UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, DC 20460

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

PC Code: 128931
DP Barcode: 436602
Date: November 8, 2016

MEMORANDUM

Subject: Addendum to Dicamba Diglycolamine (DGA) Salt and its Degradate, 3,6-dichlorosalicylic acid (DCSA) Refined Endangered Species Risk Assessments for New Uses on Herbicide-Tolerant Cotton and Soybean in 34 U.S. States (Alabama, Arizona, Arkansas, Colorado, Delaware, Florida, Georgia, Illinois, Iowa, Indiana, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia and Wisconsin) to Account for Listed Species not included in the Original Refined Endangered Species Risk Assessments

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This document includes the assessment of endangered and threatened species newly listed since EFED conducted the original listed species assessments (USEPA, 2016c-e). In March, 2016, EFED issued a Section 3 screening-level risk assessment for the use of diglycolamine salt of dicamba (dicamba DGA) on dicamba herbicide-tolerant cotton (USEPA, 2016a), an addendum to the 2011 Section 3 screening-level Risk Assessment for the use of dicamba DGA on dicamba herbicide-tolerant soybeans (USEPA, 2016b) and three addenda to the risk assessments (USEPA, 2016c-e) that refined the screening-level risk assessment to include species-specific assessments for threatened and endangered (hereafter referred to as "listed") species present in 34 states (Alabama, Arizona, Arkansas, Colorado, Delaware, Florida, Georgia, Illinois, Iowa, Indiana, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Mexico, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia and Wisconsin).

The screening-level risk assessments concluded that potential direct risk concerns could not be excluded for:

- mammals (chronic, from the soybean use only, due to residues from dicamba's metabolite, DCSA, rather than from parent dicamba);
- birds (acute from parent dicamba for both soybean and cotton uses; chronic from DCSA residues only in soybean but not in cotton), considered surrogates for reptiles, and terrestrial-phase amphibians; and
- terrestrial plants (soybean and cotton uses)

In the screening-level risk assessments, indirect effect risk concerns for all taxa were possible for any species that have dependencies (e.g., food, shelter, and habitat) on mammals, birds, reptiles, terrestrial-phase amphibians, or terrestrial plants.

Additionally, the screening-level assessment showed that direct risk levels of concern were not exceeded for:

- mammals (acute) and (chronic—for the cotton use only);
- birds, reptiles, and terrestrial-phase amphibians (chronic from parent dicamba or DCSA degradate from use on cotton);
- terrestrial insects (acute and chronic);
- freshwater fish (acute and chronic);
- aquatic-phase amphibians (acute and chronic);
- estuarine/marine fish (acute and chronic);
- freshwater invertebrates (acute and chronic); estuarine/marine invertebrates (acute and chronic); and

- aquatic plants[1]

As described below, in the screening-level cotton risk assessment and soybean addendum as part of the earlier public comment process, EFED concluded that mitigation measures, including the use of rainfast mitigation to limit runoff exposure, limiting nozzles to those that restrict droplet spectra to extra-coarse and ultra-coarse, restricting appications under certain wind conditions (*i.e.* only apply when wind speeds are between 3 and 15 mph), and the use of a 110-foot buffer (for a 0.5 lb a.i./A application) in the direction of wind to account for spray drift and applying that buffer in every direction to account for potential volatilization (a discussion of the updates to this assessment is provided below), would limit any exposures beyond the treated field to levels below thresholds that would trigger any risk concerns for any taxa. These assessments concluded that by applying the rainfast mitigation and utilizing the spray drift and volatility buffer as setbacks from the edge of the field ("in-field buffers"), exposures that could potentially trigger risk concerns would be limited to the treated field.

Since these risk assessment documents were issued, the registrant provided additional volatility data for dicamba DGA formulations that indicated dicamba DGA was unlikely to volatilize off-field at concentrations above threshold levels (USEPA, 2016f. D435792). Therefore, EPA decided that the requirement of a volatility buffer in all directions is not required to be placed on the labeling (but maintained the requirement of a spray drift buffer in the direction of wind). This assessment uses the most current label language that includes requirements that are expected to limit exposures (that would exceed a level of concern to any taxa) to the treated field. Additionally, the labeling contains a rainfast mitigation measure that prevents off-field exposures above any threshold levels via runoff. With these labeling restrictions, EFED determined that the vast majority of listed species would be off-field and therefore would not be part of the action area and consequently reached a No Effect decision for those species. Species that were potentially on the treated field or utilizing resources from the treated field and for which the screening-level risk assessment indicated concerns for that taxa would need further refinement to determine the potential for risk.

EPA has a specific process based on sound science that it follows when assessing risks to listed species for pesticides like dicamba that will be used on seeds that have been genetically modified to be tolerant to the pesticide. The Agency begins with a screening-level assessment that includes a basic ecological risk assessment based on its 2004 Overview of the Ecological Risk Assessment Process document. [USEPA, 2004, available at http://www.epa.gov/oppfead1/endanger/litstatus/riskasses.htm]. That assessment uses broad default assumptions to establish estimated environmental concentrations of particular pesticides. If the screening-level assessment results in a determination that no levels of concern are exceeded, EPA concludes its analysis. On the other hand, where the screening-level assessment does not rule out potential effects (exceedances of the level of concern) based on the broad default assumptions, EPA then uses increasingly specific methods and exposure models to refine

[1] The listed species LOC was exceeded for non-vascular aquatic plants; however, there are no listed species of this taxa.

its estimated environmental concentrations. At each screening step, EPA compares the more refined exposures to the toxicity of the pesticide active ingredient to determine whether the pesticide exceeds levels of concern established for listed aquatic and terrestrial species. EPA determines that there is no effect on listed species if, at any step in the screening level assessment, no levels of concern are exceeded. If, after performing all of the steps in the screening-level assessment, a pesticide still exceeds the Agency's levels of concern for listed species, EPA then conducts a species-specific refined assessment to make effects determinations for individual listed species. The refined assessment, unlike the screening-level assessment, takes account of species' habitats and behaviors to determine whether any listed species may be affected by use of the pesticide.

Using this process and based on EFED's LOCATES v2.4.0 database and information from the U.S. Fish and Wildlife Service (USFWS), the three addenda issued in March, 2016 respectively examined: a) 183 listed species in 16 states (USEPA, 2016c. D416416+ covering AR, IL, IN, IA, KS, LA, MN, MS, MO, NE, ND, OH, OK, SD, TN, WI); b) 307 listed species in 7 states (USEPA, 2016d. D422305 covering AL, GA, KY, MI, NC, SC, TX); and c) 322 species in 11 states (USEPA, 2016e. D425049 covering AZ, CO, DE, FL, MD, NM, NJ, NY, PA, VA and WV).

The purpose of this document is to update the refined endangered species risk assessments for the 34 states assessed to reflect the current understanding of all listed species within these states. Since the addenda were issued, some species have been either added or removed from the list of endangered or threatened species in these states. EPA revisited the list of species and identified 70 additional species, discussed below. EPA consulted U.S. Fish and Wildlife Service Recovery Plans to determine whether listed species in these states would be expected to occur in an action area encompassing the treated soybean and cotton fields. The refined assessment was then conducted on those species that could not be excluded from the action area. For these species, EPA also consulted the recovery plans for additional habitat information and incorporated species biological information regarding dietary items (used to model dicamba DGA residues in prey tissue) and body weight (used to determine food consumption rates and scale ecotoxicity data from the tested surrogate species, the bobwhite quail and rat, to the body weight of the listed species). Sixty-six of the new species that had not previously been assessessed were excluded from the action area and consequently result in No Effect determinations. These species and the rationales for their exclusion from the action area are described in **Appendix A**. The remaining four new species (Northern long-eared bat, Mexican wolf, Gunnison Sage Grouse and the Eastern Massasauga rattlesnake) could not immediately be excluded from the treated field and this addendum includes a refined species-specific assessment for these listed species.

In the March, 2016 dicamba refined endangered species assessment addenda, EPA described the lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), the Mexican long-nosed bat (*L. nivalis*) and the Canada lynx (*L. canadensis*) as species that would not be in the action area – defined as the area limited to the treated field (Appendix 2 of USEPA, 2016e). The action area is limited to the treated field because EPA expects that with the mitigation measures for spray drift and runoff in place, dicamba will remain within the field being treated. EPA determined that

these species would not be in the action area because none of these species' habitats or any of their resources (*Agave* plants for both bat species, snowshoe hares for the lynx) are present on the treated field. No Effect determinations were therefore made for these species.

EPA acknowledges that the recently released ecological risk assessment and listed species effects determinations for 2,4-D Choline salt (Enlist Duo formulation) on 2,4-D tolerant corn, cotton and soybean (USEPA, 2016g. D428301) determinations of no effect for these three species may appear to be different than this dicamba assessment. In the Enlist Duo assessment, EFED included these three species in the summary list of effects determinations for listed species within the action area (**Table 1** on pp. 6-7 of that assessment), whereas the dicamba assessment states that these species are outside the action area. The ultimate determinations of no effect in both assessments are correct; however, the process differs slightly. For Enlist Duo, EFED determined that these species could have been within the action area, but upon further refinement (including a thorough analysis of the lynx and the bat recovery plans) it was determined that because their resources are outside the action area, a No Effect determination was made.

For dicamba, EFED found that because the resouces for these species are outside the action, the species themselves were considered to be outside the action area. The bottom line is that the resources for these species are not within the action area, therefore a No Effects determination is appropriate. In an effort to remain consistent between the 2,4-D and dicamba DGA risk assessments, **Table 1** below includes both the Mexican and lesser long-nosed bat species and the Canada lynx.

Table 1 summarizes the effects determinations for listed species expected to occur within this action area (*i.e.* species for which available habitat requirement information suggests that they could co-occur with cotton or soybean fields). This table is identical to the combined list of species identified as within the action area from the three endangered species refined risk assessment addenda (USEPA, 2016c-e), with the exceptions of the aforementioned additions of four newly assessed species (Northern long-eared bat, Mexican wolf, Gunnison Sage Grouse and the Eastern Massasauga rattlesnake), the additions of the Canada lynx and the Mexican and lesser long-nosed bat species, and the removal of the Louisiana black bear, lesser prairie-chicken, Delmarva peninsula fox squirrel and Florida panther (as a result of these being delisted by USFWS since the time of the original endangered species assessment addenda).

