BIRDS AND PESTICIDES: ARE PESTICIDE REGULATORY DECISIONS CONSISTENT WITH THE PROTECTION AFFORDED MIGRATORY BIRD SPECIES UNDER THE MIGRATORY BIRD TREATY ACT?

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SYNOPSIS

The best available scientific evidence shows that bird mortality is frequent and largely unavoidable in our farm fields. This reality will continue as long as certain pesticides of high acute toxicity continue to be used. Despite considerable scientific activity aimed at improving avian risk assessment, the United States' pesticide regulatory system[1] has been somewhat insensitive to bird mortality over the years. There have been, however, a few notable exceptions. The Federal Insecticide, Fungicide, and Rodenti-

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* I wish to preface this paper by pointing out that I am a research scientist with expertise in pesticide ecotoxicology and regulatory science. This Article is based on my presentation at a recent symposium organized by the College of William and Mary Environmental Law and Policy Review. I thank Dr. David Pimentel for initially suggesting that I be a speaker at this symposium, Linda Lyon of the United States Fish and Wildlife Service ("FWS") for making me aware of the relevant United States case law, and to Jennifer Maceda and Jennifer Macierowski for searching the legal literature on my behalf. For the last twenty years, I have been a keen observer and, at times, an active participant in United States pesticide regulatory activities. This participation has allowed me to develop first-hand experience with key United States Environmental Protection Agency ("EPA") actions in the area of pesticides and wildlife; notably, the proceedings against the use of diazinon in turf, the review of both granular and liquid formulations of carbofuran, the early days of EPA's granular strategy, the review of the insecticide chlorfenapyr, and the review of EPA's proposed probabilistic approaches in ecological risk assessment.

Kelley R. Tucker, Patti Bright, and Keith Marshall commented on an earlier draft of this paper. Any errors, however, are mine alone. The views put forward in this article do not necessarily reflect those of my employer, the Canadian Wildlife Service of Environment Canada.

[1] Although the emphasis here is on the United States and on regulatory decisions of EPA, it is clear that United States' registration decisions strongly influence the way the same pesticides are considered elsewhere, especially in important trading partners such as Canada and others in Latin America. *See generally* David Vogel, *Environmental Regulation and Economic Integration*, 3 J. INT'L ECON. L. 265 (2000) (discussing how environmental regulations of nations like the United States can change standards in other nations through economic pressures). Because many migratory birds move back and forth across the Americas, their fate may be controlled by decisions taken in Washington.

cide Act ("FIFRA"),[2] which provides the regulatory framework for pesticide use in the United States, uses a risk versus benefit approach to evaluate chemical effects, thus leaving the door open for bird mortality to be judged acceptable.[3] Yet, the continued use of pesticides that result in foreseeable avian mortality runs counter to the spirit if not the letter of Migratory Bird Treaty Act ("MBTA"),[4] which is a piece of treaty legislation with strict liability provisions. Past and recent pesticide regulatory decisions placed pesticide users in legal jeopardy with respect to the MBTA.

I. INTRODUCTION: THE CURRENT REALITY

Based on a recent analysis, many of the insecticides currently used in North America regularly cause bird mortality in a measurable proportion of treated fields.[5] These bird losses are diffuse and go largely undetected. This is in sharp contrast to the occasional, documented large kill that reminds wildlife authorities both that birds are ubiquitous in agricultural landscapes, and that many of the products we still use today are acutely toxic to birds, potentially killing exposed birds. Given the large scale on which some pesticides are used, the loss of even a few breeding songbirds per hectare can amount to a large yearly kill.[6]

It is likely that such diffuse bird mortality in our agricultural fields has been the norm from the very early days of the "pesticide revolution," even if we discount the effects of persistent organochlorine insecticides.[7] Many of the

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[2] 7 U.S.C. §§ 136-136y (2000).

[3] *See* 7 U.S.C. § 136(bb) (defining "unreasonable adverse effects on the environment" as, in part, "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide").

[4] 16 U.S.C. § 703-12 (2000).

[5] Pierre Mineau, *Estimating the Probability of Bird Mortality from Pesticide Sprays on the Basis of the Field Study Record*, 21 ENVTL. TOXICOLOGY & CHEMISTRY 1497, 1505 (2002) (reviewing close to two hundred field studies where bird mortality had been examined following pesticide use; constructing a series of logistic models to predict avian mortality based on several determinants including available laboratory acute toxicity, application rate and physico-chemical constants; and concluding that mortality is much more frequent and predictable than currently acknowledged).

[6] David Pimentel et al., *Environmental and Economic Costs of Pesticide Use*, 42 BIOSCIENCE 750, 757 (1992) (making an estimated guess of 67 million bird deaths per year attributed to pesticide use in the United States); *cf.* Mineau, *supra* note 5 (illustrating how the Canadian Wildlife Service is attempting to establish a firmer quantitative basis for estimating annual bird deaths caused by pesticides in the United States).

[7] *See*, *e.g.*, ROBERT L. RUDD & RICHARD E. GENELLY, CAL. DEP'T OF FISH & GAME, GAME BULLETIN NO. 7, PESTICIDES: THEIR USE AND TOXICITY IN RELATION TO WILDLIFE 20 (1956)

cholinesterase inhibiting products which replaced the persistent and bioaccumulatory products, such as 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane ("DDT") and the cyclodiene insecticides, are extremely toxic to birds with some LD_{50}[8] values predicted to be below 1 mg/kg body weight for some of the more sensitive species.[9] This level of toxicity is almost unprecedented in the mammalian world where values below 10 mg/kg in a rat generally denote products of exceptionally acute toxicity.[10] In part, this is because birds tend to be more sensitive to cholinesterase inhibitors[11] than mammalian species.

Efforts to make insecticides less toxic to human users by testing the effects on their laboratory surrogate species, the laboratory rat, have often failed to make any difference in the effect of the insecticides in birds. Fortunately, some more recent pesticide families, such as the synthetic pyrethroids, are much less toxic to birds. Thus, for many pesticide applications, safer alternatives for birds exist.[12] A notable feature of recent pesticide introductions, however, is that reduced avian toxicity is clearly not a major design consideration.[13]

(listing cases of mass mortality of songbirds associated with the use of parathion in orchards and alfalfa fields).

[8] LD_{50}, or "Lethal $Dose_{50}$," is a toxicological term defined as the quantity of a substance which is sufficient to cause the mortality of half of the individuals exposed to it. Canadian Ctr. for Occupational Health & Safety, *Chemicals & Materials: What Does LD_{50} Mean?*, *at* http://www.ccohs.ca/oshanswers/chemicals/ld50.html (last visited Oct. 6, 2003).

[9] Pierre Mineau et al., *Pesticide Acute Toxicity: Reference Values for Birds*, *in* 170 REVIEWS OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY 13, 71 (George W. Ware ed., 2001) (presenting a technique to help characterize the toxicity of pesticides to populations of bird species of unknown sensitivity in light of the fact that considerable variation exists in interspecies susceptibility to pesticides).

[10] HEALTH & WELFARE CANADA, PESTICIDE HANDLING: A SAFETY HANDBOOK 20 (1987).

[11] Cholinesterase inhibitors comprise two large groups of pesticides: the organophosphorus and carbamate compounds. These are most often marketed as insecticides or nematicides. *See* Pesticide Action Network Pesticide Database, *Neurotoxicity*, *at* http://www.pesticideinfo.org/Docs/ref_toxicity6.html (last updated Mar. 7, 2002).

[12] Although synthetic pyrethroids are less toxic to birds, most are extremely toxic to aquatic species, notably crustacea. *See* Timothy Quinn & Ruth Milner, Wash. Dep't of Fish & Wildlife, *Great Blue Heron*, *in* 4 MANAGEMENT RECOMMENDATIONS FOR WASHINGTON'S PRIORITY SPECIES: BIRDS (E. M. Larsen & N. Nordstrom eds., 1999), *available at* http://wdfw.wa.gov/hab/phs/vol4/gbheron.htm; P.J. Sheehan et al., *Predicting the Effects of Insecticides on Aquatic Systems and the Waterfowl That Use Them*, *in* FUNDAMENTALS OF AQUATIC TOXICOLOGY 827, 842 (Gary M. Rand ed., 2d ed. 1995). Defining what is or is not safe is much easier when considering a single environmental attribute only (here, birds).

[13] *See* Memorandum from Environmental Fate and Effects Division, to the Registration Division of the Environmental Protection Agency 1-2 (Aug. 31, 1998), *available at* http://www.epa.gov/opprd001/chlorfenapyr/memoeco.pdf (finding that the insecticide chlorfenapyr, which the company American Cyanamid (now BASF) attempted to introduce

Products of low acute toxicity to birds have always been available, but a lower avian toxicity *per se* has never been used to promote the products on the market or to influence product choice in the user community.[14] The "bad actors" that are responsible for much of the avian mortality witnessed around the globe tend to be the same familiar products, such as carbofuran, monocrotophos, diazinon, parathion, and fenthion.[15] In the United States, a review of cholinesterase-inhibiting pesticides is taking place under the auspices of the Food Quality Protection Act of 1996 ("FQPA");[16] Canada is following suit. Yet, the reduction of avian impacts under FQPA re-evaluation has been inconsistent at best.

