more prone to overestimates than others, and I quite often question their estimates and in reflection they may reduce their estimate by up to tenfold. The point again is that these are very subjective guesses, often not based on scientific surveys. They should only be used as general indications on how widespread a resistant weed has become." Because the acreage infested with GR weeds is very subjective and the error is magnified at higher acreages, APHIS does not consider the data from table 1 or the analysis shown in figure 1 to be meaningful and, consequently, has not included them in the FEIS. For the estimate used in the FEIS, APHIS refers to a comment made by Ian Heap that "an estimated 6 percent of the total planted corn, soybean, and cotton acres in the United States (about 10 million acres) have some level of weeds that are resistant to glyphosate" (WSSA, 2010).

Comment: It is well known and completely undisputed in the weed science community that glyphosate-resistant crop systems are responsible for the vast majority of glyphosate resistant weeds. APHIS's attempt to obfuscate this point by speaking of the number of "weed species" that have evolved resistance to glyphosate in non-RR crop settings is wrong on several counts. First, an entire "weed species" does not evolve resistance to an herbicide; rather, geographically distinct populations of a weed species evolve resistance, while most remain susceptible. Second, as explained in CFS Science Comments 2010, it is the acreage infested by a GR weed population that mainly determines its agronomic and environmental impact, not number of "weed species" with resistant populations. The number of weed species with GR populations or biotypes is not a good indicator of impact because this parameter says nothing about the size of the population (i.e. acreage of land infested), which in turn correlates with the amount of additional herbicide or tillage or hand weeding utilized to control the resistant weed population. (APHIS-2010-0047-4351)

Response: APHIS acknowledges that the prevalence of GR weeds is related to the amount of glyphosate use. As more than 75 percent of glyphosate use in the United States is on GR crops, it stands to reason that most of the acreage of GR weeds will be on land used to raise GR crops. With regard to the comment that an entire weed species does not evolve resistance to an herbicide, APHIS is well acquainted with the concept of biotypes and includes a discussion of biotypes and how selection increases the prevalence of biotypes (for example, see p. 235 of the DEIS). APHIS disagrees with the commenter's assertion that the number of weed species that has evolved resistance is unimportant. As described in the FEIS, the fact that relatively few species have developed resistance means that glyphosate is still an effective herbicide against most weed species. As such, it will continue to offer value for weed control. APHIS agrees that the acreage infested with GR weeds is related to the extent that alternative herbicides or nonchemical means of weed control will need to be adapted to supplement glyphosate use. APHIS discusses nonchemical weed control in section III.B.1.d.(2), non-glyphosate herbicides in

section III.B.1.d.(3), and the possibility that increased prevalence of GR weeds will increase the use of non-glyphosate herbicides in section IV.B.1.b.(2) of the FEIS.

Comment: Over 99% of the reported GR weed-infested acreage emerged in soybeans, cotton, corn and/or sugar beets, all crops that are predominantly Roundup Ready (Figure 2"). (APHIS-2010-0047-4351)

Response: CFS over interpreted the data on acreages infested with GR weeds and made invalid comparisons. There has not been a systematic survey of acreages infested in GR and non-GR croplands. As Dr. Heap noted, "These data are very subjective guesses, often not based on scientific surveys. They should only be used as general indications on how widespread a resistant weed has become." APHIS also disagrees with this comment because it ignores the impact from years of glyphosate use on non-Roundup Ready® crops. Glyphosate was used for about 20 years, before the introduction of Roundup Ready® crops, as a burn-down herbicide on fields subsequently planted to Roundup Ready® crops. It simply is not possible to quantitate the contribution of Roundup Ready® and non-Roundup Ready® crops to the prevalence of GR weeds.

Comment: Crop rotation offers little or no protection against rapid evolution of glyphosate-resistant weeds when some or all of the crops in the rotation are Roundup Ready. Figure 2 (submitted as an attachment to the comment) also refutes another misconception in the DEIS. APHIS states erroneously that glyphosate-resistant weeds are most common when glyphosate is used on the same crop planted year after year without crop rotation, for instance continuous Roundup Ready soybeans or corn. APHIS further states that only "two species of weeds" have been selected for in situations involving rotation of RR corn and RR soybeans, and no GR weeds have arisen in a three-crop rotation. These statements are grossly misleading. Figure 2 shows that while roughly half (40 of 79) of GR weed reports have only "soybeans" listed as the crop setting, and five more list only "cotton," the aggregate GR weed-infested acreage of those 45 reports is quite small – less than 1.5 million acres. In contrast, 12 million acres of "cotton, soybeans" cropland and 1.2 million acres of "corn, soybeans" have been infested with GR weeds, or over 13 million acres in a two-crop setting. Likewise, five reports list three of four crops (corn, cotton or sugar beets, and soybeans) that are predominantly Roundup Ready as the crop setting, with up to 2 million acres infested. These data clearly demonstrate that the great majority of GR weeds (those infesting 14 million acres or more) have evolved on cropland that is used to grow two and even three crops, contrary to APHIS's assumption that GR weeds arise primarily in single crop situations. (APHIS-2010-0047-4351)

Response: Figure 2 and its conclusions are based on CFS' erroneous use of the data collected by the International Survey of Herbicide Resistant Weeds. CFS' conclusion that continuous cotton contributed very little GR weed, while most is from a cotton-soybean rotation, is contradicted by literature. For example, according to a survey conducted in 2006, "two-thirds of cotton producers in this region (Southeast US) had grown glyphosate resistant cotton continuously for 3–5 years" (Foresman and Glasgow, 2008). According to Neve (2008; 2011a), cotton is often grown as a continuous monoculture, but where rotation is practiced, the most common rotational crops are maize and, less commonly, soybean. The fact that most cotton is not grown in rotation and that when it is grown in rotation soybean is not the predominant rotation crop is inconsistent with the commenter's conclusion that most GR weeds evolved in a cotton-soybean rotation. In addition, the reports submitted to the International Survey of

Herbicide Resistant Weeds do not provide agronomic history, so it is not possible to know what crops, if any, were rotated with each other.

In his reply to APHIS on figure 2 supplied by the commenter, Dr. Heap stated, "Figure 2. is a misrepresentation of the data. Most of the acres represented in the figure should be 'continuous cotton' where glyphosate-resistant Palmer amaranth is the major problem. I understand where the confusion comes from, and I will explain. When a weed becomes resistant to a particular herbicide mode of action (in this case glyphosate) it is only listed in the state once as a unique case. Researchers then are asked which situations (crops) the glyphosate resistant weed has been identified in, for the whole state. Thus in Georgia the case of glyphosate-resistant Palmer amaranth has been identified in two crops – cotton, and soybean. But there is no implication that it is identified in a rotation of cotton and soybean, nor is there any indication of the split for the crops on the acres infested. In the case of Georgia, the researchers reporting the case (Stanley Culpepper and Erik Prostko) estimate that there are 1 to 2 million acres of glyphosate-resistant Palmer amaranth in the entire state. In reality 90% of those acres are probably in continuous RR cotton. So to conclude that there are 1 to 2 million acres of GR Palmer amaranth in a cotton/soybean rotation in Georgia is wrong. If the researchers had also identified GR Palmer amaranth in one peach orchard and a single case on a roadside then Figure 2 would show a crop rotation of cotton/peaches/soybean/roadsides – just to point out the error in their interpretation."

The statement that "crop rotation offers little or no protection against rapid evolution of glyphosate-resistant weeds when some or all of the crops in the rotation are Roundup Ready" is also contradicted by the experience in Western Canada, where GR weeds are a minor problem despite Roundup Ready® canola being grown on 3 million hectares annually and widespread glyphosate use in no-till systems being prevalent in this area (Blackshaw, 2011). Though Roundup Ready® canola has been grown in Canada since 1996, the first report of GR weeds occurred in 2012 on 100-500 acres. Presumably, the absence of GR weeds has been due to the adoption of integrated weed management practices and the use of 3- to 5-year crop rotations (Blackshaw, 2011). In contrast, the selection and spread of GR weeds have been more rapid and widespread with continuous cropping of soybean, corn, and cotton. Furthermore, CFS' statement is also contradicted by modeling studies conducted by Neve (2011b), who concluded that rotation between two GR crops reduced the risk of selection and spread of resistant weeds compared to continuous cropping.

Comment: While APHIS implies that RRSB were introduced commercially in 2005 (e.g. EIS at 538: "H7-1 sugar beets have been widely adopted since initial deregulation (2005)"), EIS at 546: "…continue to experience the weed control observed over the past 5 years and described under Alternative 2" to characterize weed control with RRSB, falsely implying commercial use since 2005), this is not accurate. (APHIS-2010-0047-4351)

Response: In section III.A. of the DEIS and FEIS, APHIS states that H7-1 was primarily used for production beginning in 2008: "This chapter describes key aspects of the affected environment in terms of two scenarios: (1) pre-2005 when production practices were based on the exclusive use of conventional sugar beet seeds and roots; and (2) from March 2008 to August 2010 when production practices switched almost exclusively to the use of H7-1."

Comment: One commenter stated that GR biotypes of common ragweed, giant ragweed, and common waterhemp are found in Minnesota and North Dakota and that their spread has been rapid. (APHIS-2010-0047-4351)

Response: The DEIS includes information on the occurrence of these weeds (see pp. 26 and 563 and table 4-20). The FEIS has been revised to incorporate information noted by the commenter on the spread of these weeds through the Midwest.

Comment: A commenter mentioned Stachler's (Weed Science Professor at North Dakota State and expert on weed management in sugar beet) recommendation that clopyralid be used to control GR ragweed. (APHIS-2010-0047-4351)

Response: The DEIS (p. 545) and FEIS discuss the use of clopyralid to control GR giant and common ragweed in sugar beet.

Comment: A commenter mentioned that biotypes of giant ragweed and common ragweed have been selected for resistance to ALS inhibitors. (APHIS-2010-0047-4351)

Response: The DEIS contains this information in table 3-25, which also appears in the FEIS.

Comment: A substantial population of glyphosate resistant waterhemp on hundreds of sites covering up to 10,000 acres was recently confirmed in the North Dakota county of Richland, which had 29,350 acres of sugar beets in 2007. The GR waterhemp is thus infesting a sizeable proportion of the sugar beets in that county. (APHIS-2010-0047-4351)

Response: APHIS contacted Jeff Stachler, a weed science expert at North Dakota State University, for an update on the prevalence and management of GR waterhemp in the Midwest and updated the FEIS accordingly.

Comment: Thus far, however, the most problematic weeds in the Red River Valley are kochia, pigweeds and lambsquarters. One reason kochia is so problematic in sugar beets is that virtually all of it in Minnesota and North Dakota has evolved resistance to triflusulfuron, and it is now resistant to all members of this large class of ALS inhibitor herbicides. Kochia would of course become considerably more difficult to control in RRSB if it also evolves glyphosate-resistance. GR kochia and lambsquarters (see below) have been considered likely in North Dakota since at least 2009. It was recently located in two counties of southern North Dakota, one of them a sugar beet-growing county (Sargent), and will have a substantial impact when it does evolve glyphosate resistance. The first GR kochia biotype emerged in western Kansas in 2007, infesting cotton, soybeans and corn. It has progressively spread since then. A recent report suggests that GR kochia has spread throughout the entire western third of Kansas:

The presence of glyphosate resistance in four populations of kochia in western Kansas was confirmed in 2007. The populations were dispersed more than 100 km apart and were considered to have developed resistance independent of each other. A few additional reports of lack-of-control of kochia with glyphosate in other regions were received in 2008 and 2009 and the number of such reports escalated dramatically in 2010. An extensive driving tour and unscientific field survey in the fall of 2010 confirmed the presence of uncontrolled kochia in many corn, soybean, and fallow fields throughout the western one-third of Kansas that had been sprayed with glyphosate alone or in mixture with other postemergence herbicides. Seed was collected from 17 kochia populations dispersed throughout the region that had survived spraying operations. Glyphosate dose-response trials are being conducted to determine if the sampled populations are indeed resistant to glyphosate as suspected. If resistance is confirmed, then glyphosate-resistant kochia is prevalent throughout western Kansas.

Assuming the resistance is confirmed, there are several troubling aspects about this report. First, independent evolution of glyphosate-resistance in four separate populations would suggest that kochia individuals with the capacity to survive glyphosate are not exceedingly rare (as one might assume if only one population had evolved resistance and spread via tumbleweed). Second, the dramatic escalation in number of reports in 2010 (in Colorado as well as Kansas) suggests the problem is worsening. The fact that this kochia survives glyphosate and other postemergence herbicides suggests it may have multiple resistance, perhaps to ALS inhibitors as in Minnesota and North Dakota. Finally, the presence of GR kochia throughout an area as large as the western third of Kansas suggests a capacity for rapid evolution or spread. (APHIS-2010-0047-4351)

Response: APHIS discusses the possibility that GR kochia could be selected or spread into sugar beet fields in the DEIS on pages 537-546. APHIS has updated the FEIS to include the information supplied by the commenter.

Comment: RRSB growers have regarded lambsquarters as their worst weed over the past two years (2009 and 2010) citing the survey of weed control and production practices on sugarbeet in Minnesota and Eastern North Dakota. (APHIS-2010-0047-4351)

Response: APHIS has reviewed these survey reports published over the last 3 years: (Stachler *et al.*, 2009; Stachler *et al.*, 2011; Stachler *et al.*, 2012b).

The survey asks the growers to identify their worst weed problem. In the 2011 survey, 29 percent of the growers indicated that they did not have a worst weed problem. As for common lambsquarters, the number of RRSB growers who named it as the worst weed problem decreased from 30 percent in 2009, to 23 percent in 2010, to 16 percent in 2011. APHIS interprets this data to indicate that glyphosate use on RRSB provided excellent weed control in 2011 and that common lambsquarters is lessening as a weed problem for RRSB growers.

Comment: One commenter took issue with the rate of glyphosate used by APHIS to estimate national glyphosate use. APHIS used 0.75 pounds acid equivalent per acre (lbs. ae/acre), but the commenter points out that weed shifts have necessitated using up to 1.125 lbs., the maximum allowable rate. (APHIS-2010-0047-4351)

Response: At the suggestion of the commenter to improve the estimate of glyphosate used by sugar beet growers to better reflect increasing use due to weed shifts, APHIS reanalyzed herbicide use based on the most recent data available, the herbicide use data from the 2011 survey from Minnesota and eastern North Dakota (Stachler *et al.*, 2012b). While in 2011, 0.75 lbs. ae/acre continued to be the most common herbicide treatment reported by all growers in the Midwest, APHIS acknowledges that more growers were using higher rates than in previous years. In addition to reporting the single application use rates, the surveys also report the average total rate of glyphosate applied per acre, which provides a much more accurate estimate of the glyphosate applied to the region. The average total rate reflects the number of applications made and the concentration of glyphosate applied at each application, which can vary from 0.75 to 1.125 lbs. ae/acre. Therefore, instead of using a rate per application of 0.75 lbs. or 1.125 lbs. ae/acres, APHIS used the average total rate for the season, which was 2.21 lbs. ae/acre (or 2.7 lbs. active ingredient (ai)/acre) in the 2011 growing season. This value was also used instead of 1.89 lbs. ae/acre to estimate national glyphosate use in the table in the cumulative impacts section (table 5-1 in the DEIS).

As implied by the commenter, the average total rate of glyphosate applied to RRSB increased in 2011 and 2010 relative to 2009, when the rates were 2.21, 2.09, and 1.85 lbs. ae/acre, respectively. However, the trend was interrupted from 2008 to 2009 when the rate decreased from 1.93 to 1.85 lbs. ae/acre. Presumably, weed shifts were occurring from 2008 to 2009, so the reduction in herbicide used must be attributable to other factors that could influence weed pressure. In addition to weed shifts, weather is an important factor that influences the use rate. For example, in 2011, rains during planting season delayed when herbicide could be applied, resulting in higher overall use rates of herbicides on both H7-1 and conventional sugar beets compared to 2010 (Stachler *et al.*, 2011; Stachler *et al.*, 2012b). Therefore, some part of the increased use rate from 2010 to 2011 is likely attributable to the weather.

To compare herbicide use under Alternatives 1 and 2 in the DEIS, APHIS used national herbicide use data from 2000 and compared it to estimated herbicide use based on survey data from Minnesota and North Dakota in 2010. In several respects, the data might not be comparable: (1) the regional data from Minnesota and North Dakota might not be representative of the national data; (2) the data from 2000 and 2010 might not be comparable due to yearly weather differences; and (3) the data from 2000 and 2010 might not be comparable due to weed shifts that have occurred over the past decade. To make a more reliable comparison in the FEIS, herbicide use estimates were based only on 2011 survey data from Minnesota and eastern North Dakota, which represent approximately 55 percent of the sugar beet grown in the United States. In 2011, 10 percent of the surveyed growers planted conventional sugar beet. By comparing herbicide used on conventional and H7-1 sugar beet in just this region from the same year, weather- and weed shift-related differences between the comparators are minimized relative to comparing statistics from a decade apart. Furthermore, regional differences in herbicide use are not as extreme as national differences would be.

Comment: One commenter believed that APHIS contradicted itself in its description of the stale seed bed because page 113 of the DEIS states that in stale seed beds the fields are tilled in the fall and then left untouched in the spring, while page 130 indicates that stale seed bed is when the field is tilled in advance of sowing the crop to encourage weed germination and then tilled again just prior to sowing the crop. (APHIS-2010-0047-4351)

Response: In the stale seed bed technique, weed seeds are encouraged to germinate by tillage in advance of planting the crop. However, there are multiple ways to kill the weeds that are encouraged to germinate. In some cases, additional tillage is used. In others, the seed bed is undisturbed to discourage the germination of additional seeds. Instead of tillage, weeds may be killed by herbicide treatment, burning with a propane flamer, or—for small scale farms—an application of clove oil (Taylor, 2009). These points have been clarified in the FEIS.

Comment: One commenter stated that horseweed should be noted as a problematic weed in sugar beets based on a report by Christy Sprague, an extension specialist in Michigan. (APHIS-2010-0047-4351)

Response: APHIS discussed with Dr. Christy Sprague the likelihood that GR horseweed would be a problem weed in sugar beet. Dr. Sprague told APHIS that there is a trend to use the stale seed bed technique for sugar beet without tillage in the spring, although some growers continue to use tillage. In Michigan, horseweed can emerge in both the fall and the spring. For growers who do not use tillage in the spring, GR horseweed that emerged during that season would not be effectively controlled with glyphosate and could be problematic. However, GR horseweed is not

likely to become a problem because sugar beet growers could resort to spring tillage should it become prevalent in Michigan sugar beet fields. This information and discussion are included in the FEIS.

Comment: One commenter believed that APHIS was wrong to suggest that the GR horseweed that was confirmed in Michigan in 2007 in Mason County on Christmas tree farms spread to a no-till soybean field in Ionia County and a stale seed-bed sugar beet field in Gratiot County. The commenter points out that the report (Sprague, 2011) did not state whether it was dispersed from the Christmas tree nursery population or evolved separately from glyphosate selection pressure in the sugar beet field. According to the commenter, independent evolution of glyphosate resistant populations of horseweed and other weeds is quite favored by the frequent rotations involving RRSB and other RR crops. In fact, Michigan has the highest percentage of sugar beet acreage that is estimated to rotate to another RR crop (66%). (APHIS-2010-0047-4351)

Response: APHIS acknowledges that the report did not suggest that the GR horseweed spread from the Christmas tree farm. APHIS recognizes that it is possible, as suggested by the commenter, that the population in Gratiot County was selected independently from the population on the Christmas tree farm. The FEIS has been revised accordingly. Nevertheless, it is also possible that it spread this far based on a report noted in the FEIS, (Shields *et al.*, 2006), which concludes that horseweed can travel up to 300 miles from a single plant. The distance between Mason, Ionia, and Gratiot counties is well within 300 miles. The DEIS did not conclude that 66 percent of sugar beet acreage is rotated to another Roundup Ready® crop; rather, it indicated that 66 percent is the maximum estimated by the amount of Roundup Ready® crops in the State. Based on information APHIS received from Michigan Sugar Company on crop rotations by sugar beet producers, only 34 percent of growers use a three-crop rotation, 41 percent use a four-crop rotation, and 24 percent use a five-crop rotation. Growers using a four- or five-crop rotation would include wheat, dry beans, or pickling cucumbers in the rotation, none of which are GR. Therefore, the likelihood of a sugar beet grower rotating to another Roundup Ready® crop is expected to be less than 66 percent in Michigan. The FEIS has been updated with this information.

Comment: A commenter informed APHIS that GR ragweed was identified in Nebraska, GR kochia and waterhemp are now in Nebraska, and GR kochia may be present in Colorado. (APHIS-2010-0047-4351)

Response: These instances have been noted in the FEIS.

Comment: Glyphosate-resistant weeds have triggered substantial adverse impacts wherever they have emerged: increased use of glyphosate and other, more toxic herbicides; increased use of tillage and abandonment of conservation tillage; a massive rise in hand-weeding; and skyrocketing weed control costs. (APHIS-2010-0047-4351)

Response: Weeds resistant to non-glyphosate herbicides cause the same adverse impacts that the commenter is ascribing to GR weeds, namely increased use of more toxic herbicides, increased use of tillage, abandonment of conservation tillage, a massive rise in hand-weeding, and skyrocketing weed control costs. The agency thoroughly discusses this issue in section III.C.3 of the DEIS and FEIS. Because GR crops allow weeds to be so effectively controlled, they substantially mitigate the adverse impacts growers currently face. While it is true that the emergence of GR weeds may result in a loss of the benefits initially obtained with GR crops,

under Alternative 1 the benefits would not be realized and the same impacts described by the commenter would occur without their use. Growers may increasingly adopt integrated weed management techniques that prolong the usefulness and benefits of the technology.

Comment: APHIS should assess whether alfalfa is really so little rotated with sugar beets as suggested in Table 3-6, where only a small fraction of sugar beet acreage is rotated to alfalfa in a single state (Idaho), and adjust those figures as needed. (APHIS-2010-0047-4351)

Response: APHIS extensively analyzes the possible rotations of alfalfa with sugar beets in the cumulative impacts section of the FEIS. The estimates of acreage in this section are more likely to represent alfalfa and sugar beets being grown in the same county rather than the two crops being rotated on the same field. APHIS' analysis was based on industry predictions from market research and is an overestimate of alfalfa acreage planted in the short term.

Comment: APHIS's reliance on industry best practices, including Monsanto's Technology Use Guide (TUG), to mitigate the evolution and adverse environmental impacts of glyphosate-resistant weeds is arbitrary and capricious and fails to satisfy APHIS's statutory duty to "[protect] [] the agriculture, environment, and economy of the United States." First, Monsanto's TUG recommendations are themselves grossly inadequate and in some respects counterproductive.

APHIS elsewhere concedes that Monsanto's endorsement of rotations from RRSB to other Roundup Ready crops as a supposed weed resistance management practice is misguided and actually promotes rather than prevents the evolution of glyphosate-resistant weeds. Second, to the extent the TUG recommendations have any value, the DEIS incorrectly assumes that farmers regularly observe them, despite no evidence to this effect, and considerable evidence against this assumption (see below). There is no evidence that Monsanto enforces TUG provisions and the DEIS' claim that Monsanto's voluntary stewardship measures will forestall the emergence of glyphosate-resistant weeds lacks any merit.

Voluntary stewardship measures to mitigate weed resistance, whether proffered by industry or public sector agronomists, have been a dismal failure. Hard, empirical data demonstrate conclusively that weeds are continuing to rapidly evolve resistance to glyphosate. This would not be occurring if stewardship measures were effective. In other words, the failure of voluntary stewardship is demonstrated by the continuing rapid spread of the problem stewardship is meant to mitigate.

CFS discussed Johnson et al (2009) in comments on the USDA's draft EA for RRSB partial deregulation, yet this study, despite its independence and quality is not discussed or cited in the draft EIS. CFS also extensively discussed the efforts of Monsanto and its academic associates (including Robert Wilson, who is heavily cited by APHIS in the EIS) to mislead farmers into growing Roundup Ready crops and using glyphosate continuously, year after year, practices that even APHIS now admits promote the rapid evolution of glyphosate-resistant weeds. APHIS also failed to respond to this evidence and discussion in the EIS. (APHIS-2010-0047-4351)

Response: APHIS is not relying on "industry best practices, including Monsanto's Technology Use Guide (TUG), to mitigate the evolution and adverse environmental impacts of glyphosate-

resistant weeds." The commenter is confused about APHIS' role. Maintaining the long-term efficacy of glyphosate or any other herbicide is outside the scope of the FEIS and the authority of APHIS. EPA regulates the use of pesticides and specifically defines the amounts of each pesticide that can be applied to sugar beet and other crops during the growing season.

The Monsanto TUG recommendations on mitigating the spread and selection of GR weeds are indeed recommendations and are not enforced. These recommendations are just one source of information. The FEIS discusses other sources of information and efforts by universities, extension agents, herbicide manufacturers, commodity groups, and sugar beet industry associations to educate growers on best practices (see sec. III.C.3.a.(3)).

APHIS disagrees with the commenter that the following of voluntary stewardship measures lacks any merit. Sugar beet growers have strong financial and practical interests in managing weeds effectively to reduce the selection of herbicide-resistant weeds and to maximize yield potential. The FEIS discusses how awareness among growers is increasing regarding the need to minimize the potential for development of glyphosate resistance, based on surveys that farmers are proactively adopting best management practices (see sec. III.C.3.a.(3)). The FEIS also describes that sugar beet growers and processors have established funds to support research and extension activities on weed resistance. As discussed in the FEIS, researchers from Colorado, Nebraska, and Wyoming, in cooperation with Monsanto, are developing region-specific technology usage guides to address weed management in cropping rotations that include sugar beet. Guides will provide regional and weed-specific (kochia, common lambsquarters, and pigweed) recommendations for corn, small grains, dry beans, and sugar beet, therefore enhancing the benefits of crop and herbicide rotations.

Farmers are aware that they will pay more for weed control when herbicide-resistant weeds are prevalent (see sec. III.D.1.e. of the FEIS). Some farmers can be expected to take a long-term view towards more sustainable practices and will be willing to incur additional management costs to prevent or delay selection of resistance, especially if there is uncertainty regarding the development of alternative herbicides (Pannell and Zilberman, 2000). Others may be unwilling to incur additional costs until the resistant weeds directly affect their farms either because they take a short-term view, are faced with financial hardship, expect substitute herbicides to become available over time, or believe that their individual actions will not prevent or delay the prevalence of herbicide-resistant weeds (Pannell and Zilberman, 2000). Approximately 80 percent of growers surveyed in Delaware responded that it was worthwhile to incur additional costs now to preserve glyphosate for future use (Scott and VanGessel, 2007). To encourage sustainable use of glyphosate, Monsanto has implemented the Roundup Ready Plus® incentive program for farmers to include residual herbicides, many of which are sold by other companies, in their herbicide management programs in addition to glyphosate (Monsanto, 2011). Rebates of up to $5 per acre for corn, $10 per acre for soybean, and $22 per acre for cotton are available for using recommended combinations of residual herbicides along with glyphosate. These rebates provide an economic incentive for growers, especially those who may take the short-term view, to adopt the recommended practice of including multiple herbicide chemistries in the rotation.

