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OFFICE OF
PREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

MEMORANDUM

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SUBJECT: Ecological risk assessment evaluating Imazamox (PC 129171) for the proposed new use on Clearfield rice (imidazolonone-tolerant rice).

FROM: Ibrahim Abdel-Saheb, Environmental Scientist
Michael Davy, Agronomist
Environmental Risk Branch II
Environmental Fate and Effects Division (7507P)

9/25/08
Michael Davy 9-25/08

TO: James Tompkins, Risk Manager
Herbicide branch
Registration Division (7505P)

THRU: Tom Bailey, Branch Chief
Environmental Risk Branch 2
Environmental Fate and Effects Division

Tom G. Bailey

This memo summarizes the attached EFED Environmental Risk Assessment for the proposed new use of imazamox as postemergence weed control to Clearfield rice varieties or hybrids possessing the second generation tolerance trait. It identifies major imazamox ecological risk issues, and uncertainties resulting from outstanding data requirements.



ENVIRONMENTAL FATE AND EFFECTS SCIENCE CHAPTER

Environmental Fate and Ecological Risk Assessment

**Registration of New Use Imazamox for the proposed new use
for the control of weeds in Clearfield rice.**

USEPA PC Code: 129171

**Environment Risk Branch II Team:
Ibrahim Abdel-Saheb, Environmental Scientist
Michael Davy, Agronomist
Environmental Fate and Effects Division (7507P)**

**Branch Chief Approval:
Tom Bailey, Chief
Environmental Risk Branch II
Environmental Fate and Effects Division (7507P)**

Table of Contents

I. Executive Summary	2
II. Problem Formulation	3
A. Stressor Source and Distribution	3
1. Pesticide Type, Class, and Mode of Action	3
2. Physical/Chemical/Fate and Transport Properties	3
3. Overview of Pesticide Usage	5
B. Exposure Pathways and Receptors	5
C. Assessment Endpoints	6
D. Conceptual Model	9
1. Risk Hypotheses	9
a. Aquatic Environment Risk Hypotheses for Imazamox Uses	9
b. Terrestrial Environment Risk Hypotheses for Imazamox Uses	9
1. Measures of Exposure	11
a. Terrestrial Animals	11
b. Terrestrial and Riparian or Wetland Plants	11
c. Aquatic Animals and Plants	11
2. Estimates of Risk	11
III. Analysis	13
A. Exposure Characterization	13
1. Aquatic Exposure Assessment	13
a. Aquatic Exposure Modeling	13
b. Surface Water Monitoring	14
c. Field Study Data	14
2. Terrestrial Exposure Assessment	14
a. Bird and Mammal Exposure	14
B. Ecological Effects Characterization	15
1. Aquatic Effects Characterization	16
2. Terrestrial Effects Characterization	16
A. Risk Estimation - Integration of Exposure and Effects Data	17
1. Non-Target Terrestrial Animals and Plants	17
<i>Non-Target Terrestrial Plants</i>	18
2. Non-Target Aquatic Animals (Fish and Invertebrate) and Plants	18
a. <i>Aquatic Animals</i>	18
b. Aquatic Plants	19
B. Risk Description	19
1. Risks to Terrestrial Organisms	19
a. Animals	19
b. Risk to terrestrial plants	20
2. Risk to Aquatic Organisms	20
a. Animals	20
b. Risk to aquatic plants and algae	20
3. Federally Threatened and Endangered (Listed) Species Concerns	21
a. Action Area	21
b. Taxonomic Groups Potentially at Risk	21

Spray Drift RQs from noncropland ranges from 17 to 33 for listed species.....	22
4. Implications of Indirect Effects.....	22
a Indirect Effects Analysis	22
b Critical Habitat	23
c. Co-occurrence Analysis.....	24
C. Description of Data Gaps	25
Fate Data Gaps	25
Ecotoxicity Data.....	25

List of Figures

	<u>Page</u>
Figure 1 Imazamox Chemical Structure.....	3
Figure 2. Ecological Conceptual Exposure Model for Aquatic Plants and Animals in a Screening-Level Risk Assessment of Imazamox Applied to aquatic and noncropland sites.....	10

List of Tables

	<u>Page</u>
Table 1. Environmental Fate Properties of Imazamox.....	4
Table 2. Assessment endpoints for imazamox.....	7
Table 3. Risk Presumption Levels of Concern.....	12
Table 4. Surface water exposure inputs for Tier I Rice Model v1.0 for imazamox.....	13
Table 5. Estimated EECs for imazamox in surface water based on Tier I Rice Model v1.0.....	14
Table 6. Soil EECs (lb a.i./A) in Upland Terrestrial and Semi-Aquatic Soils Adjacent to a Imazamox Treated Noncropland.....	15
Table 7. The most sensitive toxicity values.....	16
Table 8. Plant survival and growth data used for RQ derivation. Units are in lb ai/A.	17
Table 9. Upper bound Kenega, acute mammalian dose-based RQs	18
Table 10. RQ values for terrestrial nontarget plants Exposed to Imazamox through Runoff and/or Spray Drift.....	18
Table 11. RQ values for non-target aquatic plants.....	19

I. Executive Summary

Environmental Risk Conclusions

Based on the results of this baseline ecological risk assessment of imazamox, the proposed use of imazamox to Clearfield rice:

- Poses risks above the Agency's Level of Concern (LOC) to listed and non-listed non-target terrestrial plant species from runoff from rice use sites.
- Poses risks above the Agency's Level of Concern (LOC) to listed and non-listed non-target terrestrial plant species from spray drift from rice use sites.
- Poses risk above the Agency's LOC to listed and non-listed non-target aquatic vascular plants near aquatic weed control use sites.
- Does not exceed the Agency's LOC for direct acute toxic effects to listed and non-listed mammals at rice use sites.
- No adverse acute effects to birds are expected.
- Does not exceed the Agency's LOC for direct toxic effects (acute) to listed and non-listed fish and aquatic invertebrates near rice sites.
- EFED is unable to assess chronic risk to fish or aquatic invertebrates due to unavailable chronic toxicity data.
- EFED is unable to assess phytotoxic risk to unicellular plant species from use of imazamox on rice because the maximum concentration tested for phytotoxicity (40 ppb with no effect) is less than the aquatic weed control EEC (112.5 ppb).
- Since imazamox is proposed for use on rice sites only, Appendix E shows all listed plant species by State.
- Outstanding data for fresh water fish and invertebrates is needed to evaluate chronic effects for the use of imazamox on rice. Freshwater fish and invertebrate habitats are expected to be exposed to imazamox from the use on rice.
- Estuarine/marine fish and invertebrates habitats are expected to be exposed to imazamox from the use on rice.

II. Problem Formulation

A. Stressor Source and Distribution

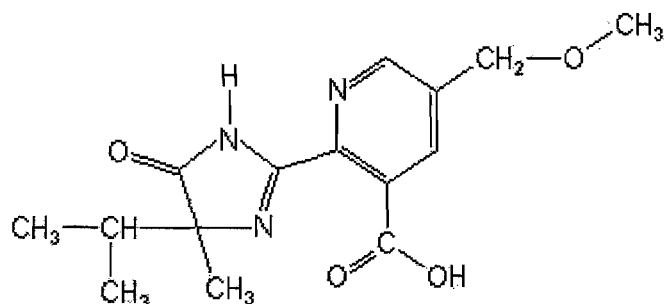
Imazamox is a member of the imidazolinone class of herbicides. Imazamox (Figure 1) is currently registered for post-emergence control of broadleaf weeds and grass in alfalfa, edible legumes, and soybeans.

1. Pesticide Type, Class, and Mode of Action

The mode of action is inhibition of acetohydroxyacid synthesis, an enzyme involved with the biosynthesis of the amino acids leucine, isoleucine, and valine.

The proposed new use is intended to control a wide range of grasses in rice sites. This risk assessment evaluates the ecological risk of this proposed new Section 3 label use.

Figure 1 Imazamox Chemical Structure



2. Physical/Chemical/Fate and Transport Properties

Known important physical, chemical, and fate and transport property values for imazamox are listed in Table 1. Imazamox is only moderately persistent (with half lives on the order of weeks to less than a month), and it degrades aerobically in the soil to a non-herbicidal metabolite which is immobile or moderately mobile. Imazamox also degrades by aqueous photolysis. Based on the aerobic soil metabolism study the major degradate in the environment is CL 354,825. Laboratory studies indicate that imazamox is stable to hydrolysis at pH 5, 7, and 9. Parent imazamox degrades via aqueous photolysis with an average half-life of 6.8 hours at pH 5, 7, and 9. Imazamox degraded much slower in a soil photodegradation study with a half-life of 65 days. However, degradation in the dark controls confirms the results from the aerobic soil metabolism study. The aerobic soil metabolism half-life was 27 days in sandy loam soil, where the oxidative

metabolite AC 312,622 (demethylated parent with intact ring structures and two carboxylic acid groups), increased to 41-44 % of the applied by 14-42 days, and then decreased to 3 % of the applied by 365 days. The other oxidative metabolite, AC 354,825 (demethylated, decarboxylated parent with intact rings, one carboxylic acid group), increased to 54 % by 365 days. The anaerobic soil metabolism, and the anaerobic aquatic metabolism studies both indicate that imazamox does not degrade under anaerobic conditions. The mobility studies indicate that imazamox is very mobile to mobile with a K_d range of 0.05-2.7 and a K_{oc} range of 5-143 in soils with 0.29-2.59% organic carbon. The metabolite CL 312,622 was very mobile to mobile also with a K_d range of 0.71-2.19. The metabolite CL 354,825 was less mobile with its K_d range of 3.8-26.6. Terrestrial field dissipation studies were conducted at five sites: North Dakota, Georgia, Arkansas, Iowa and California. The respective dissipation half-lives from the surface were calculated to be 130, 50, 35, 15 and 50 days.

Imazamox did not significantly accumulate in bluegill sunfish. Concentrations in whole fish and edible tissue were less than the minimum quantifiable limit while the bioconcentration factor for inedible tissue was <1X.

Imazamox will be mobile on many soils. Information from environmental fate studies indicates that Imazamox should not persist in shallow surface waters. However, it should persist in water at greater depths when an anaerobic environment exists and where photolytic degradation is not a factor. If imazamox does persist at greater water depths, it still is unlikely to present a risk to fish, invertebrates, birds or mammals.

Table 1. Environmental Fate Properties of Imazamox

Imazamox		
Property	Value	Source
CAS number	114311-32-9	MRID# 47111801
Molecular weight	305.33	FOOTPRINT*
Molecular formula	C ₁₅ H ₁₉ N ₃ O ₄	FOOTPRINT
Water solubility (mg/L)	4413	EPA Fact Sheet (1997).
log K_{ow}	0.73	EPA Fact Sheet (1997).
Vapor pressure at 25°C torr	9.97X 10 ⁻⁰⁸	FOOTPRINT
Henry's Law constant at 25°C (Pa m ³ mol ⁻¹)	9.76 X 10 ⁻⁰⁷	FOOTPRINT
Soil adsorption coefficient K_d (L/kg)	0.882 (avg)	MRID# 43193242

Imazamox		
Property	Value	Source
Hydrolysis half-Life pH = 5 pH = 7 pH = 9	Stable	MRID# 43193240
Photolysis half-life in water (day)	0.3	MRID#43876222
Photolysis half-life in soil (day)	65	MRID 43876223
Aerobic metabolism half-life in soil (day)	27	MRID 43876224
anaerobic soil metabolism half-life (day)	stable	MRID 43876225
anaerobic aquatic metabolism half-life (day)	stable	MRID 43876231
Terrestrial Field Dissipation half-life (day)	15-130	MRID 43876230
Fish bioconcentration factors	The bioconcentration factor for the inedible tissue was <1X.	MRID 43876231

: FOOTPRINT Pesticide Properties Database@ <http://sitem.herts.ac.uk/aeru/footprint/en/>; accessed on 7/20/2008.

3. Overview of Pesticide Usage

Target Pest: Wide range of submerged and emerged aquatic and terrestrial plant species in rice fields. Imazamox will be applied to rice before, during, or after flooding. For rice, it is assumed that Imazamox will control a wide range of weed species but the proposed label does not make this clear.

Application Rate: The application rate for this proposed new use of imazamox is 0.117 lbai/A per year. The number of applications is limited by the proposed label to three applications per season. The maximum application rate for imazamox is 0.047 lbai/A per application.

Method of Application: ground, or aerial application.

B. Exposure Pathways and Receptors

The new use of imazamox may cause exposure of non-target organisms by run-off of precipitation from treated fields, by spray drift, or by a combination of routes. Non-target plants may die, suffer reduced growth, or may have difficulty reproducing from spray drift and runoff.

Indirect effects to wildlife may also occur when population changes as a result of spray drift and runoff are causing wildlife to suffer changes in food supply and habitat thereby causing

mortality, reduced growth, reduced reproduction or population changes in the non-target population.

In contrast to the current uses, the proposed uses of imazamox on rice may cover extensive watershed areas, potentially leading to appreciable aquatic exposure. Although the proposed label for weed control use prohibits application over water bodies, agricultural crops, and pastures for grazing, the small droplets applied at 100 to 300 feet may drift onto rice paddies located hundreds or thousands of feet away.

Aquatic ecosystems potentially at risk include water bodies where the product will be used. Risks will be assessed for aquatic animals (fish, invertebrates, amphibians) and plants, which are assumed to occur in areas that have been treated.

Terrestrial ecosystems potentially at risk include areas which might receive direct use, runoff, and might include other cultivated fields, fence rows and hedgerows, meadows, fallow fields or grasslands, woodlands, riparian habitats and other uncultivated areas that may have been treated.

C. Assessment Endpoints

Assessment endpoints are defined as “explicit expressions of the actual environmental value that is to be protected.” Defining an assessment endpoint involves two steps: 1) identifying the valued attributes of the environment that are considered to be at risk; and 2) operationally defining the assessment endpoint in terms of an ecological entity (i.e., a community of fish and aquatic invertebrates) and its attributes (i.e., survival and reproduction). Therefore, selection of the assessment endpoints is based on valued entities (i.e., ecological receptors), the ecosystems potentially at risk, the migration pathways of pesticides, and the routes by which ecological receptors are exposed to pesticide-related contamination. The selection of clearly defined assessment endpoints is important because they provide direction and boundaries in the risk assessment for addressing risk management issues of concern. Changes to assessment endpoints are typically estimated from the available toxicity studies, which are used as the measures of effects to characterize potential ecological risks associated with exposure to a pesticide.

To estimate exposure concentrations, the ecological risk assessment considers application at the maximum rate to fields that have vulnerable soils. If multiple applications are allowed, the maximum amount per application and minimum interval between applications are used provided that maximum total annual application amounts are also included in this configuration. The most sensitive toxicity endpoints are used from surrogate test species to estimate treatment-related direct effects on acute mortality and chronic reproductive, growth and survival assessment endpoints. Toxicity tests are intended to determine effects of pesticide exposure on birds, mammals, fish, terrestrial and aquatic invertebrates, and plants. These tests include short-term acute, sub-acute, and reproduction studies and are typically arranged in a hierarchical or tiered system that progresses from basic laboratory tests to applied field studies. The toxicity studies are used to evaluate the potential of a pesticide to cause adverse effects, to determine whether

further testing is required, and to determine the need for precautionary label statements to minimize the potential adverse effects to non-target animals and plants. The assessment endpoints used in the assessment of the proposed use of Imazamox for the control of vegetation in and around aquatic and no cropland sites are presented in Table 2. Assessment endpoints for imazamox.

Table 2. Assessment endpoints for imazamox.

Parameter	Study Type	Species	Exposure Duration	Toxicity Value	Reference (Study Classification)
1. Abundance (i.e., survival, reproduction, and growth) of individual birds	1a. Acute (Dose-based)	Bobwhite quail (<i>Colinus virginianus</i>)	Single oral dose	>1846 mg/kg-bw (LD50) Practically non-toxic. No mortality observed at highest dose.	43193227 (acceptable)
	1b. Acute (Dietary-based)	Bobwhite quail (<i>Colinus virginianus</i>) and mallard duck	5-Day dietary	>5572 ppm (LC50) Practically non-toxic. No mortality observed at highest dose.	43193227 (acceptable)
	1c. Chronic (Dietary-based)	Bobwhite quail (<i>Colinus virginianus</i>) and mallard duck	Avian reproduction study	>2000 ppm (NOEC) No effects observed.	438762-09 (acceptable)
2. Abundance (i.e., survival, reproduction, and growth) of individual mammal	2a. Acute	Rat (<i>Rattus norvegicus</i>)	Single oral dose	2121 mg a.i./kg-bw (LD ₅₀) (female) Practically non-toxic	43876212 (acceptable)
	2b. Chronic	Rat (<i>Rattus norvegicus</i>)	2-Generation reproduction study	>20,000 ppm a.i (NOEC) No effects observed at highest dose	43876217 (acceptable)
3. Survival and reproduction of freshwater fish and invertebrates	Freshwater Fish				
	3a. Acute	Bluegill sunfish (<i>Lepomis macrochirus</i>)	96 hours	>119 mg a.i./L (LC50) Practically non-toxic	43193231 (acceptable)
	3b. Chronic	N/A	N/A	N/A	N/A
	Freshwater Invertebrates				
	3c. Acute	Water flea (<i>Daphnia magna</i>)	48 hours	>119 mg/L a.i. (EC50) Practically non-toxic	43193232 (acceptable)
3d. Chronic	N/A	N/A	N/A	N/A	
4. Survival and reproduction of estuarine/marine fish and invertebrates	Estuarine/Marine Fish				
	4a. Acute	Sheepshead minnow (<i>Cyprinodon variegatus</i>)	96 hours	>94.2 mg/L a.i. (LC50) Practically non-toxic	44565201 (acceptable)
	Chronic	N/A	N/A	N/A	N/A
	Estuarine/Marine Invertebrates				
	4b. Acute	Mysid shrimp (<i>Americamysis bahia</i>)	48 hours	>100 mg/L a.i. (EC50) Practically non-toxic	44565202 (acceptable)
4c. Chronic	N/A	N/A	N/A	N/A	

Parameter	Study Type	Species	Exposure Duration	Toxicity Value	Reference (Study Classification)
5. Perpetuation of individuals and populations of non-target terrestrial plants (crops and non-crop plant species)	Plants - seedling emergence				
	5a. Monocot	Oat	Single application	0.0015 lbs ai/acre (NOEC)	43876220 (acceptable)
				0.0020 lb ai/acre (EC ₂₅)	
	5b. Dicot	Cabbage	Single application	0.00075 lb ai/acre (NOEC)	43876220 (acceptable)
				0.0018 lb ai/acre (EC ₂₅)	
	Plants - vegetative vigor				
	5c. Monocot	Oat	Single application	0.000091 lb ai/acre (NOEC)*	43876221 (acceptable)
				0.0013 lb ai/acre (EC ₀₅)	
5d. Dicot	Tomato	Single application	0.00075 lb ai/acre (NOEC)	43876221 (acceptable)	
			0.0010 lb ai/acre (EC ₂₅)		
6. Survival of beneficial insects	6a. Acute Contact	Honey Bee (<i>Apis mellifera</i>)	48 hours	> 25 ug/bee Practically non-toxic	43193233 (acceptable)
7. Maintenance and growth of aquatic plants from standing crop or biomass	6b. Vascular	Duckweed (<i>Lemna gibba</i>)	14 days	0.011 mg a.i./L (EC ₅₀)	43876219 (acceptable)
				0.0045 mg ai/L (NOEC)	
	6c. Algae	Freshwater alga (<i>Selenastrum capricornutum</i>) Freshwater diatom (<i>Navicula pelliculosa</i>) Marine alga (<i>Skeletonema costatum</i>) Blue-green algae (<i>Anabaena flos-aquae</i>)	120 hours	>40 mg a.i./L (EC ₅₀ and NOEC)	43876219 (acceptable)

*: Most sensitive parameter for EC₂₅ & EC₅₀ is plant height. See Appendix F.

D. Conceptual Model

1. Risk Hypotheses

Based on the exposure pathways, exposure media, and potential receptors of concern (Section II.B), specific risk hypotheses formulated to characterize direct effects of Imazamox following application by ground or aerial spray on non-agricultural fields and on water bodies to selected assessment endpoints (Section II.C) is provided below. The analysis plan (Section II.E) outlines the approach and methods used in this risk assessment to evaluate these risk hypotheses.

a. Aquatic Environment Risk Hypotheses for Imazamox Uses

- A reduction in aquatic plants will occur in areas adjacent to cropland following Imazamox application if overflow of rice fields occurs and/or spray drift results in water concentrations that reach levels of concern for non-target aquatic vascular plant population growth.
- A reduction in non-target aquatic plants will occur in areas near or adjacent to treated water bodies following Imazamox application if water concentrations reach levels of concern for non-target aquatic vascular plant population growth.

b. Terrestrial Environment Risk Hypotheses for Imazamox Uses

- A reduction in non-target terrestrial plants will occur in areas adjacent to a field following Imazamox application if overflow of rice fields occurs results in concentrations that reach levels of concern for non-target terrestrial plant population growth.
- A reduction in non-target terrestrial plants will occur in areas adjacent to a field following aerial Imazamox application if spray drift results in concentrations that reach levels of concern for non-target terrestrial plant population growth.

