

Regional Pesticide Recommendations of the U.S. Fish and Wildlife Service for Protection of Threatened and Endangered Species

Allen White, U.S. Fish and Wildlife Service, Austin, Texas US

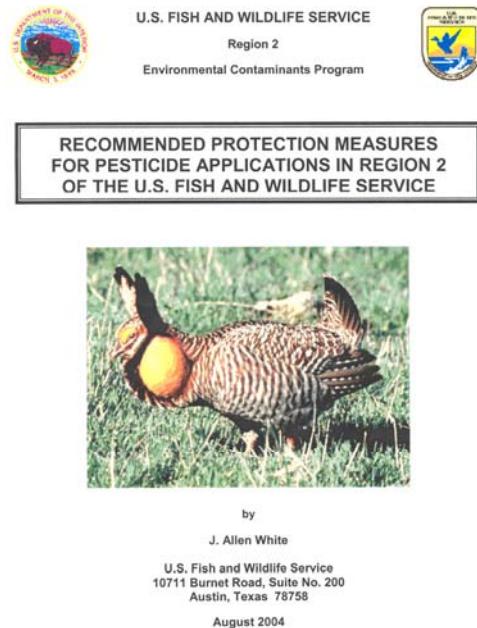
Abstract

Application of pesticides can potentially impact animal and plant species that have been listed as threatened or endangered under the Endangered Species Act of 1973. The U.S. Fish and Wildlife Service (Service) has recently developed a reference document entitled “Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service” that provides information on protecting threatened and endangered (T&E) species in the states of Arizona, New Mexico, Oklahoma, and Texas. The purpose of the document is to provide recommendations for pesticide applications that potentially involve T&E species, migratory birds, and national wildlife refuges or fish hatcheries. The document recommends specific protection measures based on a screening-level hazard assessment for various pesticide toxicities. As part of the hazard assessment process, pesticides are classified according to a system of pesticide ecotox classes and toxicological groupings of species. The ecotox class ratings for a given pesticide are used to approximate adequate buffer zones for individual species with respect to physical characteristics of pesticide spray drift and/or residues in surface runoff. Pesticide protection measures suggested in the reference document may be used in Endangered Species Act processes such as Service consultations with Federal agencies and development of Habitat Conservation Plans.

Introduction

The U.S. Fish and Wildlife Service (Service) has recently developed a reference document entitled “Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service” that provides information on protecting Federally-listed threatened and endangered (T&E) species in the Service’s southwest region (Region 2) of Arizona, New Mexico, Oklahoma, and Texas. (White 2004). The purpose of the document (Figure 1) is to provide recommendations for pesticide applications that potentially involve T&E species, migratory birds, and wildlife refuges in Region 2. The regional pesticide recommendations (RPR) do not establish legal obligations, minimum standards, or binding criteria to be adopted by the private sector or by government agencies at the Federal, state, or local levels. Protection measures in the RPR may be modified with additional information based on ecological risk assessments, field trials, or peer-reviewed science publications.

Figure 1. Regional pesticide recommendations by the U.S. Fish and Wildlife Service for T&E species, migratory birds, and wildlife refuges in Arizona, New Mexico, Oklahoma, and Texas.



Major Points

Under the Endangered Species Act of 1973 (ESA), “take” of animal species listed as threatened or endangered is prohibited. Take of T&E animal species includes harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. In particular, pesticide use may cause take of T&E animals through killing, harming, or harassment. Harm to T&E animal species can include significant habitat modification or degradation that results in death or injury to these species by impairing essential behavioral patterns such as breeding, feeding, or sheltering. Examples of harm to T&E animal species that can be caused by pesticide applications include abnormal behavioral changes in affected individuals and loss of prey species. Harassment of T&E animal species can be an intentional or negligent action (or omission of an action) that creates a likelihood of injury to a T&E species by annoying individuals of the species to such an extent as to significantly disrupt normal behavior patterns that include (but are not limited to) breeding, feeding, or sheltering. Noise disturbance from pesticide operations can result in harassment through (1) nest abandonment by birds or (2) disruption of nesting colonies of shorebirds or wading birds.