APHIS acknowledges that maintaining glyphosate selection by rotating exclusively between Roundup Ready® crops is not ideal. However, APHIS has stated in the DEIS and FEIS that crop rotation has great value for weed management and that rotation between Roundup Ready® crops is still better than continuous cropping of a Roundup Ready® crop because it takes advantage of

the differences in crop ecology that foster different dominant weeds and facilitates the use of alternative herbicide chemistries.

APHIS has extensively reviewed the literature on weed management practices in sugar beet and its rotation crops. The commenter is mistaken by his assertion that (Johnson *et al.*, 2009) is not cited. It is cited twice in section III.C.3 of the EIS. Furthermore, under Alternative 1, as well as Alternatives 2 and 3, there is likely to be an increase in the spread of GR weeds.

APHIS disagrees with the commenter's characterization of Professor Robert Wilson, a sugar beet expert and extension weed specialist at University of Nebraska. APHIS relied on Dr. Wilson for practical information on growing sugar beet in the Great Plains, especially with regard to weed control. APHIS cited his peer-reviewed research after independently reviewing it. These works were scientific studies and not promotional materials as alluded to by the commenter. Among the work cited were studies by Dr. Wilson where he recommends the use of multiple herbicide chemistries to forestall GR weeds (Wilson Jr and Sbatella, 2011) and analyzes weed management practices and their effects on weed populations and soil seedbanks (Wilson *et al.*, 2011).

Comment: APHIS should make predictions of herbicide use for at least 10 years into the future to account for inevitably rising weed resistance. In addition, APHIS should factor in usage of the dimethenamid-P recommended to control GR waterhemp, rather than ignore this herbicide. As noted earlier, the glyphosate rate utilized by APHIS appears to be too low even for the "snapshot" of current practices, and should of course be scaled gradually upward to account especially for increasing tolerance in common lambsquarters, which both has a history of "creeping resistance" to glyphosate and is regarded as the worst weed by Red River Valley RRSB growers (a substantial 23% in 2010, Stachler, JM et al (2010), Table 26). In addition, Sequence (a premix of S-metolachlor and glyphosate) appears to be registered for RR sugar beets, and will likely be used much more in the coming years, given resistance to other popular herbicides besides glyphosate. The increased use of these additional herbicides should also be factored into projections of the toxicity comparison between conventional sugar beets and RRSB. (APHIS-2010-0047-4351)

Response: In the cumulative impacts section of the FEIS, APHIS has included an analysis of past herbicide use and has made some qualitative predictions on future use based on past uses and current trends in crop adoption and weed management. APHIS has no way to accurately predict herbicide use for the next 10 years. There have been 4 years of glyphosate use data collected in Minnesota and eastern North Dakota. Between the first and second year, glyphosate use decreased by 4 percent. Between the second and third year, glyphosate use increased 13 percent. Between the third and fourth year, glyphosate use increased 6 percent. Herbicide use data is not available for the other sugar beet-producing regions. In our opinion, this amount of data is too scant to form the basis of a meaningful trend analysis. Based on conversations with Jeff Stachler, a weed scientist at North Dakota State University, dimethenamid-P is not an effective herbicide for waterhemp control, causes leaf injury to plants, and is not expected to be widely used to control GR weeds in sugar beets. It is seldom used currently (Stachler *et al.*, 2008; Stachler *et al.*, 2009; Stachler *et al.*, 2011; Stachler *et al.*, 2012b). Similarly, metolachlor is seldom used on sugar beets, although it has been registered for use since 2003 (EPA, 2003; Stachler *et al.*, 2008; Stachler *et al.*, 2009; Stachler *et al.*, 2011; Stachler *et al.*, 2012b). Even though Sequence has been registered for use on H7-1 sugar beet since 2010 (EPA, 2010), it was not listed in Minnesota or North Dakota survey data as one of the herbicides used in the past 2

years (Stachler *et al.*, 2011; Stachler *et al.*, 2012a). Therefore, APHIS does not agree that the toxicity of metolachlor needs to be analyzed in the FEIS. APHIS notes that three alternatives to dimethenamid-P and metolachlor that are much more commonly used on sugar beet—ethofumesate, cycloate, and EPTC—were analyzed in depth in the DEIS and FEIS. Use of non-glyphosate herbicides—such as clopyralid, desmedipham, phenmedipham, quizalfop, and clethodim—might increase depending on the effectiveness of preplant herbicides—such as ethofumesate, EPTC, and cycloate—and recommendations from local weed experts. APHIS has revised the FEIS to include the most recent glyphosate use rate of 2.7 lbs. ai/acre.

Comment: A commenter stated that APHIS should predict the socioeconomic impacts of increased tillage and hand weeding that might possibly result from an increase in GR weeds. (APHIS-2010-0047-4351)

Response: APHIS has analyzed the socioeconomic impacts of adopting RRSB and estimated a net benefit to the grower of over $200 per acre nationwide (see sec. III.D. of the FEIS). If GR weeds become widespread, this socioeconomic benefit could be diminished to the grower but could create economic opportunities to field workers. APHIS predicts that growers will choose to grow conventional sugar beet if GR weeds become so prevalent that adoption of H7-1 beet is no longer profitable, resulting in the socioeconomic and environmental impacts being equivalent to adopting Alternative 1. APHIS has also considered the impacts of GR weeds on other GR crops as well as the contribution of H7-1 sugar beet to this issue under Alternatives 2 and 3 (see the cumulative impacts section of the FEIS).

Comment: One commenter took issue with APHIS' conclusion that glyphosate provides another mechanism of action in the toolkit of weed control measures, stating:

This conclusion is, of course, absurd. The first problem is that RRSB does not provide "another herbicide mechanism of action." Rather, it essentially replaces all other weed control measures, as indicated by the fact that 95% of all herbicide treatments in the Red River Valley sugar beets were glyphosate alone (the other 5% are mostly glyphosate mixed with other herbicides, like clopyralid). RRSB does not enrich the weed control toolbox, it destroys it and all the tools in it, just as other RR crops have done before it. (APHIS-2010-0047-4351)

Response: APHIS disagrees with this comment. For growers and weed scientists who are concerned with weed control, glyphosate is seen as part of the solution. Overwhelmingly, they believe that glyphosate augments the toolbox rather than destroying it. For example, according to Duke (2011), "The use of glyphosate with GR crops is the most important weed management technology in agronomic crops in the western hemisphere." Other herbicides have not been as relied upon as glyphosate because they may damage the crop, are not as effective on a wide variety of weeds, require precise timing for effectiveness, may have become less effective through the selection of herbicide resistance, may be more difficult to mix, or may be more dangerous to the applicator. When GR crops were first introduced, GR weeds were not very prevalent, and few growers appreciated the need to incur additional costs to manage GR weeds. Growers are more aware now of the need to manage GR weeds due to personal experience with GR weeds and education campaigns that promote adopting more diverse weed management strategies. For example, according to (Shaw *et al.*, 2009),"In a market research study that surveyed 350 growers in 2005 and again in 2009, in response to the question, 'are you doing anything proactively to minimize the potential for resistance to glyphosate to develop,' 67% said

yes in 2005 and 87% said yes in 2009." This significant increase in proactive resistance management demonstrates that growers are gaining awareness of the benefits of diversified weed management programs. In a 2007 survey of 400 corn, soybean, and cotton growers, resistance management programs were often or always used by 70 percent or more of all three grower groups (Frisvold *et al.*, 2009; WSSA, 2010). According to (Culpepper *et al.*, 2010), "Proactively, some U.S. producers are hand-roguing fields as part of a zero-seed-production approach to address the increasing occurrence of GR weeds, mainly Palmer amaranth. The expenses these producers have incurred are far less than that of those who allowed a few plants to escape and are later confronted with sizeable soil seedbanks of resistant weeds that must be rogued multiple times each year to achieve a harvestable crop." These examples indicate that growers are increasingly shifting to a long-term strategy to manage GR weeds, which includes diversified weed management programs rather than solely relying on glyphosate for weed control.

Comment: A commenter took issue with APHIS' conclusion that adoption of H7-1 sugar beets are expected to result in a net decline in the development and dispersal of non-glyphosate herbicide-resistant weeds due to the introduction of an additional mechanism of action for weed management:

"For APHIS's prediction that there will be a net decline in herbicide-resistant weeds to be true, there would have to be massive expansion of weeds resistant to non-glyphosate herbicides to counteract the tidal wave of glyphosate resistance that the data discussed above represents. (Recall that GR weeds have increased in scope by roughly two orders of magnitude over just the past four years, and that the appearance of new populations is accelerating (CFS Science Comments – Appendix 3)). APHIS did not present any data to support such a trend. At most, there are tables that contain reports of sugar beet weeds that have evolved resistance to various non-glyphosate herbicides, mostly in the 1990s, with no indication of whether these HR weeds are increasing in scope, on the decline, or have entirely disappeared (HR weed populations are sometimes less fit and so recede in competition with fitter non-HR weeds when use of the corresponding herbicide is curtailed). In any case, one would expect that any "legacy" weeds resistant to non-glyphosate herbicides that infest conventional sugar beets would have been suppressed, over the past 5-15 years, in those hundreds of thousands of sugar beet acres that are rotated to an RR crop and thus treated with glyphosate. APHIS does not anywhere discuss this scenario. In contrast, GR weed selection pressure in RRSB is amplified by post-emergence glyphosate use on those same 600,000 plus RR crop rotation acres, as crop rotations already overly centered on glyphosate become still less diverse." (APHIS-2010-0047-4351)

Response: APHIS disagrees with this comment. There has not been an explosion of GR weeds in sugar beets. After 4 years, the first reports of GR weeds being found in sugar beet fields are just beginning in the Midwest, and there are no reports of GR weeds in sugar beet fields in other regions (see sec. III.C.3). In addition, weed control has overwhelmingly been the worst problem in sugar beet production throughout the United States in part due to the prevalence of weeds resistant to non-glyphosate herbicides (see sec.III.C.3). In the Midwest, where survey data is available, it is clear that few growers rate weeds as their worst problem since the adoption of H7-1 sugar beet (Stachler *et al.*, 2012a) [see table 27 of the DEIS]. While the percentage of growers who rated weeds as their worst problem ranged from 25 to 61 percent in past years, the percentage was 5 percent in 2011—the lowest on record during a year where early rains

exacerbated the weed problems (Stachler *et al.*, 2012a). Among growers raising H7-1 sugar beet in Minnesota and eastern North Dakota, 69 percent rated weed control excellent, 14 percent rated it good, 2 percent rated it fair, and 3 rated it poor (Stachler *et al.*, 2012a). In contrast, among growers raising conventional sugar beet, 25 percent rated weed control as excellent, 48 percent rated it good, 10 percent rated it fair, and 3 percent rated it poor (Stachler *et al.*, 2012a). Despite the commenter's claim that GR weeds are exploding in sugar beet crop land in Minnesota and North Dakota, glyphosate is still providing "excellent" weed control in nearly 70 percent of fields, meaning that 90 to 99 percent of the weeds do not survive to flower (scores defined in (North Dakota State University, 2011)). In conventional sugar beet fields, control is excellent in just 25 percent of fields, and a much higher number are fair (65- to 80-percent control) to good (80- to 90-percent control). This statistic means that a much larger number of weeds produce seed in conventional sugar beet fields than in H7-1 sugar beet fields. As the commenter correctly surmised, legacy weeds diminish as glyphosate provides excellent control, which is why APHIS concluded in the FEIS that glyphosate use on H7-1 sugar beet is contributing to a diminution of weeds resistant to non-glyphosate herbicides.

Comment: One commenter claimed that APHIS assumes that any GR weeds that evolve will be easily handled with alternative herbicides. (APHIS-2010-0047-4351)

Response: Glyphosate provides an additional mechanism of action that can aid weed control. APHIS did not say that any GR weeds that evolve will be easily handled with alternative herbicides. APHIS states in the DEIS and FEIS, "If glyphosate resistant weeds were to become prevalent in sugar beets, combinations of herbicides with different mechanisms of action are expected to still provide effective control provided that the glyphosate resistant weed does not already carry resistance to multiple herbicides." This does not mean that glyphosate and non-glyphosate herbicides can control weeds that have resistance to both herbicides.

Comment: One commenter disagreed that glyphosate should be used in tank mixtures with other herbicides even though it is still effective on most other weeds. He supports his point of view with a quote from the eminent weed scientist, Stephen Powles (Laws, 2010), "Within the cotton, corn and soybean belt the massive reliance on glyphosate means it will be driven to redundancy because many of the big driver weeds such as Palmer pigweeds, waterhemp, ragweed and johnsongrass will be resistant. There may be many weed species still controlled by glyphosate, but glyphosate will fail on the driver weeds and that means overall failure." (APHIS-2010-0047-4351)

Response: APHIS has read the article cited by the commenter (Laws, 2010) and disagrees with the commenter's interpretation of Powles remark. Powles and others in the weed science community advocate using a diversity of measures to address weed control. The problem noted by Powles relates to using a single method of weed control on GR crops. The problem is the single method of weed control, not the use of the GR crop itself. For example, in the very same article quoted by the commenter, (Laws, 2010), Powles states, "diversity is the key to preserving herbicide compounds such as the triazines, ALS and ACCase inhibitors; that is, diversity in cropping systems, herbicide modes of action and non-chemical weed control measures." In contrast to what is implied by the commenter, glyphosate increases the diversity of measures that can be used for weed control. APHIS is not aware that Powles or other weed scientists object to the use of tank mixtures with glyphosate. Tank mixtures are one way to increase the diversity of herbicide modes of action used. From a resistance-management perspective, using tank mixtures is superior to using sequential applications of different herbicides (Neve *et al.*, 2011a;

Norsworthy *et al.*, 2012). Numerous groups have advocated this approach along with other techniques to increase the diversity of weed control methods (Neve *et al.*, 2011a; Norsworthy *et al.*, 2012; Vencill *et al.*, 2012).

Comment: One commenter pointed out that the recent confirmed report of GR Palmer amaranth in Michigan may be problematic for growing sugar beet. (APHIS-2010-0047-4351)

Response: APHIS included a discussion of GR Palmer amaranth, noting that it has been detected in Michigan but has not historically been a problematic weed in sugar beet. The commenter did not provide any evidence to support his claim that it is a problematic weed in sugar beet.

Comment: APHIS received a comment indicating that although the agency noted that glyphosate can be present in air and rain, the agency did not account for these new facts in assessing risks to amphibians and fish. (APHIS-2010-0047-4435)

Response: APHIS disagrees with this statement. APHIS did take into account the fact that amphibians and fish are exposed to glyphosate present in air and rain when it moves from air and rain into surface water (see secs. III.E.4. and IV.E.4 of the FEIS). Glyphosate in surface water comes from any number of sources, including runoff and rain and atmospheric deposition. Measurements of glyphosate in surface water already include the contribution of glyphosate that cycled through the atmosphere. APHIS considered measurements of glyphosate in surface water from the following sources: (Coupe *et al.*, 2011), (Battaglin *et al.*, 2005). (Scribner *et al.*, 2007; Battaglin *et al.*, 2009).

Comment: A commenter felt that APHIS should factor plant-sequestered glyphosate into risk assessments because, citing (Doublet *et al.*, 2009) "Following application, pesticides can be intercepted and absorbed by weeds and/or crops. Plants containing pesticides residues may then reach the soil during the crop cycle or after harvest. However, the fate in soil of pesticides residues in plants is unknown. Absorption of both herbicides in plant delays their subsequent soil-degradation, and particularly, glyphosate persistence in soil could increase from two to six times. The modifications of herbicide degradation in soil due to interception by plants should be considered for environmental risks assessment." (APHIS-2010-0047-4435)

Response: EPA conducts risk assessments for pesticide registration, which are outside the scope of this EIS. APHIS notes, however, that the commenter did not faithfully represent the point that (Doublet *et al.*, 2009) made. Doublet (Doublet *et al.*, 2009) suggests that the absorption of glyphosate in plants should be taken into account in the modeling of pesticide fate, especially for risk assessments for pesticide registration.

Comment: A commenter felt that APHIS should not equivocate on whether amphibians will be present in sugar beet fields. (APHIS-2010-0047-4435)

Response: APHIS is unaware of any surveys or other studies of amphibians in sugar beet fields, and the commenter did not provide any data on the abundance of amphibians in sugar beet fields. While APHIS does not discount that some may be present, the agency expects sugar beet fields to be less attractive habitat to amphibians than less managed terrestrial alternatives due to the intensity with which sugar beet fields are managed.

Comment: A commenter noted that glyphosate formulations used on crops are more toxic to amphibians than glyphosate alone and that water bodies adjacent to glyphosate treated fields can also be contaminated at levels toxic to amphibians. The commenter said that APHIS needs to reconsider the impacts in light of real world practices and outcomes, [citing (Battaglin *et al.*, 2009)] which showed that water bodies adjacent to glyphosate treated fields can also be contaminated at levels toxic to amphibians. The commenter further noted that glyphosate can have indirect effects on amphibians, citing Vera et al. (2010). In addition, the commenter noted that APHIS did not rely on the latest studies in assessing the risks of increased glyphosate-based herbicide use to amphibians. (APHIS-2010-0047-4435)

Response: APHIS reviewed references submitted by the commenter and incorporated information into the EIS as appropriate. In particular, APHIS notes in the FEIS that in certain localized instances, levels of glyphosate in surface water can be high enough to cause sublethal effects on amphibians. APHIS includes the following summary in the FEIS: "Two points of view have developed regarding the environmental risk posed by the use of glyphosate formulations containing POEA and similar surfactants. One view is that when used in accordance with directions stipulated on product labels, the concentration of glyphosate (and by inference the concentration of POEA or associated surfactants) will be sufficiently diluted to avoid toxic concentrations in water-bodies likely to receive runoff or be contaminated by spray-drift. The opposing view is that amphibians may be particularly susceptible to the toxic effects of these pesticides because their preferred breeding habitats are often shallow, lentic or ephemeral pools that do not necessarily constitute formal waterbodies, and which can contain higher concentrations when compared to larger water-bodies" (Mann *et al.*, 2009).

Comment: One commenter felt that APHIS did not take into account key studies of negative consequences of increased glyphosate use on nontarget plants, particularly sublethal effects that may affect plant reproduction. (APHIS-2010-0047-4435)

Response: APHIS devotes sections III.C.3.b and IV.C.3.b of the FEIS to the topic of herbicide drift and impacts on nontarget plants. APHIS acknowledges that glyphosate is a nonselective herbicide that can adversely impact a wide range of nontarget plant species if drift occurs. EPA regulates the use of herbicides, including label restrictions designed to control spray drift.

Comment: One commenter felt that APHIS did not consider the impact of being able to apply glyphosate during the entire H7-1 sugar beet growing season. (APHIS-2010-0047-4435)

Response: Glyphosate is not used during the entire H7-1 growing season. By label restriction, the last application of glyphosate must occur at least 30 days prior to harvest (see sec. III.B.1.d.(4) of the FEIS). As described in the FEIS (sec. III.B.1.d), both glyphosate and non-glyphosate herbicides are typically only applied during the first 2 months of growth prior to canopy closure (about 4 months before harvest).

Comment: One commenter noted that species vary in sensitivity to drift levels of glyphosate and that the species used in EPA's tests to determine sensitivity to glyphosate may not adequately represent the range of responses found in wild species. (APHIS-2010-0047-4435)

Response: APHIS discusses the fact that species vary in sensitivity to glyphosate in section III.C.3.a of the FEIS. EPA, not APHIS, regulates herbicide use and potential impacts to nontarget organisms.

Comment: A commenter noted that formulations have not been assessed by APHIS for their impacts to non-target plant species. (APHIS-2010-0047-4435)

Response: APHIS considered the required phytotoxicity testing conducted in support of pesticide registration for each of the 13 herbicides analyzed in the FEIS, which includes formulated product testing on nontarget plants. APHIS is not aware of, and the commenter did not provide, a data set for phytotoxicity testing based on formulated products beyond those already reviewed by EPA.

Comment: One commenter noted that glyphosate drift from applications to GR crops happens when other plants are likely to be most vulnerable. The commenter supports the statement with (Lee *et al.*, 2005), a risk assessment based on agriculture in Fresno, CA. The commenter further stated, "So in spite of the non-volatile nature of glyphosate and label restrictions on application rate, droplet size, wind speed, equipment set up; with ground and air applications; drift injury does happen, and needs to be taken into account in assessing risk of increased glyphosate applications longer during the season to non-target plants." (APHIS-2010-0047-4435)

Response: APHIS acknowledged that drift from glyphosate could occur (see FEIS secs. III.C.3.b and IV.C.3.b). However, APHIS disagrees with the commenter that the drift scenario presented by (Lee *et al.*, 2005) represents a relevant case study for GR sugar beets. A wide variety of crops are grown year-round in Fresno, CA. Many of these varied crops use glyphosate, including GR cotton and non-GR crops, such as grapes, tomatoes, almonds, and oranges (figs. 30 and 31 in (Lee *et al.*, 2005)). Crops that could be impacted include alfalfa, sorghum, corn, onion, peppers, and rice. In the situation in Fresno, CA, where glyphosate is applied throughout the year and a wide diversity of crops are being grown, the window of opportunity for a nearby crop to be flowering during glyphosate application is high. In contrast, sugar beets are grown predominantly in the north, where they are among the first crops to be planted in the spring. Because herbicide applications are concentrated in the first 2 months of growth (typically April and May), they are completed by the time most nearby crops are flowering (an exception might be winter wheat).

Comment: One commenter noted that given the cryptic nature of important sublethal glyphosate effects and variations in sensitivity between species under different conditions, label restrictions may not be adequate to protect threatened and endangered plants, even if the farmers know that there are such species nearby and go to and follow the instructions on the Monsanto Pre-Serve Web site. In other words, the "legal precautions" represented by the EPA label use restrictions may not be adequate given new knowledge about glyphosate effects on non-target plants. (APHIS-2010-0047-4435)

Response: Herbicide use impacts on threatened and endangered (T&E) species are under the purview of EPA and are outside the scope of this EIS. APHIS' action does not affect EPA's regulation of the pesticide. EPA is currently considering the registration of glyphosate. As part of that assessment, they are conducting an assessment of T&E species.

Comment: One commenter noted that APHIS did not consider relevant research showing that changes in populations of rhizosphere microorganisms, including pathogens, that occur in RR crop systems where glyphosate is used post-emergence can increase the risk of diseases in subsequent crops. (APHIS-2010-0047-4435)

Response: APHIS has considered the research alluded to by the commenter and discusses this topic in section IV.C.2.b of the FEIS.

Comment: A commenter noted that APHIS does not consider the effects of glyphosate use on increased weediness of and gene flow between *Beta* varieties and species, citing papers by Londo et al. (Londo *et al.*, 2010; Londo *et al.*, 2011b; Londo *et al.*, 2011a) and Watrud et al. (Watrud *et al.*, 2011). (APHIS-2010-0047-4435)

Response: APHIS reviewed the four papers noted by the commenter and has incorporated relevant material as appropriate in the FEIS. APHIS noted that the observation that sublethal concentrations of glyphosate may delay flowering, reduce self-fertility, and thereby promote outcrossing (Londo *et al.*, 2011b) may have relevance to the likelihood of cross-pollination between wild beet and sugar beet in Imperial Valley, and it has introduced this discussion in the FEIS. However, APHIS does not consider that the scenario raised by (Londo *et al.*, 2011b) of increased gene flow between a canola crop and feral canola is relevant to gene flow between vegetable beet and sugar beet seed fields for the following four reason: (1) Glyphosate is generally not used in sugar beet seed fields because half the plants are sensitive (as described in sec. III.B.1). In order for an analogous situation to occur (i.e., mimic of drift onto a vegetable beet seed field), either the vegetable beet seed grower or a neighbor would need to use glyphosate at about the time that the vegetable beet plants were flowering. As there are few, if any, Roundup Ready® crops (including corn, soybean, canola, alfalfa, cotton, or sugar beet root crops) grown in the Willamette Valley, glyphosate use is expected to be low there (FEIS, fig. 5-3). (2) Vegetable beets are self-incompatible, so glyphosate exposure during flowering is not going to diminish self-fertility as would occur in *Brassica*. (3) Sugar beet seed and vegetable beet seed fields are miles apart, so cross-pollination is much less likely than between a crop plant and wild relatives or volunteers bordering a crop, as more commonly occurs with canola. (4) Feral populations of beets and sexually compatible species are not known to occur in the Willamette Valley where beet seed is produced. Elsewhere in the United States, cultivation of H7-1 sugar beet for root production occurs with little to no flowering and no proximity of sexually compatible species.

Comment: A commenter noted that even if the potential of the glyphosate tolerance trait moving from H7-1 to other sexually compatible *Beta* species in the United States is low, under glyphosate selection the trait will be selected and become common. Then these populations, unlikely to be detected and thus left uncontrolled, will increase the likelihood of gene flow in the future. In fact, *Brassica* populations with herbicide resistance traits have spread widely in unmanaged areas, without being controlled or monitored for over a decade. They are interbreeding, and even stacking different traits in combinations not found in agriculture (Schafer *et al.*, 2011)). Similarly, populations of wild cotton in Mexico have incorporated herbicide-resistance and other transgenes, also without being monitored or controlled for 15 years. (Watrud *et al.*, 2011; Wegier *et al.*, 2011)discuss this possibility for *Beta* species: "As cultivation of transgenic glyphosate-resistant sugar beet (*Beta vulgaris* L), which is a chenopod, increases in the United States, establishment of feral glyphosate-resistant sugar beet in disturbed habitats can be anticipated (Arnaud *et al.*, 2003; Fénart *et*

***al.*, 2007) and perhaps should be monitored for potential unintended ecological effects." (APHIS-2010-0047-4435)**

Response: APHIS disagrees with the following statement: "As cultivation of transgenic glyphosate-resistant sugar beet (*Beta vulgaris* L), which is a chenopod, increases in the United States, establishment of feral glyphosate-resistant sugar beet in disturbed habitats can be anticipated." To support their statement, (Watrud *et al.*, 2011) cite two papers on wild beet populations in Europe, (Arnaud *et al.*, 2003) and (Fénart *et al.*, 2007). In contrast to Europe, sexually compatible wild beet populations have failed to establish anywhere in the United States except California. In addition, feral populations of sugar beet have failed to establish anywhere in the United States. The speculation in (Watrud *et al.*, 2011) does not include a plausible reason for why wild or feral beet populations are now suddenly expected as a result of the cultivation of H7-1 sugar beet when such populations failed to appear after a century of conventional beet production. Where no wild populations exist, the scenarios discussed by (Schafer *et al.*, 2011; Wegier *et al.*, 2011) will not occur. In California, where wild beets do occur, the only remaining sugar beet-producing region is the Imperial Valley. In Imperial Valley, the climate is so hot and dry, wild beets only grow in cropland and irrigation ditches. APHIS discusses the likelihood of gene flow from sugar beet to wild beet in sections III.B.5 and IV.B.5 of the FEIS.