II. A HISTORY OF BIRD PROTECTION: REGULATORY REVIEWS OF THE RISK TO BIRDS

Systematic review of pesticide applications for their risk to birds began in the United States in 1972, although a framework and formal test guidelines were not proposed until 1978 and not finalized until 1982.[17] In the early 1980s, the EPA staff realized that the provisions for triggering re-evaluation of registered pesticides and applying progressively higher tiers of scrutiny under United States legislation, such as FIFRA, were not being utilized. This progression to higher tiers of scrutiny allowed risk assessors not satisfied with the safety of a pesticide, based on tier one or two laboratory data, to direct the manufacturer to conduct higher tier tests such as full-fledged field studies. Because the trigger for higher tier testing was based on possible field lethality throughout the 1980s and early 1990s, a number of field trials were conducted on the most toxic pesticides registered in the United States.[18]

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in the late 1990s, presented a "substantial risk" to birds).

[14] Regulatory bodies have generally been loath to rank registered products or recommend one over another. Since 1993, it has been possible to identify low-risk alternatives for purposes of expedited registration. *See* OFFICE OF PESTICIDE PROGRAMS, ENVTL. PROT. AGENCY, REDUCED RISK, IPM, AND POLLUTION PREVENTION (1996), *available at* http://www.epa.gov/oppfead1/fqpa/rripmpp.htm.

[15] *See*, *e.g.*, Pierre Mineau et al., *Poisoning of Raptors with Organophosphorous Pesticides with Emphasis on Canada, U.S. and U.K.*, 33 J. RAPTOR RESEARCH 1, 24-27 (1999) (reviewing those products most frequently responsible for mortality of birds of prey); *see also* American Bird Conservancy, *Pesticide Profiles*, *at* http://www.abcbirds.org/pesticides/profiles.htm (last visited Sept. 30, 2003) (describing products of dubious avian safety).

[16] Pub. L. No. 104-107, 110 Stat. 1513 (1996) (codified as amended in scattered sections of 7 U.S.C. §§ 136-136y (2000)).

[17] Leslie W. Touart & Anthony F. Maciorowski, *Information Needs for Pesticide Registration in the United States*, 7 ECOLOGICAL APPLICATIONS 1086, 1086 (1997).

[18] *See generally* Mineau, *supra* note 5 (drawing from these field trials to create models

It is arguable that the design of these field trials was heavily influenced by the success of early studies carried out on products such as granular carbofuran. The combination of extreme toxicity to birds, a short time to death, and the attractiveness of the granules to birds—hence, considerable exposure—ensured that it was possible to detect carcasses in most treated fields.[19] For that reason, the basic United States field study design, although allowing for diverse approaches, emphasized lethality and the finding of bird carcasses.[20] This approach to ecological risk assessment changed dramatically in 1992.[21] Following recommendations of a task force, the EPA Office of Pesticide Programs ("OPP") decided to no longer require avian field testing except in unusual circumstances.[22] The new approach emphasized early attempts at risk mitigation, such as more sophisticated modeling of the laboratory tests and the consideration of incident data.[23]

The decision to no longer require avian field studies was openly criticized by some prominent pesticide researchers on the grounds that it has frequently proved impossible to foresee pesticide problems based on simple laboratory data.[24] A decade after this change of direction, much skepticism remains in the scientific community about researchers not needing to go out into the real world to assess pesticide risk.[25] In order to more fully utilize

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projecting avian mortality).

[19] *Contra* Pimentel et al., *supra* note 6, at 756 (noting that scavenger animals quickly eat bird carcasses, and that birds often die far from the areas treated with pesticides).

[20] *See* EDWARD C. FITE ET AL., ENVTL. PROT. AGENCY, DOC. NO. EPA 540/09-88-109, GUIDANCE DOCUMENT FOR CONDUCTING TERRESTRIAL FIELD STUDIES 11 (1988).

[21] *See* Memorandum from Linda J. Fisher, Assistant Administrator of the Office of Pesticides & Toxic Substances, to D. Campt, Director of the Office of Pesticide Programs, Envtl. Prot. Agency 2 (Oct. 29, 1992) (on file with author).

[22] *Id.*

[23] Unfortunately, subsequent rule changes in FIFRA section 6(a)(2) on the reporting of adverse effects by registrants appear to contradict the renewed emphasis on tracking and analyzing pesticide incidents. *See* 40 C.F.R. § 159.152 (1997). Those new rules allow for registrants to report incidents in aggregated fashion for bird kills of fewer than two hundred individuals of a flocking species, of fewer than fifty individual songbirds, or of fewer than five individuals of a predatory species. 40 C.F.R. § 159.184(c)(5)(iii)(C) (1997). A quick look at some summaries of pesticide incidents indicates that most incidents would fall into the category for which aggregate reporting is permitted. *See*, *e.g.*, Mineau et al., *supra* note 15, at 8. Such aggregate reporting obscures the conditions that led to the kill and make a scientific analysis that much more difficult. In addition, EPA guidelines state that "registrants are not required under FIFRA 6(a)(2) to investigate the incident to gather additional information." ENVTL. PROT. AGENCY, PESTICIDE REGISTRATION NOTICE 98-3, at 7 (1998), *available at* http://www.epa.gov/opppmsd1/PR_Notices/pr98-3.pdf.

[24] Lawrence J. Blus & Charles J. Henny, *Field Studies on Pesticides and Birds: Unexpected and Unique Relations*, 7 ECOLOGICAL APPLICATIONS 1125, 1125 (1997).

[25] Part of this skepticism is fueled by two other observations. Pesticide registrants were

laboratory test data, EPA convened an expert panel, the Ecological Committee on FIFRA Risk Assessment Methods ("ECOFRAM").[26] ECOFRAM's recommendations were to place risk assessment on a more probabilistic basis.[27] Some of the recommendations from the ECOFRAM process are currently being implemented, but these recommendations have not yet led to any regulatory decisions.[28] Expert meetings intent on improving the risk assessment process have also been held under the auspices of the Organisation for Economic Co-operation and Development ("OECD"), the Society of Environmental Toxicology and Chemistry ("SETAC"), and the European Union.[29] Many of these efforts are ongoing.[30] Despite all this activity, there has been no formal attempt to validate the avian risk assessment process. Even though any one field study on its own may not be persuasive or sufficient in this respect, the entire corpus of field studies performed to date is an invaluable resource that could be used to improve and calibrate the risk assessment process.[31]

Because of the importance of the United States' pesticide market and because a United States registration is highly desirable to pesticide manufacturers, data mandated by the United States are usually available for most of the pesticides currently registered worldwide.[32] OECD also prom-

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growing increasingly unhappy about the costs of this testing and lobbied actively to put an end to the program. Also, a large proportion of field studies did show evidence of avian mortality, thus confirming earlier risk assessments. What field studies were unable to do (without the application of considerably more resources) was to adequately quantify the extent of bird mortality resulting from the use of a pesticide or exploring the local population consequences of this mortality. Mineau, *supra* note 5, at 1505. It is highly unlikely that the new EPA approach to risk assessment can provide these answers.

[26] ECOLOGICAL COMM. ON FIFRA RISK ASSESSMENT METHODS, ECOFRAM TERRESTRIAL DRAFT REPORT 7-1 (1999), *available at* http://www.epa.gov/oppefed1/ecorisk/terrreport.pdf [hereinafter ECOFRAM TERRESTRIAL DRAFT REPORT].

[27] *Id*. Probabilistic or quantitative uncertainty analysis makes use of distributional and statistical methods, such as a Monte Carlo analysis, to propagate uncertainty and natural variability through a risk assessment calculation. *See, e.g.*, UNCERTAINTY ANALYSIS IN ECOLOGICAL RISK ASSESSMENT 35-36 (William J. Warren-Hicks & Dwayne R.J. Moore, Soc'y of Envtl. Toxicology & Chemistry eds., 1995).

[28] *See* ECOFRAM TERRESTRIAL DRAFT REPORT, *supra* note 26.

[29] *See generally* AVIAN EFFECTS ASSESSMENT: A FRAMEWORK FOR CONTAMINANTS STUDIES (Andy Hart et al. eds., Soc'y of Envtl. Toxicology & Chemistry 2001) (providing advice on improving procedures for risk assessment); PROBABILISTIC RISK ASSESSMENT FOR PESTICIDES IN EUROPE: IMPLEMENTATION AND RESEARCH NEEDS (Andy Hart ed., U.K. 2001).