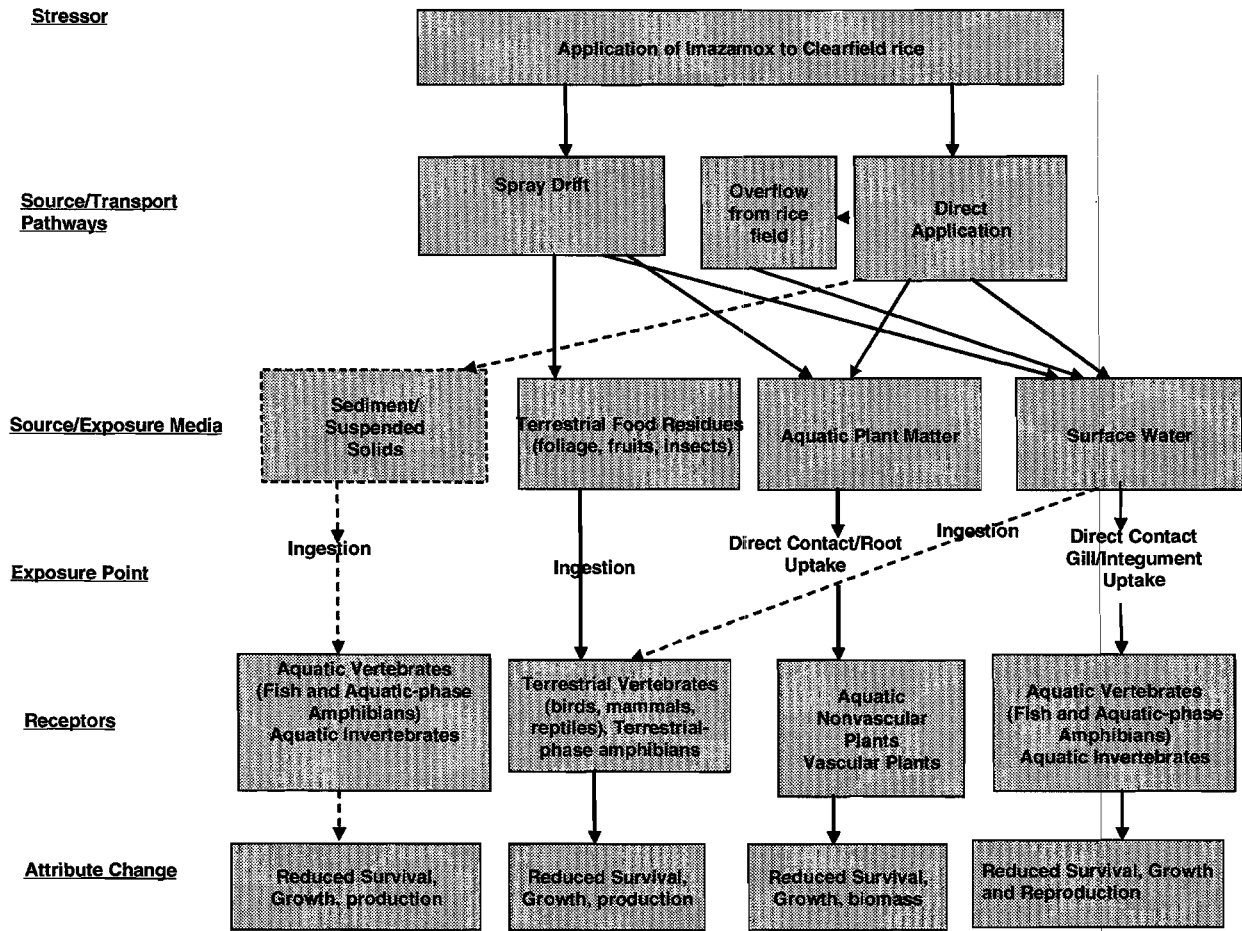


Figure 2. Ecological Conceptual Exposure Model for Aquatic Plants and Animals in a Screening-Level Risk Assessment of Imazamox Applied to Clearfield rice sites.

E. Analysis Plan

1. Measures of Exposure

a. Terrestrial Animals

Exposure of terrestrial animals to on-field residues of Imazamox is quantified by using T-REX, a model which automates calculation of dietary exposure based on application rate and number of applications and the Hoerger-Kenaga nomogram for residue on foliage, modified for insects and seeds. Several food item types and body weight classes for the exposed organisms are considered for both dose-based and dietary based exposures.

b. Terrestrial and Riparian or Wetland Plants

Exposure of off-field upland terrestrial plants and wetland or riparian plants is quantified by using AgDrift, a model that estimates off-site deposition of pesticides applied by aerial, ground, and orchard airblast spraying means, and for evaluating the potential of buffer zones to protect sensitive aquatic and terrestrial habitats from undesired exposures.

c. Aquatic Animals and Plants

Exposure of aquatic organisms is quantified by using the Tier I Rice Model v1.0. These exposures are compared to toxicity endpoints derived from standard guideline studies for acute and chronic effects.

2. Estimates of Risk

The Risk Quotient Method is the means used to integrate the results of exposure and ecotoxicity data, for evaluation of formulated Imazamox risk hypotheses (Section II.D). For this method, risk quotients (RQs) are calculated by dividing exposure estimates for given media and exposure routes (Section II.E.1) by ecotoxicity values (Section II.E.2), both acute and chronic (Equation 1).

Equation 1

$$\text{Risk Quotient (RQ)} = \frac{\text{Exposure (Concentration or Dose)}}{\text{Toxicity Value (Concentration or Dose)}}$$

RQs are then compared to OPP's risk presumptive levels of concern (LOCs), which are provided in Table 3. These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. LOCs have been defined for acute risk for non-listed species, potential restricted use classification, acute listed species risks, and chronic risks.

Table 3. Risk Presumption Levels of Concern

Risk Presumption	RQ	LOC
Birds and Wild Mammals		
Acute Risk	Dietary based: EEC ^a (ppm ^b) / LC ₅₀ (ppm) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d ^c)	0.5
Acute Restricted Use	Dietary based: EEC (ppm) / LC ₅₀ (ppm) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.2
Acute Listed Species	Dietary based: EEC (ppm) / LC ₅₀ (ppm) Dose based: EEC (mg/kg-bw/d) / LD ₅₀ (mg/kg-bw/d)	0.1
Chronic Risk	Dietary based: EEC (ppm) / NOAEC (ppm) Dose based: EEC (mg/kg-bw/d) / NOAEL (mg/kg-bw/d)	1.0
Aquatic Animals		
Acute Risk	EEC (ppm) / (LC ₅₀ (ppm) or EC ₅₀ (ppm))	0.5
Acute Restricted Use	EEC (ppm) / (LC ₅₀ (ppm) or EC ₅₀ (ppm))	0.1
Acute Listed Species	EEC (ppm) / (LC ₅₀ (ppm) or EC ₅₀ (ppm))	0.05
Chronic Risk	EEC (ppm) / NOAEC (ppm)	1.0
Terrestrial Plants and Plants Inhabiting Semi-Aquatic Areas		
Acute Risk	EEC (lbs ai/A) / EC ₂₅ (lbs ai/A)	1.0
Acute Listed Use	EEC (lbs ai/A) / (EC ₀₅ or NOAEC (lbs ai/A))	1.0
Aquatic Plants		
Risk	EEC (ppm) / EC ₅₀ (ppm)	1.0
Listed Species	EEC (ppm) / (EC ₀₅ or NOAEC (ppm))	1.0

^a EEC = estimated environmental concentration

^b ppm = parts per million

^c mg/kg-bw/d = milligrams per kilogram of body weight per day

III. Analysis

A. Exposure Characterization

1. Aquatic Exposure Assessment

a. Aquatic Exposure Modeling

Exposure concentrations resulting from direct application to Clearfield rice were calculated Using the Tier I Rice Model v1.0. This model takes the total annual application to a rice paddy and calculates partitioning of the pesticide between the water and the paddy sediment according to a linear or K_d partitioning model. Concentrations are assumed to immediately and evenly distribute throughout the rice paddy water. Dissipation processes, such as degradation, volatilization, and potential dilution with uncontaminated water outside the paddy are not accounted for by the model. Movement of pesticide on suspended sediment is not considered. Due to rapid aquatic photolysis of imazamox; lower exposure over time is expected (although the relative contribution of photolysis will depend on whether it is applied to water, how much plant cover exists, how cloudy the water is, etc). Input values for Tier I Rice Model v1.0 are listed in

Table 4. Surface water exposure inputsThe single exposure estimate produced with the Rice Model is used as an acute and a chronic screening exposure estimate that is expected to represent high-end exposure in released flood water as shown in Table 5. Calculations are shown in Appendix B.

Table 4. Surface water exposure inputs for Tier I Rice Model v1.0 for imazamox

MODEL INPUT VARIABLE	INPUT VALUE	COMMENTS
Application rate (kg ai/hectare)	0.131; 056	EPA Reg. No. 241-379
K_d (mL/g)	0.882 (average)	MRID# 43193242

The formula of the Tier I Rice Model v1.0 is as follows:

$$C_w = \frac{m_{ai}'}{0.00105 + 0.00013K_d}$$

where:

C_w = water concentration [$\mu\text{g/L}$]

m_{ai}' = mass applied per unit area [kg/ha]
 K_d = water-sediment partitioning coefficient [L/kg]

Table 5. Estimated EECs for imazamox in surface water based on Tier I Rice Model v1.0.

@ Max. season rate (15 fl oz/A)	@ Max. single application (6 fl oz/A)
112.5 PPb	48.1 PPb

b. Surface Water Monitoring

The open literature and the U.S. Geological Survey NAWQA database were searched. No surface water monitoring data for imazamox were found since they didn't include it in their analytical methods

c. Field Study Data

Imazamox dissipates in the field with half-lives of 130, 50, 35, 15 and 50 days at field sites (soybeans) in North Dakota, Georgia, Arkansas, Iowa and California, respectively. The ND, GA and IA sites showed AC 299,263 detections at the 6 inch depth. The AR and CA sites showed parent detections at 3 and 9 inch depths, respectively. The CA site also showed the metabolite CL 354,825 at 6 inches and it did not dissipate by Day 557 (5.5% of the applied). The studies conducted at the ND, GA and IA sites were considered supplemental because Day 0 recoveries were <50%.

For the proposed use (i.e rice fields), Imazamox is expected to persist even longer than in soybeabs fields due to its persistance under anaerobic conditions.

2. Terrestrial Exposure Assessment

a. Bird and Mammal Exposure

The T-REX model (v1.2.3, USEPA, 2005) was used to estimate the terrestrial mammal exposure values resulting from possible dietary ingestion of Imazamox residues on vegetative matter and insects. The EEC values were calculated based on the default foliar dissipation half-life of 35 days for the parent and degradates due to the lack of foliar dissipation data.

The predicted maximum residues of Imazamox that may be expected to occur on selected mammalian food items immediately following application are presented in section VIII.A.1. Non-Target Terrestrial Animals (Birds, Mammals, and Beneficial Insects).

The T-REX model will not be used for avians because there were no acute mortalities or adverse effects observed at the highest dose concentrations. In addition, the avian reproductive study showed no adverse reproductive effects at 2000 ppm. Therefore, it is concluded that there is no adverse effects to birds from the labeled use of Imazamox.

b. Exposure Modeling for Non-Target Plants

The assessment of terrestrial and semi-aquatic plant exposure employs AgDrift, a model that estimates off-site deposition of pesticides applied by aerial, ground, and orchard airblast spraying means, and for evaluating the potential of buffer zones to protect sensitive aquatic and terrestrial habitats from undesired exposures.

Default spray drift assumptions are 1% for ground applications and 5% for aerial, airblast, forced air, and chemigation applications. Terrestrial plant EECs for spray formulations are summarized in Table 6.

Table 6. Soil EECs (lb a.i./A) in Upland Terrestrial and Semi-Aquatic Soils Adjacent to a Imazamox Treated Noncropland

Application Method	EEC (lb ai/A)
Ground	0.1234
Aerial	0.0585

B. Ecological Effects Characterization

In screening-level ecological risk assessments, the effects characterization section describes the types of effects on aquatic and terrestrial organisms, which result from pesticide exposure. This characterization is based on registrant-submitted studies that describe information regarding acute and chronic effects toxicity for various aquatic and terrestrial animals and plants.

Appendix C summarizes the results of the registrant-submitted toxicity studies on Imazamox used to characterize effects for this risk assessment.

The toxicity testing reported in this section is not an exhaustive survey of all species of birds, mammals, or aquatic organisms. Only a few surrogate species for both freshwater fish and birds are used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, acute studies are usually limited to the Norway Rat or the House Mouse. Testing

for reptiles and amphibians are not required. The risk assessment assumes that conclusions drawn from avian toxicity studies are applicable to reptiles. Similarly, conclusions drawn from studies conducted with fish are assumed applicable to amphibians.

In general, categories of acute toxicity ranging from “practically nontoxic” to “very highly toxic” have been established for aquatic organisms (based on LC₅₀ values), terrestrial mammals (based on LD₅₀ values), avian species (based on LC₅₀ values), and non-target insects (based on LD₅₀ values for honey bees).

1. Aquatic Effects Characterization

Imazamox is practically non-toxic fish and aquatic invertebrates. At the highest concentration tested, there were no observed adverse effects to fish or aquatic invertebrates. Therefore, no acute RQ calculation will be made for fish and aquatic invertebrates.

Summarized below in Table 7 are the most sensitive toxicity values to be used to calculate risk to aquatic plants based on their maximum estimated exposure to Imazamox. A more detailed summary of the aquatic toxicity data available is given in **Appendix C**.

Table 7. The most sensitive toxicity values

Vascular plant: Duckweed (<i>Lemna gibba</i>)	Duration of test: 14 days	0.011 mg a.i./L (EC ₅₀)	43876219 (acceptable)
		0.0045 mg ai/L (NOEC)	
Freshwater alga (<i>Selenastrum capricornutum</i>) Freshwater diatom (<i>Navicula pelliculosa</i>) Marine alga (<i>Skeletonema costatum</i>) Blue-green algae (<i>Anabaena flos-aquae</i>)	Duration of test: 120 hours	>40 mg a.i./L (EC ₅₀ and NOEC)	43876219 (acceptable)

2. Terrestrial Effects Characterization

The acute and chronic toxicity values associated with exposure of terrestrial species to Imazamox are summarized in Section VIII. A.1. Non-Target Terrestrial Animals and Plants. A more detailed summary of the terrestrial toxicity data available is given in Appendix C.

The phytotoxic values associated with exposure of terrestrial non-target plants to Imazamox are summarized in Table 8 below.

Table 8. Plant survival and growth data used for RQ derivation. Units are in lb ai/A.

Plant type	Seedling Emergence		Vegetative Vigor	
	EC25	NOAEC	EC25	NOAEC /EC ₀₅
Monocot	0.002	0.0015	0.0013	0.000091
Dicot	0.0018	0.00075	0.001	0.00075

VIII. RISK CHARACTERIZATION

Risk characterization is the integration of exposure and effects characterization to determine the ecological risk and the likelihood of effects on aquatic life, wildlife, and plants based on varying pesticide-use scenarios. The risk characterization provides estimations and descriptions of the risk; articulates risk assessment assumptions, limitations, and uncertainties; synthesizes an overall conclusion; and provides the risk managers with information to make regulatory decisions.

A. Risk Estimation - Integration of Exposure and Effects Data

Results of the exposure and toxicity effects data are integrated to evaluate the likelihood of adverse ecological effects on non-target species. For the baseline risk assessment of Imazamox, the RQ method is used as an index of risk; RQs are compared to the Agency's LOCs (Section II.E.3). These LOCs (Table 3) are the Agency's interpretive policy to analyze potential risk to non-target organisms and assess the need to consider regulatory action. These criteria are used to indicate when a pesticide's directed label use has the potential to cause adverse effects on non-target organisms.

1. Non-Target Terrestrial Animals and Plants

RQ values calculated for terrestrial animal exposure and the EEC for Imazamox residues are provided in Table 9. No acute LOC is exceeded for mammals. Since Imazamox is practically nontoxic to honey bees no adverse effect is expected and no labeling precautions are required.

No adverse acute effects to birds are expected since Imazamox is practically non-toxic to birds and there were no mortality observed in avian toxicity testing. Estimated exposure (26.5 ppm) was less than the highest dose tested (>5572 ppm).

No Chronic adverse effects to mammals or birds are expected since no adverse effects were observed at the highest dose tested (>20000 ppm). Estimated exposure (26.5 ppm) was less than the highest dose tested.

Table 9. Upper bound Kenega, acute mammalian dose-based RQs

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	4661.6	463.8	0.1	212.58	0.05	260.89	0.06	28.99	0.01	6.44	0
35	3771.73	320.55	0.08	146.92	0.04	180.31	0.05	20.03	0.01	4.45	0
1000	1631.39	74.32	0.05	34.06	0.02	41.81	0.03	4.65	0	1.03	0

Non-Target Terrestrial Plants

To determine the potential risk of Imazamox to terrestrial plants, the EC₂₅ and NOEL values of the most sensitive species in the seedling emergence study (section III.B.2) are compared to spray drift exposure, and the EC₂₅ and NOEL values of the most sensitive species (section III.B.2) in the vegetative vigor study are compared to the spray drift exposure to calculate the risk quotients. See Table 10.

Table 10. RQ values for terrestrial nontarget plants Exposed to Imazamox through Runoff and/or Spray Drift.*

Plant Type	Listed Status	RQ	
		Ground Application	Aerial Application
Monocot	non-listed (EC ₂₅)	77.1	36.6
Monocot	Listed (NOEC)	82.3	39
Dicot	non-listed (EC ₂₅)	123	58.5
Dicot	Listed (NOEC)	164	78

*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.

LOC for terrestrial non-target plants (listed and non-listed species) is exceeded from the use of Imazamox on noncropland.

2. Non-Target Aquatic Animals (Fish and Invertebrate) and Plants

a. Aquatic Animals

Imazamox is practically non-toxic to freshwater and estuarine fish and invertebrates on an acute exposure basis. Since no mortality was observed at the highest concentration tested, no acute risk to aquatic animals is anticipated. Therefore, no RQ calculation was done. Since there are no chronic data available for aquatic animals, EFED was unable to estimate the chronic risk of Imazamox to aquatic animals.

b. Aquatic Plants

There is uncertainty associated with phytotoxic risk to aquatic single-celled plants. The toxicity studies resulted in EC₅₀ greater than the maximum concentration (40 ppb) that the unicellular species were exposed to. This value is less than the estimated maximum concentration (112.5 ppb) in water for imazamox use on Clearfield rice.

Table 11 shows the risk quotients for non-target vascular aquatic plants from imazamox application for aquatic weed control.

Table 11. RQ values for non-target aquatic plants

Plant Type	Species	Toxicity value used	Ground Application		Aerial Application	
			Listed species RQ	Unlisted species RQ	Listed species RQ	Unlisted species RQ
Vascular plant	Duckweed (<i>Lemna gibba</i>)	EC ₅₀ = 11 ppb	0.1	0.04	0.35	0.14
Vascular plant	Duckweed (<i>Lemna gibba</i>)	NOEC = 4.5 ppb				
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.						

Imazamox application for aquatic weed control would not exceed the Agency’s LOC for non-target aquatic vascular plants.

B. Risk Description

1. Risks to Terrestrial Organisms

a. Animals

Potential acute or chronic risk for birds or mammals from the use of imazamox on cropland or from spray drift from noncropland or aquatic weed control is expected to be minimal. Imazamox is slightly to practically non-toxic to birds on an acute basis with no mortalities observed at the highest dose tested. It is practically non-toxic to mammals on an acute basis; no acute LOCs were exceeded for mammals from the use of imazamox on noncropland.

b. Risk to terrestrial plants

LOC values are exceeded for listed and non-listed non-target plant species that receive spray drift from Imazamox use. Spray Drift RQs from noncropland and aquatic weed control range from 36.6 to 123 for non-listed nontarget plant species and 39 to 164 for listed species.

2. Risk to Aquatic Organisms

a. Animals

Acute Risk

Imazamox is practically non-toxic to freshwater and estuarine fish and invertebrates on an acute exposure basis. Since no mortality was observed at the highest concentration tested, no acute risk to aquatic animals is anticipated. Therefore, no RQ calculation was done. Potential acute risk is considered to be low from labeled use of imazamox.

Chronic Risk

Since there are no chronic data available for aquatic animals, EFED was unable to estimate the chronic risk of Imazamox to aquatic animals. There is some evidence (stable to hydrolysis) indicate that imazamox may be persistent in water once it reaches a water body. Aquatic organisms are therefore expected to be exposed to imazamox.

b. Risk to aquatic plants and algae

The RQs indicate that the LOCs are not exceeded for risk to aquatic vascular plants or algae/diatoms that receive spray drift from Imazamox use. The RQs for non-target aquatic vascular plants that may be near the sites of aquatic weed control ranges from 0.04-0.14 for non-listed and 0.1-0.35 for listed species, respectively.

Phytotoxicity studies with algae and diatoms resulted in EC50, as greater than 40 ppb and on NOEC of 40 ppb. The most sensitive species to imazamox are *Skeletonema costatum* (Marine diatom) and *Selenastrum capricornutum* (Green algae) with percentage of inhibition from exposure to imazamox reported at 11% and 8.3%, respectively. The maximum concentration (40 ppb) that the unicellular species were exposed to is well short of the maximum EEC (112.5 ppb) based on the label for aquatic weed control. Additional aquatic plant growth studies would be needed to determine if the unicellular species such as diatoms and algae are sensitive to imazamox up to 112.5 ppb. If they are sensitive, then an EC50 will need to be determined. It is uncertain as to whether imazamox will adversely affect aquatic unicellular plant species.

3. Federally Threatened and Endangered (Listed) Species Concerns

a. Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. At the initial screening-level, the risk assessment considers broadly described taxonomic groups and so conservatively assumes that listed species within those broad groups are collocated with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated site and aquatic organisms are assumed to be located in a surface water body adjacent to the treated site. The assessment also assumes that the listed species are located within an assumed area, which has the relatively highest potential exposure to the pesticide, and that exposures are likely to decrease with distance from the treatment area. The Use Characterization of this risk assessment presents the pesticide use sites (corn) that are used to establish initial collocation of species with treatment areas.

If the assumptions associated with the screening-level action area result in RQs that are below the listed species LOCs, a "no effect" determination conclusion is made with respect to listed species in that taxa, and no further refinement of the action area is necessary. Furthermore, RQs below the listed species LOCs for a given taxonomic group indicate no concern for indirect effects upon listed species that depend upon the taxonomic group covered by the RQ as a resource. However, in situations where the screening assumptions lead to RQs in excess of the listed species LOCs for a given taxonomic group, a potential for a "may affect" conclusion exists and may be associated with direct effects on listed species belonging to that taxonomic group or may extend to indirect effects upon listed species that depend upon that taxonomic group as a resource. In such cases, additional information on the biology of listed species, the locations of these species, and the locations of use sites could be considered to determine the extent to which screening assumptions regarding an action area apply to a particular listed organism. These subsequent refinement steps could consider how this information would impact the action area for a particular listed organism and may potentially include areas of exposure that are downwind and downstream of the pesticide use site.

b. Taxonomic Groups Potentially at Risk

The Level I screening assessment process for listed species uses the generic taxonomic group-based process to make inferences on direct effect concerns for listed species. The first iteration of reporting the results of the Level I screening is a listing of pesticide use sites and taxonomic groups for which RQ calculations reveal values that meet or exceed the listed species LOCs. In the majority of cases, the screening-level risk assessment process reports RQ calculations for the following broad taxonomic groupings:

- Birds (also used as surrogate for terrestrial-phase amphibians and reptiles)
- Mammals
- Freshwater fish (also used as a surrogate for aquatic phase amphibians)
- Freshwater invertebrates

- Estuarine and marine fish
- Estuarine and marine invertebrates
- Terrestrial invertebrates
- Terrestrial plants
- Aquatic plants

Discussion of Risk Quotients to Listed Species

Noncropland and Aquatic Weed Control Use- Risk to Terrestrial and Aquatic Animals

The proposed use on Clearfield rice is not anticipated to exceed the Agency's acute LOC for avian, mammalian, fish or aquatic invertebrate listed species.

There are no chronic LOC exceedances for birds.

Since there are no chronic data available for aquatic animals, EFED was unable to estimate the chronic risk of Imazamox to aquatic animals.

Aquatic Weed Control Use - Risk to Non-Target Plants

As mentioned above, there are no Imazamox LOC exceedances for listed terrestrial non-target plants inhabiting areas nearby or adjacent to Clearfield rice sites using imazamox.

Spray Drift RQs ranges from 0.1 to 0.35 and from 0.04 to 0.14 for listed species, and unlisted species, respectively.

4. Implications of Indirect Effects

a Indirect Effects Analysis

The Agency acknowledges that pesticides have the potential to exert indirect effects upon the listed organisms by, for example, perturbing forage or prey availability, altering the extent of nesting habitat, creating gaps in the food chain, etc.

