



1992

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### Recommended Citation

Olexa, Michael T. (1992) "Pesticide Use and Impact: FIFRA and Related Regulatory Issues," *North Dakota Law Review*. Vol. 68 : No. 2 , Article 9.

Available at: <https://commons.und.edu/ndlr/vol68/iss2/9>

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# PESTICIDE USE AND IMPACT: FIFRA AND RELATED REGULATORY ISSUES

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## I. INTRODUCTION

Pesticides were first subjected to federal regulations through the Insecticide Act of 1910.<sup>1</sup> This Act prevented the manufacture, sale or transportation of adulterated or misbranded pesticides and established minimal regulation of fungicide and insecticide sale. Following a surge in the development and usage of pesticides during and after the Second World War, Congress reexamined and repealed the Act of 1910 and enacted the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1947.<sup>2</sup>

In 1970, Congress transferred the administration of FIFRA from the USDA to the newly created Environmental Protection Agency (EPA).<sup>3</sup> This marked a shift in federal policy from the control of pesticides for reasonably safe use in agricultural production to control of pesticides for reduction of unreasonable risks to people and the environment. This policy was strengthened by the passage of the Federal Environmental Pesticide Control Act of 1972 (FEPCA), which amended FIFRA by specifying methods and standards of control in greater detail.<sup>4</sup>

This has resulted in a shift toward greater emphasis in understanding and minimizing risks associated with toxicity and environmental degradation, and away from the efficacy issues that dominated earlier legislation. Subsequent amendments have clarified the duties and responsibilities of the EPA.

## II. REGULATORY OVERSIGHT THROUGH REGISTRATION

In general, all pesticides must be registered by the EPA. FIFRA and the regulations issued by the EPA set out the require-

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1. Pub. L. No. 61-152, §§ 1-12, 36 Stat. 331 (1910).

2. Pub. L. No. 80-104, § 16, 61 Stat. 163 (1947).

3. Reorg. Plan of 1970, 35 Fed. Reg. 15, 623 (1970).

4. Pub. L. No. 92-516, 86 Stat. 973 (1972).

ments and procedures for registration. These requirements are quite complex and need not be elaborated here other than to point out that EPA will not register a pesticide unless it is satisfied that its use, as specified by the label, will not cause undue harm to people or the environment.<sup>5</sup> Pesticides must be reregistered periodically, and EPA must make the same kind of judgment on a reregistration that it does on an original registration.<sup>6</sup> EPA may cancel the registration of a pesticide if information becomes available showing that the material poses an undue risk to people or the environment.<sup>7</sup> Under FIFRA, no one may sell, distribute, offer to sell, hold for sale, ship, deliver for shipment or use a pesticide unless it is registered by the EPA.<sup>8</sup>

Some exemptions to the registration requirement do exist, but they do not generally affect the availability or use of a pesticide in agriculture. For example, unregistered pesticides may be made available for experimental use by a temporary permit, especially if the experimental use is needed to develop information needed to support an application for registration.<sup>9</sup> Also, unregistered pesticides may be made available to a federal or state agency (usually the State Commissioner of Agriculture) to combat an emergency. This could include a threatened or serious pest outbreak when no registered pesticide adequate for control is available, when time does not allow registering the needed pesticide in the usual manner, and when significant economic or health damage may occur.<sup>10</sup> Other exemptions include pesticides that are transferred from one establishment to another for the same producer solely for packaging or for use as a part of another formulation;<sup>11</sup> that are transferred for purposes of disposal;<sup>12</sup> that are intended for export;<sup>13</sup> that come under the Federal Food, Drug and Cosmetic Act exemption by virtue of their being adequately controlled by another federal agency;<sup>14</sup> and that the Administrator of EPA may choose to exempt while still carrying out the intent of FIFRA.<sup>15</sup>

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5. See 40 C.F.R. §§ 152.112-.114.

6. See 40 C.F.R. §§ 152.60-.70.

7. 40 C.F.R. § 152.118.

8. 40 C.F.R. § 152.15; Pub. L. No. 80-104, § 4, 61 Stat. 163, 172 (1947).

9. 40 C.F.R. part 172 (1991).

10. *Id.* part 166.

11. 40 C.F.R. § 152.30(b)(1) (1991).

12. *Id.* § 152.30(f).

