UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C., 20460
OFFICE OF
PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM **DATE: March 31, 2007**

SUBJECT: Review of Iprodione (PC Code 109801) Revised Application Rates and New IR-4 Use (DP Barcodes D315437 and D313332)

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The Environmental Fate and Effects Division (EFED) has completed its review of the Inter-Regional 4 (IR-4) petition for the use of iprodione on pistachio (DP Barcode D315437) and of the registrant's (Bayer Crop Science) request for a re-evaluation of pre-RED use rates on strawberries, stone fruits and grapes and additional uses on canola, pistachios and almonds (DP Barcode D313332). Additionally, the direct application of iprodione to water for use on rice is also discussed since this use was not assessed previously. Many of these uses were previously evaluated in the environmental fate and ecological risk assessment chapter in support of the reregistration eligibility decision for iprodione (DP Barcode D23322) dated March 31, 1998, and the reader is referred to that chapter for additional information on the environmental fate and ecological effects of iprodione.

Depending on environmental conditions, iprodione can persist with dissipation half-lives up to 4 months. The compound is moderately mobile and can move to aquatic environments through runoff and leaching. A primary degradate is 3, 5-dichloroaniline.

Iprodione is slightly toxic to both birds and mammals on an acute oral basis and is practically nontoxic to birds on a subacute dietary exposure basis. The compound is moderately toxic to freshwater and estuarine/marine fish and is highly toxic to freshwater and estuarine/marine invertebrates. Chronic exposure resulted in effects on survival and reproduction in both terrestrial and aquatic animals. Iprodione is structurally related to vinclozolin (and both form a common degradate—3, 5-dichloroaniline); however, it is uncertain whether iprodione has antiandrogenic effects similar to those of vinclozolin. In mammals, chronic exposure to iprodione resulted in testicular hyperplasia and reduced

spermatozoa in the epididymis; however, it is uncertain whether these results and effects on reproduction recorded in aquatic studies are a result of the chemical acting on endocrine-mediated processes.

Based on the newly proposed uses on pistachios, almonds, and canola and the revised use rates on strawberries, stone fruits and grapes, acute risk levels of concern for endangered species are exceeded for both terrestrial and aquatic animal. None of the acute risk LOCs are exceeded for freshwater fish; however, the acute risk to endangered species LOC for freshwater invertebrates is exceeded for all uses evaluated except canola. None of the proposed or revised uses exceed the chronic risk LOC for freshwater animals. For estuarine/marine fish, none of the proposed uses exceed the acute risk LOCs; however, use on strawberries does exceed the acute risk to listed species LOC by a factor of 2.8X. The chronic risk to estuarine/marine invertebrate LOC is exceeded for all of the proposed uses except canola. None of the freshwater aquatic plant RQs exceed LOCs; however, the use on strawberries exceeds the acute risk to plants LOC for listed estuarine/marine plants. Even for the primary degradate of iprodione (3, 5-DCA), the acute risk to endangered species LOC is exceeded for the use on strawberries.

At the proposed and revised application rates, the acute risk to endangered birds LOC is exceeded for uses with multiple applications of 0.5 lbs a.i../A (almonds, pistachio, stone fruits and grapes). Except for use on canola, the chronic risk LOC is exceeded for birds as well. Again, except for canola, the acute risk to listed species LOC and the chronic risk LOC are exceeded for various-sized mammals feeding in several forage categories.

Because of updating in exposure assessment methods since the previous iprodione assessment, several additional registered uses were also evaluated and demonstrate that following applications to rice, the acute risk endangered species LOC is exceeded for fish by a factor 3.2X, and the acute risk to aquatic invertebrate LOC is exceeded by factors ranging between 2.6 to 42X for row crops, turf and rice. Only the use on rice (direct application to water) exceeds the chronic risk LOC for freshwater fish and the chronic risk LOC for freshwater invertebrates. For estuarine/marine animals, the acute risk to listed species LOC is exceeded for fish following the direct application to water for rice while the acute risk to listed species LOC for estuarine/marine invertebrates is exceeded for turf and rice by factors of 3X and 15X, respectively. The chronic risk LOC for estuarine/marine invertebrates is exceed for all of the additional uses evaluated by factors ranging between 31 to 143X. The acute risk to estuarine/marine plant LOC is exceeded for all the additional uses evaluated as well by factors ranging between 1.1 to 17X.

Acute and chronic risk to endangered species LOCs are exceeded for the proposed and revised uses of iprodione except canola. Both direct mortality and indirect effects on listed species are possible through the uses evaluated. Canola appears to be the only use where there is no effect based on the current methodologies used in evaluating ecological risks.

PROBLEM FORMULATION

At the request of the Special Review and Reregistration Division and the Registration Division, the Environmental Fate and Effects Division has reviewed a petition by the technical registrant for iprodione to revise maximum application rates for currently registered uses of iprodione. Additionally, there is an IR-4 petition for use of iprodione on pistachios. An ecological risk assessment in support of the reregistration eligibility decision on iprodione was published in 1998 (DP Barcode D233222).

Nature and Source of the Chemical Stressor

Iprodione (CAS No. 36734-19-7) is a dicarboximide contact fungicide registered for use on a range of agricultural crops. The chemical can be applied by chemigation, aircraft, and foliar ground spray. Iprodione is intended to inhibit germination of spores and the growth of mycelium[1].

The previous ecological risk assessment stated that iprodione is listed as an endocrine disrupter in the *Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis*[2]. According to this report, iprodione is an anti-androgen, chemically related to vinclozolin, with similar effects noted in the ovary, testis and sex gland of rodents.

Mechanism of Action

Iprodione causes oxidative damage to fungal cells as well as to mammalian and fish cells through the production of free oxygen radicals. The chemical has been demonstrated to bind to the aryl hydrocarbon receptor (AhR) and induce the cytochrome P_{450} system *in vitro*.[3,4,5] Additionally, iprodione is structurally related to the dichloroanilines as one degradate is 3,5 dichloroaniline (3, 5-DCA). Based on information contained in the Assessment Tools for the Evaluation of Risk (ASTER) database[6], compounds such as 3, 5-DCA are believed to act through polar narcosis. The acute mode of toxic action for these types of compounds is generally attributed to narcosis (the toxicologically induced and reversible stages of neural disruption). The narcosis syndrome elicited by these chemicals is distinct from the syndrome elicited by compounds thought to act via nonpolar narcosis. Polar narcotics are typically more toxic than what would be predicted from the nonpolar narcotic QSAR

Figure 1 depicts the chemical structures of both iprodione and vinclozolin. In spite of their structural similarity it is uncertain whether iprodione is capable of binding to the androgen receptor like vinclozolin.

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[1] EXTOXNET 1993. Pesticide Information Project of Cooperative Extension Offices of Cornell University, Michigan State University, Oregon State University and University of California at Davis and the U.S. Department of Agriculture http://pmep.cce.cornell.edu/profiles/extoxnet/haloxyfop-methylparathion/iprodione-ext.html

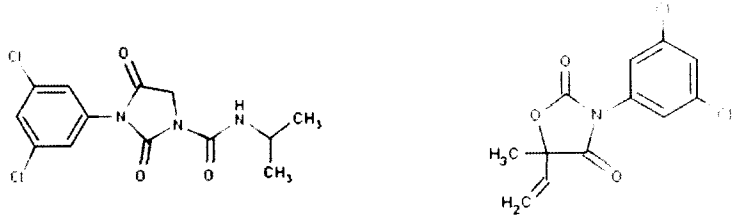
[2] Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, 630/R-96/012, 1997 http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=12462

[3] Ferraris, M., A. Flora, C. Chiesara, D. Fornasari, H. Lucchetti, L. Marabina, S. Frigerio and S. Radice. 2005. Molecular mechanism of the aryl hydrocarbon receptor activated by the fungicide iprodione in rainbow trout (*Oncorhynchus mykiss*) hepatocytes. Aquatic Toxicology 72: 209 – 220.

[4] Radice, S., M. Ferraris, L. Marabini, S. Grande, E. Chiesara. 2001. Effect of iprodione, a dicarboximide fungicide, on primary cultured rainbow trout (*Oncorhynchus mykiss*) hepatocytes. Aquatic Toxicology 54: 51 – 58.

[5] Long, M. P. Laier, A. M. Vinggaard, H. R. Anderson, J. Lynggaard, E. C. Bonefeld-Jørgensen. 2003. Effects of currently used pesticides in the AhR CALUX assay: comparison between the human TV101L and the rate H4IIE cell line. Toxicology 194: 77 – 93.

[6] ASTER (Assessment Tools for the Evaluation of Risk) http://cfistage.rtpnc.epa.gov/aster/



Iprodione

Vinclozolin

Figure 1 Chemical structures of iprodione and vinclozolin.

ANALYSIS

Use Characterization

Iprodione [3-(3,5-dichlorophenyl)-N-(1-methylethyl)-2,4-dioxo-1-imidazolidinecarboxamide] is a contact and/or locally systemic fungicide. Application methods include aircraft aerial applications, groundsprays, chemigation, and dipping. It is registered for use on a variety of fruit, vegetables, and ornamentals. The registrant is proposing to add a new uses on pistachio (IR4), and to increase label application rates for strawberries, stone fruits and grapes. The current formulations are for outdoor use only.

EFED obtained all relevant labels from the Registration Division and then summarized the relevant content in detail (see Appendix 1). EFED conducted model simulations for current and proposed labeled uses (in some cases multiple scenarios for a given use) in order to derive surface water concentrations. Some uses could not be directly simulated but were adequately simulated with close scenario approximations (e.g., California almond used for pistachio). The simulations that were performed were sufficiently broad to provide a realistic assessment of the varied uses of iprodione.

Environmental Fate and Transport Characterization

Iprodione is moderately mobile (per FAO classification system) in soil systems with a K_{oc} around 500 ml/g. It is not particularly volatile, and so it should not be subject to long-range aerial transport. Iprodione is most persistent in acidic environments, with half lives around 130 days at a pH of 5 in aquatic systems; however, in neutral aquatic systems, the half life drops to 4.7 days (pH of 7), and in basic systems, iprodione quickly dissipates (27 minutes at pH of 9). For aquatic systems, there is no strong evidence of effective mechanisms of iprodione degradation other than hydrolysis.

Submitted iprodione degradation studies involving soils are characterized by high levels of unextracted and unidentified residues which lead to uncertain degradation characterizations. For example, in a submitted aerobic soil degradation study, 75 to 87% of the residues were unextracted and uncharacterized after 300 days. Thus it remains unknown if and how much of these residues are parent iprodione or degradates of concern. Nevertheless, terrestrial and aquatic field dissipation studies tend to imply that iprodione dissipates in the environment with a DT_{50} of 3 to 7 days. However, because of the extraction concerns raised in the soil studies, it is unknown whether these DT_{50} values represent true degradation or simply a temporary sequestering of iprodione (or degradates of concern) that can be released over time.

The major degradates observed in laboratory and field studies are summarized in **Table 1**. The table also shows the fate studies that produced the degradates and the maximum percent of parent at which each of the degradates appeared in the studies. The only degradate that the Health Effects Division has reported to be of toxicological concern is 3,5-dichloroaniline (3,5-DCA or RP-32596), and it was found in several of the laboratory studies. This assessment includes consideration for the exposure of both iprodione and 3,5-DCA

Table 1. Degradates Formed In Environmental Fate Studies

Registrant Name	Chemical Name	Study in Which Found (Maximum % of Parent)	Reference MRID
RP32596	3,5-dichloroaniline (or 3,5-DCA)	Soil Photolysis (28%)*	42897101
		Aerobic Soil (9%)	43091002
		Aerobic Soil (3.9%)	44590501
		Aerobic Aquatic (9.9%)	42503801
		Anaerobic Aquatic (3.6%)	41755801
RP30228	3-(1-methylethyl)-N-(3,5-dichlorophenyl)-2,4-dioxo-1-imidazolidine-carboxamide	Hydrolysis (93%)	41885401
		Soil Photolysis (7.7%)	42897101
		Aerobic Soil (29%)	44590501
		Aerobic Aquatic (65%)	42503801
		Anaerobic Aquatic (60%)	41755801
		Terrestrial Field (--)	41877401
		Aquatic Field (--)	43718301
RP25040	3-(3,5-dichlorophenyl)-2,4-dioxoimidazolidine	Soil Photolysis (14%)	42897101
		Aerobic Soil (9.5%)	43091002
RP32490	3-(3,5-dichlorophenyl)-2,4-dioxo-1-imidazolidine-carboxamide	Aerobic Aquatic (15%)	42503801
		Terrestrial Field (--)	41877401
RP37176	N-(3,5-dichlorophenyl)-2-(1-methylethyl)-1-ureylenecarboxamide	Aquatic Field (--)	43718301
RP35606	[(dichloro-3,5-phenyl)-1-isopropylcarbamoyl-3]-2-acetic acid	Hydrolysis (12%)	41885401
RP36221	1-(3,5-dichlorophenyl)-5-isopropyl biuret	Aerobic Soil (13%)	44590501

*Photolysis is probably not the mechanism for production of 3,5-DCA in this study since the dark control produced nearly equivalent amounts of 3,5-DCA.

Table 2 summarizes the general fate properties of iprodione as determined from submitted studies, and **Table 3** presents the properties of 3,5-DCA. Summaries of the information available to EFED regarding the fate of iprodione and 3,5-DCA and which were used to construct these tables are presented in the following sections.

Table 2. General Fate Properties of Iprodione 3-(3,5-dichlorophenyl)-N-(1-methylethyl)-2,4-dioxo-1-imidazolidine-carboxamide

Property	Value	Source/MRID	comments
Molecular formula	$C_{13}H_{13}Cl_2N_3O_3$		
Molecular weight (MW)	330.2 g/mole		
Vapor pressure (20°C):	$2.7x10^{-7}$ torr	Iprodione RED	
Henry's Constant	$9.0x10^{-9}$ atm m^3/mol	calculated	=(vp/760)/(MW/sol); vp in torr; sol in mg/L; MW in g/mol
Octanol/Water Coefficient	$Log_{10} K_{ow} = 3.1$	Iprodione RED	
Solubility in water (20°C)	13 mg/L	Iprodione RED	
Hydrolysis half life	131 day (pH = 5) 4.7 day (pH= 7) 27 min (pH= 9)	41885401	
Photolysis aquatic half life	67 days	41861901	near surface, clear water
Photolysis soil half life	negligible	42897101	
Aerobic soil degradation half life	30 to 300 days 24 to 100 days	43091002 44590501	There were high amounts of unextracted material (75-87%)
Aerobic aquatic degradation half life	9 days	41927601 42503801	(likely due solely to hydrolysis)
Anaerobic aquatic degradation half life	7-14 days	41755801	(likely due solely to hydrolysis)
Sorption (K_{oc})	426 ml/g	43349202	(average of 4 soils), reasonably linear isotherms, Freundich exponents average 0.96

Table 3. Summary of Fate Properties of the Iprodione Degradate 3,5-DCA

Property	Value	Source/MRID	comments
Molecular wt	162	Product chemistry data	
Solubility	784 mg/L	EPI Suite	
Henry's Law Constant	10^{-6} atm m^3/mol	EPI Suite	
Aerobic soil degradation half life	Possibly > 9 months	45239201	high levels of unextracted residues (see text)
Sorption (K_{oc})	500 to 850 ml/g (based on Kf)	45114101	Nonlinear, Freundlich exponent = 0.6 to 0.7

Hydrolysis

The pH-dependent hydrolysis half life of iprodione is 131 days at a pH of 5, 4.7 days at a pH of 7, and 27 minutes at a pH of 9. These values were derived from laboratory studies (MRID# 41885401) in sterile aqueous buffered solutions at 25°C. The major degradates observed were RP35606 with a maximum of 11.9% of the applied at pH 5, and RP30228, with a maximum of 93.3% of the applied at pH 9. [RP-30228 is 1-(3,5-dichlorophenyl)carbamoyl-3-isopropyl-hydantoin, and RP-35606 is 3-(isopropylcarbamoyl)-5-(3,5-dichlorophenyl)hydantoic acid.]

Photolysis in Water

Iprodione degraded slowly with a half life of 67 days in a pH 5 buffered solution irradiated continuously with a UV-filtered xenon-arc lamp (MRID# 41861901). The test ran for 33 days in

conditions reported to simulate Florida sunlight. Iprodione did not degrade significantly in the dark control. No major degradates (≥10% of the applied) were observed in this study. Laboratory photolysis studies such as these are intended to provide the photolysis rate that could occur at the surface of a clear water body with access to unobstructed solar radiation; thus rates in an actual environment would be considerably lower.

Photolysis on Soil

Iprodione degraded at a somewhat higher rate under irradiated conditions than in the dark control in a soil photolysis study (MRID# 42897101). On irradiated soils, iprodione degraded with an observed DT_{50} of 7-14 days in sandy loam soil that was irradiated with a xenon-arc lamp for 8.8 hours/day for 30 days; whereas, in the dark controls, iprodione degraded with an observed DT_{50} of 14-21 days. Registrant-calculated half lives, using a first-order degradation model, were 4.64 days for the irradiated sample and 5.15 days for the dark control, thus degradation by irradiation is minimal. The major degradate observed in the irradiated soil was RP32596 [3,5-DCA] with a maximum of 28% of the applied at 14 days; while the dark control produced 37% of 3,5-DCA. Other degradates include a mixture of RP25040 [3-(3,5-dichlorophenyl)-2,4-dioxoimidazolidine] and LS720942 with a maximum of 13.75% of the applied at day 7 (3% in the dark control), and RP30228 with a maximum of 7.72% immediately post treatment (11% in the dark control).

Aerobic Aquatic Metabolism

Iprodione degraded with an observed DT_{50} of 3-7 days in a flooded silt loam sediment system incubated in the dark (MRID# 41927601 and 42503801). However, the pH of the system was 8.5, which is a level at which hydrolysis is a major mechanism of degradation. In the pH range between 7 and 9, iprodione degrades with a half life between 27 minutes and 4.7 days, as shown in a separate hydrolysis study (MRID 41885401). Thus hydrolysis is likely the means of degradation in these studies. The major degradates were RP30228, with a maximum of 64.6% of the applied at 14 days, and RP32490 [1-(3,5-dichlorophenyl)-3-carbamoyl hydantoin], with 14.6% of the applied at 2 days. RP32596 [3,5-DCA] was a maximum of 9.9% of the applied in the sediment at 30 days.

Anaerobic Aquatic Metabolism

Iprodione, at approximately 6 ppm, degraded with an observed DT_{50} of 7-14 days in anaerobic (flooded plus nitrogen atmosphere) silt loam sediment that was incubated in the dark at 25°C in an anaerobic aquatic metabolism study (MRID 41755801). The pH of the water was 7.4, which is a level at which hydrolysis is likely the most significant degradation mechanism. A sterile control showed that iprodione degrades at about the same rate under sterile conditions, but the degradate (RP-30228) did not dissipate (accounting for about 90% of applied after 1 year); whereas in the unsterilized test, it accounted for only about 10% after 1 year. Thus degradation of the parent does not appear to be microbially mediated, but degradation of RP-30228 does appear to be microbially mediated. The major degradates were RP30228 with a maximum of 70.7% of the applied at 14 days post-treatment; RP32490 with a maximum of 8.4% of the applied at 30 days. CO_2 accounted for 5.5-6.3% of the applied at 365 days. Organic volatiles were ≤0.6%, and unextracted residues were 16.7-20.0% of the applied.

Aerobic Soil Metabolism

In an aerobic soil metabolism study (MRID# 43091002) conducted in a sandy loam soil that was incubated in the dark at 25°C and 75% of 0.33 bar moisture for 276 days, unextracted and uncharacterized residues accounted for 75.8 to 86.9% of the applied ^{14}C at 181-276 days (last test interval). Thus it is difficult to estimate actual degradation rates. The half life could be higher than 300 days if all the unidentified unextracted material were iprodione. The DT_{50} of the extracted iprodione was 14-30 days. The following degradates were observed: RP30228, with a maximum of 6.92% of the applied at 14 days; RP32596 (3,5-DCA), with a maximum of 9.02% of the applied at 30 days; and RP25040, with a

maximum of 9.47% of the applied at 30 days. Volatile residues totaled 5.27% of the applied at 276 days (of which 5.23% was CO_2). Note: the soil used was the same soil used in the soil photolysis study (i.e., MRID# 42897101).