This list does not include the potential of additional mitigation measures of prohibiting use in certain counties or states (see below) on the product labeling. When considering the 27 listed species within the action area, one likely to adversely affect (LAA) determinations was made, two not likely to adversely affect (NLAA) determinations are made and no effect (NE) determinations are made for the remaining species. The refined risk assessment rationale that led to the effects determinations in this table can be found in the three endangered species risk assessment addenda (USEPA, 2016c-e). The methodology used in this addendum is identical to that used in the previously issued endangered species assessment addenda for dicamba's use on tolerant-soybean and cotton plants. Full details on EPA's methodology of effects determination, spray drift mitigation and evaluation of exposure through runoff can be found in the endangered species assessment addenda (USEPA, 2016c-e)

Table 1. Summary of Effects Determinations for Federally Listed Threatened or Endangered Species within the Action Area

Species	Effects determination	Crops Pertinent to Effects Determination*	Areas of Concern
Indiana bat	NE	Cotton, Soybean	NA
Lesser long-nosed bat	NE	Cotton, Soybean	NA
Mexican long-nosed bat	NE	Cotton, Soybean	NA
Northern long-eared bat	NE	Cotton, Soybean	NA
Ozark Bat	NE	Cotton, Soybean	NA
Virginia big-eared bat	NE	Cotton, Soybean	NA
Canada Lynx	NE	Cotton, Soybean	NA
Gray wolf	NE	Cotton, Soybean	NA
Mexican wolf	NE	Cotton, Soybean	NA
Red wolf	NE	Cotton, Soybean	NA
Jaguar	NE	Cotton, Soybean	NA
Gulf-Coast jaguarundi	NE	Cotton, Soybean	NA
Ocelot	NE	Cotton, Soybean	NA
Sonoran pronghorn antelope	NE	Cotton, Soybean	NA
Whooping crane	NE	Cotton, Soybean	NA
Attwater's greater prairie-chicken	NE	Cotton, Soybean	NA
Eskimo curlew	NLAA	NA	NA
Gunnison Sage Grouse	NE	Cotton, Soybean	NA
Mississippi Sandhill crane	NE	Cotton, Soybean	NA
Audubon's Crested Caracara	NLAA	Cotton	Palm Beach County in Florida
	NE	Soybean	NA
California condor	NE	Cotton, Soybean	NA
Eastern Massasauga rattlesnake	NE	Cotton, Soybean	NA
Indigo snake	NE	Cotton, Soybean	NA

Species	Effects determination	Crops Pertinent to Effects Determination*	Areas of Concern
Gopher tortoise	NE	Cotton, Soybean	NA
Houston toad	NE	Cotton, Soybean	NA
American burying beetle	NE	Cotton, Soybean	NA
Spring Creek bladderpod	LAA	Cotton, Soybean	Wilson County in Tennessee

NA – Not Applicable as a No Effect determination has been reached or consultation has been concluded
NE-No Effect
NLAA- May Effect, Not Likely to Adversely Affect
LAA- May Effect, Likely to Adversely Affect
*Considering soybeans and cotton, which are the focus of the previous assessments and this addendum.

Consultation has concluded for the Eskimo curlew, the U.S. Fish and Wildlife Service concurs with the NLAA Effects Determination and no further action need be taken relative to this species (USEPA, 2016d-e).

The draft XtendiMax™ With VaporGrip™ Technology (EPA Reg. No. 524-617) includes the following language:

> "XtendiMaxTM With VaporGripTM Technology is approved by U.S. EPA to be used in the following states, subject to county restriction as noted: Alabama, Arkansas, Arizona, Colorado, Delaware, Florida (excluding Palm Beach County), Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee (excluding Wilson County), Texas, Virginia, West Virginia, Wisconsin."

Under these conditions, an approved label with these prohibitions would place the Audubon's caracara and the Spring Creek bladderpod outside of the action area of the uses on cotton and soybean and therefore **no** Effects Determination would be needed or, if done, the conclusion would be **No Effect**.

Determinations for Critical Habitat Modification

The Agency has considered the potential for modification of critical habitat for the 70 additional listed species identified in the states of proposed product use. Critical habitats have been designated for 11 (10 off-field and 1 on-field species) of the 70 species and the Agency reached a **No modification** determination for each (**Appendices C-D**), concluding that the uses of dicamba DGA on dicamba-tolerant soybean and cotton do not result in any modification of designated critical habitat**.**

Species-specific ecological risk assessment for the remaining species potentially exposed to dicamba residues

As noted above, the species remaining to be assessed are the Northern long-eared bat (*Myotis septentrionalis*), Mexican wolf (*Canis lupus baileyi*), Gunnison Sage Grouse (*Centrocercus minimus*) and the Eastern Massasauga rattlesnake (*Sistrurus catenatus*). The methodology used in this addendum is identical to that used in the previously issued endangered species assessment addenda for dicamba's use on tolerant-soybean and cotton plants. Full details on EPA's methodology of effects determination, spray drift mitigation and evaluation of exposure through runoff can be found in the endangered species assessment addenda (USEPA, 2016c-e).

For the effects determinations for the Northern long-eared bat, Mexican wolf, Gunnison sage grouse and the Eastern Massasauga rattlesnake, a refined risk assessment approach was used to evaluate additional lines of evidence to determine whether the conservative generic assumptions in the screening-level risk assessment apply to a particular species of interest (*e.g.*, the Mexican wolf). For example, in the case of the Mexican wolf, the refined risk assessment investigated the impacts of more wolf-specific data related to:

1. Mammal size (as the wolf is larger than the 1000g large mammal category used in the initial screen)

2. Mammal food consumption tailored to:
   a. The true weight of the mammal
   b. Energy requirements of the wolf
   c. Improvement on the generic food intake model of the screen to assess energy content of the diet and the actual free living energy requirements of a mammal the size of a Mexican wolf

3. Toxicity endpoints scaled from the weight of the tested surrogate species (laboratory rat) to reflect the comparatively larger actual size of the wolf

Using the Mexican wolf as the example to show how EPA made its effects determinations, EPA determined that the Mexican wolf would be primarily feeding on carcasses of large mammals that may have been present in treated cotton and soybean fields. EPA therefore assumed that the predicted concentrations of dicamba DGA salt found in large (1000g) mammals that were exclusively feeding on short grass exposed to dicamba residues from the spray application would be a conservative prey analysis for the wolf consistent with the preliminary risk concerns identified in the screening assessments. For chronic exposures to DCSA residues, EPA assumed the prey mammal was feeding exclusively on soybean forage containing the maximum measured DCSA concentrations. This analysis is conservative as it assumes 1) that 100% of the wolf's food consumption comes from 1kg mammals that have fed exclusively on dicamba exposed short grass (the dietary item with the highest modeled residue levels) or DCSA residues in exposed dicamba-tolerant soybean plants (the only plants that would have significant DCSA residues) and 2) the level of dicamba DGA residues assumed to be on the consumed short grass

is based on the upper bound Kenaga residues expected for short grass directly exposed to spray applications of dicamba DGA while the level of DCSA residues is assumed to be the maximum measured concentration (61.1 ppm). Additionally, using the residues in a 1 kg mammal carcass is also likely conservative, given that the wolf primarily feeds on larger prey species such as deer and elk. EPA determined the field metabolic rate of the wolf through the use of a published peer reviewed allometric equation that relates bodyweight to energy requirements. Values were obtained from a published peer reviewed EPA document produced by the Office of Research and Development for Agency-wide use in conducting ecological risk assessment (USEPA, 1993) and the work of Dunning, 1984. The mass of dicamba DGA in the mammalian prey diet is determined from the T-REX run found in the addendum to the screening-level risk assessment (USEPA, 2016a). The mass of prey consumed per day is then multiplied by mass of dicamba in the mammal's diet to determine the mass of dicamba or DCSA in the wolf's daily diet in mg/day. Then the daily dose that the wolf (considering its bodyweight) receives is determined by multiplying the mass of dicamba or DCSA in the exposed mammalian prey (which had consumed exclusively exposed plants) divided by the bodyweight of the wolf. Then EPA scaled the chronic toxicity endpoint (based on the tested surrogate mammal species, laboratory rat, default weight of 350 grams) to the bodyweight of the wolf to determine the chronic oral toxicity for the wolf. Similarly for exposures to DCSA residues, the rat chronic toxicity endpoint from DCSA exposure was used. The chronic RQ for parent dicamba exposures is then calculated by dividing the daily dose of dicamba from consuming the exposed mammal carcasses by the chronic oral toxicity endpoint while the chronic RQ for DCSA exposures is calculated by dividing the daily dose of DCSA by the chronic toxicity endpoint. In this case, the chronic RQ for parent dicamba was 0.1, which is below the listed and non-listed chronic level of concern (LOC) of 1.0, while the chronic RQ for the metabolite DCSA was 0.41 which is below the listed and non-listed species chronic LOC of 1.0. At this point, EPA was able to conclude that dicamba DGA would not have an effect on the Mexican wolf.

Mammals

The screening-level assessments indicated that acute risk to mammals was not expected as no acute RQs exceeded the Agency's LOC (0.1) for acute risk (USEPA 2011. D378444, p. 15). However, the soybean screening-level assessment (USEPA, 2011) indicated that mammals could be at reproductive risk from chronic exposures to dicamba DGA on treated fields, though the cotton screening-level and concurrently issued soybean addendum (USEPA, 2016a-b) indicated that chronic exposures to dicamba DGA would be below the chronic LOC (1.0). This difference is due to the soybean screening-level risk assessment's use of a chronic endpoint from the rat 2-generation study (MRID 43137101), of 45 mg/kg-bw for the NOAEL, based on decreased pup weight at 136 mg/kg-bw compared to the concurrent controls. EPA's Health Effects Division (HED) recently reanalyzed the data from this study (USEPA, 2016h; D378366+) in comparison to the historical control database range and determined that the NOAEL and LOAEL should be raised to 136 and 450 mg/kg-bw, respectively, as pup weights in each generation in the 136 mg/kg-bw treatment group were within the historical control range and above the historical

control mean for the F1, F2A and F2B generations. Therefore, the cotton screening-level risk assessment, the concurrently issued soybean addendum and this refined endangered species risk assessment use this revised NOAEL for dicamba DGA salt.

The concurrently issued soybean addendum did indicate that chronic exposures to dicamba's metabolite, DCSA, residues in soybean could be a concern, while the screening-level cotton assessment indicated that chronic exposures to DCSA residues in cotton would not exceed the Agency's LOC for chronic risk. Therefore, EPA only conducted a refined assessment for chronic exposures to DCSA in soybeans for listed species that could reasonably be expected to occur on treated soybean fields.

Of the new (not previously assessed) mammalian species identified as potentially at risk in the thirty four states, two are reasonably expected to occur on treated soybean fields (Mexican Wolf and Northern long-eared bat). Species-specific biological information and dicamba DGA use patterns were considered in more depth to further refine the assessment and effects determinations for the two species potentially expected to occur on treated soybean fields.