Comment: Should growers not be allowed to plant Roundup Ready sugar beet, weed control will have to be done using conventional herbicides that, when compared to glyphosate, are generally more harmful to wildlife, fish, humans and our environment.

Response: This comment is consistent with the analysis in the EIS.

Comment: Based on the crops produced where sugar beet is grown in North Dakota and Minnesota, there is no issue of cross-pollination since sugar beet and none of its relatives are grown for seeds in these states. In areas where beets or its relatives are grown for seeds, literature suggests that it will be unlikely for pollen from a foreign source to penetrate the pollen cloud and successfully pollinate an unintended crop especially when the isolation distances are followed. Further, the use of mainly (85%) cytoplasmic male sterile plants to carry the roundup resistance gene (H7-1 trait) will further reduce the possibility of accidental cross pollination and transfer of the H7-1 trait.

Response: This comment is consistent with analysis in the EIS.

Comment: Because sugar beet are slow to emerge and develop a canopy, early season weed competition can result in significant yield reductions (Wilson *et al.*, 2001)Therefore, sugar beet growers have learned to rely on two important weed management techniques: 1) apply postemergence herbicides when weeds are less than two inches tall, and, 2) to retreat at weekly intervals until weeds die and the canopy can provide weed control. Failure to follow these parameters results in crop yield reductions or added costs for hand labor to remove weed escapes (Kniss, 2010; Wilson *et al.*, 2011).

Growers relied on treating sugar beet early and often with conventional herbicides, these principles also proved to be effective when growers began using glyphosate. Early weed control experiments with glyphosate demonstrated that treating small weeds was more effective than treating 10-inch weeds, and, that applying two applications of glyphosate at two week intervals improved common lambsquarters and pigweed control over that achieved with a single glyphosate application or two applications extended over a four

week interval (Wilson Jr *et al.*, 2002). Growers have demonstrated that the concept of treating small weeds and treating often until sugar beets develop a canopy prevents weeds from shading the crop. In addition, weeds that may have been injured with a single application of glyphosate can usually be killed when a second treatment follows in two weeks. Postemergence applications of glyphosate have not injured the sugar beet plant, which has resulted in faster canopy development while conventional herbicides caused injury that stunted the crop and increased the time from emergence until row closure. Therefore, most sugar beet growers have found they can achieve excellent weed control with two timely applications of glyphosate.

In contrast, the micro-rate herbicide "cocktail" of conventional herbicides associated with weed control techniques for conventional sugarbeets required grower perseverance and patience, and presents many downsides in weed control compared to glyphosate-resistant sugarbeet. The cocktail used by most growers consists of a combination of Betamix, UpBeet, Stinger and methylated seed oil adjuvant. For the cocktail to work effectively, herbicides had to be applied sequentially with the first application beginning as soon as weeds began to emerge and were one inch or less. Weeds injured, but not killed by the first treatment, needed to be treated in five to seven days or they would recover and become a weed escape. In addition, a second flush of weeds would emerge and require the initial herbicide treatment to be applied again. This process could continue for four to six weeks and require three to four herbicide applications. If there was sufficient wind or rain to delay treatments, weed control suffered.

Most growers utilized specialized band sprayers to apply a seven to ten inch band of spray over the crop row; sprayers could cover 12 to 24 rows and travel at speeds of four to five mph. In comparison, glyphosate is applied as a broadcast spray with sprayers that cover 40 to 60 feet and can travel at five to 10 mph.

The effects of the conventional cocktail to sugarbeet was influenced by air, temperature and sunlight. If growers applied the cocktail in the early morning and midday temperatures rose to above 80º to 90º F, severe crop injury could occur. To avoid injury, growers started spraying in the late afternoon when air temperatures began to decline. Therefore, a grower farming several hundred acres of sugarbeets would spend most of their afternoons and evenings during May and June spraying sugarbeets. With glyphosate, the time spent spraying sugarbeets declined dramatically. In addition, glyphosate can be applied in the morning when temperatures are cooler, winds generally calm, and weeds are more susceptible to herbicide uptake, without concerns of later day weather. Growers using the conventional weed control had to take special precautions for the variability of weather and spend more time and resources in application of these less environmentally-friendly herbicides. Growers would find it difficult and expensive to return to this outdated technology

Growers have strong economic incentives to utilize properly their glyphosate-resistant sugar beet cropping systems, and their actions reflect this. Sugar beet growers and processors have established funds to support research and extension activities on weed resistance. Western Sugar Cooperative sponsors grower meetings at multiple locations in their growing regions to provide every grower the opportunity to discuss industry issues and learn about new research developments. Researchers from Colorado, Nebraska, and Wyoming, in cooperation with Monsanto, are developing region-specific technology usage

guides to address weed management in cropping rotations that include sugar beet. Guides will provide regional and weed specific (kochia, common lambsquarters and pigweed) recommendations for corn, small grains, dry beans, and sugar beet, therefore enhancing the benefits of crop and herbicide rotations.

The Benchmark Study was conducted over a four-year period on 155 farms, across six states, with a minimum of 40 acres per farm. Results from this study demonstrated two important concepts in regard to glyphosate-resistant (GR) crops (Wilson Jr, 2009). First, weed control is improved by rotating GR crops, compared to continuous cropping of GR cotton and soybean. Second, weed management is improved by adding a herbicide at planting with a different mode of action than glyphosate, or by combining glyphosate applied postemergence with another herbicide.

The results from the Benchmark Study clearly relate to sugar beet. Even when sugar beet are grown in rotations that include other GR crops, the rotations usually contain non-GR crops that introduce herbicides with different modes of action. In GR crops, growers are progressing from only using glyphosate and are applying conventional preemergence herbicides at planting and mixing other herbicides with glyphosate when the herbicide is applied postemergence. This all points to the conclusion that GR sugar beet are sustainable with crop rotation and utilization of herbicides with different modes of action than glyphosate. These techniques also reduce the potential for weeds becoming resistant to glyphosate (Wilson Jr, 2009).

In the EA, APHIS fails to address the ramification of Alternative 1 on sugar beet growers' ability to participate in NRCS-sponsored programs.

Extensive early season preplant tillage associated with conventional sugar beet production has resulted in wind and water erosion in many sugar beet growing regions. During the 2002 growing season in Idaho and the 2007 growing season in Nebraska and Wyoming, 25 to 35% of the sugar beet acreage was replanted due to wind erosion and lack of soil moisture.

Approval of H7-1 sugar beet has allowed sugar beet growers to change their tillage practices over the past two years. Growers have reduced preplant tillage and moved to cropping systems that incorporate no-tillage, strip-tillage, and planting into small grain cover crops. The movement away from preplant tillage which contributes to soil erosion and loss of soil moisture has allowed sugar beet growers to meet specific conservation requirements in NRCS programs. Growers who participate in NRCS programs are required to develop a conservation plan for their farms that must be approved by NRCS. Growers have designed their plans around the utilization of H7-1 sugar beet and subsequent use of glyphosate for weed control which has allowed for a reduction in tillage.

If sugar beet growers are required to revert to conventional sugar beet herbicides, preplant tillage will be needed for herbicide (Nortron or RoNeet) incorporation and growers risk failing to meet the NRCS requirements in their conservation plan. Without an approved conservation plan, growers risk losing conservation compliance and eligibility for commodity, conservation, and disaster payments (2008 Farm Act). (APHIS-2010-0047-3850)

Response: APHIS has reviewed the information provided by the commenter and included it in the FEIS in sections III.B.1.c and IV. B.1.c, as appropriate.

Comment: A significant finding of the benchmark study on glyphosate-resistance management, in which I (Robert Wilson) was involved as a principal researcher, was the integration of soil residual herbicides preemergence to the planting of the GR crops (Wilson *et al.*, 2011). Residual herbicide use in GR corn, cotton and soybean has been the primary academic recommendation to provide improved consistency of weed management, especially early-season control to deter the evolution of GR weed species.

For sugar beets, cycloate, EPTC, ethofumesate, dimethenamid-P, S-metolachlor, and pyrazon provide soil residual properties. The most widely used soil residual herbicide in sugarbeet is ethofumesate, which can be applied at the time of planting and may be positioned in soil with rainfall or irrigation to provide control of pigweeds, lambsquarters, nightshade and kochia.

Ethofumesate is an important tool available to sugar beet growers for GR weed management. Recent experiments conducted by (Wilson Jr and Sbatella, 2011) demonstrate its utility for late-season weed control in GR sugar beet. Sugar beet growers can provide diverse GR weed management by utilizing a herbicide at planting with soil residual characteristics, followed by tank mixtures of postemergence herbicides with different modes of action after weed emergence.

I would like to reiterate that herbicide-resistance does not eliminate a herbicide's usefulness. Two GR weeds have been reported in Nebraska, horseweed and giant ragweed. Yet, over 10,000,000 acres of GR crops were planted in Nebraska in 2010 and treated with glyphosate. Growers continue to find value in the technology by managing weeds using herbicides with multiple modes of action, crop rotation and tillage. (APHIS-2010-0047-3850)

Response: APHIS concurs and has reached the same conclusion. (Wilson Jr and Sbatella, 2011) is reviewed and discussed in the FEIS.

Comment: The DEIS also mentions the potential for wild beets to crossbreed with H7-1 beets in California, but says that more studies are needed to determine what those effects might be. APHIS needs to conduct those studies before deregulating H7-1 beets. Without further explanation, APHIS cannot abandon the issue of wild beet contamination with its conclusion that "no gene flow is expected to occur from H7-1 sugar beets to wild beets."

Response: APHIS did not conclude in the DEIS that more studies are needed to determine what effects might be if wild beets were to cross-breed with H7-1. APHIS thoroughly analyzed the available data, and is confident in its conclusion that no gene flow is expected to occur to *B. macrocarpa* (see sec. IV.B.5 of the FEIS). Furthermore, APHIS has discussed what the effects might be in the remote chance that introgression of the H7-1 trait does occur into *B. macrocarpa or B. maritima* (see sec. IV.B.5 of the FEIS).

On July 7, 2011, Don Huber, Professor Emeritus Purdue University, met with Catherine Wotecki, USDA Under Secretary for Research Education, and Economics; Gregory Parham, USDA-APHIS Administrator; and Dr. Steven Kapps, Senior Advisor for Animal Protection and Production in the Office of the Chief Scientist. During the meeting, Dr. Huber raised a number

of concerns with the use of glyphosate and GR crops and further articulated his concerns in a letter dated July 31, 2011. APHIS is using this response to comment on the sugar beet EIS to respond to the issues raised by Dr. Huber that pertain to H7-1 sugar beet, as noted below:

Comment: The current crop and animal production environment is NOT normal and NOT sustainable! We are experiencing an escalating incidence of crop, animal, and human diseases, the emergence and reemergence of diseases once rare or under practical control, and new diseases previously unknown to science. There are published scientific studies documenting the intensification, and sometimes direct relationship, of these situations to genetically engineered (GMO) crops and/or the products they were engineered to tolerate. The wide spread epidemics experienced in recent years of Fusarium root rot and head blight of cereals, take-all of cereals, stalk rot and ear rots of com, sudden death syndrome of soybeans, high mycotoxin levels in crops, and an increase in numerous other plant diseases are just a few examples of debilitating conditions recently experienced in production agriculture (Fernandez et al, 2005, 2007, 2008, 2009; Johal and Huber, 2009; US Wheat and Barley Scab Initiative, 2009, 2010). I am receiving reports of the wide-spread incidence of Goss' wilt of corn for the third year in a row.

The previously unknown cause of reproductive problems threatening the viability of animal production, presented by the American Cattlemen's Association on July 24, 2001 to the Senate Agriculture Committee (Anonymous, 2002), is consistent with information on and characteristics of the 'newly' recognized electron microscopic sized organism and the impact of glyphosate and GMO crops that are becoming much clearer. The recent Indian Supreme Court finding (AgroNews, 2011) that commercial data submitted on the safety of genetically modified crops failed to meet internationally accepted standards for toxicological assessment highlights the need for independent, objective evaluation of this program for pest control. Although there is a significant body of critical research that has not been conducted in this regard, there is a growing list of scientific, peer-reviewed papers documenting serious safety issues with glyphosate at levels many times lower than permitted in the foods we consume and feeds fed our animals that are consistent with animal and human health and disease issues that are documented in practice (Antoniou et al, 2010, 2011; Aris and Leblanc, 2011; Benachour et al, 2007; Chainark, 2008; EFSA, 2007; Gasnier et al, 2009, 2010; Mazza et al, 2005; Paganelli et al, 2010; Pusztai and Bardocz, 2007, 2010; Ran et al, 2009; Schefers, 2011; Schubbert, et al, 1998; Seralini et al, 2009, 2010, 2011; Sharma et al, 2006; Tudisco et al, 2010; de Vendomois et al, 2009; Walsh et al, 2000)."

Glyphosate is a strong metal chelator that immobilizes essential plant nutrient elements (Bernards et al, 2005; Glass, 1984; Jolley et al, 2004; Lundager-Madsen et al, 1978; Martell and Smith, 1974; Motekaitis and Martell, 1985; Nilsson, 1985; Ptaszynski and Zwolinska, 2001; U.S. Patent Office, 1964) to reduce physiological efficiency and increase susceptibility of plants to disease (Bramhall and Higgins, 1988; Ganson and Jensen, 1988; Hornby et al, 1998; Keen et al, 1982; Johal and Rahe, 1984, 1988, 1990; Johal and Huber, 2009).

This broad-spectrum herbicide is also a very strong, but selective, biocide that inhibits and is toxic to many beneficial soil microorganisms responsible for plant nutrition and natural disease control, while stimulating soilborne plant pathogens and their synergists (Boyette,

et al, 2006; Dick and Lorenz, 2006; Fernandez et al, 2005, 2006, 2008, 2009; Huber and McCay-Buis, 1993; Huber et al, 2005; Huber, 2010; Kremer and Means. 2009; Kremer et al, 2000, 2005; Lanen et al, 2009; Larson et al, 2006; Levesque and Rahe, 1992, 1993; Levesque et al, 1987; Liu et al, 1995, 1997; Lorenz et al, 2008, 2009; Means et al, 2007; Mekwatanakarn and Sivasithamparam, 1987; Motavalli et at, 2004; Sanogo et al, 2000, 2001; Smiley et al, 1992; Yang, 2010; Zobiole et al, 2010).

Mineral nutrients function in plant metabolism and as plant constituents, and there is a close relationship of mineral nutrient sufficiency with disease resistance (Datnoff et al, 2007; Englehard, 1989; Huber, 1980; Huber and McCay-Buis, 1993; Huber and Haneklaus, 2007; Johal and Huber, 2009). As a strong micronutrient chelator, glyphosate reduces the physiological efficiency, uptake, and translocation of manganese and other essential nutrients in the plant and seed (Bellaloui et al, 2009; Cakmak et al, 2009; Gordon, 2007; Eker et al, 2006).

It is the strong chelating ability of glyphosate that makes it a broad-spectrum herbicide by inhibiting enzymes such as EPSPS in the shikimate pathway and other enzymes (Ganson and Jensen, 1998) that are important for plant resistance to soilborne pathogens (Rahe et al, 1990; Schafer et al, 2009, 2010). Thus, glyphosate's herbicidal mode of action is through increased disease susceptibility (Rahe and Johal, 1984, 1988; Rahe et al, 1990; Schaffer et al, 2009, 2010). Genetically engineered plants that are tolerant of glyphosate contain the bacterial EPSPS-II gene and various other genes to maintain some tolerance to the soilborne fungal pathogens that kill normal plants.

Plants genetically engineered to contain the EPSPS-II bacterial gene are less efficient in the uptake and utilization of micronutrients even in the absence glyphosate that adds an additional stress on the plant and produces a 'yield drag' (Benbrook, 1999; Dodds et al, 2002; Gordon, 2006, 2007; Zobiole et al 2010e). Since there is nothing in the glyphosate-tolerant plant that affects the chelation of micronutrients by glyphosate, the application of glyphosate also reduces the uptake, utilization, and bioavailability of micronutrients to impair photosynthesis, water use efficiency, amino acid metabolism, nodulation, nitrogen fixation, and nutrient value of Roundup Ready® plants (Hernandez et al, 1999; King et al, 2001; Purcell et al, 2000, 2001; Reddy et al, 2000; Zobiole et al, 2010a, b, c, d, e, f, g, h, 2011a, b, c).

Glyphosate is systemic in the plant, accumulates in meristematic tissues (growth points and reproductive structures), and is exuded from roots into the soil to damage adjacent or subsequent crops (Coupland and Caseley, 1979; Kremer et al, 2005; Reddy et al, 2003, 2004; Rodrigues et al, 1982). The strong chelating ability of glyphosate with mineral nutrients, and absorption in clay lattices (Farenhorst et al, 2009), inactivates glyphosate in most soils; however, this chelating detoxification may take several days or weeks and the chelated compound may persist in soil for a considerable time to be desorbed later as an active compound damaging to plants and microbes. The French Supreme Court ruled in 2009 that claims of biodegradation of glyphosate (as contained in the U.S. label) constituted fraud.

Glyphosate residues in seed and plant tissues significantly damage seed germination and subsequent plant growth (Barker, 2010) as well as produce a toxicological hazard for animals and humans (Antoniou et al, 2010. 2011; Benachour et al, 2007; Chainark, 2008; EFSA, 2007; Gasnier et al, 2009, 2010; Mazza et al, 2005; Paganelli et al, 201 0; Pusztai and Bardocz, 2007, 2010; Ran et al, 2009; Schefers, 2011; Schubbert, et al, 1998, Seralini et at, 2009,2010, 2011; Sharma et al, 2006; Tudisco et al, 2010; de Vendomois et al, 2009; Walsh et al, 2000). Dr. Hanna Mathers, Ohio State University, has documented that glyphosate can accumulate in perennial plants for years. Glyphosate can drift during application and soil residues can be desorbed and damage adjacent or subsequent crops in the rotation at extremely low concentrations (Bott et al, 2011; Eker et al, 2006; Farenhorst et al,2009; Laitinen et al, 2005; Neumann et al, 2006; Tesfamariam et al, 2009).

Mineral nutrients are not only essential for plant growth and function, but plants are also the source of minerals essential for animal and human nutrition. Glyphosate significantly reduces the content and bioavailability of mineral nutrients in feed and food (Bellaloui et al, 2009; Bott et al, 2008; Cakmak et al, 2009; Gordon, 2006; Zobiole et al, 2010b, d, g) to create functional mineral deficiencies in plants, animals and people fed the low mineral-available plant constituents. Glyphosate residues in feed and food products could also directly reduce mineral bioavailability on ingestion of this strong mineral chelator (Barker, 2010). Transmission of the gene from feed to animals is a well-documented phenomena with unknown consequences (Brown, 2000; Chainark, 2008; EFSA, 2007; McAfee, 2003; Pusztai and Bardocz, 2007, 2010; Ran et al, 2009; Schubbert et al, 1998, Seralini et al, 2009, 2010, 2011; Sharma et al, 2006; Tudisco et al, 2010). Thus, residual glyphosate in seed, and gene transfer (flow) in feed, food, and the environment constitute serious production and toxicological concerns for food and feed safety.

There has been a growing incidence of disease in animal production programs (especially cattle, dairy, and swine) associated with low manganese or other micronutrients. Manganese is essential for proper liver function and deficiencies are associated with increased infectious diseases in general, bone and tissue deformities, reproductive failure, and death (Dunham, 2010). Cakmak (2009) reported a 45% reduction of manganese, iron, and other essential nutrients in Roundup Ready soybean seed when plants were treated with glyphosate. The reduced bioavailability and content of manganese and other micronutrients in feed and food grown under glyphosate weed control programs has led to an increased need for mineral supplementation in animal rations. Veterinarians have documented manganese deficiency in new beef and dairy herds this year in Northern Iowa even though educational programs have been alerting producers to the increased need for supplementation. Loss estimates of dairy replacement heifers at birth are now 8-11 %, with the primary cause generally attributed to poor manganese uptake or excess selenium (Dunham, 2011; Schefers, 2011).

There is a serious lack of research on effects of glyphosate (Roundup®) on production, diseases, nutritive value or chemical residues with Roundup Ready alfalfa. Glyphosate is known to affect all of these factors negatively. Alfalfa, a legume, is our fourth most important agricultural crop and is produced in all of the states; however, it's profitable production is dependent on efficient fixation of atmospheric nitrogen through e symbiotic relationship with soil bacteria (Rhizobiaceae) and genetic resistance to another plant

pathogenic bacterium, *Clavibacter michiganense insidiosum*. A general decline in nitrogen fixation of beans, lentils, peas, and soybeans has been observed since the introduction of glyphosate herbicide. The application of glyphosate to leguminous plants inhibits nitrogen fixation in two ways: 1) glyphosate translocated to weed or RR crop root tissues and in root exudates is toxic to the *Bradyrhizobium*, *Rhizobium*, and other soil-borne bacterial species in the soil that are associated with root tissues that synergistically fix nitrogen for the plant to use physiologically for amino acid and protein synthesis (Zablotowicz and Reddy, 2007; Zobiole et al, 2010 a, h, 2011) and 2) by physiologically immobilizing both nickel and manganese in root tissues that are required by the bacterial and plant enzymes involved in nitrogen fixation (Purcell et al, 2000; Purcell, 2001; Zobiole et al, 2010a, b, 2011). A consequence of reduced nitrogen fixation is lower production efficiency and low nutritive value (amino acid and protein content) for animal or human food. Reduced N, P, K, Ca, Mg, S, B, Cu, Fe, Mn, and Zn have been found in Roundup Ready alfalfa compared with normal alfalfa, and lower nutrient content of soybeans and corn are also reported (Bellaloui et al, 2009; Bott et al, 2008; Cakmak et al, 2009; Eker et al, 2009; Gordon. 2006; Ozturk et al, 2008; Zobiole et al, 2010b, d, g) to contribute to the increased disease, infertility, and reproductive failure in animals that is being commonly observed unless supplemental minerals are supplied in the ration to compensate for the reduced levels in crops produced under glyphosate and or GMO weed management practices .

Profitable alfalfa production was very limited until genetic resistance to the wide-spread *Clavibacter michiganense insidiosum* causing bacterial wilt was developed. This organism occurs world-wide and is an extremely damaging pathogen of non-resistant alfalfa. Research in 2009 and 2010 demonstrated the loss of genetic resistance of Roundup Ready corn hybrids to Goss' wilt (*Clavibacter michiganense nebraskensis*), a very closely related bacterium and disease to alfalfa bacterial wilt, when the surfactant or glyphosate formulations were applied directly to the plant. Goss' wilt, a previously very localized and limited disease, has occurred in epidemic proportions in wide-spread areas of the Midwest the past two years and has already been diagnosed in broad areas of Iowa this year. The loss of genetic disease resistance, productivity, and reduced nutrient value could strike a mortal blow to struggling U.S. dairy and beef operations dependent on this most valuable forage for herbivores. The newly recognized electron microscopic-sized organism causing reproductive failure in animals has been prolific in Goss' wilt infected corn to raise serious concerns for the safety of glyphosate treated Roundup Ready® alfalfa.

New electron microscopic-sized 'organism' causing infertility and miscarriage in animals.

There has been a noticeable increase in reproductive failure and fetal losses in the Midwestern U.S. since 1998-2000, just a few years after the introduction of Roundup Ready® crops and the subsequent increase in glyphosate useage and exposure. This entity was only discovered after exhaustive searches for the cause of infertility, pseudopregnancies, and miscarriage (spontaneous abortions) that could not be attributed to any other known cause of these reproductive failures in animals. It now threatens the viability of cattle, dairy, equine, swine, and poultry production (Anonymous, 2000; Scheffeer, 2011). It is estimated that as high as 10-11 % of producers are experiencing this problem with some being forced into bankruptcy or switching to crop production because of it. The frequency of reproductive failure is increasing in all animal species.

After ruling out all previously known causes of reproductive failure, and a thorough and exhaustive search for the etiologic agent, a very small suspect agent was identified in 1998 in aborted placenta and fetal tissue with an electron microscope at 38,000 X magnification. The organism was eventually isolated and cultured on a defined agar medium – initially in conjunction with larger microorganisms such as gram positive bacteria – and later in pure culture. Pure culture inoculum was then used to test Koch's postulates to establish this organism as the etiologic agent causing reproductive failure. It can prevent pregnancy, kill a fertilized egg early to produce a pseudopregnancy, or induce a mid- to late term miscarriage later in pregnancy. Injection into a fertilized chicken egg for instance, kills the developing embryo within 24-48 hours. Detailed examination of aborted (miscarried) fetuses and placenta for the newly recognized organism has shown its presence in all of the cases examined to date. In animals, it has been identified in placental tissue, amniotic fluid, fetal tissue, stomach contents, semen, eggs, manure of several animal species, and milk from dairies feeding distillers protein.

An intense search for the inoculum source for animal infection led the scientists to soybean meal in the animal ration as a major source of the organism. It occurs in high populations in soybeans -, especially if infected with sudden death syndrome (SDS) caused by the soilborne fungal plant pathogen, *Fusarium solani* fsp. *glycines*. The organism has been identified in the mycelium of this *Fusarium* species that infects the roots of soybean plants, and subsequently in leaves and seed of plants symptomatic for SDS. The organism has been observed in soil; fungal mycelia; soybean leaves, seed and meal; various corn tissues – especially those with Goss' wilt; distillers meal; and fermentation feed products (corn silage, haylege, wheatlage, etc.). The 'new' organism is in very low concentrations or absent from the non-GMO plants and grain samples evaluated to date. Animal miscarriages have been identified from lA, IL, KY, MI, MO, NE, ND, SD, and WI.

Characteristics of the 'organism:'

The organism is very small and is seen only with a transmission or scanning electron microscope at 25,000-50,000 magnification. It is pleomorphic depending on the media and environment, varying from small spore-like entities to filamentous growths appearing to originate from the somewhat small spherical bodies. Cultural characteristics under the EM resemble mold growth with filamentous and spore-like growths produced. It can be cultured on defined agar media and produces both general forms of growth depending on the media and environment. High energy X-ray analysis (XRF and XANES mapping) of concentrated growth removed from an agar media surface showed a generally uniform mineral composition consisting of (in decreasing order) iron, zinc, potassium, manganese, and a small amount of calcium generally evenly distributed throughout the amorphous mass analyzed, typical of living material. This 'organism' does not appear to 'fit' into any of the known taxons although we are awaiting results from molecular sequencing and other analyses for this purpose.