In a shorter 100-day study (MRID 44590501), iprodione degraded with a half-life between 23.9 and 100 days. The shorter half life was based on the regression of extractable iprodione only. The longer half life was based on the observation that at 100 days there was more than 50% unrecovered and uncharacterized material that could have been iprodione. Degradates were RP30228 (observed at a maximum of 29.5 %), RP36221 (observed at a maximum of 12.7%), and 3,5-DCA (observed at a maximum of 3.9%).

Sorption

Batch sorption tests (MRID 43349202) for four soils are summarized in **Table 4**. Iprodione isotherms for these four soils are reasonably linear, with Freundlich exponents from 0.85 to 0.91. The mean of the organic carbon partitioning coefficients is 426 ml/g which would be classified as moderately mobile by the FAO mobility classification scheme (USEPA, 2006).

Table 4. Sorption Parameters for Iprodione [4].

Soil	Fraction of Organic Carbon (foc)	Freundlich Coefficient K_F [1, 2]	Freundlich Exponent N [1]	K_{oc} (ml/g) [3]
Loam	0.085	43.1	0.908	507
Sandy loam	0.011	2.45	0.905	223
Loamy sand	0.005	2.16	0.858	431
Clay	0.012	6.52	1.204	543

(1) Freundlich Isotherm $S= K_F C^N$

(2) K_F has units of $[mg/kg][L/mg]^N$,

(3) K_{oc} value is based on the sorption coefficient (S/C, where S is sorbed concentration and C is aqueous concentration) that occurs at an aqueous concentration of 1 mg/L, which has a numerical value that is equivalent to K_F/f_{oc}.

(4) These values were calculated by the registrant using the amount of decanted volume of water as the amount of water in contact with the soil, as opposed to the correct way of performing this calculation which would have been to use the total volume of water. An assessment of this error showed that the volume of water would have been underestimated by about 10% (see MRID 43349202 Table A11.3). This type of error would most significantly affect the lower K_d estimates; whereas higher K_d values would be less affected. For the cases reported in this table the sorption coefficient error should be less than 20%. One value reported by the registrant had a K_d of 0.06 and the error associated with this would be so great as to make its value meaningless and thus this value was excluded from the analysis and this table.

Terrestrial Field Dissipation

Two terrestrial field dissipation studies are available (both described in MRID #41877401). Neither study monitored for the degradate 3,5-DCA. The two studies were conducted in California and North Carolina and are summarized below.

In a study conducted in San Juan Bautista, California, iprodione was applied 8 times to carrots at 1 lb ai/A/application. Iprodione dissipated with an observed DT_{50} of 7 days in the 0-15 cm soil layer of a silt loam soil (pH 7.9-8.0). The degradates RP30228 and RP32490 were recovered from the 0-15 and the 15-30 cm soil depths. Iprodione and its degradates were not detected below the 30-cm soil level. RP30228 was a maximum average of 0.47 ppm at 28 days after treatment, declining only to 0.15 ppm at 538 days. RP32490 was observed at relatively low levels (≤0.09 ppm) in the field. Field spike recoveries of iprodione at this site were 66 to 86%.

In a study conducted in North Carolina, iprodione was applied 8 times to carrots at 1 lb ai/A/application. The observed DT_{50} was less than 3 days in the 0-15 cm soil depth of a loamy sand soil (soil pH of 6.2 – 6.8). RP30228 and RP32490 were observed only in the 0-15 cm soil depth. No residues

of these degradate or iprodione were detected below 15 cm. The concentrations of RP30228 were lower (ranging from 0.01 to 0.08 ppm until 492 days). Recoveries of iprodione field spikes at this site were 66 to 86%.

Aquatic Field Dissipation

In aquatic field dissipation studies (MRID #43718301), iprodione was applied twice to flooded rice paddies at 0.5 lb/acre at a 15-day interval at two site—one in Waller County TX, and one in Washington County, MS. Iprodione was applied to the rice foliage at both sites (55% canopy coverage at TX, 85% at MS). The two sites were flooded for 1 month. The pH of the flood waters at both sites were in the range for which iprodione readily degrades by hydrolysis. Flood water dissipation half lives were 3.7 days in Texas and 2.9 days in Mississippi; soil half lives however were on the order of months. Maximum concentrations observed in both studies were around 500 ppb. Storage sample recoveries for 3,5-DCA were only 18%, and thus this study is not suitable for characterizing the formation or persistence of 3,5-DCA. The major degradates observed at both sites were RP 30228 and RP 37176.

Volatilization/Long-Range Transport

Iprodione is not particularly volatile as indicated by the approximated Henry's Law constant (derived from vapor pressure, solubility, and molecular weight) of 2.7×10^{-9} atm m^3/mol. Thus long-range transport should not be a particular concern. The Agency has not received any direct measurements of volatility information for 3,5-DCA. In the absence of such data, the Agency used EPISuite which estimated that the Henry's Law constant is much higher than for the parent (around 10^{-6} atm m^3/mol). Although this value would imply that 3,5-DCA should be more volatile than the parent, it did not show up in any of the volatile traps in the submitted laboratory studies.

3,5-DCA sorption

Batch sorption tests (MRID 45114101) for five soils are summarized in **Table 5**. Isotherms of 3,5-DCA for these five soils are nonlinear, with Freundlich exponents around 0.7. This means that the sorption affinity increases as concentrations decreases, and that 3,5-DCA will become less mobile as concentrations decrease. According to standard EFED practice, this chemical is classifieds as moderately mobile (USEPA, 2006), with an average K_{oc} of 664 ml/g.

Table 5. Batch Sorption Results for 3,5-DCA

Soil	FreundlichCoefficient [1,2] K_F	FreundlichExponent[1,2] N	K_{oc}[3] (ml/g)
Sandy loam	1.75	0.68	593
Loamy sand	7.17	0.634	626
Silt loam	10.98	0.692	380
Clay	9.17	0.743	932
Pond sediment	4.635	0.646	788

(1) Freundlich Isotherm $S= K_F C^N$

(2) K_F has units of $[mg/kg][L/mg]^N$,

(3) K_{oc} value is based on the sorption coefficient (S/C, where S is sorbed concentration and C is aqueous concentration) that occurs at an aqueous concentration of 1 mg/L, which has a numerical value that is equivalent to K_F/f_{oc}.

3,5-DCA Aerobic Soil Degradation

An aerobic soil metabolism study of 3,5-DCA on two different soils, showed little evidence that 3,5-DCA appreciably degraded over a 9-month period at 25°C (MRID#45239201). Apparent dissipation was caused by a high level of unextracted residue. Unextracted residues accounted for 66% and 81% of the applied in the two systems. The only residues that were distinguishable from the parent amounted to only 4 to 5% of the applied ^{14}C.

Monitoring

Following the 1998 iprodione RED, surface water monitoring was required for iprodione and the degradate 3,5-DCA. Following the 2000Vinclozolin RED (vinclozolin has the same 3,5-DCA degradate), groundwater monitoring of iprodione and the degradate 3,5-DCA was added to the monitoring requirements. The surface water monitoring program started in 2006 in watersheds that contained high numbers of golf courses. A ground water monitoring program was initiated by the registrant in conjunction with Suffolk County New York after iprodione was reported in Suffolk County groundwater. These two programs are ongoing and only preliminary results have been received. The preliminary report did not provide adequate ancillary information to enable thorough evaluation of the data. For example, although the report indicates that samples were taken from private drinking water wells, irrigation wells, vineyard wells, and golf course wells, the spatial context of the sampling locations were not given so it is unknown whether the sampling locations are representative of iprodione use areas. Additionally, well depths were not given for most of the samples which would be required in order to evaluate whether these are reasonable sampling wells. For some of the samples it was not apparent whether the samples were taken from ground water or from surface water.

The intent of the report was to show that work had begun on the monitoring program rather than to provide conclusions regarding iprodione groundwater issues. However, a cursory review of the reported results indicates that there were detections of iprodione and 3,5-DCA. All of the reported iprodione groundwater detections were at concentrations less than 1 ppb, except for one detection in an irrigation well that was 5.75 ppb (well depth not given but water table depth was stated to be 80 ft). Surface water detections of iprodione were higher with 3 detections greater than 1 ppb—8.8 ppb at a golf course pond, 1.1 ppb at a golf course pond, and 2.6 ppb at unknown type of surface water (identified as a greenhouse). Lower and less frequent concentrations were reported for 3,5-DCA in groundwater, with the maximum concentration of 0.44 ppb in a golf course well. Surface water detections of iprodione include 4 ppb and 1.5 ppb in golf course ponds, along with three other golf course pond samples less than 1 ppb. The iprodione/3,5-DCA assessment may need to be reevaluated upon receipt of the final monitoring reports.

The 1998 iprodione RED reviewed several non-targeted surface and groundwater studies (e.g., Oregon, Wisconsin, California, STORET) that showed little evidence of iprodione with mostly less than

0.1 ppb detections, but with higher values (1 to 3.5 ppb) reported in one drainage ditch. A recent check (Jan 2006) of NAQWA revealed no information regarding iprodione or 3,5 DCA detections.

Surface Water Exposure Modeling

Surface water concentrations were determined for both iprodione and the degradate 3,5-DCA. The parent concentrations are calculated in the first section that follows, and the degradate concentrations are calculated in the section that follows the parent.

Surface Water Estimates for Parent Iprodione

Methods for Determining Parent (Iprodione) Concentrations

Iprodione surface water estimated concentrations were determined for the iprodione uses listed in **Table 6**. For surface water concentration calculations due to all uses except rice, the models used were PRZM 3.12beta and EXAMS 2.98.04. Input parameters for PRZM/EXAMS are given in **Tables 6** and **7.** Parameter selections were determined according to EFED guidance (EFED, 2002) unless otherwise specified.

For the PRZM/EXAMS simulations, various application dates were simulated in an attempt to capture the well-known variability associated with application dates. The application dates that are given in **Table 6** are the ones that were used for presenting the primary results, and these dates were chosen with consideration for the label recommendations for application timing and preharvest interval (see Appendix 1) along with the crop dates associated with each PRZM scenario file. The primary application dates used in these simulations were selected from the approximate middle of the possible window of applications (using the model user's best judgment); however, the selection of the date is not a precise process, and there may be some variability about the date selection. In order to address this variability, simulations were also made using applications dates before and after those dates given in Table 6, but within the temporal window of possible application dates. The possible temporal window was evaluated using the application information from the labels (see **Appendix 1**) along with the emergence and harvest dates associated with each scenario.

Table 6. Use-Specific Scenarios and Usage Inputs for Surface Water Modeling Iprodione

Use	Application method	FEED Scenario	Iprodione Application Rate [lb. a.i./A]	Number of applications	Date of Application (interval)
almond/pistachio	ground spray	CA Almond	1	4	Feb7, 14,28, Mar7
almond/pistachio	aerial spray	CA Almond	1	4	Feb7, 14,28, Mar7
canola	ground spray	ND Canola	0.45	1	Jul 1
canola	aerial	ND Canola	0.45	1	Jul 1
cotton	in furrow	CA Cotton	0.27	1	May 5
cotton	in furrow	MS Cotton	0.27	1	May 1
cotton	in furrow	NC Cotton	0.27	1	June 1
stone fruits	aerial	GA Peaches	1	4	Mar 1,8,15,22
stone fruits	aerial	MI Cherries	1	4	Apr 25 May1,8,15
berries	ground spray	OR Berries	1	4	May 20, 31,14, 30
grapes	ground spray	NY Grapes	1	4	June20,30, July10,20
grapes	ground spray	CA Grapes	1	4	May 1,11, 21,31
strawberry	Aerial Spray	FL Strawberry	0.5	10	May 1,8,15,22, June11,18, 25,Jul 2,22,29
strawberry	Aerial Spray	FL Strawberry (new use)	1.0	4	May1,8,15,22
bean	Aerial Spray	MI Beans	1	2	June 1, 21
bean	Aerial Spray	OR Beans	1	2	May 5, 26
carrot	Aerial Spray	FL Carrot	1	4	Nov 20,27, Dec3,10
carrot	Aerial Spray	FL Carrot	0.5	10	starting Oct 9 (7 day interval)
onion	Aerial Spray	GA onion	0.75	5	start Mar 1 (14 day interval)
onion	Aerial Spray	CA onion	0.75	5	start Jan 10 (14 day interval)
onion	Aerial Spray	GA onion	0.5	10	start Mar 1 (7 day interval)
onion	Aerial Spray	CA onion	0.5	10	start Feb 18 (7 day interval)
Lettuce[2]	Aerial /Ground Spray	CA lettuce	1	3	start Feb 20 (10 day interval)
potato	Aerial Spray	ME Potatoes	1	4	start on July 1 (10 day interval)
Turf (golf courses, sod farms, ornamental turf)	Ground spray	PA turf	4	6	July 1 start (14 day interval)
Turf (golf courses, sod farms, ornamental turf)	Ground spray	FL Turf	4	6	July 1 start (14 day interval)
Turf (golf courses, sod farms, ornamental turf)	Ground spray	PA turf	1.25	4	July 21 start (7 day interval)
Turf (golf courses, sod farms, ornamental turf)	Ground spray	FL Turf	1.25	4	July 1 start (7 day interval)
ornamentals	Ground spray	OR Ornamental	1.25	4	July 1 start (7 day interval)
Rice	Not applicable	Interim Rice Model	0.5	2	Not applicable

(2) Lettuce label only allows that the 1st application be aerial, and the others are ground spray. Because implementation of this mixed scheme is inconvenient with current modeling tools, two simulations were made—one with all aerial and one with all ground spray. The expected results lie somewhere between the two. As the results show, the differences are negligible.

Table 7. PRZM (v3.12beta) and EXAMS (2.98.04) input parameters for Iprodione

PARAMETER (units)	VALUE	SOURCE	COMMENT
Application Rate (kg a.i./ha)	see Table 6	Label	See Table 6
Number of Applications	see Table 6	Label	
Interval between Applications	see Table 6	Label	
Molecular weight	330.2 g/mol	Iprodione RED, 1998	—
Henry's Law Constant	2.7 x 10^{-9}atm-m^3/mol	Iprodione RED, 1998	—
Vapor Pressure (torr)	2.7 x 10^{-7} torr	Iprodione RED, 1998	—
Solubility in Water @ 20 ^{O}C, pH 8	13 mg/L	Iprodione RED, 1998	—
Soil Partition Coefficient K_{OC}	426 ml/g	MRID: 43349202	Mean of 4 soils
CAM (Chemical Application Method)	See Table 6		See Table 6
Depth of Incorporation	default 4 cm	Iprodione label.	
Application efficiency	Ground spray: 0.99 Aerial spray: 0.95	Input Guidance.	
Spray drift fraction	Ground spray: 0.01 Aerial spray: 0.05	Input Guidance.	
Application date (day/month)	various	Labels	See Table 6, above
Hydrolysis Half-life @ pH =7	4.7 days	MRIDs: 41885401	pH 7 is the pH of the standard water bodies
Anaerobic Aquatic Metabolism Half-life (days)	stable	MRID: 43091002; 44590501	Studies provided were dominated by hydrolysis, so assumed stable
Aerobic Soil Metabolism Half-life	300 days	MRIDs: 43091002; 44590501	For iprodione, half life was conservatively estimated (deviating from Input Parameter Guidance, as guidance does not cover this situation) from 2 studies—one in which the half-life was >100 and one in which the half life was 300 days
Aqueous Photolysis Half-life @ pH 7	67 days	MRID: 41861901	
Aerobic Aquatic Metabolism Half-life	stable	MRID: 41927601; 42503801	Studies provided were dominated by hydrolysis, so assumed stable to aerobic metabolism

Results: Surface Water Concentration of Parent (Iprodione)

Model output from the surface water modeling using PRZM/EXAMS is given in **Table 8**. The highest concentrations (excluding rice use) are from uses on Florida turf, and this is due in a large extent to the high labeled application rate for turf, which is 24 lb of active ingredient per acre per year. The Florida turf use results in surface water concentrations of 100 ppb for peak, and 34 ppb for 21-day and 18 ppb for 60-day concentrations followed by strawberries with 97, 33 and 14 ppb for peak, 21-day and 60-day concentrations. These values represent the one-in-ten-year peak concentration for acute risk assessments, the one-in-ten-year 21-day and 60-day mean concentration, respectively. Acute concentrations from all the modeled crops fall in the range of 4.2 to 100 ppb; chronic concentrations are in the range of 0.6 to 34 ppb. Tier 2 scenarios that result in particularly high peak surface water concentrations include Florida turf, Florida strawberries, Florida carrots, and Georgia onions.

For iprodione use on rice, the Interim Rice Model gives a concentration (acute and chronic) of **500 ppb**, which is the highest surface water concentration of any use. The Interim Rice Model is a Tier1estimate in which concentrations are calculated from an assumed equilibration of pesticide with hypothetical quantities of water and sediment, and without any degradation of the pesticide. This model is intended to serve only as a screen, and if concerns are raised by the output of this model, further refinements should be considered. Maximum concentrations of iprodione measured in two aquatic field dissipation studies conducted on rice in Mississippi and Texas were also around 500 ppb, where measurements were taken within the paddy. Downstream concentrations would be expected to be lower than 500 ppb due to dilution and degradation.

Table 8. PRZM/EXAMS Estimates of surface water concentrations for iprodione by use.

Scenario	Peak	21-day	60-day
	Iprodione		
NY Grapes	18.9	6.08	3.39
CA Almonds/pistachio	15.9	6.09	3.13
FL Strawberry	96.9	32.5	14.0
ND Canola	4.23	1.27	0.64
MI Cherries (stonefruit)	12.2	4.07	1.68
FL Turf	100	34.1	18.2
CA Lettuce	31.9	10.7	4.66
GA Onion	47.6	18.9	11.6
FL Carrot	53.1	25.7	11.6

Surface Water Estimates for the degradate 3,5-DCA

Methods for Determining Parent (Iprodione) Concentrations

According to the registrant-proposed mechanisms of degradation, every pathway of iprodione degradation forms 3,5-DCA (although submitted study data do not always show formation of 3, 5-DCA). Therefore, it is reasonable to assume that 3,5-DCA can be simulated with the same scenarios as iprodione and with the same molar application rate as iprodione. Nine scenarios were chosen for 3,5-DCA simulations by selecting scenarios that gave the highest parent concentration from Table 10 (*i.e.*, FL turf, FL strawberry, CA lettuce, CA almonds/pistachio, GA onion, and FL carrot, MI cherries, ND canola, NY grapes). Application rates for these scenarios are the same as the equivalent iprodione applications except that they were adjusted by the molecular weight ratio (162/330). Chemical input parameters are summarized in **Tables 9a** for surface water and **Table 9b** for rice.

Table 9a. PRZM (v3.12 beta) and EXAMS (2.98.04) input parameters for 3,5-DCA

PARAMETER (units)	VALUE	SOURCE	COMMENT
Application Rate (kg a.i./ha)	Various		Same as in **Table 6** but adjusted by molecular weight ratio 162/330.
Number of Applications	Various		
Interval between Applications	Various		
Molecular weight	160 g/mol	Iprodione RED, 1998	-
Henry's Law Constant	10^{-6} atm-m^3/mol	EPI Suite	-
Vapor Pressure (torr)	2.7×10^{-9}	EPI Suite	-
Solubility in Water @ 20 ^{O}C, pH= 8	784 mg/L	EPI Suite	-
Soil Organic Carbon Partition Coefficient (K_{oc})	664 ml/g	MRID: 43349202	Mean value
CAM (Chemical Application Method)	Various	label	See **Table 6**, above
Depth of Incorporation	default 4 cm	Iprodione label.	Default PRZM value
Application efficiency	Ground spray: 0.99 Aerial spray: 0.95	Input Guidance.	
Spray drift fraction	Ground spray: 0.01 Aerial spray: 0.05	Input Guidance.	
Application date	Various	Labels	See **Table 6**
Hydrolysis Half-life	Assumed Stable	No data	3,5-DCA assumed stable
Aqueous Photolysis Half-life @ pH 7	Assumed Stable	No data	3,5-DCA assumed stable
Aerobic Aquatic Metabolism Half-life	Assumed Stable	No data	3,5-DCA assumed stable
Anaerobic Aquatic Metabolism Half-life	Assumed Stable	No data	3,5-DCA assumed stable
Aerobic Soil Metabolism Half-life	Stable	MRID: 45239201	Large amounts of unextracted material were present in study

[1] Parameters are selected as per Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides; Version I, February 28, 2002, except as noted..

