**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)

**FROM:** Dirk F. Young, Ph.D., Environmental Engineer
Thomas Steeger, Ph.D., Senior Biologist
Environmental Risk Branch IV
Environmental Fate and Effects Division

**THRU:** Elizabeth Behl, Branch Chief
Environmental Risk Branch IV
Environmental Fate and Effects Division

**TO:** Mary Waller, Chemical Review Manager
Cynthia Giles-Parker, Risk Manager
Registration Division

Demson Fuller, Risk Manager Reviewer
Robert McNally, Risk Manager
Special Review and Reregistration Division

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.

---

[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

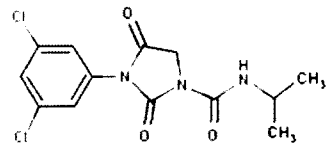
[2] Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC, 630/R-96/012, 1997 http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=12462

[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.

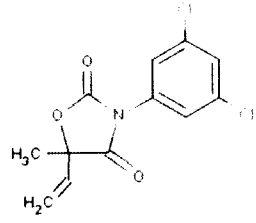
[4] Radice, S., M. Ferraris, L. Marabini, S. Grande, E. Chiesara. 2001. Effect of iprodione, a dicarboximide fungicide, on primary cultured rainbow trout (*Oncorhynchus mykiss*) hepatocytes. Aquatic Toxicology 54: 51 – 58.

[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)<br>4.7 day (pH= 7)<br>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<br>24 to 100 days | 43091002<br>44590501 | There were high amounts of unextracted material (75-87%) |
| Aerobic aquatic degradation half life | 9 days | 41927601<br>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 $2.7 \times 10^{-9}$ 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<br>Aerial spray: 0.95 | Input Guidance. | |
| Spray drift fraction | Ground spray: 0.01<br>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) | $2.7 \times 10^{-9}$ | 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<br>Aerial spray: 0.95 | Input Guidance. | |
| Spray drift fraction | Ground spray: 0.01<br>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).

---

[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:<br>Monocots<br>Dicots | <br>Acute: no data<br>Acute: no data | <br>--<br>-- | <br>--<br>-- |

[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 $4.2 \times 10^8$. (**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 $1.6 \times 10^4$. 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<br>2nd full bloom<br>3rd petal fall<br>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<br>2nd full bloom<br>3rd petal fall<br>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)<br>45 day PHI | 0.45 lb | 1 application | Foliar ground spray |
| Canola | Rorval 4 Fungicide 264-482 | 20 – 30 % bloom (~60 days after planting)<br>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<br>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<br>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<br>36 dat phi | 0.75 to 1 lb | 5 applications (14 days) | Foliar spray |
| Berries | Rorval 4 Fungicide 264-482 | Early bloom<br>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<br>2nd prior to bunch closing<br>3rd start of fruit opening<br>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<br>432-891<br>432-889<br><br>Super GT<br>432-1408<br><br>26/36 Fungicide<br>432-RURU | Non specific | 1.25 lb/acre ai | 4 applications (7-14 days) | |
| Ornamental | Super GT<br>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<br>Terrestrial | Yes |
| Owl, Mexican Spotted *(Strix occidentalis lucida)* | Threatened | Bird<br>Terrestrial | Yes |
| Pygmy-owl, Cactus Ferruginous *(Glaucidium brasilianum cactorum)* | Endangered | Bird<br>Terrestrial | No |
| Rail, Yuma Clapper *(Rallus longirostris yumanensis)* | Endangered | Bird<br>Terrestrial | No |
| Ambersnail, Kanab *(Oxyloma haydeni kanabensis)* | Endangered | Gastropod<br>Freshwater, Terrestrial | No |
| Bat, Lesser (=Sanborn's) Long-nosed *(Leptonycteris curasoae yerbabuenae)* | Endangered | Mammal<br>Subterraneous, Terrestrial | No |
| Ferret, Black-footed *(Mustela nigripes)* | Endangered | Mammal<br>Terrestrial | No |
| Jaguar *(Panthera onca)* | Endangered | Mammal<br>Terrestrial | No |
| Jaguarundi, Sinaloan *(Herpailurus (=Felis) yagouaroundi tolteca)* | Endangered | Mammal<br>Terrestrial | No |
| Ocelot *(Leopardus (=Felis) pardalis)* | Endangered | Mammal<br>Terrestrial | No |
| Pronghorn, Sonoran *(Antilocapra americana sonoriensis)* | Endangered | Mammal<br>Terrestrial | No |
| Squirrel, Mount Graham Red *(Tamiasciurus hudsonicus grahamensis)* | Endangered | Mammal<br>Terrestrial | Yes |
| Vole, Hualapai Mexican *(Microtus mexicanus hualpaiensis)* | Endangered | Mammal<br>Terrestrial | No |
| Wolf, Gray *(Canis lupus)* | Endangered | Mammal<br>Terrestrial | Yes |
| Rattlesnake, New Mexican Ridge-nosed *(Crotalus willardi obscurus)* | Threatened | Reptile<br>Terrestrial | Yes |
| Tortoise, Desert *(Gopherus agassizii)* | Threatened | Reptile<br>Terrestrial | Yes |

