Perpetuating the Cycle: The Failure of APHIS and EPA to Consider the Cumulative Impact of Pairing Herbicides with Herbicide-Resistant Crops

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I. INTRODUCTION

In *Geertson Seed Farms v. Johanns*, the United States District Court, Northern District of California wrote,

> The Court notes . . . that it is unclear from the record whether any federal agency is considering the cumulative impact of the introduction of so many glyphosate resistant crops; one would expect that some federal agency is considering whether there is some risk to engineering all of America's crops to include the gene that confers resistance to glyphosate.[1]

Unfortunately, the Northern District of California was wrong.

Under the existing statutory framework, the U.S. Department of Agriculture's Animal and Plant Health

1. Geertson Seed Farms v. Johanns, No. C 06–01075 CRB, 2007 WL 518624, at *11 (N.D. Cal. Feb. 13, 2007).

Inspection Service ("APHIS") has the authority to regulate certain genetically engineered crops, while the Environmental Protection Agency ("EPA") regulates all herbicide products sold in the United States. Although the development of a crop engineered to be resistant to a certain herbicide contemplates the future widespread use of that herbicide, EPA and APHIS fail to account for this cumulative impact. Specifically, when performing a National Environmental Policy Act ("NEPA") analysis for the deregulation of crops designed to be herbicide-resistant, APHIS violates NEPA and its implementing regulations by failing to analyze the environmental effects of the increased herbicide use that the deregulation presupposes. Meanwhile, the courts have determined that EPA need not comply with NEPA when registering herbicides, finding the Federal Insecticide, Fungicide, and Rodenticide Act ("FIFRA") analysis sufficient even though it does not evaluate the environmental effects of registering the herbicide.[2] Consequently, APHIS, EPA, and the courts have perpetuated a cycle of herbicide registration and herbicide-resistant crop deregulation in which neither EPA nor APHIS fully contemplates the cumulative impact of their respective actions.

The regulation of the herbicide 2,4-Dichlorophenoxyacetic acid ("2,4-D"); the deregulation of Enlist™ corn and soybean, designed to be resistant to 2,4-D and glyphosate; and the regulation Enlist Duo™, designed for use in controlling weeds in corn and soybeans genetically-engineered to tolerate 2,4-D and glyphosate,[3] is emblematic of the cycle that this regulatory regime continues. Recently, APHIS released an Environmental Impact Statement ("Enlist EIS") that failed to consider the effects of the increased use of 2,4-D contemplated in the

2. *See* Merrell v. Thomas, 807 F.2d 776 (9th Cir. 1986).

3. ENVTL. PROT. AGENCY, *EPA Announces Final Decision to Register Enlist Duo, Herbicide Containing 2, 4-D and Glyphosate/Risk Assessment Ensures Protection of Human Health, Including Infants, Children* (Oct. 15, 2014) [hereinafter "*2,4-D Decision*"], *available at* http://yosemite.epa.gov/opa/admpress.nsf/a543211f64e4d1998525735900404442/72fde554930f3f6985257d7200591180!opendocument [http://perma.cc/3CE4-SK6S]; ENVTL. PROT. AGENCY, FINAL REGISTRATION OF ENLIST DUO™ HERBICIDE 1 (2014) [hereinafter "ENLIST DUO DECISION"], *available at* http://www2.epa.gov/sites/production/files/2014-10/documents/final_registration_-_enlist_duo.pdf [http://perma.cc/L5W3-KNUC].

deregulation of the Enlist™ crops.[4] Exposure to 2,4-D is known to cause neurotoxicity, reproductive toxicity, and developmental toxicity.[5] Inquiries into the human carcinogenicity of 2,4-D have proven inconclusive.[6] Nevertheless, on September 22, 2014,[7] APHIS listed the approval of Enlist™ corn and soybean as its "preferred alternative" in the Enlist EIS.[8] On October 15, 2014, EPA decided to register Enlist Duo™, the 2,4-D-based herbicide developed to be used in tandem with the Enlist™ crops, and set the stage for extensive use of 2,4-D for years to come.[9]