[30] The author, as a member of the Canadian Wildlife Service's National Wildlife Research Center, is a part of these on-going efforts.

[31] *See* Mineau, *supra* note 5, at 1497.

[32] Note that the manufacturers have generated the data. The availability of these data to individuals outside of the pesticide regulatory agencies varies from country to country. There is a clear bias in pesticide data (lab or field) that is reported at scientific conferences or that

ulgates its own guidelines, although, up to this point, the avian study guidelines under OECD have been virtual copies of the EPA guidelines.[33] This may, however, be changing in the near future. Following a key meeting of experts in 1996, the scientific community expressed a wish to revisit the existing avian testing guidelines and ensure their suitability with current pesticide chemistry and other issues of concern.[34] Expert groups are currently reworking all existing guidelines, albeit at an exceedingly slow pace.[35]

III. BIRDS AS A FACTOR IN INDIVIDUAL PESTICIDE REGISTRATION DECISIONS

As described above, avian impact assessments are carried out routinely for pesticide registration or re-registration decisions. Only rarely is the safety to birds, however, the focus of a pesticide assessment. There are several ways in which pesticides can affect birds.[36] The emphasis in this Article will be on acute effects, such as mortality and debilitation. Modern (post-organochlorine era) pesticides also have the potential to affect avian reproduction, although this effect has not been adequately investigated in the field.[37] The best documented effects of pesticides on wildlife populations, however, are the indirect effects of insecticides and herbicides on some bird species such as the grey partridge (*Perdrix perdrix*) in the United Kingdom.[38] Equivalent research has not been carried out in North America.

This Part will briefly review a few cases of pesticides with the potential to cause significant avian mortality that have come up over the last two

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is published in scientific periodicals. Because the data is paid for by manufacturers, even if generated by academics, those data that put any pesticide in a "bad light" have a much lower probability of being made public.

[33] *See* ORG. FOR ECON. CO-OPERATION & DEV., AVIAN TESTING: COMPARISON OF EXISTING METHODS (Nov. 1994).

[34] ORG. FOR ECON. CO-OPERATION & DEV., SERIES ON TESTING AND ASSESSMENT NO. 5, REPORT OF THE SETAC/OECD WORKSHOP ON AVIAN TOXICITY TESTING 11-12 (1996), *available at* http://www.olis.oecd.org/olis/1996doc.nsf/7b20c1f93939d029c125685d005300b1/2ec1787698f5d608c12563f4005a10a8?OpenDocument.

[35] *Id.*

[36] *See generally* Pierre Mineau, *Avian Species*, *in* 1 ENCYCLOPEDIA OF AGROCHEMICALS 129 (J.R. Plimmer ed., 2003) (providing basic information about the effect of pesticides on birds).

[37] *See* Pierre Mineau et al., *An Analysis of Avian Reproduction Studies Submitted for Pesticide Registration*, 29 ECOTOXICOLOGY & ENVTL. SAFETY 304, 327 (1994).

[38] *See* N. Sotherton & J. Holland, *Indirect Effects of Pesticides on Farmland Wildlife*, *in* HANDBOOK OF ECOTOXICOLOGY 1175-76, 1178-79 (David J. Hoffman et al. eds., Lewis Pub. 2d ed. 2002). It is rather ironic that, even in the United Kingdom where most of the research on indirect effects has been carried out, the potential for pesticides to cause indirect effects in wildlife is not part of routine pesticide assessment. *See* EUROPEAN COMM'N HEALTH &

decades. These cases show that, with a few notable exceptions, North American regulatory systems have been largely insensitive to pesticide-induced avian mortality. It must be emphasized that avian mortality, especially diffuse mortality occurring in the breeding range of a species, is very difficult to detect. Yet, as mentioned earlier, the field evidence indicates it is occurring frequently and regularly.[39]

A. *Parathion*

Parathion, also known as ethyl parathion, is worthy of mention if only because it is one of the earliest registered organophosphorus insecticides. Bird mortality resulting from this insecticide was recognized very soon after the product was introduced,[40] but any scaling back of its uses over the years was clearly in response to human exposure rather than avian mortality.[41] The

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CONSUMER PROT. DIRECTORATE-GENERAL, DRAFT GUIDANCE DOCUMENT ON RISK ASSESSMENT FOR BIRDS AND MAMMALS UNDER COUNCIL DIRECTIVE 91/414/EEC, SANCO/4145/2000, draft at 8 (Sept. 25, 2002), *available at* http://www.pesticides.gov.uk/applicant/registration_guides/data_reqs_handbook/Supporting/4145Rev6.pdf.

[39] *See* Pimentel et al., *supra* note 6, at 757; Mineau, *supra* note 5, at 1504-05.

[40] *See* RUDD & GENELLY, *supra* note 7, at 112.

[41] *See* ENVTL. PROT. AGENCY, DOC. NO. EPA 738-F00-009, REGISTRATION ELIGIBILITY DECISION FACT SHEET 1-4 (2000), *available at* http://www.epa.gov/oppsrrd1/REDs/factsheets/0155fct.pdf.

> Ethyl parathion was first registered as a pesticide in the U.S. in 1948. EPA issued a Registration Standard for ethyl parathion in December 1986 that stated the Agency planned to initiate a Special Review due to acute human and avian concerns. In 1991, the Agency and the registrants of ethyl parathion reached an agreement under which the registrants agreed to limit use sites and restrict application and post-application practices. This action was taken by the Agency to mitigate risk to workers exposed during application and post-application.
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> Since 1991, the use of ethyl parathion in the United States has been limited to nine crops: alfalfa, barley, canola (rapeseed), corn, cotton, sorghum, soybeans, sunflowers, and wheat. All of the technical ethyl parathion sold in the United States is produced by Cheminova Agro A/S, formulated at one location and sold under the Cheminova label. Two formulations of ethyl parathion are currently being sold in the United States: Parathion 8EC (emulsifiable concentrate) and Ethyl Methyl Parathion 6-3 EC. A third formulation, 4EC, is registered but is not currently marketed. Additionally, seven other registrants hold a total of 15 product registrations; none, however, are currently marketed.
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> Due to the high estimated risks based on the best information available to the Agency, and the registrants' decision not to support the data requirements for reregistration, the registrants have signed an agreement to voluntarily cancel their registrations. Cancellation of manufacturing use products is effective immediately, and end use products

1991 interim arrangements[42] are particularly eloquent in their absence of any consideration of avian risk. The crops for which use was retained, such as alfalfa, are among the most frequented by wildlife.[43] Furthermore, restricting application to aerial delivery, in order to reduce exposure to the applicator, likely had the effect of exposing an even higher number of birds. This occured as a result of increasing drift and overspray of non-crop areas in proximity to agricultural fields.[44] The impact on migratory birds and endangered species was clearly acknowledged.[45] It is impossible to say whether it was the widespread public opposition to continued registration,[46] or the increasing discomfort of EPA with this pesticide that finally prompted the manufacturer to no longer support the product in the United States. Nevertheless, it will have taken forty-seven years after publication of cases of widespread bird mortality[47] to finally cancel this product.

> will be canceled [sic] effective December 31, 2002, with last legal use on October 31, 2003. Additionally, ethyl parathion end use product labels will be amended to delete use on corn grown for seed, the site with the highest potential risk to reentry workers, and add the last legal use date.

Id. at 1-2 (citations omitted).

> Ethyl parathion is very highly toxic to birds, fish, aquatic invertebrates and small mammals, poses a high acute risk to birds, mammals and aquatic invertebrates, and also poses a high chronic and reproductive risk to birds. This high acute, chronic, and reproductive risk would also be expected to impact many endangered species in the ethyl parathion use area.

Id. at 4.

[42] *Id.* at 1-2.

[43] *See* ALEXANDER C. MARTIN ET AL., AMERICAN WILDLIFE & PLANTS 471 (1951).

[44] *See* Mike O'Bryant, *Judge Orders Pesticide Buffer Zones to Protect ESA Fish*, COLUMBIA BASIN BULL. (July 18, 2003), *available at* http://www.bluefish.org/buffzone.htm.

[45] ENVTL. PROT. AGENCY, *supra* note 41, at 4. OFFICE OF PESTICIDE PROGRAMS, ENVTL. PROT. AGENCY, COMPARATIVE ANALYSIS OF ACUTE AVIAN RISK FROM GRANULAR PESTICIDES 68 (1992) ("Field studies [for granular formulations of parathion] have not been required because the data based on the bird kill incidents resulting from liquid and unknown formulations collectively demonstrate that ethyl parathion repeatedly kills large numbers of birds living or feeding in treated areas.") [hereinafter COMPARATIVE ANALYSIS OF ACUTE AVIAN RISK].

[46] *See* Press Release, American Bird Conservancy, One of World's Most Toxic Pesticides Cancelled: Farmers, Birds and Animals to Benefit (Oct. 17, 2000), *available at*, http://www.abcbirds.org/pesticides/EP_press_release.htm.