Table 9b. Interim Rice Model input parameters for 3.5-DCA

Input Parameter	Value	Source	Comment
Annual Application Rate	0.49 lb iprodione./A	Label	3,5,DCA application rate = iprodione application rate adjusted by molecular weight ratio (162/330 = 0.49)
Soil Organic Carbon Partitioning Coefficient (K_{oc})	662 ml/g	MRID: 43349202	Average of 4 soils

As supported by registrant-submitted information, the fundamental assumption here is that all iprodione degrades to 3,5-DCA at one time or another. However, it is not known when the formation of 3,5-DCA will occur with respect to the time of application of iprodione to a field. It is not likely (as supported by registrant studies) that this transformation would occur rapidly. Rapid formation of 3,5-DCA from iprodione promotes high acute estimates because of the greater availability of DCA at one time; whereas slower formation would dampen peak 3,5-DCA formation, but have less impact on long-term average concentration. Thus, acute estimates derived in this manner are likely conservative. Importantly, conservative assumptions were made during the calculations of both 3,5-DCA and its parent iprodione, which would be contradictory if both assumptions occurred. For example, in the calculation of 3,5-DCA, it was assumed that rapid transformation of iprodione to 3,5-DCA occurred; whereas in the calculation for iprodione, it was assumed that iprodione degraded slowly. Clearly both cases cannot occur, but it is uncertain which case is the actual case. Thus both cases are presented in this assessment with the understanding that the concentrations derived for 3,5-DCA and iprodione are not intended to represent concurrent exposure concentrations.

Results: Surface Water Concentration of Degradate 3,5-DCA

Results for surface water concentrations of 3,5-DCA are given in **Table 10** for the six PRZM/EXAMS surface water simulations; DCA concentrations for rice acute and chronic exposures are 200 µg/L. As with the parent, the highest concentrations resulted from the Florida turf scenario with acute concentration of 1066 ppb and chronic concentration of 1057 ppb

Table10. Estimated surface water concentrations of 3,5-DCA by use.

Scenario	Peak	21-day	60-day
	DCA		
NY Grapes	226	225	225
CA Almonds/pistachio	149	149	148
FL Strawberry	1345	1344	1344
ND Canola	23.7	23.6	23.5
MI Cherries (stone fruit)	228	227	227
FL Turf	1066	1057	1057
CA Lettuce	313	312	310
GA Onion	680	680	679
FL Carrot	845	844	842

Terrestrial Exposure Assessment

Terrestrial exposure was also evaluated using EECs generated from a spreadsheet-based model (TREX Version 1.2.3) that calculates the decay of a chemical applied to foliar surfaces for single or multiple applications. The model uses the same principle as the batch code models FATE and TERREEC for calculation of terrestrial estimated exposure concentrations (TEEC) on plant surfaces following application. Further explanation of the model is presented in **APPENDIX 2**.

The terrestrial exposure assessment is based on the methods of Hoerger and Kenaga (1972)[7] as modified by Fletcher *et al.* (1994)[8]. Terrestrial estimated environmental concentrations (EECs) for nongranular formulations were derived for the proposed and revised crops along with selected row crops, and turf using maximum application rates and minimum intervals between applications. Uncertainties in the terrestrial EECs are primarily associated with a lack of data on interception and subsequent dissipation from foliar surfaces. When data are absent, as in this case, EFED assumes a 35-day foliar dissipation half life, based on the work of Willis and McDowell (1987)[9].

For pesticides applied as a nongranular product (*e.g.*, liquid, dust), the estimated environmental concentrations (EECs) on food items following product application are compared to LC_{50} values to assess risk. Uses and associated application rates modeled for terrestrial exposure assessments are presented in **Table 6**. Although some aquatic exposure estimates are provided for 3, 5-DCA, no terrestrial exposure estimates are provided for this degradate since terrestrial animal toxicity estimates for the degradate are not available.

Ecological Effect Characterization

Table 11 contains a summary of the ecological effect data used in assessing the potential risk of iprodione use to nontarget organisms. A more thorough discussion of the ecological effects of this chemical can be found in the ecological risk assessment chapter in support of the reregistration eligibility decision on iprodione. Although iprodione is similar in structure to vinclozolin and has been associated with effects on endocrine-mediated processes, the only study previously assessed suggesting potential effects on endocrine organs is a 2-year rat study showing testicular hyperplasia and reduced spermatozoa (426378-01).

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[7] Hoerger, F., and E.E. Kenaga. 1972. Pesticide residues on plants: Correlation of representative data as a basis for estimation of their magnitude in the environment. In F. Coulston and F. Korte, *eds.*, Environmental Quality and Safety: Chemistry, Toxicology, and Technology, Georg Thieme Publ, Stuttgart, West Germany, pp. 9-28.

[8] Hoerger, F., and E.E. Kenaga. 1972. Pesticide residues on plants: Correlation of representative data as a basis for estimation of their magnitude in the environment. In F. Coulston and F. Korte, *eds.*, Environmental Quality and Safety: Chemistry, Toxicology, and Technology, Georg Thieme Publ, Stuttgart, West Germany, pp. 9-28.

[9] Willis, Guye H., and Leslie.L. McDowell, 1987. Pesticide Persistence on Foliage. in *Reviews of Environmental Contamination and Toxicology*. 100:23-73.

Information on the potential ecological effects of iprodione are available from both registrant-submitted data on the technical grade active ingredient and through published open literature available through EPA's database ECOTOX[10]. The ECOTOXicology database (ECOTOX) is a source for locating single chemical toxicity data for aquatic life, terrestrial plants and wildlife. ECOTOX was created and is maintained by the U.S.EPA, Office of Research and Development (ORD), and the National Health and Environmental Effects Research Laboratory's (NHEERL's) Mid-Continent Ecology Division (MED). ECOTOX integrates three previously independent databases - AQUIRE, PHYTOTOX, and TERRETOX - into a unique system which includes toxicity data derived predominately from the peer-reviewed literature, for aquatic life, terrestrial plants, and terrestrial wildlife, respectively. A review of open literature contained in ECOTOX did not reveal any more sensitive endpoints than those contained in **Table 12**.

Table 11. Summary of acute and chronic toxicity data for terrestrial organisms exposed to iprodione.

Species	Acute Toxicity				Chronic Toxicity	
	LD_{50} mg/kg	Acute Oral Toxicity (MRID)	5-day LC_{50} (ppm)	Subacute Dietary Toxicity (MRID)	NOAEC/ LOAEC (ppm) (MRID)	Affected Endpoints
Northern Bobwhite quail (*Colinus virginianus*)	930	Slightly toxic (Acc# 232703)	>5620	Practically nontoxic (416041-02)	300 / 1,000 (Acc# 00099126)	
Laboratory rat *Rattus norvegicus*	1160	Slightly toxic (236497)	nd	nd	150 / 300 (426378-01)	Testicular hyperplasia/ reduced spermatozoa in epididymis
Honey bee *Apis mellifera*	>120 µg/bee	Practically nontoxic (442620-61)	nd	nd	nd	nd

nd no data

[10] U.S. Office of Research and Development National Health and Environmental Effects Research Laboratory Mid-Contnent Ecology Division ECOTOXicology Database http://cfpub.epa.gov/ecotox/

Table 12. Summary of acute and chronic aquatic toxicity estimates using technical grade iprodione.

Species	Acute Toxicity		Chronic Toxicity	
	96-hr LC_{50} (µg/L)	Acute Toxicity (MRID)	NOAEC / LOAEC (µg/L)	Affected Endpoints (MRID)
Bluegill Sunfish *Lepomis macrochirus*	3,100	moderately toxic 4702540-18	nd	nd
Fathead Minnow *Pimephales promelas*	nd	nd	260 / 550	Larval survival (405508-01)
Water flea *Daphnia magna*	240	Highly toxic (416420-01)	170 / 330	Reproduction ; larval survival; growth (408920-01)
Sheepshead minnow *Cyprinodon variegatus*	7,700	Moderately toxic (404892-05)	nd	nd
Mysid shrimp *Mysidopsis bahia*	680	Highly toxic (404892-04)	3.5 / 7.5	Reproduction (408322-01)

nd no data

Toxicity estimates for freshwater and estuarine/marine plants are listed in **Table 13**. The study on vascular aquatic plants was recently submitted and not discussed in the original ecological risk assessment.

Table 13. Summary of acute toxicity estimates for freshwater and estuarine/marine plants using technical grade iprodione.

Species	Acute Toxicity		
	EC_{50} (µg/L)	NOAEC (µg/L)	MRID
Green Algae *Psuedokirchneriella subcaptata*	2000	140	416041-07
Marine Diatom *Skeletonema costatum*	330	30	416041-09
Duckweed Lemna gibba	>12,640	12,640	457413-01

Toxicity estimates for the degradate 3,5-dichloroaniline (**Table 14**) were obtained using ASTER. The ASTER (ASsessment Tools for the Evaluation of Risk) database[11] integrates aquatic and terrestrial toxicity database information and quantitative structure activity relationships (QSARs) to assess the environmental risk of discrete chemicals. ASTER is designed to provide high quality data for discrete chemicals, when available in the ECOTOX database, and mechanistically-based QSAR estimates when data are lacking.

[11] ASTER (Assessment Tools for the Evaluation of Risk) http://cfistage.rtpnc.epa.gov/aster/

Table 14. ASTER ecotoxicity profile for 3,5-dichloroaniline

Habitat	Taxon Group	Name	Endpoint	Dur (d)	Median Conc
A	Fish	Rainbow trout *Oncorhynchus mykiss*	LC_{50}	4	5819.96 µg/L
A	Fish	Channel catfish *Ictalurus punctatus*	LC_{50}	4	6127.34 µg/L
A	Invertebrate	Waterflea *Daphnia magna*	LC_{50}	4	7982.50 µg/L
A	Fish	Bluegill sunfish *Lepomis macrochirus*	LC_{50}	4	11307.36 µg/L
A	Fish	Fathead minnow *Pimephales promelas*	LC_{50}	4	14197.58 µg/L

RISK CHARACTERIZATION

Risk Estimation

A means of integrating the results of exposure and ecotoxicity data is called the quotient method. For this method, risk quotients (RQs) are calculated by dividing exposure estimates by ecotoxicity values, both acute and chronic (**Equation 2**).

$$Equation\ 2.\quad RQ = \frac{EEC}{Toxicity}$$

Risk quotients are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. Exceedance of the LOC indicates that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories: (1) **acute** - potential for acute risk to Federally unlisted species is high, regulatory action may be warranted in addition to restricted use classification (2) **acute restricted use** - the potential for acute risk is high, but this may be mitigated through restricted use classification (3) **acute listed species** - the potential for acute risk to endangered (Federally listed) species is high, regulatory action may be warranted, and (4) **chronic risk** - the potential for chronic risk is high, regulatory action may be warranted. Currently, EFED does not perform assessments for chronic risk to plants and acute or chronic risks to non-target insects.

The ecotoxicity test values (*i.e.*, measurement endpoints) used in the acute and chronic risk quotients are obtained from the results of required studies. Examples of ecotoxicity values from the results of short-term laboratory studies that assess acute effects are: (1) median lethal concentrations (LC_{50}) (fish and birds) (2) median lethal doses (LD_{50}) (birds and mammals) (3) median effects concentrations (EC_{50}) (aquatic plants and aquatic invertebrates) and (4) first quartile effects concentration (EC_{25}) (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: (1) lowest observed adverse effect concentration (LOAEC) (birds, fish, and aquatic invertebrates) and (2) no observed adverse effect concentration (NOAEC) (birds, fish and aquatic invertebrates). For birds, mammals, and all aquatic organisms, the NOAEC is the ecotoxicity test value used in assessing chronic risk. Other values may be used when justified. Risk presumptions, along with the corresponding RQs and LOCs, are summarized in **Tables 15** through **17.**

Table 15. Risk presumptions for terrestrial animals (birds and wild mammals)

Risk Presumption	RQ	LOC
Acute High (Non-listed) Risk	EEC[1]/LC_{50} or LD_{50}/ft^2 or LD_{50}/day[3]	0.5
Acute Restricted Use	EEC/LC_{50} or LD_{50}/ft^2 or LD_{50}/day (or LD_{50} < 50 mg/kg)	0.2
Acute Endangered (Listed) Species	EEC/LC_{50} or LD_{50}/ft^2 or LD_{50}/day	0.1
Chronic Risk	EEC/NOAEC	1

[1] abbreviation for Estimated Environmental Concentration (ppm) on avian/mammalian food items

[2] $\frac{mg/ft^2}{LD_{50} * wt. of bird}$ [3] $\frac{mg\ of\ toxicant\ consumed/day}{LD_{50} * wt. of bird}$

Table 16. Risk presumptions for aquatic animals

Risk Presumption	RQ	LOC
Acute High (Non-listed) Risk	EEC[1]/LC_{50} or EC_{50}	0.5
Acute Restricted Use	EEC/LC_{50} or EC_{50}	0.1
Acute Endangered (Listed) Species	EEC/LC_{50} or EC_{50}	0.05
Chronic Risk	EEC/NOAEC	1

[1] EEC = (ppm or ppb) in water

Table 17. Risk presumptions for plants

Risk Presumption	RQ	LOC
Terrestrial and Semi-Aquatic Plants		
Acute High (Non-listed) Risk	EEC[1]/EC_{25}	1
Acute Endangered (Listed) Species	EEC/EC_{05} or NOAEC	1
Aquatic Plants		
Acute (Non-listed) Risk	EEC[2]/EC_{50}	1
Acute Endangered (Listed) Species	EEC/EC_{05} or NOAEC	1

[1] EEC = lbs ai/A

[2] EEC = (µg/L or mg/L) in water

Acute risk quotients for freshwater fish and invertebrates are presented in **Table 18** and show that for freshwater fish, only the direct application of iprodione to water for rice production exceeds the acute risk to endangered species (RQ>0.05) and the acute restricted use (RQ≥0.1) levels of concern. For freshwater invertebrates, except for the use of iprodione on canola, the acute risk to endangered species level of concern is exceeded for all of the other uses of iprodione evaluated. For strawberries, lettuce, onions, carrots, rice and turf, the acute restricted use LOC is exceeded. Use on rice exceeds the acute risk to non-listed species LOC (RQ≥0.5).

For both freshwater fish and invertebrates, only the direct application to water for use on rice exceeds the chronic risk LOC (RQ≥1) (**Table 19**).

Table 18 Acute RQ Values for Freshwater Fish and Invertebrates Exposed to Iprodione.

Use Scenario	Peak EEC µg/L	Channel Catfish 96-hr LC_{50}	Acute Fish RQ Value	Daphnid 48-hr EC_{50}	Acute Invertebrate RQ Value
NY Grapes	18.9	3100	<0.01	240	0.08[a]
CA Almonds/pistachio	15.9	3100	<0.01	240	0.07[a]
FL Strawberries	96.9	3100	0.03	240	0.40[a b]
ND Canola	4.23	3100	<0.01	240	0.02
MI Cherries	12.2	3100	<0.01	240	0.05[a]
FL Turf	100	3100	0.03	240	0.42[a b]
CA Lettuce	31.9	3100	0.01	240	0.13[a b]
GA Onion	47.6	3100	0.01	240	0.20[a b]
FL Carrot	53.1	3100	0.02	240	0.22[a b]
Rice	500	3100	0.16[a b]	240	2.1[a b c]

[a] Exceeds acute risk to endangered species level of concern (RQ≥0.05)
[b] Exceeds acute restricted use level of concern (RQ>0.1).
[c] Exceeds acute risk to non-listed species level of concern (RQ≥0.5)

Table 19 Chronic RQ Values for Freshwater Fish and Invertebrates Exposed to Iprodione.

Use Scenario	60-day EEC µg/L	Fathead Minnow NOEC	Chronic Fish RQ Value	21-day EEC µg/L	Daphnid NOEC	Chronic Invertebrate RQ Value
NY Grapes	3.39	260	0.01	6.08	170	0.04
CA Almonds/pistachio	3.13	260	0.01	6.09	170	0.04
FL Strawberries	14	260	0.05	32.5	170	0.19
ND Canola	0.64	260	0.002	1.27	170	0.007
MI Cherries	1.68	260	0.006	4.07	170	0.02
FL Turf	18.2	260	0.07	34.1	170	0.20
CA Lettuce	4.66	260	0.02	10.7	170	0.06
GA Onion	11.6	260	0.04	18.9	170	0.11
FL Carrot	11.6	260	0.04	25.7	170	0.15
Rice	500	260	1.9[a]	500	170	2.9[a]

[a] Exceeds chronic risk level of concern (RQ≥1.0)

Acute risk quotients for estuarine/marine fish and invertebrates are presented in **Table 20** and only the use on rice exceeds the acute risk to endangered species LOC for fish. However, for estuarine/marine invertebrates, the acute restricted use and the acute risk to endangered species LOCs are exceeded for use on strawberries and turf. For use on rice, the acute risk to non-listed species LOC is exceeded.

No data are available to assess the potential chronic risk to estuarine marine fish; however, the chronic risk LOC is exceeded for estuarine/marine invertebrates across all of the uses evaluated (RQ range: 1.2 – 143) except canola (RQ=0.36) (**Table 21**).

Table 20 Acute RQ Values for Estuarine/Marine Fish and Invertebrates Exposed to Iprodione.

Use Scenario	Peak EEC µg/L	Sheepshead Minnow 96-hr LC_{50}	Acute Fish RQ Value	Mysid 96-hr EC_{50}	Acute Invertebrate RQ Value
NY Grapes	18.9	7700	<0.01	680	0.03
CA Almonds/pistachio	15.9	7700	<0.01	680	0.02
FL Strawberries	96.9	7700	0.01	680	0.14 [a b]
ND Canola	4.23	7700	<0.01	680	0.006
MI Cherries	12.2	7700	<0.01	680	0.02
FL Turf	100	7700	0.01	680	0.15 [a b]
CA Lettuce	31.9	7700	<0.01	680	0.05
GA Onion	47.6	7700	<0.01	680	0.07
FL Carrot	53.1	7700	<0.01	680	0.08
CA Rice	500	7700	0.06 [a]	680	0.74 [a b c]

[a] Exceeds acute risk to endangered species level of concern (RQ≥0.05)
[b] Exceeds acute restricted use level of concern (RQ>0.1).
[c] Exceeds acute risk to non-listed species level of concern (RQ≥0.5)

Table 21 Chronic RQ Values for Estuarine/Marine Fish and Invertebrates Exposed to Iprodione.

Use Scenario	21-day EEC µg/L	Mysid NOEC µg/L	Chronic Invertebrate RQ Value
NY Grapes	6.08	3.5	1.7[a]
CA Almonds/pistachio	6.09	3.5	1.7 [a]
FL Strawberries	32.5	3.5	9.3 [a]
ND Canola	1.27	3.5	0.36
MI Cherries	4.07	3.5	1.2 [a]
FL Turf	34.1	3.5	9.7 [a]
CA Lettuce	10.7	3.5	3.1 [a]
GA Onion	18.9	3.5	5.4 [a]
FL Carrot	25.7	3.5	7.3 [a]
CA Rice	500	3.5	143 [a]

[a] Exceeds chronic risk level of concern (RQ≥1.0)

Acute risk quotients for the most sensitive aquatic plants are presented in **Table 22** and indicat that none of the uses evaluated exceed the acute risk to endangered species LOC (RQ≥1.0); however, all of the uses except grapes, almonds/pistachios, canola and cherries exceed the acute risk to endangered plant LOC (RQ range 1.1 – 16.7). Although not reported in the table, aquatic vascular plants are not particularly sensitive to iprodione and there RQ values are below the acute risk to endangered species LOC.

Table 22. Acute RQ Values for Freshwater and Estuarine/Marine Plants Exposed to Iprodione.