Potential interactions of the 'new' organism with glyphosate:
Increased severity of plant diseases after glyphosate is applied is well documented and, although rarely cited, increased disease susceptibility is the herbicidal mode of action of glyphosate (Johal and Rahe, 1988, 1990; Johal and Huber, 2009; Schafer et al, 2009, 2010).

The loss of disease resistance in Roundup Ready®sugar beets when glyphosate was applied prompted researchers at the USDA sugar beet laboratory to include a precautionary statement in their paper, e.g. "Precautions need to be taken when certain soil-borne diseases are present if weed management for sugar beet is to include post-emergence glyphosate treatments" (Larson et al, 2006). Increased disease severity is documented from glyphosate applied 2-3 years previous to planting a cereal crop (Fernandez et al, 2005, 2007, 2009). Glyphosate also increases the severity of *Fusarium* diseases in other crops in the rotation (Fernandez et al, 2008).

Severe epidemics have occurred the past few years on our three major crops: wheat (take-all root and crown rot, Fusarium root and crown rot, Fusarium head blight and high mycotoxin concentrations), corn (Goss' wilt, Gibberella stalk rot, high mycotoxin concentrations), and soybean (sudden death syndrome -or SDS and Fusarium root rot) where weather conditions were favorable for disease. These diseases were especially pronounced under glyphosate weed management practices and/or with GMO crops. Many producers are finding that production of their primary crops has become unprofitable because of high disease incidence, yet there were isolated fields of non-GMO and non-glyphosate management within all of these epidemic areas where plants remained healthy and productive. These healthy fields had the same rainfall, temperature, and soil conditions as those adjacent to severely diseased fields where GMO or glyphosate management practices were used.

Although most com hybrids have been genetically resistant to Goss' wilt, preliminary research in 2010 demonstrated that the application of glyphosate herbicide or surfactants nullified this resistance and rendered them fully susceptible to this pathogen. This disease was commonly observed in many Midwestern U.S. fields planted to RR corn in 2009 and 2010, while adjacent non-GMO com with the same temperature, moisture and soil conditions had very light to no infections in spite of the high inoculum present in no-till crop residues. Severe infection by Goss' wilt is already reported from wide-spread areas of the Midwest this year. The increased Goss' wilt in 2010 was a major contributor to the estimated almost one billion bushels of com 'lost' last year (based on USDA August estimated yields and actually harvested crop reported by USDA in January) in spite of generally good harvest conditions.

The excessive use of glyphosate, encouraged by RR crops and further development of glyphosate-resistant weeds (Gaines et al, 2010; Johnson et al, 2009), is a major contributor to the increased severity and epidemics of plant and animal diseases, reduced nutrient quality, high mycotoxin levels, and toxic chemical residues we are experiencing in production agriculture. The glyphosate-GMO-weed management system has not been adequately researched for safety, equivalency, or sustainability (Brown, 2000; McAfee, 2003)."

Response: APHIS carefully examined the concern that glyphosate reduces the uptake, translocation, and utilization of essential mineral nutrients, particularly manganese, in both tolerant and non-tolerant plants and seeds. Although a decrease in various mineral nutrients does not in itself constitute harm to plants, APHIS found that studies examining the levels of iron, manganese, and zinc in glyphosate-treated plants have generated conflicting results. There are fewer studies examining other micronutrients; these studies have similarly generated conflicting

results. In some cases, deficits in one or more of these minerals were observed in glyphosate-treated plants, while in other cases deficits were not observed (in addition to the studies cited in the letter, see (Ebelhar *et al.*, 2007) and (Rosolem *et al.*, 2009)). Many of the studies that found mineral deficits measured mineral content shortly after the plants were treated with glyphosate and did not determine whether mineral levels recovered over time. Two greenhouse studies reported a reduction in manganese levels in seed of glyphosate-tolerant and non-tolerant soybeans treated with glyphosate many weeks earlier at the full or 1 percent of the typical label rate, respectively (Cakmak *et al.*, 2009; Zobiole *et al.*, 2010). Importantly, results of greenhouse studies may not reflect actual field situations. Indeed, two separate field studies have found no reduction in manganese levels after glyphosate-tolerant soybeans were treated with glyphosate at standard label rates (Ebelhar *et al.*, 2007), (Vyn *et al.*, 2010)). A third field study found a reduction in iron levels in seeds of non-tolerant soybeans treated with glyphosate at one-eighth typical label rate; the extent of reduction decreased as the time since treatment increased, and reduced exposure to glyphosate had no effect on the non-tolerant soybean yield (Bellaloui *et al.*, 2009). APHIS is not aware of any studies that demonstrate deficits in mineral nutrients in glyphosate-tolerant alfalfa, and none of the references provided by Dr. Huber report such studies. In summary, the currently available evidence does not support the conclusion that exposure to glyphosate leads to meaningful decreases in manganese or other mineral content in glyphosate-tolerant or non-tolerant plants.

Regarding concerns about relationships between glyphosate, glyphosate-tolerant plants, and increased incidence or severity of various plant diseases, exposure to glyphosate—like exposure to other herbicides—can increase the susceptibility in non-tolerant plants to disease. The weight of evidence indicates that glyphosate likely does not cause increased disease susceptibility in glyphosate-tolerant plants. While initial studies in the greenhouse did indicate that glyphosate-tolerant sugar beets might be more susceptible to root rot (Larson *et al.*, 2006), no such increased susceptibility was observed in subsequent field studies (Larson, 2010). The suggestion that there has been an increased incidence of specific diseases of wheat, corn, and soybean over the last few years, and that this increase is associated with glyphosate-tolerant crops and/or the use of glyphosate management practices is not supported by the data and references noted in the Huber letter. Our assessment of the studies referenced on non-tolerant wheat and barley production agrees with the assessment of the authors (Fernandez *et al.*, 2005; Fernandez *et al.*, 2009); the association they observed between previous glyphosate use and Fusarium Head Blight in these crops is very small and the data do not establish a cause-effect relationship between glyphosate use and plant disease. A more recent study specifically designed to test for such a relationship found no increase in disease in non-tolerant wheat or barley grown in rotation after glyphosate-tolerant soybeans that had been treated with glyphosate (Berube *et al.*, 2012). In sum, the weight of currently available evidence does not indicate that glyphosate treatment leads to greater disease in glyphosate-tolerant crops or in subsequent non-tolerant crops planted in rotation.

The concern that glyphosate use leads to reductions in nodulation and nitrogen fixation in glyphosate-tolerant legumes is also not supported by the weight of evidence. While laboratory studies indicate that the growth of certain nitrogen-fixing bacteria is inhibited by glyphosate and initial greenhouse studies demonstrated reductions in nodule number and/or mass per plant in glyphosate treated as compared to untreated glyphosate-tolerant soybeans, the observed reductions were neither strong nor consistent and in many cases were accompanied by decreases in root and/or shoot mass such that there was no difference in nodulation when normalized to

mass. Moreover, more recent studies in both the greenhouse and the field have found no or only minor reductions in nodulation or nitrogen accumulation in glyphosate-tolerant soybeans treated with glyphosate (Reddy and Zablotowicz, 2003; Zablotowicz and Reddy, 2007; Bellaloui *et al.*, 2008; Bohm *et al.*, 2009; Powell *et al.*, 2009). When minor reductions in nitrogen content did occur after treatment with typical label rates of glyphosate, there was no negative effect on yield. APHIS could find no support for the statement that there has been a general decline in nitrogen fixation in leguminous plants since the introduction of glyphosate as an herbicide.

Dr. Huber raised a number of concerns about negative effects on animal health resulting from the use of glyphosate and/or glyphosate-tolerant crops in production agriculture. First, it was mentioned that reduced mineral levels in feed derived from plants exposed to glyphosate, particularly reduced manganese levels, create "functional mineral deficiencies" in animals unless supplemental minerals are provided. Dr. Huber stated that these mineral deficiencies contribute to increased disease, infertility, reproductive failures, and developmental deformities in animals. Mineral deficiencies are known to result in the types of problems described. Indeed, mineral deficiencies in feed, including manganese deficiency in soy- and corn-based feeds, have been known for many years prior to the widespread use of glyphosate (Scheffers, 2011). As noted, problems created by such deficiencies can be corrected by providing supplemental minerals in the feed. Moreover, as discussed above, the weight of evidence does not support the conclusion that glyphosate use is resulting in mineral deficiencies in glyphosate-tolerant or non-tolerant plants that are used for animal feed. Second, it was stated that glyphosate residues in food and feed products could directly reduce mineral bioavailability upon ingestion. APHIS could not find, and Dr. Huber did not provide, any evidence to support this statement. Third, it was stated that glyphosate residues in seed and plant tissue produce toxicological hazards for animals and humans. EPA has determined that glyphosate may be classified as either a Category III (slightly toxic) or Category IV (practically nontoxic) substance and is of low acute toxicity by oral, dermal, inhalation, and ocular routes of exposure (U.S. EPA 1993). In EPA's most recent human health dietary risk assessment, an acute analysis was not conducted for lack of an acute toxicity endpoint, and chronic dietary risks were not of concern. EPA has also classified glyphosate as not likely to be a human carcinogen. EPA's most recent ecological analysis has also shown glyphosate to be of low risk to birds, mammals, terrestrial invertebrates, and aquatic organisms. EPA is currently re-evaluating risks from glyphosate to humans and the environment as part of its registration review of glyphosate (US EPA, 2009). Fourth, regarding the concern about potential negative consequences of gene transfer from feed to animals, APHIS and the U.S. Food and Drug Administration (FDA) have previously addressed this issue (e.g., (FDA, 1998; USDA-APHIS, 2009)).

Dr. Huber raises a specific concern about an association between the introduction of glyphosate-tolerant crops and the emergence of a newly identified pathogen that can cause infertility and miscarriage in animals. It was implied that the organism is highly associated with GE glyphosate-tolerant crops, especially when they are infected with other pathogens. Although the letter includes a number of summary statements and conclusions, APHIS was not provided with any actual data concerning this alleged pathogen nor even the names of any scientists involved in its study. APHIS can make no conclusions about the existence of this organism, its distribution, its association with GE crops including glyphosate-tolerant crops, or its effects on animals in the absence of actual data. APHIS welcomes the opportunity to review and evaluate any documented

data concerning the referenced microorganism, particularly: methods and results of diagnostic tests and histological examinations of sample materials; data establishing that the organism is an infectious agent and establishing its effects on animals; and epidemiological or ecological data that identify plant hosts, exposure pathways, distribution, and history associated with the organism sufficient to establish causal links between glyphosate-tolerant crops and the presence of the organism in plants and plant products.

In addition, Dr. Huber raises the concern that glyphosate applied to glyphosate-tolerant crops can, at low concentrations, cause damage to adjacent non-tolerant crops or to subsequent crops grown on the same land. It was stated that glyphosate could be exuded from the roots of treated plants into soil, and then be taken up by the roots of adjacent plants. Glyphosate exudation from the roots of treated plants is well established. However, in the experiments cited by Dr. Huber, the non-tolerant plants were located inches away from the treated plants. This situation is not relevant to most agricultural contexts, and glyphosate application would be precluded if a non-tolerant crop is closely interplanted with a tolerant crop.

Dr. Huber also states that glyphosate can persist in the soil and later be desorbed from soil particles and taken up by plant roots and, in this way, could provide a mechanism by which subsequent crops might be exposed to low levels of glyphosate. APHIS carefully considered this route of exposure. Experimental data indicate that glyphosate residues can be desorbed from soil, particularly if phosphorus fertilizer is added to the soil. Not unexpectedly, as noted above, research also indicates that low-level exposure to glyphosate can have adverse effects on non-tolerant plants. However, the amount of glyphosate that would become available to plants via desorption from the soil will vary widely from one location to another, depending on factors such as time since application and soil characteristics such as pH and microbial activity (Borggaard and Gimsing, 2008). It is not clear that soil desorption would result in the exposure of subsequent non-tolerant crops to levels of glyphosate sufficient to cause harm. Moreover, should there be locations where glyphosate persistence and remobilization may pose a problem, proper crop choice and management practices can alleviate potential damage. APHIS is not aware of any reports that clearly demonstrate that the use of glyphosate-tolerant crops and/or glyphosate weed management practices causes negative impacts on non-tolerant crops subsequently grown on the same field. Many herbicides have residual activity and require a period of time before crops can be planted back in the field. In contrast, glyphosate-sensitive crops can be planted into glyphosate-treated fields with no plant-back restrictions (FEIS section III.B.1.d.(3)).

VI Physical

Comment: One commenter stated that APHIS needs to incorporate information from a number of references, including (Battaglin *et al.*, 2005; Battaglin *et al.*, 2009; Chang *et al.*, 2011; Coupe *et al.*, 2011) on the behavior of glyphosate herbicides in water, air, soil, and within plant residues. For example, the commenter indicated that information regarding how frequently glyphosate is found in surface waters near RR crops should be incorporated:

"These recent studies conclude that glyphosate and presumably surfactants are found in most surface water samples when measured after herbicide applications, showing that offsite movement is much more common in areas where Roundup Ready crops are grown than APHIS states. Also, glyphosate is found in air and rain in concentrations higher than more volatile herbicides, against APHIS' predictions based on physical properties, showing the importance of basing risk assessments on real-world data." (APHIS-2010-0047-4435)

Response: APHIS examined the papers mentioned in the comment; all were incorporated into the FEIS. APHIS disagrees that offsite movement is more common than stated in the FEIS. (Coupe *et al.*, 2011) estimated that less than 1 percent of the applied glyphosate moves into surface water. (Battaglin *et al.*, 2005) typically found glyphosate in streams after application at rates below 1 percent of EPA's maximum concentration level (MCL), suggesting "that the concentrations of glyphosate measured in Midwestern streams in 2002 would not be expected to cause harm to wildlife or aquatic organisms." Furthermore, according to (Battaglin *et al.*, 2005), "although glyphosate was found in many samples, other herbicides with similar or less total use in the Midwestern United States, such as acetochlor, atrazine, and metolachlor, were often detected more frequently and at higher concentrations. It is probable that glyphosate is not as mobile and is transformed more rapidly in the environment than these other herbicides." They also found that atrazine exceeded its MCL in 57 percent of premergence samples, acetochlor exceeded its MCL in 25 percent of preemergence samples and 4 percent of postemergence samples, and alachlor and simizine exceeded their MCL in 2 percent of premergence samples. This paper is consistent with the conclusions in the FEIS that glyphosate is not as mobile in the aqueous phase or as toxic to wildlife as other herbicides.

Comment: The district I manage provides irrigation water to over 875 water users located in Goshen County, Wyoming and in Sioux, Scotts Bluff and Morrill counties of Nebraska. These water users irrigate approximately 117,000 acres. Lands served by the District have historically and are currently used to grow sugar beets. They are a very important crop for the irrigators within the District and elsewhere in the area. From my own personal observations, I have seen the use of Roundup Ready Sugarbeet seed and other crops like Roundup Ready Corn make a huge difference in the water demand by these crops. Much of the reduction is due to better control of weeds using glysophate weed control products, reduction in the weed population reduces their competition with crops for water and nutrients. I have also seen first hand the improvements to beet yields and the time and costs associated with harvest. With Roundup Ready seed, the fields are virtually clear of weeds that add to harvest conditions and cost. Many producers I have talked to would not grow sugar beets if it were not for Roundup Ready seed. The loss of this valuable technological advancement could and would have a devastating affect on the economy of the area, which depends heavily upon the sugar beet industry. (APHIS-2010-0047-3403)

Response: APHIS has updated the EIS to incorporate the information in this comment (see sec IV. E.4.a.). .

Comment: I have the right to insure that I am getting the best organic foods for me and my family. RoundUp chemical kills all the beneficial organisms in the soil which promote healthy growth of plants. Therefore the yield is not large as Monsanto claims unless larger quantities of fertilizers are used, which in turn pollute our rivers and streams; our drinking water. GE plants are also more subject to disease than Organically grown crops which are naturallly resistant to local disease due to seed selection and natural survival of the fittest. (APHIS-2010-0047-4383)

Response: APHIS has evaluated H7-1 sugar beets in a PPRA and concluded that these sugar beets are no different with respect to pest or disease susceptibility, yield, or other growth characteristics from other conventional sugar beet varieties, with the exception of resistance to the herbicide glyphosate. APHIS has no evidence to believe that sugar beet growers use a different fertilizer regime for H7-1 and conventional sugar beets, and the commenter has provided no evidence.

Comment: Two growers at the public meeting in North Dakota said that they used less water on H7-1 sugar beets because the application of chemicals on H7-1 sugar beets used less total water:

With Roundup, we are using roughly three less sprays to control weeds. And so just with that, the water we are saving on our farm is roughly 20,000 gallons of less water being used with less applications. Also, that means less diesel fuel being used and less exhaust emitted into the air, which is also good for the environment.

Using Roundup, we only use 5 gallons of water per acre, where before we were using 20 gallons of water per acre on each spray, so that—do the math, that's, that's a lot of water that we're not using and that's beneficial to the environment.

Response: APHIS recognizes that some growers may use less water because the application of glyphosate requires less water than other herbicides used on sugar beets.

Comment: APHIS relies heavily on the anticipated increase in conservation tillage associated with a full deregulation of RRSB as an environmental benefit relative to conventional sugar beet production. However, the DEIS itself shows that APHIS's reliance is misplaced. Even with 95 percent adoption of RRSB from 2009-2010, conservation tillage did not increase substantially. "[I]n the areas with the greatest proportion of acres dedicated to sugar beet production, conservation tillage does not appear to be used widely." (DEIS at 666). The vast majority of RRSB adoption that will occur has already occurred; APHIS's claims of increased conservation tillage and its beneficial effects on soil and air quality are contrary to the record.

Response: APHIS disagrees with the commenter's assertions because APHIS does not rely on growers adopting any particular production practices in the DEIS or FEIS. In some regions, such as the Great Plains and Northwest, strip till and even no till are being used as a result of the adoption of H7-1 sugar beet whereas in Imperial Valley, tillage is used for irrigation purposes and not just for weed control. However in all sugar beet growing areas, growers report using less cultivation to control weeds during the growing season. Overall, there has been a substantial

increase in the use of conservation practices as a result of the adoption of H7-1 sugar beet. This subject is discussed in the FEIS in sections III.B.1 and III.E.2.

Comment: **APHIS examined the question of tillage with respect to glyphosate-tolerant soybeans and found no support for this presumption. A 2010 report from NRCS—USDA's experts on soil erosion—also argues against any meaningful effect of RR crops in promoting conservation tillage: Below, we reproduce a graph of soil erosion on U.S. cropland based explicitly on type of tillage regime. Consistent with and extending further into the past, the ERS data presented above, soil erosion (a proxy for conservation tillage) decreased dramatically in the 15 years before the first RR crop, RR soybeans, were introduced. Interestingly, soil erosion rates level out precisely between 1997 to 2007, the decade that American agriculture made the massive switch to RR soybeans, cotton, and corn. This proves conclusively that the great majority of acreage converted to conservation tillage since 1982 was converted for reasons unrelated to RR crop systems because they simply did not exist when the conversions took place.**

Response: The commenter suggests that APHIS considered the presumption that herbicide-resistant soybeans contribute to conservation tillage, citing a paper prepared by the Economic Research Service (Fernandez-Cornejo and McBride, 2002). While APHIS did not write this paper, the agency read it. The authors conclude that growers who adopt herbicide-resistant crops adopt conservation tillage at higher rates than those growing conventional crops. Likewise, growers who use conservation tillage are more likely to use herbicide-resistant crops than conventional crops. However, the authors were unable to establish a causal relationship based on the data available at the time of the report. However, Givens (2009) concludes that there is a causal relationship.

APHIS asked agronomists at the sugar beet cooperatives if they were aware of conservation tillage being used on sugar beet. APHIS received the following reply from the Ag Manager at Western Sugar Cooperative: "We were probably around the 15 to 20% of the Nebraska beet crop on strip till prior to RR beets. After 4 years of RR beets our growers are using strip tillage on at least 75 – 80% of the beets grown in Nebraska. We also have a small percentage of our acres that are no tilled. Growers wouldn't even attempt this without RR beets!" (Wilson Jr, 2012). APHIS also received a reply from the Director of Agriculture at Amalgamated Sugar Company in Idaho: "With the introduction of H7-1 sugar beets there has been adoption of minimum till practices. It is estimated that minimum till practices were applied to 32,400 acres in 2011. This is out of a planted acreage of 188,486 acres. Before the use of H7-1 there was very little use of minimum till. Growers have also reduced their tillage operations. It was the general practice to cultivate 3 to 4 times per season. With the advent of H7-1 most (80 to 90 percent) cultivate only 1 to 2 times per season" (Schorr, 2012).

The 2010 report from NRCS referred to by the commenter does not discuss tillage (USDA-NRCS, 2010). Therefore, it is not possible to conclude from the report conclusively or otherwise "that the great majority of acreage converted to conservation tillage since 1982 was converted for reasons unrelated to RR crop systems" because the report did not even deal with the topic of tillage. It is a high-level report on erosion from agriculture lands and the changes in erosion as the result of management of highly erodible lands. There are many methods that are used to manage highly erodible lands. However, these methods and their practical adoption are not the focus of the study.

VII Human Health/Animal Feed

Comment: APHIS received comments from a few growers indicating that they have become allergic to chemicals that are used on conventional sugar beets. For example: "I've been growing sugar beets for 25 years. Over the years I became allergic to the chemicals. Round Up Ready Beets has allowed me to continue to be a sugar beet farmer." (APHIS-2010-0047-3684)

Response: It is not clear exactly what is meant by "allergies" in these comments. APHIS discusses the effects of three alternatives on human health, including health effects on workers, in the EIS. APHIS reviewed the information available on herbicides used on sugar beet; the herbicides that cause skin sensitivities are listed in table 3-53 of the FEIS.

Comment: APHIS received several comments from individuals who have concerns about the safety of eating GE foods. The comments do not raise specific concerns about H7-1 sugar beets. They cite concerns about GE foods generally. Commenters made unsupported claims that foods derived from GE crops are responsible for a number of diseases and health concerns, including cancer, Celiac disease, birth defects, organ failure, and food allergies. Several commenters referred to a study on hamsters: "A Russian study done on hamsters showed a marked increase in mortality rate and a decrease in fertility, and complete infertility in the second generation of hamsters fed on GMO foods. At the same time, we see rising infertility rates clinically." (APHIS-2010-0047-3187).

Comment: APHIS assumes that a second study referenced is from (Aris and Leblanc, (2011b): "There was a recent study done in Canada by a team at Sherbrooke University Hospital in Quebec and accepted for publication in the peer-reviewed journal Reproductive Toxicology has found that 93% of blood samples taken from pregnant women, 80% from umbilical cords and 67% of non-pregnant women tested positive for traces of the toxic Bt protein Cry1Ab originating from GM food consumed as part of a normal diet in Canada, where GM presence in food is unlabelled. This shows that the Bt proteins have survived the human digestive system and passed into the blood supply – something that regulators had said could not happen." (APHIS-2010-0047-4292)

Response: APHIS evaluates and describes the effects of the three alternatives on human health in sections III.E and IV.F of the FEIS. APHIS has concluded that there are no human health-related impacts associated with H7-1 sugar beet. APHIS also examined the potential for human health effects associated with changes in management practices under Alternatives 2 and 3. Nothing in APHIS' analysis supports the commenters' assertions.

In addition, no U.S. agency has made an assertion linking GE crops to the presence or increased prevalence of any disease. Furthermore, a report from the European Commission (European Commission, 2011) examines the risk of GE crops and concludes: "The main conclusion to be drawn from the efforts of more than 130 research projects, covering a period of more than 25 years of research, and involving more than 500 independent research groups, is that biotechnology, and in particular GMOs, are not per se more risky than e.g. conventional plant breeding technologies."

Commenters did not provide support for their assertions that GE crops are related to specific diseases and health concerns. Therefore, APHIS cannot evaluate the validity of these statements. Based on the best available scientific evidence, the commenters' assertions are unfounded.

APHIS was unable to locate the Russian study on hamsters that examined mortality and fertility. There are several Internet references to the study, but none provide a link to the actual study. APHIS searched several databases and was not able to identify the paper. The commenter did not provide a copy of the study, so APHIS cannot evaluate it.

APHIS assumes that the study of pregnant women and infant blood is (Aris and Leblanc, 2011a). In that particular study, the Cry1ab protein (a common insecticidal protein introduced into GE crops such as corn) was detected in 93 percent of maternal blood, 80 percent of fetal blood, and 69 percent of blood from nonpregnant women. The subjects of this study all resided in Sherbrooke, an urban area of Eastern Townships of Quebec, Canada. H7-1 sugar beets do not contain the Cry 1ab protein.

In response to the assertion that GE crops are responsible for an increase in food allergies, APHIS discusses both the EPSPS protein and allergens associated with sugar beet in section III.F.1 of the FEIS. As discussed in this section, it has been reported that two allergenic proteins, Beta v 1 and Beta v 2, have been identified in pollen from conventional sugar beet (Luoto *et al.*, 2008).

APHIS also reviewed the data related to allergenicity for the EPSPS protein. As described in the DEIS:

- There are no known reports of allergies or significant pathogenicity to *Agrobacterium* sp., the soil bacterium used as the source of the CP4 EPSPS coding sequence for H7-1 sugar beets and other GR plant lines (Swiss Institute of Bioinformatics, 2011). This bacterium has been known to infect people, but generally only locally (e.g., in tissues surrounding catheters) in immunocompromised patients, as with many other common bacteria (Van Baarlen *et al.*, 2007).
- There is an absence of immunologically relevant amino acid sequence homology between CP4 EPSPS and known allergens, as determined by comparing the CP4 EPSPS' amino acid sequence using the FASTA algorithm to sequences in the ALLERGEN3 database (Monsanto and KWS SAAT AG, 2010) (Hileman *et al.*, 2002) and as confirmed by APHIS using an updated FASTA database, (FARRP (Food Allergy Research and Resource Program).
- The CP4 EPSPS protein is rapidly degraded in *in vitro studies* using simulated gastric and intestinal fluids. Two studies were performed to assess the *in vitro* digestibility of CP4 EPSPS protein. In the first study, the CP4 EPSPS protein was exposed to simulated gastric and intestinal fluids (Harrison *et al.*, 1996). The half-life of the CP4 EPSPS protein was reported to be less than 15 seconds in the gastric fluid, greatly minimizing any potential for the protein to be absorbed in the intestine. The half-life was less than 10 minutes in the simulated intestinal fluid. The second study, conducted under different experimental conditions, reported similar results, as noted in the FDA consultation (U.S. FDA, 2004).