[47] *See* RUDD & GENELLY, *supra* note 7, at 112 (indicating earliest concerns with bird mortality, now forty-seven years ago, a concern which continued until parathion's cancellation).

B. *Carbofuran*

Perhaps the most publicized example of a bird-pesticide conflict is that of the carbamate insecticide, carbofuran. The re-evaluation of the granular formulations of carbofuran was launched by the EPA in 1985, following a field study that indicated substantial mortality,[48] and a risk assessment that tended in the same direction.[49] A negotiated settlement was reached with the manufacturer, Food Machinery and Chemical Corporation ("FMC"), in 1991, the result of which was the gradual phase-out of the main use patterns.[50] As recently as 2002, EPA proposed to relax restrictions on carbofuran use in rice, a move that environmental groups fiercely contested.[51] Perhaps more surprising is that the use of the liquid formulation continues more or less unabated, despite ample evidence from industry field studies mandated by EPA and submitted in 1989 that liquid carbofuran is also responsible for regular and predictable avian mortality.[52]

C. *Diazinon*

One notable exception to the general indifference of North American regulatory authorities to demonstrated bird mortality was the 1986 Special Review of diazinon used on turfgrass.[53] Largely through the sole perseverance

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[48] ENVTL. PROT. AGENCY, CARBOFURAN: SPECIAL REVIEW TECHNICAL SUPPORT DOCUMENT, at II-25, II-26 (Jan. 1989).

[49] Notice of Preliminary Determination to Cancel Registrations of Carbofuran Products, 54 Fed. Reg. 3,744, 3,744 (Jan. 25, 1989).

[50] *See*, *e.g.*, ENVTL. PROT. AGENCY, STATUS OF PESTICIDES IN REGISTRATION, REREGISTRATION, AND SPECIAL REVIEW 31 (1998) (summarizing EPA wildlife regulatory actions on granular carbofuran), *available at* http://www.epa.gov/oppsrrd1/Rainbow/98rainbo.pdf.

[51] *See* American Bird Conservancy, *Pesticide Profiles: Carbofuran*, *at* http://www.abcbirds.org/pesticides/Profiles/carbofuran.htm (last visited Sept. 7, 2003).

[52] In Canada, a few uses of the liquid formulation were cancelled as a result of a study that indicated the product was affecting the endangered burrowing owl (*Athene cunicularia*). Other uses, however, especially corn and potatoes, were retained despite higher application rates and demonstrated bird mortality at those rates of application. *See* PIERRE MINEAU, THE HAZARD OF CARBOFURAN TO BIRDS AND OTHER VERTEBRATE WILDLIFE, at xxii, 96 (Canadian Wildlife Serv., Technical Report Series No. 177, 1993) (describing United States' studies released in 1989 which show consistent mortality with the liquid formulation reviewed). Despite on-going review activity going back to the 1980s, to date EPA has not made public any assessment of liquid carbofuran.

[53] *See* Special Review and Preliminary Determination to Cancel Registration and Deny Applications for Certain Uses of Diazinon; Notice of Availability of Support Document, 51 Fed. Reg. 1842 (proposed Jan. 15, 1986); Intent to Cancel Registrations of Denial of

of Ward Stone, a wildlife pathologist employed by the State of New York, repeated kills of ducks and geese on turf—most often golf courses—were documented.[54] The conditions were right, and EPA management was receptive to take on this issue. The diazinon proceedings are important because this was the first, and only, case where avian risk was the sole reason for a major regulatory review.[55] Following a meeting of EPA's Scientific Advisory Panel ("SAP"), and an appeal by the manufacturer, Ciba Geigy (now Syngenta), in Administrative Law Court,[56] the use of diazinon on golf courses and sod farms was cancelled because of predictable and repeated bird mortality, primarily waterfowl grazing on treated turf, without any overwhelming social benefits.[57] Unfortunately, this decision was not extended to other grassed areas, although the hazard from diazinon use was similar.[58] Indeed, kills of waterfowl on other turf surfaces treated with diazinon continued unabated.[59] Following review under FQPA, the cancellations were far more compre-

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Applications for Registration of Pesticide Products Containing Diazinon; Conclusions of Special Review, 51 Fed. Reg. 35,034 (Oct. 1, 1986); Pesticide Tolerance for O,O-Diethyl O-(2-Isopropyl-6-Methyl-4Pyrimidinyl) Phosphorothioate, 51 Fed. Reg. 40,987 (proposed Nov. 12, 1986) (to be codified at 40 C.F.R. pt. 180); *see also* ENVTL. PROT. AGENCY, FACT SHEET 9/86, DIAZINON (D.Z.N. SPECTRACIDE) (1986), *available at* http://pmep.cce.cornell.edu/profiles/insect-mite/ddt-famphur/diazinon/insect-prof-diazinon.html.

[54] Ward B. Stone & Peter B. Gradoni, N.Y. State Dep't of Envtl. Conservation, *Wildlife Mortality Related to Use of the Pesticide Diazinon*, 4 NORTHEASTERN ENVTL. SCI. 30, 30-38 (1985).

[55] *In re* Ciba-Geigy Corp., 3 E.A.D. 232, 232 (1990) ("This case is the first proceeding in which . . . the Agency's Assistant Administrator for Pesticides and Toxic Substances, has advocated the cancellation of pesticide registrations based on risks posed solely to birds.") (citation omitted). *But cf.* THOMAS R. DUNLAP, DDT: SCIENTISTS, CITIZENS, AND PUBLIC POLICY 138, 172-75 (1981) (explaining that the risk of bird eggshell thinning featured prominently in the review of DDT and other organochlorine pesticides prior to *Ciba-Geigy Corp.*).

[56] *See* ENVTL. PROT. AGENCY, *supra* note 53, at 34 (summarizing EPA wildlife regulatory actions on diazinon).

[57] It is noteworthy that the EPA Administrator had to overrule the Administrative Law Judge in order to cancel the product. Judge Harwood, while clearly agreeing with the substance of the EPA case and rejecting much of the manufacturer's argumentation, allowed the putative benefits of the product to weigh unduly in his decision. The Administrator rejected this emphasis on benefits. For a more complete discussion, see R.S. McLaughlin et al., *Exceptions of the Environmental Protection Agency to the Initial Decision of the Administrative Law Judge*, *In re* Ciba-Geigy Corp., 3 E.A.D. 232, 232 (1990).

[58] Even though the hazard was similar, it can be argued that the actual risk was less because waterfowl are less frequently found on people's lawns and because most of the evidence for large and repeated bird kills was of grazing waterfowl species. *See generally* Stone & Gradoni, *supra* note 54.

[59] *See* ENVTL. PROT. AGENCY, ENVIRONMENTAL RISK ASSESSMENT FOR DIAZINON (2000), *available at* http://www.epa.gov/pesticides/op/diazinon/risk_oct2000.pdf [hereinafter ENVIRONMENTAL RISK ASSESSMENT FOR DIAZINON].

hensive—all indoor, turf, and domestic garden uses of diazinon have now been cancelled.[60] The avian risk on agricultural crops is clear. Mortality is expected as long as the product continues to be used regardless of the crop.[61] This is a weight of evidence assessment that includes an analysis of risk quotients, reported incidents, and the finding of extensive mortality of a large number of bird species in company field studies mandated by EPA.[62] Yet, to date, EPA proposes to retain most of the agricultural uses of diazinon.[63]

D. *Fenthion*

Fenthion has been repeatedly shown to cause avian mortality when used for mosquito control.[64] Yet, only after the American Bird Conservancy, Defenders of Wildlife, and the Florida Wildlife Federation brought a lawsuit against EPA in 2002, alleging kills of protected migratory birds and an endangered species, the piping plover, documented in 1998, did the manufacturer, Bayer, finally withdraw the product from the Florida mosquito control market.[65]

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[60] *See* ENVTL. PROT. AGENCY, OVERVIEW OF DIAZINON REVISED RISK ASSESSMENT (2000), *available at* http://www.epa.gov/oppsrrd1/op/diazinon/overview.pdf.

[61] ENVIRONMENTAL RISK ASSESSMENT FOR DIAZINON, *supra* note 59, at 164.

> In conclusion, diazinon has caused widespread and repeated mortality of birds. The mortality has been well documented over many years and we have high certainty regarding diazinon's risk to birds. Diazinon was canceled [sic] for use on golf courses and sod farms due to its high risk to birds. The risk to birds is very high on other sites as well, since birds can be attracted to a wide range of turf and agricultural sites. The continued mortalities over the years make it clear that neither the modestly lowered application rates on turf sites (i.e., from a typical 6 lb ai/A in the mid-1980's to a 4-5 lb ai/A rate in the past 10 years), nor the various added label environmental hazard statements, have been adequate to prevent bird mortalities. Mortality is likely to continue in the future if diazinon continues to be used on sites where birds can be exposed.

Id. at 164.