Use Scenario	Peak EEC µg/L	Green Algae NOEC µg/L	Freshwater Plant RQ Value	Marine Diatom NOEC	Estuarine/Marine Plant RQ Value
NY Grapes	18.9	140	<1.0	30	<1.0
CA Almonds/pistachio	15.9	140	<1.0	30	<1.0
FL Strawberries	96.9	140	<1.0	30	3.2[a]
ND Canola	4.23	140	<1.0	30	<1.0
MI Cherries	12.2	140	<1.0	30	<1.0
FL Turf	100	140	<1.0	30	3.3[a]
CA Lettuce	31.9	140	<1.0	30	1.1[a]
GA Onion	47.6	140	<1.0	30	1.6[a]
FL Carrot	53.1	140	<1.0	30	1.8[a]
CA Rice	500	140	<1.0	30	16.7[a]

[a] Exceeds the acute risk to endangered plant level of concern (RQ≥1.0)

Based on acute toxicity estimates from ASTER, RQ values were calculated for freshwater fish and invertebrates exposed to the 3,5-DCA degradate of iprodione (**Table 23**). Acute restricted use and the acute risk to endangered species LOCs are exceeded at maximum application rates to strawberries, turf, onions and carrots for freshwater fish (RQ range: 0.12 – 0.23). For freshwater invertebrates, acute restricted use and the acute risk to endangered species LOCs are exceeded at maximum application rates to strawberries, turf and carrots (RQ range 0.11 – 0.17) while the acute risk to endangered species LOC is exceeded for use on onions (RQ=0.09).

Table 23 Acute RQ Values for Freshwater Fish and Invertebrates Exposed to 3,5-DCA. Acute toxicity values estimated using ASTER (Assessment Tools for the Evaluation of Risk) http://cfistage.rtpnc.epa.gov/aster/.

Use Scenario	Peak EEC µg/L	Bluegill 96-hr LC_{50}	Acute Fish RQ Value	Daphnid 48-hr EC_{50}	Acute Invertebrate RQ Value
NY Grapes	226	5820	0.04	7983	0.03
CA Almonds/pistachio	149	5820	0.03	7983	0.02
FL Strawberries	1345	5820	0.23[a b]	7983	0.17[a b]
ND Canola	23.7	5820	<0.01	7983	<0.01
MI Cherries	228	5820	0.04	7983	0.03
FL Turf	1066	5820	0.18[a b]	7983	0.13[a b]
CA Lettuce	313	5820	0.05	7983	0.04
GA Onion	680	5820	0.12[a b]	7983	0.09[a]
FL Carrot	845	5820	0.15[a b]	7983	0.11[a b]

[a] Exceeds acute risk to endangered species level of concern (RQ≥0.05)
[b] Exceeds acute restricted use level of concern (RQ>0.1).
[c] Exceeds acute risk to non-listed species level of concern (RQ≥0.5)

Acute dietary-based risk quotients for birds are presented in **Table 24** and indicated that all modeled use rates greater than 0.5 lbs a.i./A exceed the acute risk to endangered species LOC for birds feeding on short grasses. The only uses where acute RQ values were consistently below acute risk LOCs were strawberries and canola owing to their application rates of less than 0.5 lbs a.i./A.

Except for canola, chronic dietary-based RQ values exceeded the chronic risk LOC for birds feeding on short grasses (**Table 24**). Multiple applications of greater than 0.75 lbs a.i./A also exceeded the chronic risk LOC for birds feeding on tall grasses and broadleaf plants/small insects. None of the uses evaluated exceeded the chronic risk LOC for birds feeding on fruits, pods, seeds and large insects.

Acute dose-based RQ values for mammals (**Table 25**) indicate that uses with application rates greater than 0.45 lbs a.i./A exceed the acute risk to endangered species LOC for small (15 g) and intermediate-sized (35 g) mammals feeding on short grasses. At multiple applications of 0.75 lbs a.i./A or greater, the acute endangered species LOC is exceeded across all size classes for mammals feeding on short grass and for small mammals feeding on tall grasses. At the highest multiple application rate evaluated, *i.e.*, 4 applications of 1.25 lbs a.i./A with a 7-day reapplication interval, the acute risk to endangered species LOC is exceeded for all size classes feeding on short grasses, tall grasses, and broadleaf plants/small insects. Not one of the uses evaluated exceeded and of the acute risk LOC for any size mammal feeding on fruits/pods/large insects and seeds.

Except for the lowest use rate on canola, *i.e.*, single application of 0.45 lbs a.i./A, the RQ values for the remaining uses (**Table 26**) exceed the chronic risk LOC for mammals feeding on short grasses, tall grasses and broadleaf plants/small insects (RQ range: 1.53 – 6.58).

Table 24 Acute and chronic dietary-based risk quotients for birds following application of iprodione to various crops.

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Maximum EEC (mg/kg)[a]	Acute RQ (EEC/LC_{50})	Chronic RQ (EEC/ NOAEC)
Almond/ Pistachio	1 lbs (4 / 7)	Short grass	789	0.14[a]	2.63[b]
		Tall grass	362	0.06	1.21[b]
		Broadleaf plants/small insects	443	0.08	1.48[b]
		Fruits, pods, seeds, and large insects	49.3	0.01	0.16
Canola	0.45 (1 / na)	Short grass	108	0.02	0.36
		Tall grass	49.5	0.01	0.17
		Broadleaf plants/small insects	60.8	0.01	0.20
		Fruits, pods, seeds, and large insects	6.75	<0.01	0.02
Stone Fruits (Cherries), Carrots	1 (4 / 7)	Short grass	789	0.14[a]	2.63[b]
		Tall grass	362	0.06	1.21[b]
		Broadleaf plants/small insects	443	0.08	1.48[b]
		Fruits, pods, seeds, and large insects	49.3	0.01	0.16
Grapes	1 (4 / 10)	Short grass	731	0.13[a]	2.44[b]
		Tall grass	334	0.06	1.12[b]
		Broadleaf plants/small insects	411	0.07	1.37[b]
		Fruits, pods, seeds, and large insects	45.7	0.01	0.15
Strawberries, Carrots, Onions	0.5 (10 / 7)	Short grass	501	0.09	1.67[b]
		Tall grass	230	0.04	0.77
		Broadleaf plants/small insects	282	0.05	0.94
		Fruits, pods, seeds, and large insects	31.3	0.01	0.10
Onions	0.75 (5 / 14)	Short grass	558	0.10[a]	1.9[b]

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Maximum EEC (mg/kg)[a]	Acute RQ (EEC/LC_{50})	Chronic RQ (EEC/ NOAEC)
		Tall grass	256	0.05	0.85
		Broadleaf plants/small insects	314	0.06	1.1 [b]
		Fruits, pods, seeds, and large insects	34.9	0.01	0.12
Lettuce	1 (3 / 10)	Short grass	598	0.11 [a]	2.0 [b]
		Tall grass	274	0.05	0.91
		Broadleaf plants/small insects	337	0.06	1.1 [b]
		Fruits, pods, seeds, and large insects	37.4	0.01	0.12
Turf	1.25 (4 / 7)	Short grass	986	0.18 [a]	3.3 [b]
		Tall grass	452	0.08	1.5 [b]
		Broadleaf plants/small insects	555	0.10 [a]	1.9 [b]
		Fruits, pods, seeds, and large insects	61.7	0.01	0.21

[a] Exceeds acute risk to endangered species level of concern (RQ≥0.1)
[b] Exceeds chronic risk level of concern (RQ≥1)

Table 25. Acute dose-based mammalian RQ values for iprodione uses.

Use/App. Method	Appl. Rate lbs. a.i./A (# app / interval, days)	Body Weight, g	Mammalian Acute Risk Quotients				
			Short Grass	Tall Grass	Broadleaf Plants/Small Insects	Fruits/pods/ large insects	Seeds
Almond/ Pistachio/ Stone Fruits (Cherries)/ Carrots (high)	1 lbs (4 / 7)	15	0.30 [a b]	0.14 [a]	0.17 [a]	0.02	<0.01
		35	0.25 [a b]	0.12 [a]	0.14 [a]	0.02	<0.01
		1000	0.14 [a]	0.06	0.08	0.01	<0.01
Canola	0.45 (1 / na)	15	0.04	0.02	0.02	<0.01	<0.01
		35	0.03	0.02	0.02	<0.01	<0.01
		1000	0.02	0.01	0.01	<0.01	<0.01
Grapes	1 (4 / 10)	15	0.27 [a b]	0.13 [a]	0.15 [a]	0.02	<0.01
		35	0.23 [a b]	0.11 [a]	0.13 [a]	0.01	<0.01
		1000	0.13 [a]	0.06	0.07	0.01	<0.01
Strawberries, Carrots (low), Onions (low)	0.5 (10 / 7)	15	0.19 [a]	0.09	0.11 [a]	0.01	<0.01
		35	0.16 [a]	0.07	0.09	0.01	<0.01
		1000	0.09	0.04	0.05	0.01	<0.01
Onions (high)	0.75 (5 / 14)	15	0.21 [a b]	0.10 [a]	0.12 [a]	0.01	<0.01
		35	0.18 [a]	0.08	0.10 [a]	0.01	<0.01
		1000	0.10 [a]	0.04	0.05	0.01	<0.01
Lettuce	1 (3 / 10)	15	0.22 [a b]	0.10 [a]	0.13 [a]	0.01	<0.01
		35	0.19 [a]	0.09	0.11 [a]	0.01	<0.01
		1000	0.10 [a]	0.05	0.06	0.01	<0.01
Turf	1.25 (4 / 7)	15	0.37 [a b]	0.17 [a]	0.21 [a b]	0.02	0.01
		35	0.32 [a b]	0.14 [a]	0.18 [a]	0.02	<0.01
		1000	0.17 [a]	0.08	0.10 [a]	0.01	<0.01

[a] Exceeds acute risk to endangered species level of concern (RQ≥0.1)
[b] Exceeds acute restricted use level of concern (RQ≥02)

Table 26. Chronic mammalian dietary-based risk quotients for use of iprodione.

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Maximum EEC (mg/kg)[a]	Chronic RQ (EEC/ NOAEC)
Almond/ Pistachio, Stone Fruits (Cherries), Carrots (high)	1 lbs (4 / 7)	Short grass	789	5.26[a]
		Tall grass	362	2.41[a]
		Broadleaf plants/small insects	443	2.96[a]
		Fruits, pods, seeds, and large insects	49.3	0.33
Canola	0.45 (1 / na)	Short grass	108	0.72
		Tall grass	49.5	0.33
		Broadleaf plants/small insects	60.8	0.41
		Fruits, pods, seeds, and large insects	6.75	0.05
Grapes	1 (4 / 10)	Short grass	731	4.87[a]
		Tall grass	334	2.23[a]
		Broadleaf plants/small insects	411	2.74[a]
		Fruits, pods, seeds, and large insects	45.7	0.30
Strawberries, Carrots (low), Onions (low)	0.5 (10 / 7)	Short grass	501	3.34[a]
		Tall grass	230	1.53[a]
		Broadleaf plants/small insects	282	1.88[a]
		Fruits, pods, seeds, and large insects	31.3	0.21
Onions (high)	0.75 (5 / 14)	Short grass	558	3.72[a]
		Tall grass	256	1.70[a]
		Broadleaf plants/small insects	314	2.09[a]
		Fruits, pods, seeds, and large insects	34.9	0.23
Lettuce	1		598	3.99[a]

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Maximum EEC (mg/kg)[a]	Chronic RQ (EEC/ NOAEC)
	(3 / 10)	Short grass	274	1.83 [a]
		Tall grass	337	2.24 [a]
		Broadleaf plants/small insects	37.4	0.25
		Fruits, pods, seeds, and large insects		
Turf	1.25 (4 / 7)	Short grass	986	6.58 [a]
		Tall grass	452	3.01 [a]
		Broadleaf plants/small insects	555	3.70 [a]
		Fruits, pods, seeds, and large insects	61.7	0.41

[a] Exceeds chronic risk LOC (RQ≥1).

Risk Discussion

Iprodione's primary route of degradation is through alkaline hydrolysis, and under acid conditions the chemical can persist with half-lives around four months. The chemical is moderately mobile and can be transported to aquatic environment through runoff and leaching. A major degradate of iprodione is 3,5-dichloroaniline. Although exposure modeling extends beyond the uses identified in the data packages (DP Barcodes D315437 and D313332) which include strawberries, stone fruits, grapes, canola, pistachios and almonds, the crops modeled provide some context for how risks may differ from those identified in the original risk assessment in support of the reregistration eligibility decision for iprodione.

Based on exposure modeling, there is sufficient iprodione in water to exceed the acute risk to Federally-listed threatened and endangered species LOC for freshwater invertebrates for all of the uses evaluated except canola. For freshwater fish, the only use to exceed the acute risk to endangered species LOC is from the direct application of iprodione to water in rice production. The chronic risk LOC is also exceeded for both freshwater fish and invertebrates following application to rice alone. For estuarine/marine invertebrates, the acute risk LOC for listed species is exceeded for use of iprodione on strawberries, turf and rice. No data are available to evaluate the potential chronic effects of iprodione on estuarine/marine fish, however, all of the uses of iprodione except canola exceed the chronic risk LOC for estuarine/marine invertebrates by factors ranging from 1.2 to 143X. Based on exposure estimates for the primary degradate of iprodione (*i.e.*, 3,5-DCA) and using QSAR-derived toxicity endpoints for freshwater fish and invertebrates, the acute risk to listed species LOC is exceeded for both taxa at the maximum application rates used on strawberries, turf, onions and carrots by factors ranging from 2.4 to 4.6X.

Risk quotients are calculated for terrestrial animals in two ways depending on the available toxicity data. For birds, RQ values are based on dietary LC_{50} values, whereas for mammals, RQ values for iprodione are based on oral LD_{50} values since these represented the most sensitive endpoints for each

taxa. In general, dose-based RQ values are typically higher than dietary-based RQ values since the former take into account that different-sized animals have differing energy requirements and have to consume differing amounts of food. If dietary-based RQ values were adjusted for the differential food consumption, they would likely approach the dose-based values. Potenital risk from 3, 5-DCA were not evaluated since toxicity estimates for terrestrial animals were not available.

Application rates greater than 0.5 lbs a.i./A exceed the acute risk to listed species LOC for birds using dietary-based RQ values. Only use on canola and strawberries were below the acute risk LOCs. Similarly, except for canola, dietary-based RQ values for all of the uses evaluated exceeded the chronic risk LOC for birds feeding on short grasses. Multiple applications of greater than 0.75 lbs a.i./A also exceed the chronic risk LOC for birds feeding on tall grasses and broadleaf plants/small insects.

For mammals, application rates greater than 0.45 lbs a.i./A result in dose-based RQ values which exceed the acute risk to endangered species LOC for small mammals feeding on short grasses. Again, only the use on canola is below any of the acute risk LOCs. At higher application rates, the acute risk to listed species LOC is exceeded for larger-sized mammal feeding on a broader range of forage categories. At the highest application rate evaluated (*i.e.*, 4 applications of 1.25 lbs a.i./A with a 7-day reapplication interval), the acute risk to endangered species LOC is exceeded for small, intermediate, and large mammals feeding in all forage categories except fruits/pods/large insects and seeds. The acute restricted use LOC is exceeded, at the highest application rate, across small and intermediate-sized mammals feeding on short grasses and for small mammals feeding on broadleaf plants/small insects. Additionally, canola was the only use below the chronic risk LOC for mammals; all other uses evaluated exceed the chronic risk LOC by factors ranging between 1.5 to 6.6X for mammals feeding in all forage categories except fruits/pods/seeds/large insects.

Endocrine Disruption

Mammalian toxicity studies have indicated that chronic dietary exposure to iprodione resulted in testicular hyperplasia and reduced spermatozoa in the epididymis of rats. Aquatic toxicity studies indicate effects on reproduction in both fish and invertebrates. Whether these test results reflect the ability of iprodione to act on endocrine-mediated processes is uncertain. Additionally, iprodione has a structure similar to that of vinclozolin, an antiandrogenic compound; however, there is uncertainty regarding the extent to which iprodione may act through a similar mode of action.

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "*may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effects as the Administrator may designate.*" Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was scientific basis for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP). When the appropriate screening and/or testing protocols being considered under the Agency's EDSP have been developed, iprodione may be subjected to additional screening and/or testing to better characterize effects related to endocrine disruption.

Uncertainties

Age Class and Sensitivity of Effects Thresholds

Test organism age may have a significant impact on the observed sensitivity to a toxicant. The screening risk assessment acute toxicity data for fish are collected on juvenile fish weighing between 0.1 and 5 grams. Aquatic invertebrate acute testing is performed on recommended immature age classes (*e.g.*, first instar for daphnids, second instar for amphipods, stoneflies and mayflies, and third instar for midges). Similarly, acute dietary testing with birds is also performed on juveniles, with mallard being 5-10 days old and quail 10-14 days old. The screening risk assessment has no current provisions for a generally applied method that accounts for uncertainty associated with study organism age. In so far as the available toxicity data may provide ranges of sensitivity information with respect to age class, the risk assessment uses the most sensitive life-stage information as the screening endpoint.

Additionally, this assessment does not evaluate whether iprodione could be more toxic for organisms that have lower metabolic activity. This may occur in more sensitive life stages and may render these organisms more vulnerable to chronic effects.

Lack of Effects Data for Amphibians and Reptiles

Currently, toxicity studies on terrestrial-phase amphibians and reptiles are not required for pesticide registration. Since these data are lacking, the Agency uses birds as surrogates for terrestrial-phase amphibians and reptiles. These surrogates are thought to be reflective of or protective (more sensitive) of herpetofauna or are likely to experience higher exposures based on dietary needs or behavior. Amphibians are characterized by a permeable skin. For terrestrial species, the difference between amphibians and birds and reptiles and birds is quite large. Terrestrial amphibians and reptiles are both ectothermic while birds are endothermic; birds have a higher basal metabolic rate required to maintain constant body temperature. The higher metabolic demands of birds may predispose birds to higher relative exposures. However, this does not address any potential differences in toxicity. To date, there are few controlled studies on reptile species that could be used to compare to similar studies on birds. *A priori*, there is no strong reason to think that one taxon is more or less sensitive than another. Further research is required to determine whether, in general, reptiles and terrestrial-phase amphibians are suitably represented by bird species in assessing risks.

Use of the Most Sensitive Species Tested

Although the screening risk assessment relies on a selected toxicity endpoint from the most sensitive species tested, it does not necessarily mean that the selected toxicity endpoints reflect sensitivity of the most sensitive species existing in a given environment. The relative position of the most sensitive species tested in the distribution of all possible species is a function of the overall variability among species to a particular chemical. The relationship between the sensitivity of the most tested species versus wild species (including listed species) is unknown and a source of significant uncertainty. The use of laboratory species has historically been driven by availability and ease of maintenance. A widespread comparison of species is lacking; however, even variation within a species can be quite high.

Additional Uncertainties

The stability of 3, 5-DCA in the environment is uncertain; however, in evaluating potential risk from iprodione and 3, 5-DCA, the environmental concentrations have to be considered independently as

iprodione degrades to 3, 5-DCA. Additionally, there are uncertainties regarding the nature of unextracted residues from studies with iprodione and whether these residues are bioavailable.

Federally Threatened and Endangered (Listed) Species Concerns

Section 7 of the Endangered Species Act, 16 U.S.C. Section 1536(a)(2), requires all federal agencies to consult with the National Marine Fisheries Service (NMFS) for marine and anadromous listed species, or the United States Fish and Wildlife Services (FWS) for listed wildlife and freshwater organisms, if they are proposing an "action" that may affect listed species or their designated critical habitat. Each federal agency is required under the Act to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. To jeopardize the continued existence of a listed species means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species."[12]

To facilitate compliance with the requirements of the Endangered Species Act subsection (a)(2), the Environmental Protection Agency Office of Pesticide Programs has established procedures to evaluate whether a proposed registration action may directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of any listed species (U.S. EPA 2004). After the Agency's screening-level risk assessment is conducted, if any of the Agency's listed species LOCs are exceeded for either direct or indirect effects, an analysis is conducted to determine if any listed or candidate species may co-occur in the area of the proposed pesticide use or areas downstream or downwind that could be contaminated from drift or runoff/erosion. If determined that listed or candidate species may be present in the proposed action areas, further biological assessment is undertaken. The extent to which listed species may be at risk then determines the need for the development of a more comprehensive consultation package as required by the Endangered Species Act.

The federal action addressed herein is the new registration of iprodione on pistachio (DP Barcode D315437) and revised use rates on strawberries, stone fruits and grapes and new uses on canola and almonds (DP Barcode D313332).