13. *Id.* § 152.30(d).

14. *Id.* § 152.20.

15. *Id.* § 152.25.

### III. PESTICIDE USE

A pesticide is "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest," and any substance of mixture of substances "intended for use as a plant regulator, defoliant, or dessicant."<sup>16</sup> The term does not include any substance that is a new animal drug or feed within the meaning of the Federal Food, Drug, and Cosmetic Ac.<sup>17</sup> Pesticides are classified for either "general" or "restricted" use. General use pesticides may be applied by anyone. Restricted use pesticides may only be applied by applicators certified by states where they operate under programs approved by EPA.<sup>18</sup>

FIFRA distinguishes between commercial and private applicators.<sup>19</sup> Private applicators use or supervise the use of pesticides on property owned or leased by them or their employers for the purpose of producing an agricultural commodity. Commercial applicators include all other certified applicators. Private applicators may be required by the states to demonstrate their competency to apply pesticides through a written or oral examination.<sup>20</sup> Restrictions on commercial applicators are more stringent, requiring persons seeking certification to demonstrate competency by taking a written examination and, if required by state law, to attend certification programs and take performance tests.<sup>21</sup>

Labeling is the basis for enforcement of FIFRA, so knowledge of FIFRA's labeling requirements is of primary importance to applicators. FIFRA defines "label" as "the written, printed, or graphic matter on, or attached to, the pesticide or device or any of its containers or wrappers."<sup>22</sup> "Labeling" is defined as "all labels and all other written, printed, or graphic matter (A) accompanying the pesticide or device at any time; or (B) to which reference is made on the label or in literature accompanying the pesticide or device."<sup>23</sup>

FIFRA makes it unlawful to "use any registered pesticide in a manner inconsistent with its labeling."<sup>24</sup> The exceptions include:

- Application of a registered pesticide at a dosage, con-

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16. 40 C.F.R. § 152.3(s) (1991).

17. *Id.* § 152(s)(1).

18. 7 U.S.C. § 136i(a)(2) (1991).

19. *Id.* §§ 136(e)(2) [private], 136(e)(3) [commercial] (1991).

20. 40 C.F.R. § 171.5(b) (1989).

21. *Id.* §§ 171.4(a) & (b).

22. 7 U.S.C. § 136(p)(1) (1988).

23. *Id.* § 136(p)(2).

24. *Id.* § 136j(a)(2)(G).

centration, or frequency less than that specified on the labeling;

- Application against a target pest not specified on the labeling as long as the application to the crop, animal or site is permitted by the labeling;
- Employing any method of application not prohibited by the labeling;
- Mixing a pesticide with a fertilizer when the mixture is not prohibited by the labeling.<sup>25</sup>

FIFRA achieves the Congressional objective of environmental protection in three manners:

- section 136(c) explains what acts are unlawful violations of the statute;
- section 136(k) provides “stop use” provisions, which do not penalize the user of the pesticide, but prevent its further use;
- finally, there are provisions that penalize violators of FIFRA.<sup>26</sup>

The distinction between private and commercial applicators is significant when penalties are at issue.

Private applicators who use a pesticide “in a manner inconsistent with its labeling” are subject to a written warning or citation from the EPA.<sup>27</sup> Subsequent violations are punishable by a civil penalty of not more than \$1,000 for each offense.<sup>28</sup> Private applicators who apply a pesticide for others, but do not come within the definition of a commercial applicator, may be assessed a civil penalty of not more than \$500 for the first offense instead of a written warning or citation.<sup>29</sup> Before assessment of a civil penalty, the person charged is given notice and an opportunity for a hearing.<sup>30</sup> In determining the amount of the penalty, the EPA considers such factors as:

- the gravity of the violation,
- the effect on the person’s ability to continue in business, and
- the size of the business of the person charged.<sup>31</sup>

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25. *Id.* § 136(ee).

26. *Id.* § 136l.

27. 7 U.S.C. § 136l(a)(2) (1988).

28. *Id.*

29. *Id.*

30. *Id.* § 136l(a)(3).

31. *Id.* § 136l(a)(4).