Mexican Wolf

Dicamba Chronic Effects Assessment

According to the USFWS listing document (https://www.gpo.gov/fdsys/pkg/FR-2015-01-16/pdf/2015-00441.pdf, USFWS 2015b), Mexican wolves show a strong preference for elk compared to other ungulates, and other documented sources of prey include deer and occasionally small mammals and birds. Mexican wolves are an average of 70 kg and, like other grey wolves, they are habitat generalists. Mexican wolves are a carnivorous species. While the species is not likely to feed on agricultural resources itself, the primary prey species of the wolf may be expected to feed on plant material within the field during the period of applications. Based on this information, it is reasonable to conclude that the Mexican wolf may be exposed to dicamba DGA residues in prey and EPA conducted the following species-specific analysis for the Mexican wolf. Using the conservative assumptions that the prey species is represented by a 1000g mammal (conservative for the wolf's primary prey) that feeds exclusively on exposed short grass receiving the upper bound Kenaga residues from the spray application of dicamba DGA and that the wolf exclusively feeds on this prey species, exposure assumptions and risk calculations were adjusted to account for the species' biology (namely body weight and food ingestion rate) and body weight specific adjusted toxicity endpoints:

Field metabolic rate kcal/day = $0.6167(70000)^{0.862}$ = 9258 kcal/day (USEPA 1993, body weight reflects mean wolf weight from

https://www.gpo.gov/fdsys/pkg/FR-2015-01-16/pdf/2015-00441.pdf)

Mass of prey consumed per day = 9258 kcal/day/(1.7 kcal/g-ww X 0.84 AE) = 6483 g/day [1.7 is energy content of prey item from USEPA (1993); 0.84 is assimilation efficiency from USEPA 1993, 1 kg mammal diet from Whitaker and Hamilton (1998)]

Mass of dicamba DGA in 1 kg mammal diet = 40.17 mg/kg-ww from T-REX run

Mass of dicamba in daily diet = 6483 g/day X 40.17 mg dicamba DGA/kg-ww mammal prey X 0.001 = 260.4 mg/day

Daily dose in wolf = 260.4 mg dicamba DGA/day/70 = 3.7 mg/kg-bw/day

Wolf dicamba chronic NOAEL mg/kg-bw/day = 136 mg/kg-bw X $(350/70000)^{(0.25)}$ = 36.2 mg/kg-bw

The RQ for chronic effects = 3.7/36.2 = 0.10

A chronic RQ of 0.10 does not exceed the chronic LOC of 1.0. **Consequently, a "no effect" determination is made for the wolf.**

DCSA Chronic Effects Assessment for Mexican wolf consuming prey that had previously consumed exposed soybean forage

Using the conservative assumptions that the prey species is represented by a 1000 g mammal that feeds exclusively on exposed soybean forage containing the maximum measured DCSA residues (61.1 mg/kg), exposure assumptions from the screening assessment were adjusted to account for the wolf's biology:

The first step in the refinement process is to calculate DCSA residues in the prey species. Using the assumption that the prey species is represented by a 1000 g mammal and the conservative assumptions that the prey animal feeds exclusively on exposed soybean forage containing the maximum measured residues of 61.1 ppm, EFED calculated the residues based on the following allometric equations (USEPA, 1993):

1000 g mammal prey ingestion rate (dry) = $0.621(1000)^{0.564}$ =30.56 g /day

1000 g mammal prey ingestion rate (wet) = 30.56/0.2 = 152.8 g/day

DCSA residue in prey eating soybean forage/hay 61.1 mg DCSA/kg-food (ww) x 0.1528 kg food/kg-bw = **9.34 mg/kg-bw/day**

The next step is to determine the expected daily dose for a typical 70 kg wolf, the adjusted NOAEL value and the chronic dose-based RQ for the wolf based on the following allometric equations:

Field metabolic rate kcal/day = $0.6167(70000)^{0.862}$ = 9258 kcal/day (USEPA 1993, body weight reflects mean wolf weight from:

https://www.gpo.gov/fdsys/pkg/FR-2015-01-16/pdf/2015-00441.pdf)

Mass of prey consumed per day = 9258 kcal/day/(1.7 kcal/g-ww X 0.84 AE) = 6483 g/day [1.7 is energy content of prey item from USEPA (1993); 0.84 is assimilation efficiency from USEPA 1993, 1 kg mammal diet from Whitaker and Hamilton (1998)]

Mass of DCSA in 1 kg mammal diet = 9.34 mg/kg-ww (conservative estimate for a 1 kg mammal feeding on soybean forage containing the maximum measured empirical residues of 61.1 mg/kg)

Mass of DCSA in daily diet = 6483 g/day X 9.34 mg DCSA/kg-ww mammal prey X 0.001 = 60.6

Daily dose in wolf = 60.6 mg DCSA/day/70 kg = **0.9 mg/kg-bw/day**

Wolf DCSA chronic NOAEL mg/kg-bw/day = 8 mg/kg-bw X $(350/70000)^{(0.25)}$ = **2.1 mg/kg-bw**

The RQ for chronic effects = 0.9/2.1 = 0.41

A chronic RQ of 0.41 does not exceed the chronic LOC of 1.0. **Consequently, a "no effect" determination is made for the wolf.**

Northern long-eared bat

Dicamba Chronic Effects Assessment

The northern long-eared bat is an insectivorous myotine bat (Whitaker and Hamilton, 1998). With an average weight of 6.5 g, this bat forages principally in forested areas but has been shown to forage over water, open clearings and along roads (https://www.gpo.gov/fdsys/pkg/FR-2015-04-02/pdf/2015-07069.pdf, USFWS 2015a). Consequently, its potential use of open areas without canopy could place the species foraging over agricultural land on insects from treated fields. Therefore, EPA conducted the following species-specific analysis for the northern long-eared bat. Using the conservative assumption that the bat's diet consists entirely of insects having been exposed to the upper bound Kenaga residues from the spray application of dicamba DGA, exposure assumptions and risk calculations were adjusted to account for the species' biology (namely body weight and food ingestion rate) and body weight specific adjusted toxicity endpoints:

Field metabolic rate kcal/day = $0.6167(6.5)^{0.862}$ = 3.1 kcal/day

(USEPA 1993, body weight 6.5 g reflects mean weight for the bat based on https://www.gpo.gov/fdsys/pkg/FR-2015-04-02/pdf/2015-07069.pdf)

Mass of insect prey consumed per day = (3.1 kcal/day)/(1.7 kcal/g ww X 0.87) = 2.1 g/day (1.7 is energy content of prey item from USEPA (1993); 0.87 is assimilation efficiency from USEPA 1993)

Mass of dicamba DGA in insect diet = 102.99 mg/kg-ww from T-REX run

Mass of dicamba DGA in daily diet = 2.1 g/day X 102.99 mg dicamba DGA/kg-ww mammal prey X 0.001 = 0.22 mg/day

Daily dose in bat = 0.22 mg dicamba DGA/day/0.0065 = **36.2 mg/kg-bw/day**

Northern long-eared bat parent dicamba NOAEL mg/kg-bw/day = 136 mg/kg-bw X $(350/6.5)^{0.25}$ = **368.4 mg/kg-bw**

RQ for chronic exposure = 36.2/368.4 = 0.09

A chronic RQ of 0.09 does not exceed the chronic LOC of 1.0 for listed species. **Consequently, a "no effect" determination is made for the northern long-eared bat.**

DCSA Chronic Effects Assessment for Northern long-eared bat consuming prey that had previous consumed exposed soybean forage

EFED considered DCSA residues in arthropods to be the maximum measured DCSA residues from broadleaf plants, modified by the Kenaga nomogram relationship between broadleaf plant and arthropods (specifically, insects) as a conservative pesticide load in the prey base. This is considered a conservative approach as 100% of the bat's diet would be considered to consist of exposed arthropods feeding on dicamba-tolerant soybean plants that had the highest measured DCSA residues. A biologically representative refinement to the screening assessment follows.

Field metabolic rate kcal/day = $0.6167(6.5)^{0.862}$ = 3.1 kcal/day

(USEPA 1993, body weight 6.5 g reflects mean weight for the bat based on https://www.gpo.gov/fdsys/pkg/FR-2015-04-02/pdf/2015-07069.pdf)

Mass of insect prey consumed per day = (3.1 kcal/day)/(1.7 kcal/g ww X 0.87) = 2.1 g/day
(1.7 is energy content of prey item from USEPA (1993); 0.87 is assimilation efficiency from USEPA 1993)

Mass of DCSA in insect diet 42.5 mg/kg-ww (conservative assumption of Kenaga nomogram relationship between arthropod residues and broadleaf plant tissue residues based on 61.1 mg/kg maximum value from empirical data for soybean forage)

Mass of DCSA in daily diet = 2.1 g/day X 42.5 mg DCSA/kg-ww insect prey X 0.001 = 0.089 mg/day

Daily dose in bat = 0.089 mg DCSA/0.0065 = **13.73 mg/kg-bw/day**

Northern long-eared bat parent dicamba NOAEL mg/kg-bw/day = 8 mg/kg-bw X $(350/6.5)^{0.25}$ = **21.67 mg/kg-bw**

RQ for chronic exposure = 13.73/21.67 = 0.63

A chronic RQ of 0.63 does not exceed the chronic LOC of 1.0. **Consequently, a "no effect" determination is made for the northern long-eared bat.**

Birds

The screening-level assessments showed that birds could be at risk of mortality from acute exposures to dicamba DGA on treated fields, but chronic risk to dicamba was not expected as no chronic RQs exceeded the Agency's LOC (1.0) for chronic risk (USEPA 2011. D378444, p. 15). The concurrently issued soybean addendum indicated that chronic exposures to DCSA residues in soybean could be a concern, while the screening-level cotton assessment indicated that chronic exposures to DCSA residues in cotton would not exceed the Agency's LOC for chronic risk. Therefore, for listed species that could reasonably be expected to occur on treated soybean and cotton fields, EPA conducted a refined assessment for acute (dicamba only) and chronic (DCSA only, and only for soybean) exposures.

Of the new (not previously assessed) bird species identified as potentially at acute or chronic risk in the thirty four states, one is reasonably expected to occur on treated soybean and cotton fields. Therefore, species specific biological information and dicamba DGA use patterns were considered in more depth to further refine the assessment and effects determinations for this species.

Gunnison Sage Grouse

The November 20, 2014 designation of critical habitat document for the Gunnison sage grouse (https://www.gpo.gov/fdsys/pkg/FR-2014-11-20/pdf/2014-27113.pdf, USFWS, 2014) indicates that this bird will consume a mixture of vegetable and animal matter and the crop of the bird is too weak for seed consumption. This is likely seasonally dependent being composed of nearly 100 percent sagebrush in the winter, and forbs and insects as well as sagebrush in the remainder of the year. Insect consumption may coincide with the time period associated with application of dicamba DGA. Based on this information, it is reasonable to conclude that the sage grouse may be exposed to dicamba DGA residues in insect prey items on crop fields, therefore EPA conducted the following species-specific analysis for the sage grouse.

Dicamba Acute Effects Assessment

Using the conservative assumption that the grouse's diet consists entirely of insects having been exposed to the upper bound Kenaga residues from the spray application of dicamba DGA, exposure assumptions and risk calculations were adjusted to account for the species' biology (namely body weight and food ingestion rate) and body weight specific adjusted toxicity endpoint.