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 adjacent to the treated site and aquatic organisms are assumed to be located in surface water that is 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 section of this risk assessment presents the pesticide use sites that are used to establish initial collocation of species with treatment areas.

[12] 50 C.F.R. § 402.02

Taxonomic Groups Potentially at Risk

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.

Assessment endpoints, exposure pathways, the conceptual model addressing proposed iprodione uses, and the associated exposure and effects analyses conducted for the iprodione screening-level risk assessment have been discussed previously. The assessment endpoints used in the screening-level risk assessment include those defined operationally as reduced survival, reproduction, and growth for both aquatic and terrestrial animal species from direct acute and direct chronic exposures. These assessment endpoints address the standard set forth in the Endangered Species Act requiring federal agencies to ensure that any action they authorize does not reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the species. Risk estimates (*i.e.*, RQs integrating exposure and effects) are calculated for broad-based taxa groups for the screening-level risk assessment and presented in risk estimation section of this document.

Both acute endangered species and chronic risk LOCs are considered in the screening-level risk assessment to identify direct and indirect effects to taxa of listed species. This section identifies direct effect concerns, by taxa, triggered by exceeding listed species LOCs in the screening-level risk assessment with an evaluation of the potential probability of individual effects for exposures that may occur at the established listed species LOC. Data on exposure and effects collected under field conditions are evaluated to make determinations on the predictive utility of the direct effect screening assessment findings to listed species. Additionally, the results of a screen for indirect effects to listed species, using direct effect acute and chronic LOCs for each taxonomic group, are presented and evaluated.

Listed Species Risk Quotients

A description of the potential direct effects associated with exposure to iprodione from the new uses on pistachio (DP Barcode D315437) and revised use rates on strawberries, stone fruits and grapes and the new uses on canola and almonds (DP Barcode D313332) is discussed for each of the taxonomic groups below. **Table 27** provides a summary of the direct effects for Federally-listed threatened/endangered species, including the range of RQ values and the acute dose-response slopes used in evaluating the probability of individual effects on listed species. **Appendix 4** contains a list of potentially affected listed species.

Table 27. Summary of direct effects for Federally listed species from fungicidal.

Listed Species Taxonomic Group of Concern	Direct Effects	Slope[a]	RQ
Freshwater Fish	Acute: mortality	4.5	<0.05
Aquatic-phase Amphibians	Acute: mortality	4.5	<0.05
Freshwater Invertebrates	Acute: mortality/immobilization	4.5	0.07 – 0.40
Saltwater Fish	Acute: mortality	4.5	<0.05
Saltwater Mollusc	Acute mortality	4.5	0.14
Aquatic Plants: Non-vascular	Acute: cell density	4.5	3.2
Birds	Acute: mortality	4.5	0.13 – 0.14
Mammals	Acute: mortality	4.5	0.1 – 0.30
Terrestrial Plants: Monocots Dicots	 Acute: no data Acute: no data	 -- --	 -- --

[a]Raw data were not provided so the default value of 4.5 is used.
*Dose-based value.

Freshwater Fish and Amphibians

No listed species acute risk LOCs are exceeded for direct effects on freshwater fish or amphibians when used at the maximum label rate for the uses identified above. None of the proposed/revised uses exceed the chronic risk LOC for fish and/or aquatic-phase amphibians.

Freshwater Invertebrates

Listed species acute risk LOCs for direct effects on freshwater invertebrates are exceeded (RQ range 0.07 – 0.40) for iprodione when used at the maximum treatment rate for pistachio, strawberries, stonefruits, grapes and almonds. None of the proposed/revised uses exceed the chronic risk LOC for freshwater invertebrates.

Estuarine/Marine Fish and Invertebrates

No listed species acute risk LOC is exceeded for direct effects to estuarine/ marine fish; however, use of iprodione on strawberries does exceed (RQ=0.14) the acute risk LOC for endangered estuarine/marine invertebrates. Except for use on canola, the chronic risk LOC is exceeded for all of the uses evaluated.

Aquatic Plants

No listed species acute risk LOC is exceeded for freshwater plants; however, the acute risk LOC is exceeded for estuarine/marine plants for iprodione use on strawberries (RQ=3.2).

Birds

The listed species acute risk LOC for direct effects on birds is exceeded with RQ values ranging from 0.13 to 0.14 for use of iprodione on pistachios/almonds, stonefruits and grapes. The chronic risk LOC for birds is exceeded for all uses except canola.

Mammals

The listed species acute risk LOC for direct effects on mammals is exceeded for all of the proposed/revised uses, except canola, with RQ values ranging between 0.1 – 0.30. The chronic risk LOC for mammals is exceeded across all uses except for canola.

Probit Dose Response Relationship

Aquatic Listed Species Probability of Effects on Individuals

The probability of individual effects at estimated acute RQs above the listed species acute risk LOC was calculated. The probit slope used for freshwater vertebrates is 4.5 (the default value used in OPP assessments. Should exposure to listed freshwater vertebrates occur at the maximum exposure concentration of 500 mg/L, the highest probability of one individual being affected is 1 in 4.2×10^8. **(Appendix 3)**.

The probability of individual effects to listed freshwater invertebrates should exposure occur at the maximum treatment rate is 1 out of 27. The probit dose-response slope used for freshwater invertebrates was 4.5.

The probability of individual effects to listed estuarine/marine invertebrates should exposure occur at the maximum treatment rate is 1 out of 1.6×10^4. Again, the probit dose-response slope used for the estuarine/marine invertebrates was 4.5.

Appendix 1

Table A1-1 Summary of Labeled Uses for Iprodione

Crop	Label	Application timing	Application rate [lb ai/ app]	Number of applications (interval)	Application Method
Almond	Rorval Fungicide 264-453	1st at pink bud 2nd full bloom 3rd petal fall 4th up to 5 weeks after petal fall	0.5 to 1 lb (1)	4 applications	Foliar ground spray
Almond	Rorval 4 Fungicide 264-482	1st at pink bud 2nd full bloom 3rd petal fall 4th up to 5 weeks after petal fal	0.5 to 1 lb (1)	4 applications	Aerial and Foliar ground spray
Canola	Rorval Fungicide 264-453	20 – 30 % bloom (~60 days after planting) 45 day PHI	0.45 lb	1 application	Foliar ground spray
Canola	Rorval 4 Fungicide 264-482	20 – 30 % bloom (~60 days after planting) 45 day PHI	0.45 lb	1 application	Aerial (also ground spray)
Canola Seed Treatment	Foundation Lite 264-XXX	Not applicable	0.02 lb/acre (assuming 10 lb seed per acre)	---	Seed treatment
Cotton	Rorval 4 Fungicide 264-482	At planting	0.20 to 0.27 lb/acre(2)	1 application	In-furrow spray
Peanuts	Rorval 4 Fungicide 264-482	when needed PHI = 10	1 lb(3)	3 applications (14-21 days)	Ground spray
Pistachio (New use)	Rorval 4 Fungicide 264-482	14 day PHI	0.5 to 1 lb (2 lb max/season)	4 applications (30 days)	Aerial or Ground Spray
Stone Fruit (Peaches, Apricots, Cherries, prunes, plums)	Rorval 4 Fungicide 264-482	When bud present, Not after petal fall 7 day PHI	0.5 to 1 lb (1)	4 applications (7 -14 days)	Aerial or Ground Spray
Ginseng	Rorval 4 Fungicide 264-482	When needed 36 dat phi	0.75 to 1 lb	5 applications (14 days)	Foliar spray
Berries	Rorval 4 Fungicide 264-482	Early bloom Full bloom + 2 others at 14 day interval, 0 PHI	0.5 to 1 lb	4 applications	Foliar ground spray
Grapes	Rorval 4 Fungicide 264-482	1st early to mid bloom 2nd prior to bunch closing 3rd start of fruit opening 4th up to 7 days prior harvest	0.5 to 1 lb	4 applications	Foliar spray and chemigation (except NY)

Strawberries (tank mix)	Rorval 4 Fungicide 264-482	Non specific, but no later than 10% bloom.	0.5 lb	10 applications (7-14 days)	Aerial and ground
Strawberries (foliar spray)	Rorval 4 Fungicide 264-482	Non specific, but no later than 10% bloom. 0 PHI	0.75 to 1 lb	4 applications Additional sprays on 10 – 14 day interval up to day of harvest	Aerial and ground
Beans	Rorval 4 Fungicide 264-482	1st bloom 2nd peak bloom	0.75 to 1 lb	2 applications	Aerial and ground
Broccoli	Rorval 4 Fungicide 264-482	Immediately after thinning	1 lb	2 applications 0 PHI	Ground spray
Carrots	Rorval 4 Fungicide 264-482	Non specific	0.5 to 1 lb	4 applications (7-14 days) 0 PHI	Aerial and ground
Carrots	Rorval 4 Fungicide 264-482	Non specific	0.5 lb	10 applications (7-10 days) 0 PHI	Aerial and ground
Chinese Mustard (only FL)	Rorval 4 Fungicide 264-482	Non specific	0.5 lb	4 applications (10-14 days) 10 day PHI	Foliar spray
Dry Bulb Onion	Rorval 4 Fungicide 264-482	Non specific	0.75 lb	5 applications (14 days) 7 day PHI	Aerial and ground spray, chemigation
Dry Bulb Onion (tank mix)	Rorval 4 Fungicide 264-482	Non specific	0.5 lb	10 applications (7-10 days) 7 day PHI	Aerial and ground spray, chemigation
Lettuce	Rorval 4 Fungicide 264-482	1st at 3 leaf stage	0.75 to 1 lb	3 applications (10 days) 14 PHI	Aerial and ground spray, chemigation (aerial allowed only on 1st application)
Potatoes	Rorval 4 Fungicide 264-482	Non specific	0.5 to 1 lb	4 applications (10-14 days) 14 PHI	Aerial and ground spray, chemigation
Garlic	Rorval 4 Fungicide 264-482	At planting	2 lb,	1 application	In furrow
Rice (Not in CA)	Rorval 4 Fungicide 264-482	1st joint movement to booting 2nd not after 75% heading	0.5 lb	2 applications (14 days)	aerial
Turf	Chipco Brand 26019 Fungicide 432-891 432-889 Super GT 432-1408	Non specific	17.6 oz product per 1000 ft^2/year (equivalent to 24 lb ai /acre/year)	6 applications	

Turf (foliar drench)	Chipco Brand 26019 Fungicide 432-891 432-889 Super GT 432-1408 26/36 Fungicide 432-RURU	Non specific	1.25 lb/acre ai	4 applications (7-14 days)	
Ornamental	Super GT 432-1408	Non specific	0.5 to 1.25 lb	4 applications (7 to 14 days)	Foliar spray

[1] Assuming that rate on label refers to product and not the ai, ai = 0.5 x product
[2] Actual rate depends on row spacing
[3] Label appears to be inconsistent, max is either 3 lb or 2.5 lb.

APPENDIX 2. SPREADSHEET-BASED TERRESTRIAL EXPOSURE VALUES

A first-order decay assumption is used to determine the concentration at each day after initial application based on the concentration resulting from the initial and additional applications. The decay is calculated from the first order rate equation:

$$C_T = C_i e^{-kT}$$

or in log-transformed form:

$$\ln (C_T/C_i) = -kT$$

Where:

C_T = concentration at time T

C_i = concentration in parts per million (ppm) present initially (on day zero) on the surfaces. C_i is calculated based on Kenaga and Fletcher by multiplying the application rate, in pounds active ingredient per acre, by 240 for short grass, 110 for tall grass, and 135 for broad-leaf plants/insects and 15 for seeds. Additional applications are converted from pounds active ingredient per acre to parts per million (PPM) on the plant surface and the additional mass added to the mass of the chemical still present on the surfaces on the day of application.

k= degradation rate constant determined from studies of hydrolysis, photolysis, microbial degradation, etc. Since degradation rate is generally reported in terms of half-life, the rate constant is calculated from the input half-life ($k = \ln 2/t_{½}$) instead of being input directly. Choosing which process controls the degradation rate and which half-life to use in terrestrial exposure calculations is open for debate and should be done by a qualified scientist.

T= time, in days, since the start of the simulation. The initial application is on day 0. The simulation is set to run for 365 days.

The program calculates concentration on each type of surface on a daily interval for one year. The maximum concentration during the year and the average concentration during the first 56 days are calculated.

Example Output from TREX

Upper Bound Kenaga Residues For RQ Calculation

[redacted]

Acute and Chronic RQs are based on the Upper Bound Kenaga Residues.

The maximum single day residue estimation is used for both the acute and reproduction RQs.

RQs reported as "0.00" in the RQ tables below should be not <0.01 in your assessment. This is due to rounding and signi figure issues in Excel.

Endpoints

[redacted]

[redacted]
789.16
361.70
443.90
49.32

Avian Results

[redacted]

[redacted]

[redacted]			
	898.77	512.52	229.46
	411.94	234.90	105.17
	505.56	288.29	129.07
	56.17	32.03	14.34

[redacted]			
	1.34	0.60	0.19
	0.61	0.28	0.09
	0.75	0.34	0.11
	0.08	0.04	0.01

[redacted]		
	Acute	Chronic
	0.14	2.63
	0.06	1.21
	0.08	1.48
	0.01	0.16

Note: To provide risk management with the maximum possible information, *it is recommended that both the dose-based and concentration-based* RQs be calculated when data are available

Mammalian Results

[redacted]

[redacted]

[redacted]

752.40	520.01	120.57			
344.85	238.34	55.26			
423.23	292.51	67.82			
47.03	32.50	7.54	10.45	7.22	1.67

[redacted]

Acute	Chronic	Acute	Chronic	Acute	Chronic
0.30	45.65	0.25	38.99	0.14	20.90
0.14	20.92	0.12	17.87	0.06	9.58
0.17	25.68	0.14	21.93	0.08	11.76
0.02	2.85	0.02	2.44	0.01	1.31
0.00	0.63	0.00	0.54	0.00	0.29

[redacted]

Acute	Chronic
#VALUE!	5.26
#VALUE!	2.41
#VALUE!	2.96
#VALUE!	0.33

Note: To provide risk management with the maximum possible information, it is recommended that both the dose-based and concentration-based RQs be calculated when data are available

APPENDIX 3. INDIVIDUAL EFFECT CHANCE MODEL VERSION 1

Freshwater Fish

IEC V1 - Individual Effect Chance Model Version 1
Predictor of chance of individual effect using probit dose-response curve slope and median lethal estimate

Enter LC_{50} or LD_{50}	3100	Note: This is not used in calculation, just serves as a reminder to user
Enter desired threshold	0.05	Note: This is either the RQ fraction of the toxicity endpoint, the EEC or dose fraction of the dose/concentration at tox endpoint, or the LOC
Enter slope of dose-response	4.5	Note: This is the slope of the dose response relationship from the study providing the above endpoint
z score result	-5.85463498	z is the standard normal deviate
Probability associated with z	2.39029E-09	Uses Excel NORMDIST function to estimate P
Chance of individual effect, ~1 in . . .	4.18E+08	Calculated as 1/P rounded to 0 decimals

This is based on the formula $\log LC_k = \log LC_{50} + (z/b)$
where: z is the standard normal deviate and b equals slope
Works for dose-response models based on a probit assumption (i.e. log normal distribution of individual sensitivity)
Note: Probability asociated with z value may be reported as "0". This is due to the inability of Excel to handle extremes in z scores beyond -8.2
In such cases the chance of individual effect is defaulted to 1 in 10^{16}, which is the limit of Excel reporting.

Ed Odenkirchen, May 28, 2003 EFED/OPP/USEPA

Estuarine/Marine Invertebrates

IEC V1 - Individual Effect Chance Model Version 1
Predictor of chance of individual effect using probit dose-response curve slope and median lethal estimate

Enter LC_{50} or LD_{50}	680	Note: This is not used in calculation, just serves as a reminder to user
Enter desired threshold	0.14	Note: This is either the RQ fraction of the toxicity endpoint, the EEC or dose fraction of the dose/concentration at tox endpoint, or the LOC
Enter slope of dose-response	4.5	Note: This is the slope of the dose response relationship from the study providing the above endpoint
z score result	-3.842423839	z is the standard normal deviate
Probability associated with z	6.09126E-05	Uses Excel NORMDIST function to estimate P
Chance of individual effect, ~1 in . . .	1.64E+04	Calculated as 1/P rounded to 0 decimals

This is based on the formula $\log LC_k = \log LC_{50} + (z/b)$
where: z is the standard normal deviate and b equals slope
Works for dose-response models based on a probit assumption (i.e. log normal distribution of individual sensitivity)
Note: Probability asociated with z value may be reported as "0". This is due to the inability of Excel to handle extremes in z scores beyond -8.2
In such cases the chance of individual effect is defaulted to 1 in 10^{16}, which is the limit of Excel reporting.

Ed Odenkirchen, May 28, 2003 EFED/OPP/USEPA

APPENDIX 4. FEDERALLY-LISTED SPECIES POTENTIALLY AFFECTED BY IPRODIONE.

Minimum of 1 Acre.

All Medium Types Reported

Mammal, Bird, Reptile, Crustacean, Bivalve, Gastropod

pistachios, almonds, strawberries, grapes, cherries, tart, nectarines, peaches, all, peaches, clingstone (AZ

& CA only), peaches, freestone (AZ & CA only), plums (AZ & CA only), plums and prunes, prunes (AZ

& CA only), apricots, cherries, sweet

Alabama (54) species:		**Taxa**	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Stork, Wood	Endangered	Bird	No
(Mycteria americana)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Combshell, Southern (=Penitent mussel)	Endangered	Bivalve	No
(Epioblasma penita)		Freshwater	
Combshell, Upland	Endangered	Bivalve	Yes
(Epioblasma metastriata)		Freshwater	
Kidneyshell, Triangular	Endangered	Bivalve	Yes
(Ptychobranchus greenii)		Freshwater	
Mucket, Orangenacre	Threatened	Bivalve	Yes
(Lampsilis perovalis)		Freshwater	
Mucket, Pink (Pearlymussel)	Endangered	Bivalve	No
(Lampsilis abrupta)		Freshwater	
Mussel, Acornshell Southern	Endangered	Bivalve	Yes
(Epioblasma othcaloogensis)		Freshwater	
Mussel, Alabama Moccasinshell	Threatened	Bivalve	Yes
(Medionidus acutissimus)		Freshwater	
Mussel, Coosa Moccasinshell	Endangered	Bivalve	Yes
(Medionidus parvulus)		Freshwater	
Mussel, Cumberland Combshell	Endangered	Bivalve	Yes
(Epioblasma brevidens)		Freshwater	
Mussel, Dark Pigtoe	Endangered	Bivalve	Yes
(Pleurobema furvum)		Freshwater	
Mussel, Fine-lined Pocketbook	Threatened	Bivalve	Yes
(Lampsilis altilis)		Freshwater	
Mussel, Fine-rayed Pigtoe	Endangered	Bivalve	No
(Fusconaia cuneolus)		Freshwater	

Alabama (54) species:		**Taxa**	Critical Habitat
Mussel, Flat Pigtoe (=Marshall's Mussel)	Endangered	Bivalve	No
(Pleurobema marshalli)		Freshwater	
Mussel, Heavy Pigtoe (=Judge Tait's Mussel)	Endangered	Bivalve	No
(Pleurobema taitianum)		Freshwater	
Mussel, Heelsplitter Inflated	Threatened	Bivalve	No
(Potamilus inflatus)		Freshwater	
Mussel, Ovate Clubshell	Endangered	Bivalve	Yes
(Pleurobema perovatum)		Freshwater	
Mussel, Ring Pink (=Golf Stick Pearly)	Endangered	Bivalve	No
(Obovaria retusa)		Freshwater	
Mussel, Rough Pigtoe	Endangered	Bivalve	No
(Pleurobema plenum)		Freshwater	
Mussel, Shiny Pigtoe	Endangered	Bivalve	No
(Fusconaia cor)		Freshwater	
Mussel, Shiny-rayed Pocketbook	Endangered	Bivalve	No
(Lampsilis subangulata)		Freshwater	
Mussel, Southern Clubshell	Endangered	Bivalve	Yes
(Pleurobema decisum)		Freshwater	
Mussel, Southern Pigtoe	Endangered	Bivalve	Yes
(Pleurobema georgianum)		Freshwater	
Pearlymussel, Alabama Lamp	Endangered	Bivalve	No
(Lampsilis virescens)		Freshwater	
Pearlymussel, Cracking	Endangered	Bivalve	No
(Hemistena lata)		Freshwater	
Pearlymussel, Cumberland Monkeyface	Endangered	Bivalve	No
(Quadrula intermedia)		Freshwater	
Pearlymussel, Orange-footed	Endangered	Bivalve	No
(Plethobasus cooperianus)		Freshwater	
Pearlymussel, Pale Lilliput	Endangered	Bivalve	No
(Toxolasma cylindrellus)		Freshwater	
Pearlymussel, Turgid-blossom	Endangered	Bivalve	No
(Epioblasma turgidula)		Freshwater	
Pearlymussel, White Wartyback	Endangered	Bivalve	No
(Plethobasus cicatricosus)		Freshwater	
Stirrupshell	Endangered	Bivalve	No
(Quadrula stapes)		Freshwater	
Shrimp, Alabama Cave	Endangered	Crustacean	No
(Palaemonias alabamae)		Freshwater	
Campeloma, Slender	Endangered	Gastropod	No
(Campeloma decampi)		Freshwater	
Elimia, Lacy	Threatened	Gastropod	No
(Elimia crenatella)		Freshwater	