Private applicators are also subject to criminal penalties for knowingly violating any provisions of the statute.<sup>32</sup>

A commercial applicator, wholesaler, dealer, retailer or other distributor who uses, stores or disposes of a registered pesticide in violation of FIFRA may be assessed a civil penalty of not more than \$5,000 for each offense.<sup>33</sup> A person charged must be given notice and opportunity for a hearing before assessment of the penalty.<sup>34</sup> In determining the amount of the penalty, the EPA considers factors similar to those listed for the private applicator.<sup>35</sup> A knowing violation can result in a fine or imprisonment or both.<sup>36</sup> While several environmental laws contain provisions allowing a private right of action or a citizen's suit clause, FIFRA does not.

#### IV. REGULATORY ISSUES CONCERNING PESTICIDE USE AND IMPACT

Minor use pesticides are those producing limited revenue for the manufacturer or registrant, given the cost of maintaining these registrations.<sup>37</sup> These uses are, however, of importance to producers and consumers. Without the use of these pesticides, pest outbreaks would destroy many of the nation's fruits, vegetables and ornamentals. According to the EPA, minor use registrations include:

- "many, if not most, pesticide uses on fruit and vegetable crops;"
- "uses on commercially-grown flowers, ornamentals, trees and turf grass;" and
- "infrequent or very limited acreage use on major crops, such as wheat, soybeans or corn, where the pest problem being treated is not widespread."<sup>38</sup>

The costs associated with registering a new minor use pesticide or reregistering an existing one are forcing manufacturers to withdraw minor crop labels and direct registration costs toward major crops providing greater revenues. Additionally, fears of liability associated with efficacy problems on high value specialty crops have further dampened the incentive to register new prod-

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32. 7 U.S.C. § 136l(b)(2) (1988).

33. *Id.* § 136l(a)(1).

34. *Id.* § 136l(a)(3).

35. *Id.* § 136l(a)(4).

36. *Id.* § 136l(b)(1)(A).

37. EPA, *Minor Use and Pesticide Reregistration How Growers Can Participate*, (H-7508W) 21T-1007, at 1 (April 1991).

38. *Id.*

ucts or to reregister old ones. This has resulted in the decreasing availability of minor use pesticides.

Minor crop producers have been provided with some assistance through the USDA Interregional Research Project No. 4 (IR-4 program) and FIFRA. The IR-4 program was established pursuant to the 1988 FIFRA amendments,<sup>39</sup> because some 1200 minor use pesticides registered before November 1984 must be reregistered. The major objective of the IR-4 program, a cooperative effort between government and industry,<sup>40</sup> is to notify growers of the pesticide's reregistration status. If the registrant cannot or will not support reregistration, the affected parties are informed of the product's pending cancellation. The purpose of notification is to provide enough time for the impacted parties to muster a defense against cancellation.<sup>41</sup>

FIFRA provides the registrant with some cost relief for reregistration. As stated in the Act:

The Administrator, in establishing standards for data requirements for the registration of pesticides with respect to minor uses, shall make such standards commensurate with the anticipated extent of use, pattern of use, and the level and degree of potential exposure of man and the environment to the pesticide.<sup>42</sup>

Impact of the IR-4 program and FIFRA exemption is mixed. Success of the IR-4 program rests on grower involvement and financial input. While grower involvement within the process has retained some minor use products, sufficient funding is lacking. Unless adequate funding is provided by Congress, these products will continue to be cancelled. With the rising costs of generating data, the impact of the FIFRA exemption also remains uncertain.

## V. ENDANGERED SPECIES

Legal authority for the EPA's Endangered Species Protection Program rests with FIFRA and the Endangered Species Act (ESA).<sup>43</sup> Under FIFRA's registration standard, a pesticide can be registered for use if it does not pose an unreasonable risk to people or the environment. Once registered, enforcement of the pesticide's proper use is through labeling. Under the Endangered Spe-

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39. Pub. L. No. 100-532, 102 Stat. 2654 (1988).

40. EPA, *supra* note 37, at 2.

41. *Id.*

42. 7 U.S.C. § 136a(c)(2)(A) (1988).