## *Arkansas* ( 15) species:

| | | Taxa | Critical Habitat |
|---|---|---|---|
| Eagle, Bald *(Haliaeetus leucocephalus)* | Threatened | Bird<br>Terrestrial | No |
| Tern, Interior (population) Least *(Sterna antillarum)* | Endangered | Bird<br>Terrestrial | No |
| Woodpecker, Red-cockaded *(Picoides borealis)* | Endangered | Bird<br>Terrestrial | No |
| Fatmucket, Arkansas *(Lampsilis powelli)* | Threatened | Bivalve<br>Freshwater | No |
| Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)* | Endangered | Bivalve<br>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 | Endangered | Bird | No |
| *(Lanius ludovicianus mearnsi)* | | Terrestrial | |
| Sparrow, San Clemente Sage | Threatened | Bird | No |
| *(Amphispiza belli clementeae)* | | Terrestrial | |
| Tern, California Least | Endangered | Bird | No |
| *(Sterna antillarum browni)* | | Terrestrial | |
| Towhee, Inyo Brown | Threatened | Bird | Yes |
| *(Pipilo crissalis eremophilus)* | | Terrestrial | |
| Vireo, Least Bell's | Endangered | Bird | Yes |
| *(Vireo bellii pusillus)* | | Terrestrial | |
| Abalone, White | Endangered | Crustacean | No |
| *(Haliotis sorenseni)* | | Saltwater | |
| Crayfish, Shasta | Endangered | Crustacean | No |
| *(Pacifastacus fortis)* | | Freshwater | |
| Fairy Shrimp, Conservancy Fairy | Endangered | Crustacean | Yes |
| *(Branchinecta conservatio)* | | Vernal pool | |
| Fairy Shrimp, Longhorn | Endangered | Crustacean | Yes |
| *(Branchinecta longiantenna)* | | Vernal pool | |
| Fairy Shrimp, Riverside | Endangered | Crustacean | Yes |
| *(Streptocephalus woottoni)* | | Vernal pool | |
| Fairy Shrimp, San Diego | Endangered | Crustacean | Yes |
| *(Branchinecta sandiegonensis)* | | Vernal pool | |
| Fairy Shrimp, Vernal Pool | Threatened | Crustacean | Yes |
| *(Branchinecta lynchi)* | | Vernal pool | |
| Shrimp, California Freshwater | Endangered | Crustacean | No |
| *(Syncaris pacifica)* | | Freshwater | |
| Tadpole Shrimp, Vernal Pool | Endangered | Crustacean | Yes |
| *(Lepidurus packardi)* | | Vernal pool | |
| Snail, Morro Shoulderband | Endangered | Gastropod | Yes |
| *(Helminthoglypta walkeriana)* | | Terrestrial | |
| Fox, San Joaquin Kit | Endangered | Mammal | No |
| *(Vulpes macrotis mutica)* | | Terrestrial | |
| Fox, San Miguel Island | Endangered | Mammal | Yes |
| *(Urocyon littoralis littoralis)* | | Terrestrial | |
| Fox, Santa Catalina Island | Endangered | Mammal | Yes |
| *(Urocyon littoralis catalinae)* | | Terrestrial | |
| Fox, Santa Cruz Island | Endangered | Mammal | Yes |
| *(Urocyon littoralis santacruzae)* | | Terrestrial | |
| Fox, Santa Rosa Island | Endangered | Mammal | Yes |
| *(Urocyon littoralis santarosae)* | | Terrestrial | |
| Kangaroo Rat, Fresno | Endangered | Mammal | Yes |
| *(Dipodomys nitratoides exilis)* | | Terrestrial | |