Alabama (54) species:

		Taxa	Critical Habitat
Pebblesnail, Flat *(Lepyrium showalteri)*	Endangered	Gastropod Freshwater	No
Riversnail, Anthony's *(Athearnia anthonyi)*	Endangered	Gastropod Freshwater	No
Rocksnail, Painted *(Leptoxis taeniata)*	Threatened	Gastropod Freshwater	No
Rocksnail, Plicate *(Leptoxis plicata)*	Endangered	Gastropod Freshwater	No
Rocksnail, Round *(Leptoxis ampla)*	Threatened	Gastropod Freshwater	No
Snail, Armored *(Pyrgulopsis (=Marstonia) pachyta)*	Endangered	Gastropod Freshwater	No
Snail, Lioplax Cylindrical *(Lioplax cyclostomaformis)*	Endangered	Gastropod Freshwater	No
Snail, Tulotoma *(Tulotoma magnifica)*	Endangered	Gastropod Terrestrial	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Mouse, Alabama Beach *(Peromyscus polionotus ammobates)*	Endangered	Mammal Terrestrial, Coastal (neritic)	Yes
Mouse, Perdido Key Beach *(Peromyscus polionotus trissyllepsis)*	Endangered	Mammal Coastal (neritic)	Yes
Sea turtle, loggerhead *(Caretta caretta)*	Threatened	Reptile Saltwater	No
Snake, Eastern Indigo *(Drymarchon corais couperi)*	Threatened	Reptile Terrestrial	No
Tortoise, Gopher *(Gopherus polyphemus)*	Threatened	Reptile Terrestrial	No
Turtle, Alabama Red-bellied *(Pseudemys alabamensis)*	Endangered	Reptile Terrestrial, Freshwater	No
Turtle, Flattened Musk *(Sternotherus depressus)*	Threatened	Reptile Freshwater, Terrestrial	No

Arizona (20) species:

		Taxa	Critical Habitat
Bobwhite, Masked *(Colinus virginianus ridgwayi)*	Endangered	Bird Terrestrial	No
Condor, California *(Gymnogyps californianus)*	Endangered	Bird Terrestrial	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Falcon, Northern Aplomado *(Falco femoralis septentrionalis)*	Endangered	Bird Terrestrial	No

Arizona (20) species:

		Taxa	Critical Habitat
Flycatcher, Southwestern Willow *(Empidonax traillii extimus)*	Endangered	Bird Terrestrial	Yes
Owl, Mexican Spotted *(Strix occidentalis lucida)*	Threatened	Bird Terrestrial	Yes
Pygmy-owl, Cactus Ferruginous *(Glaucidium brasilianum cactorum)*	Endangered	Bird Terrestrial	No
Rail, Yuma Clapper *(Rallus longirostris yumanensis)*	Endangered	Bird Terrestrial	No
Ambersnail, Kanab *(Oxyloma haydeni kanabensis)*	Endangered	Gastropod Freshwater, Terrestrial	No
Bat, Lesser (=Sanborn's) Long-nosed *(Leptonycteris curasoae yerbabuenae)*	Endangered	Mammal Subterraneous, Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No
Jaguar *(Panthera onca)*	Endangered	Mammal Terrestrial	No
Jaguarundi, Sinaloan *(Herpailurus (=Felis) yagouaroundi tolteca)*	Endangered	Mammal Terrestrial	No
Ocelot *(Leopardus (=Felis) pardalis)*	Endangered	Mammal Terrestrial	No
Pronghorn, Sonoran *(Antilocapra americana sonoriensis)*	Endangered	Mammal Terrestrial	No
Squirrel, Mount Graham Red *(Tamiasciurus hudsonicus grahamensis)*	Endangered	Mammal Terrestrial	Yes
Vole, Hualapai Mexican *(Microtus mexicanus hualpaiensis)*	Endangered	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes
Rattlesnake, New Mexican Ridge-nosed *(Crotalus willardi obscurus)*	Threatened	Reptile Terrestrial	Yes
Tortoise, Desert *(Gopherus agassizii)*	Threatened	Reptile Terrestrial	Yes

Arkansas (15) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Fatmucket, Arkansas *(Lampsilis powelli)*	Threatened	Bivalve Freshwater	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No

Arkansas (15) species:

		Taxa	Critical Habitat
Mussel, Scaleshell *(Leptodea leptodon)*	Endangered	Bivalve Freshwater	No
Mussel, Speckled Pocketbook *(Lampsilis streckeri)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Fat Pocketbook *(Potamilus capax)*	Endangered	Bivalve Freshwater	No
Rock-pocketbook, Ouachita (=Wheeler's pm) *(Arkansia wheeleri)*	Endangered	Bivalve Freshwater	No
Crayfish, Cave (Cambarus aculabrum) *(Cambarus aculabrum)*	Endangered	Crustacean Freshwater	No
Crayfish, Cave (Cambarus zophonastes) *(Cambarus zophonastes)*	Endangered	Crustacean Freshwater	No
Shagreen, Magazine Mountain *(Mesodon magazinensis)*	Threatened	Gastropod Terrestrial	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Bat, Ozark Big-eared *(Corynorhinus (=Plecotus) townsendii ingens)*	Endangered	Mammal Terrestrial, Subterraneous	No

California (54) species:

		Taxa	Critical Habitat
Condor, California *(Gymnogyps californianus)*	Endangered	Bird Terrestrial	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Flycatcher, Southwestern Willow *(Empidonax traillii extimus)*	Endangered	Bird Terrestrial	Yes
Gnatcatcher, Coastal California *(Polioptila californica californica)*	Threatened	Bird Terrestrial	Yes
Murrelet, Marbled *(Brachyramphus marmoratus marmoratus)*	Threatened	Bird Freshwater, Terrestrial, Saltwater	Yes
Owl, Northern Spotted *(Strix occidentalis caurina)*	Threatened	Bird Terrestrial	Yes
Pelican, Brown *(Pelecanus occidentalis)*	Endangered	Bird Terrestrial	No
Plover, Western Snowy *(Charadrius alexandrinus nivosus)*	Threatened	Bird Terrestrial	Yes
Rail, California Clapper *(Rallus longirostris obsoletus)*	Endangered	Bird Terrestrial	No
Rail, Light-footed Clapper *(Rallus longirostris levipes)*	Endangered	Bird Terrestrial	No
Rail, Yuma Clapper *(Rallus longirostris yumanensis)*	Endangered	Bird Terrestrial	No

California (54) species:

		Taxa	Critical Habitat
Shrike, San Clemente Loggerhead *(Lanius ludovicianus mearnsi)*	Endangered	Bird Terrestrial	No
Sparrow, San Clemente Sage *(Amphispiza belli clementeae)*	Threatened	Bird Terrestrial	No
Tern, California Least *(Sterna antillarum browni)*	Endangered	Bird Terrestrial	No
Towhee, Inyo Brown *(Pipilo crissalis eremophilus)*	Threatened	Bird Terrestrial	Yes
Vireo, Least Bell's *(Vireo bellii pusillus)*	Endangered	Bird Terrestrial	Yes
Abalone, White *(Haliotis sorenseni)*	Endangered	Crustacean Saltwater	No
Crayfish, Shasta *(Pacifastacus fortis)*	Endangered	Crustacean Freshwater	No
Fairy Shrimp, Conservancy Fairy *(Branchinecta conservatio)*	Endangered	Crustacean Vernal pool	Yes
Fairy Shrimp, Longhorn *(Branchinecta longiantenna)*	Endangered	Crustacean Vernal pool	Yes
Fairy Shrimp, Riverside *(Streptocephalus woottoni)*	Endangered	Crustacean Vernal pool	Yes
Fairy Shrimp, San Diego *(Branchinecta sandiegonensis)*	Endangered	Crustacean Vernal pool	Yes
Fairy Shrimp, Vernal Pool *(Branchinecta lynchi)*	Threatened	Crustacean Vernal pool	Yes
Shrimp, California Freshwater *(Syncaris pacifica)*	Endangered	Crustacean Freshwater	No
Tadpole Shrimp, Vernal Pool *(Lepidurus packardi)*	Endangered	Crustacean Vernal pool	Yes
Snail, Morro Shoulderband *(Helminthoglypta walkeriana)*	Endangered	Gastropod Terrestrial	Yes
Fox, San Joaquin Kit *(Vulpes macrotis mutica)*	Endangered	Mammal Terrestrial	No
Fox, San Miguel Island *(Urocyon littoralis littoralis)*	Endangered	Mammal Terrestrial	Yes
Fox, Santa Catalina Island *(Urocyon littoralis catalinae)*	Endangered	Mammal Terrestrial	Yes
Fox, Santa Cruz Island *(Urocyon littoralis santacruzae)*	Endangered	Mammal Terrestrial	Yes
Fox, Santa Rosa Island *(Urocyon littoralis santarosae)*	Endangered	Mammal Terrestrial	Yes
Kangaroo Rat, Fresno *(Dipodomys nitratoides exilis)*	Endangered	Mammal Terrestrial	Yes

California (54) species:		**Taxa**	Critical Habitat
Kangaroo Rat, Giant	Endangered	Mammal	No
(Dipodomys ingens)		Terrestrial	
Kangaroo Rat, Morro Bay	Endangered	Mammal	Yes
(Dipodomys heermanni morroensis)		Terrestrial	
Kangaroo Rat, San Bernardino Merriam's	Endangered	Mammal	Yes
(Dipodomys merriami parvus)		Terrestrial	
Kangaroo Rat, Stephens'	Endangered	Mammal	No
(Dipodomys stephensi (incl. D. cascus))		Terrestrial	
Kangaroo Rat, Tipton	Endangered	Mammal	No
(Dipodomys nitratoides nitratoides)		Terrestrial	
Mountain Beaver, Point Arena	Endangered	Mammal	No
(Aplodontia rufa nigra)		Freshwater, Terrestrial	
Mouse, Pacific Pocket	Endangered	Mammal	No
(Perognathus longimembris pacificus)		Terrestrial	
Mouse, Salt Marsh Harvest	Endangered	Mammal	No
(Reithrodontomys raviventris)		Terrestrial	
Rabbit, Riparian Brush	Endangered	Mammal	No
(Sylvilagus bachmani riparius)		Terrestrial	
Sheep, Peninsular Bighorn	Endangered	Mammal	Yes
(Ovis canadensis)		Terrestrial	
Sheep, Sierra Nevada Bighorn	Endangered	Mammal	No
(Ovis canadensis californiana)		Terrestrial	
Shrew, Buena Vista Lake Ornate	Endangered	Mammal	Yes
(Sorex ornatus relictus)		Terrestrial	
Vole, Amargosa	Endangered	Mammal	Yes
(Microtus californicus scirpensis)		Terrestrial	
Woodrat, Riparian	Endangered	Mammal	No
(Neotoma fuscipes riparia)		Terrestrial	
Lizard, Blunt-nosed Leopard	Endangered	Reptile	No
(Gambelia silus)		Terrestrial	
Lizard, Coachella Valley Fringe-toed	Threatened	Reptile	Yes
(Uma inornata)		Terrestrial	
Lizard, Island Night	Threatened	Reptile	No
(Xantusia riversiana)		Terrestrial	
Sea turtle, olive ridley	Threatened	Reptile	No
(Lepidochelys olivacea)		Saltwater	
Snake, Giant Garter	Threatened	Reptile	No
(Thamnophis gigas)		Freshwater, Terrestrial	
Snake, San Francisco Garter	Endangered	Reptile	No
(Thamnophis sirtalis tetrataenia)		Freshwater, Terrestrial	
Tortoise, Desert	Threatened	Reptile	Yes
(Gopherus agassizii)		Terrestrial	

		Taxa	Critical Habitat
California (54) species:			
Whipsnake (=Striped Racer), Alameda	Threatened	Reptile	Yes
(Masticophis lateralis euryxanthus)		Terrestrial	
Colorado (5) species:		**Taxa**	Critical Habitat
Crane, Whooping	Endangered	Bird	Yes
(Grus americana)		Terrestrial, Freshwater	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Owl, Mexican Spotted	Threatened	Bird	Yes
(Strix occidentalis lucida)		Terrestrial	
Ferret, Black-footed	Endangered	Mammal	No
(Mustela nigripes)		Terrestrial	
Mouse, Preble's Meadow Jumping	Threatened	Mammal	Yes
(Zapus hudsonius preblei)		Terrestrial	
Connecticut (6) species:		**Taxa**	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Tern, Roseate	Endangered	Bird	No
(Sterna dougallii dougallii)		Terrestrial	
Mussel, Dwarf Wedge	Endangered	Bivalve	No
(Alasmidonta heterodon)		Freshwater	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Turtle, Bog (Northern population)	Threatened	Reptile	No
(Clemmys muhlenbergii)		Terrestrial, Freshwater	
Delaware (4) species:		**Taxa**	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Squirrel, Delmarva Peninsula Fox	Endangered	Mammal	No
(Sciurus niger cinereus)		Terrestrial	
Turtle, Bog (Northern population)	Threatened	Reptile	No
(Clemmys muhlenbergii)		Terrestrial, Freshwater	
Florida (34) species:		**Taxa**	Critical Habitat
Caracara, Audubon's Crested	Threatened	Bird	No
(Polyborus plancus audubonii)		Terrestrial	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Kite, Everglade Snail	Endangered	Bird	Yes
(Rostrhamus sociabilis plumbeus)		Terrestrial	

Florida (34) species:		**Taxa**	Critical Habitat
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Scrub-Jay, Florida	Threatened	Bird	No
(Aphelocoma coerulescens)		Terrestrial	
Sparrow, Cape Sable Seaside	Endangered	Bird	Yes
(Ammodramus maritimus mirabilis)		Terrestrial	
Sparrow, Florida Grasshopper	Endangered	Bird	No
(Ammodramus savannarum floridanus)		Terrestrial	
Stork, Wood	Endangered	Bird	No
(Mycteria americana)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Bankclimber, Purple	Threatened	Bivalve	No
(Elliptoideus sloatianus)		Freshwater	
Mussel, Gulf Moccasinshell	Endangered	Bivalve	No
(Medionidus penicillatus)		Freshwater	
Mussel, Ochlockonee Moccasinshell	Endangered	Bivalve	No
(Medionidus simpsonianus)		Freshwater	
Mussel, Oval Pigtoe	Endangered	Bivalve	No
(Pleurobema pyriforme)		Freshwater	
Mussel, Shiny-rayed Pocketbook	Endangered	Bivalve	No
(Lampsilis subangulata)		Freshwater	
Slabshell, Chipola	Threatened	Bivalve	No
(Elliptio chipolaensis)		Freshwater	
Threeridge, Fat (Mussel)	Endangered	Bivalve	No
(Amblema neislerii)		Freshwater	
Shrimp, Squirrel Chimney Cave	Threatened	Crustacean	No
(Palaemonetes cummingi)		Freshwater, Subterraneous	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Mouse, Choctawhatchee Beach	Endangered	Mammal	Yes
(Peromyscus polionotus allophrys)		Coastal (neritic), Terrestrial	
Mouse, Perdido Key Beach	Endangered	Mammal	Yes
(Peromyscus polionotus trissyllepsis)		Coastal (neritic)	
Mouse, Southeastern Beach	Threatened	Mammal	No
(Peromyscus polionotus niveiventris)		Coastal (neritic), Terrestrial	
Panther, Florida	Endangered	Mammal	No
(Puma (=Felis) concolor coryi)		Terrestrial	
Vole, Florida Salt Marsh	Endangered	Mammal	No
(Microtus pennsylvanicus dukecampbelli)		Terrestrial, Brackish	

Florida (34) species:

		Taxa	Critical Habitat
Crocodile, American	Endangered	Reptile	Yes
(Crocodylus acutus)		Terrestrial, Freshwater	
Sea turtle, green	Endangered	Reptile	No
(Chelonia mydas)		Saltwater	
Sea turtle, hawksbill	Endangered	Reptile	Yes
(Eretmochelys imbricata)		Saltwater	
Sea turtle, Kemp's ridley	Endangered	Reptile	No
(Lepidochelys kempii)		Saltwater	
Sea turtle, leatherback	Endangered	Reptile	Yes
(Dermochelys coriacea)		Saltwater	
Sea turtle, loggerhead	Threatened	Reptile	No
(Caretta caretta)		Saltwater	
Skink, Blue-tailed Mole	Threatened	Reptile	No
(Eumeces egregius lividus)		Terrestrial	
Skink, Sand	Threatened	Reptile	No
(Neoseps reynoldsi)		Terrestrial	
Snake, Atlantic Salt Marsh	Threatened	Reptile	No
(Nerodia clarkii taeniata)		Saltwater, Terrestrial, Brackish	
Snake, Eastern Indigo	Threatened	Reptile	No
(Drymarchon corais couperi)		Terrestrial	

Georgia (26) species:

		Taxa	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Stork, Wood	Endangered	Bird	No
(Mycteria americana)		Terrestrial	
Warbler (=Wood), Kirtland's	Endangered	Bird	No
(Dendroica kirtlandii)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Bankclimber, Purple	Threatened	Bivalve	No
(Elliptoideus sloatianus)		Freshwater	
Combshell, Upland	Endangered	Bivalve	Yes
(Epioblasma metastriata)		Freshwater	
Fanshell	Endangered	Bivalve	No
(Cyprogenia stegaria)		Freshwater	
Kidneyshell, Triangular	Endangered	Bivalve	Yes
(Ptychobranchus greenii)		Freshwater	
Mucket, Pink (Pearlymussel)	Endangered	Bivalve	No
(Lampsilis abrupta)		Freshwater	
Mussel, Acornshell Southern	Endangered	Bivalve	Yes
(Epioblasma othcaloogensis)		Freshwater	

Georgia (26) species:		**Taxa**	Critical Habitat
Mussel, Alabama Moccasinshell	Threatened	Bivalve	Yes
(Medionidus acutissimus)		Freshwater	
Mussel, Coosa Moccasinshell	Endangered	Bivalve	Yes
(Medionidus parvulus)		Freshwater	
Mussel, Fine-lined Pocketbook	Threatened	Bivalve	Yes
(Lampsilis altilis)		Freshwater	
Mussel, Gulf Moccasinshell	Endangered	Bivalve	No
(Medionidus penicillatus)		Freshwater	
Mussel, Oval Pigtoe	Endangered	Bivalve	No
(Pleurobema pyriforme)		Freshwater	
Mussel, Ovate Clubshell	Endangered	Bivalve	Yes
(Pleurobema perovatum)		Freshwater	
Mussel, Shiny-rayed Pocketbook	Endangered	Bivalve	No
(Lampsilis subangulata)		Freshwater	
Mussel, Southern Clubshell	Endangered	Bivalve	Yes
(Pleurobema decisum)		Freshwater	
Mussel, Southern Pigtoe	Endangered	Bivalve	Yes
(Pleurobema georgianum)		Freshwater	
Threeridge, Fat (Mussel)	Endangered	Bivalve	No
(Amblema neislerii)		Freshwater	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Bat, Virginia Big-eared	Endangered	Mammal	Yes
(Corynorhinus (=Plecotus) townsendii virginianus)		Terrestrial, Subterraneous	
Sea turtle, loggerhead	Threatened	Reptile	No
(Caretta caretta)		Saltwater	
Snake, Eastern Indigo	Threatened	Reptile	No
(Drymarchon corais couperi)		Terrestrial	