43. 16 U.S.C. § 1531 *et seq.* (1988).

cies Act (ESA), it is unlawful to "take" any animal that is listed by the United States Fish and Wildlife Service (FWS) as an endangered species.<sup>44</sup> "Take" is broadly defined to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct."<sup>45</sup> "Harm" has been defined by the FWS as an act which actually kills or injures wildlife. This may include significant habitat modification or degradation which actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering.<sup>46</sup>

The 1988 ESA amendments address EPA's activities affecting pesticides.<sup>47</sup> The 1988 amendments "require that EPA work jointly with USDA and the U.S. Department of the Interior to identify appropriate alternatives for implementing a labeling program to protect listed species from pesticides."<sup>48</sup> Implementation of the 1988 amendment is based on the labeling of affected pesticides. Here, a generic label statement instructs pesticide users to comply with use limitations described in county bulletins.<sup>49</sup> Bulletins would contain a county map identifying areas of pesticide use limitations in order to protect listed endangered species.<sup>50</sup>

Indoor uses and public health emergencies are situations where consideration of the effects of pesticide use on endangered species may be overlooked. To demonstrate a public health emergency the state or federal agency must show that:

- (1) An emergency, nonroutine condition exists that requires the use of a pesticide.
- (2) Effective registered pesticides or alternative practices are not available or economically or environmentally feasible.
- (3) The situation will present significant risks to human health.<sup>51</sup>

This amendment is implemented under FIFRA section 12(a)(1)(E) (misbranding) and section 12(a)(2)(G) (use inconsistent with the labeling), in addition to the ESA's provision regarding unlawful taking.<sup>52</sup>

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44. *Id.* § 1538(a)(1)(B).

45. *Id.* § 1532(19).

46. 50 C.F.R. § 17.3 (1991).

47. Pub. L. No. 100-478, 102 Stat. 2313 (1988) (codified at 16 U.S.C. §§ 1531-1544 (1988)).

48. 54 Fed. Reg. 126,27984 (1989).

49. *Id.* at 126,27985.

50. *Id.* at 126,27986.

51. 40 C.F.R. § 166.50 (1991).

52. 16 U.S.C. § 1532(19) (1988).

The U.S. Fish and Wildlife Service administers the ESA for a majority of endangered species, while the National Marine Fisheries Service is earmarked to protect listed aquatic species. Impact of the program's implementation is the subject of considerable debate between the environmental and producer communities. While many producers agree with the intent of the program, they argue that its implementation is excessively broad and, as such, will have a significant impact on production output and practices. Some specific concerns raised about the program include:

- its impact on pest quarantine and eradication programs and other federally sponsored farm programs;
- the program's affect on U.S. competitiveness in a global agricultural market;
- the lack of long term available funding to develop alternative pest control strategies and to carry out education efforts necessary for their implementation.

Unlike FIFRA, the ESA contains a citizen's suit provision which raises additional concerns and unknowns about the program's ultimate impact on the agricultural sector.<sup>53</sup>

## VI. STORAGE AND DISPOSAL OF PESTICIDES AND PESTICIDE CONTAINERS

Farmers and ranchers are subject to penalties if they fail to store or dispose of pesticides and pesticide containers properly. The two principal federal statutes applicable in this area are FIFRA and the Resource Conservation and Recovery Act (RCRA).<sup>54</sup> The EPA has the primary responsibility for enforcement of these statutes. Each registered pesticide product, whether general or restricted use, contains brief instructions regarding storage and disposal in its labeling. The applicator must follow these instructions and ensure that employees follow them as well.<sup>55</sup>

In addition to the mandatory procedures contained within the labeling of each pesticide product, EPA has published recommended procedures for storage and disposal of containers in the Code of Federal Regulations.<sup>56</sup> Procedures apply to both general and restricted use pesticides and address the needs of both private

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53. *Id.* § 1540(g).

54. 42 U.S.C. §§ 6901-6992k (1988).

55. *See generally* 7 U.S.C. § 136q (1988).