In conducting a screen for indirect effects, direct effect LOCs for each taxonomic group are used to make inferences concerning the potential for indirect effects upon listed species that rely upon non-listed organisms in these taxonomic groups as resources critical to their life cycle.

Screening-level RQs for terrestrial and aquatic vascular plants are above the LOCs. The Agency considers this to be indicative of a potential for adverse effects to those listed species within the action area that rely either on a specific plant species (plant species obligate) or multiple plant

species (plant dependent) for some important aspect of their life cycle. The Agency may determine if listed organisms, for which plants were a critical component of their resource needs, are within the action area. This will be accomplished through a comparison of Service-provided species profiles and listed species location data. If no listed organisms that are either plant species obligates or plant dependent reside within the action area, a no effect determination on listed species will be made. If plant species obligate or dependent organism resides within the pesticide use area, the Agency will consider temporal and geographical nature of exposure, and the scope of the effects data, to determine if any potential effects can be determined to not likely adversely affect a plant species obligate or dependent listed organism.

EFED concludes that due to terrestrial plant LOC exceedances (using maximum application rates); there may be a concern for indirect effects to the following groups of organisms in the area for the Imazamox regulatory action:

- Freshwater fish
- Freshwater amphibians
- Freshwater invertebrates
- Terrestrial invertebrates
- Birds
- Mammals
- Reptiles

For listed species that may potentially be affected directly and/or indirectly by the Federal action, see Appendices F (Locates runs).

b Critical Habitat

In the evaluation of pesticide effects on designated critical habitat, consideration is given to the physical and biological features (constituent elements) of a critical habitat identified by the U.S Fish and Wildlife and National Marine Fisheries Services as essential to the conservation of a listed species and which may require special management considerations or protection. The evaluation of impacts for a screening level pesticide risk assessment focuses on the biological features that are constituent elements and is accomplished using the screening-level taxonomic analysis (risk quotients, RQs) and listed species levels of concern (LOCs) that are used to evaluate direct and indirect effects to listed organisms.

The screening-level risk assessment has identified potential concerns for indirect effects on listed species for those organisms dependant upon *terrestrial and aquatic vascular plants*. In light of the potential for indirect effects, the next step for EPA and the Service(s) is to identify which listed species and critical habitat are potentially implicated. Analytically, the identification of such species and critical habitat can occur in either of two ways. First, the agencies could determine whether the action area overlaps critical habitat or the occupied range of any listed species. If so, EPA would examine whether the pesticide's potential impacts on non-listed species would affect the listed species indirectly or directly affect a constituent element of the

critical habitat. Alternatively, the agencies could determine which listed species depend on biological resources or have constituent elements that fall into the taxa that may be directly or indirectly impacted by the pesticide. Then EPA would determine whether use of the pesticide overlaps the critical habitat or the occupied range of those listed species. At present, the information reviewed by EPA does not permit use of either analytical approach to make a definitive identification of species that are potentially impacted indirectly or critical habitats that is potentially impacted directly by the use of the pesticide. EPA and the Service(s) are working together to conduct the necessary analysis.

This screening-level risk assessment for critical habitat provides a listing of potential biological features that, if they are constituent elements of one or more critical habitats, would be of potential concern. These correspond to the taxa identified above as being of potential concern for indirect effects and include the following: freshwater fish and aquatic invertebrates, amphibians, birds, mammals, and reptiles. This list should serve as an initial step in problem formulation for further assessment of critical habitat impacts outlined above, should additional work be necessary.

c. Co-occurrence Analysis

The goal of the analysis for co-location is to determine whether sites of pesticide use are geographically associated with known locations of listed species. At the screening level, this analysis is accomplished using the LOCATES database. The database uses location information for listed species at the county level and compares it to agricultural census data for crop production at the same county level of resolution. The product is a listing of federally listed species that are located within counties known to produce the crop upon which the pesticide will be used. Because the Level I screening assessment considers both direct and indirect effects across generic taxonomic groupings, it is not possible to exclude any taxonomic group from a LOCATES database run for a screening risk assessment. Given the extent of proposed Imazamox usage across the U.S. and the expected large number of listed species that are likely to occur in counties where this pesticide is proposed to be used, a list of endangered/threatened plant species and crop acreage at the county level for the taxonomic groups and crops of concern is not included in this phase of the risk assessment process.

Appendices F provide a list of endangered/threatened species at the state level for the taxonomic groups of concern. EFED assumes that listed species may be at risk for the all states where noncropland and aquatic weed control use occurs since LOCATES only does agricultural land use.

C. Description of Data Gaps

Fate Data Gaps

Given the rice use, an aquatic field dissipation study is needed for the following reasons:

- (1) The terrestrial field dissipation studies indicate that imazamox is at least as persistent in the field as it was in the lab aerobic soil metabolism study;
- (2) Lab data indicate that imazamox is likely to be stable under anaerobic conditions, suggesting a potential for greater persistence in rice fields during periods when the field is anaerobic;
- (3) The aquatic photolysis study suggested that imazamox may photolyze quickly in water (although not in soil). A field study would help determine the extent to which aqueous photolysis may be a route of dissipation under rice use conditions.

In the absence of an aquatic field dissipation study, we would continue to assume that imazamox is stable in the rice paddy.

Ecotoxicity Data

Phytotoxicity Data for Aquatic Plant. Algae and diatoms were tested up to 40 ppb and showed effects less than 50%. The maximum EEC for aquatic weed control is 112.5 ppb. Additional testing needs to be done on the unicellular plant species up to 112.5 ppb (Tier I) or an EC50 needs to be determined (Tier II).

Appendix A

Environmental Fate Studies

§161-1 Hydrolysis (MRID 43193240)

Imazamox is stable to degradation by hydrolysis. AC 299,263 did not degrade in sterile aqueous buffer solutions (pH 5, 7, and 9) that were incubated in darkness at 25 °C for 30 days. The guideline requirement (GLN 161-1) is fulfilled.

§161-2 Aqueous Photolysis (MRID 43876222)

Imazamox photodegraded with an average half-life of 6.8 hours in pH 5, 7, and 9 aqueous buffer solutions. Six major photoproducts were identified in the study, and several minor degradates were formed also, all of which were ring rearrangements of parent AC 299,263. Dark controls were stable with <3 % of parent AC 299,263 degrading. The guideline requirement (GLN 161-2) is fulfilled. .

§161-3 Soil Photolysis (MRID 43876223)

Imazamox degraded slowly with a calculated half-life of 65 days in the irradiated samples, and did not degrade in the dark controls with >90 % remaining by the end of the study (30 days). The only major photoproduct was the diacid (AC 312,622, parent compound with intact rings minus a methoxymethyl group). The diacid reached 11.9-15.4 % of the applied by 30 days. There were 14 other photoproducts, but none of these reached more than 7 % in the study. The structures of the diacid molecule are in Table 1. Material balances ranged from 99-112 % in the study, even though volatiles were not measured. The guideline requirement (161-3) is fulfilled. .

§162-1 Aerobic Soil Metabolism (MRID 43876224)

Imazamox is moderately persistent in sandy loam soil with a calculated half-life of 27 days. Parent AC 299,263 declined from 89.9 % at Day 0 to 12.5 % at 365 days. The oxidative metabolite AC 312,622 (demethylated parent with intact ring structures and two carboxylic acid groups), increased to 40.8-43.6 % of the applied by 14-42 days, and then decreased to 2.9 % of the applied by 365 days. The other oxidative metabolite, AC 354,825 (demethylated, decarboxylated parent with intact rings, one carboxylic acid group), increased to 54 % by 365 days, and appears to be the terminal residue in the environment.

EDTA-extractable residues decreased from 93.6-95.5 % at zero days after treatment to 19.5 % after 365 days. At the same time, NaOH-extractable residues increased from 8.3 % at two days to 52.6 % at 365 days. The bound residues after two extractions increased to 5.5 % by 365 days. Total extracted residues decreased from 97.1 % at zero days to 79 % at 365 days. The guideline requirement (162-1) is fulfilled.

§162-2 Anaerobic Soil Metabolism (MRID 43876225)

Parent imazamox and its two oxidative metabolites from the aerobic portion of the study did not degrade in the anaerobic portion of the study. Between 68.2-71.1% of the residues in the anaerobic portion of study were associated with the aqueous phase. Soil residues were equally extractable with the EDTA or NaOH extraction methods (10.5-14 % of the applied from each method throughout the study). Material balances slightly decreased from 97.1 % of the applied at zero days to 93.9 % of the applied at 56 days of anaerobic conditions. The guideline requirement (162-2) is fulfilled.

§162-3 Anaerobic Aquatic Metabolism (MRID 43876231)

Parent imazamox was stable to anaerobic aquatic metabolism in the laboratory with an extrapolated half-life of 761 days. Aqueous residues were 39-56 % and 35-56 % of total radioactivity in the non-sterile samples incubated at 25 °C and 4 °C, respectively. In the sterile samples at 25 °C, aqueous residues declined from 52 % at zero days after treatment to 32 % by the end of the study (12 months). Volatile residues were minimal throughout the study, regardless of treatment. In the non-sterile treatments, fulvic acid (extractable) residues generally increased from 36 to 51-54 % by the end of the study. In the sterile system, fulvic acid residues increased from 43 % at zero days after treatment to 63 % by 12 months. The guideline requirement (162-3) is fulfilled.

§163-1 Mobility - Leaching and Adsorption/Desorption (MRID 43193242, MRID 43876227)

Imazamox was very mobile in the tested soils with Freundlich K_{ads} values of 0.5-2.7 (see below table). The unaged portion of the guideline requirement (GLN 163-1) is fulfilled.

Soil Texture and % OC	Freundlich K_{ads}	Freundlich K_{ocads}	Freundlich K_{des}	Freundlich K_{ocdes}	N (slope values) for adsorption and desorption
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Loamy Sand (0.29 % OC)	0.05	17	0.12	41	
Sandy Loam (0.85 % OC)	0.85	35	0.48	56	
Loam (1.37 % OC)	0.13	18	0.42	31	
Silt Loam (1.05 % OC)	1.43	136	2.18	207	
Silty Clay Loam (2.59 % OC)	0.13	5	0.23	9	
Clay Loam (1.88 % OC)	2.7	143	1.1	59	

Adsorption/Desorption Batch Equilibrium (Aged)

Based on batch equilibrium experiments, the degradate AC 312,62 was very mobile in the tested soils and the degradate AC 354,825 was moderately mobile to immobile in the tested soils with Freundlich K_{ads} of 0.71-2.19 and 3.8-26.6, respectively (See below tables). The aged portion of the guideline requirement (GLN 163-1) is fulfilled.

Soil Mobility for AC 312,622

Soil Texture and % OC	Freundlich K_{ads}	Freundlich K_{ocads}	Freundlich K_{des}	Freundlich K_{ocdes}	N (slope values) for adsorption and desorption
Loamy Sand (0.29 % OC)	0.78	278	0.08	28	1.03, 1.08
Sandy Loam (0.85 % OC)	0.79	93	0.05	6	1.04, 0.77
Loam (1.37 % OC)	0.81	59	0.11	8	1.05, 0.95
Silt Loam (1.05 % OC)	2.19	208	1.65	157	1.09, 0.71
Silty Clay Loam (2.59 % OC)	0.71	27	0.03	1	1.06, 1.00

Clay Loam (1.88 % OC)	1.3	69	0.85	45	1.11, 1.12
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Soil Mobility for AC 354,825

Soil Texture and % OC	Freundlich K_{ads}	Freundlich K_{OCads}	Freundlich K_{des}	Freundlich K_{OCdes}	N (slope values) for adsorption and desorption
Loamy Sand (0.29 % OC)	3.8	1364	9.0	3228	1.04, 1.31
Sandy Loam (0.85 % OC)	10.7	1259	22.6	2658	1.27, 1.18
Loam (1.37 % OC)	14.4	1051	26.1	1905	1.30, 1.21
Silt Loam (1.05 % OC)	20.2	1924	35.7	3400	1.13, 1.11
Silty Clay Loam (2.59 % OC)	8.6	331	16.6	640	1.45, 1.34
Clay Loam (1.88 % OC)	26.6	1415	55.8	1415	1.12, 1.09

§164-1 Terrestrial Field Dissipation (MRID 43876230)

AC 299,263 dissipates in the field with half-lives of 130, 50, 35, 15 and 50 days at field sites in North Dakota, Georgia, Arkansas, Iowa and California, respectively. The ND, GA and IA sites showed AC 299,263 detections at the 6 inch depth. The AR and CA sites showed parent detections at 3 and 9 inch depths, respectively. The CA site also showed the metabolite CL 354,825 at 6 inches and it did not dissipate by Day 557 (5.5% of the applied). The studies conducted at the ND, GA and IA sites were considered supplemental because Day 0 recoveries were <50%. The terrestrial field dissipation guideline requirement (GLN 164-1) is fulfilled.

§165-4 Accumulation in Fish (MRID 43876231)

Imazamox did not significantly accumulate in bluegill sunfish. Concentrations in whole fish and edible tissue were less than the minimum quantifiable limit while the

bioconcentration factor for the inedible tissue was <1X. The accumulation in fish guideline (GLN 165-4) requirement is fulfilled.

Appendix B

Imazamox Surface water EEC from Tier I Rice Model v1.0

	appl. Rate		
	lbai/A		
15 fl oz applied	0.117	EPA Reg No. 241-379	
mai (Kgai/ha)	0.131		
kd (L/Kg)=	0.882	Avg	MRID# 43193242
Cw (ppb)=	112.51		

	appl. Rate		
	lbai/A		
6 fl oz applied	0.05	EPA Reg No. 241-379	
mai (Kgai/ha)	0.056		
kd (L/Kg)=	0.882	Avg	MRID# 43193242
Cw (ppb)=	48.083		

Appendix C

Description of Ecological Effects Studies

Imazamox

1. Ecological Toxicity Data

a. Toxicity to Terrestrial Animals

(1) Birds, Acute and Subacute

An oral (LD₅₀) study (preferably mallard or bobwhite quail) and two subacute dietary (LC₅₀) studies (one species of waterfowl, preferably the mallard duck and one species of upland game bird, preferably bobwhite quail) are required to establish the toxicity of a pesticide to birds. Results of these tests are tabulated below.

Table : Avian Acute Oral Toxicity Findings (LD₅₀)

Species	% A.I.	LD ₅₀ (mg a.i./kg)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Northern bobwhite	98.2	> 1846	43193227 Campbell et al ,1994	Slightly toxic to practically nontoxic	Yes
Mallard duck	98.2	>1950	43193226 Campbell et al 1994	Slightly toxic to practically nontoxic	Yes

Table : Avian Subacute Dietary Toxicity Findings (LC₅₀)

Species	% A.I.	LC ₅₀ (ppm ai)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Northern Bobwhite	97.1	>5572	43193228 Campbell 1994	Practically nontoxic	yes
Mallard Duck	97.1	>5572	43193229 Campbell 1994	Practically nontoxic	yes

These results indicate that Imazamox is slightly toxic to practically nontoxic to avian species on an acute oral basis.

(2) Birds, Chronic

Avian reproduction studies using the technical grade of the active ingredient are required when birds may be exposed to a pesticide repeatedly or continuously through its persistence, bioaccumulation, or from multiple applications, or if mammalian reproduction tests indicate possible adverse reproductive effects. The preferred test species are the mallard duck and bobwhite quail. Avian reproduction studies are required for Imazamox because it is persistent. Results of these tests are tabulated below.

Table : Avian Reproduction Findings

Species	% A.I.	NOEC (ppm ai)	LOEC (ppm ai)	Endpoints Affected	MRID No. Author/Year	Fulfills Guideline Requirement?
Mallard	97.1	>2000	>2000	None	438762-11 Gagne et. al., 1995	Yes
Northern Bobwhite	97.1	>2000	>2000	None	438762-09 Gagne et. al., 1995	Yes

(3) Mammals

Wild mammal testing may be required on a case-by-case basis, depending on the results of the lower tier studies such as acute and subacute testing, intended use pattern and pertinent environmental fate characteristics. This testing has not been required for Imazamox. Acute oral LD₅₀ data for laboratory rats submitted to the Health Effects Division (HED) for evaluation of human toxicity were used to assess the mammalian acute toxicity of Imazamox. The LD₅₀ for rats was 2313 (1863 -2973) mg/kg for the male and 2121 (639-7047) mg/kg-bw for the female (MRID 43876212). These results classify Imazamox as practically nontoxic to mammals on an acute basis. The active ingredient tested was 90%.

Rat 2-generation reproductive study (MRID 43876217) showed the NOEL to be greater than 20,000 ppm (1705 mg/kg female, 1469 mg/kg male). No effects were observed at the highest dose. The active ingredient tested was 98.2%.

(4) Insects

A honey bee acute contact LD₅₀ study using the technical grade of the active ingredient is required when the proposed use will result in honey bee exposure. A honey bee acute contact study is not required for this pesticide because its use sites are not expected to result in significant exposure to bees. However an acute contact study was submitted by the registrant. A Summary of the study is as follows.

Species	%A.I.	MRID	LD ₅₀	Toxicity Category	Fulfills Guideline Requirement?
<i>Apis mellifera</i>	98.2	431932-33	>25 ug/bee	Practically Nontoxic	Yes

CITATION: Parrish, J.R., B. Yeager, V.M. Canez and P.J. Boughton. 1994. An Acute Contact Toxicity Study with AC 299,263 in the Honey Bee (*Apis mellifera* L.). Laboratory Study No. 954-93-115. Prepared by BIO/WEST, Inc. Submitted by American Cyanamid Company, Princeton, NJ. EPA MRID No. 431932-33.

b. Toxicity to Aquatic Animals
(1) Freshwater Fish, Acute

Two freshwater fish toxicity studies using the technical grade of the active ingredient are required to establish the toxicity of a pesticide to freshwater fish. One study should use a coldwater species (preferably the rainbow trout), and the other should use a warmwater species (preferably the bluegill sunfish). Results of these tests are given below.

Species	LC ₅₀ (mg ai/L)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Bluegill sunfish	>119	Yurk and Wisk, 1994 431932-30	Practically nontoxic	Yes
Rainbow trout	>122	Yurk and Wisk, 1994 431932-31	Practically nontoxic	Yes

The results indicate that Imazamox is practically nontoxic to fish on an acute basis. The guideline requirements for testing with the technical grade [GLN 72-1(a) and 72-1(c)] are fulfilled.

(2) Freshwater, Fish Chronic

No data on fresh water fish early life stage has been submitted or is available. This study is outstanding in order to determine chronic effects for fresh water fish because imazamox is applied directly to water on rice. The preferred test organism is the rainbow trout.

(3) Freshwater Invertebrates, Acute

A freshwater aquatic invertebrate toxicity test using the technical grade of the active ingredient is required to assess the toxicity of a pesticide to freshwater invertebrates. The preferred test organism is *Daphnia magna*, but early instar amphipods, stoneflies, mayflies, or midges may also be used. Results of this test are tabulated below.

Species	% A.I.	EC ₅₀ (ppm ai)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
<i>Daphnia magna</i>	97.1	>122	431932-32 Yurk and Wisk, 1994	practically nontoxic	Yes

The results indicate that Imazamox is practically nontoxic to aquatic invertebrates on an acute basis. The guideline requirement for testing the TGAI [72-2(a)] are fulfilled (MRID 431932-32).

(4) Freshwater Invertebrate, Chronic

No aquatic invertebrate life-cycle studies have been submitted or available for imazamox risk assessment. The study is outstanding since imazamox is applied directly to water for the use on rice. The preferred test organism is the *Daphnia magna*.

(5) Estuarine and Marine Animals, Acute

Acute toxicity testing with estuarine and marine organisms (fish, shrimp, and oysters) using the technical grade of the active ingredient is required when an end-use product is intended for direct application to the marine/estuarine environment or is expected to reach this environment in significant concentrations. The preferred test organisms are the sheepshead minnow, mysid shrimp and eastern oyster.

Estuarine/marine acute toxicity testing is required for Imazamox because its use on rice is expected to result in significant exposure to marine and estuarine environments.

Species	LC ₅₀ (mg ai/L)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Sheepshead minnow	>94.2	Olivieri et.al., 1998 44565201	Practically nontoxic	Yes
Mysid	>100	Olivieri et.al., 1998 44565202	Practically nontoxic	Yes

Both of the above studies were done with 97.1% a.i.

(6) Estuarine and Marine Animals, Chronic

No estuarine/marine animal fish or invertebrates chronic studies have been submitted or available to use for imazomox risk assessment.

c. Toxicity to Plants

(1) Terrestrial

Terrestrial plant testing (seedling emergence and vegetative vigor) is required for herbicides which have terrestrial non-residential outdoor use patterns and which may move off the application site through volatilization (vapor pressure $\geq 1.0 \times 10^{-5}$ mm Hg at 25°C) or drift (aerial or irrigation); and/or which may have endangered or threatened plant species associated with the application site. Terrestrial plant testing is required for this pesticide because it is an herbicide with a terrestrial nonresidential use pattern (rice) and because aerial applications may result in drift.

For the seedling emergence and vegetative vigor testing the following plant species and groups should be tested: (1) six species of at least four dicotyledonous families, one species of which is soybean (*Glycine max*), and the second of which is a root crop, and (2) four species of at least two monocotyledonous families, one of which is corn (*Zea mays*).

Corn, oat, onion, ryegrass, cabbage, cucumber, lettuce, radish, soybean, and tomato were tested in a seed germination using a rate of 0.048 lb a.i./A, which is slightly more than maximum application rate. There was no demonstrable effect on seedling germination. The test fulfills the seed germination part of the guideline requirement 123-1(a).

These same ten species were also tested in a tier II seedling emergence test [part of 123-1(a)] and a tier II vegetative vigor test. Results of the seedling emergence test are given in the table below:

Table : Tier II Seedling Emergence Findings

Species	% AI	Parameter Affected	EC ₂₅ (lb ai/A)	NOEC (lb ai/A)	MRID No. Author/Year	Fulfills Guideline Requirement?
Monocot--Corn	97.1	dry weight	0.013	0.012	438762-20 Chetram, 1995	Yes
Monocot--Oat	97.1	dry weight	0.0020	0.0015		Yes
Monocot--Onion	97.1	dry weight	0.011	0.0060		Yes
Monocot--Ryegrass	97.1	dry weight	0.0051	0.0030 ^a		Yes
Dicot/Root Crop-- Cabbage	97.1	dry weight	0.0018	0.00075		Yes
Dicot--Cucumber	97.1	plant height	0.0073	0.0015		Yes
Dicot-Lettuce	97.1	dry weight	0.029	0.012		Yes
Dicot--Radish	97.1	dry weight	0.0026	0.0015		Yes
Dicot--Soybean	97.1	phytotoxicity	>0.048	0.0015		Yes
Dicot--Tomato	97.1	dry weight	0.0075	0.0015		Yes

^aThe statistically determined NOEL was higher than the EC₂₅. The concentration level below the EC₂₅ was chosen as the NOEL.