Hawaii (30) species:		**Taxa**	Critical Habitat
'Akepa, Hawaii	Endangered	Bird	No
(Loxops coccineus coccineus)		Terrestrial	
'Akepa, Maui	Endangered	Bird	No
(Loxops coccineus ochraceus)		Terrestrial	
'Akia Loa, Kauai (Hemignathus procerus)	Endangered	Bird	No
(Hemignathus procerus)		Terrestrial	
'Akia Pola'au (Hemignathus munroi)	Endangered	Bird	No
(Hemignathus munroi)		Terrestrial	
Coot, Hawaiian (=Alae keo keo)	Endangered	Bird	No
(Fulica americana alai)		Terrestrial	
Creeper, Hawaii	Endangered	Bird	No
(Oreomystis mana)		Terrestrial	

Hawaii (30) species:		**Taxa**	Critical Habitat
Creeper, Molokai (Kakawahie)	Endangered	Bird	No
(Paroreomyza flammea)		Terrestrial	
Crow, Hawaiian ('Alala)	Endangered	Bird	No
(Corvus hawaiiensis)		Terrestrial	
Duck, Hawaiian (Koloa)	Endangered	Bird	No
(Anas wyvilliana)		Freshwater, Terrestrial	
Goose, Hawaiian (Nene)	Endangered	Bird	No
(Branta (=Nesochen) sandvicensis)		Terrestrial, Freshwater	
Hawk, Hawaiian (Io)	Endangered	Bird	No
(Buteo solitarius)		Terrestrial	
Honeycreeper, Crested ('Akohekohe)	Endangered	Bird	No
(Palmeria dolei)		Terrestrial	
Moorhen, Hawaiian Common	Endangered	Bird	No
(Gallinula chloropus sandvicensis)		Terrestrial	
Nuku Pu'u	Endangered	Bird	No
(Hemignathus lucidus)		Terrestrial	
'O'o, Kauai (='A'a)	Endangered	Bird	No
(Moho braccatus)		Terrestrial	
'O'u (Honeycreeper)	Endangered	Bird	No
(Psittirostra psittacea)		Terrestrial	
Palila	Endangered	Bird	Yes
(Loxioides bailleui)		Terrestrial	
Parrotbill, Maui	Endangered	Bird	No
(Pseudonestor xanthophrys)		Terrestrial	
Petrel, Hawaiian Dark-rumped	Endangered	Bird	No
(Pterodroma phaeopygia sandwichensis)		Terrestrial	
Po'ouli	Endangered	Bird	No
(Melamprosops phaeosoma)		Terrestrial	
Shearwater, Newell's Townsend's	Threatened	Bird	No
(Puffinus auricularis newelli)		Terrestrial, Saltwater	
Stilt, Hawaiian (=Ae'o)	Endangered	Bird	No
(Himantopus mexicanus knudseni)		Terrestrial	
Thrush, Large Kauai	Endangered	Bird	No
(Myadestes myadestinus)		Terrestrial	
Thrush, Molokai (Oloma'o)	Endangered	Bird	No
(Myadestes lanaiensis rutha)		Terrestrial	
Thrush, Small Kauai (Puaiohi)	Endangered	Bird	No
(Myadestes palmeri)		Terrestrial	
Amphipod, Kauai Cave	Endangered	Crustacean	Yes
(Spelaeorchestia koloana)		Freshwater, Subterraneous	
Snail, Newcomb's	Threatened	Gastropod	Yes
(Erinna newcombi)		Freshwater	

Hawaii (30) species:

		Taxa	Critical Habitat
Bat, Hawaiian Hoary *(Lasiurus cinereus semotus)*	Endangered	Mammal Terrestrial, Subterraneous	No
Sea turtle, green *(Chelonia mydas)*	Endangered	Reptile Saltwater	No
Sea turtle, hawksbill *(Eretmochelys imbricata)*	Endangered	Reptile Saltwater	Yes

Idaho (12) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Limpet, Banbury Springs *(Lanx sp.)*	Endangered	Gastropod Freshwater	No
Snail, Bliss Rapids *(Taylorconcha serpenticola)*	Threatened	Gastropod Freshwater	No
Snail, Snake River Physa *(Physa natricina)*	Endangered	Gastropod Terrestrial	No
Snail, Utah Valvata *(Valvata utahensis)*	Endangered	Gastropod Terrestrial	No
Springsnail, Bruneau Hot *(Pyrgulopsis bruneauensis)*	Endangered	Gastropod Freshwater	No
Springsnail, Idaho *(Fontelicella idahoensis)*	Endangered	Gastropod Freshwater	No
Bear, Grizzly *(Ursus arctos horribilis)*	Threatened	Mammal Terrestrial	No
Caribou, Woodland *(Rangifer tarandus caribou)*	Endangered	Mammal Terrestrial	No
Squirrel, Northern Idaho Ground *(Spermophilus brunneus brunneus)*	Threatened	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes

Illinois (14) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Fanshell *(Cyprogenia stegaria)*	Endangered	Bivalve Freshwater	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No

Illinois (14) species:

		Taxa	Critical Habitat
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Fat Pocketbook *(Potamilus capax)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Higgins' Eye *(Lampsilis higginsii)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Orange-footed *(Plethobasus cooperianus)*	Endangered	Bivalve Freshwater	No
Pearlymussel, White Wartyback *(Plethobasus cicatricosus)*	Endangered	Bivalve Freshwater	No
Amphipod, Illinois Cave *(Gammarus acherondytes)*	Endangered	Crustacean Subterraneous, Freshwater	No
Snail, Iowa Pleistocene *(Discus macclintocki)*	Endangered	Gastropod Terrestrial	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

Indiana (17) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Fanshell *(Cyprogenia stegaria)*	Endangered	Bivalve Freshwater	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Mussel, Ring Pink (=Golf Stick Pearly) *(Obovaria retusa)*	Endangered	Bivalve Freshwater	No
Mussel, Rough Pigtoe *(Pleurobema plenum)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Fat Pocketbook *(Potamilus capax)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Orange-footed *(Plethobasus cooperianus)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Tubercled-blossom *(Epioblasma torulosa torulosa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, White Cat's Paw *(Epioblasma obliquata perobliqua)*	Endangered	Bivalve Freshwater	No

Indiana (17) species:

		Taxa	Critical Habitat
Pearlymussel, White Wartyback *(Plethobasus cicatricosus)*	Endangered	Bivalve Freshwater	No
Riffleshell, Northern *(Epioblasma torulosa rangiana)*	Endangered	Bivalve Freshwater	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Snake, Northern Copperbelly Water *(Nerodia erythrogaster neglecta)*	Threatened	Reptile Freshwater, Terrestrial	No

Iowa (7) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Pearlymussel, Fat Pocketbook *(Potamilus capax)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Higgins' Eye *(Lampsilis higginsii)*	Endangered	Bivalve Freshwater	No
Snail, Iowa Pleistocene *(Discus macclintocki)*	Endangered	Gastropod Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

Kansas (6) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No

Kentucky (33) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No

Kentucky (33) species:		**Taxa**	Critical Habitat
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Tern, Interior (population) Least	Endangered	Bird	No
(Sterna antillarum)		Terrestrial	
Warbler (=Wood), Kirtland's	Endangered	Bird	No
(Dendroica kirtlandii)		Terrestrial	
Warbler, Bachman's	Endangered	Bird	No
(Vermivora bachmanii)		Terrestrial	
Woodpecker, Ivory-billed	Endangered	Bird	No
(Campephilus principalis)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Fanshell	Endangered	Bivalve	No
(Cyprogenia stegaria)		Freshwater	
Mucket, Pink (Pearlymussel)	Endangered	Bivalve	No
(Lampsilis abrupta)		Freshwater	
Mussel, Clubshell	Endangered	Bivalve	No
(Pleurobema clava)		Freshwater	
Mussel, Cumberland Combshell	Endangered	Bivalve	Yes
(Epioblasma brevidens)		Freshwater	
Mussel, Cumberland Elktoe	Endangered	Bivalve	Yes
(Alasmidonta atropurpurea)		Freshwater	
Mussel, Oyster	Endangered	Bivalve	Yes
(Epioblasma capsaeformis)		Freshwater	
Mussel, Ring Pink (=Golf Stick Pearly)	Endangered	Bivalve	No
(Obovaria retusa)		Freshwater	
Mussel, Rough Pigtoe	Endangered	Bivalve	No
(Pleurobema plenum)		Freshwater	
Mussel, Winged Mapleleaf	Endangered	Bivalve	No
(Quadrula fragosa)		Freshwater	
Pearlymussel, Appalachian Monkeyface	Endangered	Bivalve	No
(Quadrula sparsa)		Freshwater	
Pearlymussel, Cracking	Endangered	Bivalve	No
(Hemistena lata)		Freshwater	
Pearlymussel, Cumberland Bean	Endangered	Bivalve	No
(Villosa trabalis)		Freshwater	
Pearlymussel, Dromedary	Endangered	Bivalve	No
(Dromus dromas)		Freshwater	
Pearlymussel, Fat Pocketbook	Endangered	Bivalve	No
(Potamilus capax)		Freshwater	
Pearlymussel, Little-wing	Endangered	Bivalve	No
(Pegias fabula)		Freshwater	

Kentucky (33) species:

		Taxa	Critical Habitat
Pearlymussel, Orange-footed *(Plethobasus cooperianus)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Purple Cat's Paw *(Epioblasma obliquata obliquata)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Tubercled-blossom *(Epioblasma torulosa torulosa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, White Wartyback *(Plethobasus cicatricosus)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Yellow-blossom *(Epioblasma florentina florentina)*	Endangered	Bivalve Freshwater	No
Riffleshell, Northern *(Epioblasma torulosa rangiana)*	Endangered	Bivalve Freshwater	No
Riffleshell, Tan *(Epioblasma florentina walkeri (=E. walkeri))*	Endangered	Bivalve Freshwater	No
Shrimp, Kentucky Cave *(Palaemonias ganteri)*	Endangered	Crustacean Freshwater	Yes
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Bat, Virginia Big-eared *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal Terrestrial, Subterraneous	Yes

Louisiana (17) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Pelican, Brown *(Pelecanus occidentalis)*	Endangered	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, California Least *(Sterna antillarum browni)*	Endangered	Bird Terrestrial	No
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No
Mussel, Heelsplitter Inflated *(Potamilus inflatus)*	Threatened	Bivalve Freshwater	No
Pearlshell, Louisiana *(Margaritifera hembeli)*	Threatened	Bivalve Freshwater	No
Bear, Louisiana Black *(Ursus americanus luteolus)*	Threatened	Mammal Terrestrial	No

Louisiana (17) species:

		Taxa	Critical Habitat
Sea turtle, green *(Chelonia mydas)*	Endangered	Reptile Saltwater	No
Sea turtle, hawksbill *(Eretmochelys imbricata)*	Endangered	Reptile Saltwater	Yes
Sea turtle, Kemp's ridley *(Lepidochelys kempii)*	Endangered	Reptile Saltwater	No
Sea turtle, leatherback *(Dermochelys coriacea)*	Endangered	Reptile Saltwater	Yes
Sea turtle, loggerhead *(Caretta caretta)*	Threatened	Reptile Saltwater	No
Tortoise, Gopher *(Gopherus polyphemus)*	Threatened	Reptile Terrestrial	No
Turtle, Ringed Sawback *(Graptemys oculifera)*	Threatened	Reptile Freshwater, Terrestrial	No

Maine (4) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Roseate *(Sterna dougallii dougallii)*	Endangered	Bird Terrestrial	No
Lynx, Canada *(Lynx canadensis)*	Threatened	Mammal Terrestrial	No

Maryland (6) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Squirrel, Delmarva Peninsula Fox *(Sciurus niger cinereus)*	Endangered	Mammal Terrestrial	No
Turtle, Bog (Northern population) *(Clemmys muhlenbergii)*	Threatened	Reptile Terrestrial, Freshwater	No

Massachusetts (7) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes

Massachusetts (7) species:

		Taxa	Critical Habitat
Starling, Ponape Mountain *(Aplonis pelzelni)*	Endangered	Bird Terrestrial	No
Tern, Roseate *(Sterna dougallii dougallii)*	Endangered	Bird Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Turtle, Bog (Northern population) *(Clemmys muhlenbergii)*	Threatened	Reptile Terrestrial, Freshwater	No
Turtle, Plymouth Red-bellied *(Pseudemys rubriventris bangsi)*	Endangered	Reptile Terrestrial, Freshwater	Yes

Michigan (9) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Warbler (=Wood), Kirtland's *(Dendroica kirtlandii)*	Endangered	Bird Terrestrial	No
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Riffleshell, Northern *(Epioblasma torulosa rangiana)*	Endangered	Bivalve Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Lynx, Canada *(Lynx canadensis)*	Threatened	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes
Snake, Northern Copperbelly Water *(Nerodia erythrogaster neglecta)*	Threatened	Reptile Freshwater, Terrestrial	No

Minnesota (6) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Mussel, Winged Mapleleaf *(Quadrula fragosa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Higgins' Eye *(Lampsilis higginsii)*	Endangered	Bivalve Freshwater	No
Lynx, Canada *(Lynx canadensis)*	Threatened	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Threatened	Mammal Terrestrial	Yes

Mississippi (24) species:		**Taxa**	Critical Habitat
Crane, Mississippi Sandhill	Endangered	Bird	Yes
(Grus canadensis pulla)		Terrestrial, Freshwater	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Pelican, Brown	Endangered	Bird	No
(Pelecanus occidentalis)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Tern, Interior (population) Least	Endangered	Bird	No
(Sterna antillarum)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Combshell, Southern (=Penitent mussel)	Endangered	Bivalve	No
(Epioblasma penita)		Freshwater	
Mucket, Orangenacre	Threatened	Bivalve	Yes
(Lampsilis perovalis)		Freshwater	
Mussel, Alabama Moccasinshell	Threatened	Bivalve	Yes
(Medionidus acutissimus)		Freshwater	
Mussel, Black (=Curtus' Mussel) Clubshell	Endangered	Bivalve	No
(Pleurobema curtum)		Freshwater	
Mussel, Heavy Pigtoe (=Judge Tait's Mussel)	Endangered	Bivalve	No
(Pleurobema taitianum)		Freshwater	
Mussel, Heelsplitter Inflated	Threatened	Bivalve	No
(Potamilus inflatus)		Freshwater	
Mussel, Ovate Clubshell	Endangered	Bivalve	Yes
(Pleurobema perovatum)		Freshwater	
Mussel, Southern Clubshell	Endangered	Bivalve	Yes
(Pleurobema decisum)		Freshwater	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Bear, Louisiana Black	Threatened	Mammal	No
(Ursus americanus luteolus)		Terrestrial	
Sea turtle, green	Endangered	Reptile	No
(Chelonia mydas)		Saltwater	
Sea turtle, Kemp's ridley	Endangered	Reptile	No
(Lepidochelys kempii)		Saltwater	
Sea turtle, loggerhead	Threatened	Reptile	No
(Caretta caretta)		Saltwater	
Snake, Eastern Indigo	Threatened	Reptile	No
(Drymarchon corais couperi)		Terrestrial	

Mississippi (24) species:

		Taxa	Critical Habitat
Tortoise, Gopher *(Gopherus polyphemus)*	Threatened	Reptile Terrestrial	No
Turtle, Ringed Sawback *(Graptemys oculifera)*	Threatened	Reptile Freshwater, Terrestrial	No
Turtle, Yellow-blotched Map *(Graptemys flavimaculata)*	Threatened	Reptile Freshwater, Terrestrial	No

Missouri (13) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No
Mussel, Scaleshell *(Leptodea leptodon)*	Endangered	Bivalve Freshwater	No
Mussel, Winged Mapleleaf *(Quadrula fragosa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Curtis' *(Epioblasma florentina curtisii)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Fat Pocketbook *(Potamilus capax)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Higgins' Eye *(Lampsilis higginsii)*	Endangered	Bivalve Freshwater	No
Crayfish, Cave (Cambarus aculabrum) *(Cambarus aculabrum)*	Endangered	Crustacean Freshwater	No
Cavesnail, Tumbling Creek *(Antrobia culveri)*	Endangered	Gastropod Subterraneous, Freshwater	No
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

Montana (7) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No

Montana (7) species:

		Taxa	Critical Habitat
Bear, Grizzly *(Ursus arctos horribilis)*	Threatened	Mammal Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes

Nebraska (5) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No

Nevada (4) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Flycatcher, Southwestern Willow *(Empidonax traillii extimus)*	Endangered	Bird Terrestrial	Yes
Rail, Yuma Clapper *(Rallus longirostris yumanensis)*	Endangered	Bird Terrestrial	No
Tortoise, Desert *(Gopherus agassizii)*	Threatened	Reptile Terrestrial	Yes

New Hampshire (3) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

New Jersey (5) species:

		Taxa	Critical Habitat
Curlew, Eskimo *(Numenius borealis)*	Endangered	Bird Terrestrial	No
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

New Jersey (5) species:

		Taxa	Critical Habitat
Turtle, Bog (Northern population) *(Clemmys muhlenbergii)*	Threatened	Reptile Terrestrial, Freshwater	No

New Mexico (20) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Falcon, Northern Aplomado *(Falco femoralis septentrionalis)*	Endangered	Bird Terrestrial	No
Flycatcher, Southwestern Willow *(Empidonax traillii extimus)*	Endangered	Bird Terrestrial	Yes
Owl, Mexican Spotted *(Strix occidentalis lucida)*	Threatened	Bird Terrestrial	Yes
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Amphipod, Noel's *(Gammarus desperatus)*	Endangered	Crustacean Freshwater	No
Isopod, Socorro *(Thermosphaeroma thermophilus)*	Endangered	Crustacean Freshwater	No
Snail, Pecos Assiminea *(Assiminea pecos)*	Endangered	Gastropod Freshwater	Yes
Springsnail, Alamosa *(Tryonia alamosae)*	Endangered	Gastropod Freshwater	No
Springsnail, Koster's *(Juturnia kosteri)*	Endangered	Gastropod Terrestrial	No
Springsnail, Roswell *(Pyrgulopsis roswellensis)*	Endangered	Gastropod Freshwater	No
Springsnail, Socorro *(Pyrgulopsis neomexicana)*	Endangered	Gastropod Freshwater	No
Bat, Lesser (=Sanborn's) Long-nosed *(Leptonycteris curasoae yerbabuenae)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Mexican Long-nosed *(Leptonycteris nivalis)*	Endangered	Mammal Subterraneous, Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No
Jaguar *(Panthera onca)*	Endangered	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes
Rattlesnake, New Mexican Ridge-nosed *(Crotalus willardi obscurus)*	Threatened	Reptile Terrestrial	Yes

New York (7) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Roseate *(Sterna dougallii dougallii)*	Endangered	Bird Terrestrial	No
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No
Snail, Chittenango Ovate Amber *(Succinea chittenangoensis)*	Threatened	Gastropod Terrestrial, Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Turtle, Bog (Northern population) *(Clemmys muhlenbergii)*	Threatened	Reptile Terrestrial, Freshwater	No

North Carolina (23) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Stork, Wood *(Mycteria americana)*	Endangered	Bird Terrestrial	No
Tern, Roseate *(Sterna dougallii dougallii)*	Endangered	Bird Terrestrial	No
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Elktoe, Appalachian *(Alasmidonta raveneliana)*	Endangered	Bivalve Freshwater	Yes
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No
Mussel, Heelsplitter Carolina *(Lasmigona decorata)*	Endangered	Bivalve Freshwater	Yes
Mussel, Oyster *(Epioblasma capsaeformis)*	Endangered	Bivalve Freshwater	Yes
Pearlymussel, Little-wing *(Pegias fabula)*	Endangered	Bivalve Freshwater	No
Purple Bean *(Villosa perpurpurea)*	Endangered	Bivalve Freshwater	Yes
Spinymussel, James River *(Pleurobema collina)*	Endangered	Bivalve Freshwater	No
Spinymussel, Tar River *(Elliptio steinstansana)*	Endangered	Bivalve Freshwater	No
Snail, Noonday *(Mesodon clarki nantahala)*	Threatened	Gastropod Terrestrial	No

North Carolina (23) species:

		Taxa	Critical Habitat
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Bat, Virginia Big-eared	Endangered	Mammal	Yes
(Corynorhinus (=Plecotus) townsendii virginianus)		Terrestrial, Subterraneous	
Squirrel, Carolina Northern Flying	Endangered	Mammal	No
(Glaucomys sabrinus coloratus)		Terrestrial	
Sea turtle, green	Endangered	Reptile	No
(Chelonia mydas)		Saltwater	
Sea turtle, hawksbill	Endangered	Reptile	Yes
(Eretmochelys imbricata)		Saltwater	
Sea turtle, Kemp's ridley	Endangered	Reptile	No
(Lepidochelys kempii)		Saltwater	
Sea turtle, leatherback	Endangered	Reptile	Yes
(Dermochelys coriacea)		Saltwater	
Sea turtle, loggerhead	Threatened	Reptile	No
(Caretta caretta)		Saltwater	

North Dakota (4) species:

		Taxa	Critical Habitat
Crane, Whooping	Endangered	Bird	Yes
(Grus americana)		Terrestrial, Freshwater	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Tern, Interior (population) Least	Endangered	Bird	No
(Sterna antillarum)		Terrestrial	

Ohio (12) species:

		Taxa	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Fanshell	Endangered	Bivalve	No
(Cyprogenia stegaria)		Freshwater	
Mucket, Pink (Pearlymussel)	Endangered	Bivalve	No
(Lampsilis abrupta)		Freshwater	
Mussel, Clubshell	Endangered	Bivalve	No
(Pleurobema clava)		Freshwater	
Pearlymussel, Purple Cat's Paw	Endangered	Bivalve	No
(Epioblasma obliquata obliquata)		Freshwater	
Pearlymussel, White Cat's Paw	Endangered	Bivalve	No
(Epioblasma obliquata perobliqua)		Freshwater	

Ohio (12) species:

		Taxa	Critical Habitat
Riffleshell, Northern	Endangered	Bivalve	No
(Epioblasma torulosa rangiana)		Freshwater	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Snake, Lake Erie Water	Threatened	Reptile	No
(Nerodia sipedon insularum)		Terrestrial, Freshwater	
Snake, Northern Copperbelly Water	Threatened	Reptile	No
(Nerodia erythrogaster neglecta)		Freshwater, Terrestrial	

Oklahoma (12) species:

		Taxa	Critical Habitat
Crane, Whooping	Endangered	Bird	Yes
(Grus americana)		Terrestrial, Freshwater	
Curlew, Eskimo	Endangered	Bird	No
(Numenius borealis)		Terrestrial	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Tern, Interior (population) Least	Endangered	Bird	No
(Sterna antillarum)		Terrestrial	
Vireo, Black-capped	Endangered	Bird	No
(Vireo atricapilla)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Mussel, Scaleshell	Endangered	Bivalve	No
(Leptodea leptodon)		Freshwater	
Rock-pocketbook, Ouachita (=Wheeler's pm)	Endangered	Bivalve	No
(Arkansia wheeleri)		Freshwater	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Bat, Ozark Big-eared	Endangered	Mammal	No
(Corynorhinus (=Plecotus) townsendii ingens)		Terrestrial, Subterraneous	

Oregon (7) species:

		Taxa	Critical Habitat
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	
Murrelet, Marbled	Threatened	Bird	Yes
(Brachyramphus marmoratus marmoratus)		Freshwater, Terrestrial, Saltwater	
Owl, Northern Spotted	Threatened	Bird	Yes
(Strix occidentalis caurina)		Terrestrial	

Oregon (7) species:

		Taxa	Critical Habitat
Pelican, Brown *(Pelecanus occidentalis)*	Endangered	Bird Terrestrial	No
Plover, Western Snowy *(Charadrius alexandrinus nivosus)*	Threatened	Bird Terrestrial	Yes
Fairy Shrimp, Vernal Pool *(Branchinecta lynchi)*	Threatened	Crustacean Vernal pool	Yes
Deer, Columbian White-tailed *(Odocoileus virginianus leucurus)*	Endangered	Mammal Terrestrial	No

Pennsylvania (7) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Riffleshell, Northern *(Epioblasma torulosa rangiana)*	Endangered	Bivalve Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Squirrel, Delmarva Peninsula Fox *(Sciurus niger cinereus)*	Endangered	Mammal Terrestrial	No
Turtle, Bog (Northern population) *(Clemmys muhlenbergii)*	Threatened	Reptile Terrestrial, Freshwater	No

Rhode Island (2) species:

		Taxa	Critical Habitat
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

South Carolina (12) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Stork, Wood *(Mycteria americana)*	Endangered	Bird Terrestrial	No
Warbler, Bachman's *(Vermivora bachmanii)*	Endangered	Bird Terrestrial	No
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Mussel, Heelsplitter Carolina *(Lasmigona decorata)*	Endangered	Bivalve Freshwater	Yes

South Carolina (12) species:

		Taxa	Critical Habitat
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Sea turtle, green *(Chelonia mydas)*	Endangered	Reptile Saltwater	No
Sea turtle, Kemp's ridley *(Lepidochelys kempii)*	Endangered	Reptile Saltwater	No
Sea turtle, leatherback *(Dermochelys coriacea)*	Endangered	Reptile Saltwater	Yes
Sea turtle, loggerhead *(Caretta caretta)*	Threatened	Reptile Saltwater	No
Snake, Eastern Indigo *(Drymarchon corais couperi)*	Threatened	Reptile Terrestrial	No

South Dakota (5) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No

Tennessee (48) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Stork, Wood *(Mycteria americana)*	Endangered	Bird Terrestrial	No
Tern, Interior (population) Least *(Sterna antillarum)*	Endangered	Bird Terrestrial	No
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Combshell, Upland *(Epioblasma metastriata)*	Endangered	Bivalve Freshwater	Yes
Elktoe, Appalachian *(Alasmidonta raveneliana)*	Endangered	Bivalve Freshwater	Yes
Fanshell *(Cyprogenia stegaria)*	Endangered	Bivalve Freshwater	No
Kidneyshell, Triangular *(Ptychobranchus greenii)*	Endangered	Bivalve Freshwater	Yes
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No

Tennessee (48) species:		**Taxa**	Critical Habitat
Mussel, Alabama Moccasinshell *(Medionidus acutissimus)*	Threatened	Bivalve Freshwater	Yes
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Mussel, Coosa Moccasinshell *(Medionidus parvulus)*	Endangered	Bivalve Freshwater	Yes
Mussel, Cumberland Combshell *(Epioblasma brevidens)*	Endangered	Bivalve Freshwater	Yes
Mussel, Cumberland Elktoe *(Alasmidonta atropurpurea)*	Endangered	Bivalve Freshwater	Yes
Mussel, Cumberland Pigtoe *(Pleurobema gibberum)*	Endangered	Bivalve Freshwater	No
Mussel, Fine-lined Pocketbook *(Lampsilis altilis)*	Threatened	Bivalve Freshwater	Yes
Mussel, Fine-rayed Pigtoe *(Fusconaia cuneolus)*	Endangered	Bivalve Freshwater	No
Mussel, Ovate Clubshell *(Pleurobema perovatum)*	Endangered	Bivalve Freshwater	Yes
Mussel, Oyster *(Epioblasma capsaeformis)*	Endangered	Bivalve Freshwater	Yes
Mussel, Ring Pink (=Golf Stick Pearly) *(Obovaria retusa)*	Endangered	Bivalve Freshwater	No
Mussel, Rough Pigtoe *(Pleurobema plenum)*	Endangered	Bivalve Freshwater	No
Mussel, Shiny Pigtoe *(Fusconaia cor)*	Endangered	Bivalve Freshwater	No
Mussel, Southern Pigtoe *(Pleurobema georgianum)*	Endangered	Bivalve Freshwater	Yes
Pearlymussel, Alabama Lamp *(Lampsilis virescens)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Appalachian Monkeyface *(Quadrula sparsa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Birdwing *(Conradilla caelata)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Cracking *(Hemistena lata)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Cumberland Bean *(Villosa trabalis)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Cumberland Monkeyface *(Quadrula intermedia)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Dromedary *(Dromus dromas)*	Endangered	Bivalve Freshwater	No

Tennessee (48) species:

		Taxa	Critical Habitat
Pearlymussel, Green-blossom	Endangered	Bivalve	No
(Epioblasma torulosa gubernaculum)		Freshwater	
Pearlymussel, Little-wing	Endangered	Bivalve	No
(Pegias fabula)		Freshwater	
Pearlymussel, Orange-footed	Endangered	Bivalve	No
(Plethobasus cooperianus)		Freshwater	
Pearlymussel, Pale Lilliput	Endangered	Bivalve	No
(Toxolasma cylindrellus)		Freshwater	
Pearlymussel, Purple Cat's Paw	Endangered	Bivalve	No
(Epioblasma obliquata obliquata)		Freshwater	
Pearlymussel, Tubercled-blossom	Endangered	Bivalve	No
(Epioblasma torulosa torulosa)		Freshwater	
Pearlymussel, Turgid-blossom	Endangered	Bivalve	No
(Epioblasma turgidula)		Freshwater	
Pearlymussel, White Wartyback	Endangered	Bivalve	No
(Plethobasus cicatricosus)		Freshwater	
Pearlymussel, Yellow-blossom	Endangered	Bivalve	No
(Epioblasma florentina florentina)		Freshwater	
Purple Bean	Endangered	Bivalve	Yes
(Villosa perpurpurea)		Freshwater	
Rabbitsfoot, Rough	Endangered	Bivalve	Yes
(Quadrula cylindrica strigillata)		Freshwater	
Riffleshell, Tan	Endangered	Bivalve	No
(Epioblasma florentina walkeri (=E. walkeri))		Freshwater	
Crayfish, Nashville	Endangered	Crustacean	No
(Orconectes shoupi)		Freshwater	
Marstonia, Royal (=Royal Snail)	Endangered	Gastropod	No
(Pyrgulopsis ogmorhaphe)		Terrestrial	
Riversnail, Anthony's	Endangered	Gastropod	No
(Athearnia anthonyi)		Freshwater	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	
Squirrel, Carolina Northern Flying	Endangered	Mammal	No
(Glaucomys sabrinus coloratus)		Terrestrial	

Texas (26) species:

		Taxa	Critical Habitat
Crane, Whooping	Endangered	Bird	Yes
(Grus americana)		Terrestrial, Freshwater	
Curlew, Eskimo	Endangered	Bird	No
(Numenius borealis)		Terrestrial	
Eagle, Bald	Threatened	Bird	No
(Haliaeetus leucocephalus)		Terrestrial	

Texas (26) species:		**Taxa**	Critical Habitat
Falcon, Northern Aplomado	Endangered	Bird	No
(Falco femoralis septentrionalis)		Terrestrial	
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Owl, Mexican Spotted	Threatened	Bird	Yes
(Strix occidentalis lucida)		Terrestrial	
Pelican, Brown	Endangered	Bird	No
(Pelecanus occidentalis)		Terrestrial	
Plover, Piping	Endangered	Bird	Yes
(Charadrius melodus)		Terrestrial	
Prairie-chicken, Attwater's Greater	Endangered	Bird	No
(Tympanuchus cupido attwateri)		Terrestrial	
Tern, Interior (population) Least	Endangered	Bird	No
(Sterna antillarum)		Terrestrial	
Vireo, Black-capped	Endangered	Bird	No
(Vireo atricapilla)		Terrestrial	
Warbler (=Wood), Golden-cheeked	Endangered	Bird	No
(Dendroica chrysoparia)		Terrestrial	
Woodpecker, Red-cockaded	Endangered	Bird	No
(Picoides borealis)		Terrestrial	
Amphipod, Peck's Cave	Endangered	Crustacean	No
(Stygobromus (=Stygonectes) pecki)		Subterraneous, Freshwater	
Snail, Pecos Assiminea	Endangered	Gastropod	Yes
(Assiminea pecos)		Freshwater	
Bat, Mexican Long-nosed	Endangered	Mammal	No
(Leptonycteris nivalis)		Subterraneous, Terrestrial	
Bear, Louisiana Black	Threatened	Mammal	No
(Ursus americanus luteolus)		Terrestrial	
Jaguarundi, Gulf Coast	Endangered	Mammal	No
(Herpailurus (=Felis) yagouaroundi cacomitli)		Terrestrial	
Jaguarundi, Sinaloan	Endangered	Mammal	No
(Herpailurus (=Felis) yagouaroundi tolteca)		Terrestrial	
Ocelot	Endangered	Mammal	No
(Leopardus (=Felis) pardalis)		Terrestrial	
Sea turtle, green	Endangered	Reptile	No
(Chelonia mydas)		Saltwater	
Sea turtle, hawksbill	Endangered	Reptile	Yes
(Eretmochelys imbricata)		Saltwater	
Sea turtle, Kemp's ridley	Endangered	Reptile	No
(Lepidochelys kempii)		Saltwater	
Sea turtle, leatherback	Endangered	Reptile	Yes
(Dermochelys coriacea)		Saltwater	

Texas (26) species:		Taxa	Critical Habitat
Sea turtle, loggerhead *(Caretta caretta)*	Threatened	Reptile Saltwater	No
Snake, Concho Water *(Nerodia paucimaculata)*	Threatened	Reptile Freshwater, Terrestrial	Yes

Utah (6) species:		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Flycatcher, Southwestern Willow *(Empidonax traillii extimus)*	Endangered	Bird Terrestrial	Yes
Owl, Mexican Spotted *(Strix occidentalis lucida)*	Threatened	Bird Terrestrial	Yes
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No
Prairie Dog, Utah *(Cynomys parvidens)*	Threatened	Mammal Terrestrial, Subterraneous	No
Tortoise, Desert *(Gopherus agassizii)*	Threatened	Reptile Terrestrial	Yes

Vermont (3) species:		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes

Virginia (33) species:		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Woodpecker, Red-cockaded *(Picoides borealis)*	Endangered	Bird Terrestrial	No
Fanshell *(Cyprogenia stegaria)*	Endangered	Bivalve Freshwater	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No
Mussel, Cumberland Combshell *(Epioblasma brevidens)*	Endangered	Bivalve Freshwater	Yes
Mussel, Cumberland Elktoe *(Alasmidonta atropurpurea)*	Endangered	Bivalve Freshwater	Yes
Mussel, Dwarf Wedge *(Alasmidonta heterodon)*	Endangered	Bivalve Freshwater	No

Virginia (33) species:		**Taxa**	Critical Habitat
Mussel, Fine-rayed Pigtoe	Endangered	Bivalve	No
(Fusconaia cuneolus)		Freshwater	
Mussel, Oyster	Endangered	Bivalve	Yes
(Epioblasma capsaeformis)		Freshwater	
Mussel, Rough Pigtoe	Endangered	Bivalve	No
(Pleurobema plenum)		Freshwater	
Mussel, Shiny Pigtoe	Endangered	Bivalve	No
(Fusconaia cor)		Freshwater	
Pearlymussel, Appalachian Monkeyface	Endangered	Bivalve	No
(Quadrula sparsa)		Freshwater	
Pearlymussel, Birdwing	Endangered	Bivalve	No
(Conradilla caelata)		Freshwater	
Pearlymussel, Cracking	Endangered	Bivalve	No
(Hemistena lata)		Freshwater	
Pearlymussel, Cumberland Bean	Endangered	Bivalve	No
(Villosa trabalis)		Freshwater	
Pearlymussel, Cumberland Monkeyface	Endangered	Bivalve	No
(Quadrula intermedia)		Freshwater	
Pearlymussel, Dromedary	Endangered	Bivalve	No
(Dromus dromas)		Freshwater	
Pearlymussel, Green-blossom	Endangered	Bivalve	No
(Epioblasma torulosa gubernaculum)		Freshwater	
Pearlymussel, Little-wing	Endangered	Bivalve	No
(Pegias fabula)		Freshwater	
Purple Bean	Endangered	Bivalve	Yes
(Villosa perpurpurea)		Freshwater	
Rabbitsfoot, Rough	Endangered	Bivalve	Yes
(Quadrula cylindrica strigillata)		Freshwater	
Riffleshell, Tan	Endangered	Bivalve	No
(Epioblasma florentina walkeri (=E. walkeri))		Freshwater	
Spinymussel, James River	Endangered	Bivalve	No
(Pleurobema collina)		Freshwater	
Isopod, Lee County Cave	Endangered	Crustacean	No
(Lirceus usdagalun)		Freshwater	
Isopod, Madison Cave	Threatened	Crustacean	No
(Antrolana lira)		Freshwater	
Snail, Virginia Fringed Mountain	Endangered	Gastropod	No
(Polygyriscus virginianus)		Terrestrial	
Bat, Gray	Endangered	Mammal	No
(Myotis grisescens)		Subterraneous, Terrestrial	
Bat, Indiana	Endangered	Mammal	Yes
(Myotis sodalis)		Subterraneous, Terrestrial	

Virginia (33) species:

		Taxa	Critical Habitat
Bat, Virginia Big-eared *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal Terrestrial, Subterraneous	Yes
Squirrel, Delmarva Peninsula Fox *(Sciurus niger cinereus)*	Endangered	Mammal Terrestrial	No
Squirrel, Virginia Northern Flying *(Glaucomys sabrinus fuscus)*	Endangered	Mammal Terrestrial	No
Sea turtle, loggerhead *(Caretta caretta)*	Threatened	Reptile Saltwater	No

Washington (9) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Murrelet, Marbled *(Brachyramphus marmoratus marmoratus)*	Threatened	Bird Freshwater, Terrestrial, Saltwater	Yes
Owl, Northern Spotted *(Strix occidentalis caurina)*	Threatened	Bird Terrestrial	Yes
Pelican, Brown *(Pelecanus occidentalis)*	Endangered	Bird Terrestrial	No
Plover, Western Snowy *(Charadrius alexandrinus nivosus)*	Threatened	Bird Terrestrial	Yes
Bear, Grizzly *(Ursus arctos horribilis)*	Threatened	Mammal Terrestrial	No
Deer, Columbian White-tailed *(Odocoileus virginianus leucurus)*	Endangered	Mammal Terrestrial	No
Rabbit, Pygmy *(Brachylagus idahoensis)*	Endangered	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes

West Virginia (12) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Fanshell *(Cyprogenia stegaria)*	Endangered	Bivalve Freshwater	No
Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)*	Endangered	Bivalve Freshwater	No
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Tubercled-blossom *(Epioblasma torulosa torulosa)*	Endangered	Bivalve Freshwater	No
Spinymussel, James River *(Pleurobema collina)*	Endangered	Bivalve Freshwater	No
Snail, Flat-spired Three-toothed *(Triodopsis platysayoides)*	Threatened	Gastropod Terrestrial	No

West Virginia (12) species:

		Taxa	Critical Habitat
Bat, Gray *(Myotis grisescens)*	Endangered	Mammal Subterraneous, Terrestrial	No
Bat, Indiana *(Myotis sodalis)*	Endangered	Mammal Subterraneous, Terrestrial	Yes
Bat, Virginia Big-eared *(Corynorhinus (=Plecotus) townsendii virginianus)*	Endangered	Mammal Terrestrial, Subterraneous	Yes
Squirrel, Carolina Northern Flying *(Glaucomys sabrinus coloratus)*	Endangered	Mammal Terrestrial	No
Squirrel, Virginia Northern Flying *(Glaucomys sabrinus fuscus)*	Endangered	Mammal Terrestrial	No

Wisconsin (8) species:

		Taxa	Critical Habitat
Crane, Whooping *(Grus americana)*	Endangered	Bird Terrestrial, Freshwater	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Plover, Piping *(Charadrius melodus)*	Endangered	Bird Terrestrial	Yes
Warbler (=Wood), Kirtland's *(Dendroica kirtlandii)*	Endangered	Bird Terrestrial	No
Mussel, Winged Mapleleaf *(Quadrula fragosa)*	Endangered	Bivalve Freshwater	No
Pearlymussel, Higgins' Eye *(Lampsilis higginsii)*	Endangered	Bivalve Freshwater	No
Lynx, Canada *(Lynx canadensis)*	Threatened	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes

Wyoming (4) species:

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird Terrestrial	No
Bear, Grizzly *(Ursus arctos horribilis)*	Threatened	Mammal Terrestrial	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal Terrestrial	No
Wolf, Gray *(Canis lupus)*	Endangered	Mammal Terrestrial	Yes