56. 40 C.F.R. § 165 (1991).

and commercial applicators.<sup>57</sup> Exemptions occur if the procedures:

- 1) Do not apply to the disposal of single containers or pesticides registered for home and garden, which may be disposed of during municipal waste collection if wrapped according to the recommendations.<sup>58</sup>
- 2) Do not apply to single containers used on farms and ranches which may be disposed of by open-field burial with due regard for the protection of surface and subsurface waters.<sup>59</sup>

Many states have banned the burying of containers in a manner that would cause injury or damage.<sup>60</sup>

Storage sites should be carefully chosen to minimize the possibility of chemical escape into the environment.<sup>61</sup> Other key precautions include:

- Pesticides should not be stored in an area susceptible to flooding or where the characteristics of the soil at the site would allow escaped chemicals to percolate into the environment;
- Storage facilities should be dry and well-ventilated and should be provided with fire protection equipment;
- All stored pesticides should be carefully labeled and segregated and stored off ground;
- Pesticides should not be stored in the same area as animal feed;
- Protective clothing and decontamination equipment should also be present where highly toxic pesticides are stored.<sup>62</sup>

Extreme care should be taken in the disposal of pesticides or pesticide wastes. Disposal requires the use of specialized equipment or the availability of specially designated landfills and should not be undertaken if these are unavailable.<sup>63</sup>

EPA guidelines separate pesticides into three categories and

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57. *Id.* § 165.2(c).

58. *Id.* § 165.2(e).

59. *Id.*

60. *See, e.g.*, ALA. CODE § 2-27-59 (1991).

61. 40 C.F.R. § 165.10(b) (1991).

62. *Id.* §§ 165.10(c)-(f).

63. *Id.* §§ 165.8, 165.10.

specify increasingly stringent disposal procedures for each. These categories include:

- organic pesticides (except organic mercury, lead, cadmium, and arsenic),
- metallo-organic pesticides, and
- inorganic pesticides (this category includes organic mercury, lead, cadmium, and arsenic).<sup>64</sup>

Disposal procedures differ with the categories and are addressed in the Code of Federal Regulations.<sup>65</sup> Standards may differ among the states.

## VII. HAZARDOUS WASTE REGULATIONS: PESTICIDES & CONTAINERS

Although FIFRA controls federal regulation of pesticide use, including application, storage and disposal, in some circumstances the disposal of pesticides and pesticide containers is subject to the EPA's hazardous waste management regulations pursuant to RCRA.<sup>66</sup> Discarded pesticides and their containers constitute solid waste under RCRA.<sup>67</sup> Individual pesticide products, their containers and residues constitute hazardous solid waste if they meet the characteristics of hazardous wastes specified in the EPA's hazardous waste regulations,<sup>68</sup> or if the pesticide is included in the EPA's list of hazardous wastes.<sup>69</sup>

Most registered pesticides, containers, and residues come within the hazardous waste category of subpart D, section 261.33 of the EPA's regulations which includes "discarded commercial chemical products, off-specification species, containers, and residues thereof."<sup>70</sup> Pesticide containers, inner liners, and any residues are subject to the hazardous waste regulatory provisions unless the containers or liners are empty.<sup>71</sup> A container or liner is empty if:

- the container or liner has been triple rinsed using a solvent capable of removing the commercial chemical product;

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64. 40 C.F.R. § 165.8 (1991).

65. *Id.* § 165.8.

66. 42 U.S.C. §§ 6901-6992k (1991).

67. *Id.* § 6903(5).

68. 40 C.F.R. §§ 261.20-.24 (1991).

69. *Id.* §§ 261.30-35.

70. *Id.* § 261.33.

71. *Id.* § 261.7(a)(1).

- the container or liner has been cleaned by another method that has been shown in the scientific literature, or by tests conducted by the generator, to achieve equivalent removal; or,
- in the case of a container, the inner liner that has prevented contact between the commercial chemical product and the container, has been removed.<sup>72</sup>

Once emptied by one of these methods, the container is no longer subject to the hazardous waste regulations. Improper disposal of containers that have not been emptied subjects the generator to civil and criminal penalties<sup>73</sup> as well as to citizens' suits<sup>74</sup> for violating the provisions of RCRA.

Farmers disposing of waste pesticides for their own use are not required to comply with the requirements of parts 264, 265, 268, or 270 of the EPA's hazardous waste regulations, provided that they triple rinse each container and dispose of the residues on their own farms in a manner consistent with the disposal instructions on the pesticide label.<sup>75</sup> Disposal of pesticide residues into water where they are likely to reach surface or groundwater may be considered a source of pollution under the Clean Water Act<sup>76</sup> or the Safe Drinking Water Act.<sup>77</sup> Disposal of pesticides may also be regulated under state law. "Empty" containers are still subject to any disposal instructions contained within the labeling of the product. Disposal in a manner inconsistent with the labeling instructions is a violation of FIFRA. Local regulation may be more stringent.