Field metabolic rate kcal/day = $1.146(2400)^{0.749}$ = 389.9 kcal/day

(USEPA 1993, body weight reflects mean for the bird from Dunning (1984)

Mass of prey consumed per day = 389.9 kcal/day/(1.7 kcal/g-ww X 0.72 AE) = 318.5 g/day

(1.7 is energy content of prey item from USEPA (1993); 0.72 is assimilation efficiency from USEPA 1993, assumption of insect prey USFWS 1983)

Mass of dicamba DGA in insect diet = 102.99 mg/kg-ww from T-REX run

Mass of dicamba DGA in daily diet = 318.5 g/day X 102.99 mg dicamba DGA/kg-ww insect prey X 0.001 = 32.8 mg/day

Daily dose in bird = 32.8 mg dicamba DGA/day/2.4 = 13.7 mg/kg-bw/day

Grouse LD50 mg/kg-bw = 188 mg/kg-bw X $(2400/178)^{(1.15-1)}$ = 277.7 mg/kg-bw

The RQ for acute effects = 13.7/277.7 = 0.05

An acute RQ of 0.05 does not exceed the acute LOC of 0.1 for listed species. Further, if the diet was composed of a forb such as the treated crop plants (*i.e.* broadleaf plants), the screening level-risk assessment would place the dicamba DGA residue at 147.91 mg/kg instead of 102.99 mg/kg, resulting in a slight increase in the RQ for the bird to 0.07, which is still below the LOC of 0.1. **Consequently, a "no effect" determination is made for the Gunnison sage grouse**

DCSA Chronic Effects Assessment for Gunnison sage grouse consuming prey that had previously consumed soybean forage

EFED considered DCSA residues in arthropods to be the maximum measured DCSA residues from broadleaf plants, modified by the Kenaga nomogram relationship between broadleaf plant and arthropods as a conservative pesticide load in the prey base. This is considered a conservative approach as 100% of the grouse's diet would be considered to consist of exposed arthropods feeding on dicamba-tolerant soybean plants that had the highest measured DCSA residues. A biologically representative refinement to the screening assessment follows.

Field metabolic rate kcal/day = $1.146(2400)^{0.749}$ = 389.9 kcal/day
(USEPA 1993, body weight reflects mean for the bird from Dunning (1984)

Mass of prey consumed per day = 389.9 kcal/day/(1.7 kcal/g-ww X 0.72 AE) = 318.5 g/day
(1.7 is energy content of prey item from USEPA (1993); 0.72 is assimilation efficiency from USEPA 1993, assumption of insect prey USFWS 1983)

Mass of DCSA in daily diet = 318.5 X 42.5 X 0.001 = 13.5 mg/day

Daily dose in grouse = 13.5 mg DCSA/day/2.4 = **5.6 mg/kg-bw/day**

Avian Chronic Endpoint of 695 mg/kg-diet (from mallard duck study for parent dicamba) modified by ratio of parent dicamba to metabolite DCSA from chronic rat studies (17x) results in Avian chronic NOAEC of **40.88 mg/kg-diet.**

RQ for chronic exposure: RQ = 5.6/40.88 = 0.14

An RQ of 0.14 does not exceed the chronic LOC of 1.0. Further, if the diet was composed of a forb such as the treated crop plants (*i.e.* broadleaf plants), and considered to contain the maximum measured DCSA residues in soybean forage (61.1 mg/kg), the RQ would rise to approximately 0.20, which is still below the chronic LOC of 1.0; **consequently a "no effect" determination is concluded for the Gunnison sage grouse.**

Reptiles and amphibians

Using birds as a surrogate for reptiles and terrestrial-phase amphibians, consistent with the Overview document (USEPA, 2004), the screening-level assessment suggests that reptiles and terrestrial-phase amphibians could be at risk of effects from acute exposures to dicamba DGA or chronic exposures to DCSA on treated fields. Of the new reptile and amphibian species identified as potentially at risk in the 34 states, one reptile is reasonably expected to occur on treated soybean and cotton fields. Therefore, species specific biological information and dicamba DGA use patterns were considered in more depth to further refine the assessment and effects determinations for that species.

Eastern Massasauga rattlesnake

The eastern massasauga rattlesnake is an inhabitant of open to forested wetlands and adjacent upland areas that is known to eat voles, mice, other small mammals, small birds, amphibians, and also other species of snakes (https://www.fws.gov/midwest/endangered/reptiles/eama/). Therefore, the species was determined to potentially occupy treated cotton and soybean fields and thus be subject to exposure to Dicamba DGA on the treated field. The snake feeds largely on small mammals, (http://mnfi.anr.msu.edu/emr/eco.cfm). Using the conservative assumptions that the prey species is represented by a 35g mammal that feeds exclusively on exposed short grass receiving the upper bound Kenaga residues from the spray application of dicamba DGA and that the snake exclusively feeds on this prey species, exposure assumptions and risk calculations were adjusted to account for the species' biology (namely body weight and food ingestion rate) and body weight specific adjusted toxicity endpoints.

Dicamba Acute Effects Assessment

Field metabolic rate kcal/day = $0.0530(350)^{0.799}$ = 5.7 kcal/day

(USEPA 1993, body weight is mean of reported values in https://www.aboutanimals.com/reptile/massasauga-rattlesnake/).

Mass of prey consumed per day = 5.7 kcal/day/(1.7 kcal/g ww X 0.78 AE) = 4.3 g/day

(1.7 is energy content of prey item from USEPA (1993); 0.78 is assimilation efficiency from USEPA 1993)

Mass of dicamba DGA in a 35-g mammal diet = 173.26 mg/kg-ww from T-REX run

Mass of dicamba DGA in daily diet = 4.3 g/day X 173.26 mg/kg-ww mammal prey X 0.001 = 1.0 mg/day

Daily dose in rattlesnake = 1.0 mg/day dicamba DGA/0.350 = **2.82 mg/kg-bw/day**

Appropriate scaling factors are not available for reptiles and amphibians so the acute toxicity value for the bobwhite quail (most sensitive avian species for which acute data are available) serves as a surrogate (USEPA, 2004) toxicity value for the rattlesnake:

Rattlesnake LD_{50} mg/kg-bw = **188 mg/kg-bw**

RQ for acute effects = 2.82/188 = 0.015

An acute RQ of 0.015 does not exceed the acute listed species LOC of 0.1. **Consequently, EPA makes a "no effect" (NE) determination for the Eastern Massasauga rattlesnake.**

DCSA Chronic Effects Assessment for Eastern Massasauga rattlesnake consuming prey that had previously consumed exposed soybean forage

As noted above, the Eastern Massasauga rattlesnake feeds largely on small mammals and also birds, amphibians and other snakes. Using the conservative assumptions that the prey species is represented by a mammal that feeds exclusively on exposed soybean plant tissue containing the maximum measured DCSA residues of 61.1 ppm and that the snake exclusively feeds on this prey species, the assumptions in the initial screen were adjusted to account for the rattlesnake's biology:

Field metabolic rate kcal/day = $0.0530(350)^{0.799}$ = 5.7 kcal/day
(USEPA 1993, body weight is mean of reported values in https://www.aboutanimals.com/reptile/massasauga-rattlesnake/).

Mass of prey consumed per day = 5.7 kcal/day/(1.7 kcal/g ww X 0.78 AE) = 4.3 g/day
(1.7 is energy content of prey item from USEPA (1993); 0.78 is assimilation efficiency from USEPA 1993)

Mass of DCSA in a mammal diet 61.1 mg/kg-ww (maximum empirical residue data on soybean forage)

Mass of DCSA in rattlesnake's daily diet = 4.3 g/day X 61.1 mg dicamba DGA/kg-ww mammal prey X 0.001 = 0.26 mg/kg-bw/day

Daily dose in rattlesnake = 0.26 mg DCSA/day/0.350 = **0.75 mg/kg-bw/day**

Avian Chronic Endpoint of 695 mg/kg-diet (from mallard duck [most sensitive avian species for

which chronic data are available and serves as the surrogate species for reptiles] study for parent dicamba) modified by ratio of parent dicamba to metabolite DCSA from chronic rat studies (17x) results in Avian chronic NOAEC of **40.88 mg/kg-diet.**

RQ for chronic exposure: RQ = 0.75/40.88 = **0.02**

An RQ of 0.02 does not exceed the chronic LOC of 1.0**; consequently a "no effect" determination is concluded for the Eastern Massasauga rattlesnake.**

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Appendix A. Summary List of Species Considered for Effects Determinations

Entity ID	Name	Scientific Name	Status	Group	States	Habitat Description	ON/OFF Field	References
10021	Red-crowned parrot	*Amazona viridigenalis*	Candidate	Birds	Texas	primarily urban areas that have large trees. The species requires forested cover not expected to be provided by land cleared for the proposed use sites for the pesticides	Off Field.	https://www.gpo.gov/fdsys/pkg/FR-2015-12-24/pdf/2015-32284.pdf Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions
2567	Skiff milkvetch	*Astragalus microcymbus*	Candidate	Plants	Colorado	spotty distribution within Gunnison and Saguache Counties in Colorado, where it is found in open, park-like landscapes in the sagebrush steppe ecosystem on rocky or cobbly, moderate-to-steep slopes of hills and draws. Elevation range for the species id Greater than 7500 feet. The species occurs in habitat not suitable for agrcultual planting of the proposed use-site crops for the pesticides	Off Field	https://www.gpo.gov/fdsys/pkg/FR-2015-12-24/pdf/2015-32284.pdf Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions
6596	Pecos amphipod	*Gammarus pecos*	Endangered	Crustaceans	Texas	Found in all flowing water habitats associated with the Y Diamond Spring system.	Off-field	USFWS. 2013. FR Notice. 78 FR 41227 41258 http://www.gpo.gov/fdsys/pkg/F R-2013-07-09/pdf/2013-16222.pdf
6620	Sonoyta mud turtle	*Kinosternon sonoriense longifemorale*	Candidate	Reptiles	Arizona	Sonoyta mud turtles are found both in natural and artificial spring-fed ponds and stream channels. Adults are typically captured in the deeper sections of the pond near dense stands of tules and	Off-field	U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

						other vegetation. Vegetation free shorline habitat is used for nesting.		http://ecos.fws.gov/docs/candidate/assessments/2014/r2/C067_V01.pdf
3497	Roundtail chub	*Gila robusta*	Candiddate	Fishes	New Mexico, Arizona, Colorado	Mid size to larger streams; localized in protected pools, The most frequently occupied pools have current velocities reaching a maximum of 0.18m/s. and average 0.03m/s, with a pH of 8.1.; .4 to 1.4 m deep with a mean of .8 m, velocities ranging from 0 to .8 m/s with mean of .32 m/s, (juveniles occupied areas with velocities of 0 to .6 m/s with mean of .2 m/s, and larval occurred in essentially still water 0 to .3 m/s mean of .06 m/s pools below riffles but adults were also found in deeper pools, closer to the stream bottom and in faster water	Off-field	http://ecos.fws.gov/docs/life_histories/E00R.html http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E00R
10145	North Pacific Right Whale	*Eubalaena japonica*	Endangered	Mammals	Virginia, Florida, Maryland, New York, New Jersey, North Carolina, South Carolina, Delaware, Georgia	Designated critical habitat is in waters off the coast of Alaska. Since 1996, observed in Bristol Bay, southeastern Bering Sea, during the summer months. Have been sited in central North Pacific and Bering Sea, central Baja California in the eastern North Pacific, Hawaii in the central North Pacific, and the sub-Arctic waters of the Bering Sea and sea of Okhotsk. Based on distribution map (1), it appears that this species may occur off the coast of WA, OR and CA. Shallow coastal waters though movements over deep waters are known to occur.	Off-Field	National Marine Fisheries NOAA Fisheries Species Information. Office of Protected Resources: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rightwhale_northpacific.htm Federal Register, 73(68):19000-19014, April 8, 2008. Available online at: http://www.gpo.gov/fdsys/pkg/FR-2008-04-08/pdf/E8-7233.pdf#page=1