Although take does not apply to T&E plant species, the ESA does prohibit the following actions in areas under Federal jurisdiction: (1) removal, damage, or destruction of endangered plant species and (2) removal of threatened plant species. In addition, actions that remove, damage, or cause destruction of endangered plant species in non-Federal areas that are in violation of state or local laws are prohibited. Experimental populations of T&E species are protected by the ESA against unlawful use of pesticides if these populations are (1) essential experimental populations on either public or private lands or (2) nonessential experimental populations on national parks or wildlife refuges. Candidate species and species proposed for listing do not have ESA protections until the time of listing.

Unlawful uses of pesticides that potentially involve T&E species, migratory birds, or national wildlife refuges and hatcheries can have substantial penalties according to various Federal regulatory statutes. Civil penalties can be assessed under the ESA for up to \$25,000 for knowing violations of the act and up to \$500 for unknowing violations. Criminal penalties for individuals under the act include up to \$100,000 in fines and one year imprisonment. The Migratory Bird Treaty Act of 1918 prohibits the killing of migratory birds and assesses penalties for up to \$15,000 and six months imprisonment for misdemeanor violations. Felony violations by individuals under the act can involve up to \$250,000 in fines and two years’ imprisonment. The Bald Eagle Protection Act of 1940 assesses penalties for killing, poisoning, or disturbing both bald eagles and golden eagles with up to \$5,000 in fines for civil penalties and up to \$250,000 in fines and two years’ imprisonment for a felony violation. The National Wildlife Refuge System Administration Act of 1966 prohibits disturbing, injuring, or damaging plants and animals within a refuge. Criminal penalties under the act include up to \$100,000 in fines and one year imprisonment. In addition to the aforementioned acts, penalties for unlawful pesticide use may also be assessed under the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA) and other statutory authorities.

The RPR provides protection measures that can be used in the southwest region of the U.S. Fish and Wildlife Service to avoid or limit pesticide impacts to T&E species, migratory birds, and national wildlife refuges. Pesticide buffer zones are specifically recommended in the RPR for protection of species and habitat from (1) downwind spray drift during pesticide application and (2) pesticide residues in surface runoff. In particular, a buffer zone can provide greater protection against take of T&E animal species including take from (1) killing or injuring species, (2) indirect effects (e.g., loss of prey species) or (3) sublethal effects (abnormal behavioral changes, endocrine system disruption, etc.). Chronic toxicities for T&E species in aquatic habitat may also be reduced by using buffer zones; however, chronic conditions of toxicity in these habitats are potentially influenced by mass transport of pesticide residues (e.g., sediment-borne residues) from portions of the watershed that lie beyond the habitat itself.

Discussion

The RPR recommends specific protection measures based on a screening-level hazard assessment for various pesticide toxicities. As part of the hazard assessment process, active ingredients of pesticides are classified according to a system of seven pesticide ecotox classes and 18 toxicological groupings of species. Four ecotox classes for animals and three ecotox classes for plants are used in the classification system to rank active ingredients or formulations of pesticides. For animal species, the four ecotox classes cover ranges of pesticide toxicity:

- Class 0 This class includes pesticides that are practically nontoxic to a specific group of animal species that have similar toxicological responses (e.g., fungicidal toxicity for large mammal species). Class 0 pesticides ordinarily do not require protection measures for animal species.
- Class 1 This class includes pesticides that are slightly to moderately toxic to a specific group of animal species that have similar toxicological responses (e.g., malathion toxicity for small mammal species). Protection measures for Class 1 pesticides are minimal for T&E animal species.
- Class 2 This class includes pesticides that are highly toxic to a specific group of animal species that have similar toxicological responses (e.g., diazinon toxicity for warm water fish species). Protection measures for Class 2 pesticides are relatively substantial for T&E animal species.
- Class 3 This class includes pesticides that are very highly toxic to a specific group of animal species that have similar toxicological responses (e.g., carbofuran toxicity for small avian species). Protection measures for Class 3 pesticides can be highly stringent for T&E animal species depending on the sensitivity of a species or its habitat.

Toxicity endpoints for animal ecotoxicity classes (Classes 0, 1, 2, and 3) are defined according to standard EPA classifications for pesticide toxicity. Since plant species do not have ranges of pesticide toxicity similar to animal species, pesticides are rated in the RPR by ecotox class according to their herbicidal toxicity:

- Class D This class includes pesticides that have specific toxicity for dicot plants (including non-angiosperms). Protection measures for Class D herbicides depend on the dicot classification of T&E plant species and canopy structure of their habitat.
- Class M This class includes pesticides that have specific toxicity for monocot plants such as grasses, sedges, etc. Protection measures for Class M herbicides depend on the monocot classification of T&E plant species and the canopy structure of their habitat.
- Class NS This class includes pesticides that have nonspecific toxicity for any plant species. Protection measures for Class NS herbicides do not depend on the dicot or monocot classification of T&E plant species but may depend on the canopy structure of their habitat.