Therefore, the best available scientific information does not support the assertions of the comments that eating food derived from GE crops such as H7-1 sugar beet is associated with an increase in food allergies, reproductive disorders, or other diseases.

VIII Socioeconomic

Comment: Several sugar beet growers and sugar beet cooperatives commented that the cost of complying with the current requirements of the partial deregulation (USDA-APHIS, 2011b) is burdensome. One commenter claimed, "Indeed, the requirement under our APHIS Compliance Agreement to inspect for bolters before bolting and pollination are biologically possible imposed at least 3,750 hours in unnecessary field personnel work on our cooperative in 2011 -a cost of at least $52,500 in hourly time, not including the cost of fuel and mileage, costs that are borne by our grower shareholders." (APHIS-2010-0047-3874)

Response: Permanently adopting the partial deregulation is considered under Alternative 3 in the EIS. APHIS examined the cost associated with compliance agreements and calculated it to be around $2 an acre (see sec. IV.D.1). While many of the commenters felt that the conditions were unnecessary, they did not offer a figure to counter the estimate of $2 an acre. The numbers cited by the commenter are consistent with that figure when inspection costs and fuel costs are included.

Comment: Several sugar beet growers, sugar cooperatives, and employees of related businesses wrote to express a belief that H7-1 sugar beet was needed to keep sugar beet production profitable in their communities. APHIS received several estimates of the value of the sugar beet industry to the local economy of the different commenters. For example:

RRSB is critical to Snake River's and Amalgamated's financial well-being. In 2005, before RRSB technology was available, Amalgamated closed one factory and reduced employment by over 100 employees because of reduced demand for sugar beet acreage caused by poor profitability. In 2008 alone, Snake River lost over 25,000 acres of sugarbeets when numerous members permanently forfeited their shares and instead planted alternative, more profitable, crops. These two events demonstrate that sugarbeet growers compete for limited agricultural acreage in a highly competitive environment.

RRSB made sugarbeets attractive again because they increased grower efficiency while simultaneously reducing growers' per acre operating costs. However, if Snake River's growers are forced to plant conventional seed, the loss of yield and sugar content alone will lead to significant revenue losses- harming not only Amalgamated and Snake River, but its growers, their employees, and the people who depend on the sugarbeet industry. These losses do not even take into account additional costs for conventional sugarbeet herbicide and equipment, labor, and efficiency losses.

Recent experience has shown that, some growers will turn to planting other crops and forfeit their shares in Snake River rather than incurring these additional costs and endure reduced profitability for their sugarbeets. If a grower does so, their forfeited stock is retired in the cooperative system, and cannot be used plant sugarbeets. In turn, Amalgamated's costs for processing sugarbeets increase for all remaining growers - including me. This could lead to the closure of more Amalgamated factories and, possibly, the ultimate closure of Amalgamated and Snake River. (APHIS-2010-0047-3874)

A related business wrote, "IDFA will not comment on such technical matters as the environmental impact of H7- 1 sugar beets. Rather, we would like to highlight on the

negative economic impact that an abrupt withdrawal of H7- 1 sugar beets from the marketplace would have on our $110-billion industry.

Ice cream and dairy products consume 11% of industrial sugar deliveries. Industrial users account for most purchases of sugar in the United States. In fiscal year (FY) 2011, total deliveries (consumption) of sugar by industrial users in the U.S. market were 5,465,737 short tons actual weight. Of this number, dairy accounted for 605,866 short tons or 11%.

Beet sugar derived from H7-1 sugar beets now accounts for most domestically produced sugar. The dairy industry primarily relies upon domestic sugar industry for our needs. Therefore, the impact on both industrial producers and retail consumers of affected dairy products would be substantial and negative. USDA previously estimated that users and consumers of sugar would pay an extra $1.6 billion if H7-1 sugar beet seed could not be planted in 2011. The average price paid by industrial users at wholesale would have risen 24%, according to USDA. Prices are already at record-high levels, largely for other reasons, so this further price rise would look even more dramatic when compared to normal price ranges. Ultimately, these increased costs are reflected in higher prices for consumers. These further price increases would come while U.S. consumers are already stressed by high prices as a result of tight sugar supplies. As such, it will be very difficult to absorb further price increases, thus potentially resulting in significant economic damages and job loss in the sugar-using dairy products industry.

Concluding, IDFA supports alternative 2, full deregulation of H7-1 Sugar beets. Otherwise, the result is likely to be market turmoil, unnecessarily high costs and the loss of jobs and small businesses in an already-stressed U.S. economy. For various reasons, tight supplies are already driving up sugar prices to record levels. In this challenging economic environment, IDFA's sugar-using members can ill afford to incur further cost increases, nor are consumers well-positioned to absorb these costs. IDFA strongly urges APHIS to act decisively in this matter. (APHIS-2010-0047-4192)

Response: APHIS examined the cost of sugar beet production under the three alternatives (see secs. III.D.1 and IV.E.1). APHIS also examined the trends in sugar beet and sugar cane plant closures and identified the decline in the number of farms growing sugar beet (see tables 3-31 and 3-34). The analysis in the FEIS supports the commenter's conclusion that some processing plants are likely to close if they are not profitable, the availability of sugar beet positively contributes to that profitability, and the production of H7-1 sugar beet is more profitable than conventional sugar beet. This profitability comes from lower herbicide costs, lower labor costs, and reduced equipment use.

In addition, the FEIS includes an analysis of the impacts of GR weeds on resistance management costs. If the cost of managing GR weeds was to become high enough that sugar beet was no longer profitable, then growers may choose to grow other crops, thereby reducing the availability of sugar beet and potentially resulting in future plant closures. The cost of weed resistance management is the function of many variables (e.g., weather, weed pressure, chemical and labor costs, and the price of sugar and other crops that compete for acres) and influenced by growers' choices. Therefore, the ultimate effect of weed management on sugar beet plant closures is speculative.

Effects, such as the price of sugar, on food processors that use sugar to produce processed foods are an indirect effect of the impacts of the three alternatives to the sugar beet industry. APHIS

analyzes the effect of each alternative on the availability of sugar beet seed and the cost of sugar beet production in the FEIS. APHIS agrees that decreases in the availability of sugar can increase the costs for sugar and products that are made with sugar. APHIS discusses these impacts in section IV.D.1 of the FEIS.

Comment: We need RR sugarbeets for our farm to be able to grow sugarbeets.They have the diease package's that we need like Aphanomyces, Rhizoctonia, Fusarium, Cercospora. All the good Varieties have these package's built in. There are not enough good non GMO Varieties for the industry to plant. (APHIS-2010-0047-3441)

Response: APHIS describes sugar beet breeding and variety testing in the FEIS. The cooperative determines the availability of varieties based on variety performance in field trials. APHIS discusses the impact of each alternative on the near-term availability of seed in section IV.B.1 of the FEIS.

Comment: APHIS received comments from vegetable beet growers and seed companies. A vegetable beet seed production manager commented that H7-1 trait was identified in some of their seed lots (APHIS 2010-0047-3281), indicating that cross-pollination had occurred between H7-1 sugar beets and some of their vegetable beet seed. This information contradicted information in the EIS, which indicated that the agency was unaware of any cross-pollination from H7-1 sugar beets to vegetable beet seed in the Willamette Valley.

Response: At the time that the DEIS was prepared, APHIS was unaware of the testing done by Universal Seeds. APHIS followed up with the company and has incorporated the information provided by the company into the FEIS in sections III.B.5 and IV.B.5.

Comment: I currently and have for the past 40years grown Swiss Chard for seed, some if not all will be shipped over Sea's to Japan, China, South Africa and Europe to name a few. Most counties DO NOT want GMO containation. As you know Sugar Beets will cross with Swiss Chard. The Beet companies currently stay 3 miles away from my fields but they have planted closer than that in the past few years. They at one point wanted my fields at least 5 miles away and told me to back off, but since they have Sugar beet fields all around my isolation had nowhere to go. I'm grandfathered in here since I've grown Chard for 40 years and my father did before that. Its just a big company trying to push out a smaller one for their own $$$. This year I have 126 acres of Swiss Chard for seed and cannot afford contaminations of GMO into my crop. (APHIS-2010-0047-3220)

Response: APHIS followed up with this commenter via telephone. After discussing the commenter's specific comments, APHIS concluded that the analysis in the FEIS is consistent with the information provided by the commenter.

Comment: My name is Frank Morton. I am an organic seed grower in Oregon's Willamette Valley. I grow both table beet and Swiss chard seed on contract for organic seed companies in the US, Great Britain, Australia, and Canada. These customers do not want to risk buying contaminated seed from the Willamette Valley. Presently, I must pay for genetic testing of all my Beta vulgaris seed crops prior to selling them to my customers, and if I get positive results, that seed will be worthless to me. The reputation of the Willamette Valley has already taken a hit from the perceived risk of purchasing high value beet or chard seed grown here. I know of contracts cancelled due to the avoidable risk associated with Oregon grown seed. The illegal rules adopted by the USDA only allow

transgenic sugar beet seed production in western Oregon...home of a thriving specialty seed industry known for its purity standards. (APHIS-2010-0047-4383)

Response: APHIS notes that the commenter does not claim to have ever had any positive results from the genetic testing of any of his *Beta vulgaris* seed crops, but only comments hypothetically that his seeds will be worthless if he ever gets any positive results. APHIS also notes that though the commenter claims that Willamette Valley has "taken a hit from the perceived risk of purchasing high value beet or chard seed grown here," this grower has elsewhere acknowledged that the value of his seed operations have increased nearly 60 percent since the sugar beet litigation began in 2008 (Morton, 2011). APHIS analyzes the potential effects of the three different alternatives on *B. vulgaris* seed production in the DEIS and FEIS. APHIS specifically considered the impacts of each alternative on growers in the Willamette Valley of Oregon. While sugar beet, table beet, and chard seeds are all grown in this area, sugar beet seed is the primary crop among the three. The commenter's statements regarding contracts and testing are consistent with the analysis in the DEIS and FEIS. APHIS includes a discussion of potential lost contracts for individual growers in the Willamette Valley and an analysis of the cost to growers of testing seed to meet contract specifications in the FEIS. APHIS certainly disagrees with the commenter's characterization of the Willamette Valley growers association's isolation distances "rules" as being somehow illegal or only allowing transgenic sugar beet seed production. None of the three alternatives that APHIS is considering in the FEIS restrict the production of any type of seed other than H7-1 seed. Under Alternatives 1 and 3, specific regulatory permits issued by APHIS are required to produce H7-1 seed.

Comment: If you were to ask me, the organic red beet growers are the ones who need to police their practices more. Every year we find at least 5 red beets in our 205 acres of sugar beets. We have not had a sugar beet bolter since 1996. The growers of red beets are the ones being sloppy and careless in their handling of seed and beets not the sugar beet growers. If roundup ready sugar beets are not deregulated, then you should at least make sure the red beet growers are following our same guidelines. The red beet growers CONTAMINATE our sugar beets every year reducing our sugar content and clear juice purity damaging our income. (APHIS-2010-0047-3766)

Response: APHIS acknowledges the comment. Cross-pollination moves in both directions. Based on the commenter's figure of 5 red beets in 205 acres, the level of cross-pollination between these crops is well below 1 in 10,000 seeds; in fact, it is less than 1 in 1,000,000 seeds. APHIS based its assessment on the assumption that currently used isolation distances were likely to consistently achieve a level of cross-pollination below 1 in 10,000.

Comment: Transgenic sugar beet production poses a risk of contamination to our beet and chard supply. As stated in the Environmental Impact Statement (EIS), sugar beets are wind pollinated and easily cross---pollinate with both table beets and Swiss chard. Because pollen can travel several miles, it is nearly impossible to prevent cross-pollination of crops in an area where there is highly concentrated seed production, such as Oregon's Willamette Valley, where a significant amount of beet seed is grown.

The unwanted spread of genetically engineered traits threatens organic markets and livelihoods. Maintaining genetic purity with proper isolation distances and sufficient testing is difficult. Yet because organic standards prohibit use of genetically engineering, genetic contamination results in marketplace rejection.

Transgenic contamination of conventional sugar beets and conventional and organic table beet and Swiss chard is almost a certainty under full deregulation. With no mandatory measures in place to keep GE and non---GE fields distant enough to prevent contamination, there will be an increased level of gene flow from GE to non---GE fields resulting in contaminated seed.

Oregon and Washington account for over 80 percent of U.S. chard and table beet seed production. This de-regulation will send much of this seed production to other countries, resulting in a loss of a high value specialty market for U.S. growers. Organic farmers should not have to shoulder the whole burden of protecting seed integrity. The genetic polluters should be held liable for contamination. USDA should prohibit the commercial use and planting of Roundup Ready Sugar Beets, unless it can fully protect organic farmers and consumers from unwanted contamination from genetically engineered crops. (APHIS-2010-0047-4543)

Response: APHIS analyzed the impacts that the three alternatives could have on organic vegetable beet growers and discussed the current vegetable beet market in the DEIS and FEIS (see secs. IV.D.4 and III.D.4). APHIS disagrees with the commenter's characterization that "transgenic contamination of conventional sugar beets and conventional and organic table beet and Swiss chard is almost a certainty under full deregulation." APHIS analyzed the likelihood of cross-pollination and concluded that it is a rare (but not absent) event. Given the current practices in the Willamette Valley, APHIS concluded that the likelihood of cross-pollination is less than 1 seed in 10,000 seeds. In areas where sugar beet seed is not grown, the likelihood approaches zero. APHIS does not have the authority to hold anyone liable for contamination. APHIS has not seen evidence for a loss of seed production to other countries. It appears that if vegetable beet seed is less profitable, alternative seed crops are an option to grow for export. APHIS disagrees that the inadvertent presence of GE material in an organic crop constitutes a violation of the organic rule.

Comment: Controls delineated in Appendix A of Appendix D. are not sufficient to protect abutting lands, farmed or fallow or forest or residential garden, from "unauthorized releases" caused by inevitable and unchecked incidents of drift. For example, there needs to be greater clarity on the grower's and the responsible entity's obligations and culpability following an ABUTTER'S report to the adjoining grower of an incidence of "unauthorized releases" on the abutter's land caused by unplanned and UNCHECKED pollen, seed, or chemical drift. This Appendix A. needs to reflect the obligation, BEYOND just their own property, that the grower and the responsible entity BOTH have to act on an abutter's report of "unauthorized release" on the abutter's land, including the obligation for full and timely restitution. This paragraph applies: "...In incidents involving unauthorized releases and/or noncompliance, growers shall give notice immediately to the responsible entity so that the responsible entity may notify APHIS/BRS. When contacting APHIS/BRS, the authorized representative shall describe the incident, the date it occurred, the location (including county and state and GPS coordinate(s) of release site), name and address of grower, and field personnel associated with the incident. The authorized representative shall also provide immediate or short term corrective actions and, if necessary and available, long-term plans to return the situation to compliance and prevent similar incidents from occurring in the future..." Fix this paragraph to protect abutters from "unauthorized" drift. (APHIS-2010-0047-4292)

Response: The commenter is discussing an example of a compliance agreement that APHIS referenced as part of its analysis of Alternative 3. However, it is unclear from the comment what modifications to the compliance agreement are recommended by the commenter. The compliance agreement identifies the conditions that apply to growing sugar beet roots for sugar production. The comment appears to be referencing pollen movement, an issue associated with seed production. Seed production is not authorized under the compliance agreement in appendix D.

Comment: Employees from several sugar beet cooperatives and sugar beet processing plants commented on the importance of sugar beets to their rural communities. They discussed the number of people employed by the sugar industry and the value of the industry to growers and their communities.

Response: APHIS reviewed this information and incorporated it into the FEIS where appropriate.

Comment: I am a insurance agent working for Nodak Mutual Insurance Company selling all types of insurance products including crop insurance. This crop insurance is adminstered by the RMA agency of the USDA.
I support farmers having the choice to plant sugarbeets engineered for tolerance to the herbicide glyphosate because it saved RMA millions of dollars in losses to the Minndak area alone.

The MinnDak area had a terrible crop year due to the excessive rains. Without the technology found in Genuity Roundup Ready beets, my husband and crew would not have been able to harvest beets on the 4 to 12 ton fields due to the weed pressure that would have been there using conventional seed. Because of the Roundup Ready sugar beet, we were able to kill all of the late emerging weeds and harvest what ever the Good Lord provided to us. These tons therefore were not paid out as losses and MinnDak Farmers Cooperative was able to process up to 150,000 tons of more beets. This saved my company and RMA over $7,000,000 just in my little neck of the woods.

Thank you for considering my comments. (APHIS-2010-0047-3613)

Response: APHIS acknowledges that flexibility in weed management may be responsible for fewer crop losses during years with excessive rain. Many of the herbicides that are labeled for use on sugar beets have restrictions on the timing of applications. APHIS analyzes changes in herbicide use throughout the FEIS.

Comment: The Oregon Legislature recognized the increased emphasis on local small-scale food in 2011 when they passed House Bill 2336, allowing small-scale commercial processing of vegetables into preserves and acidic foods. This bill de-regulated inspection of certain processing facilities and products, thereby allowing an increasing amount of growers to enter the market with their homegrown processed products. By allowing these de-regulated producers to enter the market, the availability of more products increases the likelihood that these small producers' products may contain GE sugar beet material cross-pollinated to table beets or Swiss chard. With their overwhelming preference for non-GE foods, consumers will chose not to take the risk of consuming local producers' products. Or worse, they would unknowingly be consuming GE foods, against their expectations from a small local producer.

Response: The Oregon Legislature passed this bill in 2011. At that time, H7-1 sugar beet was already being grown in the Willamette Valley. The bill is about public health, not about the use of GE organisms in agriculture. The act makes no mention of GE plants. It is a food safety law related to the production of canned goods. APHIS disagrees with the commenter's speculation that this bill is related to consumer preference for non-GE foods or that this bill will result in people unknowingly eating GE food. APHIS examines the likelihood of cross-pollination between different *Beta* crop varieties in the FEIS and has found that contamination of the vegetable crop is not possible during the growing season because the crop is harvested prior to flowering and the crops are visually distinguishable so off-types can be recognized and culled from among the progeny. Vegetable beet growers who have concerns about the presence of transgenes in their products may also choose to source seed from growers in regions that do not grow sugar beets or purchase seed from distributors who test for GE material. Furthermore, when sugar beet hybridizes with vegetable beet, the resulting seeds are half sugar beet and half vegetable beet and look different than chard or table beet. Such vegetables are recognizable and can be culled rather than canning them.

Comment: GE modified sugar beet seed production significantly impacts the commerce from small gardens within Oregon because of the cross-pollination possibilities between sugar beets, table beets, and Swiss chard. APHIS fails to analyze the sources of these small-scale growers' seed. Large-scale seed production in the Willamette Valley allows genetic transfer of GE sugar beet material to these smaller crops. APHIS's analysis of this issue is vague and does not constitute a "hard look:" APHIS analysis does not go much beyond the statement that "[h]ome gardeners may or may not use organic methods and may or may not be GE sensitive." This arbitrary and capricious judgment that no study is needed to determine the activities of home or small-scale commercial producers is insufficient under NEPA. Given a choice, consumers do not want GE foods for consumption, and would avoid purchasing crops contaminated with GE material and avoid potentially GE-contaminated crops. There will be a significant impact to the local agricultural market when consumers avoid purchasing table beets and Swiss chard because of the uncontrolled and residual presence of GE material in the environment.

Response: The commenter neither offers data to support the accusation that commerce from small-gardens will be affected nor characterizes the size of this industry or the relative contribution of vegetable beets to this industry. APHIS has not received comments, through scoping, the public comment period, or from people in this industry that provide this information. APHIS disagrees with the commenter's assertion that vague information does not constitute a hard look. When information does not exist or there is uncertainty, it is sufficient to say so. As described in the FEIS, APHIS consulted Oregon Tilth, the USDA national organic program, and litigation records; conducted a well-attended public meeting in Corvallis; and followed up on public comments to form an understanding of the impacts to small-scale growers (see secs. III.B.2, II.B.3, IV.B.2, and IV.B.3). In addition, APHIS obtained information from growers who produce as little as 1 acre of vegetable beet seed. APHIS does not have the authority or the resources to investigate every backyard in Oregon, to know who is letting the occasional plant flower to collect seed, and to analyze where such backyard hobbyists acquire their seed. Nevertheless, APHIS acknowledged in the FEIS that such growers exist and qualitatively analyzed the impacts to them. APHIS examined consumer preferences (see secs. III.D.4 and IV.D.4). In addition, in 2011, APHIS analyzed where vegetable beet seed is produced in the United States and determined that about 50 percent of Swiss chard seed and less

than 10 percent of table beet seed is produced in the Willamette Valley. APHIS also learned that two vegetable beet seed producers tested their 2011 seed for H7-1 and neither had any positive results. Based on this information, APHIS has concluded that it is possible to get GE-free seed from both outside of and within the Willamette Valley. APHIS also knows that it is biologically impossible for local producers of vegetable beets to be impacted by H7-1 pollen. Thus, APHIS has concluded that any backyard grower in the Willamette Valley who wishes to grow GE-free vegetable beets could do so. Therefore, while APHIS acknowledges that there may be some people who grow vegetables and wish to avoid GE vegetables, they can source seed from companies that test seed or have contracts with seed growers in areas where sugar beet is not grown.

Comment: This arbitrary and capricious judgment that no study is needed to determine the activities of home or small-scale commercial producers is insufficient under NEPA. Given a choice, consumers do not want GE foods for consumption, and would avoid purchasing crops contaminated with GE material and avoid potentially GE-contaminated crops. There will be a significant impact to the local agricultural market when consumers avoid purchasing table beets and Swiss chard because of the uncontrolled and residual presence of GE material in the environment.

Response: APHIS disagrees with the comment. APHIS examined the vegetable beet industry to the extent that information was available. Vegetable beets cannot be cross-pollinated because they are not allowed to flower. APHIS did not receive any specific data concerning the impacts on home or small-scale commercial operations or vegetable beet growers during the public comment period or while scoping this EIS. APHIS examines consumer preferences with regard to GE products in section III.D.3. The commenter has supplied no information, and APHIS is not aware of any information, indicating that consumers have avoided purchasing vegetable beet produced in Oregon.

Comment: The proposed alternatives two and three are unacceptably significant economic impacts in that they will force some farmers to relocate out of the Willamette Valley. The costs of relocation are surely astronomical. These specific harms, especially to Willamette Valley seed producers, constitute an unacceptably significant economic impact on conventional and organic seed producers.

Response: The possibility of vegetable seed production being relocated out of the Willamette Valley is hypothetical. Despite the controversy that has existed for 3 years, vegetable beet seed production has remained constant at the level of 300 to 400 acres per year, as it was before the controversy. Accordingly, there is no evidence that vegetable beet seed production is moving out of the valley. In addition, if vegetable seed production did move out of the valley, growers are not expected to relocate. Instead, seed companies could contract with a seed grower in a different area to produce vegetable beet seed, and the local seed grower could produce a different crop. The feedback that APHIS received from organic growers is that they tend to produce many different seed crops. (Morton, 2010; Tipping, 2010; USDA, 2011). One grower indicated that his sales of vegetable beet seeds declined from $18,000 in 2009, to $6,500 in 2010, to $3,750 in 2011. Despite the decline of $15,000 in sales of vegetable beet seeds, sales of other organic seeds have increased nearly 60 percent since the sugar beet litigation began, from $151,000 in 2008 to $240,000 in 2011 (Morton, 2011). As such, it appears that the loss of beet seed sales may be compensated by the sale of an even more profitable seed crop. Furthermore, APHIS has not seen

any evidence for an unacceptably significant impact on conventional and organic seed producers since H7-1 sugar beet seed production began in 2005.

Comment: The presence of GE traits would not change the likelihood of outcrossing, so the potential for that remains the same. The only difference would be that any outcrossing now might lead to detection of very low level GE traits in such seed. This is a risk that the seed producer should accept if he chooses to grow such seed in this area. This has long been the standard practice in the seed industry: the producer seeking a higher purity standard accepts the responsibility to achieve the isolation required by the intended higher-value market. If such isolation is not possible in the environment of the farm, then it does not make economic sense to attempt to produce that specific product in that location. Economically, the higher value of the higher purity product compensates for the additional costs that may be required to achieve it.

An implication of adopting Alternative 3 is that by permits and regulation, specific isolation zones would be mandated around specific GE-sensitive farms. Reasonable isolation zones are a standard practice in the seed industry, so would remain in effect under Alternative 2 as a practical measure. However, mandating larger isolation zones strictly to allow some segments of agriculture to achieve a zero-tolerance threshold with no risk would be a highly disproportionate response. With the 10-mile radius (over 200,000 acres!) isolation zone requested by the plaintiff in the lawsuit, it would take only two farms to essentially eliminate any other seed production in the lower Willamette Valley. This would result in an industry growing 1.1 million acres of sugar beets and worth $1.5 billion in farm gate value alone to be unable to produce seed of its desired varieties in an established seed production area in order to protect a plaintiff who claimed potential (not actual) lost value of $15,000 in chard seed. This would be a wildly disproportionate regulatory response, undermining support for co-existence among agricultural sectors.

While theoretically a farmer should have complete freedom of choice in what crops to grow, in reality farmer choices are determined by many factors, both economic and environmental. If a single farmer in the well-established sugar beet seed production region of Oregon were to decide to become a chard or red beet seed producer, they would have difficulty achieving their own seed quality goals, while at the same time destroying the value of the region for sugar beet seed production. We have considerable experience in seed production in California, with which I am particularly knowledgeable. For example, the northern Sacramento Valley of California produces a large fraction of the hybrid sunflower seeds used both domestically and globally. Seed producers and companies cooperate to achieve isolation that results in high quality seed with minimal gene flow. However, should an individual farmer, for whatever reason, decide to grow commodity sunflowers in this region without regard for isolation requirements, it would cause major economic damage in a region that is specifically suited to production of this seed crop. The situation for the Willamette Valley and sugar beet seeds is analogous. While a given farmer has a right to make that choice, is it the right choice for the US industry as a whole? And if the government establishes regulations to mandate a required isolation zone to protect this farmer's choice, what about the rights and choices of the surrounding farmers? As is noted in the EIS, the area of a circle increases exponentially with the radius, such that a 1-mile isolation zone encompasses only 2010 acres, while a 5-mile isolation zone encompasses 50,240 acres.

Expanding isolation zones beyond what is scientifically justifiable results in a disproportionate regulatory "taking" of the options of farms surrounding the isolated one. How can it be justified that a single farm (of indeterminate size) should dictate the choices of farmers in 50,000 surrounding acres? This is where mandated isolation zones enforced through permits on seed production would inevitably lead. Alternatively, it is a common occurrence in the seed industry that companies vary their seed production locations in response to changes in cropping patterns in an area. Seed companies go where they can economically achieve their desired level of isolation; they do not attempt to carve such zones out of existing production areas for the same crop. (APHIS-2010-0047-4458)

Response: This comment is consistent with the analysis done under Alternatives 2 and 3, although APHIS makes no conclusion about whether isolation zones constitute a regulatory taking.