	Rough Cactus Coral	*Mycetophyllia ferox*	Threatened	Corals	Florida	Aquatic habitats in the Caribbean Sea, Florida, Puerto Rico, US Virgin Islands	Off-field	NOAA (2015)2 http://coralreef.noaa.gov/aboutcorals/coral101/feedinghabits/welcome.html NOAA (2011) http://www.nmfs.noaa.gov/stories/2012/05/docs/009_corals_status_review_western_atlantic.pdf NOAA (2014) http://www.fisheries.noaa.gov/stories/2014/08/docs/corals_fact_sheet.pdf
5065	Black warrior (=Sipsey Fork) Waterdog	*Necturus alabamensis*	Candidate	Amphibians	Alabama	Found in streams	Off-field	USFWS 2013 SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM for Necturus alabamensis. Available online at: http://ecos.fws.gov/docs/candidate/assessments/2013/r4/D030_V01.pdf
1415	White fringeless orchid	*Platanthera integrilabia*	Candidate	Plants	Alabama, Tennessee, Kentucky, Georgia, South Carolina, North Carolina	Platanthera integrilabia grows in wet, boggy areas at the heads of streams and on seepage slopes. It is often associated with Sphangnum in partially, but not fully shaded areas. The plants flower from late July through September and the small narrow fruting capsule matures in October. The hydric regime for this species suggest that it is not reasonable to expect the species on cotton or soybean cultivated fields.	Off-field	USFWS 2012. U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM, http://ecos.fws.gov/docs/candidate/assessments/2013/r4/Q2GF_P01.pdf http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2GF

5714	Kenk's amphipod	*Stygobromus kenki*	Candidate	Crustaceans	Maryland	*Occurs in ground water and ground water-related habitats (e.g., caves, seeps, small springsl wells, interstices, and rarely deep ground water lakes). Found in wooded areas where groundwater emerges to form seepage springs. Shading, hydroglogical conditions and organic matter found in woodlands help maintain suitable habitat. Can also be found in dead leaves, or fine sediment submerged in waters for seepage spring outflows.	Off-field	http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=K04P http://ecos.fws.gov/docs/candidate/assessments/2015/r5/K04P_I01.pdf
9721	Florida bristle fern	*Trichomanes punctatum ssp. floridanum*	Proposed Endangered	Ferns	Florida	Florida bristle fern is always associated with shaded limestone outcrops. Plants usually grow on bare limestone, but are occasionally found on tree roots growing on limestone. In Miami-Dade County, it has been found exclusively in oolitic (composed of minute rounded concretions resembling fish eggs) limestone solution holes and rocky outcrops in rockland hammocks. Solution holes are formed by dissolution of subsurface limestone followed by a collapse above (Snyder et al. 1990, p. 236). Solution holes vary in size, from shallow holes less than 0.5 meter (m) (1.6 feet [ft]) deep to those that cover over 100 m2 (1,076 ft2) and are several meters deep. The bottoms of most solution holes are filled with deep organic soils. Deeper solution holes penetrate the water table and have (at least historically) standing water for part of the year. Humidity levels are higher in and around the solution holes because of standing water and moisture retained in the organic soils. The canopy cover is typically very dense where Florida bristle fern occurs, and consists of a mix of temperate and tropical hardwood trees. Soils are composed of limestone, oolitic (composed of minute rounded concretions resembling	Off-field	USFWS 2012. SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM for Trichomanes punctatum ssp. Floridanum http://ecos.fws.gov/specesProfile/profile/speciesProfile.action?spcode=S02G

						fish eggs) limestone solution holes and rocky outcrops in rockland hammocks as well as organic soils. Soils at the Miami-Dade County sites are classified as Matecumbe Muck (http://www.fgdl.org/). In Sumter County, the plants occur in a mesic/hydric hammock on limestone boulders. Florida bristle fern grows on boulders with tall, horizontal faces. Soils at the Sumter County station are classified as Mabel Fine Sand, bouldery subsurface. Spores have been recorded in October (J. Possley, pers. comm. 2007), but plants probably produce spores during much of the summer wet season. During the dry season, sporophytes have been observed to desiccate, and probably do not produce spores. For Florida bristle fern, the reproductive requirements, such as moisture levels, needed for each stage of its life history are unknown. The Florida bristle fern is a very small, mat-forming fern, superficially resembling some liverwort species.		
	Squirrel Chimney Cave shrimp	*Palaemonetes cummingi*	Threatened	Crustaceans	Florida	Aquatic species found in one location in caves in Florida. The proposed DGA uses are unlikely to correspond to this location	Off-field	5-Year Review: Summary and Evaluation http://ecos.fws.gov/docs/five_year_review/doc1919.pdf
1678	Bracted twistflower	*Streptanthus bracteatus*	Candidate	Plants	Texas	The species is frequently found within adense understory of small trees and shrubs, including Rhus virens, (evergreen sumac), Acacia roemeriana (Roemer acacia), Mahonia trifoliolata (agarita), Garrya ovata ssp lindheimeri (Lindheimer silk-tassel), Ageratina havanensis (thoroughwort), and Bernardia myricifolia (oreja de raton) We received descriptions of plant species associated with bracted twistflower populations from 12 independent sources (see Appendix 1 for sources). Of the more than 100 species reported, bracted twistflower occurs most often under a tree canopy of Juniperus	Off Field.	Species Profile FWS Website http://ecos.fws.gov/docs/candidate/assessments/2015/r2/Q1R7_P01.pdf USFWS 2011. Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions http://ecos.fws.gov/speciesProfile/p

						ashei (Ashe juniper), Quercus fusiformis (Texas live oak)), Diospyros texana (Texas persimmon), Sophora secundiflora (Texas mountain laurel), and Quercus buckleyi (Texas red oak). The proposed use is not expected to overlap with agricultural habitat.		rofile/speciesProfile.action?spcode=Q1R7
1535	Sand flax	*Linum arenicola*	Endangered	Plants	Florida	Sand flax is found in pine rockland, disturbed pine rockland, marl prairie, roadsides on rocky soils, and disturbed areas (Bradley and Gann 1999, p. 61; Hodges and Bradley 2006, p. 37). Bradley and Gann (1999, p. 61) stated, It grows on oolitic limestone formations. The pine rockland and marl prairie where this species occurs requires periodic wildfires in order to maintain an open, shrub free subcanopy and reduce litter levels. This taxon is currently rare in relatively undisturbed natural areas, with the exception of plants on Big Pine Key and the grounds of an office building on Old Cutler Road. Several occurrences are in scarified pine rockland fragments that are dominated by native pine rockland species, but have little or no canopy or subcanopy. One population in Miami-Dade County occurs entirely on a levee composed of crushed oolitic limestone in the middle of a sawgrass marsh. The soils are composed of rocky soils and oolitic limestone formations Sand flax is currently known from four occurrences in the Keys and six occurrences in Miami-Dade County (Bradley 2006, p. 5; K. Bradley, pers. comm. 2007, 2011; J. Maschinski, Fairchild Tropical Botanic Garden [FTBG], pers. comm. 2007, 2011; J. Possley, FTBG, pers. comm. 2011; Bradley and van der Heiden 2013, pp. 6, 19). Based upon Bradley and Gann (1999, p. 65), Hodges and Bradley (2006, pp. 37-39), Bradley (2009, pp. 1-13), data from IRC (K. Bradley, pers. comm. 2007; Gann et al. 2001-2010, p. 1), data from FTBG	Off field.	2013 USFWS Species Assessment Form for the *Linum arenicola* Http://ecos.fws.gov/speciesProfile/profile/speceisProfile.action?spcode=Q14H https://www.gpo.gov/fdsys/pkg/FR-2015-09-29/pdf/2015-24291.pdf

						(Maschinski et al. 2002, Appendix B1, p. 6; J. Maschinski, pers. comm. 2007; J. Possley, pers. comm. 2011; J. Maschinski, pers. comm. 2011), Bradley and Saha (2009, p. 10), and Bradley and van der Heiden (2013, pp. 7-12, 19), sand flax is extant at the sites in Table 2. On Big Pine Key, sand flax occurs at the Terrestris Preserve, which is owned by The Nature Conservancy (TNC); this occurrence is included within the Big Pine Key site		
13	Mexican grey wolf	*Canis lupus baileyi*	Endangered	Mammals	New Mexico, Arizona, Texas	Evergreen pine–oak woodlands, pinyon–juniper woodlands, and mixed-conifer montane forests	Potentially on field	USFWS. 1987. Mexican Wolf Recovery Plan. United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/docs/recovery_plan/820915_1.pdf USFWS. 2000. US Counties in which the Mexican gray wolf, is known to or is believed to occur. United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/countiesBySpecies?entityId=13 USFWS. 2015. Species Profile for Mexican Gray Wolf (Canis lupus baileyi). United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A00E
4064	Gunnison sage grouse	*Centrocercus minimus*	Threatened	Pants	Florida	Sand flax is found in pine rockland, disturbed pine rockland, marl prairie, roadsides on rocky soils, and disturbed areas (Bradley and Gann 1999, p. 61; Hodges and Bradley 2006, p. 37). Bradley and Gann (1999, p. 61) stated, It grows on oolitic limestone formations. The pine rockland and marl prairie where this species occurs requires periodic wildfires in order to maintain an open, shrub free subcanopy and reduce litter levels. This taxon is currently rare in relatively undisturbed natural areas, with the	Potentially on field	

						exception of plants on Big Pine Key and the grounds of an office building on Old Cutler Road. Several occurrences are in scarified pine rockland fragments that are dominated by native pine rockland species, but have little or no canopy or subcanopy. One population in Miami-Dade County occurs entirely on a levee composed of crushed oolitic limestone in the middle of a sawgrass marsh. The soils are composed of rocky soils and oolitic limestone formations Sand flax is currently known from four occurrences in the Keys and six occurrences in Miami-Dade County (Bradley 2006, p. 5; K. Bradley, pers. comm. 2007, 2011; J. Maschinski, Fairchild Tropical Botanic Garden [FTBG], pers. comm. 2007, 2011; J. Possley, FTBG, pers. comm. 2011; Bradley and van der Heiden 2013, pp. 6, 19). Based upon Bradley and Gann (1999, p. 65), Hodges and Bradley (2006, pp. 37-39), Bradley (2009, pp. 1-13), data from IRC (K. Bradley, pers. comm. 2007; Gann et al. 2001-2010, p. 1), data from FTBG (Maschinski et al. 2002, Appendix B1, p. 6; J. Maschinski, pers. comm. 2007; J. Possley, pers. comm. 2011; J. Maschinski, pers. comm. 2011), Bradley and Saha (2009, p. 10), and Bradley and van der Heiden (2013, pp. 7-12, 19), sand flax is extant at the sites in Table 2. On Big Pine Key, sand flax occurs at the Terrestris Preserve, which is owned by The Nature Conservancy (TNC); this occurrence is included within the Big Pine Key site		
7800	Eastern Massauga Rattlesnake	*Sistrurus catenatus*	Threatened	Reptiles	Ohio, Wisconsin, Pennsulvania, Indiana, Michigan, Illinois, Minnesota, New York, West Virginia, Iowa Missouri	shallow wetland, adjacent upland habitat	Potentially on field	http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=C03P http://ecos.fws.gov/docs/candidate/assessments/2013/r3/C03P_V01.pdf http://www.fws.gov/midwest/endangered/reptiles/eama/eama-fct-sht.html