The seven ecotox class ratings for animals and plants are used to rate each pesticide active ingredient or formulation by ecotox class according to its overall toxic effect on individual groups of species (e.g., a Large Avian toxicity group is used to reflect general responses of species such as the brown pelican and

whooping crane). These species toxicity groups reflect general responses of species with respect to individual pesticide active ingredients or formulations. Species toxicity groups used in the RPR are:

1. Large Mammal (L-MA)
2. Predatory Mammal (P-MA)
3. Small Mammal (S-MA)
4. Gallinaceous Avian (G-AV)
5. Large Avian (L-AV)
6. Predatory Avian (P-AV)
7. Small Avian (S-AV)
8. Waterfowl Avian (W-AV)
9. Reptile (REP)
10. Aquatic Amphibian (A-AM)
11. Terrestrial Amphibian (T-AM)
12. Cold Water Fish (CW-F)
13. Warm Water Fish (WW-F)
14. Aquatic Arthropod (A-AR)
15. Bee (BEE)
16. Terrestrial Arthropod (T-AR)
17. Fresh Water Mollusk (FW-M)
18. Plant (PLANT)

When pesticide toxicity data are lacking for a particular species toxicity group, the ecotox class rating is modeled after the closest taxonomic group, e.g., the toxicity groups of Predatory Avian, Small Avian, and Reptile are modeled from the Gallinaceous Avian toxicity group.

Ecotox class ratings for individual pesticide active ingredients or formulations are summarized in Table 2 of the RPR (Figure 2) which serves as a screening level hazard assessment for pesticide toxicity. In general, the ecotox ratings in the table reflect the highest level or type of necessary protection for a species toxicity group according to potential pesticide hazards (acute oral toxicity, subacute dietary toxicity, etc.). Blank cells in the table indicate insufficient information to (1) make a determination of a pesticide's ecotoxicity rating or (2) justify modeling from an appropriate species toxicity group.

4.4 Supplemental Information

4.4.1 Pesticide ecotoxicity ratings

Pesticide					Species Toxicity Groups *†																	
common name/active ingredient	alternative name/ e.g., trade name	type ‡	use §	CASRN	L-MA	P-MA	S-MA	G-AV	L-AV	P-AV	S-AV	W-AV	REP	A-AM	T-AM	CW-F	WW-F	A-AR	BEE	T-AR	FW-M	PLANT
ABAMECTIN	AVERMECTIN	I, M	C, U	65195-55-3	1	1	2	0	0	0	0	0	0	3	3	3	3	3	2	3	3	
ACEPHATE (see note below)	e.g., ORTHENE	I, M	C, F, R/P, U	30560-19-1	2	2	2	3	3	3	3	3	3	1	1	1	1	3	2	3	3	
ACETAMIPRID		I	C	135410-20-7	1	1	1	1	1	1	1	1	1	0	0	0	0	1	2	3	1	
ACETOCHLOR		H	C	34256-82-1	1 _e	1 _e	1 _e	1	1	1	1	1	1	2	2	2	1	1	2	2	1	NS
ACIFLUORFEN		H	C	62476-59-9	1 _e	1 _e	1 _e	1 _e	1 _e	1 _e	1 _e	1 _e	1 _e	1	1	1	1	1	0	1	1	NS
ACROLEIN (aquatic)	e.g., MAGNACIDE	H	W	107-02-8	2	2	2	2	3	2	2	3	2	3	3	3	3	2	1	2	2	NS _{aq}
ACROLEIN (nonaquatic)		R	U	107-02-8	2	2	2 _b	2	3	2	2	3	2	3	3	3	3	2	1	2	2	NS
ALACHLOR		H	C	15972-60-8	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	1	NS
ALDICARB (granular formulation only)		I, N	C	116-06-3	2	2 _{sp}	2	3	3	3 _{sp}	3	3	3	1	1	1	1	3	0	3	3	
ALDOXYCARB	ALDICARB SULFONE	I, N	C	1646-88-4	2	2	2	2	2	2	2	2	2	1	1	1	1	3	0	3	3	
ALLETHRIN		I	U	584-79-2	1	1	1	0	0	0	0	0	0	2	2	2	2	1	1	3	1	
ALLOXYDIM		H	C	66003-55-2	1	1	1	0		0	0		0	0	0	0	0		0			M
ALUMINUM PHOSPHIDE		R	F, R/P	20859-73-8	2 _b	2 _b	2 _b	2 _b	2 _b	2 _b	2 _b	2 _b	2 _b							3 _b		