For Tier II seedling emergence, cabbage is the most sensitive dicot, and the most sensitive overall species, with an EC₂₅ of 0.0018 lb ai/A. Oat is the most sensitive monocot with a EC₂₅ of 0.0020 lb ai/A. This study fulfills the guideline requirement for seed germination and seedling emergence testing. [GLN 123-1(a), MRID 43876220]

Results of the tier II vegetative vigor test are given below:

Table : Tier II Vegetative Vigor Findings

Species	% AI	Parameter Affected	EC ₂₅ (lb ai/A)	NOEC (lb ai/A)	MRID No. Author/Year	Fulfills Guideline Requirement?
Monocot--corn	97.1	plant height	0.0021	0.0015	438762-21 Chetram, 1995	Yes
Monocot--Oat	97.1	dry weight	0.0016	0.0015		Yes
Monocot--Onion	97.1	dry weight	0.012	0.0060		Yes
Monocot--Ryegrass	97.1	dry weight	0.0052	0.0030		Yes
Dicot/Root Crop--Cabbage	97.1	dry weight	0.0031	0.0015		Yes
Dicot--Cucumber	97.1	dry weight	0.0022	0.00075		Yes

Table : Tier II Vegetative Vigor Findings

Species	% AI	Parameter Affected	EC ₂₅ (lb ai/A)	NOEC (lb ai/A)	MRID No. Author/Year	Fulfills Guideline Requirement?
Dicot-Lettuce	97.1	dry weight	> 0.048	0.012		Yes
Dicot--Radish	97.1	dry weight	0.0020	0.0015		Yes
Dicot--Soybean	97.1	all similar	> 0.048	0.048		Yes
Dicot--Tomato	97.1	dry weight	0.0010	0.00075		Yes

For Tier II vegetative vigor, tomato is the most sensitive dicot, and the most sensitive overall species, with an EC₂₅ of 0.0010 lb ai/A. Oat is the most sensitive monocot with a EC₂₅ of 0.0016 lb ai/A. This study fulfills the guideline requirement for vegetative testing. [GLN 123-1(b), MRID 438762-21]

(2) Aquatic

Aquatic plant testing is required for any herbicide which has outdoor non-residential terrestrial uses in which it may move off-site by runoff (solubility >10 ppm in water), by drift (aerial or irrigation), or that is applied directly to aquatic use sites (except residential). The following species should be tested: *Kirchneria subcapitata*, *Lemna gibba*, *Skeletonema costatum*, *Anabaena flos-aquae*, and a freshwater diatom.

Aquatic plant testing is required for this pesticide because it may be applied aerially.

Results of Tier I toxicity testing on the technical material are tabulated below.

Table : Nontarget Aquatic Plant Toxicity Findings (Tier I)

Species	% A.I.	EC50 (ppb)	% reduction	MRID No. Author/Year	Fulfills Guideline Requirement?
Freshwater diatom <i>Navicula pelliculosa</i>	97.1	> 40	0	438762-19 Canez, 1995	Yes
Green algae <i>Selenastrum capricornutum</i>	97.1	> 40	8.3		Yes
Marine diatom <i>Skeletonema costatum</i>	97.1	> 40	11		Yes
Blue-green algae <i>Anabaena flos-aquae</i>	97.1	> 40	3.6		Yes

Tier I results indicate that the aquatic unicellular plant species do not have adverse effects from exposure to Imazamox up to 40 ppb. The maximum exposure level was based on

0.048 lb ai/A applied to 6 inch water column. The guideline requirement (122-2) is fulfilled (MRID 41690901).

Table : Nontarget Aquatic Plant Toxicity Findings (Tier II)

Species	% A.I.	EC50 (ppb)	NOEC (ppb)	MRID No. Author/Year	Fulfills Guideline Requirement?
Duckweed <i>Lemna gibba</i>	97.1	11	4.5	438762-19 Canez, 1995	Yes

The Tier II results indicate that the aquatic vascular plant *Lemna gibba* is the most sensitive aquatic plant species. Probit slope is 8.0. An Imazamox concentration of 11 ppb ai is predicted to cause a 50% reduction in the growth and reproduction of this species. The guideline requirement (123-2) is fulfilled (MRID 41690901).

Appendix D

Terrestrial Animal Exposure Model Analysis and Risk Quotient Calculations (TRES)

The application rate and avian and mammalian toxicity input page for the TRES program, with Imazamox inputs shown. The program calculates residues on dietary items using the Kenaga nomograph and is used to determine the Imazamox estimated terrestrial organism dose-based and dietary-based exposure values and RQ values.

TREX MODEL INPUTS

These values will be used in the calculation of exposure estimates for foliar, granular, liquid and/or seed applications of pesticides.

Chemical Name:	imazamox
Use:	rice
Product name and form:	
% A.I. (leading zero must be entered for formulations <1% a.i.):	100.00%
Application Rate (lbs/A):	0.039
Half-life (days):	35
Application Interval (days):	3
Number of Applications:	3

Note: Sources of wildlife diet are assumed to be available for less than one year for this model.

Endpoints

Avian		Indicate test species below	
LD50 (mg/kg-bw)		Mallard duck	▼
LC50 (mg/kg-diet)		Bobwhite quail	▼
NOAEL (mg/kg-bw)		Mallard duck	▼
NOAEC (mg/kg-diet)		Bobwhite quail	▼
Enter the Mineau et al. Scaling Factor		1.15	
Mammals			
LD50 (mg/kg-bw)	2121.00		
LC50 (mg/kg-diet)			
Reported Chronic Endpoint		mg/kg-bw	▼
Is dietary concentration (mg/kg-diet) reported from the available chronic mammal study? (yes or no)			
Enter dietary concentration (mg/kg-diet)			
Estimated Chronic Diet Concentration Equivalent to Reported Chronic Daily Dose	0	mg/kg-diet based on standard FDA lab rat conversion	

Table X. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	4661.60	25.26	0.01	11.58	0.00	14.21	0.00	1.58	0.00	0.35	0.00
35	3771.73	17.46	0.00	8.00	0.00	9.82	0.00	1.09	0.00	0.24	0.00
1000	1631.39	4.05	0.00	1.86	0.00	2.28	0.00	0.25	0.00	0.06	0.00

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs

Table X. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients									
Size Class (grams)	Adjusted LD50	EECs and RQs							
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	1329.91	136.67	0.10	62.64	0.05	76.88	0.06	8.54	0.01
100	1693.05	77.93	0.05	35.72	0.02	43.84	0.03	4.87	0.00
1000	2391.49	34.89	0.01	15.99	0.01	19.63	0.01	2.18	0.00

Table X. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients								
LC50	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
3083	120.00	0.04	55.00	0.02	67.50	0.02	7.50	0.00

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients								
NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
100	120.00	1.20	55.00	0.55	67.50	0.68	7.50	0.08

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients								
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Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	5714.36	114.41	0.02	52.44	0.01	64.36	0.01	7.15	0.00	1.59	0.00
35	4623.53	79.07	0.02	36.24	0.01	44.48	0.01	4.94	0.00	1.10	0.00
1000	1999.82	18.33	0.01	8.40	0.00	10.31	0.01	1.15	0.00	0.25	0.00

Table X. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

LC50 (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
5572	120.00	0.02	55.00	0.01	67.50	0.01	7.50	0.00

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients

NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
2000	120.00	0.06	55.00	0.03	67.50	0.03	7.50	0.00

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	219.78	114.41	0.52	52.44	0.24	64.36	0.29	7.15	0.03	1.59	0.01
35	177.83	79.07	0.44	36.24	0.20	44.48	0.25	4.94	0.03	1.10	0.01
1000	76.92	18.33	0.24	8.40	0.11	10.31	0.13	1.15	0.01	0.25	0.00

Appendix E

List of Endangered/Threatened Plant Species for Imazamox

Species Occurrence in Selected States and Selected Taxa

No species were excluded
All Medium Types Reported

Dicot, Monocot, Ferns, Conflucyds, Lichen

AL, AK, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, PR, RI, SC, SD, TN, TX, UT, VT, VA, WA,

WV, WI, WY

Alabama

(16) species:

CH

Dicot

Amphianthus, Little	<i>Amphianthus pusillus</i>	Threatened	Freshwater	No
Barbara Buttons, Mohr's	<i>Marshallia mohrii</i>	Threatened	Terrestrial	No
Bladderpod, Lyrate	<i>Lesquerella lyrata</i>	Threatened	Terrestrial	No
Clover, Leafy Prairie	<i>Dalea foliosa</i>	Endangered	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Leather-flower, Alabama	<i>Clematis socialis</i>	Endangered	Terrestrial	No
Leather-flower, Morefield's	<i>Clematis morefieldii</i>	Endangered	Terrestrial	No
Pitcher-plant, Alabama Canebroke	<i>Sarracenia rubra alabamensis</i>	Endangered	Freshwater, Terrestrial	No
Pitcher-plant, Green	<i>Sarracenia oreophila</i>	Endangered	Terrestrial, Freshwater	No
Potato-bean, Price's	<i>Apios priceana</i>	Threatened	Terrestrial	No

Ferns

Fern, Alabama Streak-sorus	<i>Thelypteris pilosa var. alabamensis</i>	Threatened	Terrestrial	No
Fern, American hart's-tongue	<i>Asplenium scolopendrium var. americanum</i>	Threatened	Terrestrial	No
Quillwort, Louisiana	<i>Isoetes louisianensis</i>	Endangered	Freshwater, Terrestrial	No

Monocot

Grass, Tennessee Yellow-eyed	<i>Xyris tennesseensis</i>	Endangered	Terrestrial	No
Trillium, Relict	<i>Trillium reliquum</i>	Endangered	Terrestrial	No
Water-plantain, Kral's	<i>Sagittaria secundifolia</i>	Threatened	Freshwater	No

Alaska

(1) species:

CH

Ferns

Fern, Aleutian Shield	<i>Polystichum aleuticum</i>	Endangered	Terrestrial	No
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Arizona

(18) species:

CH

Dicot

Blue-star, Kearney's	<i>Amsonia kearneyana</i>	Endangered	Terrestrial	No
Cactus, Arizona Hedgehog	<i>Echinocereus triglochidiatus var. arizonicus</i>	Endangered	Terrestrial	No
Cactus, Brady Pincushion	<i>Pediocactus bradyi</i>	Endangered	Terrestrial	No

Cactus, Cochise Pincushion	<i>Coryphantha robbinsorum</i>	Threatened	Terrestrial	No
Cactus, Nichol's Turk's Head	<i>Echinocactus horizontalonius var. nicholii</i>	Endangered	Terrestrial	No
Cactus, Peebles Navajo	<i>Pediocactus peeblesianus peeblesianus</i>	Endangered	Terrestrial	No
Cactus, Pima Pineapple	<i>Coryphantha scheeri var. robustispina</i>	Endangered	Terrestrial	No
Cactus, Siler Pincushion	<i>Pediocactus (=Echinocactus,=Utahia) sileri</i>	Threatened	Terrestrial	No
Cliffrose, Arizona	<i>Purshia (=cowania) subintegra</i>	Endangered	Terrestrial	No
Cycladenia, Jones	<i>Cycladenia jonesii (=humilis)</i>	Threatened	Terrestrial	No
Fleabane, Zuni	<i>Erigeron rhizomatus</i>	Threatened	Terrestrial	No
Groundsel, San Francisco Peaks	<i>Senecio franciscanus</i>	Threatened	Terrestrial	Yes
Milk-vetch, Holmgren	<i>Astragalus holmgreniorum</i>	Endangered	Terrestrial	No
Milk-vetch, Sentry	<i>Astragalus cremnophylax var. cremnophylax</i>	Endangered	Terrestrial	No
Milkweed, Welsh's	<i>Asclepias welshii</i>	Threatened	Terrestrial	Yes
Umbel, Huachuca Water	<i>Lilaeopsis schaffneriana var. recurva</i>	Endangered	Terrestrial, Freshwater	Yes

Monocot

Ladies'-tresses, Canelo Hills	<i>Spiranthes delitescens</i>	Endangered	Terrestrial	No
Sedge, Navajo	<i>Carex specuicola</i>	Threatened	Terrestrial	Yes

Arkansas

(4) species:

CH

Dicot

Bladderpod, Missouri	<i>Lesquerella filiformis</i>	Threatened	Terrestrial	No
Fruit, Earth (=geocarpon)	<i>Geocarpon minimum</i>	Threatened	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No

California

(181) species:

CH

Conf/cycds

Cypress, Gowen	<i>Cupressus goveniana ssp. goveniana</i>	Threatened	Terrestrial	No
Cypress, Santa Cruz	<i>Cupressus abramsiana</i>	Endangered	Terrestrial	No

Dicot

Adobe Sunburst, San Joaquin	<i>Pseudobahia peirsonii</i>	Threatened	Terrestrial	No
Allocarya, Calistoga	<i>Plagiobothrys strictus</i>	Endangered	Vernal pool	No
Ambrosia, San Diego	<i>Ambrosia pumila</i>	Endangered	Terrestrial	No
Baccharis, Encinitas	<i>Baccharis vanessae</i>	Threatened	Terrestrial	No
Barberry, Island	<i>Berberis pinnata ssp. insularis</i>	Endangered	Terrestrial	No
Barberry, Nevin's	<i>Berberis nevinii</i>	Endangered	Terrestrial	No
Bedstraw, El Dorado	<i>Galium californicum ssp. sierrae</i>	Endangered	Terrestrial	No

Bedstraw, Island	<i>Galium buxifolium</i>	Endangered	Terrestrial	No
Bird's-beak, Palmate-bracted	<i>Cordylanthus palmatus</i>	Endangered	Terrestrial	No
Bird's-beak, Pennell's	<i>Cordylanthus tenuis ssp. capillaris</i>	Endangered	Terrestrial	No
Bird's-beak, salt marsh	<i>Cordylanthus maritimus ssp. maritimus</i>	Endangered	Saltwater	No
Bird's-beak, Soft	<i>Cordylanthus mollis ssp. mollis</i>	Endangered	Brackish, Saltwater	No
Bladderpod, San Bernardino Mountains	<i>Lesquerella kingii ssp. bernardina</i>	Endangered	Terrestrial	Yes
Bluecurls, Hidden Lake	<i>Trichostema austromontanum ssp. compactum</i>	Threatened	Terrestrial	No
Broom, San Clemente Island	<i>Lotus dendroideus ssp. traskiae</i>	Endangered	Terrestrial	No
Buckwheat, Cushenbury	<i>Eriogonum ovalifolium var. vineum</i>	Endangered	Terrestrial	Yes
Buckwheat, Lone (incl. Irish Hill)	<i>Eriogonum apricum (incl. var. prostratum)</i>	Endangered	Terrestrial	No
Buckwheat, Southern Mountain Wild	<i>Eriogonum kennedyi var. austromontanum</i>	Threatened	Terrestrial	No
Bush-mallow, San Clemente Island	<i>Malacothamnus clementinus</i>	Endangered	Terrestrial	No
Bush-mallow, Santa Cruz Island	<i>Malacothamnus fasciculatus var. nesioticus</i>	Endangered	Terrestrial	No
Butterweed, Layne's	<i>Senecio layneae</i>	Threatened	Terrestrial	No
Button-celery, San Diego	<i>Eryngium aristulatum var. parishii</i>	Endangered	Terrestrial	No
Cactus, Bakersfield	<i>Opuntia treleasei</i>	Endangered	Terrestrial	No
Ceanothus, Coyote	<i>Ceanothus ferrisae</i>	Endangered	Terrestrial	No
Ceanothus, Pine Hill	<i>Ceanothus roderickii</i>	Endangered	Terrestrial	No
Ceanothus, Vail Lake	<i>Ceanothus ophiochilus</i>	Threatened	Terrestrial	No
Centaury, Spring-loving	<i>Centaureium namophilum</i>	Threatened	Terrestrial	Yes
Checker-mallow, Keck's	<i>Sidalcea keckii</i>	Endangered	Terrestrial	Yes
Checker-mallow, Kenwood Marsh	<i>Sidalcea oregana ssp. valida</i>	Endangered	Terrestrial	No
Checker-mallow, Pedate	<i>Sidalcea pedata</i>	Endangered	Terrestrial	No
Clarkia, Pismo	<i>Clarkia speciosa ssp. immaculata</i>	Endangered	Terrestrial	No
Clarkia, Presidio	<i>Clarkia franciscana</i>	Endangered	Terrestrial	No
Clarkia, Springville	<i>Clarkia springvillensis</i>	Threatened	Terrestrial	No
Clarkia, Vine Hill	<i>Clarkia imbricata</i>	Endangered	Terrestrial	No
Clover, Fleshy Owl's	<i>Castilleja campestris ssp. succulenta</i>	Threatened	Vernal pool	Yes
Clover, Monterey	<i>Trifolium trichocalyx</i>	Endangered	Terrestrial	No
Clover, Showy Indian	<i>Trifolium amoenum</i>	Endangered	Terrestrial	No
Coyote-thistle, Loch Lomond	<i>Eryngium constancei</i>	Endangered	Terrestrial	No
Crownbeard, Big-leaved	<i>Verbesina dissita</i>	Threatened	Terrestrial	No
Crownscale, San Jacinto Valley	<i>Atriplex coronata var. notatior</i>	Endangered	Terrestrial	No
Daisy, Parish's	<i>Erigeron parishii</i>	Threatened	Freshwater	Yes

Dudleya, Conejo	<i>Dudleya abramsii ssp. parva</i>	Threatened	Terrestrial	No
Dudleya, Marcescent	<i>Dudleya cymosa ssp. marcescens</i>	Threatened	Terrestrial	No
Dudleya, Santa Clara Valley	<i>Dudleya setchellii</i>	Endangered	Terrestrial	No
Dudleya, Santa Cruz Island	<i>Dudleya nesiotica</i>	Threatened	Terrestrial	No
Dudleya, Santa Monica Mountains	<i>Dudleya cymosa ssp. ovatifolia</i>	Threatened	Terrestrial	No
Dudleya, Verity's	<i>Dudleya verityi</i>	Threatened	Terrestrial	No
Dwarf-flax, Marin	<i>Hesperolinon congestum</i>	Threatened	Terrestrial	No
Evening-primrose, Antioch Dunes	<i>Oenothera deltoides ssp. howellii</i>	Endangered	Terrestrial	Yes
Evening-primrose, Eureka Valley	<i>Oenothera avita ssp. eurekaensis</i>	Endangered	Terrestrial	No
Evening-primrose, San Benito	<i>Camissonia benitensis</i>	Threatened	Terrestrial	No
Fiddleneck, Large-flowered	<i>Amsinckia grandiflora</i>	Endangered	Terrestrial	Yes
Flannelbush, Mexican	<i>Fremontodendron mexicanum</i>	Endangered	Terrestrial	No
Flannelbush, Pine Hill	<i>Fremontodendron californicum ssp. decumbens</i>	Endangered	Terrestrial	No
Fringepod, Santa Cruz Island	<i>Thysanocarpus conchuliferus</i>	Endangered	Terrestrial	No
Gilia, Hoffmann's Slender-flowered	<i>Gilia tenuiflora ssp. hoffmannii</i>	Endangered	Terrestrial	No
Gilia, Monterey	<i>Gilia tenuiflora ssp. arenaria</i>	Endangered	Terrestrial	No
Golden Sunburst, Hartweg's	<i>Pseudobahia bahiifolia</i>	Endangered	Terrestrial	No
Goldfields, Burke's	<i>Lasthenia burkei</i>	Endangered	Terrestrial	No
Goldfields, Contra Costa	<i>Lasthenia conjugens</i>	Endangered	Terrestrial	Yes
Grass, Hairy Orcutt	<i>Orcuttia pilosa</i>	Endangered	Vernal pool	Yes
Grass, Sacramento Orcutt	<i>Orcuttia viscida</i>	Endangered	Vernal pool	Yes
Grass, Slender Orcutt	<i>Orcuttia tenuis</i>	Threatened	Vernal pool	Yes
Gumplant, Ash Meadows	<i>Grindelia fraxino-pratensis</i>	Threatened	Terrestrial	Yes
Ivesia, Ash Meadows	<i>Ivesia kingii var. eremica</i>	Threatened	Terrestrial	Yes
Jewelflower, California	<i>Caulanthus californicus</i>	Endangered	Terrestrial	No
Jewelflower, Metcalf Canyon	<i>Streptanthus albidus ssp. albidus</i>	Endangered	Terrestrial	No
Jewelflower, Tiburon	<i>Streptanthus niger</i>	Endangered	Terrestrial	No
Larkspur, Baker's	<i>Delphinium bakeri</i>	Endangered	Terrestrial	Yes
Larkspur, San Clemente Island	<i>Delphinium variegatum ssp. kinkiense</i>	Endangered	Terrestrial	No
Larkspur, Yellow	<i>Delphinium luteum</i>	Endangered	Terrestrial	Yes
Layia, Beach	<i>Layia camosa</i>	Endangered	Terrestrial, Coastal (neritic)	No
Lessingia, San Francisco	<i>Lessingia germanorum (=L.g. var. germanorum)</i>	Endangered	Terrestrial	No
Liveforever, Laguna Beach	<i>Dudleya stolonifera</i>	Threatened	Terrestrial	No
Liveforever, Santa Barbara Island	<i>Dudleya traskiae</i>	Endangered	Terrestrial	No
Lupine, Clover	<i>Lupinus tidestromii</i>	Endangered	Coastal (neritic)	No