Comment: Restricting the use of transgenic technologies in beets only in California or other restricted areas, without any conceivable basis for harm to public health or environmental harm, would simply be arbitrary and capricious. Alternative 3 would arbitrarily restrict or delay new uses or production opportunities that may arise in the future in California or other restricted areas. Alternative 3 requires high transaction costs for detailed testing, monitoring and other activities without equivalent public benefit. It would induce longer-term indirect costs from loss of agronomic efficiency. Methods exist to safeguard seed purity for all producers.

The use of herbicide tolerant beets in California, in this particular instance in the Imperial Valley, would be a great asset to growers and improve the environmental performance of the crop. Glyphosate is a much more benign compound than the mixture of current weed control materials that are used (http://www.ipm.ucdavis.edu/PMG/r735700111.html). It would control problematic wild beet when currently there are no economic alternatives. The presence of these weedy species also complicates other pest management issues, especially the control of sugarbeet cyst nematode, which is an increasingly severe problem in the region. The presence of weed beets makes crop rotation less effective as a management tool for nematodes by maintaining weed hosts for nematodes and leads to the need for expensive and more eco-toxic nematicides, or abandonment of fields for beet production. Herbicide tolerant sugarbeets would help eliminate alternative weed beet hosts acting to maintain nematode populations. (APHIS-2010-0047-3792)

Response: The majority of this comment is consistent with the analysis done under Alternatives 2 and 3. APHIS considers the potential effects on all three alternatives including Alternative 3, which places restrictions on production. Any decision on the petition would be reasoned and grounded in science, based on thorough analysis of the plant pest risk, and would not be arbitrary and capricious.

Comment: Weeds were considered as the worst production problem for sugar beet growers because they were difficult to control with conventional herbicides. Poor weed control not only resulted in reduced yield from competition, but very importantly, delays harvesting operations which can be costly to farmers if there is an early hard freeze and/or heavy rainfall. "Most growers use two applications of glyphosate and have reported excellent weed control. I have conducted several tests which showed that glyphosate can be safely mixed with most of the insecticides and fungicides used in sugar beet without causing

phytotoxicity. Growers wisely use mixtures when possible to reduce the number of passes over a field, thus reducing fossil fuel usage, labor and machinery and equipment. (APHIS-2010-0047-3259)

Response: This comment is consistent with the analysis in the FEIS.

Comment: Mandatory conditions added additional burden and hardship to our research program. It is rather costly to pay for auditors and inspectors, and it is time consuming to be available to take these personnel to multiple sites on multiple occasions, especially when our research activities are hampered by unfavorable weather. (APHIS-2010-0047-3259)

Response: This comment is consistent with analysis in the FEIS.

Comment: Under alternative 3 where compliance agreements would be required for planting H7-1 sugar beet seed for root production. APHIS does not provide estimates on what costs the sugar beet industry will incur to comply with the additional permit requirements. The expenses associated with this regulation ultimately will be borne by sugar beet growers and their families. This expense should be taken into consideration by APHIS in its final decision-making process." (APHIS-2010-0047-3850)

Response: In the socioeconomics analysis, APHIS estimates that the regulatory burden of Alternative 3 would cost the industry between $1 to 2 million per year for the root crop.

Comment: Considering that most of the seeds for sugar beets, Swiss chard, and table beets are primarily grown in the Willamette Valley, the pollen need not travel far to causes serious contamination. Further, considering that 98% of H7-1 is grown in the Willamette Valley, irreversible harm to this region is all but inevitable.

Response: These statements are incorrect. As described in the FEIS, the amounts of sugar beet seed, including H7-1, and Swiss chard seed grown in the Willamette Valley is about 50 percent, not 98 percent. About 50 percent of sugar beet seed is grown in eastern Washington, and about half of Swiss chard seed is grown in Arizona, California, and western Washington. The majority of table beet seed is grown in Washington and California. In addition, as described in the FEIS, all sugar beet and vegetable beet fields need to maintain adequate isolation to have a successful crop for seed purity. In the Willamette Valley, a 4-mile isolation distance is used between open-pollinated varieties of *B. vulgaris*. This distance has been determined by years of experience of the growers in the Willamette Valley to be adequate to keep the level of cross-pollination to an acceptably low level. In addition, because these crops have been coexisting for several decades without any irreversible harm, the notion that irreversible harm to this region is inevitable is conjecture and not supported by the evidence.

Comment: In the face of overwhelming evidence to the contrary, APHIS's conclusion that "no gene flow from sugar beet seed production is expected" is arbitrary and capricious. APHIS's conclusion is based entirely on isolation distances, but, as explained Part III of this comment, the isolation distances will not be good enough for Oregon. APHIS offers an empty assurance to Willamette Valley farmers that, "sugar beet seed is . . . separated by isolation distances established to ensure varietal purity and that reduce the likelihood of gene flow." If APHIS doesn't expect gene flow to occur, then should show that is has investigated transgenic contamination in the area. For instance, APHIS must study whether organic farms growing Swiss chard seed in the Willamette Valley are contaminated with H7- 1 genes. This type of analysis is required to comply with NEPA.

Without more, APHIS's analysis of the impacts of transgenic contamination is conclusory and insufficient under NEPA.

Response: This comment mischaracterizes the FEIS's executive summary. The relevant passage is stated below:

"Movement of genes between sugar beets and other related species requires flowering. Sugar beet roots and table beet and Swiss chard vegetables are harvested before flowering. Therefore no gene flow can occur to the vegetable crop under any of the alternatives. For about half the vegetable beet seed produced in the U.S., no gene flow from sugar beet seed production is expected because the production fields are geographically isolated. For the other half of the vegetable seed, grown in the Willamette Valley, sugar beet seed is grown in proximity but separated by isolation distances established to ensure varietal purity and that reduce the likelihood of gene flow."

APHIS did not conclude that "no gene flow from sugar beet seed production is expected in the Willamette Valley." Rather, APHIS concluded that no gene flow can occur to the vegetable crop under any of the three alternatives considered in detail in the FEIS. APHIS also concluded that for about half the vegetable beet seed produced in the United States, no gene flow from sugar beet seed production is expected because the production fields are geographically isolated.

APHIS disagrees that it has an obligation to proactively study whether organic farms growing Swiss chard have detected any H7-1 genes in their seed lines. APHIS would expect organic farmers growing Swiss chard who were aware of the Notice of Intent to publish an EIS and/or the issuance of the DEIS to inform APHIS if they had detected any H7-1 genes in their seed lines. Moreover, APHIS did specifically inquire about whether people were experiencing any gene flow problem through scoping for this EIS. APHIS encouraged growers to provide this information, and two growers have actually done so. APHIS has included this information in the DEIS and/or FEIS. Additionally, if there is no plant pest risk, APHIS has no legal authority to either pay for or confiscate seed to test for transgenes.

APHIS also disagrees with the statement, "Without more, APHIS's analysis of the impacts of transgenic contamination is conclusory and insufficient under NEPA." First, APHIS' analysis of the impacts of transgenic gene flow (or cross-pollination) is distinct from the extent of actual, if any, transgenic gene flow (or cross-pollination). Second, the extent of actual transgenic cross-pollination does not, by itself, reveal or explain whether isolation conditions are sufficient because it does not reveal how or why the contamination occurs. Third, the adequacy of planting isolation distances are best assessed by gene flow studies, which have been analyzed in the DEIS and FEIS. Fourth, the impacts of transgenic cross-pollination can be accurately assessed by growers' specific feedback and comments on their experiences with low-level presence and its consequences.

Comment: Human exposure to GE modified sugar beet material may come through the ingestion of honey. Bees are active in beet fields. In fact, the USDA encourages honeybee use in the production of beet seed, as "evidence indicates that [bees] may be beneficial [in pollination], and for that reason their activity in flowering beet fields should be encouraged." When bees are present in beet fields, they collect nectar and pollen. The nectar and pollen collection can also increase the GE material footprint, as "[b]ees have a range of at least two to ten miles." This broad range increases the likelihood that GE material can be introduced to humans through the collected honey. The end consumer will

not know if the honey, whether in a primary or ingredient form, contains GE material. This effectively leaves the consumer without a choice to ingest GE products. Additionally, the apiarist will not have a choice whether or not to harvest non-GE honey in any of the areas where GE sugar beets are flowering. This is a significant impact under NEPA, and the EIS fails to address this issue.

Response: APHIS determined that beet pollen, and especially H7-1 beet pollen, is unlikely to be present in Willamette Valley honey. To address this comment, APHIS reviewed the literature and contacted beet seed growers to determine whether bees are active in beet fields as suggested by the commenter. APHIS learned from the staff of West Coast Beet Seed and Betaseed—the entities responsible for all sugar beet seed production in the Willamette Valley—that neither company has used or plans to use beehives in their sugar beet fields (Miller and Lehner, 2012). Therefore, bees must arrive into sugar beet fields from neighboring fields. In addition, several observations suggest that beets are not an attractive source of pollen and nectar. For example, Greg Loberg, the production manager of West Coast Beet Seeds who spends time in beet seed fields every day, indicated to APHIS that he has not noticed bees in sugar beet seed fields, in contrast to fields of insect-pollinated crops where one is very aware of bees in order to avoid being stung. This anecdotal observation is substantiated by the literature. For example, a detailed study of insect pollination of sugar beet seed crops noted that although "many honeybees were foraging nearby on wild flowers, very few were caught on sugar-beet flowers" (Free *et al.*, 1975). Similarly, (1976) concluded that "the finding of numerous honey bees or wild bees on beet flowers in the United States is unlikely if there is other pollen available in the area." Honey beehives are placed into crops that are sources of pollen and nectar, which are attractive to bees. Thus, the likelihood is remote that bees will spend energy to move over some distance from a crop that provides an attractive food source to a crop that does not provide such a source. In addition, an analysis of pollen collected from traps placed in honey beehives in Willamette Valley red clover fields during early, peak, and late bloom indicated that while honeybees visited nine families of plants, the beet family was not among the families of plants that were determined to have been visited (Maxfield-Taylor and Rao, 2011). Furthermore, while it is unlikely that beet pollen is present in honey, the likelihood that the beet pollen has the H7-1 trait is diminished by another 6-7 fold because most of the sugar beet pollen-producing plants lack the H7-1 trait. In 2011, just 15 percent of the acreage used for sugar beet seed production in the Willamette Valley produced H7-1 pollen (see sec. III.B.1.b.(8)).

IX Cumulative effects

Comment: For example, any decrease in the overall biological impacts of herbicide use associated in the short-term with RRSB must be counterbalanced by projected impacts of herbicidal responses to glyphosate-resistant weeds in the longer term. A similar assessment should be carried out for weed control costs, tillage/soil erosion, and productivity of sugar beets (since glyphosate-resistant weeds are more likely to adversely impact yields, because more difficult to control). Adverse impacts on crops grown in rotation with RRSB must also be assessed. While such projections are necessarily imprecise, there are good data to aid in this process that are more fully discussed in CFS science comments.

Response: APHIS has updated the FEIS's cumulative effects section to include more information on the medium- and long-term benefits of adopting H7-1 sugar beet and the medium- and long-term effects of weed management. After conducting this analysis, APHIS has determined that the benefits derived from the adoption of Alternative 2 over the short-, medium-, and long-term outweigh the potential adverse consequences associated with the adoption of Alternative 2. Ultimately, the adverse consequences of adopting Alternative 2 are to return to practices and economic costs more similar to those used and incurred under Alternative 1. The use of resistance management practices over the short-, medium-, and long-term can delay the selection and spread of herbicide-resistant weeds, maintaining the benefits associated with the adoption of Alternative 2.

Comment: An announced closure of the Simplot potato processing plant in Aberdeen Idaho by 2015 makes sugarbeets an even more essential crop to balance the overall crop production area of southeast Idaho. (APHIS-2010-0047-3999)

Response: APHIS acknowledges that sugar beet plant closures, combined with other processing plant closures, can have negative effects on local economies. APHIS describes the closures of sugar beet processing plants over the last several years (see table 3-31) and analyzes the impact of sugar beet availability under each of the three alternatives in the EIS.

Comment: On behalf of the U.S. Canola Association (USCA), I write to offer strong support for the full deregulation of Genuity® Roundup Ready® Sugarbeets, an action which is validated by the draft Environmental Impact Statement (EIS) prepared by the Animal and Plant Health Inspection Service (APHIS).

The USCA believes it essential that USDA's regulatory system offer timely and efficient decisions on biotech crop approvals based on sound scientific evidence to keep agricultural productivity on pace to meet the demands of a growing world population that is expected to require a 70 percent increase in food production by 2050. According to a study released by PG Economics LTD, UK earlier this year, (http://www.pgeconomics.co.uk/pdf/2011globalimpactstudy.pdf) since 1996, biotech traits have added 219.5 million tonnes to global production of soybeans, corn, and canola.

The study also documents major positive environmental impacts of biotech crops. These technologies have reduced pesticide spraying worldwide (1996-2009) by 393 million kg (-8.7%) and as a result, have decreased the environmental impact associated with herbicide and insecticide use on the area planted to biotech crops by 17.1%. Biotech crops have also contributed to significantly reducing the release of greenhouse gas emissions from agricultural practices. In 2009, this was equivalent to removing 17.7 billion kg of carbon

dioxide from the atmosphere. And these improved farming techniques have reduced soil erosion by 1 billion tons annually in the U.S. alone. (http://www.ctic.purdue.edu/) (APHIS-2010-0047-3760)

Response: APHIS acknowledges the comment. Information from this comment and studies conducted in previous years by the noted authors have been incorporated in the FEIS.

Comment: Consideration of cumulative impacts requires "some quantified or detailed information; ... [g]eneral statements about 'possible' effects and 'some risk' do not constitute a 'hard look' absent a justification regarding why more definitive information could not be provided."

APHIS improperly narrowed the scope of its cumulative impacts in several ways.

First, APHIS does not attempt to set temporal boundaries for its analysis because "the actual timeframes for many of the reasonably foreseeable future actions are not definitively known."

Yet lack of definite knowledge about the future is unavoidable; far from being a justification for ignoring future actions and impacts, it is one of the very reasons NEPA demands a cumulative impacts analysis in the first place. APHIS does not mention much less set a temporal boundary in the past, yet past actions and events are important in their own rights and are one obvious source of guidance in projecting future developments. Two critically important developments that APHIS fails to assess, quantitatively over time, are the history of commercial RR crop cultivation, which stretches back to 1996, and the dissemination of glyphosate-resistant weeds by RR crop systems, which dates back to the year 2000. Inability to make precise quantitative predictions is unavoidable in forecasting of this sort, and must not be used a pretext to avoid quantitative analysis altogether.

Response: APHIS has updated the cumulative effects section in the FEIS to better explain the spatial and temporal boundaries used in the analysis. APHIS has clarified that Alternative 1 is the baseline. This baseline includes an analysis of all Roundup Ready® crops introduced since 1996, considers the first GR weeds noted in the United States since 2000, and considers glyphosate use over the last 30 years. APHIS chose Alternative 1 as the baseline for the most conservative estimate of glyphosate use in the cumulative effects analysis. APHIS extensively discusses the selection and spread of GR weeds in sections III.C.1 and IV.C.1 of the FEIS. APHIS has updated those sections to include the most recent information on GR weeds. In addition, APHIS expanded the analysis in section V to include the new information included in sections III and IV with respect to GR weeds.

Comment: A commenter suggested that APHIS failed to properly assess the cumulative impacts of the alternatives described in the EIS. The comment appears to focus on alternative two, the preferred alternative:

NEPA provides that an EIS must evaluate not only the direct and indirect effects, but also the "cumulative impacts" of agency action. NEPA regulations define cumulative impacts as effects "which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions" of a person or agency.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The total impact of a set of actions, adding a small amount here, and a small amount there, could add up to an impact that is "greater than the

sum of the parts." The agency must get a sense of the point at which the environmental threshold is unable to tolerate "even a marginal increase" in activity.

To address cumulative impacts, APHIS must determine "whether the action is related to other actions with individually insignificant but cumulatively significant impacts."

NEPA requires APHIS to consider quantified or detailed information in order to provide a useful analysis of cumulative impacts of past, present, and future projects. NEPA regulations at 40 C.F.R. § 1508.8 specifically require the agency to consider effects that are "later in time or farther removed in distance." Further, general statements about "possible effects" and "some risk" do not constitute a hard look, "absent a justification regarding why more definitive information could not be provided."

APHIS's analysis of the cumulative impacts of H1-7 deregulation fails to satisfy its legal obligation under NEPA. APHIS ultimate conclusion is that "no cumulative effects are expected from adoption of H1-7 sugar beets on a national and regional scale because sugar beet production represents a very small percentage of the glyphosate resistant crops planted on a national and regional level. This reasoning cannot satisfy NEPA and misses the point of cumulative impacts analysis. The percentage of overall increase is irrelevant. Instead, APHIS must analyze its action, even an action that seems "individually minor" to determine the extent to which it may have a "collectively significant" environmental impact. (APHIS-2010-0047-4614)

Response: The commenter misses the point of APHIS' analysis. The Council on Environmental Quality recommends that cumulative impacts be analyzed on a meaningful scale: "For cumulative effects analysis to help the decisionmaker and inform interested parties, it must be limited through scoping to effects that can be evaluated meaningfully. The boundaries for evaluating cumulative effects should be expanded to the point at which the resource is no longer affected significantly or the effects are no longer of interest to affected parties" (http://ceq.hss.doe.gov/nepa/ccenepa/sec1.pdf).

If the addition of a particular action is so small that it would be lost among other actions already taking place, the incremental impact of that action cannot be assessed. If the action's effect is not measureable at a particular scale because it is smaller than the normal variability of the other actions' effects, then it cannot be assessed. APHIS has concluded that the contribution of Alternatives 2 and 3 to the cumulative effects on the environment cannot be measured at a national scale, so there is no measurable change in the baseline at this scale. As such, there are no direct, indirect, or cumulative impacts, either minor or significant at this particular scale. APHIS appropriately narrowed the geographic scope of the analysis to areas where a measurable change in the baseline might occur. By focusing on these areas, APHIS can take a hard look at the impacts and present a meaningful analysis. APHIS did conclude that there were cumulative impacts at the local and regional scale in some cases.

Comment: APHIS fails to adequately analyze cumulative impacts of increased glyphosate use. APHIS says that it is unable to quantify the anticipated increase in glyphosate use.

However, it seems clear that, compared to glyphosate use on conventional sugar beets, the increase will be significant.Glyphosate use would increase on H7-1 sugar beets by about 45-foldcompared to the glyphosate use on conventional sugar beets.

Despite what seems significant in the context of beets, APHIS chooses to examine significance only in the context of the national scale, claiming that the increase in glyphosate use is only "minor."

APHIS evaluated this increase in glyphosate usage in the context of all glyphosate usage . . . glyphosate use on sugar beets with the adoption of H7-1 sugar beets is less than 1% of the total glyphosate use. Therefore, the increase in glyphosate use as a result of the adoption of H7-1 is minor compared to other uses on a national scale.

However, the fact that the relative increase of glyphosate use is "minor" does not mean that the "incremental impact" is minor. APHIS must analyze the "incremental impact" on glyphosate use that will result from the deregulation of sugar beets. APHIS must then analyze this in the context of overall impacts of glyphosate use. Until it does so, APHIS's cumulative impacts analysis cannot meet the requirements of NEPA.

Response: In the environmental consequences section of the DEIS, APHIS analyzes the direct and indirect effects of changes in pesticide use on sugar beets at local levels. APHIS has updated the analysis of total glyphosate use and the contribution of glyphosate use to the total herbicide use at the national level in section V of the FEIS. Analyzing total glyphosate use and change in pesticide use on all crops at the regional and local levels is more challenging because that data is not readily available. Therefore, there is uncertainty regarding the total change in glyphosate use on a regional or local level. Glyphosate is labeled for different uses, many of which do not involve GE crops. Accordingly, depending on regional use, the adoption of H7-1 sugar beet may have a greater or smaller proportional contribution to the change in herbicide use. APHIS has updated the FEIS to examine the regional contributions of H7-1 sugar beet to glyphosate use on GE crops. APHIS discusses the direct and indirect effects of glyphosate on sugar beet to the receiving environment in section IV. The commenter asks APHIS to speculate on the level of glyphosate use that can be tolerated by the receiving environment. However, the FEIS concerns the agency's regulatory decision regarding H7-1 sugar beet, not glyphosate use. EPA regulates the use of glyphosate and other herbicides. The commenter's assertion that there is a specific amount of glyphosate use that would cause significant impacts is based on the assumption that all glyphosate use is equal in its impact on the environment. The quantity of glyphosate that is degraded in the environment is just as important as the quantity of glyphosate that is applied. Many factors contribute to the overall exposure of the receiving environment to glyphosate. These include the application rate, application method, weather, soil type, and application location. The net amount of glyphosate in the local environment at any time is a function of what is applied and what has not yet degraded from previous applications. Glyphosate does not persist for long periods of time. Degradation of glyphosate is discussed in section IV.E.4 of the FEIS. Herbicide use on sugar beet was reanalyzed in the FEIS using survey data from 2011, the latest growing season. The analysis found that higher quantities of glyphosate were used on conventional sugar beets as a preplant burndown than was estimated from data collected in 2000 and that the overall increase in glyphosate use on H7-1 sugar beet was sevenfold, not 45-fold.

Comment: In its scoping section, APHIS lists the following questions relevant to determine the cumulative impact on from increased glyphosate usage:

- **What are the past, present, and future impacts of glyphosate usage on soil quality, water quality, air quality, weed populations, crop rotations, soil microorganisms, diseases, insects,**

soil fertility, food or feed quality, crop acreages, and crop yields as a result of the introduction of glyphosate tolerant

crops?

- **Does the level of glyphosate tolerance within glyphosate tolerant sugar beet plants have an impact on the amount of glyphosate applied on the glyphosate sugar beet crop on a routine basis?**

Response: APHIS agrees that these questions were asked during scoping. However, no one provided information about these areas during the comment period on the notice of intent or the DEIS. APHIS has taken the best available information and used it to assess the cumulative effects of the alternatives on changes in herbicide use, including glyphosate, in the EIS.

Comment: According to the clear language of NEPA regulations defining "cumulative impacts,"APHIS must analyze the incremental impact of its action when added to other past, present, and reasonably foreseeable future actions. To do this analysis, APHIS must be able to answer the following questions:

- **What is the <u>overall environmental impact</u> from glyphosate usage?**

Specifically, according to Table 5-1 on page 650 of the DEIS (see below), what is the environmental impact of the national use of over 178 million pounds of glyphosate?

- **How much will the deregulation increase *impacts from* glyphosate usage?**

Specifically, at what point will the environment be unable to handle even a marginal increase in glyphosate usage?

Table 5- 1

Glyphosate usage on a National Scale						
RR crops	lbs/acre[1]	RR adoption [2]	total acres x 1 million [3]	RR acres x 1 million	lbs x 1000	% of total
Corn	0.95	0.7	87.9	61.5	58454	25.1
Cotton	1.89	0.78	10.9	8.5	16069	6.9
Soybean	1.36	0.93	79	73.5	99919	42.9
Canola	1.125	1	1.5	1.5	1688	0.7
Sugar beet	1.89	1	1.1	1.1	2079	0.9

Response: APHIS has updated table 5-1 in the DEIS (now Table 5-7 in the FEIS) to include more current information on glyphosate use rates. Throughout the FEIS, APHIS extensively discusses the effects of changes in herbicide use under the three alternatives. APHIS has expanded its discussion in section V on the impacts of agriculture to the environment and the incremental contribution of each alternative to those impacts. The focus of the FEIS is APHIS' action on the petition for nonregulated status. APHIS does not regulate glyphosate use or make choices about when or where to apply the chemical. Therefore, the overall impact of nationwide glyphosate use is outside of the scope of this FEIS. As APHIS explains in section V, the

majority of glyphosate used in agriculture is not being used in areas where sugar beet is grown, so use on sugar beet cannot contribute to impacts in those regions. APHIS also notes that EPA labels herbicides for use. EPA is currently evaluating glyphosate for re-registration.

Comment: Other problems with APHIS's cumulative impacts analysis include that APHIS claims that any harms of increased glyphosate use will be outweighed by substantial reductions in the use of other pesticides. In order to be analytically meaningful, this statement must be supported by objective analysis over overall impacts from pesticide use.

Response: APHIS includes this analysis in section IV of the DEIS. APHIS has also updated the FEIS to include an analysis of trends in total herbicide use in the United States, including glyphosate use.

Comment: Furthermore, the DEIS does not talk about potential for a monocrop disease. If Monsanto continues to sell GE crops to more and more farmers throughout the country and a significant portion of sugar beet farmers are growing H7-1 beets, a disease specifically targeting this species could devastate the entire Country's crops. This affects both consumers and farmers, alike. NEPA requires APHIS to address these significant impacts.

Response: APHIS disagrees with the comment. The commenter seems to be confused about the distinction between genetic engineering and genetic diversity in crop species. The commenter assumes that all GE crops would be susceptible to the same diseases, which is not true. Corn plants are susceptible to the diseases of corn, and sugar beets are susceptible to the diseases of sugar beets. Furthermore, sugar beets are genetically very diverse, and the H7-1 trait has been bred into hundreds of different varieties. As such, the genetic diversity of H7-1 sugar beet is comparable to the genetic diversity of conventional sugar beet. Many of the sugar beet varieties are bred to resist particular diseases of sugar beet. Because growers have different disease pressures in different growing regions, some varieties are preferred in some areas and not in others. As described in the FEIS, disease is currently the biggest problem sugar beet growers face, and grower cooperatives typically conduct 3 years of variety trials to assess disease resistance characteristics in each region before adopting a variety. This process helps to avoid the widescale adoption of a variety that will fail to provide disease resistance in a given region. In addition, as part of the PPRA, APHIS assessed pest and disease susceptibility in H7-1 sugar beet and concluded that they are no more susceptible to pests and disease than conventional sugar beet varieties.

Comment: APHIS fails to analyze the cumulative impacts of increased glyphosate use on the creation of super weeds.

Response: Contrary to the commenter's assertion, the DEIS and FEIS contain an extensive analysis of GR weeds, including an analysis of resistant biotypes of weeds that were identified in other regions but could become weeds of sugar beets in the future (see sec. IV.C.3). In addition, APHIS identifies weeds of sugar beet that are resistant to other herbicides (see sec. II.C.3). APHIS has updated the discussion of GR weed selection and spread in sections III.C.3, IV.C.3, and V based on information received during the public comment period on the DEIS and consultations with experts in weed science, including extension agents in sugar beet-growing areas. Unfortunately, there are no comprehensive surveys of the distribution and density of GR weeds on agricultural lands. Reports in current databases do not show the distribution, density, or even persistence of populations over time.