* A-AM = Aquatic Amphibian CW-F = Cold Water Fish G-AV = Gallinaceous Avian L-MA = Large Mammal P-MA = Predatory Mammal S-AV = Small Avian T-AM = Terrestrial Amphibian WW-F = Warm Water Fish
A-AR = Aquatic Arthropod FW-M = Freshwater Mollusk L-AV = Large Avian P-AV = Predatory Avian REP = Reptile S-MA = Small Mammal T-AR = Terrestrial Arthropod W-AV = Waterfowl Avian
† Subscripts: aq = aquatic formulation b = burrow fumigant e = eye irritation rating f = formulation dependent L = Lepidopteran specific s = skin irritation rating sp = secondary poisoning potential

Figure 2. Screening-level hazard assessment for pesticide active ingredients and various formulations used in regional pesticide recommendations. Levels or types of pesticide ecotoxicity for various toxicity groups of species are represented by Classes 0, 1, 2, or 3 for animals and Classes D, M, or NS for plants.

For a given pesticide, the ecotox class ratings are used to approximate adequate buffer zones for individual species with respect to physical characteristics of pesticide spray drift and/or residues in surface runoff. A buffer zone is defined in the RPR as the distance between the boundary of the area requiring protection and the closest point of the last spot application or application swath. The size of the buffer zone is relative to the type of application (i.e., spot, mechanized ground, or aerial) and depositional pattern of the formulation (liquid, ULV, granular, etc.). For T&E animal species, minimal buffer zones for Class 1 pesticides are based on estimates in the scientific literature on generic distances required for attaining (1) approximately 98 to 99 percent reduction in deposited active ingredient or (2) minimal effects during ground or aerial application. Minimal buffer zones recommended in the RPR for application of Class 1 pesticides by mechanized ground equipment or aircraft are

1. Thirty feet for mechanized ground applications of liquid formulations,
2. Eighty feet for mechanized ground applications of ULV formulations,
3. One hundred fifty feet for low (< 10 feet) aerial applications of liquid formulations,
4. Five hundred feet for low aerial applications of ULV or dust formulations,
5. One-eighth mile for high (> 10 feet) aerial applications of liquid formulations, and
6. One-fourth mile for high aerial applications of ULV or dust formulations.

Additional safety factors are provided in the RPR for Class 2 and Class 3 pesticides by respectively doubling and tripling buffer zones required of Class 1 pesticides. Class 2 and Class 3 pesticides may have the same buffer zone when the habitat of a T&E species is less susceptible to pesticide applications (e.g., aquatic species in large rivers). Otherwise, buffer zones for Class 3 pesticides are three times the minimal buffer zones of Class 1 pesticides when the Class 3 pesticides are applied in proximity to (1) edge habitat of sensitive species (e.g., bird species nesting along the edge of cropland) or (2) species habitat with a limited range (e.g., fish species restricted to a small spring system). Except for small aquatic habitat and other types of relatively vulnerable habitat, species serving as food sources for T&E species are not given additional safety factors and have the same buffer zones designated for Class 1 pesticides when necessary.

For aquatic habitats with T&E species, buffer zones are based on the potential for adverse pesticide concentrations relative to water volume. Small water bodies are considered to include (1) ponds, lakes, and reservoirs less than 100 surface acres; (2) spring runs, streams, and rivers less than 100 cfs (cubic feet per second, mean monthly discharge); or (3) shallows of relatively large waterbodies. Large waterbodies include either (1) lakes or reservoirs of 100 to 1,000 surface acres; or (2) spring runs, streams, and rivers of 100 to 1,000 cfs (mean monthly discharge).