[62] For example, see *id.* at 99 for a brief review of R.J. Kendall's apple orchard study, discussing the response of wildlife exposed to multiple applications of Diazinon 50W in apple orchards of eastern Washington and south central Pennsylvania.

[63] In a very recent development, Syngenta, one of the primary manufacturers of diazinon, is planning to voluntarily withdraw all of its registrations of diazinon. It remains to be seen what effect this will have on the other manufacturers of this insecticide. *See* Diazinon; Notice of Receipt of Requests to Voluntarily Cancel Certain Pesticide Registrations, 68 Fed. Reg. 32,501-03 (May 30, 2003).

[64] *See generally* L.R. DeWeese et al., *Effects on Birds of Fenthion Aerial Application for Mosquito Control*, 76 J. ECON. ENTOMOLOGY 906 (1983) (citing published reports describing avian mortality due to fenthion dating back to 1962).

[65] Other factors which might have weighed in the balance include a recent merger between

E. *Granular Insecticides*

It can be difficult to understand why the regulatory system appears to be as reluctant as it is to put bird protection measures in place. Clearly, this is not for lack of trying by scientists and risk assessors working within these regulatory bodies. A good example is that of granular insecticides. Because these are formulated on particles resembling grit or food, granular insecticides have been long recognized as an important route of exposure to birds. As early as 1980, SAP was asked to comment on a proposal to place granular insecticides in the restricted pesticide category because of their high hazard to birds.[66] SAP advised against such a classification.[67] Eventually, EPA proposed that some granular products would be placed in a restricted category on a case-by-case basis through the "Registration Standard" procedure starting in 1986.[68] In 1992, EPA released a comparative analysis of granular insecticides. This risk assessment identified fourteen insecticides likely to cause lethal intoxications in birds.[69] EPA asked manufacturers of those products to implement voluntary remedial measures to reduce risk largely by reducing the number of granules available to birds on the soil surface. By 1994, EPA received proposals from seven registrants that covered many topics, including "lower application rates, reduced number of applications, and use of application methods designed to reduce the number of exposed granules in end rows."[70] It is not clear to date whether any of these changes

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the manufacturer Bayer and Aventis, another pesticide manufacturer. Such mergers typically lead to a consideration of the new company's "portfolio" of products. Also, fenthion was only used in Florida and, as such, probably generated relatively small sales relative to other insecticides.

[66] Richard Balcomb, Remarks at the Proceedings of the Environmental Protection Agency FIFRA Scientific Advisory Panel 142 (Mar. 5, 1980) (on file with author). Mr. Richard Balcomb, a risk assessor with EPA, said:

> What obligation does the Agency have to the user? A person that misuses a product, mismeasuring, using too high of a rate, therefore not following label directions, can be prosecuted and prosecutions have taken place and penalties have been placed at the rate of $500.00 for a bird kill. Requiring a user to take a four hour (in most states) training course to be able to use that so that he is given instruction in how to read a label and what it means and how to measure out a pesticide, is that too much to ask to protect the user from violating the law?

Id.

[67] *Id.*

[68] *Restricted Use Classification of Granulars to be Done in Standards*, PESTICIDE & TOXIC CHEM. NEWS, Mar. 7, 1984, at 9, *available at* http://www.ptcnonline.com/home.asp.

[69] COMPARATIVE ANALYSIS OF ACUTE AVIAN RISK, *supra* note 45, at 25.

[70] *See* ENVTL. PROT. AGENCY, 1994 ANNUAL REPORT (1995), *available at* http://www.epa.

led to real risk reduction. Unfortunately, the available science indicates that risk is not necessarily related to the number of exposed granules.[71] Mitigation is unlikely to be effective where granules are acutely toxic and attractive to foraging birds. To date, granular insecticides continue to represent a high source of avian exposure and mortality except where actions have been taken to restrict some uses under FQPA. Clearly, EPA biologists and risk assessors have tried for over twenty years to reduce the impact of these products. Unfortunately, their efforts appear to have had minimal effect on registration decisions.

F. *Chlorfenapyr*

Unless multiple stakeholders demand a system that places a priority on not killing birds as a consequence of pest control, governments are unlikely to deliver. Conversely, when a broad public coalition joins with the scientific community and speaks loud and clear, regulatory bodies are more likely to listen. The EPA assessment highlighted a number of characteristics that suggested chlorfenapyr was environmentally unsound, including a high acute and reproductive toxicity to birds.[72] With broad based opposition to chlorfenapyr's use on cotton, coordinated by the American Bird Conservancy,[73] and the resulting scientific review by SAP,[74] EPA officials were able to come to the decision not to register the product, consistent with EPA's original ecological assessment.

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gov/oppfead1/annual/1994/94a_text.htm.

[71] For example, see D.L. Fischer & L.B. Best, *Avian Consumption of Blank Pesticide Granules Applied at Planting to Iowa Cornfields*, 14 ENVTL. TOXICOLOGY & CHEMISTRY 1543 (1995).

[72] *See* Memorandum from Ed Odenkirchen et al. to Ann Siebold & Susan Lewis, Office of Prevention, Pesticides, and Toxic Substances, Envtl. Prot. Agency 1 (Aug. 31, 1998), *available at* http://www.epa.gov/opprd001/chlorfenapyr/memoeco.pdf.

[73] *See* Press Release, American Bird Conservatory, American Cyanamid Withdraws Insecticide Chlorfenapyr for Use on Cotton (Mar. 16, 2000), *available at* http://www.abcbirds.org/pesticides/chlorfenapyr.htm.

[74] Under FQPA, EPA was able to extend the membership of the panel and now has a number of scientists who are identified and available to serve on panels for which they have specific expertise. Formation and Request for Nominations to Serve on the Food Quality Protection Act, Scientific Review Board, 64 Fed. Reg. 30,991-93 (June 9, 1999).

G. *Monocrotophos—An International Example*

Many older pesticides are off-patent and, thus, are manufactured by a large number of companies, including many which operate in the developing world where pesticide use is still growing, but where regulatory standards have not necessarily kept pace.[75] Even when one of the initial registrants decides to withdraw from the global market, the void is quickly filled—this appears to be the case with the insecticide monocrotophos. This organophosphate pesticide disappeared from the United States market,[76] but had an unprecedented popularity in many parts of the world, including developing countries, making it the second highest selling insecticide in the world.[77] It attracted attention when it was found to be responsible for the death of a large number of Swainson's Hawks (*Buteo swainsoni*), a North American raptor that winters on the Argentine pampas.[78] A multi-national effort brought together scientists from Argentina, the United States, and Canada with avian conservation groups in Argentina and the United States to document and elevate the visibility of the issue.[79] These efforts set the stage for negotiations leading to voluntary withdrawal of the chemical from parts of Argentina and, eventually, to cancellation of all uses by the Argentine government.[80] Despite the withdrawal of one of the original patent holders—Ciba-Geigy, which then

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[75] *See* PAN *UK*, *Control of Pesticides and IPM in Developing Countries, available at* http://www.pan-uk.org/internat/IPMinDC/ipmindex.htm (last modified Sept. 23, 2003).

[76] Monocrotophos had a long and consistent history of bird kills in the United States, primarily when used in cotton although the largest bird kills, however, were documented in a potato field. *See* Michael J. Hooper et al., *Pesticides and International Migratory Bird Conservation*, *in* HANDBOOK OF EXOTOXICOLOGY, *supra* note 38, at 737, 740-41. Dupont acquired the United States registration of this product from American Cyanamid and attempted to obtain registration for corn in the 1980s. *Id.* Fortunately, this request came at a time when avian field studies were required for a number of insecticides acutely toxic to birds. After a preliminary field study, the company withdrew their request and, in 1988, voluntarily cancelled the product. ENVTL. PROT. AGENCY, *supra* note 50, at 54. Field studies are no longer required. *See* FITE ET AL., *supra* note 20, at 11. Therefore, it is interesting to speculate whether monocrotophos would be registered today. The high cost of field studies along with a high probability that mortality would be detected has probably had a significant dissuasive effect in the case of some products of high toxicity.

[77] *See* Günther Voss & Pater Schätzle, *Special Forward*, *in* 139 REVIEWS OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY: CONTINUATION OF RESIDUE REVIEWS, at xi, xi (George W. Ware ed., 1994).

[78] *See* PANUPS, *Agreement to Protect Swainson's Hawks, Pesticide Impacts on Wildlife* (Nov. 4, 1996), *at* http://www.pmac.net/hawks.htm.

[79] For a review of the case, see Hooper et al., *supra* note 76, at 738-39.