10043	Northern long-eared bat	*Myotis septentrionalis*	Threatened	Mammals	Wisconsin, West Virginia, Tennessee, South Dakota, Iowa, Pennsylvania, Delaware, Missouri, Minnesota, Indiana, Texas, Kentucky, New York, Oklahoma, Virginia, North Dakota, Illinois, Arkansas, New Jersey, Georgia, Louisiana, South Carolina, Maryland, Kansas, Michigan, Nebraska, Ohio, North Carolina, Alabama	Forests (hardwood), caves, bark, cavities and crevices of live and dead trees	Potentially on field	USFWS. 2015. Species Profile for Northern long-eared Bat (Myotis septentrionalis). United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE USFWS. 2015. Threatened Species Status for the Northern Long-Eared Bat With 4(d) RuleFR 80, No. 63. Available online at: http://www.gpo.gov/fdsys/pkg/FR-2015-04-02/pdf/2015-07069.pdf
6672	Georgia rockcress	*Arabis georgiana*	Threatened	Plants	Georgia, Alabama	Associated with high bluffs along major rivers with dry-mesic to mesic soils of open rocky woodland and forested slopes, generally within regions underlain or otherwise influenced by granite, sandstone, or limestone. Georgia rockcress grows in a variety of dry situations, including shallow soil accumulations on rocky bluffs, ecotones of sloping rock outcrops, and sandy loam along eroding riverbanks. It is occasionally found in adjacent mesic woods (or glades), but it will not persist in heavily shaded conditions.	Off field.	USFWS. 2013. FR Notice. 78FR 56192 56201 http://www.gpo.gov/fdsys/pkg/FR-2013-09-12/pdf/2013-22129.pdf
5233	Blodgett's silverbush	*Argythamnia blodgettii*	Candidate	Plants	Florida	Occurs in Florida and is found in open, sunny areas in pine rockland, edges of rockland hammock, edges of coastal berm, and sometimes in disturbed areas at the edges of natural areas. Plants can be found growing from crevices on limestone, or on sand.	Off field	USFWS. 2013. Review of Native Species That are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q045

2730	Schmoll milk-vetch	*Astragalus schmolliae*	Candidate	Plants	Colorado	Grows in the mature pinyon-juniper woodland of mesa tops in the Mesa Verde National Park area and in the Ute Mountain Ute Tribal Park in Colorado The habitat for Schmoll's milkvetch is dense piñon-juniper woodland of mesa tops in the Mesa Verde area with a preference for reddish lowess soils. These areas are not expected to be planted in the use site crops for the pesticide.	Off field	USFWS. 2014. Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q07C
1769	Sei whale	*Balaenoptera borealis*	Endangered	Mammals	Texas Virginia Louisiana Florida Maryland New York New Jersey Alabama North Carolina South Carolina Delaware Georgia	Aquatic species	Off field	NMFS. 2012. Sei Whale (Balaenoptera borealis). National Marine Fisheries Service. Available online at: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm USFWS. 2012. Species profile for Sei Whale (Balaenoptera borealis). United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A02S http://www.nmfs.noaa.gov/pr/pdfs/recovery/seiwhale.pdf
3199	Blue whale	*Balaenoptera musculus*	Endangered	Mammals	Texas Virginia Louisiana Florida Maryland New Jersey New York Alabama North Carolina South Carolina Delaware Pennsylvania Georgia	Aquatic species	Off field	NMFS. 1998. Recovery plan for blue whale. National Marine Fisheries Service. Available online at: http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_blue.pdf (3) NMFS. 2012. Blue Whale (Balaenoptera musculus), Office of Protected Resources, NOAA Fisheries Species Information. Date accessed June 4, 2012. Available online at: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/bluewhale.htm

								http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_blue.pdf
8621	Red knot	*Calidris canutus rufa*	Threatened	Birds	Nebraska South Dakota Kentucky Pennsylvania Colorado Oklahoma Ohio Tennessee Virginia West Virginia Texas Louisiana Michigan Indiana Georgia Kansas Florida Illinois North Carolina Missouri New Jersey North Dakota Arkansas Maryland Iowa Minnesota Wisconsin New York New Mexico South Carolina Alabama Delaware	Robin-sized shorebird that annually migrates from the Canadian Arctic to southern Argentina. Use mid-Atlantic stopovers from late April through late May or early June (The stopover time in Delaware Bay is about 10 to 14 days. From Delaware Bay and other mid-Atlantic stopovers, birds tend to fly overland directly northwest to the central Canadian breeding grounds, with many stopping briefly along the shores of James and Hudson Bays	Off field	US FWS. Rufa Red Knot Ecology and Abundance SUPPLEMENT TO Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Rufa Red Knot (Calidris canutus rufa) Info from P 20. https://www.fws.gov/northeast/redkn ot/pdf/20130923_REKN_PL_Supplement02_Ecology%20Abundance_Final.pdf
95	Ivory-billed woodpecker	*Campephilus principalis*	Endangered	Birds	Arkansas	Forest – large contiguous forest with numerous large trees	Off field	USFWS. 2010. Recovery plan for the ivory-billed woodpecker. http://ecos.fws.gov/docs/recovery_plan/100719.pdf
13	Mexican gray wolf	*Canis lupus baileyi*	Endangered	Mammals	New Mexico Arizona Arizona New Mexico Texas	Wide ranging: Evergreen pine–oak woodlands, pinyon–juniper woodlands, and mixed-conifer montane forests	On Field	USFWS. 1987. Mexican Wolf Recovery Plan. United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/docs/recovery_plan/820915_1.pdf

								USFWS. 2000. US Counties in which the Mexican gray wolf, is known to or is believed to occur. United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/countiesBySpecies?entityId=13 USFWS. 2015. Species Profile for Mexican Gray Wolf (Canis lupus baileyi). United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A00E
10130	Arapahoe snowfly	*Capnia arapahoe*	Candidate	Insects	Colorado	Cold, clean and well oxygenated streams and rivers.	Off field	https://www.fws.gov/mountain-prairie/species/invertebrates/arapahoesnowfly/ http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0W0 http://ecos.fws.gov/docs/candidate/assessments/2015/r6/I0W0_I01.pdf
4253	Pineland sandmat	*Chamaesyce deltoidea pinetorum*	Candidate	Plants	Florida	Only known from Miami-Dade County, Florida, located on Long Pine Key within Everglades National Park.	Off field	USFWS. 2010. Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q03HI
7948	Wedge spurge	*Chamaesyce deltoidea serpyllum*	Candidate	Plants	Florida	estricted to pine rocklands on Big Pine Key in Monroe County, Florida. Inhabits sites with low woody cover (e.g., low palm and hardwood densities) and usually, exposed rock or gravel.	Off field	USFWS. 2010. Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule. Http://ecos.fws.gov/speciesProfile/

								profile/speciesProfile.action?spcode=Q0E7
9965	Wright's marsh thistle	*Cirsium wrightii*	Candidate	Plants	New Mexico Arizona,Texas	wet, alkaline soils in spring seeps and marshy edges of streams and ponds between 3,450 and 7,850 ft (1,152 and 2,393 m) in elevation	Off field	USFWS 2015 - Species Assessment Form for the Cirsium wrightii http://ecos.fws.gov/docs/candidate/assessments/2015/r2/Q3N3_P01.pdf
6901	Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened	Birds	Colorado New Mexico Arizona Texas Colorado New Mexico Arizona Texas	Riparian woodlands. Riparian woodlands with mixed willow cottonwood vegetation, mesquite-thorn-forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 ft (100 m) in width and 200 ac (81 ha) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats. Adequate prey base. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas. Dynamic riverine processes. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old. Open woodland with clearings and scrubs that are associated with watercourses. Breeds in riparian areas.	Off-field	http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06R

5273	Florida prairie-clover	*Dalea carthagenensis floridana*	Candidate	Plants	Florida	This shrub is found in pine rocklands, edges of rockland hammocks, coastal uplands, and marl prairie. Fire is probably very important to the livelihood of this taxon. In 1999, each of the five occurrences known at that time were located in slightly different habitat types: disturbed pine rockland, pine rockland / rockland hammock ecotone, pine rockland / rockland hammock ecotone along road edges, edge of roadside in marl prairie, and ecotone between rockland hammock and marl prairie and flatwoods. Substrate-Rocky and rocklands. Scarification has a positive effect on the germination of this plants seeds. Residential and commercial development and agriculture have drastically reduced the habitat for this species throughout pine rockland habitats in south Florida.	Off field	USFWS 2013. Species Assessment Form for the Dalea carthagenensis floridana. Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=#3HL
10310	Pillar Coral	*Dendrogyra cylindricus*	Threatened	Corals	Florida	Aquatic species	Off field	NOAA (2015) http://coralreef.noaa.gov/aboutcorals/coral101/feedinghabits/welcome.html NOAA (2011) http://www.nmfs.noaa.gov/stories/2012/05/docs/009_corals_status_review_western_atlantic.pdf NOAA (2014) http://www.fisheries.noaa.gov/stories/2014/08/docs/corals_fact_sheet.pdf
4712	Florida pineland crabgrass	*Digitaria pauciflora*	Candidate	Plants	Florida	Plants occur most commonly along the ecotone between pine rockland and marl prairie, but do overlap somewhat into both of these ecosystems. These habitats, particularly marl prairie, do flood for one to several months every year in the wet season. habitat types for Florida pineland crabgrass at Long Pine Key to consist of pineland/prairie ecotones and prairies. It was found 49 percent of the time in mixed marl and rock substrate, 22 percent in marl, and 6 percent on rock. IPrior to research by Gann et al. (2006, p. 7), this species was known from the following	Off field	2013_USFWS_Species Assessment Form for the Digitaria pauciflora. Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1VG