***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: | | | |
| 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: | | | |
| 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: | | | |
| 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: | | | |
| 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 *(Medionidus acutissimus)* | Threatened | Bivalve Freshwater | Yes |
| Mussel, Coosa Moccasinshell *(Medionidus parvulus)* | Endangered | Bivalve Freshwater | Yes |
| Mussel, Fine-lined Pocketbook *(Lampsilis altilis)* | Threatened | Bivalve Freshwater | Yes |
| Mussel, Gulf Moccasinshell *(Medionidus penicillatus)* | Endangered | Bivalve Freshwater | No |
| Mussel, Oval Pigtoe *(Pleurobema pyriforme)* | Endangered | Bivalve Freshwater | No |
| Mussel, Ovate Clubshell *(Pleurobema perovatum)* | Endangered | Bivalve Freshwater | Yes |
| Mussel, Shiny-rayed Pocketbook *(Lampsilis subangulata)* | Endangered | Bivalve Freshwater | No |
| Mussel, Southern Clubshell *(Pleurobema decisum)* | Endangered | Bivalve Freshwater | Yes |
| Mussel, Southern Pigtoe *(Pleurobema georgianum)* | Endangered | Bivalve Freshwater | Yes |
| Threeridge, Fat (Mussel) *(Amblema neislerii)* | Endangered | Bivalve Freshwater | No |
| 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 |
| Sea turtle, loggerhead *(Caretta caretta)* | Threatened | Reptile Saltwater | No |
| Snake, Eastern Indigo *(Drymarchon corais couperi)* | Threatened | Reptile Terrestrial | No |

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

***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<br>Terrestrial, Subterraneous | No |
| Sea turtle, green *(Chelonia mydas)* | Endangered | Reptile<br>Saltwater | No |
| Sea turtle, hawksbill *(Eretmochelys imbricata)* | Endangered | Reptile<br>Saltwater | Yes |

## *Idaho* ( 12) species:

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

## *Illinois* ( 14) species:

| | | Taxa | Critical Habitat |
|---|---|---|---|
| Eagle, Bald *(Haliaeetus leucocephalus)* | Threatened | Bird<br>Terrestrial | No |
| Plover, Piping *(Charadrius melodus)* | Endangered | Bird<br>Terrestrial | Yes |
| Tern, Interior (population) Least *(Sterna antillarum)* | Endangered | Bird<br>Terrestrial | No |
| Fanshell *(Cyprogenia stegaria)* | Endangered | Bivalve<br>Freshwater | No |
| Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)* | Endangered | Bivalve<br>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 | | Endangered | Bivalve | No |
| *(Plethobasus cicatricosus)* | | | Freshwater | |
| 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, Northern Copperbelly Water | | Threatened | Reptile | No |
| *(Nerodia erythrogaster neglecta)* | | | Freshwater, Terrestrial | |