[80] *Id.* at 747.

became Novartis, now Syngenta,[81] fifteen manufacturers remain, including one of the original multinational patent holders, American Cyanamid (now BASF), which bought the product from Shell.[82] An unpublished assessment and review of the avian risk suggests that there is no registered rate of monocrotophos that is effective at killing insects without also killing exposed birds.[83] Yet, the product continues to be used worldwide.[84]

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[81] Again, company mergers and a re-evaluation of the combined portfolio may have played a substantial role in the business decision by Novartis to abandon the monocrotophos market. *See FIS Respond to Sygenta Open Offer, Tender Shares,* ECON. TIMES OF INDIA, Jan. 29, 2003.

[82] Hooper et al., *supra* note 76, at 740.

[83] Pierre Mineau, Is There a Safe Level of Application of Monocrotophos? 6 (Jan. 1998) (unpublished manuscript, on file with author). This risk assessment was part of an expert group's effort to review the risk of monocrotophos to birds globally. Representatives from the two primary manufacturers, Novartis Corporation (now Syngenta) and American Cyanamid (now BASF) participated in this task group initially. Both companies contributed studies which were considered in the risk assessment. American Cyanamid withdrew its participation before the assessment was completed.

[84] One factor which may reduce the popularity of monocrotophos is the withdrawal of the tolerance for monocrotophos residues in foodstuffs imported into the United States. The tolerance is the acceptable level of contamination of a foodstuff. Removal of a tolerance for monocrotophos would reduce the use of the product in countries exporting to the United States. *See* Dimethyl Phosphate of 3-Hydroxy-N-Methyl-Cis-Crotonamide (Monocrotophos) Final Rule; Tolerance Revocations, 64 Fed. Reg. 19,489, 19,489-93 (Apr. 21, 1999) (codified at 40 C.F.R. § 180.296).

> On June 13, 1988, the producer of monocrotophos requested voluntary cancellation of all registrations with a recall of all products in the channels of trade that would not be used by September 30, 1989. The last registered uses for monocrotophos were cancelled on January 22, 1991, for nonpayment of the March 1, 1990, maintenance fees. On June 9, 1993, the Agency's proposed revocation of tolerances for monocrotophos was published in the Federal Register. Comments were received from Ciba-Geigy Corporation, now Novartis Crop Protection, Inc. and Biologic Research & Development Inc., a U.S. regulatory consultant for the Shell International Chemical Company, expressing strong interest in maintaining tolerance on commodities imported into the United States. As a result, the Agency allowed tolerances to remain on peanut hulls, cottonseed, potatoes, sugarcane, and tomatoes.
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> On January 22, 1999, Novartis Crop Protection Inc. the sole producer of monocrotophos, informed EPA that it no longer intended to support monocrotophos tolerances for import purposes. Novartis indicates that sale of monocrotophos will end in 1999, and has requested that tolerances for import purposes be retained until December 31, 2000, in order to fully utilize their existing stock. As Novartis is the sole producer of monocrotophos, EPA believes that there is no one else who will support tolerances for monocrotophos for import commodities. Therefore, EPA is revoking these tolerances for monocrotophos in or on peanuts, peanut hulls, tomatoes, cottonseed, potatoes and sugarcane and in concentrated tomato products.

IV. BIRD MORTALITY RESULTING FROM PESTICIDE USE AS VIEWED BY THE MIGRATORY BIRD TREATY ACT

In the United States, as well as in Canada and Mexico, the most important statute concerning migratory birds is MBTA,[85] accompanied by MBCA in Canada.

In the 1970s, federal prosecutors and private citizens started bringing cases dealing with the incidental killing of migratory birds. In January of 1978, the District Court for the Eastern District of California, in *United States v. Corbin Farm Service*, found that the provisions of MBTA against "taking" birds did not only apply to willful hunting or capture but also to kill-ing birds with a labeled pesticide.[86] Since this opinion many commentators have discussed the issue of scienter and whether there are any limits to the strict liability provisions of MBTA.[87] The hypothetical concern that these commentators expressed is whether apparently innocent acts, such as driving one's car or installing a picture window in one's house, could be considered a violation of MBTA because of the high probability that migratory birds will be killed as a result of these acts. In *Corbin Farm Service*, however, the court valued pesticide use more than everyday human activities and put the public

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Id. (citations omitted).

EPA is incorrect in stating that Novartis is the only producer of monocrotophos, at least in potential exporting countries. Hooper et al, *supra* note 76, at 740. Nevertheless, it appears that no other manufacturer is willing to support the United States' tolerances and the data burden under FQPA.

[85] 16 U.S.C. §§ 703-712 (2000). For Canada's corresponding statute, see Migratory Birds Convention Act of 1994, R.S.C. ch. 22 (2003) (Can.) (Canada Federal Statutes Database, WESTLAW through Gazette vol. 137:17).

Much of the following discussion is based on a recent article by Larry Martin Corcoran and Elinor Colbourn. *See* Larry Martin Corcoran & Elinor Colbourn, *Shocked, Crushed and Poisoned*: *Criminal Enforcement in Non-Hunting Cases Under the Migratory Bird Treaties*, 77 DENV. U. L. REV. 359 (1999). These authors provide a comprehensive review of the MBTA, and of the Supreme Court's upholding of the Act as a valid exercise of treaty power and of important national interest. *Id.* They describe the struggle that courts encountered in applying MBTA's strict liability standard, which applies to misdemeanor offenses under MBTA. *See id*. at 377, 386 & n.206. Felony offenses are restricted to "[w]hoever . . . shall knowingly . . . take by any manner whatsoever any migratory bird with intent to sell, offer to sell, barter or offer to barter such bird . . . ." Migratory Bird Treaty Act, 16 U.S.C. § 707(b) (2000). Other pieces of legislation relevant to the incidental take of birds by pesticides are the Endangered Species Act, 16 U.S.C. §§ 1531-1544 (2000), and the Bald and Golden Eagle Protection Act, 16 U.S.C. § 668 (2000), review of which are beyond the scope of this article.

[86] *See* United States v. Corbin Farm Serv., 444 F. Supp. 510, 520-21 (E.D. Cal. 1978).

[87] *See*, *e.g.*, Corcoran & Colbourn, *supra* note 85, at 388-89.

on notice that pesticide use required special care because of the nature of the products.[88] The court argued that the label warned of bird toxicity and that a reasonable person *should have known* the crop in question, alfalfa, would be attractive to birds.[89]

Also in 1978, the Court of Appeals for the Second Circuit ruled against FMC Corp., which manufactures carbofuran, for killing birds at a wastewater pond at its manufacturing plant.[90] In finding FMC Corp. strictly liable for "fail[ing] to prevent [carbofuran] from escaping into the pond and killing birds,"[91] the court made an analogy to tort liability arising from dangerous conditions and substances.[92] The court further noted that "the sound discretion of prosecutors and the courts" would limit the scope of MBTA's strict liability provisions to ensure that not every migratory bird death resulting from human activity be subject to prosecution.[93] David P. Gold, however, notes that the Supreme Court already ruled that such discretionary power is insufficient protection against prosecuting the innocent.[94]

Of the eight circuits that have considered the mens rea requirement of MBTA, seven circuits have imposed strict liability for misdemeanors under MBTA.[95] The dissenting circuit, the Court of Appeals for the Fifth Circuit, required a showing of negligence before imposing liability in a case involving baiting of migratory birds.[96] This requirement has not impeded prosecution, and Mr. Gold argues this dissenting view will not have much of an effect on other circuits.[97]

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[88] *See Corbin Farm Serv.*, 444 F. Supp. at 518-21.
[89] *Id.* at 521 ("The means were present whereby the defendants could determine whether water fowl had been feeding repeatedly in the field and an unreasonable failure to do so cannot free them from liability.").
[90] *See* United States v. FMC Corp., 572 F.2d 902, 908 (2d Cir. 1978).
[91] *Id.* at 908.
[92] *Id.* at 907 (noting "[t]he principle here is the same as in the tort situation . . . . [w]hen one enters into a business or activity for his own benefit, and that benefit results in harm to others, the party should bear the responsibility for that harm").
[93] *Id.* at 905.
[94] *See* David P. Gold, Note, *Wildlife Protection and Public Welfare Doctrine*, 27 COLUM. J. ENVTL. L. 633, 661-62 (2002) (citing Staples v. United States, 511 U.S. 600, 614 (1994); Liparota v. United States, 471 U.S. 419, 433 (1985)).
[95] Gold, *supra* note 94, at 663. The seven circuits are the "Second, Third, Fourth, Sixth, Seventh, Eighth, and Tenth." *Id.*
[96] *See* United States v. Delahoussaye, 573 F.2d 910, 913 (5th Cir. 1978); *see also* Gold, *supra* note 94, at 663 (discussing *Delahoussaye*).
[97] Gold, *supra* note 94, at 664.