Buffer zones recommended in the RPR for T&E plant species are relative to the type of plant canopy associated with the habitat. Minimal buffer zones (i.e., buffer zones used for Class 1 pesticides) are used for T&E plant species in plant communities with closed or dense canopies (e.g., forest). T&E plant species in communities with open to semi-open canopies (e.g., grassland) that are susceptible to spray drift are given minimal buffer zones plus an additional safety factor (i.e., buffer zones used for Class 2 pesticides). Buffer zones for plant pollinators are based on a pollinator's ability (as determined by size) to range from an area with a T&E plant species. A buffer zone of 1/2 mile at the edge of sites occupied by T&E plant species is recommended for small pollinators such as halictid (metallic) bees whereas a 2-mile buffer zone is recommended for relatively large pollinators such as bumble bees or hawkmoths.

An example in the RPR of a protection measure with buffer zones that can be used to protect dicot T&E plant species in small aquatic habitats (e.g., a pond with less than 10 surface acres) is shown in Figure 3 below. The protection measure addresses aquatic pesticides that can potentially be used inside the habitat as well as land-based applications of pesticides with herbicidal activity. The buffer zones for applications with spot ULV, mechanized ground, or aerial equipment in the example include a setback (untreated) distance of 300 feet to allow adequate filtration of water-borne pesticide residues by riparian vegetation.

35. To protect dicot plant species in relatively small aquatic habitat, the Service recommends —

- a. Federal agencies should either conduct a survey for the species in accordance with Service protocols or otherwise require a Service-approved survey before application of herbicide inside or adjacent to aquatic habitat of the species. For all other applicators or relevant agencies, a survey is recommended prior to herbicide application inside or adjacent to aquatic habitat of the species on non-Federal land. Pesticide users should contact the nearest Service field office for information on survey protocols. After a survey has been conducted, further restrictions on pesticide application are unnecessary if the habitat is unoccupied by the species. For occupied habitat or habitat that has not been surveyed, the Service should be consulted prior to pesticide treatment for appropriate protection measures and for any necessary authorization.
- b. Applicators should not use the following aquatic herbicides or any other aquatic herbicide within aquatic habitat of proposed or listed plant species.

acrolein	2, 4-D (e.g., Aqua-Kleen®)	fluridone	simazine
copper chelate	diquat	glyphosate (e.g., Rodeo®)	terbutryn
copper sulfate	endothall	imazapyr (e.g., Habitat®)	

- c. Applicators should use the following protection measures for application of pesticides on land adjacent to waterbodies and wetlands that serve as species habitat. Recommended buffer zones should be used for (1) all of the habitat area and (2) at least 1 mile upstream from the habitat area in any contributing channel, tributary, or spring run. The buffer zones should also be applied for at least 300 feet downstream from species habitat.

- ◆ Buffer zones are usually unnecessary for herbicides rated as Class M. Applicators using these pesticides should make sure that adverse effects for proposed or listed species will not occur inside species habitat as a result of pesticide application.
- ◆ The following buffer zones should be used at the edge of the waterbody or wetland to be protected if the pesticide rates either as Class D or Class NS.

Buffer Zones ¹	Spot applications ²	Mechanized ground applications	Low aerial applications ³	High aerial applications ³
Solid formulations ⁴	50 feet	350 feet	350 feet	350 feet
Liquid formulations ⁵	50 feet	350 feet	1/8 mile *†	1/4 mile
ULV or dust formulations ⁶	450 feet †	450 feet †	1/4 mile †	1/2 mile

Alternative Buffer Zones:
 * These applications and formulations can have a buffer zone of 350 feet at the edge of the waterbody or wetland to be protected if a strong, steady wind of at least 3 miles per hour is blowing directly away from the waterbody or wetland during the time of application.
 † These applications and formulations can have a buffer zone of 350 feet at the edge of the waterbody or wetland to be protected if the pesticide is applied by a sprayer with low pressure nozzles that deliver a spray ranging from coarse to very coarse in droplet size.

Figure 3. RPR protection measure for dicot T&E plants in small aquatic habitats.

Conclusion

The regional pesticide recommendations for Region 2 of the U.S. Fish and Wildlife can be used by regulatory agencies or pesticide users to reduce impacts to T&E species, migratory birds, and wildlife refuges. Protection measures suggested in the reference document may also be used in ESA processes such as Federal agency consultations and habitat conservation planning. Comments on the document or requests for copies can be sent to Allen White by phone (512) 490-0057 or email: allen_white@fws.gov.

References

White, J.A. 2004. Recommended protection measures for pesticide applications in Region 2 of the U.S. Fish and Wildlife Service. U.S. Fish Wildl. Serv., August 2004. Austin, TX.