Comment: Super weeds are weeds that have developed a tolerance to glyphosate or other herbicides and, according to farmers interviewed in the *New York Times*, might be "the single largest threat to production agriculture that [farmers] have ever seen." If enough of these weeds exist, Roundup® will no longer be an effective herbicide and farmers will have to use multiple herbicides in their fields. APHIS analysis does not satisfy NEPA because APHIS does not seem sure about how deregulation will affect herbicide use and super weeds. On one hand, APHIS asserts that the deregulation of H1-7 will allow sugar beet growers to control weeds in their own fields more effectively, as well as decrease weed pressure on neighboring fields. On the other hand, APHIS asserts "glyphosate resistant weeds could become a problem for [H1-7] sugar beet growers." APHIS offers little analysis of how the super weeds epidemic will play out. Instead, APHIS points to unenforceable, hypothetical reassurances. For example, APHIS claims "industry and growers are aware of this situation and will likely take proactive measures aimed to reduce and delay the development and spread of glyphosate resistant weeds." Ultimately, however, APHIS has not determined the cumulative impacts of increased glyphosate use because it has not asked the right questions.

Response: The commenter seems to focus on the uncertainty around the future selection and spread of GR weeds, suggesting that it is a flaw in the analysis. APHIS disagrees that it is a flaw to identify uncertainty in future outcomes. Growers choose management practices, including weed resistance management, based on many factors. APHIS cannot control which practices growers will choose, so the agency can only discuss the potential outcomes under different management practices.

In addition, the commenter mischaracterizes APHIS' analysis of glyphosate effects on the selection of resistant weeds and makes a number of assumptions that are incorrect. The commenter defines super weeds as weeds that have developed a tolerance to glyphosate or other herbicides and quotes a New York Times article that states this may be "the single largest threat to production agriculture that farmers have ever seen." APHIS has seen no evidence, and the commenter provides none, to suggest that weeds resistant to glyphosate are somehow more aggressive or invasive than other weeds as implied by the hyperbolic label. The scientific evidence does not support such a hyperbolic concept. Weeds resistant to herbicides have been selected since herbicides were first used in the 1940s, and the farmers quoted in the New York Times article have been dealing with this situation for decades. Any management technique, including tillage or the use of cover crops, will eventually select for weeds that survive the use of that management technique. Thus, there is no contradiction that growers will have more effective weed control with glyphosate use, but that one day they may face a problem controlling GR weeds. It is expected that growers will need to alter and vary management techniques to control the weeds as they are selected against that management technique.

The commenter wrongly asserts that if enough of GR weeds exist, Roundup® will no longer be an effective herbicide. As the FEIS states, Roundup® is effective on over 250 species of weeds. The fact that Roundup® may not be effective on one biotype does not mean that it will no longer be effective on other biotypes of the same weed. Biotypes resistant to atrazine have been prevalent over the last 40 years, yet atrazine has remained the most common herbicide used on corn. Its use has recently been reduced by regulation over concerns of its impacts on nontarget organisms—not because its effectiveness has been diminished due to some weeds developing resistance.

The commenter also implies that there is something wrong with the fact that "farmers will have to use multiple herbicides in their fields." The use of multiple herbicide chemistries has been advocated for years as a best management practice to mitigate the selection of resistant weeds. APHIS does not agree that following a best management practice is bad for farmers.

Comment: In its scoping section, APHIS lists the following questions relevant to determine the Cumulative impact on the development of glyphosate resistant weeds:

- **What glyphosate resistant weeds have been identified and what is their occurrence in crops and in non-crop ecosystems?**
- ***How would the addition of glyphosate tolerant sugar beet impact the occurrence of glyphosate resistant weeds in sugar beet, in other crops, and in the environment?***
- **Which are the most likely weeds, if any, to gain glyphosate resistance and why would they gain such resistance with the use of glyphosate tolerant sugar beet?**
- **What are the current and potentially effective strategies for management of glyphosate tolerant or other herbicide tolerant weeds in glyphosate tolerant sugar beet stands or in subsequent crops?**
- **What are the potential changes that may occur in glyphosate tolerant sugar beet as to susceptibility or tolerance to other herbicides?**

The most pertinent question relating to cumulative impacts is highlighted in bold [and italicized], and currently APHIS has failed to provide a sufficient answer. To find an answer, APHIS must provide much more rigorous and expansive analysis of glyphosate resistant weeds in the environment. It must specifically analyze the impacts of glyphosate resistant weeds resulting from its "past, present, and reasonably foreseeable future" deregulations of other glyphosate crops. For example, APHIS should look back at its approval of at least 87 genetically engineered seeds varieties, not including an additional 22 seeds whose approval status is currently pending. In fact, according to APHIS, it is possible that other herbicide-tolerant sugar beets would be developed in the future. Until APHIS takes a hard look at other past, present, and foreseeable future deregulation decisions, it is impossible to know the cumulative impact of deregulation.

Response: APHIS agrees that these questions were asked during scoping. To the extent that APHIS received information during the comment period on the notice of intent or the DEIS, APHIS has analyzed that data. APHIS has taken the best available information and used it in the assessment. APHIS provides very clear questions to address and answers them in the cumulative impacts section, including the following question noted by the commenter: "How would the addition of glyphosate tolerant sugar beet impact the occurrence of glyphosate resistant weeds in sugar beet, in other crops, and in the environment?" APHIS analyzed the production of all GR crops nationally, regionally, and locally with respect to where H7-1 sugar beet is being produced and concluded that the additional glyphosate use on H7-1 sugar beet could have cumulative impacts on the selection of GR weeds at the local level and identified those local areas. The commenter is not specific about how the agency should look at all 87 GE varieties that have been the subject of approved petitions nor how this would be any different than the analysis that APHIS conducted, which quantitated the amount of GR crops grown in all U.S. geographies where sugar beets are also grown. APHIS does not agree with the commenter's vague assertion that the analysis should be more rigorous and expansive. APHIS also disagrees with the notion

that the agency can analyze the impacts of future sugar beet petitions when there are none before the agency.

Comment: APHIS asserts that H1-7 will only contribute "marginally" to the total amount of herbicide resistant crops and glyphosate use. However, in the Northwest, the total increase of herbicide resistant crops may be at least 31% under full or partial deregulation—bringing the total herbicide-resistant cropland to a total of 71%. This increase is not "marginal" by any account. Nevertheless, marginal or not, NEPA specifically requires that APHIS analyze the margin—that is, the "incremental" impact—because the impact of yet another seemingly marginal increase to the total amount of herbicide resistant crops may be greater the sum of its parts. A "meaningful cumulative impact analysis" must ensure that an action is not the proverbial straw that breaks the camel's back. *See Grand Canyon Trust v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002). APHIS completely misses the point of cumulative impacts analysis when it concludes that the widespread adoption of glyphosate-resistant crops precludes the need to address the synergistic impacts of H1-7 deregulation.

Response: This comment mischaracterizes APHIS' analysis. APHIS did not conclude that full or partial deregulation would bring the total herbicide-resistant cropland to 71 percent in the Northwest. APHIS states that 40 percent of the cropland is used for crops that have herbicide-resistant varieties. In addition, APHIS never states that 40 percent of the cropland is planted to herbicide-resistant varieties. In fact, most of the cropland is used for alfalfa, which is primarily planted to conventional varieties. However, because a petition for nonregulated status for Roundup Ready® alfalfa has recently been approved, it is reasonably foreseeable that Roundup Ready® alfalfa adoption will increase in the near future. Based on the 50-percent adoption rate supplied by the alfalfa industry, APHIS predicts that about 23 percent of this cropland may someday be planted to herbicide-resistant alfalfa. This prediction is the same regardless of the regulatory decision for H7-1 sugar beet. Furthermore, APHIS states in the FEIS that while about 7 percent of the cropland is currently used to grow sugar beet, the maximum expected total of glyphosate resistant crops in the area is 31 percent—not 71 percent as the commenter calculated—if there is 100-percent adoption of H7-1 sugar beet.

APHIS never concludes in the DEIS or FEIS that H7-1 sugar beet would not have cumulative impacts because its production is small relative to the widespread adoption of GR crops. APHIS examined the production of H7-1 sugar beet at national, regional, and local levels. APHIS concluded that there would be no cumulative effect at the national level because variation in production of other GR crops exceeded the acreages of sugar beet planted at the national levels. However, at the local level, APHIS found areas where glyphosate use on H7-1 sugar beet could have cumulative impacts on the selection of GR weeds. APHIS has revised the FEIS based on information obtained from public comments and survey data published after the publication of the DEIS to describe cumulative impacts that might be measurable at a regional level as well.

Comment: APHIS is certain that H7-1 sugar beets will frequently be grown in rotation with, or proximity to, other glyphosate resistant crops. Increasingly simplified cropping systems (such as one based on the rotation of crops with identical genetic-engineered traits), have been shown to result in weed population shifts driven by ecological adaptation, evolved resistance, and selection for naturally resistant species. APHIS admits that conventional tillage practices and non-glyphosate herbicide applications will likely be needed to address the emergence of glyphosate resistance weeds, yet these forecasts are not

part of APHIS's final calculation. Consequently, H7-1 sugar beet production will significantly contribute to selection pressure for glyphosate resistant weeds. The DEIS must do a better job considering the cumulative impacts of adding another glyphosate dependent crop to the agro-environment.

Response: The commenter concludes that the forecasts of additional conventional tillage and use of non-glyphosate herbicides are not part of APHIS' final calculation. APHIS is not clear to what calculation the commenter is referring. The FEIS provides an extensive discussion of weed management practices, including tillage and the use of non-glyphosate herbicides.

Contrary to the commenter's assertion, the DEIS and FEIS contain an extensive analysis of GR weeds (see sec. IV.C.3). APHIS has updated the discussion of GR weed selection and spread in sections III.C.3, IV.C.3, and V based on information received during the public comment period on the DEIS and consultations with experts in weed science, including extension agents in sugar beet-growing areas. Unfortunately, there are no comprehensive surveys on the distribution and density of GR weeds on agricultural lands. Reports in current databases do not show the distribution, density, or even persistence of populations over time.

The commenter seems to focus on the uncertainty around the future selection and spread of GR weeds, suggesting that it is a flaw in the analysis. APHIS disagrees that it is a flaw to identify uncertainty in future outcomes. The selection and spreads of GR weeds is dependent on many factors, including the management practices adopted by growers. APHIS does not control which practices growers choose, so the agency can only discuss the potential outcomes under different management practices.

Comment: Containment of genetically engineered crop genes has proven ineffective due to human error and other reasons. Transgenic contamination has already occurred in multiple situations for several crops, including corn, rice, canola, soybean, and bentgrass. *Beta* species will suffer a similar fate. APHIS extensively covers the likelihood of cross pollination between beta species and remedies should that occur. Several things are mentioned as potential causes for transgenic contamination that are not thoroughly explored. For instance, transportation of seeds from the Willamette Valley to the Midwest, where most H7-1 root beets are grown, is done by truck. The DEIS does not mention what, if any, procedures are used by trucking companies to ensure that seed does not escape during these trips.

Response: The DEIS and FEIS describe the standard procedures, namely triple containment, used by trucking companies to ensure that seed does not escape. Seed is very valuable, and these precautions are also taken for conventional seed. In addition, no feral populations of sugar beet have established in the United States in the past century, so escape is not reasonably foreseeable.

Comment: Another concern is the potential for bees to transport pollen great distances. The DEIS mentions that bees can pollinate beet plants. Since one method of gene flow is pollen-mediated, this may create the potential for H7-1 genes to travel much further distances than they normally would by wind. The DEIS does not mention how often bees will visit beet flowers, how far they might travel after doing so, and what this could mean for nearby *Beta* species farming. APHIS also does not explain the consequences of contamination given a windstorm event or other above average windy condition. It seems from the size of the pollen clouds created by sugar beets that these consequences would be significant.

Response: Beets' normal route of pollination is by wind. Insect pollinator behavior and the distances over which cross-pollination can occur have been studied extensively on crops that depend on insects for pollination, such as cotton and alfalfa. In alfalfa pollinated by honey bees, cross-pollination was negligible at 3 miles. In cotton, 3 miles is also used as a stringent isolation distance. If 3 miles is an adequate isolation distance for crops that depend on insects for cross-pollination, it stands to reason that the same isolation distance will be adequate to mitigate insect pollination for a crop that is only occasionally pollinated by insects. The fact that 4 miles are used to isolate beets from wind pollination should indicate that this distance is also adequate to isolate these crops from insect pollinators. The FEIS does consider wind effects (sec. III.B.5), citing (Westgate, 2010) who modeled pollen dispersal and outcrossing between agricultural fields. The model used by (Westgate, 2010) takes into account wind and eddy patterns between fields. (Westgate, 2010) considered wind patterns in the Willamette Valley during flowering season from June 1 to July 8 for the past 5 years, which would include a typical range of weather conditions and still concluded that cross-pollination would be undetectable. (Pfender *et al.*, 2007) also note that "A calculation based simply on survival time and average windspeed may overestimate the distance for dispersal, however, because the pollen must be deposited from the air column to be effective in pollination. After reaching appreciable height, probability of immediate deposition decreases due to the relatively slow settling velocity of pollen." In other words, strong winds may increase the dispersal distance of pollen but may not make cross-pollination any more likely.

Comment: H7-1 contamination will have a significant environmental impact. Aside from understating the myriad ways transgenic contamination could occur, APHIS does not sufficiently analyze the impacts that contamination could have on conventional and organic *Beta* species farmers. A farmer's business, as well as his or her reputation, would suffer from contamination of their crops with H7-1 genes. Especially for growers of Swiss chard and Swiss chard seed, which is grown organically and in the same geographical region as H7-1 sugar beet seeds. Discovery of GE plants in a *Beta* crop would certainly lead to decreased business because the Swiss chard market is GE-intolerant. This means that customers that demand GE-free foods, and will not support farmers whose crops are genetically engineered. Farmers are then forced to test all of their seeds and crops for GE genes, adding substantial cost to their businesses solely based on the fear that GE genes will destroy their businesses.

Response: APHIS describes and fully analyzes the potential impacts of H7-1 sugar beet on the GE-sensitive marketplace in section IV.D.4.

Comment: Throughout the Draft EIS, APHIS refers to isolation distances as assurance that transgenic contamination will not be a problem for farmers in the Willamette Valley and elsewhere. It cites the use of "guidelines" by organizations like Willamette Valley Specialty Seed Association (WVSSA) and others, which instruct farmers in practices that will prevent transgenic contamination, see Table 3-3 below. First it must be noted that the guidelines in WVSSA, are "not mandatory." Second, participation in the such organizations is not required for all farmers. Third, the DEIS does not say what percentage of farmers are actually members of these organizations. Without this information, APHIS's analysis does not comply with NEPA.

Isolation distances are dependent on many things that may not be feasible for most farmers. For instance, not every farmer has enough land to create a one-mile to three-mile

radius around an H7-1 field. Additionally, for isolation distances to work, the farmer must ensure that no volunteer plants are growing in the isolation "buffer." Doing this requires manual inspection. Even the most well-intentioned farmer may miss volunteers in such a large buffer area, and that is assuming the farmer has time to manually inspect in the first place. The DEIS does not address the potential effects human error might have in the areas of composting, seed exchange, equipment sharing, or transportation. Further, while the DEIS does mention the fact that it would be impossible to apply these isolation distances to home gardeners, APHIS not mention how prevalent these gardeners are in areas where H7-1 beets might be grown and the extent of harm that contamination would have on home gardens.

Response: APHIS acknowledges that pinning guidelines are not mandatory, that participation in WVSSA is not required, and that the DEIS and FEIS do not indicate what percentage of farmers are actually members of this organization. APHIS disagrees with the commenter's assertion that the analysis does not comply with NEPA without this information included. APHIS obtained the information that it could by talking to local extension agents and all of the major vegetable beet and sugar beet seed producers in the region. APHIS also received a comment from a local organic grower who named several chard seed growers and APHIS contacted all of them. If APHIS missed any growers, they must grow very small acreages to not be noticed by their colleagues. If a farmer does not have enough land to maintain isolation distance, does not have priority, and plants a crop anyway, that grower will jeopardize the quality of both his and his neighbors' crops. Farmers need to maintain isolation distances to protect varietal purity anytime they grow different varieties of sexually compatible crops. Ideally, farmers will cooperate and work together to accommodate each other. The WVSSA has an arbitration process for growers who are in conflict. It is not APHIS' responsibility to work out these differences. APHIS acknowledges that growers can miss volunteers and discusses in the FEIS the possibility that unwanted cross-pollination can occur from abandoned fields. APHIS disagrees that it would be useful to speculate on the numerous ways that human error could introduce contamination but instead focuses on the best management practices used by the sugar beet industry to minimize human error. APHIS is aware that there are many ways that human error can cause admixing, but the agency does not believe they are likely to occur because of the process systems in place.

Comment: Finally, in order for APHIS to rely on isolation distances, NEPA requires that the agency give concrete data as to the effectiveness to date of these procedures. Additionally, APHIS should institute follow-up procedures to ensure that farmers are adhering to the standards they have promised to adopt. Even if APHIS conducted effectiveness studies and instituted follow-up procedures, there is nothing to indicate these procedures would continue should H7-1 be deregulated.

Response: APHIS does not rely on isolation distances for its decision. APHIS makes its decision on whether H7-1 sugar beet is a plant pest, not whether it is capable of pollinating a sexually compatible crop. In addition, APHIS describes extensively in the FEIS that cross-pollination between vegetable beet crops is obvious when it occurs and that the industry has decades of experience minimizing such cross pollination. This is concrete evidence that the guidelines in place are effective. Furthermore, all the growers need to maintain varietal purity. They do not need to be regulated to adhere to industry standards because their customers require that they meet those standards. Should APHIS approve the petition for nonregulated status of

H7-1 sugar beet, growers can still use the practices that they have developed to meet their market demands for varietal purity.

Comment: Although there are rules and arbitration procedures, pinning seems to be self-policing. This offers little assurance to the conventional farmer, the only party in this arrangement that stands to suffer from contamination. The pinning processes is also flawed in that it does not provide notice to seed producers, but instead relies on seed producers to actively explore the potential of transgenic contamination affirmatively. And once a farm has been "pinned" as containing GE plants, it forecloses opportunities for anyone else but GE seed producers to participate in the market. The failure of sufficient regulation in the pinning practices allows for monopolies in the beet seed production, as introducing a wind-carried pollen contaminant into the environment forecloses any competition to non-GE beet seed production with the GE production controlled by a single patent holder.

Response: APHIS disagrees with the above statement. First, it is false that only conventional farmers suffer from cross-pollination. There are three types of compatible beet crops produced in the Willamette Valley. As described in the FEIS, crosses between any of these different crops results in undesirable off-types. Pinning procedures were established to help enable these compatible crops to be produced in the same area. Second, quality control is the seed producer's responsibility. Pinning maps were never meant as a substitute for quality control. They are merely established to help growers coordinate with one another. Third, the pinning of GE sugar beet seed fields do not foreclose opportunities for anyone else. Whether seed fields have GE or non-GE seed, they need to maintain isolation distances in order to meet varietal purity standards. In addition, the commenter ignores the fact discussed in the EIS that 85 percent of the sugar beet acreage in the Willamette Valley produces conventional, not H7-1, pollen. While this percentage can change from year to year, the trend has been to decrease the use of H7-1 pollen parents (male fertile) in the Willamette Valley.

Comment: APHIS fails to analyze organic production commercial impacts. For Oregon table beet and Swiss chard producers, to be able to label their products as organic, they have to be produced in accordance with organic practices as well as be free from GE material, meaning sown from organic seed. Labeling products as organic is prohibited under the Organic Foods Production Act (OFPA) if the products contain any GE material. Seed producers in the Willamette Valley have few choices. Either the producer can choose not to label the products as organic and be shut out of that competitive market, or submit to costly testing of their products to determine if there is any GE material. This is a significant economic impact under NEPA, and APHIS's failure to consider the economic impacts to organic produce growers in seed production areas is insufficient.

Response: APHIS disagrees with this comment. Inadvertent levels of GE material do not violate organic labeling. APHIS analyzed the cost of testing for the GE-sensitive market and considered the economic impacts on organic produce growers. APHIS concluded there would be no impacts because they can obtain their seeds from a tested source or from an area outside of the Willamette Valley. As they produce vegetables, the vegetables cannot be cross-pollinated because they are harvested prior to flowering and production of seed.

Comment: This increased availability of small-scale commercial activity is missing from the analysis, as the increased popularity of non-traditional sources of "commercial" beets and Swiss chard available from Willamette Valley producers is an important aspect of local

agriculture production. Additionally, these producers do not participate in the "pinning" of their crops in relation of known GE seed crops. Because of the unknown nature of cross-pollinating crop locations, the introduction of GE sugar beet material into the environment will not be able to be contained. Additionally, the pinning process is unregulated and varies by state and region. Pinning could also completely prohibit organic seed production on a person's own land if it is within four miles of a "pin." This needs to be studied and evaluated prior to deciding any of the regulatory alternatives proposed.

Response: APHIS disagrees that small-scale commercial activity is missing from the analysis. APHIS gleaned information from declarants in the sugar beet litigation who can be considered small-scale commercial seed producers. It is neither feasible nor necessary for APHIS to have comprehensive information from every backyard gardener who might trade seeds. The fact that these producers choose not to pin compromises all beet seed producers in the area, not just GE beet seed producers. The organic certification agency would determine whether GE beet seed grown within 4 miles of the organic seed production field would be acceptable for the grower under their organic production plan. Prior to the sugar beet litigation, an organic vegetable beet seed producer sought to decrease the isolation distance between hybrid beet production and open-pollinated production from 4 miles to 3 miles, and it is possible that the organic certification agency would agree with this reduced isolation distance. APHIS agrees that pinning processes may vary by State or region. Because pinning is used by growers to establish and maintain a coexistence system that works for growers in the area, it would be expected that each group would adapt their system to meet their area's needs.

Comment: APHIS's reliance on voluntary industry stewardship to conclude that any contamination would be mitigated is arbitrary, capricious, and contrary to record evidence before the agency. Under APHIS's Preferred Alternative, the job of preventing gene flow falls to the actors least likely to take those precautions, namely those who do not care if contamination occurs. A full analysis of the likelihood that such practices will in fact be used is lacking. What little analysis APHIS does provide reveals the agency's reliance on voluntary measures to be wholly misplaced. After adopting a similar strategy to control glyphosate-tolerant weeds, APHIS admits that in some areas 13% of growers are not following best management practices. The DEIS acknowledges that non-adherence to best management practices is a "mechanism that could contribute to the unintended dispersal and movement of sugar beet seed." In the face of these and other similar admissions in the DEIS, the DEIS lacks a rational connection between APHIS's conclusion that transgenic contamination is not likely to occur and the facts before the agency.

Moreover, by now it is clear that usual practices and policy—now given APHIS's imprimatur— will not prevent contamination. Most of the voluntary industry practices that APHIS claims will prevent transgenic contamination are the same practices that were in place when the *Sugar Beets I* court determined that contamination was likely. The DEIS fails to acknowledge that (1) consistent compliance with industry stewardship/best management practices is unlikely, and (2) that even when in compliance, contamination occurs. APHIS's conclusion that transgenic contamination is not likely to occur is flatly contrary to the record evidence, and is therefore arbitrary and capricious. Transgenic contamination occurs with mandatory gene isolation measures in place, equivalent to those proposed in Alternative 3, and will obviously be more prevalent with full deregulation. As

will likelihood of contamination through human error, e.g., through composting and exchanging seeds.

Response: APHIS did not conclude that voluntary industry stewardship would mitigate all cross-pollination. However, APHIS did analyze and determine that voluntary industry stewardship measures do in fact reduce the potential for cross-pollination to a level below 1 in 10,000 (see secs. III.B.1.b.(11), III. B.5, IV.B.1.a., and IV.B.5). Finally, since cross-pollination is not a plant pest risk, applying mitigation measures to prevent it is outside of APHIS' authority under part 340 after APHIS has prepared a full plant pest risk assessment and found that H7-1 poses no plant pest risks.

APHIS describes current industry practices in the FEIS and is using them to analyze the environmental impacts of each of the alternatives. APHIS is not relying on industry practices to mitigate cross-pollination. Because the levels of off-types are market-driven, the industry has adopted practices to meet market demands. APHIS does not regulate one industry so that another can meet its market demands.

Comment: Transgenic contamination is a multifaceted harm, with a significant environmental as well as intertwined socioeconomic impact on farmers and the public. As several Courts have held: "the potential elimination of farmer's choice to grow non-genetically engineered crops, or a consumer's choice to eat non-genetically engineered food, and an action that potentially eliminates or reduces the availability of a particular plant has a significant effect on the human environment." Further, "Once the gene transmission occurs and a farmer's seed crop is contaminated with the Roundup Ready gene, there is no way for the farmer to remove the gene from the crop or control its further spread." Despite documented incidents of RRSB contamination, APHIS nevertheless concludes that granting nonregulated status to RRSB will not have significant impact on the human environment. This conclusion is contrary to the facts before the agency, and therefore violates NEPA.

APHIS's DEIS is deficient because it completely fails to consider and analyze an important aspect of the deregulation decision: the socioeconomic impacts on persons other than agricultural producers. Contamination will not only cost farmers their right to sow the crops of their choice, but also will deprive consumers of the right to feed their families non-GE food. The *Sugar Beets I* court, which ordered APHIS to prepare this EIS, expressly found that these were both cognizable harms pursuant to NEPA in its underlying order. APHIS's failure to analyze the full spectrum of socioeconomic impacts, including impacts on persons who are not agricultural producers, violates NEPA.

Response: This comment does not supply any information to challenge the analysis in the FEIS. Instead, it makes unsupported accusations that APHIS failed to analyze issues. APHIS disagrees with these assertions and refers the commenter to the FEIS. With regard to the economic analysis, APHIS refers the commenter specifically to sections III.D and IV.D. APHIS disagrees with the commenter's claim that H7-1 sugar beets will deprive consumers of the right to feed their families non-GE food (see sec. IV.D.4). APHIS analyzes cross-pollination between *B. vulgaris* varieties in sections III.B.5 and IV.B.5.

Comment: APHIS's analysis of the various alternatives' impacts on minorities fails to consider several significant factors. APHIS correctly notes that, when evaluating the impact that the alternatives will have on minorities, the main minority population to consider consists of farm workers.