Lupine, Nipomo Mesa	<i>Lupinus nipomensis</i>	Endangered	Coastal (neritic)	No
Malacothrix, Island	<i>Malacothrix squalida</i>	Endangered	Terrestrial	No
Malacothrix, Santa Cruz Island	<i>Malacothrix indecora</i>	Endangered	Terrestrial	No
Mallow, Kern	<i>Eremalche kernensis</i>	Endangered	Terrestrial	No
Manzanita, Del Mar	<i>Arctostaphylos glandulosa</i> ssp. <i>crassifolia</i>	Endangered	Terrestrial	No
Manzanita, Ione	<i>Arctostaphylos myrtifolia</i>	Threatened	Terrestrial	No
Manzanita, Morro	<i>Arctostaphylos morroensis</i>	Threatened	Terrestrial	No
Manzanita, Pallid	<i>Arctostaphylos pallida</i>	Threatened	Terrestrial	No
Manzanita, Presidio (=Raven's)	<i>Arctostaphylos hookeri</i> var. <i>ravenii</i>	Endangered	Terrestrial	No
Manzanita, Santa Rosa Island	<i>Arctostaphylos confertiflora</i>	Endangered	Terrestrial	No
Meadowfoam, Butte County	<i>Limnanthes floccosa</i> ssp. <i>californica</i>	Endangered	Vernal pool	Yes
Meadowfoam, Sebastopol	<i>Limnanthes vinculans</i>	Endangered	Freshwater, Terrestrial	No
Milk-vetch, Braunton's	<i>Astragalus brauntonii</i>	Endangered	Terrestrial	No
Milk-vetch, Clara Hunt's	<i>Astragalus clarianus</i>	Endangered	Terrestrial	No
Milk-vetch, Coachella Valley	<i>Astragalus lentiginosus</i> var. <i>coachellae</i>	Endangered	Terrestrial	Yes
Milk-vetch, Coastal Dunes	<i>Astragalus tener</i> var. <i>titi</i>	Endangered	Terrestrial	No
Milk-vetch, Cushenbury	<i>Astragalus albens</i>	Endangered	Terrestrial	Yes
Milk-vetch, Fish Slough	<i>Astragalus lentiginosus</i> var. <i>piscinensis</i>	Threatened	Terrestrial	No
Milk-vetch, Lane Mountain	<i>Astragalus jaegerianus</i>	Endangered	Terrestrial	Yes
Milk-vetch, Pierson's	<i>Astragalus magdalenae</i> var.	Threatened	Terrestrial	Yes
Milk-vetch, Triple-ribbed	<i>Astragalus tricarinatus</i>	Endangered	Terrestrial	No
Milk-vetch, Ventura Marsh	<i>Astragalus pycnostachyus</i> var. <i>lanosissimus</i>	Endangered	Terrestrial, Freshwater	Yes
Mint, Otay Mesa	<i>Pogogyne nudiuscula</i>	Endangered	Terrestrial	No
Mint, San Diego Mesa	<i>Pogogyne abramsii</i>	Endangered	Terrestrial	No
Monardella, Willowy	<i>Monardella linoides</i> ssp. <i>viminea</i>	Endangered	Terrestrial	No
Morning-glory, Stebbins	<i>Calystegia stebbinsii</i>	Endangered	Terrestrial	No
Mountainbalm, Indian Knob	<i>Eriodictyon altissimum</i>	Endangered	Terrestrial	No
Mountain-mahogany, Catalina Island	<i>Cercocarpus traskiae</i>	Endangered	Terrestrial	No
Mustard, Slender-petaled	<i>Thelypodium stenopetalum</i>	Endangered	Terrestrial	No
Navarretia, Few-flowered	<i>Navarretia leucocephala</i> ssp. <i>pauciflora</i> (=N. <i>pauciflora</i>)	Endangered	Vernal pool, Terrestrial	No
Navarretia, Many-flowered	<i>Navarretia leucocephala</i> ssp. <i>plieantha</i>	Endangered	Terrestrial, Vernal pool	No
Navarretia, Spreading	<i>Navarretia fossalis</i>	Threatened	Vernal pool	No
Niterwort, Amargosa	<i>Nitrophila mohavensis</i>	Endangered	Terrestrial	Yes
Oxytheca, Cushenbury	<i>Oxytheca parishii</i> var. <i>goodmaniana</i>	Endangered	Terrestrial	Yes

Paintbrush, Ash-grey Indian	<i>Castilleja cinerea</i>	Threatened	Terrestrial	No
Paintbrush, San Clemente Island Indian	<i>Castilleja grisea</i>	Endangered	Terrestrial	No
Paintbrush, Soft-leaved	<i>Castilleja mollis</i>	Endangered	Terrestrial	No
Paintbrush, Tiburon	<i>Castilleja affinis ssp. neglecta</i>	Endangered	Terrestrial	No
Penny-cress, Kneeland Prairie	<i>Thlaspi californicum</i>	Endangered	Terrestrial	Yes
Pentachaeta, Lyon's	<i>Pentachaeta lyonii</i>	Endangered	Terrestrial	No
Pentachaeta, White-rayed	<i>Pentachaeta bellidiflora</i>	Endangered	Terrestrial	No
Phacelia, Island	<i>Phacelia insularis ssp. insularis</i>	Endangered	Terrestrial	No
Phlox, Yreka	<i>Phlox hirsuta</i>	Endangered	Terrestrial	No
Polygonum, Scott's Valley	<i>Polygonum hickmanii</i>	Endangered	Terrestrial	Yes
Potentilla, Hickman's	<i>Potentilla hickmanii</i>	Endangered	Terrestrial	No
Pussypaws, Mariposa	<i>Calyptidium pulchellum</i>	Threatened	Terrestrial	No
Rock-cress, Hoffmann's	<i>Arabis hoffmannii</i>	Endangered	Terrestrial	No
Rock-cress, McDonald's	<i>Arabis mcdonaldiana</i>	Endangered	Terrestrial	No
Rock-cress, Santa Cruz Island	<i>Sibara filifolia</i>	Endangered	Terrestrial	No
Rush-rose, Island	<i>Helianthemum greenei</i>	Threatened	Terrestrial	No
Sandwort, Bear Valley	<i>Arenaria ursina</i>	Threatened	Terrestrial	No
Sandwort, Marsh	<i>Arenaria paludicola</i>	Endangered	Freshwater, Terrestrial	No
Sea-blite, California	<i>Suaeda californica</i>	Endangered	Terrestrial	No
Spineflower, Ben Lomond	<i>Chorizanthe pungens var. hartwegiana</i>	Endangered	Terrestrial	No
Spineflower, Howell's	<i>Chorizanthe howellii</i>	Endangered	Terrestrial	No
Spineflower, Monterey	<i>Chorizanthe pungens var. pungens</i>	Threatened	Terrestrial	Yes
Spineflower, Orcutt's	<i>Chorizanthe orcuttiana</i>	Endangered	Terrestrial	No
Spineflower, Robust	<i>Chorizanthe robusta var. robusta</i>	Endangered	Terrestrial	Yes
Spineflower, Scotts Valley	<i>Chorizanthe robusta var. hartwegii</i>	Endangered	Terrestrial	Yes
Spineflower, Slender-horned	<i>Dodecahema leptoceras</i>	Endangered	Terrestrial	No
Spineflower, Sonoma	<i>Chorizanthe valida</i>	Endangered	Terrestrial	No
Spurge, Hoover's	<i>Chamaesyce hooveri</i>	Threatened	Vernal pool	Yes
Stickseed, Baker's	<i>Blennosperma bakeri</i>	Endangered	Vernal pool	No
Stoncrop, Lake County	<i>Parvisedum leiocarpum</i>	Endangered	Vernal pool	No
Sunflower, San Mateo Woolly	<i>Eriophyllum latilobum</i>	Endangered	Terrestrial	No
Taraxacum, California	<i>Taraxacum californicum</i>	Endangered	Terrestrial	No
Tarplant, Gaviota	<i>Deinandra increscens ssp. villosa</i>	Endangered	Terrestrial	Yes
Tarplant, Otay	<i>Deinandra (=Hemizonia) conjugens</i>	Threatened	Terrestrial	Yes
Tarplant, Santa Cruz	<i>Holocarpa macradenia</i>	Threatened	Terrestrial	Yes
Thistle, Chorro creek Bog	<i>Cirsium fontinale var. obispoense</i>	Endangered	Terrestrial, Freshwater	No

Thistle, Fountain	<i>Cirsium fontinale</i> var. <i>fontinale</i>	Endangered	Terrestrial	No
Thistle, La Graciosa	<i>Cirsium loncholepis</i>	Endangered	Coastal (neritic), Freshwater, Saltwater, Brackish	Yes
Thistle, Suisun	<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	Endangered	Brackish, Terrestrial	No
Thornmint, San Diego	<i>Acanthomintha ilicifolia</i>	Threatened	Terrestrial	No
Thornmint, San Mateo	<i>Acanthomintha obovata</i> ssp. <i>duttonii</i>	Endangered	Terrestrial	No
Tuctoria, Green's	<i>Tuctoria greenei</i>	Endangered	Vernal pool	Yes
Vervain, California	<i>Verbena californica</i>	Threatened	Terrestrial	No
Wallflower, Ben Lomond	<i>Erysimum teretifolium</i>	Endangered	Terrestrial	No
Wallflower, Contra Costa	<i>Erysimum capitatum</i> var. <i>angustatum</i>	Endangered	Terrestrial	Yes
Wallflower, Menzie's	<i>Erysimum menziesii</i>	Endangered	Terrestrial	No
Watercress, Gambel's	<i>Rorippa gambellii</i>	Endangered	Terrestrial, Brackish, Freshwater	No
Woodland-star, San Clemente Island	<i>Lithophragma maximum</i>	Endangered	Terrestrial	No
Woolly-star, Santa Ana River	<i>Eriastrum densifolium</i> ssp. <i>sanctorum</i>	Endangered	Terrestrial	No
Woolly-threads, San Joaquin	<i>Monolopia</i> (= <i>Lembertia</i>) <i>congdonii</i>	Endangered	Terrestrial	No
Yerba Santa, Lompoc	<i>Eriodictyon capitatum</i>	Endangered	Terrestrial	Yes
Monocot				
Alopecurus, Sonoma	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	Endangered	Terrestrial	No
Amole, Cammatta Canyon	<i>Chlorogalum purpureum</i> var. <i>reductum</i>	Threatened	Terrestrial	Yes
Amole, Purple	<i>Chlorogalum purpureum</i> var. <i>purpureum</i>	Threatened	Terrestrial	Yes
Bluegrass, Napa	<i>Poa napensis</i>	Endangered	Terrestrial, Freshwater	No
Bluegrass, San Bernardino	<i>Poa atropurpurea</i>	Endangered	Terrestrial	No
Brodiaea, Chinese Camp	<i>Brodiaea pallida</i>	Threatened	Terrestrial	No
Brodiaea, Thread-leaved	<i>Brodiaea filifolia</i>	Threatened	Terrestrial	Yes
Grass, California Orcutt	<i>Orcuttia californica</i>	Endangered	Vernal pool, Terrestrial	No
Grass, Colusa	<i>Neostapfia colusana</i>	Threatened	Vernal pool	No
Grass, Eureka Dune	<i>Swallenia alexandrae</i>	Endangered	Terrestrial	No
Grass, San Joaquin Valley Orcutt	<i>Orcuttia inaequalis</i>	Threatened	Vernal pool	Yes
Grass, Solano	<i>Tuctoria mucronata</i>	Endangered	Vernal pool, Terrestrial	Yes
Lily, Pitkin Marsh	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>	Endangered	Freshwater	No
Lily, Tiburon Mariposa	<i>Calochortus tiburonensis</i>	Threatened	Terrestrial	No
Lily, Western	<i>Lilium occidentale</i>	Endangered	Terrestrial	No
Onion, Munz's	<i>Allium munzii</i>	Endangered	Terrestrial	No
Piperia, Yadon's	<i>Piperia yadonii</i>	Endangered	Terrestrial	No

Sedge, White	<i>Carex albida</i>	Endangered	Freshwater, Terrestrial	No
Colorado	(13) species:			<u>CH</u>
Dicot				
Beardtongue, Penland	<i>Penstemon penlandii</i>	Endangered	Terrestrial	No
Bladderpod, Dudley Bluffs	<i>Lesquerella congesta</i>	Threatened	Terrestrial	No
Butterfly Plant, Colorado	<i>Gaura neomexicana var. coloradensis</i>	Threatened	Terrestrial	Yes
Cactus, Knowlton	<i>Pediocactus knowltonii</i>	Endangered	Terrestrial	No
Cactus, Mesa Verde	<i>Sclerocactus mesae-verdae</i>	Threatened	Terrestrial	No
Cactus, Uinta Basin Hookless	<i>Sclerocactus glaucus</i>	Threatened	Terrestrial	No
Milk-vetch, Mancos	<i>Astragalus humillimus</i>	Endangered	Terrestrial	No
Milk-vetch, Osterhout	<i>Astragalus osterhoutii</i>	Endangered	Terrestrial	No
Mustard, Penland Alpine Fen	<i>Eutrema penlandii</i>	Threatened	Terrestrial, Freshwater	No
Phacelia, North Park	<i>Phacelia formosula</i>	Endangered	Terrestrial	No
Twinpod, Dudley Bluffs	<i>Physaria obcordata</i>	Threatened	Terrestrial	No
Wild-buckwheat, Clay-loving	<i>Eriogonum pelinophilum</i>	Endangered	Terrestrial	Yes
Monocot				
Ladies'-tresses, Ute	<i>Spiranthes diluvialis</i>	Threatened	Terrestrial	No
Connecticut	(2) species:			<u>CH</u>
Dicot				
Gerardia, Sandplain	<i>Agalinis acuta</i>	Endangered	Terrestrial	No
Monocot				
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Delaware	(2) species:			<u>CH</u>
Monocot				
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Florida	(54) species:			<u>CH</u>
Conf/cycds				
Torreya, Florida	<i>Torreya taxifolia</i>	Endangered	Terrestrial	No
Dicot				
Aster, Florida Golden	<i>Chrysopsis floridana</i>	Endangered	Terrestrial	No
Bellflower, Brooksville	<i>Campanula robinisiae</i>	Endangered	Terrestrial	No
Birds-in-a-nest, White	<i>Macbridea alba</i>	Threatened	Terrestrial	No
Blazing Star, Scrub	<i>Liatris ohlingerae</i>	Endangered	Terrestrial	No
Bonamia, Florida	<i>Bonamia grandiflora</i>	Threatened	Terrestrial	No

Buckwheat, Scrub	<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>	Threatened	Terrestrial	No
Butterwort, Godfrey's	<i>Pinguicula ionantha</i>	Threatened	Terrestrial, Freshwater	No
Cactus, Key Tree	<i>Pilosocereus robinii</i>	Endangered	Terrestrial	No
Campion, Fringed	<i>Silene polypetala</i>	Endangered	Terrestrial	No
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Fringe Tree, Pygmy	<i>Chionanthus pygmaeus</i>	Endangered	Terrestrial	No
Gooseberry, Miccosukee	<i>Ribes echinellum</i>	Threatened	Terrestrial	No
Gourd, Okeechobee	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>	Endangered	Terrestrial	No
Harebells, Avon Park	<i>Crotalaria avonensis</i>	Endangered	Terrestrial	No
Hypericum, Highlands Scrub	<i>Hypericum cumulicola</i>	Endangered	Terrestrial	No
Jacquemontia, Beach	<i>Jacquemontia reclinata</i>	Endangered	Terrestrial, Coastal (neritic)	No
Lead-plant, Crenulate	<i>Amorpha crenulata</i>	Endangered	Terrestrial	No
Lupine, Scrub	<i>Lupinus aridorum</i>	Endangered	Terrestrial	No
Meadowrue, Cooley's	<i>Thalictrum cooleyi</i>	Endangered	Terrestrial	No
Milkpea, Small's	<i>Galactia smallii</i>	Endangered	Terrestrial	No
Mint, Garrett's	<i>Dicerandra christmanii</i>	Endangered	Terrestrial	No
Mint, Lakela's	<i>Dicerandra immaculata</i>	Endangered	Terrestrial	No
Mint, Longspurred	<i>Dicerandra cornutissima</i>	Endangered	Terrestrial	No
Mint, Scrub	<i>Dicerandra frutescens</i>	Endangered	Terrestrial	No
Mustard, Carter's	<i>Warea carteri</i>	Endangered	Terrestrial	No
Pawpaw, Beautiful	<i>Deeringothamnus pulchellus</i>	Endangered	Terrestrial	No
Pawpaw, Four-petal	<i>Asimina tetramera</i>	Endangered	Terrestrial	No
Pawpaw, Rugel's	<i>Deeringothamnus rugelii</i>	Endangered	Terrestrial	No
Pinkroot, Gentian	<i>Spigelia gentianoides</i>	Endangered	Terrestrial	No
Plum, Scrub	<i>Prunus geniculata</i>	Endangered	Terrestrial	No
Polygala, Lewton's	<i>Polygala lewtonii</i>	Endangered	Terrestrial	No
Polygala, Tiny	<i>Polygala smallii</i>	Endangered	Terrestrial	No
Prickly-apple, Fragrant	<i>Cereus eriophorus</i> var. <i>fragrans</i>	Endangered	Terrestrial	No
Rhododendron, Chapman	<i>Rhododendron chapmanii</i>	Endangered	Terrestrial	No
Rosemary, Apalachicola	<i>Conradina glabra</i>	Endangered	Terrestrial	No
Rosemary, Etonia	<i>Conradina etonia</i>	Endangered	Terrestrial	No
Rosemary, Short-leaved	<i>Conradina brevifolia</i>	Endangered	Terrestrial	No
Sandlace	<i>Polygonella myriophylla</i>	Endangered	Terrestrial	No
Skullcap, Florida	<i>Scutellaria floridana</i>	Threatened	Terrestrial	No
Snakeroot	<i>Eryngium cuneifolium</i>	Endangered	Terrestrial	No

Spurge, Deltoid	<i>Chamaesyce deltoidea ssp. deltoidea</i>	Endangered	Terrestrial	No
Spurge, Garber's	<i>Chamaesyce garberi</i>	Threatened	Terrestrial	No
Spurge, Telephus	<i>Euphorbia telephioides</i>	Threatened	Terrestrial	No
Warea, Wide-leaf	<i>Warea amplexifolia</i>	Endangered	Terrestrial	No
Water-willow, Cooley's	<i>Justicia cooleyi</i>	Endangered	Terrestrial	No
Whitlow-wort, Papery	<i>Paronychia chartacea</i>	Threatened	Terrestrial	No
Wings, Pigeon	<i>Clitoria fragrans</i>	Threatened	Terrestrial	No
Wireweed	<i>Polygonella basiramia</i>	Endangered	Terrestrial	No
Ziziphus, Florida	<i>Ziziphus celata</i>	Endangered	Terrestrial	No

Lichen

Cladonia, Florida Perforate	<i>Cladonia perforata</i>	Endangered	Terrestrial	No
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Monocot

Beargrass, Britton's	<i>Nolina brittoniana</i>	Endangered	Terrestrial	No
Beauty, Harper's	<i>Harperocallis flava</i>	Endangered	Freshwater, Terrestrial	No
Seagrass, Johnson's	<i>Halophila johnsonii</i>	Threatened	Coastal (neritic), Saltwater	Yes

Georgia

(20) species:

CH

Conf/cycds

Torreya, Florida	<i>Torreya taxifolia</i>	Endangered	Terrestrial	No
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Dicot

Amphianthus, Little	<i>Amphianthus pusillus</i>	Threatened	Freshwater	No
Barbara Buttons, Mohr's	<i>Marshallia mohrii</i>	Threatened	Terrestrial	No
Campion, Fringed	<i>Silene polypetala</i>	Endangered	Terrestrial	No
Dropwort, Canby's	<i>Oxypolis canbyi</i>	Endangered	Terrestrial, Freshwater	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Pitcher-plant, Green	<i>Sarracenia oreophila</i>	Endangered	Terrestrial, Freshwater	No
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No
Rattleweed, Hairy	<i>Baptisia arachnifera</i>	Endangered	Terrestrial	No
Skullcap, Large-flowered	<i>Scutellaria montana</i>	Threatened	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Sumac, Michaux's	<i>Rhus michauxii</i>	Endangered	Terrestrial	No

Ferns

Quillwort, Black-spored	<i>Isoetes melanospora</i>	Endangered	Vernal pool	No
Quillwort, Mat-forming	<i>Isoetes tegetiformans</i>	Endangered	Vernal pool	No

Monocot

Grass, Tennessee Yellow-eyed	<i>Xyris tennesseensis</i>	Endangered	Terrestrial	No
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No

Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Trillium, Persistent	<i>Trillium persistens</i>	Endangered	Terrestrial	No
Trillium, Relict	<i>Trillium reliquum</i>	Endangered	Terrestrial	No
Water-plantain, Kral's	<i>Sagittaria secundifolia</i>	Threatened	Freshwater	No

Hawaii

(267) species:

CH

Dicot

Abutilon eremitopetalum (ncn)	<i>Abutilon eremitopetalum</i>	Endangered	Terrestrial	Yes
Abutilon sandwicense (ncn)	<i>Abutilon sandwicense</i>	Endangered	Terrestrial	Yes
Achyranthes mutica (ncn)	<i>Achyranthes mutica</i>	Endangered	Terrestrial	Yes
Achyranthes splendens var. rotundata (ncn)	<i>Achyranthes splendens var. rotundata</i>	Endangered	Terrestrial	No
A'e (Zanthoxylum dipetalum var. tomentosum)	<i>Zanthoxylum dipetalum var. tomentosum</i>	Endangered	Terrestrial	Yes
A'e (Zanthoxylum hawaiiense)	<i>Zanthoxylum hawaiiense</i>	Endangered	Terrestrial	Yes
'Aiea (Nothocestrum breviflorum)	<i>Nothocestrum breviflorum</i>	Endangered	Terrestrial	Yes
'Aiea (Nothocestrum peltatum)	<i>Nothocestrum peltatum</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce celastroides var. kaenana)	<i>Chamaesyce celastroides var. kaenana</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce deppeana)	<i>Chamaesyce deppeana</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce herbstii)	<i>Chamaesyce herbstii</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce kuwaleana)	<i>Chamaesyce kuwaleana</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce rockii)	<i>Chamaesyce rockii</i>	Endangered	Terrestrial	Yes
'Akoko (Chamaesyce skottsbergii var. skottsbe)	<i>Chamaesyce skottsbergii var. kalaeloana</i>	Endangered	Terrestrial	No
'Akoko (Euphorbia haeleeleana)	<i>Euphorbia haeleeleana</i>	Endangered	Terrestrial	Yes
Alani (Melicope adscendens)	<i>Melicope adscendens</i>	Endangered	Terrestrial	Yes
Alani (Melicope balloui)	<i>Melicope balloui</i>	Endangered	Terrestrial	Yes
Alani (Melicope haupuensis)	<i>Melicope haupuensis</i>	Endangered	Terrestrial	Yes
Alani (Melicope knudsenii)	<i>Melicope knudsenii</i>	Endangered	Terrestrial	Yes
Alani (Melicope lydgatei)	<i>Melicope lydgatei</i>	Endangered	Terrestrial	Yes
Alani (Melicope mucronulata)	<i>Melicope mucronulata</i>	Endangered	Terrestrial	Yes
Alani (Melicope munroi)	<i>Melicope munroi</i>	Endangered	Terrestrial	No
Alani (Melicope ovalis)	<i>Melicope ovalis</i>	Endangered	Terrestrial	Yes
Alani (Melicope pallida)	<i>Melicope pallida</i>	Endangered	Terrestrial	Yes
Alani (Melicope quadrangularis)	<i>Melicope quadrangularis</i>	Endangered	Terrestrial	No
Alani (Melicope reflexa)	<i>Melicope reflexa</i>	Endangered	Terrestrial	Yes
Alani (Melicope saint-johnii)	<i>Melicope saint-johnii</i>	Endangered	Terrestrial	Yes
Alani (Melicope zahlbruckneri)	<i>Melicope zahlbruckneri</i>	Endangered	Terrestrial	Yes
Alsinidendron obovatum (ncn)	<i>Alsinidendron obovatum</i>	Endangered	Terrestrial	Yes