						locations within Long Pine Key: Hole-in-the Donut, Pine Blocks A, C, D, H. Follow-up surveys of historical locations yielded two additional extant occurrences of this species in the Hole-in-the-Donut (Gann et al. 2006, p. 8). In addition, Jimi Sadle, botanist at ENP, located the species at Pine Blocks SW2, B, and F2 . Gann et al. (2006, p. 9) also expect to find new occurrences of Florida pineland crabgrass within ENP as work continues to establish the limits of this species habitat requirements. Florida pineland crabgrass appears to have a much wider range than previously thought		
8434	Black mudalia	*Elimia melanoides*	Candidate	Snails	Alabama	Clings to clean gravel, cobble, boulders and logs in flowing water on shoals and riffles.	Off field	http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=G0C7 http://ecos.fws.gov/docs/candidate/assessments/2013/r4/G0C7_I01.pdf
10060	Kentucky arrow darter	*Etheostoma spilotum*	Candidate	Fishes	Kentucky Virginia	Aquatic species	Off field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E0BF
6782	Guadalupe fescue	*Festuca ligulata*	Candidate	Plants	New Mexico Texas	he known habitats of Guadalupe fescue are pine-oak-juniper woodlands of talus slopes above 1,829 meters (m) (6,000 feet (ft)) elevation in trans-Pecos Texas and Coahuila, Mexico (Poole 1989, p. 8).. Guadalupe fescue flowers primarily in August and September, or occasionally earlier, in response to rainfall (Gordon and Poole 2009, p. 1). The Chisos Mountains population in BIBE is the only known population remaining in the United States. Botanists have extensively surveyed the limited amount of potential habitat at BIBE, where the elevation exceeds 1,829 m (6,000 ft), as well as most of the potential habitat in the Davis Mountains of Texas, but have not found additional populations (BIBE and Service 2008, p. 3). Despite intensive searches, Guadalupe fescue was last observed in the Guadalupe Mountains in 1952 (Texas Natural Diversity Database 2007, pp. 3073-3074).. However, undiscovered populations might exist in the New Mexico portion of GUMO where the habitat appears suitable.	Off field	2014 USFWS Species Assessment Form for the Festuca ligulata. Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?=spcode=Q0UM

8765	Berry Cave salamander	*Gyrinophilus gulolineatus*	Candidate	Amphibians	Tennessee	Aquatic troglodític species. Pesticide runoff from agricultural activities is cited as a contributing threat. If the pesticide poses not concerns for runoff to aquatic animals, no concern here as the species will not be on the agricultural field	Off field	U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM https://ecos.fws.gov/docs/candidate/assessments/2015/r4/D03B_V01.pdf
3412	Dakota Skipper	*Hesperia dacotae*	Threatened	Insects	South Dakota North Dakota Minnesota Iowa	Undisturbed (remnant, untilled) high quality prairie, ranging from wet-mesic tallgrass prairie to dry-mesic mixed grass prairie.	Off field	US FWS, Threatened Status for Dakota Skipper and Endangered Status for Poweshiek Skipperling (2013) http://www.gpo.gov/fdsys/pkg/FR-2013-10-24/pdf/2013-24175.pdf
2767	Stephan's Riffle beetle	*Heterelmis stephani*	Candidate	Insects	Arizona	Aquatic species	Off field	U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM https://ecos.fws.gov/docs/candidate/assessments/2015/r4/D03B_V01.pdf
9694	Arizona Treefrog	*Hyla wrightorum*	Candidate	Amphibians	Arizona New Mexico	oak woodland and savannah, pine-oak woodland, mixed conifer forest, grassland; Ponds used for breeding	Off field	USFWS 2013 Species Assessment Form for the Hyla wrightorum (Huachuca/Canelo Population). Available online at: http://ecos.fws.gov/docs/candidate/assessments/2014/r2/D03S_V02.pdf
10038	Texas fatmucket	*Lampsilis bracteata*	Candidate	Clams	Texas	Aquatic species	Off field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F04I https://ecos.fws.gov/docs/candidate/assessments/2015/r2/F04I_I01.pdf
3628	Relict leopard Frog	*Lithobates onca*	Candidate	Amphibians	Arizona	Leopard frogs generally require shallow water with emergent vegetation for foraging and basking, and deeper water, root masses, undercut banks, and debris piles for cover and hibernacula	Off field	U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM http://ecos.fws.gov/docs/candidate/

								assessments/2014/r8/D00E_V01.pdf
7482	Striped newt	*Notophthalmus perstriatus*	Candidate	Amphibians	Georgia Florida	*Ephemeral ponds, upland habitats (forest, scrub); aquatic and terrestrial	Off field	USFWS 2014 SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM for the Notophthalmus perstriatus. Available online at: http://ecos.fws.gov/docs/candidate/assessments/2014/r4/D02P_V01.pdf
10147	Poweshiek skipperling	*Oarisma poweshiek*	Endangered	Insects	South Dakota, Minnesota, Iowa, North Dakota, Michigan, Wisconsin	Include prairie fens, grassy lake and stream margins, moist meadow, sedge meadow, and wet-to-dry prairie.	Off Field	USFWS. 2014. FR Notice. 79FR 63671 63748 http://www.gpo.gov/fdsys/pkg/F R-2014-10-24/pdf/2014-25190.pdf
2859	Band-rumped storm-petrel	*Oceanodroma castro*	Candidate	Birds	Florida	Forages in ocean. Nests on islands free of mammalian predators.	Off Field	http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B08V
10311	Lobed Star Coral	*Orbicella annularis*	Threatened	Corals	Florida	Florida, Puerto Rico and US Virgin Islands	Off Field	NOAA (2014) http://www.fisheries.noaa.gov/stories/2014/08/docs/corals_fact_sheet.pdf https://www.gpo.gov/fdsys/pkg/FR-2014-09-10/pdf/2014-20814.pdf
10312	Mountainous Star Coral	*Orbicella faveolata*	Threatened	Corals	Florida	Florida, Puerto Rico, US Virgin Islands and Gulf of Mexico	Off Field	NOAA (2014) http://www.fisheries.noaa.gov/stories/2014/08/docs/corals_fact_sheet.pdf https://www.gpo.gov/fdsys/pkg/FR-2014-09-10/pdf/2014-20814.pdf
10908	Boulder star coral	*Orbicella franksi*	Threatened	Corals	Florida	Florida, Puerto Rico, US Virgin Islands and Gulf of Mexico	Off Field	NOAA (2014) http://www.fisheries.noaa.gov/stories/2014/08/docs/corals_fact_sheet.pdf

								https://www.gpo.gov/fdsys/pkg/FR-2014-09-10/pdf/2014-20814.pdf
9126	Killer whale	*Orcinus orca*	Endangered	Mammals	Texas, Virginia, Louisiana, Florida, Maryland, New Jersey, New York, Alabama, North Carolina, South Carolina, Delaware, Pennsylvania, Georgia	Southern Resident killer whales are concentrated in Washington State and British Columbia (Strait of Georgia, Strait of Juan de Fuca, and Puget Sound) and can extend south to Oregon and Central California and north to Queen Charlotte Islands Most common in coastal marine waters at higher latitudes. NMFS. 2008. Recovery plan for Southern Resident Killer Whales, (Orcinus orca). National Marine Fisheries Service, Northwest Region, Seattle, Washington. Available online at: http://ecos.fws.gov/docs/recovery_plan/whale_killer.pdf.	Off Field	
3670	Rattlesnake-master borer moth	*Papaipema eryngii*	Candidate	Insects	Illinois, Arkansas, Indiana, Kansas, Michigan, Oklahoma, North Carolina	*Obligate residents of undisturbed praires and woodland openings.	Off field	https://ecos.fws.gov/docs/candidate/assessments/2015/r3/I0LJ_I01.pdf https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0LJ
4431	Pearl darter	*Percina aurora*	Candidate	Fishes	Alabana, Mississippi	Occurs in moderately sized rivers, with mud, sand, gravel and cobble substrate. Found in water depths < 2 feet.	Off field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E07A https://ecos.fws.gov/docs/candidate/assessments/2014/r4/E07A_V01.pdf
6097	Black pine snake	*Pituophis melanoleucus lodingi*	Proposed Threatened	Reptiles	Alabama, Louisiana	Fire e-dependent long leaf pine forests; Riparian areas, hardwood forests	Off Field	http://ecos.fws.gov/docs/candidate/assessments/2013/r4/C029_V01.pdf

3722	Louisiana pine snake	*Pituophis ruthveni*	Candidate	Reptiles	Louisiana Texas	Fire-dependent long leaf and short leaf pine forest; Use of burrows of bairds pocket gopher	Off Field	
1358	Magnificent ramshorn	*Planorbella magnifica*	Candidate	Snails	South Carolina, North Carolina	Occurs in lentic (slow flowing) aquatic habitats and shallow, still freshwater waterbodies with abundance of aquatic vegetation and a neutral pH. An endemic species in southeastern North Carolina. Only recorded in Greenfield Lake (millpond tributary) to the Cape Fear River.	Off field	http://ecos.fws.gov/tess_public/profile/speciesProfile?spcode=G02R
2917	Texas Hornshell	*Popenaias popei*	Candidate	Clams	New Mexico Texas	Small grained substrata (silt, sand, clay gravel), and in undercut riverbanks, crevices, shelves and at the base of large boulders.	Off-field	https://ecos.fws.gov/docs/candidate/assessments/2013/r2/F02M_I01.pdf https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F02M
5064	Clifton Cave beetle	*Pseudanophthalmus caecus*	Candidate	Insects	Kentucky	Limestone caves	Off-field	https://ecos.fws.gov/docs/candidate/assessments/2014/r4/I0Q7_I01.pdf https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0Q7
6464	Coleman Cave beetle	*Pseudanophthalmus colemanensis*	Candidate	Insects	Kentucky	Limestone caves	Off-field	https://ecos.fws.gov/docs/candidate/assessments/2014/r4/I0Q7_I01.pdf https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0Q7
2862	Icebox Cave beetle	*Pseudanophthalmus frigidus*	Candidate	Insects	Kentucky Tennessee Virginia	Found in limestone caves with leaf litter, small bits of organic matter, or bat guano.	Off-field	http://ecos.fws.gov/docs/candidate/assessments/2014/r4/I0JD_I01.pdf http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0JD