| ***Iowa*** | ( 7) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|---|
| 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 | |
| Pearlymussel, Fat Pocketbook | | Endangered | Bivalve | No |
| *(Potamilus capax)* | | | Freshwater | |
| Pearlymussel, Higgins' Eye | | Endangered | Bivalve | No |
| *(Lampsilis higginsii)* | | | Freshwater | |
| Snail, Iowa Pleistocene | | Endangered | Gastropod | No |
| *(Discus macclintocki)* | | | Terrestrial | |
| Bat, Indiana | | Endangered | Mammal | Yes |
| *(Myotis sodalis)* | | | Subterraneous, Terrestrial | |

| ***Kansas*** | ( 6) 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 | |
| Bat, Gray | | Endangered | Mammal | No |
| *(Myotis grisescens)* | | | Subterraneous, Terrestrial | |
| Ferret, Black-footed | | Endangered | Mammal | No |
| *(Mustela nigripes)* | | | Terrestrial | |

| ***Kentucky*** | ( 33) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|---|
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |

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

## *Louisiana* ( 17) species:

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

## *Louisiana* ( 17) species:

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

## *Maine* ( 4) species:

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

## *Maryland* ( 6) species:

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

## *Massachusetts* ( 7) species:

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

| ***Massachusetts*** ( 7) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|
| Starling, Ponape Mountain | Endangered | Bird | No |
| *(Aplonis pelzelni)* | | Terrestrial | |
| Tern, Roseate | Endangered | Bird | No |
| *(Sterna dougallii dougallii)* | | Terrestrial | |
| Bat, Indiana | Endangered | Mammal | Yes |
| *(Myotis sodalis)* | | Subterraneous, Terrestrial | |
| Turtle, Bog (Northern population) | Threatened | Reptile | No |
| *(Clemmys muhlenbergii)* | | Terrestrial, Freshwater | |
| Turtle, Plymouth Red-bellied | Endangered | Reptile | Yes |
| *(Pseudemys rubriventris bangsi)* | | Terrestrial, Freshwater | |

| ***Michigan*** ( 9) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|
| Eagle, Bald | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | Terrestrial | |
| Plover, Piping | Endangered | Bird | Yes |
| *(Charadrius melodus)* | | Terrestrial | |
| Warbler (=Wood), Kirtland's | Endangered | Bird | No |
| *(Dendroica kirtlandii)* | | Terrestrial | |
| Mussel, Clubshell | Endangered | Bivalve | No |
| *(Pleurobema clava)* | | Freshwater | |
| Riffleshell, Northern | Endangered | Bivalve | No |
| *(Epioblasma torulosa rangiana)* | | Freshwater | |
| Bat, Indiana | Endangered | Mammal | Yes |
| *(Myotis sodalis)* | | Subterraneous, Terrestrial | |
| Lynx, Canada | Threatened | Mammal | No |
| *(Lynx canadensis)* | | Terrestrial | |
| Wolf, Gray | Endangered | Mammal | Yes |
| *(Canis lupus)* | | Terrestrial | |
| Snake, Northern Copperbelly Water | Threatened | Reptile | No |
| *(Nerodia erythrogaster neglecta)* | | Freshwater, Terrestrial | |

| ***Minnesota*** ( 6) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|
| Eagle, Bald | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | Terrestrial | |
| Plover, Piping | Endangered | Bird | Yes |
| *(Charadrius melodus)* | | Terrestrial | |
| Mussel, Winged Mapleleaf | Endangered | Bivalve | No |
| *(Quadrula fragosa)* | | Freshwater | |
| Pearlymussel, Higgins' Eye | Endangered | Bivalve | No |
| *(Lampsilis higginsii)* | | Freshwater | |
| Lynx, Canada | Threatened | Mammal | No |
| *(Lynx canadensis)* | | Terrestrial | |
| Wolf, Gray | Threatened | Mammal | Yes |
| *(Canis lupus)* | | Terrestrial | |

***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<br>Terrestrial | No |
| Turtle, Ringed Sawback *(Graptemys oculifera)* | Threatened | Reptile<br>Freshwater, Terrestrial | No |
| Turtle, Yellow-blotched Map *(Graptemys flavimaculata)* | Threatened | Reptile<br>Freshwater, Terrestrial | No |