Alsinidendron trinerve (ncn)	<i>Alsinidendron trinerve</i>	Endangered	Terrestrial	Yes
Alsinidendron viscosum (ncn)	<i>Alsinidendron viscosum</i>	Endangered	Terrestrial	Yes
Amaranthus brownii (ncn)	<i>Amaranthus brownii</i>	Endangered	Terrestrial	Yes
'Anaunau (<i>Lepidium arbuscula</i>)	<i>Lepidium arbuscula</i>	Endangered	Terrestrial	Yes
'Anunu (<i>Sicyos alba</i>)	<i>Sicyos alba</i>	Endangered	Terrestrial	Yes
Aupaka (<i>Isodendron hosakae</i>)	<i>Isodendron hosakae</i>	Endangered	Terrestrial	Yes
Aupaka (<i>Isodendron laurifolium</i>)	<i>Isodendron laurifolium</i>	Endangered	Terrestrial	Yes
Aupaka (<i>Isodendron longifolium</i>)	<i>Isodendron longifolium</i>	Threatened	Terrestrial	Yes
'Awikiwiki (<i>Canavalia molokaiensis</i>)	<i>Canavalia molokaiensis</i>	Endangered	Terrestrial	Yes
'Awiwi (<i>Centaurium sebaeoides</i>)	<i>Centaurium sebaeoides</i>	Endangered	Terrestrial	Yes
'Awiwi (<i>Hedyotis cookiana</i>)	<i>Hedyotis cookiana</i>	Endangered	Terrestrial	Yes
Bonamia menziesii (ncn)	<i>Bonamia menziesii</i>	Endangered	Terrestrial	Yes
Chamaesyce Halemanui (ncn)	<i>Chamaesyce halemanui</i>	Endangered	Terrestrial	Yes
Cyanea undulata (ncn)	<i>Cyanea undulata</i>	Endangered	Terrestrial	Yes
Delissea rhytidisperma (ncn)	<i>Delissea rhytidisperma</i>	Endangered	Terrestrial	Yes
Dubautia latifolia (ncn)	<i>Dubautia latifolia</i>	Endangered	Terrestrial	Yes
Dubautia pauciflorula (ncn)	<i>Dubautia pauciflorula</i>	Endangered	Terrestrial	Yes
Geranium, Hawaiian Red-flowered	<i>Geranium arboreum</i>	Endangered	Terrestrial	Yes
Gouania hillebrandii (ncn)	<i>Gouania hillebrandii</i>	Endangered	Terrestrial	Yes
Gouania meyenii (ncn)	<i>Gouania meyenii</i>	Endangered	Terrestrial	Yes
Gouania vitifolia (ncn)	<i>Gouania vitifolia</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea acuminata</i>)	<i>Cyanea acuminata</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea asarifolia</i>)	<i>Cyanea asarifolia</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea copelandii</i> ssp. <i>copelandii</i>)	<i>Cyanea copelandii</i> ssp. <i>copelandii</i>	Endangered	Terrestrial	No
Haha (<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i>)	<i>Cyanea copelandii</i> ssp. <i>haleakalaensis</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea Crispa</i>) (=Rollandia <i>crispa</i>)	<i>Cyanea (=Rollandia) crispa</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea dunbarii</i>)	<i>Cyanea dunbarii</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea glabra</i>)	<i>Cyanea glabra</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i>)	<i>Cyanea grimesiana</i> ssp. <i>grimesiana</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea grimesiana</i> ssp. <i>obatae</i>)	<i>Cyanea grimesiana</i> ssp. <i>obatae</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea hamatiflora</i> ssp. <i>carlsonii</i>)	<i>Cyanea hamatiflora carlsonii</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i>)	<i>Cyanea hamatiflora</i> ssp. <i>hamatiflora</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea humboldtiana</i>)	<i>Cyanea humboldtiana</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea koolauensis</i>)	<i>Cyanea koolauensis</i>	Endangered	Terrestrial	Yes

Haha (<i>Cyanea longiflora</i>)	<i>Cyanea longiflora</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea Macrostegia</i> var. <i>gibsonii</i>)	<i>Cyanea macrostegia</i> ssp. <i>gibsonii</i>	Endangered	Terrestrial	No
Haha (<i>Cyanea mannii</i>)	<i>Cyanea mannii</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea mceldowneyi</i>)	<i>Cyanea mceldowneyi</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea pinnatifida</i>)	<i>Cyanea pinnatifida</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea platyphylla</i>)	<i>Cyanea platyphylla</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea procera</i>)	<i>Cyanea procera</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea recta</i>)	<i>Cyanea recta</i>	Threatened	Terrestrial	Yes
Haha (<i>Cyanea remyi</i>)	<i>Cyanea remyi</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea shipmanii</i>)	<i>Cyanea shipmanii</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea stictophylla</i>)	<i>Cyanea stictophylla</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea St-Johnii</i>) (=Rollandia <i>St-Johnii</i>)	<i>Cyanea st-johnii</i>	Endangered	Terrestrial	Yes
Haha (<i>Cyanea superba</i>)	<i>Cyanea superba</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra crenata</i>)	<i>Cyrtandra crenata</i>	Endangered	Terrestrial	No
Ha'lwale (<i>Cyrtandra dentata</i>)	<i>Cyrtandra dentata</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra giffardii</i>)	<i>Cyrtandra giffardii</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra limahuliensis</i>)	<i>Cyrtandra limahuliensis</i>	Threatened	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra munroi</i>)	<i>Cyrtandra munroi</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra polyantha</i>)	<i>Cyrtandra polyantha</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra subumbellata</i>)	<i>Cyrtandra subumbellata</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra tintinnabula</i>)	<i>Cyrtandra tintinnabula</i>	Endangered	Terrestrial	Yes
Ha'lwale (<i>Cyrtandra viridiflora</i>)	<i>Cyrtandra viridiflora</i>	Endangered	Terrestrial	Yes
Haplostachys (<i>Haplostachya</i> (ncn))	<i>Haplostachys haplostachya</i>	Endangered	Terrestrial	No
Hau Kauhiwi (<i>Hibiscadelphus woodii</i>)	<i>Hibiscadelphus woodii</i>	Endangered	Terrestrial	Yes
Hau Kuahiwi (<i>Hibiscadelphus distans</i>)	<i>Hibiscadelphus distans</i>	Endangered	Terrestrial	No
Heau (<i>Exocarpos luteolus</i>)	<i>Exocarpos luteolus</i>	Endangered	Terrestrial	Yes
Hedyotis (<i>degeneri</i> (ncn))	<i>Hedyotis degeneri</i>	Endangered	Terrestrial	Yes
Hedyotis (<i>parvula</i> (ncn))	<i>Hedyotis parvula</i>	Endangered	Terrestrial	Yes
Hedyotis (<i>St.-Johnii</i> (ncn))	<i>Hedyotis st.-johnii</i>	Endangered	Terrestrial	Yes
Hesperomannia (<i>arborescens</i> (ncn))	<i>Hesperomannia arborescens</i>	Endangered	Terrestrial	Yes
Hesperomannia (<i>arbuscula</i> (ncn))	<i>Hesperomannia arbuscula</i>	Endangered	Terrestrial	Yes
Hesperomannia (<i>lydgatei</i> (ncn))	<i>Hesperomannia lydgatei</i>	Endangered	Terrestrial	Yes
Hibiscus, Clay's	<i>Hibiscus clayi</i>	Endangered	Terrestrial	Yes
Holei (<i>Ochrosia kilaueaensis</i>)	<i>Ochrosia kilaueaensis</i>	Endangered	Terrestrial	No
Iliau (<i>Wilkesia hobdyi</i>)	<i>Wilkesia hobdyi</i>	Endangered	Terrestrial	Yes
Kamakahala (<i>Labordia cyrtandrae</i>)	<i>Labordia cyrtandrae</i>	Endangered	Terrestrial	Yes

Kamakahala (<i>Labordia lydgatei</i>)	<i>Labordia lydgatei</i>	Endangered	Terrestrial	Yes
Kamakahala (<i>Labordia tinifolia</i> var. <i>lanaiensis</i>)	<i>Labordia tinifolia</i> var. <i>lanaiensis</i>	Endangered	Terrestrial	No
Kamakahala (<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>)	<i>Labordia tinifolia</i> var. <i>wahiawaensis</i>	Endangered	Terrestrial	Yes
Kamakahala (<i>Labordia triflora</i>)	<i>Labordia triflora</i>	Endangered	Terrestrial	No
Kanaloa kahoolawensis (ncn)	<i>Kanaloa kahoolawensis</i>	Endangered	Terrestrial	Yes
Kauila (<i>Colubrina oppositifolia</i>)	<i>Colubrina oppositifolia</i>	Endangered	Terrestrial	Yes
Kaulu (<i>Pteralyxia kauaiensis</i>)	<i>Pteralyxia kauaiensis</i>	Endangered	Terrestrial	Yes
Kio'Ele (<i>Hedyotis coriacea</i>)	<i>Hedyotis coriacea</i>	Endangered	Terrestrial	Yes
Kiponapona (<i>Phyllostegia racemosa</i>)	<i>Phyllostegia racemosa</i>	Endangered	Terrestrial	Yes
Koki'o (<i>Kokia drynarioides</i>)	<i>Kokia drynarioides</i>	Endangered	Terrestrial	Yes
Koki'o (<i>Kokia kauaiensis</i>)	<i>Kokia kauaiensis</i>	Endangered	Terrestrial	Yes
Koki'o Ke'oke'o (<i>Hibiscus arnottianus</i> ssp. <i>immaculatus</i>)	<i>Hibiscus arnottianus</i> ssp. <i>immaculatus</i>	Endangered	Terrestrial	Yes
Koki'o Ke'oke'o (<i>Hibiscus waimeae</i> ssp. <i>hannerae</i>)	<i>Hibiscus waimeae</i> ssp. <i>hannerae</i>	Endangered	Terrestrial	Yes
Kolea (<i>Myrsine juddii</i>)	<i>Myrsine juddii</i>	Endangered	Terrestrial	Yes
Kolea (<i>Myrsine linearifolia</i>)	<i>Myrsine linearifolia</i>	Threatened	Terrestrial	Yes
Ko'oko'olau (<i>Bidens micrantha</i> ssp. <i>kalealaha</i>)	<i>Bidens micrantha</i> ssp. <i>kalealaha</i>	Endangered	Terrestrial	Yes
Ko'oko'olau (<i>Bidens wiebkei</i>)	<i>Bidens wiebkei</i>	Endangered	Terrestrial	Yes
Ko'oloa'ula (<i>Abutilon menziesii</i>)	<i>Abutilon menziesii</i>	Endangered	Terrestrial	No
Kopa (<i>Hedyotis schlechtendahlia</i> var. <i>remyi</i>)	<i>Hedyotis schlechtendahlia</i> var. <i>remyi</i>	Endangered	Terrestrial	No
Kuawawaenuhu (<i>Alsinidendron lychnoides</i>)	<i>Alsinidendron lychnoides</i>	Endangered	Terrestrial	Yes
Kulu'l (<i>Nototrichium humile</i>)	<i>Nototrichium humile</i>	Endangered	Terrestrial	Yes
Laukahi Kuahiwi (<i>Plantago hawaiiensis</i>)	<i>Plantago hawaiiensis</i>	Endangered	Terrestrial	Yes
Laukahi Kuahiwi (<i>Plantago princeps</i>)	<i>Plantago princeps</i>	Endangered	Terrestrial	Yes
Lauhilihi (<i>Schiedea stellarioides</i>)	<i>Schiedea stellarioides</i>	Endangered	Terrestrial	Yes
Lipochaeta venosa (ncn)	<i>Lipochaeta venosa</i>	Endangered	Terrestrial	No
Lobelia monostachya (ncn)	<i>Lobelia monostachya</i>	Endangered	Terrestrial	Yes
Lobelia niihauensis (ncn)	<i>Lobelia niihauensis</i>	Endangered	Terrestrial	Yes
Lobelia oahuensis (ncn)	<i>Lobelia oahuensis</i>	Endangered	Terrestrial	Yes
Lysimachia filifolia (ncn)	<i>Lysimachia filifolia</i>	Endangered	Terrestrial	Yes
Lysimachia lydgatei (ncn)	<i>Lysimachia lydgatei</i>	Endangered	Terrestrial	Yes
Lysimachia maxima (ncn)	<i>Lysimachia maxima</i>	Endangered	Terrestrial	Yes
Mahoe (<i>Alectryon macrococcus</i>)	<i>Alectryon macrococcus</i>	Endangered	Terrestrial	Yes
Makou (<i>Peucedanum sandwicense</i>)	<i>Peucedanum sandwicense</i>	Threatened	Terrestrial	Yes

Ma'o Hau Hele (Hibiscus brackenridgei)	<i>Hibiscus brackenridgei</i>	Endangered	Terrestrial	Yes
Ma'oli'oli (Schiedea apokremnos)	<i>Schiedea apokremnos</i>	Endangered	Terrestrial	Yes
Ma'oli'oli (Schiedea kealiae)	<i>Schiedea kealiae</i>	Endangered	Terrestrial	Yes
Mapele (Cyrtandra cyaneoides)	<i>Cyrtandra cyaneoides</i>	Endangered	Terrestrial	Yes
Mehamehame (Flueggea neowawraea)	<i>Flueggea neowawraea</i>	Endangered	Terrestrial	Yes
Munroidendron racemosum (ncn)	<i>Munroidendron racemosum</i>	Endangered	Terrestrial	Yes
Na'ena'e (Dubautia herbstobatae)	<i>Gopherus polyphemus</i>	Endangered	Terrestrial	Yes
Na'ena'e (Dubautia plantaginea ssp. humilis)	<i>Dubautia plantaginea ssp. humilis</i>	Endangered	Terrestrial	Yes
Nani Wai'ale'ale (Viola kauaensis var. wahiawaensis)	<i>Viola kauaensis var. wahiawaensis</i>	Endangered	Terrestrial	Yes
Nanu (Gardenia mannii)	<i>Gardenia mannii</i>	Endangered	Terrestrial	Yes
Na'u (Gardenia brighamii)	<i>Gardenia brighamii</i>	Endangered	Terrestrial	No
Naupaka, Dwarf (Scaevola coriacea)	<i>Scaevola coriacea</i>	Endangered	Terrestrial	No
Nehe (Lipochaeta fauriei)	<i>Lipochaeta fauriei</i>	Endangered	Terrestrial	Yes
Nehe (Lipochaeta kamolensis)	<i>Lipochaeta kamolensis</i>	Endangered	Terrestrial	Yes
Nehe (Lipochaeta lobata var. leptophylla)	<i>Lipochaeta lobata var. leptophylla</i>	Endangered	Terrestrial	Yes
Nehe (Lipochaeta micrantha)	<i>Lipochaeta micrantha</i>	Endangered	Terrestrial	Yes
Nehe (Lipochaeta tenuifolia)	<i>Lipochaeta tenuifolia</i>	Endangered	Terrestrial	Yes
Nehe (Lipochaeta waimeaensis)	<i>Lipochaeta waimeaensis</i>	Endangered	Terrestrial	Yes
Neraudia angulata (ncn)	<i>Neraudia angulata</i>	Endangered	Terrestrial	Yes
Neraudia ovata (ncn)	<i>Neraudia ovata</i>	Endangered	Terrestrial	Yes
Neraudia sericea (ncn)	<i>Neraudia sericea</i>	Endangered	Terrestrial	Yes
Nioi (Eugenia koolauensis)	<i>Eugenia koolauensis</i>	Endangered	Terrestrial	Yes
Nohoanu (Geranium multiflorum)	<i>Geranium multiflorum</i>	Endangered	Terrestrial	Yes
'Oha (Delissea rivularis)	<i>Delissea rivularis</i>	Endangered	Terrestrial	Yes
'Oha (Delissea subcordata)	<i>Delissea subcordata</i>	Endangered	Terrestrial	Yes
'Oha (Delissea undulata)	<i>Delissea undulata</i>	Endangered	Terrestrial	Yes
'Oha (Lobelia gaudichaudii koolauensis)	<i>Lobelia gaudichaudii ssp. koolauensis</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia drepanomorpha)	<i>Clermontia drepanomorpha</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia lindseyana)	<i>Clermontia lindseyana</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia oblongifolia ssp. brevipes)	<i>Clermontia oblongifolia ssp. brevipes</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia oblongifolia ssp. mauiensis)	<i>Clermontia oblongifolia ssp. mauiensis</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia peleana)	<i>Clermontia peleana</i>	Endangered	Terrestrial	Yes
'Oha Wai (Clermontia pyrularia)	<i>Clermontia pyrularia</i>	Endangered	Terrestrial	Yes

'Oha Wai (<i>Clermontia samuelii</i>)	<i>Clermontia samuelii</i>	Endangered	Terrestrial	Yes
'Ohai (<i>Sesbania tomentosa</i>)	<i>Sesbania tomentosa</i>	Endangered	Terrestrial	Yes
'Ohe'ohe (<i>Tetraplasandra gymnocarpa</i>)	<i>Tetraplasandra gymnocarpa</i>	Endangered	Terrestrial	Yes
'Olulu (<i>Brighamia insignis</i>)	<i>Brighamia insignis</i>	Endangered	Terrestrial	Yes
Opuhe (<i>Urera kaalae</i>)	<i>Urera kaalae</i>	Endangered	Terrestrial	Yes
Pamakani (<i>Viola chamissoniana</i> ssp. <i>chamissoniana</i>)	<i>Viola chamissoniana</i> ssp. <i>chamissoniana</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>hirsuta</i> (ncn)	<i>Phyllostegia hirsuta</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>kaalaensis</i> (ncn)	<i>Phyllostegia kaalaensis</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>knudsenii</i> (ncn)	<i>Phyllostegia knudsenii</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>mannii</i> (ncn)	<i>Phyllostegia mannii</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>mollis</i> (ncn)	<i>Phyllostegia mollis</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>parviflora</i> (ncn)	<i>Phyllostegia parviflora</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>velutina</i> (ncn)	<i>Phyllostegia velutina</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>waimeae</i> (ncn)	<i>Phyllostegia waimeae</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>warshaueri</i> (ncn)	<i>Phyllostegia warshaueri</i>	Endangered	Terrestrial	Yes
Phyllostegia <i>wawrana</i> (ncn)	<i>Phyllostegia wawrana</i>	Endangered	Terrestrial	Yes
Pilo (<i>Hedyotis mannii</i>)	<i>Hedyotis mannii</i>	Endangered	Terrestrial	Yes
Po'e (<i>Portulaca sclerocarpa</i>)	<i>Portulaca sclerocarpa</i>	Endangered	Terrestrial	Yes
Popolo 'Aiakeakua (<i>Solanum sandwicense</i>)	<i>Solanum sandwicense</i>	Endangered	Terrestrial	Yes
Popolo Ku Mai (<i>Solanum incompletum</i>)	<i>Solanum incompletum</i>	Endangered	Terrestrial	Yes
Pua'ala (<i>Brighamia rockii</i>)	<i>Brighamia rockii</i>	Endangered	Terrestrial	Yes
Remya <i>kauaiensis</i> (ncn)	<i>Remya kauaiensis</i>	Endangered	Terrestrial	Yes
Remya <i>montgomeryi</i> (ncn)	<i>Remya montgomeryi</i>	Endangered	Terrestrial	Yes
Remya, Maui	<i>Remya mauiensis</i>	Endangered	Terrestrial	Yes
Sandalwood, Lanai (= 'Iliahi)	<i>Santalum freycinetianum</i> var. <i>lanaiense</i>	Endangered	Terrestrial	No
Sanicula <i>mariversa</i> (ncn)	<i>Sanicula mariversa</i>	Endangered	Terrestrial	Yes
Sanicula <i>purpurea</i> (ncn)	<i>Sanicula purpurea</i>	Endangered	Terrestrial	Yes
Schiedea <i>haleakalensis</i> (ncn)	<i>Schiedea haleakalensis</i>	Endangered	Terrestrial	Yes
Schiedea <i>helleri</i> (ncn)	<i>Schiedea helleri</i>	Endangered	Terrestrial	Yes
Schiedea <i>hookeri</i> (ncn)	<i>Schiedea hookeri</i>	Endangered	Terrestrial	Yes
Schiedea <i>kaalae</i> (ncn)	<i>Schiedea kaalae</i>	Endangered	Terrestrial	Yes
Schiedea <i>kauaiensis</i> (ncn)	<i>Schiedea kauaiensis</i>	Endangered	Terrestrial	Yes
Schiedea <i>lydgatei</i> (ncn)	<i>Schiedea lydgatei</i>	Endangered	Terrestrial	Yes
Schiedea <i>membranacea</i> (ncn)	<i>Schiedea membranacea</i>	Endangered	Terrestrial	Yes
Schiedea <i>nuttallii</i> (ncn)	<i>Schiedea nuttallii</i>	Endangered	Terrestrial	Yes

2/6/2008 10:00:35 AM Ver. 2.10.3

Page 16 of 32

Schiedea sarmentosa (ncn)	<i>Schiedea sarmentosa</i>	Endangered	Terrestrial	Yes
Schiedea spergulina var. leiopoda (ncn)	<i>Schiedea spergulina</i> var. <i>leiopoda</i>	Endangered	Terrestrial	Yes
Schiedea spergulina var. spergulina (ncn)	<i>Schiedea spergulina</i> var. <i>spergulina</i>	Threatened	Terrestrial	Yes
Schiedea verticillata (ncn)	<i>Schiedea verticillata</i>	Endangered	Terrestrial	Yes
Schiedea, Diamond Head (Schiedea adamantis)	<i>Schiedea adamantis</i>	Endangered	Terrestrial	No
Silene alexandri (ncn)	<i>Silene alexandri</i>	Endangered	Terrestrial	Yes
Silene hawaiiensis (ncn)	<i>Silene hawaiiensis</i>	Threatened	Terrestrial	Yes
Silene lanceolata (ncn)	<i>Silene lanceolata</i>	Endangered	Terrestrial	Yes
Silene perlmanii (ncn)	<i>Silene perlmanii</i>	Endangered	Terrestrial	Yes
Silversword, Haleakala ('Ahinahina)	<i>Argyroxiphium sandwicense</i> ssp. <i>macrocephalum</i>	Threatened	Terrestrial	Yes
Silversword, Ka'u (Argyroxiphium kauense)	<i>Argyroxiphium kauense</i>	Endangered	Terrestrial	Yes
Silversword, Mauna Kea ('Ahinahina)	<i>Argyroxiphium sandwicense</i> ssp. <i>sandwicense</i>	Endangered	Terrestrial	No
Spermolepis hawaiiensis (ncn)	<i>Spermolepis hawaiiensis</i>	Endangered	Terrestrial	Yes
Stenogyne angustifolia (ncn)	<i>Stenogyne angustifolia</i> var. <i>angustifolia</i>	Endangered	Terrestrial	No
Stenogyne bifida (ncn)	<i>Stenogyne bifida</i>	Endangered	Terrestrial	Yes
Stenogyne campanulata (ncn)	<i>Stenogyne campanulata</i>	Endangered	Terrestrial	Yes
Stenogyne kanehoana (ncn)	<i>Stenogyne kanehoana</i>	Endangered	Terrestrial	Yes
Tetramolopium arenarium (ncn)	<i>Tetramolopium arenarium</i>	Endangered	Terrestrial	No
Tetramolopium capillare (ncn)	<i>Tetramolopium capillare</i>	Endangered	Terrestrial	Yes
Tetramolopium filiforme (ncn)	<i>Tetramolopium filiforme</i>	Endangered	Terrestrial	Yes
Tetramolopium lepidotum ssp. lepidotum (ncn)	<i>Tetramolopium lepidotum</i> ssp. <i>lepidotum</i>	Endangered	Terrestrial	Yes
Tetramolopium remyi (ncn)	<i>Tetramolopium remyi</i>	Endangered	Terrestrial	Yes
Tetramolopium rockii (ncn)	<i>Tetramolopium rockii</i>	Threatened	Coastal (neritic), Terrestrial	Yes
Trematolobelia singularis (ncn)	<i>Trematolobelia singularis</i>	Endangered	Terrestrial	Yes
Uhihi (Caesalpinia kawaiiensis)	<i>Caesalpinia kawaiiense</i>	Endangered	Terrestrial	No
Ulihi (Phyllostegia glabra var. lanaiensis)	<i>Phyllostegia glabra</i> var. <i>lanaiensis</i>	Endangered	Terrestrial	No
Vetch, Hawaiian (Vicia menziesii)	<i>Vicia menziesii</i>	Endangered	Terrestrial	No
Vigna o-wahuensis (ncn)	<i>Vigna o-wahuensis</i>	Endangered	Terrestrial	Yes
Viola helenae (ncn)	<i>Viola helenae</i>	Endangered	Terrestrial	Yes
Viola lanaiensis (ncn)	<i>Viola lanaiensis</i>	Endangered	Terrestrial	No
Viola oahuensis (ncn)	<i>Viola oahuensis</i>	Endangered	Terrestrial	Yes
Wahine Noho Kula (Isodendron pyriforme)	<i>Isodendron pyriforme</i>	Endangered	Terrestrial	Yes