In *United States v. Rollins*, the District Court for the District of Idaho recognized that it is difficult to keep birds out of agricultural fields.[98] If one agrees with the court in *Rollins*,[99] then it follows logically that allowing the sale of toxic pesticides with a high probability of killing birds, places users in jeopardy with respect to the "take" provisions of MBTA. Seemingly, many of the regulatory decisions reviewed above in Part III are incompatible with a pesticide user's ability to avoid prosecution under MBTA.[100]

Additionally, whereas the courts have generally interpreted poisoning by pesticides to constitute an unlicensed "take,"[101] they have not extended this view to the protection of migratory bird habitat. In 1991, the Court of Appeals for the Ninth Circuit in *Seattle Audubon Society v. Evans*, ruled that habitat destruction, in this case timber harvesting, did not constitute a "take" within the meaning of MBTA.[102] As discussed below, this lack of protection of migratory bird habitat has clear repercussions on the possible indirect effects of pesticides on migratory birds.[103]

V. WHAT DOES FIFRA HAVE TO SAY ABOUT BIRD KILLS?

FIFRA is a "risk balancing statute."[104] Discussing the approval of pesticide registrations, FIFRA deals with the issue of environmental acceptability by indicating that, "[t]he Administrator shall register a pesticide if the Administrator determines that . . . it will perform its intended function without

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[98] United States v. Rollins, 706 F. Supp. 742, 744 (D. Idaho 1989).

[99] One also could make the case that keeping birds out of agricultural areas is not only difficult, but also generally undesirable. From a conservation point of view, birds need to use agricultural habitat. Also, the majority of bird species have a positive influence on the agroecosystem through consumption of pest species. *See* David A. Kirk et al., *Past and Current Attempts to Evaluate the Role of Birds as Predators of Insect Pests in Temperate Agriculture*, *in* 13 CURRENT ORNITHOLOGY 175, 176 (Val Nolan & Ellen D. Ketterson eds., 1996).

[100] *See* discussion *supra* Part III.

[101] *See supra* notes 85-94 and accompanying text.

[102] *See* Seattle Audubon Soc'y v. Evans, 952 F.2d 297, 303 (9th Cir. 1991).

[103] MBTA's failure to protect against indirect effects, such as habitat destruction, limits its effectiveness to protect migratory birds. Interestingly, the indirect effects of pesticide use have received most of the attention in the context of bird population effects, in part, because the best data with which to address population impacts—both pesticide use data and farmland bird data—come from the United Kingdom, where the use of pesticides acutely toxic to birds is much reduced compared to what it is in North America. *See* Sotherton & Holland, *supra* note 38, at 1178-79.

[104] Elizabeth M. Jalley et al., *Environmental Crimes*, 39 AM. CRIM. L. REV. 403, 467 (2002) (citations and internal quotations omitted).

unreasonable adverse effects on the environment; and . . . when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment."[105] FIFRA defines "unreasonable adverse effects on the environment" as "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."[106]

FIFRA, therefore, does not specifically address birds as a valued component of the environment or treaty obligations toward migratory bird species and leaves the Administrator a great deal of discretion in the relative weighing of risks and benefits in granting applications.[107] Even in cases where regulatory action was taken by EPA to protect birds, one could argue that MBTA and the upholding of its strict liability provisions by the courts was not given sufficient weight in EPA's final decision. For example, as a justification for the cancellation of the insecticide diazinon from turf farms and golf courses, EPA Administrator Lee Thomas emphasized that regular and repeated bird kills would not be tolerated unless justified by the pesticide's benefits.[108] He further ruled that regular kills did not mean kills had to occur following a majority of applications, and he also rejected the industry view that EPA had to demonstrate population-level impacts before taking action.[109] He also made it clear, however, "that the ultimate benefits of the uses at issue here–unblemished golf courses and lawns–are not as significant as the benefits to public health programs and food crops often implicated in cancellation proceedings."[110] This suggests that regular repeated bird kills might have been tolerated had the benefits of the pesticide in question been greater. Indeed, failure to cancel agricultural uses of the same pesticide suggests that the benefits case was more compelling for food uses than for turf, although this was never tested in a hearing.

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[105] 7 U.S.C. § 136a(c)(5) (2000).
[106] *Id.* § 136(bb).
[107] *See* Envtl. Def. Fund v. Envtl. Prot. Agency, 510 F.2d 1292, 1297 (D.C. Cir. 1975) (noting the Administrator's "broad discretion . . . to find facts and to set policy in the public interest") (citations and internal quotations omitted); *see also* John M. Megara, Comment, *The Rose Industry Exception for Early Entery Into Pesticide Treated Greenhouses: Romance in Regulation*, 25 B.C. ENVTL. AFF. L. REV. 941, 977 (1998).
[108] *In re* Ciba-Geigy Corp., 2 E.A.D. 516, 547 (1988), *vacated by* 874 F.2d 277 (5th Cir. 1989), *remanded to* 3 E.A.D. 232 (1990).
[109] *See id.* at 523, 531-32.
[110] *Id.* at 548 (citation omitted).

VI. ARE THERE INTERNATIONAL AGREEMENTS THAT COULD BE INVOKED TO PROTECT BIRDS FROM PESTICIDE IMPACT?

United States' registration decisions clearly carry a great deal of weight in other countries and in the Western hemisphere as a whole.[111] Nevertheless, international instruments are needed if we hope to address the safety of our migratory birds throughout their range. A good example was the case of monocrotophos, described above.[112]

The Persistent Organic Pollutant ("POP") Treaty has a very narrow coverage that excludes most modern pesticides.[113] The only other possibility for concerted international action on pesticides that repeatedly and predictably kill birds is the Rotterdam Convention on Prior Informed Consent ("PIC").[114] Even if fully implemented, however, PIC is a tool with very limited potential.

A. *Prior Informed Consent*

PIC was a joint agreement between the United Nations Environment Programme ("UNEP") and the Food and Agriculture Organization of the United Nations ("FAO") drafted in 1989 to help control impacts from banned or severely restricted chemicals.[115] Its genesis can be found in two previous

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[111] *Cf.* Anne Rowley, *Mexico's Legal System of Environmental Protection*, [1994] 24 Envtl. L. Rep. (Envtl. L. Inst.) 10,431, 10,445 (Aug. 1994) (noting that Mexican officials review foreign data when making pesticide registration decisions, but not indicating that this data comes from the United States).

[112] *See* discussion *supra* Part III.G.

[113] *See* Stockholm Convention on Persistent Organic Pollutants, May 22, 2001, 40 I.L.M. 532, U.N. Doc. No. UNEP/POPs/CONF/2; Pep Fuller & Thomas O. McGarity, *Beyond the Dirty Dozen: The Bush Administration's Cautious Approach to Listing New Persistent Organic Pollutants and the Future of the Stockholm Convention*, 28 WM. & MARY ENVTL. L. & POL'Y REV. 1 (2003).

[114] *See* Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Sept. 10, 1998, *available at* http://www.pic.int [hereinafter PIC].

[115] *See id.* pmbl., art. 1. Article 1 describes PIC as follows:

> The objective of this convention is to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use, by facilitating information exchange about their characteristics, by providing for national decision-making process on their import and export and by disseminating these decisions to Parties.

Id. art. 1.

sets of international guidelines—the International Code of Conduct on the Distribution and Use of Pesticides, which was originally developed in 1985 by FAO,[116] and the London Guidelines for the Exchange of Information on Chemicals in International Trade, which was developed in 1987 by UNEP.[117]

Under PIC, member countries have to notify the Secretariat of regulatory actions taken on specific pesticides.[118] When the Secretariat receives notifications from jurisdictions in different geographical "blocks," the Chemical Review Committee prepares an assessment of the chemical and "recommend[s] to the Conference of the Parties whether the chemical in question should . . . be listed in [the annex]."[119] Once this is done, exporting countries have the obligation to warn importing countries that the pesticide is listed under PIC.[120] These warnings, however, are for information only. Countries can still opt to import.

Although PIC allows for listing based on environmental criteria, emphasis until now has been on human poisonings. For example, even though the assessment of monocrotophos mentions reported bird kills, the measures taken under PIC are inconsistent with bird protection and only address worker safety.[121]

The 1998 Rotterdam Convention may make the provisions of PIC mandatory. To date, a total of seventy-three countries, including the European Union have signed the Convention.[122] Now fifty-four countries are parties to the Convention,[123] meeting the requirement for ratification, acceptance, approval, or accession by fifty countries to enter into force and setting the date for entry into force for February 24, 2004.[124] The United States has not

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[116] Food & Agric. Org. of the U.N., *International Code of Conduct on the Distribution and Use of Pesticides (Revised Version)*, 123d Sess. (2002), *available at* http://www.fao.org/ag/agp/agpp/pesticid/code/pm_code.htm (last updated Jan. 2003).

[117] U.N. Env't Programme, *London Guidelines for the Exchange of Information on Chemicals in International Trade, 1989 Amendment* (1989), *available at* http://www.chem.uncp.ch/ethics/default.html (last updated Sept. 13, 2001).

[118] *See* PIC, *supra* note 114, art. 5(1).

[119] *Id.* art. 5(6).

[120] *Id.* art. 12.