## *Missouri* ( 13) species:

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

## *Montana* ( 7) species:

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

| ***Montana*** | ( 7) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|---|
| Bear, Grizzly | | Threatened | Mammal | No |
| *(Ursus arctos horribilis)* | | | Terrestrial | |
| Ferret, Black-footed | | Endangered | Mammal | No |
| *(Mustela nigripes)* | | | Terrestrial | |
| Wolf, Gray | | Endangered | Mammal | Yes |
| *(Canis lupus)* | | | Terrestrial | |

| ***Nebraska*** | ( 5) 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 | |
| Ferret, Black-footed | | Endangered | Mammal | No |
| *(Mustela nigripes)* | | | Terrestrial | |

| ***Nevada*** | ( 4) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|---|
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |
| Flycatcher, Southwestern Willow | | Endangered | Bird | Yes |
| *(Empidonax traillii extimus)* | | | Terrestrial | |
| Rail, Yuma Clapper | | Endangered | Bird | No |
| *(Rallus longirostris yumanensis)* | | | Terrestrial | |
| Tortoise, Desert | | Threatened | Reptile | Yes |
| *(Gopherus agassizii)* | | | Terrestrial | |

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

| ***New Jersey*** | ( 5) species: | | **Taxa** | Critical Habitat |
|---|---|---|---|---|
| Curlew, Eskimo | | Endangered | Bird | No |
| *(Numenius borealis)* | | | Terrestrial | |
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |
| Plover, Piping | | Endangered | Bird | Yes |
| *(Charadrius melodus)* | | | Terrestrial | |
| Bat, Indiana | | Endangered | Mammal | Yes |
| *(Myotis sodalis)* | | | Subterraneous, Terrestrial | |

## *New Jersey* ( 5) species:

| | | Taxa | Critical Habitat |
|---|---|---|---|
| Turtle, Bog (Northern population) *(Clemmys muhlenbergii)* | Threatened | Reptile<br>Terrestrial, Freshwater | No |

## *New Mexico* ( 20) species:

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

## *South Dakota* ( 5) species:

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

## *Tennessee* ( 48) species:

| | | Taxa | Critical Habitat |
|---|---|---|---|
| Eagle, Bald *(Haliaeetus leucocephalus)* | Threatened | Bird<br>Terrestrial | No |
| Stork, Wood *(Mycteria americana)* | Endangered | Bird<br>Terrestrial | No |
| Tern, Interior (population) Least *(Sterna antillarum)* | Endangered | Bird<br>Terrestrial | No |
| Woodpecker, Red-cockaded *(Picoides borealis)* | Endangered | Bird<br>Terrestrial | No |
| Combshell, Upland *(Epioblasma metastriata)* | Endangered | Bivalve<br>Freshwater | Yes |
| Elktoe, Appalachian *(Alasmidonta raveneliana)* | Endangered | Bivalve<br>Freshwater | Yes |
| Fanshell *(Cyprogenia stegaria)* | Endangered | Bivalve<br>Freshwater | No |
| Kidneyshell, Triangular *(Ptychobranchus greenii)* | Endangered | Bivalve<br>Freshwater | Yes |
| Mucket, Pink (Pearlymussel) *(Lampsilis abrupta)* | Endangered | Bivalve<br>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 | | Threatened | Reptile | No |
| *(Caretta caretta)* | | | Saltwater | |
| Snake, Concho Water | | Threatened | Reptile | Yes |
| *(Nerodia paucimaculata)* | | | Freshwater, Terrestrial | |
| ***Utah*** | ( 6) species: | | **Taxa** | Critical Habitat |
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |
| Flycatcher, Southwestern Willow | | Endangered | Bird | Yes |
| *(Empidonax traillii extimus)* | | | Terrestrial | |
| Owl, Mexican Spotted | | Threatened | Bird | Yes |
| *(Strix occidentalis lucida)* | | | Terrestrial | |
| Ferret, Black-footed | | Endangered | Mammal | No |
| *(Mustela nigripes)* | | | Terrestrial | |
| Prairie Dog, Utah | | Threatened | Mammal | No |
| *(Cynomys parvidens)* | | | Terrestrial, Subterraneous | |
| Tortoise, Desert | | Threatened | Reptile | Yes |
| *(Gopherus agassizii)* | | | Terrestrial | |
| ***Vermont*** | ( 3) species: | | **Taxa** | Critical Habitat |
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |
| Mussel, Dwarf Wedge | | Endangered | Bivalve | No |
| *(Alasmidonta heterodon)* | | | Freshwater | |
| Bat, Indiana | | Endangered | Mammal | Yes |
| *(Myotis sodalis)* | | | Subterraneous, Terrestrial | |
| ***Virginia*** | ( 33) species: | | **Taxa** | Critical Habitat |
| Eagle, Bald | | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | | Terrestrial | |
| Plover, Piping | | Endangered | Bird | Yes |
| *(Charadrius melodus)* | | | 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, Cumberland Combshell | | Endangered | Bivalve | Yes |
| *(Epioblasma brevidens)* | | | Freshwater | |
| Mussel, Cumberland Elktoe | | Endangered | Bivalve | Yes |
| *(Alasmidonta atropurpurea)* | | | Freshwater | |
| Mussel, Dwarf Wedge | | Endangered | Bivalve | No |
| *(Alasmidonta heterodon)* | | | Freshwater | |