Xylosma crenatum (ncn)	<i>Xylosma crenatum</i>	Endangered	Terrestrial	Yes
Ferns				
Asplenium fragile var. insulare (ncn)	<i>Asplenium fragile var. insulare</i>	Endangered	Terrestrial	Yes
Diellia erecta (ncn)	<i>Diellia erecta</i>	Endangered	Terrestrial	Yes
Diellia falcata (ncn)	<i>Diellia falcata</i>	Endangered	Terrestrial	Yes
Diellia pallida (ncn)	<i>Diellia pallida</i>	Endangered	Terrestrial	Yes
Diellia unisora (ncn)	<i>Diellia unisora</i>	Endangered	Terrestrial	Yes
Diplazium molokaiense (ncn)	<i>Diplazium molokaiense</i>	Endangered	Terrestrial	Yes
Fern, Pendant Kihī (Adenophorus periens)	<i>Adenophorus periens</i>	Endangered	Terrestrial	Yes
'Ihi'Ihi (Marsilea villosa)	<i>Marsilea villosa</i>	Endangered	Vernal pool, Terrestrial	Yes
Pauoa (Ctenitis squamigera)	<i>Ctenitis squamigera</i>	Endangered	Terrestrial	Yes
Pteris lidgatei (ncn)	<i>Pteris lidgatei</i>	Endangered	Terrestrial	Yes
Wawae'ole (Phlegmariurus (=Huperzia) mannii)	<i>Huperzia mannii</i>	Endangered	Terrestrial	Yes
Wawae'ole (Phlegmariurus (=Lycopodium) nutans)	<i>Lycopodium (=Phlegmariurus) nutans</i>	Endangered	Terrestrial	Yes
Monocot				
Bluegrass, Hawaiian	<i>Poa sandvicensis</i>	Endangered	Terrestrial	Yes
Bluegrass, Mann's (Poa mannii)	<i>Poa mannii</i>	Endangered	Terrestrial	Yes
Gahnia Lanaiensis (ncn)	<i>Gahnia lanaiensis</i>	Endangered	Terrestrial	No
Grass, Fosberg's Love	<i>Eragrostis fosbergii</i>	Endangered	Terrestrial	Yes
Hala Pepe (Pleomele hawaiiensis)	<i>Pleomele hawaiiensis</i>	Endangered	Terrestrial	Yes
Hilo Ischaemum (Ischaemum)	<i>Ischaemum byrone</i>	Endangered	Terrestrial	Yes
Kamanomano (Cenchrus agrimonioides)	<i>Cenchrus agrimonioides</i>	Endangered	Terrestrial	Yes
Lau'ehu (Panicum niihauense)	<i>Panicum niihauense</i>	Endangered	Terrestrial	Yes
Lo`ulu (Pritchardia affinis)	<i>Pritchardia affinis</i>	Endangered	Terrestrial	No
Lo`ulu (Pritchardia kaalae)	<i>Pritchardia kaalae</i>	Endangered	Terrestrial	No
Lo`ulu (Pritchardia munroi)	<i>Pritchardia munroi</i>	Endangered	Terrestrial	Yes
Lo`ulu (Pritchardia napaliensis)	<i>Pritchardia napaliensis</i>	Endangered	Terrestrial	No
Lo`ulu (Pritchardia remota)	<i>Pritchardia remota</i>	Endangered	Terrestrial	Yes
Lo`ulu (Pritchardia schattaueri)	<i>Pritchardia schattaueri</i>	Endangered	Terrestrial	No
Lo`ulu (Pritchardia viscosa)	<i>Pritchardia viscosa</i>	Endangered	Terrestrial	No
Mariscus fauriei (ncn)	<i>Mariscus fauriei</i>	Endangered	Terrestrial	Yes
Mariscus pennatifomis (ncn)	<i>Mariscus pennatifomis</i>	Endangered	Terrestrial	Yes
Panicgrass, Carter's (Panicum fauriei var. carteri)	<i>Panicum fauriei var. carteri</i>	Endangered	Terrestrial	Yes
Platanthera holochila (ncn)	<i>Platanthera holochila</i>	Endangered	Terrestrial	Yes
Poa siphonoglossa (ncn)	<i>Poa siphonoglossa</i>	Endangered	Terrestrial	Yes

Pu'uka'a (<i>Cyperus trachysanthos</i>)	<i>Cyperus trachysanthos</i>	Endangered	Terrestrial	Yes
Wahane (<i>Pritchardia aylmer-robinsonii</i>)	<i>Pritchardia aylmer-robinsonii</i>	Endangered	Terrestrial	No

Idaho

(3) species:

CH

Dicot

Catchfly, Spalding's	<i>Silene spaldingii</i>	Threatened	Terrestrial	No
Four-o'clock, Macfarlane's	<i>Mirabilis macfarlanei</i>	Threatened	Terrestrial	No
Howellia, Water	<i>Howellia aquatilis</i>	Threatened	Freshwater	No

Illinois

(9) species:

CH

Dicot

Aster, Decurrent False	<i>Boltonia decurrens</i>	Threatened	Terrestrial, Freshwater	No
Clover, Leafy Prairie	<i>Dalea foliosa</i>	Endangered	Terrestrial	No
Clover, Prairie Bush	<i>Lespedeza leptostachya</i>	Threatened	Terrestrial	No
Daisy, Lakeside	<i>Hymenoxys herbacea</i>	Threatened	Freshwater	No
Milkweed, Mead's	<i>Asclepias meadii</i>	Threatened	Terrestrial	No
Potato-bean, Price's	<i>Apios priceana</i>	Threatened	Terrestrial	No
Thistle, Pitcher's	<i>Cirsium pitcheri</i>	Threatened	Terrestrial	No

Monocot

Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No

Indiana

(5) species:

CH

Dicot

Clover, Running Buffalo	<i>Trifolium stoloniferum</i>	Endangered	Terrestrial	No
Goldenrod, Short's	<i>Solidago shortii</i>	Endangered	Terrestrial	No
Milkweed, Mead's	<i>Asclepias meadii</i>	Threatened	Terrestrial	No
Thistle, Pitcher's	<i>Cirsium pitcheri</i>	Threatened	Terrestrial	No

Monocot

Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
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Iowa

(6) species:

CH

Dicot

Clover, Prairie Bush	<i>Lespedeza leptostachya</i>	Threatened	Terrestrial	No
Milkweed, Mead's	<i>Asclepias meadii</i>	Threatened	Terrestrial	No
Monkshood, Northern Wild	<i>Aconitum noveboracense</i>	Threatened	Terrestrial	No

Ferns

Fern, American hart's-tongue	<i>Asplenium scolopendrium var. americanum</i>	Threatened	Terrestrial	No
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Monocot

Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Kansas	(2) species:			<u>CH</u>
Dicot				
Milkweed, Mead's	<i>Asclepias meadii</i>	Threatened	Terrestrial	No
Monocot				
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Kentucky	(10) species:			<u>CH</u>
Dicot				
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Clover, Running Buffalo	<i>Trifolium stoloniferum</i>	Endangered	Terrestrial	No
Goldenrod, Short's	<i>Solidago shortii</i>	Endangered	Terrestrial	No
Goldenrod, White-haired	<i>Solidago albopilosa</i>	Threatened	Terrestrial	No
Potato-bean, Price's	<i>Apios priceana</i>	Threatened	Terrestrial	No
Rock-cress, Large (=Braun's)	<i>Arabis perstellata</i> E. L. Braun var. <i>ampla</i> Rollins	Endangered	Terrestrial	Yes
Rock-cress, Small	<i>Arabis perstellata</i> E. L. Braun var. <i>perstellata</i> Fernald	Endangered	Terrestrial	Yes
Rosemary, Cumberland	<i>Conradina verticillata</i>	Threatened	Terrestrial	No
Sandwort, Cumberland	<i>Arenaria cumberlandensis</i>	Endangered	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Louisiana	(3) species:			<u>CH</u>
Dicot				
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Fruit, Earth (=geocarpon)	<i>Geocarpon minimum</i>	Threatened	Terrestrial	No
Ferns				
Quillwort, Louisiana	<i>Isoetes louisianensis</i>	Endangered	Freshwater, Terrestrial	No
Maine	(3) species:			<u>CH</u>
Dicot				
Lousewort, Furbish	<i>Pedicularis furbishiae</i>	Endangered	Terrestrial	No
Monocot				
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Maryland	(6) species:			<u>CH</u>
Dicot				
Dropwort, Canby's	<i>Oxypolis canbyi</i>	Endangered	Terrestrial, Freshwater	No
Gerardia, Sandplain	<i>Agalinis acuta</i>	Endangered	Terrestrial	No

Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Joint-vetch, Sensitive	<i>Aeschynomene virginica</i>	Threatened	Terrestrial, Brackish	No
Monocot				
Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No
Massachusetts	(3) species:			<u>CH</u>
Dicot				
Gerardia, Sandplain	<i>Agalinis acuta</i>	Endangered	Terrestrial	No
Monocot				
Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Michigan	(8) species:			<u>CH</u>
Dicot				
Daisy, Lakeside	<i>Hymenoxys herbacea</i>	Threatened	Freshwater	No
Goldenrod, Houghton's	<i>Solidago houghtonii</i>	Threatened	Terrestrial	No
Monkey-flower, Michigan	<i>Mimulus glabratus var. michiganensis</i>	Endangered	Terrestrial, Freshwater	No
Thistle, Pitcher's	<i>Cirsium pitcheri</i>	Threatened	Terrestrial	No
Ferns				
Fern, American hart's-tongue	<i>Asplenium scolopendrium var. americanum</i>	Threatened	Terrestrial	No
Monocot				
Iris, Dwarf Lake	<i>Iris lacustris</i>	Threatened	Terrestrial	No
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Minnesota	(4) species:			<u>CH</u>
Dicot				
Clover, Prairie Bush	<i>Lespedeza leptostachya</i>	Threatened	Terrestrial	No
Roseroot, Leedy's	<i>Sedum integrifolium ssp. leedyi</i>	Threatened	Terrestrial	No
Monocot				
Lily, Minnesota Trout	<i>Erythronium propullans</i>	Endangered	Terrestrial	No
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Mississippi	(3) species:			<u>CH</u>
Dicot				
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No
Potato-bean, Price's	<i>Apios priceana</i>	Threatened	Terrestrial	No

Ferns				
Quillwort, Louisiana	<i>Isoetes louisianensis</i>	Endangered	Freshwater, Terrestrial	No
Missouri				<u>CH</u>
(8) species:				
Dicot				
Aster, Decurrent False	<i>Boltonia decurrens</i>	Threatened	Terrestrial, Freshwater	No
Bladderpod, Missouri	<i>Lesquerella filiformis</i>	Threatened	Terrestrial	No
Clover, Running Buffalo	<i>Trifolium stoloniferum</i>	Endangered	Terrestrial	No
Fruit, Earth (=geocarpon)	<i>Geocarpon minimum</i>	Threatened	Terrestrial	No
Milkweed, Mead's	<i>Asclepias meadii</i>	Threatened	Terrestrial	No
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No
Sneezeweed, Virginia	<i>Helenium virginicum</i>	Threatened	Vernal pool	No
Monocot				
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Montana				<u>CH</u>
(2) species:				
Dicot				
Catchfly, Spalding's	<i>Silene spaldingii</i>	Threatened	Terrestrial	No
Howellia, Water	<i>Howellia aquatilis</i>	Threatened	Freshwater	No
Nebraska				<u>CH</u>
(3) species:				
Dicot				
Butterfly Plant, Colorado	<i>Gaura neomexicana var. coloradensis</i>	Threatened	Terrestrial	Yes
Penstemon, Blowout	<i>Penstemon haydenii</i>	Endangered	Terrestrial	No
Monocot				
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Nevada				<u>CH</u>
(9) species:				
Dicot				
Blazing Star, Ash Meadows	<i>Mentzelia leucophylla</i>	Threatened	Terrestrial	Yes
Buckwheat, Steamboat	<i>Eriogonum ovalifolium var. williamsiae</i>	Endangered	Terrestrial	No
Centaury, Spring-loving	<i>Centaureum namophilum</i>	Threatened	Terrestrial	Yes
Gumplant, Ash Meadows	<i>Grindelia fraxino-pratensis</i>	Threatened	Terrestrial	Yes
Ivesia, Ash Meadows	<i>Ivesia kingii var. eremica</i>	Threatened	Terrestrial	Yes
Milk-vetch, Ash Meadows	<i>Astragalus phoenix</i>	Threatened	Terrestrial	Yes
Niterwort, Amargosa	<i>Nitrophila mohavensis</i>	Endangered	Terrestrial	Yes
Sunray, Ash Meadows	<i>Enceliopsis nudicaulis var.</i>	Threatened	Terrestrial	Yes
Monocot				
Ladies'-tresses, Ute	<i>Spiranthes diluvialis</i>	Threatened	Terrestrial	No

New Hampshire

(2) species:

CH**Dicot**

Milk-vetch, Jesup's

Astragalus robbinsii var. *jesupi*

Endangered

Terrestrial

No

Monocot

Pogonia, Small Whorled

Isotria medeoloides

Threatened

Terrestrial

No

New Jersey

(5) species:

CH**Dicot**

Chaffseed, American

Schwalbea americana

Endangered

Terrestrial

No

Joint-vetch, Sensitive

Aeschynomene virginica

Threatened

Terrestrial, Brackish

No

Monocot

Beaked-rush, Knieskern's

Rhynchospora knieskernii

Threatened

Terrestrial

No

Pink, Swamp

Helonias bullata

Threatened

Terrestrial, Freshwater

No

Pogonia, Small Whorled

Isotria medeoloides

Threatened

Terrestrial

No

New Mexico

(13) species:

CH**Dicot**

Cactus, Knowlton

Pediocactus knowltonii

Endangered

Terrestrial

No

Cactus, Kuenzler Hedgehog

Echinocereus fendleri var. *kuenzleri*

Endangered

Terrestrial

No

Cactus, Lee Pincushion

Coryphantha sneedii var. *leei*

Threatened

Terrestrial

No

Cactus, Mesa Verde

Sclerocactus mesae-verdae

Threatened

Terrestrial

No

Cactus, Sneed Pincushion

Coryphantha sneedii var. *sneedii*

Endangered

Terrestrial

No

Fleabane, Zuni

Erigeron rhizomatus

Threatened

Terrestrial

No

Ipomopsis, Holy Ghost

Ipomopsis sancti-spiritus

Endangered

Terrestrial

No

Milk-vetch, Mancos

Astragalus humillimus

Endangered

Terrestrial

No

Pennyroyal, Todsen's

Hedeoma todsenii

Endangered

Terrestrial

Yes

Poppy, Sacramento Prickly

Argemone pleiacantha ssp. *pinnatisecta*

Endangered

Terrestrial

No

Sunflower, Pecos

Helianthus paradoxus

Threatened

Terrestrial, Freshwater

No

Thistle, Sacramento Mountains

Cirsium vinaceum

Threatened

Terrestrial

No

Wild-buckwheat, Gypsum

Eriogonum gypsophilum

Threatened

Terrestrial

Yes

New York

(6) species:

CH**Dicot**

Amaranth, Seabeach

Amaranthus pumilus

Threatened

Coastal (neritic)

No

Gerardia, Sandplain

Agalinis acuta

Endangered

Terrestrial

No

Monkshood, Northern Wild

Aconitum noveboracense

Threatened

Terrestrial

No

Roseroot, Leedy's

Sedum integrifolium ssp. *leedyi*

Threatened

Terrestrial

No

Ferns

Fern, American hart's-tongue	<i>Asplenium scolopendrium</i> var. <i>americanum</i>	Threatened	Terrestrial	No
Monocot				
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
North Carolina	(27) species:			<u>CH</u>
Dicot				
Amaranth, Seabeach	<i>Amaranthus pumilus</i>	Threatened	Coastal (neritic)	No
Avens, Spreading	<i>Geum radiatum</i>	Endangered	Terrestrial	No
Bittercress, Small-anthered	<i>Cardamine micranthera</i>	Endangered	Terrestrial	No
Blazing Star, Heller's	<i>Liatris helleri</i>	Threatened	Terrestrial	No
Bluet, Roan Mountain	<i>Hedyotis purpurea</i> var. <i>montana</i>	Endangered	Terrestrial	No
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Coneflower, Smooth	<i>Echinacea laevigata</i>	Endangered	Terrestrial	No
Dropwort, Canby's	<i>Oxypolis canbyi</i>	Endangered	Terrestrial, Freshwater	No
Goldenrod, Blue Ridge	<i>Solidago spithamea</i>	Threatened	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Heartleaf, Dwarf-flowered	<i>Hexastylis naniflora</i>	Threatened	Terrestrial	No
Heather, Mountain Golden	<i>Hudsonia montana</i>	Threatened	Terrestrial	Yes
Joint-vetch, Sensitive	<i>Aeschynomene virginica</i>	Threatened	Terrestrial, Brackish	No
Loosestrife, Rough-leaved	<i>Lysimachia asperulaefolia</i>	Endangered	Terrestrial	No
Meadowrue, Cooley's	<i>Thalictrum cooleyi</i>	Endangered	Terrestrial	No
Pitcher-plant, Green	<i>Sarracenia oreophila</i>	Endangered	Terrestrial, Freshwater	No
Pitcher-plant, Mountain Sweet	<i>Sarracenia rubra</i> ssp. <i>jonesii</i>	Endangered	Freshwater, Terrestrial	No
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Sumac, Michaux's	<i>Rhus michauxii</i>	Endangered	Terrestrial	No
Sunflower, Schweinitz's	<i>Helianthus schweinitzii</i>	Endangered	Terrestrial	No
Lichen				
Lichen, Rock Gnome	<i>Gymnoderma lineare</i>	Endangered	Terrestrial	No
Monocot				
Arrowhead, Bunched	<i>Sagittaria fasciculata</i>	Endangered	Freshwater	No
Irisette, White	<i>Sisyrinchium dichotomum</i>	Endangered	Terrestrial	No
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Sedge, Golden	<i>Carex lutea</i>	Endangered	Terrestrial	No
North Dakota	(1) species:			<u>CH</u>
Monocot				

Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Ohio	(6) species:			<u>CH</u>
Dicot				
Clover, Running Buffalo	<i>Trifolium stoloniferum</i>	Endangered	Terrestrial	No
Daisy, Lakeside	<i>Hymenoxys herbacea</i>	Threatened	Freshwater	No
Monkshood, Northern Wild	<i>Aconitum noveboracense</i>	Threatened	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Monocot				
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Oklahoma	(2) species:			<u>CH</u>
Monocot				
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Oregon	(14) species:			<u>CH</u>
Dicot				
Catchfly, Spalding's	<i>Silene spaldingii</i>	Threatened	Terrestrial	No
Checker-mallow, Nelson's	<i>Sidalcea nelsoniana</i>	Threatened	Terrestrial	No
Daisy, Willamette	<i>Erigeron decumbens</i> var. <i>decumbens</i>	Endangered	Terrestrial	No
Four-o'clock, Macfarlane's	<i>Mirabilis macfarlanei</i>	Threatened	Terrestrial	No
Lomatium, Bradshaw's	<i>Lomatium bradshawii</i>	Endangered	Terrestrial, Freshwater	No
Lomatium, Cook's	<i>Lomatium cookii</i>	Endangered	Vernal pool	No
Lupine, Kincaid's	<i>Lupinus sulphureus</i> (=oreganus) ssp. <i>kincaidii</i> (=var. <i>kincaidii</i>)	Threatened	Terrestrial	No
Meadowfoam, Large-flowered Woolly	<i>Limnanthes floccosa</i> ssp. <i>Grandiflora</i>	Endangered	Vernal pool	No
Milk-vetch, Applegate's	<i>Astragalus applegatei</i>	Endangered	Terrestrial	No
Popcornflower, Rough	<i>Plagiobothrys hirtus</i>	Endangered	Vernal pool	No
Thelypody, Howell's Spectacular	<i>Thelypodium howellii spectabilis</i>	Threatened	Terrestrial	No
Wire-lettuce, Malheur	<i>Stephanomeria malheurensis</i>	Endangered	Terrestrial	Yes
Monocot				
Fritillary, Gentner's	<i>Fritillaria gentneri</i>	Endangered	Terrestrial	No
Lily, Western	<i>Lilium occidentale</i>	Endangered	Terrestrial	No
Pennsylvania	(2) species:			<u>CH</u>
Monocot				
Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No

Puerto Rico
Dicot

(49) species:

CH

Auerodendron pauciflorum (ncn)	<i>Auerodendron pauciflorum</i>	Endangered	Terrestrial	No
Bariaco	<i>Trichilia triacantha</i>	Endangered	Terrestrial	No
Boxwood, Vahl's	<i>Buxus vahlII</i>	Endangered	Terrestrial	No
Calyptranthes Thomasiana (ncn)	<i>Calyptranthes thomasiana</i>	Endangered	Terrestrial	No
Capa Rosa	<i>Callicarpa ampla</i>	Endangered	Terrestrial	No
Catesbaea Melanocarpa (ncn)	<i>Catesbaea melanocarpa</i>	Endangered	Terrestrial	No
Chamaecrista glandulosa (ncn)	<i>Chamaecrista glandulosa var. mirabilis</i>	Endangered	Terrestrial	No
Chumbo, Higo	<i>Harrisia portoricensis</i>	Threatened	Terrestrial	No
Chupacallos	<i>Pleodendron macranthum</i>	Endangered	Terrestrial	No
Cobana Negra	<i>Stahlia monosperma</i>	Threatened	Terrestrial	No
Cordia bellonis (ncn)	<i>Cordia bellonis</i>	Endangered	Terrestrial	No
Daphnopsis hellerana (ncn)	<i>Daphnopsis hellerana</i>	Endangered	Terrestrial	No
Erubia	<i>Solanum drymophilum</i>	Endangered	Terrestrial	No
Eugenia Woodburyana	<i>Eugenia woodburyana</i>	Endangered	Terrestrial	No
Gesneria pauciflora (ncn)	<i>Gesneria pauciflora</i>	Threatened	Terrestrial	No
Goetzea, Beautiful (Matabuey)	<i>Goetzea elegans</i>	Endangered	Terrestrial	No
Higuero De Sierra	<i>Crescentia portoricensis</i>	Endangered	Terrestrial	No
Holly, Cook's	<i>Ilex cookii</i>	Endangered	Terrestrial	No
Ilex sintenisii (ncn)	<i>Ilex sintenisii</i>	Endangered	Terrestrial	No
Leptocereus grantianus (ncn)	<i>Leptocereus grantianus</i>	Endangered	Terrestrial	No
Lyonia truncata var. proctorii (ncn)	<i>Lyonia truncata var. proctorii</i>	Endangered	Terrestrial	No
Mitracarpus Maxwelliae	<i>Mitracarpus maxwelliae</i>	Endangered	Terrestrial	No
Mitracarpus Polycladus	<i>Mitracarpus polycladus</i>	Endangered	Terrestrial	No
Myrcia Paganii	<i>Myrcia paganii</i>	Endangered	Terrestrial	No
Palo Colorado (Ternstroemia luquillensis)	<i>Ternstroemia luquillensis</i>	Endangered	Terrestrial	No
Palo de Jazmin	<i>Styrax portoricensis</i>	Endangered	Terrestrial	No
Palo de Nigua	<i>Comutia obovata</i>	Endangered	Terrestrial	No
Palo de Ramon	<i>Banara vanderbiltii</i>	Endangered	Terrestrial	No
Palo de Rosa	<i>Ottoschulzia rhodoxylon</i>	Endangered	Terrestrial	No
Peperomia, Wheeler's	<i>Peperomia wheeleri</i>	Endangered	Terrestrial	No
Prickly-ash, St. Thomas	<i>Zanthoxylum thomasianum</i>	Endangered	Terrestrial	No
Schoepfia arenaria (ncn)	<i>Schoepfia arenaria</i>	Threatened	Terrestrial	No
Ternstroemia subsessilis (ncn)	<i>Ternstroemia subsessilis</i>	Endangered	Terrestrial	No
Uvillo	<i>Eugenia haematocarpa</i>	Endangered	Terrestrial	No

Vernonia Proctorii (ncn)	<i>Vernonia proctorii</i>	Endangered	Terrestrial	No
Walnut, Nogal	<i>Juglans jamaicensis</i>	Endangered	Terrestrial	No
Ferns				
Fern, Adiantum vivesii	<i>Adiantum vivesii</i>	Endangered	Terrestrial	No
Fern, Elaphoglossum serpens	<i>Elaphoglossum serpens</i>	Endangered	Terrestrial	No
Fern, Thelypteris inabonensis	<i>Thelypteris inabonensis</i>	Endangered	Terrestrial	No
Fern, Thelypteris verecunda	<i>Thelypteris verecunda</i>	Endangered	Terrestrial	No
Fern, Thelypteris yaucoensis	<i>Thelypteris yaucoensis</i>	Endangered	Terrestrial	No
Polystichum calderonense (ncn)	<i>Polystichum calderonense</i>	Endangered	Terrestrial	No
Tectaria Estremerana	<i>Tectaria estremerana</i>	Endangered	Terrestrial	No
Tree Fern, Elfin	<i>Cyathea dryopteroides</i>	Endangered	Terrestrial	No
Monocot				
Aristida chaseae (ncn)	<i>Aristida chaseae</i>	Endangered	Terrestrial	No
Cranichis Ricartii	<i>Cranichis ricartii</i>	Endangered	Terrestrial	No
Lepanthes eltorensis (ncn)	<i>Lepanthes eltorensis</i>	Endangered	Terrestrial	No
Manaca, palma de	<i>Calyptrionoma rivalis</i>	Threatened	Terrestrial	No
Pelos del Diablo	<i>Aristida portoricensis</i>	Endangered	Terrestrial	No
Rhode Island (2) species:				<u>CH</u>
Dicot				
Gerardia, Sandplain	<i>Agalinis acuta</i>	Endangered	Terrestrial	No
Monocot				
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
South Carolina (20) species:				<u>CH</u>
Dicot				
Amaranth, Seabeach	<i>Amaranthus pumilus</i>	Threatened	Coastal (neritic)	No
Amphianthus, Little	<i>Amphianthus pusillus</i>	Threatened	Freshwater	No
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Coneflower, Smooth	<i>Echinacea laevigata</i>	Endangered	Terrestrial	No
Dropwort, Canby's	<i>Oxypolis canbyi</i>	Endangered	Terrestrial, Freshwater	No
Gooseberry, Miccosukee	<i>Ribes echinellum</i>	Threatened	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Heartleaf, Dwarf-flowered	<i>Hexastylis naniflora</i>	Threatened	Terrestrial	No
Loosestrife, Rough-leaved	<i>Lysimachia asperulaefolia</i>	Endangered	Terrestrial	No
Pitcher-plant, Mountain Sweet	<i>Sarracenia rubra ssp. jonesii</i>	Endangered	Freshwater, Terrestrial	No
Pondberry	<i>Lindera melissifolia</i>	Endangered	Terrestrial	No
Sunflower, Schweinitz's	<i>Helianthus schweinitzii</i>	Endangered	Terrestrial	No
Ferns				

Quillwort, Black-spored	<i>Isoetes melanospora</i>	Endangered	Vernal pool	No
Lichen				
Lichen, Rock Gnome	<i>Gymnoderma lineare</i>	Endangered	Terrestrial	No
Monocot				
Arrowhead, Bunched	<i>Sagittaria fasciculata</i>	Endangered	Freshwater	No
Irisette, White	<i>Sisyrinchium dichotomum</i>	Endangered	Terrestrial	No
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Trillium, Persistent	<i>Trillium persistens</i>	Endangered	Terrestrial	No
Trillium, Relict	<i>Trillium reliquum</i>	Endangered	Terrestrial	No
South Dakota (1) species:				<u>CH</u>
Monocot				
Orchid, Western Prairie Fringed	<i>Platanthera praeclara</i>	Threatened	Terrestrial	No
Tennessee (21) species:				<u>CH</u>
Dicot				
Aster, Ruth's Golden	<i>Pityopsis ruthii</i>	Endangered	Terrestrial	No
Avens, Spreading	<i>Geum radiatum</i>	Endangered	Terrestrial	No
Bladderpod, Spring Creek	<i>Lesquerella perforata</i>	Endangered	Floodplain	No
Bluet, Roan Mountain	<i>Hedyotis purpurea var. montana</i>	Endangered	Terrestrial	No
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Clover, Leafy Prairie	<i>Dalea foliosa</i>	Endangered	Terrestrial	No
Coneflower, Tennessee Purple	<i>Echinacea tennesseensis</i>	Endangered	Terrestrial	No
Goldenrod, Blue Ridge	<i>Solidago spithamaea</i>	Threatened	Terrestrial	No
Ground-plum, Guthrie's	<i>Astragalus bibullatus</i>	Endangered	Terrestrial	No
Pitcher-plant, Green	<i>Sarracenia oreophila</i>	Endangered	Terrestrial, Freshwater	No
Potato-bean, Price's	<i>Apios priceana</i>	Threatened	Terrestrial	No
Rock-cress, Large (=Braun's)	<i>Arabis perstellata E. L. Braun var. ampla Rollins</i>	Endangered	Terrestrial	Yes
Rock-cress, Small	<i>Arabis perstellata E. L. Braun var. perstellata Fernald</i>	Endangered	Terrestrial	Yes
Rosemary, Cumberland	<i>Conradina verticillata</i>	Threatened	Terrestrial	No
Sandwort, Cumberland	<i>Arenaria cumberlandensis</i>	Endangered	Terrestrial	No
Skullcap, Large-flowered	<i>Scutellaria montana</i>	Threatened	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Ferns				
Fern, American hart's-tongue	<i>Asplenium scolopendrium var. americanum</i>	Threatened	Terrestrial	No
Lichen				

Lichen, Rock Gnome	<i>Gymnoderma lineare</i>	Endangered	Terrestrial	No
Monocot				
Grass, Tennessee Yellow-eyed	<i>Xyris tennesseensis</i>	Endangered	Terrestrial	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No
Texas	(30) species:			<u>CH</u>
Dicot				
Ambrosia, South Texas	<i>Ambrosia cheiranthifolia</i>	Endangered	Terrestrial	No
Ayenia, Texas	<i>Ayenia limitaris</i>	Endangered	Terrestrial	No
Bladderpod, White	<i>Lesquerella pallida</i>	Endangered	Terrestrial	No
Bladderpod, Zapata	<i>Lesquerella thamnophila</i>	Endangered	Terrestrial	Yes
Cactus, Black Lace	<i>Echinocereus reichenbachii</i> var. <i>albertii</i>	Endangered	Terrestrial	No
Cactus, Bunched Cory	<i>Coryphantha ramillosa</i>	Threatened	Terrestrial	No
Cactus, Chisos Mountain Hedgehog	<i>Echinocereus chisoensis</i> var. <i>chisoensis</i>	Threatened	Terrestrial	No
Cactus, Lloyd's Mariposa	<i>Echinomastus mariposensis</i>	Threatened	Terrestrial	No
Cactus, Nellie Cory	<i>Coryphantha minima</i>	Endangered	Terrestrial	No
Cactus, Sneed Pincushion	<i>Coryphantha sneedii</i> var. <i>sneedii</i>	Endangered	Terrestrial	No
Cactus, Star	<i>Astrophytum asterias</i>	Endangered	Terrestrial	No
Cactus, Tobusch Fishhook	<i>Ancistrocactus tobuschii</i>	Endangered	Terrestrial	No
Cat's-eye, Terlingua Creek	<i>Cryptantha crassipes</i>	Endangered	Terrestrial	No
Dawn-flower, Texas Prairie (=Texas Bitterweed)	<i>Hymenoxys texana</i>	Endangered	Terrestrial	No
Dogweed, Ashy	<i>Thymophylla tephroleuca</i>	Endangered	Terrestrial	No
Frankenia, Johnston's	<i>Frankenia johnstonii</i>	Endangered	Terrestrial	No
Fruit, Earth (=geocarpon)	<i>Geocarpon minimum</i>	Threatened	Terrestrial	No
Manioc, Walker's	<i>Manihot walkerae</i>	Endangered	Terrestrial	No
Oak, Hinckley	<i>Quercus hinckleyi</i>	Threatened	Terrestrial	No
Phlox, Texas Trailing	<i>Phlox nivalis</i> ssp. <i>texensis</i>	Endangered	Terrestrial	No
Pitaya, Davis' Green	<i>Echinocereus viridiflorus</i> var. <i>davisii</i>	Endangered	Terrestrial	No
Poppy-mallow, Texas	<i>Callirhoe scabriuscula</i>	Endangered	Terrestrial	No
Rush-pea, Slender	<i>Hoffmannseggia tenella</i>	Endangered	Terrestrial	No
Sand-verbena, Large-fruited	<i>Abronia macrocarpa</i>	Endangered	Terrestrial	No
Snowbells, Texas	<i>Styrax texanus</i>	Endangered	Terrestrial	No
Sunflower, Pecos	<i>Helianthus paradoxus</i>	Threatened	Terrestrial, Freshwater	No
Wild-buckwheat, Gypsum	<i>Eriogonum gypsophilum</i>	Threatened	Terrestrial	Yes
Monocot				
Ladies'-tresses, Navasota	<i>Spiranthes parksii</i>	Endangered	Terrestrial	No

Pondweed, Little Aguja Creek	<i>Potamogeton clystocarpus</i>	Endangered	Freshwater	No
Wild-rice, Texas	<i>Zizania texana</i>	Endangered	Freshwater	Yes

Utah

(24) species:

CH

Dicot

Bear-poppy, Dwarf	<i>Arctomecon humilis</i>	Endangered	Terrestrial	No
Bladderpod, Kodachrome	<i>Lesquerella tumulosa</i>	Endangered	Terrestrial	No
Buttercup, Autumn	<i>Ranunculus aestivalis (=acriformis)</i>	Endangered	Terrestrial	No
Cactus, San Rafael	<i>Pediocactus despainii</i>	Endangered	Terrestrial	No
Cactus, Siler Pincushion	<i>Pediocactus (=Echinocactus,=Utahia) sileri</i>	Threatened	Terrestrial	No
Cactus, Uinta Basin Hookless	<i>Sclerocactus glaucus</i>	Threatened	Terrestrial	No
Cactus, Winkler	<i>Pediocactus winkleri</i>	Threatened	Terrestrial	No
Cactus, Wright Fishhook	<i>Sclerocactus wrightiae</i>	Endangered	Terrestrial	No
Cycladenia, Jones	<i>Cycladenia jonesii (=humilis)</i>	Threatened	Terrestrial	No
Daisy, Maguire	<i>Erigeron maguirei</i>	Threatened	Freshwater	No
Milk-vetch, Deseret	<i>Astragalus desereticus</i>	Threatened	Terrestrial	No
Milk-vetch, Heliotrope	<i>Astragalus montii</i>	Threatened	Terrestrial	Yes
Milk-vetch, Holmgren	<i>Astragalus holmgreniorum</i>	Endangered	Terrestrial	No
Milk-vetch, Shivwits	<i>Astragalus ampullarioides</i>	Endangered	Terrestrial	No
Milkweed, Welsh's	<i>Asclepias welshii</i>	Threatened	Terrestrial	Yes
Phacelia, Clay	<i>Phacelia argillacea</i>	Endangered	Terrestrial	No
Primrose, Maguire	<i>Primula maguirei</i>	Threatened	Terrestrial	No
Reed-mustard, Barneby	<i>Schoenocrambe barnebyi</i>	Endangered	Terrestrial	No
Reed-mustard, Clay	<i>Schoenocrambe argillacea</i>	Threatened	Terrestrial	No
Reed-mustard, Shrubby	<i>Schoenocrambe suffrutescens</i>	Endangered	Terrestrial	No
Ridge-cress (=Pepper-cress),	<i>Lepidium barnebyanum</i>	Endangered	Terrestrial	No
Townsendia, Last Chance	<i>Townsendia aprica</i>	Threatened	Terrestrial	No

Monocot

Ladies'-tresses, Ute	<i>Spiranthes diluvialis</i>	Threatened	Terrestrial	No
Sedge, Navajo	<i>Carex specuicola</i>	Threatened	Terrestrial	Yes

Vermont

(2) species:

CH

Dicot

Milk-vetch, Jesup's	<i>Astragalus robbinsii var. jesupi</i>	Endangered	Terrestrial	No
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Monocot

Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
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Virginia

(17) species:

CH

Dicot

Amaranth, Seabeach	<i>Amaranthus pumilus</i>	Threatened	Coastal (neritic)	No
Birch, Virginia Round-leaf	<i>Betula uber</i>	Threatened	Floodplain	No
Bittercress, Small-anthered	<i>Cardamine micranthera</i>	Endangered	Terrestrial	No
Chaffseed, American	<i>Schwalbea americana</i>	Endangered	Terrestrial	No
Coneflower, Smooth	<i>Echinacea laevigata</i>	Endangered	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Joint-vetch, Sensitive	<i>Aeschynomene virginica</i>	Threatened	Terrestrial, Brackish	No
Mallow, Peter's Mountain	<i>Iliamna corei</i>	Endangered	Terrestrial	No
Rock-cress, Shale Barren	<i>Arabis serotina</i>	Endangered	Terrestrial	No
Sneezeweed, Virginia	<i>Helenium virginicum</i>	Threatened	Vernal pool	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No
Sumac, Michaux's	<i>Rhus michauxii</i>	Endangered	Terrestrial	No
Sunflower, Schweinitz's	<i>Helianthus schweinitzii</i>	Endangered	Terrestrial	No

Monocot

Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Pink, Swamp	<i>Helonias bullata</i>	Threatened	Terrestrial, Freshwater	No
Pogonia, Small Whorled	<i>Isotria medeoloides</i>	Threatened	Terrestrial	No

Washington

(7) species:

CH

Dicot

Catchfly, Spalding's	<i>Silene spaldingii</i>	Threatened	Terrestrial	No
Checker-mallow, Nelson's	<i>Sidalcea nelsoniana</i>	Threatened	Terrestrial	No
Checker-mallow, Wenatchee Mountains	<i>Sidalcea oregana var. calva</i>	Endangered	Terrestrial	Yes
Howellia, Water	<i>Howellia aquatilis</i>	Threatened	Freshwater	No
Lupine, Kincaid's	<i>Lupinus sulphureus (=oreganus) ssp. kincaidii (=var. kincaidii)</i>	Threatened	Terrestrial	No
Paintbrush, Golden	<i>Castilleja levisecta</i>	Threatened	Terrestrial	No
Stickseed, Showy	<i>Hackelia venusta</i>	Endangered	Terrestrial	No

West Virginia

(5) species:

CH

Dicot

Clover, Running Buffalo	<i>Trifolium stoloniferum</i>	Endangered	Terrestrial	No
Harperella	<i>Ptilimnium nodosum</i>	Endangered	Freshwater	No
Rock-cress, Shale Barren	<i>Arabis serotina</i>	Endangered	Terrestrial	No
Spiraea, Virginia	<i>Spiraea virginiana</i>	Threatened	Terrestrial	No

Monocot

Bulrush, Northeastern (=Barbed Bristle)	<i>Scirpus ancistrochaetus</i>	Endangered	Terrestrial, Freshwater	No
Wisconsin (6) species:				<u>CH</u>
Dicot				
Clover, Prairie Bush	<i>Lespedeza leptostachya</i>	Threatened	Terrestrial	No
Locoweed, Fassett's	<i>Oxytropis campestris var. chartacea</i>	Threatened	Terrestrial	No
Monkshood, Northern Wild	<i>Aconitum noveboracense</i>	Threatened	Terrestrial	No
Thistle, Pitcher's	<i>Cirsium pitcheri</i>	Threatened	Terrestrial	No
Monocot				
Iris, Dwarf Lake	<i>Iris lacustris</i>	Threatened	Terrestrial	No
Orchid, Eastern Prairie Fringed	<i>Platanthera leucophaea</i>	Threatened	Terrestrial	No
Wyoming (2) species:				<u>CH</u>
Dicot				
Butterfly Plant, Colorado	<i>Gaura neomexicana var. coloradensis</i>	Threatened	Terrestrial	Yes
Yellowhead, Desert	<i>Yermo xanthocephalus</i>	Threatened	Terrestrial	Yes

No species were selected for exclusion.

Dispersed species included in report.

Appendix F

Toxicity measurement for continuous endpoints, using weighted nonlinear regression, weighting proportional to predicted means.

Program: Nuthatch

Date: 7/22/08

Toxicity measurement for continuous endpoints, using weighted nonlinear regression, weighting proportional to predicted means.

Reference

R.D. Bruce and D.J. Versteeg. 1992. A statistical procedure for modeling continuous toxicity data. *Env. Tox. and Chem.* 11:1485-1494.

Input file: OATHT.DAT

Raw data:

oat height vv

8

4

4

4

4

4

4

4

4

control

551

543

524
527
0.00075
506
533
594
572
0.0015
455
515
537
501
0.0030
422
289
283
472
0.0060
207
234
220
211
0.012
218
211
223
189
0.024
208
212
196
210
0.048

196

195

220

204

In c:\nuthatch\OATHT.DAT : `control`

Interpreted as Dose = 0

OATHT.DAT : oat height vv

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose Isotone T-bar P-value Significance
 Means

0	544	.		
0.00075	544	-0.268	N.S.	
0.0015	502	1.224	N.S.	
0.003	367	6.066	<0.005	*
0.006	218	11.37	<0.005	*
0.012	210	11.65	<0.005	*
0.024	207	11.78	<0.005	*
0.048	204	11.88	<0.005	*

***=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound
		Lower	Upper		
EC5	9.1E-05	1.2E-05	0.00071	0.43	0.13
EC10	0.00025	4.4E-05	0.0014	0.37	0.18
EC25	0.0013	0.00040	0.0044	0.26	0.30
EC50	0.0085	0.0041	0.018	0.15	0.48

Slope = 0.836 Std.Err. = 0.139

!!!Poor fit: $p < 0.001$ based on DF= 5.00 24.0

OATHHT.DAT : oat height vv

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. - Pred.	Pred. %Control	%Change
0.00	4.00	536.	581.	-44.5	100.	0.00
0.000750	4.00	551.	471.	80.4	81.1	18.9
0.00150	4.00	502.	427.	74.9	73.6	26.4
0.00300	4.00	367.	376.	-9.40	64.7	35.3
0.00600	4.00	218.	320.	-102.	55.0	45.0
0.0120	4.00	210.	261.	-51.2	45.0	55.0
0.0240	4.00	207.	205.	1.37	35.3	64.7
0.0480	4.00	204.	154.	49.9	26.5	73.5

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.

Input file: OATWT.DAT

Raw data:

oat weight vv

8
4
4
4
4

4
4
4
4
control
1.729
1.778
1.795
1.710
0.00075
1.504
1.666
1.810
1.779
0.0015
1.421
1.658
1.560
1.574
0.0030
1.303
0.861
1.065
1.434
0.0060
0.525
0.738
0.644
0.681
0.012
0.617
0.661
0.680

0.466

0.024

0.574

0.531

0.535

0.566

0.048

0.376

0.416

0.372

0.536

In c:\nuthatch\OATWT.DAT : `control`

Interpreted as Dose = 0

OATWT.DAT : oat weight vv

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose Isotone T-bar P-value Significance
 Means

0 1.75 .
0.00075 1.69 0.7338 N.S.
0.0015 1.55 2.317 0.017 *
0.003 1.17 6.813 <0.005 *
0.006 0.647 12.83 <0.005 *
0.012 0.606 13.31 <0.005 *
0.024 0.551 13.94 <0.005 *
0.048 0.425 15.41 <0.005 *

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound
		Lower	Upper		
EC5	0.00013	3.4E-05	0.00051	0.29	0.26
EC10	0.00030	9.6E-05	0.00096	0.25	0.32
EC25	0.0012	0.00053	0.0029	0.18	0.43
EC50	0.0059	0.0035	0.010	0.11	0.59

Slope = 0.996 Std.Err. = 0.119

!!!Poor fit: $p < 0.001$ based on $DF = 5.00 \quad 24.0$

OATWT.DAT : oat weight vv

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	1.75	1.87	-0.120	100.	0.00
0.000750	4.00	1.69	1.52	0.166	81.3	18.7
0.00150	4.00	1.55	1.35	0.199	72.3	27.7
0.00300	4.00	1.17	1.15	0.0145	61.5	38.5
0.00600	4.00	0.647	0.930	-0.283	49.7	50.3
0.0120	4.00	0.606	0.710	-0.104	37.9	62.1
0.0240	4.00	0.551	0.509	0.0427	27.2	72.8
0.0480	4.00	0.425	0.341	0.0840	18.2	81.8

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.