Environmental contamination issues relating to storage and disposal of pesticides and pesticide containers have resulted in a variety of changes at the field level. Some of these have included:

- changes and calls for changes in container design and recycling;
- the development of container rinsing systems to prevent environmental contamination and exposure to residues; and
- calls for standardization of containers throughout the industry.

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72. *Id.* § 261.7(b)(3).

73. 42 U.S.C. § 6928 (1988).

74. *Id.* § 6972.

75. 40 C.F.R. § 262.70 (1991).

76. 33 U.S.C. §§ 1251-1279 (1988).

77. 42 U.S.C. §§ 300f-300j (1988).

Because of the potential risk of environmental contamination and the fear of liability exposure under various federal environmental statutes such as "Superfund," the agricultural community has widely endorsed sound and sensible regulation in this area.

### VIII. CERCLA AND THE FIFRA EXEMPTION

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)<sup>78</sup> authorizes the federal government to clean up inactive hazardous waste sites that threaten human health or the environment. CERCLA, also known as "Superfund," provides a fund for cleanup of contaminated sites when no other parties are able to conduct the cleanup. CERCLA empowers the EPA to recover the cleanup costs from those parties with little or no costs to the taxpayer.<sup>79</sup>

Section 104 of CERCLA authorizes the EPA to act "[w]henever (A) any hazardous substance is released or there is a substantial threat of such a release into the environment, or (B) there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare."<sup>80</sup> Liability imposed under CERCLA is retroactive, strict, and joint and several.<sup>81</sup> Penalties are severe. Providing false or misleading information or failing to report releases of hazardous substances is a criminal offense.<sup>82</sup>

Depending upon the circumstances, several defenses are available under the Act. One such defense exempts the producer "for any response costs or damages resulting from the application of a pesticide product registered under the Federal Insecticide, Fungicide and Rodenticide Act."<sup>83</sup> Specifically, the farm or ranch will not be considered a "Superfund site" or the owner held responsible for the cost of cleanup, since pesticides applied in compliance with labeling are not considered hazardous substances.<sup>84</sup> However, soil and ground and surface waters contaminated by the

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78. 42 U.S.C. §§ 9601-9675 (1991).

79. *Id.* § 9612(c).

80. *Id.* § 9604.

81. *See* *New York v. Shore Realty Corp.*, 759 F.2d 1032, 1044 (2d Cir. 1985) (strict liability); *United States v. Northeastern Pharmaceutical & Chemical Co.*, 810 F.2d 726, 732 n.3 (liability is strict, joint and several, and retroactive).

82. *Id.* §§ 9603(b)-(d).

83. *Id.* § 9607(i).

84. James B. Wadley & Anita Settle, *Statutory Regulation of Hazardous Chemicals on the Farm*, *Agricultural Law Update*, at 6 (July 1989).

improper use, storage or disposal of registered pesticides can result in CERCLA liability.

Some of the more serious on-farm contamination problems involve mixing and loading sites. Cleanup costs here can be excessive. Thousands of these abandoned and contaminated sites exist throughout the United States. While farms and ranches have not yet been specifically targeted for compliance by the regulatory agencies, agriculture-related enterprises such as nurseries and golf courses have been.<sup>85</sup> Several lending institutions have been found responsible under CERCLA for cleanup costs because of their business dealings with farm clients. As a result, these institutions have become increasingly wary of financial involvement with farming operations unless detailed environmental questionnaires and audits are provided as a condition for farm loans. Many of these questionnaires and audits center on pesticide use and impact.

## IX. CONCLUSION

Since the 1970s, a large body of law and regulation addressing environmental issues associated with agricultural production has evolved. Use of pesticides and their environmental impacts have played a major role in this evolution. Today, regulatory issues associated with FIFRA continue to surface. While this paper has addressed some of the major pesticide issues facing farmers and ranchers, these are by no means the only ones. As more FIFRA amendments are passed by Congress, and as the courts decide the merits of FIFRA enforcement, even more complex issues will evolve.

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85. Thomas Missimer, *Environmental Audits of Agricultural Facilities and Properties* (Proceedings of the Third Annual Agricultural Environmental Seminar of the Florida Fruit and Vegetable Association), at 1 (March 1990).