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

## *Washington* ( 9) 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 | |
| Pelican, Brown | Endangered | Bird | No |
| *(Pelecanus occidentalis)* | | Terrestrial | |
| Plover, Western Snowy | Threatened | Bird | Yes |
| *(Charadrius alexandrinus nivosus)* | | Terrestrial | |
| Bear, Grizzly | Threatened | Mammal | No |
| *(Ursus arctos horribilis)* | | Terrestrial | |
| Deer, Columbian White-tailed | Endangered | Mammal | No |
| *(Odocoileus virginianus leucurus)* | | Terrestrial | |
| Rabbit, Pygmy | Endangered | Mammal | No |
| *(Brachylagus idahoensis)* | | Terrestrial | |
| Wolf, Gray | Endangered | Mammal | Yes |
| *(Canis lupus)* | | Terrestrial | |

## *West Virginia* ( 12) species:

| | | Taxa | Critical Habitat |
|---|---|---|---|
| Eagle, Bald | Threatened | Bird | No |
| *(Haliaeetus leucocephalus)* | | 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, Tubercled-blossom | Endangered | Bivalve | No |
| *(Epioblasma torulosa torulosa)* | | Freshwater | |
| Spinymussel, James River | Endangered | Bivalve | No |
| *(Pleurobema collina)* | | Freshwater | |
| Snail, Flat-spired Three-toothed | Threatened | Gastropod | No |
| *(Triodopsis platysayoides)* | | Terrestrial | |

## *West Virginia* ( 12) 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 | |
| Squirrel, Virginia Northern Flying | Endangered | Mammal | No |
| *(Glaucomys sabrinus fuscus)* | | Terrestrial | |

## *Wisconsin* ( 8) 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 | |
| Warbler (=Wood), Kirtland's | Endangered | Bird | No |
| *(Dendroica kirtlandii)* | | Terrestrial | |
| Mussel, Winged Mapleleaf | Endangered | Bivalve | No |
| *(Quadrula fragosa)* | | Freshwater | |
| Pearlymussel, Higgins' Eye | Endangered | Bivalve | No |
| *(Lampsilis higginsii)* | | Freshwater | |
| Lynx, Canada | Threatened | Mammal | No |
| *(Lynx canadensis)* | | Terrestrial | |
| Wolf, Gray | Endangered | Mammal | Yes |
| *(Canis lupus)* | | Terrestrial | |

## *Wyoming* ( 4) species:

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