[121] Only formulations which exceed 600 grams ai/l are listed. Application rates of less concentrated formulations are adjusted so that the overall effect on birds is nil. *See Operation of the Prior Informed Consent Procedure for Banned or Severely Restricted Chemicals in International Trade, Decision Guidance Documents: Monocrotophes*, Joint FAO/UNEP Programme for the Operation of Prior Informed Consent, at 29 (1996).

[122] *See* Rotterdam Convention: Signatures and Ratifications, *at* http://www.pic.int (last visited Jan. 6, 2004) (indicating status as of Dec. 23, 2003).

[123] *Id.*

[124] *Id.*; PIC, *supra* note 114, art. 26.

yet ratified the Convention[125] nor provided any response to interim procedures which are in effect pending ratification.

VII. CONCLUSION: THE WAY FORWARD

One could argue that many of the apparent inconsistencies in the protection afforded to migratory birds following pesticide regulatory decisions by EPA result from the highly subjective weighing of pesticide risks and benefits under FIFRA.[126] The skill and perseverance of individual risk assessors, the risk managers' personal value systems, the degree of public participation and publicity surrounding a decision, economic interests of the manufacturer and user groups, and politics may all weigh heavily in such a process. In the absence of clearer language in FIFRA, the best ultimate guarantee for the protection of migratory birds against pesticides still lies with MBTA. Unfortunately, rulings made under FIFRA risk balancing may place pesticide users in legal jeopardy with respect to MBTA's strict liability provisions.[127] Also, protection against pesticides under MBTA is only partial at best: courts have not extended strict liability protection to indirect effects of pesticides on bird habitats.[128] Therefore, MBTA can only deal with the direct, lethal effects of pesticides on birds, effects which, in the end, only represent part of the problem.[129]

Larry Martin Corcoran has described how tempting it is for the courts to try to distinguish between different ways of killing migratory birds based on the idea of proximate causation or foreseeability in order to separate "legitimate" indictable offenses from "absurd and unintended results" under MBTA.[130] One could argue that the death of a protected bird is generally not a consequence of driving an automobile whereas the use of a pesticide known to be acutely toxic to birds foreseeably may cause mortality. Mr. Corcoran, however, argues against such a distinction.[131] The best available science

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[125] *See* Rotterdam Convention: Signatures and Ratification, *supra* note 122.
[126] *See supra* Parts IV & V.
[127] For a discussion of FIFRA's risk balancing, see *supra* Part V. For a discussion of MBTA's strict liability provisions and their treatment in the courts, see *supra* Part IV.
[128] *See supra* notes 98-103 and accompanying text.
[129] See *supra* notes 29, 38 & 103, for a discussion about the demonstrated importance of indirect pesticide effects in Europe.
[130] *See* Larry Martin Corcoran, *Migratory Bird Treaty Act: Strict Criminal Liability for Non-Hunting, Human Caused Bird Deaths*, 77 DENV. U. L. REV. 315, 338-42, 357 (1999) (citation omitted).
[131] *Id.* at 357 ("Court's conclusory statements that impact deaths are not foreseeable or

indicates that, unless proper mitigation is put into place, death of birds by human-caused misadventure is a statistical reality.[132] Birds will strike towers, windows, cars, and other human creations, and those deaths are as foreseeable as deaths caused by other means, such as pollution, pesticides, and electrocution, for which the courts have generally recognized criminal liability under MBTA.[133] Instead of relying on MBTA, Mr. Corcoran proposes three approaches: (1) amending MBTA to create statutory distinctions among different types of human-caused bird deaths, (2) setting take permits by regulation, and (3) entering into discussion and negotiations with individual industries and regulatory agencies.[134]

The most draconian measure would be to amend MBTA to create statutory distinctions among different types of human-caused bird deaths.[135] According to Mr. Corcoran, however, amendment is not necessary,[136] and, although not explicitly stated, would be an abdication of the conservation principles, which are the cornerstone of MBTA.

A second possibility would be the setting of "take" permits by regulation.[137] For example, the Secretary of the Interior might grant a pesticide manufacturer approval for a particularly toxic product and at the same time, grant a permit allowing for a certain "take" of migratory birds—in essence a "bag limit" for a large number of migratory bird species frequenting agricultural fields. This raises a number of difficult questions about the societal costs of implementing such a system. Considerable resources, including monitoring, analysis, and enforcement, are expended every year to ensure that a handful of species, such as waterfowl and doves, are harvested in a sustainable fashion. Given that pesticide use is extremely variable in time and place, in response to pest pressure and market forces, how would a permit system be designed, managed, and enforced to ensure a sustainable "take" of bird species? Who would pay for such a system? How would "bag limits" be shared among companies producing competing, but equally dangerous, pesticides?

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proximately caused are inconsistent with available data.").

[132] *See id.* at 346-52 (discussing empirical data regarding human-caused non-hunting migratory bird deaths).

[133] *Id.* at 357-58.

[134] *See id.* at 355-57 (outlining these three proposals).

[135] *See id.* at 357.

[136] *See* Cocoran, *supra* note 130, at 357.

[137] *See id.* at 355-56.

A third option, the one clearly favored by Mr. Corcoran and by this author, is the incremental process of discussion and negotiations with individual industries and, by extension, with the regulatory oversight agencies.[138] As the science of mitigation develops, standard techniques and approaches change to include available measures to reduce the incidental "take" of migratory birds. Mr. Corcoran gives the example of the power industry and current attempts to reduce the electrocution of raptors through the redesign and retrofitting of power lines and pylons.[139] In the pesticide arena, industry has not yet shown much of an indication that it is willing or able to police itself.[140] This lack of self-regulation places the onus on pesticide regulators to more carefully weigh the putative benefits of pesticides that impact migratory birds, mindful of the fact that the latter are protected under treaty law.[141]

Protection of migratory birds requires better dialogue between the pesticide regulators and the managers of the migratory bird resource.[142] Pesticide regulators need to take some ownership of current conservation initiatives, like the North American Bird Conservation Initiative,[143] and help reduce the extent of bird losses in agricultural lands. In order to play their much-needed role in achieving environmental sustainability on our agricultural lands, EPA and national pesticide regulatory bodies elsewhere need to institute a fast-tracking of reviews—and, hopefully, cancellations—of those pesticides causing predictable and unavoidable bird mortality. It is unreasonable to have some cases dragging on for decades while acknowledged

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[138] *See id.* at 356-57.
[139] *Id.* at 356.
[140] Indeed, the reason it has taken so long to bring forth regulatory actions intended to protect birds—for example, granular carbofuran, diazinon on turf—has been the very vigorous and protracted opposition to the proposed cancellations by the manufacturers. Also, in the case of monocrotophos, several manufacturers, including a large multinational manufacturer, continue marketing the product despite unprecedented publicity surrounding its impact on birds. *See supra* Part III.G.
[141] Pesticide benefits are notoriously difficult to estimate because of the sometime uncertain availability of alternatives. A product judged to have a very high economic benefit may derive most of its benefit merely because its presence on the market has discouraged manufacturers from putting forward better alternatives. Current assessments of pesticide benefits are, by definition, heavily weighted to the status quo because alternative pesticides may be lacking for reasons just explained.
[142] The relevant agencies are, of course, EPA and Fish and Wildlife Service in the United States, although this recommendation holds for any country, for example, the Pest Management Regulatory Agency and the Canadian Wildlife Service in Canada.
[143] For general information on the North American Bird Conservation Initiative, see NABCI, *at* http://www.nabci.org (last visited Aug. 30, 2003).

kills of migratory birds continue.[144] Measures will also need to include serious mitigation and/or remediation efforts in the case of products of borderline acceptability. Industry will have to be forced to provide more resources to demonstrate the feasibility of mitigation measures and to show that their combined impact on the bird resource is minimized. In the past, regulators and industry have attempted to solve every bird-pesticide conflict with more restrictive labeling leading to warnings of dubious value and enforceability. For example, how is a farmer supposed to react to a label that enjoins him or her not to use a product in "areas frequented by wildlife?"[145] What agricultural fields anywhere can be said to be devoid of wildlife species? A regulatory system that relies on labeling alone to prevent damage to birds has abandoned the farmers and needlessly placed them in a situation of legal jeopardy.

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[144] For example, although evidence supports the toxicity of carbofuran to birds, it is still registered for use in the United States. *See generally* American Bird Conservancy, *Carbofuran, at* http://www.abcbirds.org/pesticides/Profiles/carbofuran.htm (last visited Aug. 30, 2003); Extension Toxicology Network, *Pesticide Information Profiles: Carbofuran, at* http://ace.ace.orst.edu/info/extonet/pips/carbofur.htm (last revised June 1996). The American Bird Conservancy, however, notes that Canada and the Commonwealth of Virginia have banned the use of granular carbofuran. *See* American Bird Conservancy, *supra.*

[145] This language is frequently used on carbofuran product labels.