However, the DEIS's analysis of the impacts that increasing reliance on Roundup Ready crop systems will have on farm workers contradicts itself. APHIS claims that there will be no differences between the alternatives when it comes to impacts on minorities, yet concludes elsewhere that adoption of RRSB will result in fewer health impacts on farm workers.

APHIS's analysis of the impacts on farm workers also treats changes in the size of the work force inconsistently without explaining why. APHIS concludes that fewer farm workers resulting from less need for hand-weeding is a positive impact because fewer farm workers means fewer health impacts stemming from exposure to pesticides. When it comes to beet factory workers, however, APHIS concludes that having fewer workers is a negative impact because it represents a loss of economic activity. APHIS reaches this conclusion despite its admission that beet factory work is dangerous relative to other jobs and results in injuries. The DEIS lacks any corresponding socioeconomic analysis of the impact of lost farm worker jobs, such as the number of jobs lost, the economic value of that lost income, and which minorities would be disproportionately affected. APHIS's failure to analyze the full socioeconomic effects on minorities, particularly farm worker populations, is arbitrary, capricious, and contrary to the mandates of NEPA.

Response: APHIS updated sections III.D.1 and IV.D.1 in the FEIS to estimate the values of lost wages from hand weeding fields. APHIS explains that a decrease in labor costs would likely result in a decrease in employment opportunities for some people under Alternatives 2 and 3.

Comment: The DEIS does not analyze seed market concentration. Yet, research and development suffer from seed market concentration, in that fewer crop varieties are offered to farmers. Seed companies have aggressively undermined independent researchers' ability to fully investigate their patented crops' performance. Seed companies often want the right to approve all publications, which researchers find unreasonable. This chills research on the performance and potential adverse impacts of GE crops.

The privatization and concentration of the world's seed supply is a serious and continuously evolving problem, compounded with each new GE crop deregulation. "It is estimated that the top ten seed corporations around the globe hold 49-51% of the commercial seed market, and the top ten agro-chemicals control 84% of the agrochemicals market. Likewise, all genetically modified (GM) seeds are bio-patented by multinational corporations and 13 commercial corporations own 80% of the GM food market." As the practical options become limited to varieties patented by Monsanto and the major seed companies, there are effects on the price of seed, and in this case, the price of sugar beets, the price of sugar, and the cost of groceries.

The domination of the seed industry by pesticide firms has driven the research and development agenda towards pesticide-promoting crops such as RRSB. Interestingly, KWS, Monsanto's German partner in development of RRSB, has entered into a collaboration with another pesticide company, Dow Agrosciences. Dow's biggest biotech innovation is corn and soybeans genetically engineered for resistance to 2,4-D, the toxic

chlorophenoxy herbicide that formed part of the Vietnam War defoliant Agent Orange. Dow is heavily marketing its 2,4-D-resistant crops as the false "solution" to glyphosate-resistant weeds. The evidence that RRSB, after just three years of widespread commercialization, is contributing to the glyphosate-resistant weed epidemic in North Dakota and Minnesota, suggests the likelihood that sugar beets resistant to other herbicides will be developed as pesticide-promoting "fixes" to glyphosate-resistant weeds. KWS's collaboration with Dow may well give birth to 2,4-D-resistant sugar beets, offered as the false "solution" to GR weeds in sugar beets tomorrow as it is being marketed for imminent use in soybeans and corn today.

In the longer term, price increases associated with biotech seed, coupled with dramatic increases in herbicide use and costs to combat multiple herbicide-resistant weeds, could well endanger the financial viability of sugar beet farms. Cotton farms face this exact issue are going under thanks largely to epidemic glyphosate-resistant weeds.

The Department of Justice has noticed the effects. In August of 2009, it announced that it would investigate anticompetitive conduct in the seed industry, the recent ability to patent seed having led to unprecedented seed industry concentration. The commercialization of RRSB further exacerbates Monsanto's influence over seed prices and market consolidation. The general public is adversely affected, as increased seed prices are reflected in the cost of food. Concentration of the seed industry "affects virtually every farmer in the country and in a very vital way," and has drawn large crowds at unprecedented hearings scheduled by the antitrust division of the Department of Justice and USDA.

For these and other reasons, the DEIS does not adequately address the cumulative impact of seed market concentration. The seed market concentration impacts of a deregulation of RRSB constitute a significant cumulative impact.

Response: The commenter fails to understand the sugar beet seed industry. APHIS describes the industry in section III.B.1 of the FEIS. The adoption of H7-1 has not changed the companies that grow sugar beet seed or the way that sugar beet seed is tested or marketed in the United States. The marketing and production of sugar beets has no effect on the marketing and production of cotton seed varieties or other GE seeds. In addition, the U.S. Patent and Trade Office—not APHIS—takes actions on patents. General issues regarding what can or cannot be patented is outside the scope of this EIS. Furthermore, APHIS' action on this petition does not affect what can or cannot be patented. The commenter speculates about future variety development. If other varieties are developed in the future, APHIS will analyze the impacts of those varieties if asked to take action on them.

Comment: Second, APHIS's default assumption is that cumulative effects from full deregulation of RRSB will be additive, when in fact some important effects are synergistic with past actions. As discussed further in CFS science comments, the cumulative effects of RRSB cultivation on evolution of glyphosate-resistant weeds are synergistic with, rather than additive to, the effects of pre-existing RR crop systems, at least in some areas and situations (e.g. where RRSB is rotated with other RR crops, which occurs on half of total sugar beet acreage). APHIS's bare mention of the potential for cumulative effects of RRSB cultivation to increase nonlinearly with respect to evolution of glyphosate-resistant weeds is not an analysis, much less a quantitative one, but merely the starting point for such an

analysis. APHIS's quantification of RR crop acreage at the county level is a helpful start, but is unmatched by any corresponding assessment of the relevant effects, increasing acreage infested by GR weeds and responses to those weeds.

Response: According to Merriam-Webster (http://www.merriam-webster.com/dictionary/synergism), synergism is defined as the interaction of discrete agencies (as industrial firms), agents (as drugs), or conditions such that the total effect is greater than the sum of the individual effects. APHIS has not identified any interactions that contribute to the development of herbicide-resistant weeds that are synergistic. The commenter fails to state which interactions he or she believes are synergistic or to supply any evidence to suggest that interactions are synergistic. APHIS has updated the cumulative impacts section in the FEIS to clarify the incremental contribution of each alternative to the cumulative effects of agriculture on physical, biological, and sociocultural resources. APHIS also discusses the incremental contribution of each alternative to the selection and spread of herbicide-resistant weeds.

Comment: RRSB is grown in rotation with one or more other RR crops. Because glyphosate resistance takes several years to evolve, glyphosate use with each of the RR crops in the rotation contributes to the selection pressure that triggers the evolution of the GR weed. Hence, it will in most cases never be possible to attribute the GR weed to the production of any single RR crop in a field where several are grown in rotation. This does not mean, and cannot be used as a pretext to assert, that RRSB is not contributing to the evolution of GR weeds. Further, a glyphosate- resistant waterhemp has recently been confirmed in hundreds of North Dakota fields covering thousands of acres planted to corn, soybeans and sugarbeets, likely a result of continuous glyphosate selection pressure acting on rotations involving two or three RR versions of each crop.

Response: APHIS has analyzed this issue in the cumulative impacts section of the FEIS and has concluded that on a local level H7-1 sugar beet contributes to the selection and spread of GR weeds. This local effect may contribute to an impact on a regional scale in areas with a high incidence of successive GR crops, including North Dakota, Minnesota, Michigan, Nebraska, and Colorado.

Comment: Third, APHIS fails to provide any structured assessment of the cumulative effects of glyphosate-resistance in weeds in combination with pre-existing resistances to other herbicides. In general, the adverse effects of acquisition of glyphosate resistance would increase disproportionately with the number of pre-existing resistances in the pertinent weed population, a synergistic cumulative effect in NEPA terms. Cumulative effects increase disproportionately as progressively more resistances shrink the universe of control options to the least desirable herbicide(s) – least desirable because, for instance, more expensive, more toxic, less effective, more time- consuming, more soil-eroding, etc. Synergism is at play in another sense: As the universe of effective herbicides diminishes with accumulation of resistances, more selection pressure will be exerted on weed populations to evolve resistance to the few remaining effective options than would be the case if a larger array of herbicidal alternatives were in play. Hence, as a general rule, each resistance a weed population acquires sets the stage for more rapid evolution of resistance to the remaining effective mode(s) of action.

Response: APHIS disagrees with the commenter's vague assertion that there are synergistic cumulative effects. The story told by the commenter is pure conjecture. Section IV.C.3 of the

FEIS discusses the control of multiply-resistant weeds. The FEIS concludes that glyphosate is an additional tool to control weeds, including those that are resistant to other herbicides. By controlling weeds that are resistant to other herbicides, glyphosate use can reduce the weed seed bank, thereby decreasing the availability of these weed biotypes to cross with other resistant biotypes. APHIS analyzes how the adoption of H7-1 sugar beet under Alternatives 2 and 3 could incrementally affect weed management costs. There is no evidence that the development of resistance to herbicides with one mode of action makes a weed more likely to become resistant to an herbicide with a different mode of action. In addition, data do not support the notion that a second resistance develops more quickly than the first.

Comment: The DEIS emphasizes the prevalence of sugar beet weeds resistant to non-glyphosate herbicides, but purely to stress the short-term benefits of RRSB-associated glyphosate use in controlling them. APHIS provides no analysis of the medium- to long-term impacts of glyphosate- resistance, particularly when already resistant weeds acquire additional resistance to glyphosate. Instead, APHIS merely acknowledges that use of non-glyphosate herbicides and tillage "may" increase "if" GR weeds become more prevalent due to RRSB cultivation, APHIS's hypothetical response disregards facts in the record, and is thus arbitrary and capricious.

Response: APHIS is unclear about which "facts in the record" the commenter refers. APHIS analyzes the medium- and long-term impacts of weed management under the different alternatives in the FEIS. These include the adoption of resistance management techniques, such as cover crops, residual herbicides, and tillage. APHIS has updated the cumulative impacts section to incorporate this analysis from section IV.

Comment: Regarding already-resistant weeds and their potential to acquire additional resistance to glyphosate, APHIS dismisses concerns as a matter of luck. However, the accumulation of resistances to different herbicide modes of action is clearly a very significant cumulative effect, in that it can transform a troublesome weed into a noxious weed, which can have numerous adverse impacts on the interests of agriculture, natural resources, and the environment. In Illinois, agronomists warn that if already quad-resistant waterhemp acquires resistance to the sole remaining post-emergence herbicide that can control it (glufosinate), which they think likely, growing soybeans may become "impractical" in some Midwestern fields. Palmer amaranth resistant to glyphosate and often to ALS inhibitors is wreaking havoc in the South, and a glyphosate-resistant population has recently been confirmed in Michigan.

Response: APHIS agrees that the selection of weeds resistant to multiple herbicides is a serious problem, and it is one that will continue under all three alternatives considered in this FEIS. Weed scientists believe that the best way to approach this problem is to develop new herbicide options and to follow best management practices, such as crop rotation, use of multiple herbicide chemistries (especially the use of residual herbicides), use of cultivation, use of cover crops, monitoring of weeds, and others management practices described in the FEIS (Tranel *et al.*, 2011) (see APHIS-2010-0047-4530). Contrary to the commenter's viewpoint, herbicide-resistant crops are part of the solution. If GR crops were not deployed, the situation that the commenter raises concerns about—namely that post-emergent herbicides would no longer be available to control waterhemp in soybean—would have occurred in 2000 when waterhemp developed resistance to three herbicides (PSII, ALS, and PPO inhibitors). The availability of GR and glufosinate-resistant crops has provided two additional herbicide options that have positively

impacted agriculture, natural resources, and the environment. Moving forward, an important component will be educating growers about not relying on a single weed management strategy so that herbicide-resistant crop technology can be employed sustainably. Eliminating herbicide options for America's farmers would, through regulation, create the very scenario feared by the commenter. Herbicide-resistant crops coupled with growers' implementation of proactive strategies may allow control of multiple herbicide-resistant weeds. Therefore, Alternative 2 does the most to alleviate the commenter's concerns about control of herbicide-resistant weeds.

Comment: Glyphosate-resistant common ragweed is spreading exponentially in the sugarbeet growing counties of Minnesota and North Dakota. Since "[t]he majority of common ragweed populations in ND and MN contain some frequency of biotypes resistant to ALS-inhibiting herbicides," many of these GR weeds will have dual resistance, leaving just one effective herbicide option – clopyralid (Stinger) – to control glyphosate-resistant ragweed in sugar beets. Acquisition of resistance to that last herbicide could have serious socioeconomic impacts, as growers' fields become overrun with weeds unamenable to control, drastically reducing yields, making harvest difficult or uneconomic, and perhaps even putting farmers out of business. Andrew Kniss's admonition in his USDA NIFA research proposal, warned that RRSB will likely lead to "near total reliance on" glyphosate, which in turn "will almost surely lead to glyphosate resistant weeds," *leaving growers with "few acceptable management options."* (This statement is directly contrary to Mr. Kniss's declaration that APHIS relies on so heavily, See CFS Science Comments for further discussion and documentation).

Response: APHIS analyzed information supplied by the commenter's organization in comment number APHIS-2010-0047-4351. The commenter misinterpreted the data in the International Survey of Herbicide Resistant Weeds. Reports on the spread of common ragweed have not been verified, so it is premature to conclude that the populations are increasing exponentially. APHIS also pointed out that not using the "last herbicide" will have the same serious socioeconomic impacts as that future day when GR weeds have become "uncontrollable". The only difference is that the commenter argues for that day to be today and not at some future time.

The agency disagrees with the commenter's characterization of Dr. Andrew Kniss's statement. Dr. Kniss' point was that if growers totally rely on glyphosate, GR weeds will surely follow. Therefore, he recommends developing alternative management strategies and pursued the investigation of the use of ethofumesate in combination with glyphosate to introduce a second herbicide mode of action for weed control in H7-1 sugar beet. APHIS does not find Dr. Kniss's statement to be contradictory. This statement is consistent with best management practices advocated by the Weed Science Society of America. APHIS analyzes the development of GR weeds and their management in section III.C.3 and the socioeconomic impacts of weed management in section V.

X General comments on the sufficiency of the EIS

Comment: Under NEPA, agencies must ensure the professional integrity, including the scientific integrity, of the discussions and analyses in their environmental impact statements. In doing so, they must "discuss at appropriate points in the final statement any responsible opposing view which was not adequately discussed in the draft statement and shall indicate the agency's response to the issues raised." As noted above, the PPA also requires that APHIS decisions be based on "sound science."

APHIS's analysis of several critical issues avoids serious consideration of evidence that is contrary to its preferred outcome. The DEIS is arbitrary, capricious, and violates NEPA and the PPA because it relies on scientific and economic analyses that APHIS knows to have been discredited—judicially, by prior inconsistent statements, or by overwhelming scientific consensus. For instance, CFS submitted comments on the draft environmental assessment for partial deregulation of RRSB (hereinafter referred to as CFS Science Comments 2010, included in supporting materials) that provide evidence refuting and discrediting APHIS's unsound science with respect to glyphosate-resistant weeds, yet APHIS continues to rely on discredited views in the draft EIS.

Response: APHIS disagrees with the commenter. APHIS has in the DEIS and FEIS considered opposing views, has reviewed data submitted by those who oppose deregulation, and has not relied on discredited views. Further, APHIS' decision on the PPA regarding the plant pest risk posed by H7-1 is clearly based on sound science and does not rely on discredited views. APHIS responded to comments submitted by this commenter on the environmental assessment (EA) (USDA-APHIS, 2011a).

Comment: In assessing the socioeconomic impacts of the three alternatives on the sugar beet industry, the DEIS relies heavily on opinions by Dr. Sexton, an expert witness on behalf of industry Intervenor-Defendants in prior litigation regarding RRSB. In that litigation, Dr. Sexton provided opinions on the same topics as those discussed in the DEIS: the economic impacts of halting full scale production of RRSB. However, the district court in *Sugar Beets II* found Dr. Sexton's opinions to be unreliable. Dr. Sexton's estimates regarding the net economic benefit of adopting H7-1 are based on hearsay: self-reported data from industry groups either involved in pending RRSB litigation or with economic interests in its outcome. Dr. Sexton also did not consider the impacts of fluctuating commodity prices on profitability or on a farmer's choice of crops, or the cost of Monsanto's technology fee for its patented seed in the costs of producing RRSB. Dr. Sexton's methodologies are unreliable and cannot be used to support the DEIS's conclusions about economic impacts. .

Response: APHIS disagrees with this comment because APHIS has included an extensive analysis of the socioeconomic impacts of each of the three alternatives evaluated in the DEIS and FEIS. APHIS used the best available information from various sources, including Dr. Sexton. APHIS disagrees that Dr. Sexton used unreliable methodologies. The criticism is that he obtained his data from industry groups that have an economic interest in the outcome. However, the industry groups are the only source of the data. Dr. Sexton did a sound analysis using the best information available. Growers, beet processors, and others indirectly affected by the beet industry commented on the DEIS, and their comments are consistent with the analysis in the DEIS and FEIS, namely that they derive a significant economic benefit from

producing H7-1 sugar beet. Samples of these comments are included earlier in this Response to Comments section. In addition, Dr. Sexton's analysis that economic harm under Alternative 1 might result in closure of additional sugar beet processing plants is in accord with the history of sugar mill and refinery closings over the last 15 years, during which 13 mills closed and none have opened (FEIS table 3-31). The commenter does not suggest any additional socioeconomic impacts that are not included in the DEIS.

Comment: In its analysis of the likelihood that RRSB will hasten the emergence of glyphosate-resistant weeds, the DEIS also relies on opinions by Andrew Kniss. These opinions are contrary to evidence before the agency. Specifically, the DEIS relies on weed control practices contradicted by record evidence and Mr. Kniss's own prior inconsistent statements. The DEIS also fails to acknowledge contradictory and inconsistent evidence. It does not meet NEPA's requirements regarding professional and scientific integrity in the decision making process.

Response: APHIS disagrees with this comment. APHIS has reviewed Andrew Kniss's declarations and papers and, contrary to the commenter's assertion, has found them to be consistent amongst themselves and with weed science papers and weed science experts' recommendations. Because the commenter fails to specify examples of contradictory and inconsistent evidence, APHIS cannot further assess the validity of this assertion.

Comment: Although APHIS makes repeated claims that pollen flow from RRSB is "not likely to occur," APHIS has not measured the likelihood or possibility of pollen flow from RRSB to sexually compatible *Beta* crops at the 4-mile isolation distances the industry is meant to observe. APHIS instead relies on analysis and studies with, at best, a tenuous connection to observational data. APHIS's reliance on overly derivative and unreliable scientific analysis here is therefore arbitrary, capricious, and contrary to NEPA and the PPA.

Response: APHIS has relied on the best available scientific studies and observations of growers in the Willamette Valley, which support the conclusion that cross-pollination is not likely to occur (see sec. IV.B.5).

Comment: The DEIS states that "[d]espite testing over 3 years, no evidence of H7-1 gene flow has been detected." APHIS supports this statement with a reference to a declaration in prior *Sugar Beets* litigation, without providing further context. Critically, the DEIS fails to disclose the existence of confidential evidence before the agency, introduced during *Sugar Beets I, II* and *III*, revealing that H7-1 gene flow has occurred, and continues to occur. APHIS's conclusion to the contrary disregards facts before the agency. Failure to address this contrary evidence is arbitrary, capricious, and violates NEPA and PPA's mandates concerning professional and scientific integrity.

Response: We disagree with the commenter's characterization of the information, which, as the commenter notes, is confidential and thus APHIS cannot explicitly discuss or disclose this information in this Response to Comments section. However, APHIS has fully analyzed, considered, and reviewed the confidential evidence referenced and has concluded that the information does not controvert or call into question APHIS' analysis regarding H7-1 gene flow as examined and analyzed in the DEIS and FEIS.

Comment: The DEIS claims that, should growers rely on a single herbicide (glyphosate) to control weeds, glyphosate-resistant weeds would nevertheless take five or more years to develop. CFS rebutted this erroneous prediction, including discussion of the sources APHIS cited, in comments on the draft environmental assessment for partial deregulation (CFS Science Comments 2010). APHIS also fails to acknowledge contrary evidence introduced at all stages of the *Sugar Beets* litigation that glyphosate-resistant weeds are currently infesting fields where RRSB is grown.

Failure to address this contrary evidence known to APHIS is arbitrary, capricious, and violates NEPA and PPA's mandates concerning professional and scientific integrity.

Response: APHIS disagrees with this comment. APHIS addressed this comment in the Response to Comments for the draft EA (USDA-APHIS, 2011a). APHIS has considered and reviewed all evidence regarding glyphosate that was discovered and presented during the Sugar Beet I and II litigation. Furthermore, the specific instance of whether weeds would develop resistance in 5 years in sugar beet refers to selection of a new biotype, not the movement of a GR weed from another crop into sugar beet fields that would happen under any of the alternatives. The commenter conflates the two instances. The FEIS clearly distinguishes these two possibilities and analyzes them in section IV. C.3. In areas where other GR crops are not being grown extensively, GR weeds have not been identified as a problem in sugar beet crops although H7-1 sugar beet has been grown for 4 years.

XI Other Environmental Laws

Comment: To the limited extent APHIS claims to have "consulted" with the U.S. Fish and Wildlife Service (FWS), APHIS did not follow mandatory procedures under the Endangered Species Act (ESA). These failures are significant because glyphosate—directly stemming from APHIS's approval of the Roundup Ready Sugar Beet crop system -- is known to be highly toxic to several listed species that may be present where RRSB will be grown and therefore affected.

APHIS must make a written request to FWS for a list of the listed species (or species proposed to be listed) in the proposed action area that may be present. This request is crucial to the ESA decision process, because only a determination by FWS "based on the best scientific and commercial data available" can decide whether or not APHIS must then prepare a biological assessment. Here, Appendix F indicates that APHIS did not make any such request, much less prepare a biological assessment.

Additionally, APHIS violated Section 7(a)(2) of the ESA by failing to consult with FWS—informally or formally—about the effects of RRSB deregulation on listed species and critical habitat. Under ESA, there is only one determination that can conclude 7(a)(2) consultation: whether the proposed action is "likely to adversely affect" listed species or critical habitat. APHIS and FWS may not decline to consult, or prematurely terminate consultation, without performing any analysis at all, simply based on their (erroneous) conclusion that any adverse effects are some other agency's problem to solve.

The increase in glyphosate use resulting from full deregulation of RRSB will create direct, indirect and interrelated impacts on several endangered species. As Appendix E reveals, there are myriad plant and animal species listed as endangered or threatened where this anticipated increase in glyphosate is to occur and that therefore may be affected by the agency's action. ESA requires APHIS to solicit information about the potential adverse impacts to these species, and if they may be affected by the agency's proposed action, to consult with the expert agency, so that APHIS may then tailor its action to avoid any such harms.

By failing to complete Section 7(a)(2) consultation based on an erroneous legal assumption regarding its duties under the ESA, APHIS based its analysis on factors Congress did not intend for it to consider. Deregulating RRSB without completing consultation would therefore be arbitrary, capricious, and contrary to the mandates of the ESA.

Response: APHIS disagrees with the commenter's statements that glyphosate use directly stems from APHIS' approval of the H7-1 sugar beet cropping system and is known to be highly toxic to, and will affect, several listed T&E species that may be present where sugar beet will be grown. If APHIS decides that it is appropriate for H7-1 sugar beet to have nonregulated status because it does not pose a plant pest risk, that regulatory decision removes H7-1 sugar beet from being regulated under part 340; it does not in any manner legally approve—nor require—farmers who choose to grow H7-1 sugar beet to use or apply glyphosate on their planted H7-1 sugar beet.

APHIS likewise disagrees with the commenter's characterization of how it should or must consult with the U.S. Fish and Wildlife Service (USFWS) as well as with the commenter's statement that APHIS must prepare a biological assessment analyzing the impacts of glyphosate use on H7-1 sugar beet.

In USFWS' Section 7 Consultation technical assistance instructions (see http://www.fws.gov/midwest/endangered/section7/s7process/7a2process.html), USFWS explains that Federal agencies must review their actions and determine whether the action may affect Federally listed and proposed T&E species or proposed and designated T&E critical habitat. To accomplish this review, Federal agencies must request from USFWS a list of T&E species and critical habitat that may be in the project area or request USFWS' concurrence with their species list. Once a species list is obtained or verified as accurate, Federal agencies need to determine whether their actions may affect any of those T&E species or their critical habitat. If T&E species and their critical habitat are unaffected, no further consultation is required. If Federal agencies determine that any of those T&E species or their critical habitat are or may be affected, then consultation with USFWS is required. This consultation will conclude either informally with written concurrence from USFWS or through formal consultation with an issuance of a biological opinion provided by USFWS to the Federal agency.

APHIS began an analysis of any possible impacts on T&E species that could result from growing and harvesting RRSB by obtaining a list of all T&E species in the different U.S. regions where sugar beets are or may most likely be grown (see app. E). APHIS uses a specifically developed "decision tree" to perform its Endangered Species Act (ESA) reviews and to indicate what issues topics and questions need to be brought to the USFWS for either formal or informal consultation. APHIS completed an analysis of potential impacts on T&E species and determined that H7-1 sugar beet plants would have no impact on any T&E species or critical habitat in any U.S. regions likely to have H7-1 production sites.

APHIS concluded that the H7-1 sugar beet plant would have "no effect" on any T&E species or on their critical habitat (nor on any species proposed to be listed as T&E or on their critical habitat) in those regions of the country where H7-1 sugar beet is, or most likely will be, grown.

On June 15, 2011, APHIS met with USFWS officials to discuss whether APHIS has any obligations under the ESA to analyze the impacts of herbicide use associated with all GE crops on T&E species. As a result of these joint discussions, USFWS and APHIS agreed that it is not necessary for APHIS to perform an ESA effects analysis on herbicide use associated either with H7-1 sugar beet or other currently planted GE crops.

The registration and all approved uses of glyphosate are under EPA's legal jurisdiction and control. APHIS has no legal jurisdiction to regulate, control, restrict, or approve any registration or uses of glyphosate or any other pesticide. The EPA-approved label provides specific use requirements for the application of glyphosate to H7-1 sugar beet that must be complied with by anyone who uses glyphosate on them.

Under APHIS' current part 340 regulations, APHIS only has the authority to regulate H7-1 sugar beet or other GE organisms if the agency believes they may pose a plant pest risk. APHIS has no regulatory jurisdiction over any other risks associated with GE organisms, including risks resulting from the use of herbicides or other pesticides on those organisms. Nevertheless, based on assessments provided by EPA and information in peer-reviewed scientific literature, APHIS is aware that there may be potential environmental impacts resulting from the use of glyphosate on H7-1 sugar beet, including potential impacts on T&E species and critical habitats. APHIS provides this information in the FEIS.

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