7134	Tatum Cave beetle	*Pseudanophthalmus parvus*	Candidate	Insects	Kentucky	Found in limestone caves with leaf litter, small bits of organic matter, or bat guano.	Off-field	http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0QE http://ecos.fws.gov/docs/candidate/assessments/2014/r4/I0QE_I01.pdf
7745	Nobletts cave beetle	*Pseudanophthalmus paulus*	Candidate	Insects	Tennessee North Carolina	Trogloditic species not expected to occur ontreated agricultural field	Off-field	http://explorer.natureserve.org/servlet/NatureServe?searchName=Pseudanophthalmus+paulus
3379	Louisville Cave beetle	*Pseudanophthalmus troglodytes*	Candidate	Insects	Indiana Kentucky	Found in limestone caves with leaf litter, small bits of organic matter, or bat guano.	Off-field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I0QJ https://ecos.fws.gov/docs/candidate/assessments/2014/r4/I0QJ_I01.pdf
6739	Huachuca springsnail	*Pyrgulopsis thompsoni*	Candidate	Snails	Arizona New Mexico	Occur in seeps, marshes, spring pools, outflows and lotic waters. Firm substrate (e.g, cobble, gravel, woody debris and aquatic vegetation).	Off-field	http://ecos.fws.gov/tess_public/profile/speciesProfile?spcode=G05C http://ecos.fws.gov/docs/candidate/assessments/2014/r2/G05C_I01.pdf
10039	Golden orb	*Quadrula aurea*	Candidate	Clams	Texas	Flowing waters in moderately sized rivers. Found in one reservoir in lower Nueces River. Wave action can enhance flowing water conditions. Occurs in substrates including firm mud,gravel, sand, but not unstable substrates (i.e., loose silt and sand)	Off-field	https://ecos.fws.gov/docs/candidate/assessments/2015/r2/F04J_I01.pdf https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F04J
9969	Smooth pimpleback	*Quadrula houstonensis*	Candidate	Clams	Texas	Occurs in moderately sized rivers, with mud, sand, gravel and cobble substrate. Found in water depths < 2 feet.	Off-field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F04G https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F04G
9968	Texas pimpleback	*Quadrula petrina*	Candidate	Clams	Texas	Occurs in moderately sized rivers, with mud, sand, gravel and cobble substrate. Found in water depths < 2 feet.	Off-field	http://ecos.fws.gov/tess_public/profile/speciesProfile?spcode=F04F http://ecos.fws.gov/docs/candidate/assessments/2015/r2/F04F_I01.pdf
4395	Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*	Candidate	Plants	Florida	Occurs on pinelands, pineland/prairie ecotones, and prairies in Everglades National Park and private lands in Miami-Dade County, and Big Cypress National Preserve in Monroe County, Florida. Everglades bully is restricted to pinelands with tropical understory vegetation on	Off-field	USFWS 2007. Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule.

						limestone rock (pine rocklands) which are covertypes not associated with cotton or soybean agriculture		Http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q31M
4228	Penasco least chipmunk	*Tamias minimus atristriatus*	Candidate	Mammals	New Mexico Texas	Spruce fir forest, Douglas/white fir mixed conifer, ponderosa pine, woodlands, savanna, grassland, riparian, barren, dryland and irrigated land.	Off-field	USFWS. 2015. Species Profile for Penasco least chipmunk (Tamias minimus atristriatus). United States Fish and Wildlife Service. Available online at: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A08G 3) USFWS. 2014. Species assessment form. Available online at: http://ecos.fws.gov/docs/candidate/assessments/2014/r2/A08G_V01.pdf
9967	Texas fawnsfoot	*Truncilla macrodon*	Candidate	Clams	Texas	Occurs in rivers with soft sandy sediement and moderate water flow.	Off-field	https://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=F04E https://ecos.fws.gov/docs/candidate/assessments/2015/r2/F04E_I01.pdf
123	Least Bell's vireo	*Vireo bellii pusillus*	Endangered	Birds	Arizona	The least Bell's vireo is an obligate riparian species during the breeding season and is characterized as preferring early successional habitat in structurally diverse woodlands along watercourses. They winter in mesquite scrub vegetation, arroos, but also use palm groves and hedgerows associated with agricultural fields and rural residential areas.	Off-field during growing season when applications are made or when residues are likely to be present	http://ecos.fws.gov/ecp0/profile/speciesProfile?sId=5945

Appendix B

Species with Habitat Attributes Considered to Include Treated Cotton or Soybean Fields

(n=4)

7800	Eastern massauga rattlesnake	*Sistrurus catenatus*	Endangered	Reptiles	Ohio, Wisconsin, Pennsylvania, Indiana, Michigan, Illinois, Minnesota, New York, West Virginia, Iowa Missouri	Potentially on field.

10043	Northern long-eared bat	*Myotis septentrionalis*	Threatened	Mammals	Wisconsin, West Virginia, Tennessee, South Dakota, Iowa, Pennsylvania, Delaware, Missouri, Minnesota, Indiana, Texas, Kentucky, New York, Oklahoma, Virginia, North Dakota, Illinois, Arkansas, New Jersey, Georgia, Louisiana, South Carolina, Maryland, Kansas, Michigan, Nebraska, Ohio, North Carolina, Alabama	Potentially on field.
4064	Gunnison sage grouse	*Centrocercus minimus*	Threatened	Birds	Florida	Potentially on field.
13	Mexican grey wolf	*Canis lupus baileyi*	Endangered	Mammals	New Mexico, Arizona, Texas	Potentially on field.

Appendix C

Critical Habitat Accounting Tables

Summary of Species Identified as Being on Agricultural Fields With and Without Critical Habitat Designations[2]

Species Name	Primary Constituent Elements (PCE)	Source
Species with Critical Habitat Designations		
Gunnison Sage Grouse	PCE's: 1) Extensive Sagebrush Habitat with at least 25% sagebrush cover 2) Breeding Habitat containing sagebrush, shrubs, grass, and forb cover. 3) Summer-fall habitat including sagebrush communities as well as agricultural fiels, wet meadow and riparian habitat types. 4) Winter habitat of sagebrush plant communities	https://www.fws.gov/mountain-prairie/species/birds/gunnisonsagegrouse/

[2]Critical habitat designation status determined using U.S. Fish & Wildlife Service's Environmental Conservation Online System (ECOS) species profiles.

	5) Alterative, mesic habitats primarily used in summer-late fall including riparian communities, springs, seeps and mesic meadows.	
Species without critical habitat designations		
Eastern Massasauga	Found in wet areas including prairies, marshes and low areas along rivers and lakes. Use adjacent uplands during parts of the year. Hibernate in crayfish burrows and often found under logs and tree roots or in small mammal borrows.	https://www.fws.gov/midwest/endangered/reptiles/eama/eama-fct-sht.html
Northern Long-Eared Bat	Roost underneath bark, in cavitites and crevicces of live and dead trees. Males and non-reproductive females roost in cooler places like caves or mines.	https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A0JE
Mexican Grey Wolf	Found in southwestern habitats. Preferably mountain woodlands with cover water and prey availability.	https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A00E#lifeHistory

Appendix. D

Listed Species Identified as being off Agricultural Fields with and without Critical Habitat Designations Assessed for 2,4-D

Critical Habitat Designation	Common Name	Scientific Name
Species off agricultural fields with critical habitat designations (*10 species)*	Georgia rockcress	*Arabis georgiana*
	Yellow-billed Cuckoo	*Coccyzus americanus*

	Kentucky Arrow Darter	*Etheostoma spilotum*
	Dakota Skipper	*Hesperia dacotae*
	Least Bell's vireo	*Vireo bellii pusillus*
	Black pine snake	*Pituophis melanoleucus lodingi*
	North Pacific Right Whale	*Eubalaena japonica*
	Pecos amphipod	*Gammarus pecos*
	Killer whale	*Orcinus orca*
	Poweshiek skipperling	*Oarisma poweshiek*
Species off agricultural Fields without critical habitat designations (*56 species*)	Blodgett's silverbush	*Argythamnia blodgettii*
	Roundtail chub	*Gila robusta*
	Sonoyta mud turtle	*Kinosternon sonoriense longifemorale*
	Rough Cactus Coral	*Mycetophyllia ferox*
	Black warrior (=Sipsey Fork) Waterdog	*Necturus alabamensis*
	Squirrel Chimney Cave shrimp	*Palaemonetes cummingi*
	Skiff milkvetch	*Astragalus microcymbus*
	Schmoll milk-vetch	*Astragalus schmolliae*
	White fringeless orchid	*Platanthera integrilabia*
	Florida bristle fern	*Trichomanes punctatum ssp. floridanum*
	Kenk's amphipod	*Stygobromus kenki*
	Sei whale	*Balaenoptera borealis*
	Blue whale	*Balaenoptera musculus*
	Red knot	*Calidris canutus rufa*
	Ivory-billed woodpecker	*Campephilus principalis*
	Arapahoe snowfly	*Capnia arapahoe*
	Big Pine partridge pea	*Chamaecrista lineata keyensis*
	Pineland sandmat	*Chamaesyce deltoidea pinetorum*
	Wedge spurge	*Chamaesyce deltoidea serpyllum*
	Wright's marsh thistle	*Cirsium wrightii*
	Florida prairie-clover	*Dalea carthagenensis floridana*
	Pillar Coral	*Dendrogyra cylindricus*
	Hirst Brothers' Panic grass	*Dichanthelium (=Panicum) hirstii*
	Florida pineland crabgrass	*Digitaria pauciflora*
	Guadalupe fescue	*Festuca ligulata*
	Berry Cave salamander	*Gyrinophilus gulolineatus*
	Stephan's Riffle beetle	*Heterelmis stephani*
	Hawaiian stilt	*Himantopus mexicanus knudseni*
	Arizona Treefrog	*Hyla wrightorum*
	Texas fatmucket	*Lampsilis bracteata*
	Relict leopard Frog	*Lithobates onca*
	Striped newt	*Notophthalmus perstriatus*
	Band-rumped storm-petrel	*Oceanodroma castro*
	Lobed Star Coral	*Orbicella annularis*
	Mountainous Star Coral	*Orbicella faveolata*
	Boulder star coral	*Orbicella franksi*
	Rattlesnake-master borer moth	*Papaipema eryngii*
	Pearl darter	*Percina aurora*
	Louisiana pine snake	*Pituophis ruthveni*

	Magnificent ramshorn	*Planorbella magnifica*
	Texas Hornshell	*Popenaias popei*
	Clifton Cave beetle	*Pseudanophthalmus caecus*
	Coleman Cave beetle	*Pseudanophthalmus colemanensis*
	Fowler's cave beetle	*Pseudanophthalmus fowlerae*
	Icebox Cave beetle	*Pseudanophthalmus frigidus*
	Tatum Cave beetle	*Pseudanophthalmus parvus*
	Nobletts cave beetle	*Pseudanophthalmus paulus*
	Louisville Cave beetle	*Pseudanophthalmus troglodytes*
	Golden orb	*Quadrula aurea*
	Smooth pimpleback	*Quadrula houstonensis*
	Texas pimpleback	*Quadrula petrina*
	Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*
	Sand flax	*Linum arenicola*
	Bracted twistflower	*Streptanthus bracteatus*
	Penasco least chipmunk	*Tamias minimus atristriatus*
	Texas fawnsfoot	*Truncilla macrodon*