This article will proceed as follows. Part II will address the cycle of herbicide use that the introduction of herbicide-resistant crops perpetuates, with particular focus on the Enlist™ varieties and 2,4-D. Part III will explain the regulatory system for herbicides and herbicide-resistant crops and will share some common criticisms of that regime. Part IV will outline the parts of NEPA and its implementing regulations pertinent to herbicide registration and the deregulation of herbicide-resistant crops. Part V will establish that APHIS failed to consider the impact of the increased herbicide use contemplated by its decision to deregulate the Enlist™ varieties, thus violating NEPA. Part VI will demonstrate that EPA's decisions to reregister 2,4-D and register Enlist Duo™ did not account for the effects of registering these herbicides for use with herbicide-resistant crops. Part VII will demonstrate that EPA and APHIS consistently fail to consider the cumulative impact of pairing herbicides with herbicide-resistant crops. Part VIII will

4. *See* U.S. DEP'T OF AGRIC., DOW AGROSCIENCES PETITIONS (09-233-01P, 09-349-01P, AND 11-234-01P) FOR DETERMINATIONS OF NONREGULATED STATUS FOR 2,4-D-RESISTANT CORN AND SOYBEAN VARIETIES—FINAL ENVIRONMENTAL IMPACT STATEMENT—AUGUST 2014 (2014) [hereinafter "ENLIST EIS"], *available at* http://www.aphis.usda.gov/brs/aphisdocs/24d_feis.pdf [http://perma.cc/NTS4-KMYK].

5. NATIONAL PESTICIDE INFORMATION CENTER, 2,4-D TECHNICAL FACT SHEET (2008), *available at* http://npic.orst.edu/factsheets/2,4-DTech.pdf [http://perma.cc/QS5T-ZSK4]; ENLIST DUO DECISION, *supra* note 3, at 2–7.

6. 2,4-D TECHNICAL FACT SHEET, *supra* note 5, at 5; ENLIST DUO DECISION, *supra* note 3, at 2.

7. *See Petitions Table*, USDA, http://www.aphis.usda.gov/biotechnology/petitions_table_pending.shtml [http://perma.cc/UWK8-Y25D] (last visited June 16, 2015).

8. ENLIST EIS, *supra* note 4, at vii, viii.

9. *2,4-D Decision*, *supra* note 3.

recommend that the power to regulate both herbicides and herbicide-resistant crops reside in APHIS.

II. BACKGROUND

A. General Background

In 1995, the first transgenic herbicide-resistant crops were introduced into the environment.[10] Since then, the planting of genetically engineered herbicide-resistant crops has grown substantially.[11] These crops were designed to benefit the grower by increasing productivity, decreasing production costs, enabling greater flexibility and efficiency in production regimes, and improving grower health.[12] However, that is not the full extent of their impact.

The introduction of herbicide-resistant crops eventually results in the propagation of herbicide-resistant weeds.[13] The spread of herbicide-resistant weeds occurs through two primary processes: (1) naturally herbicide-resistant weed species replaces those species effectively controlled by the herbicide; and (2) the herbicide utilized with the resistant crop exerts strong selection pressure on a specific weed species, which causes the appearance of herbicide-resistant biotypes.[14]

The spread of herbicide-resistant weeds diminishes the benefits of pairing an herbicide with an herbicide-resistant crop.[15] To counter this impact, growers either revert to mechanical cultivation practices or use different herbicides, which causes an increase in herbicide use.[16] In fact, the

10. Stephen O. Duke, *Taking Stock of Herbicide-Resistant Crops Ten Years After Introduction*, 61 PEST MGMT. SCI. 211 (2005).

11. *Id.*

12. Andrés R. Schwember, *An Update on Genetically Modified Crops*, 35 CIENCIA E INVESTIGACIÓN AGRARIA 231 (2008).

13. *Id.*; ENLIST EIS, *supra* note 4, at iii, v–vi, 116–47; Margaret Sova McCabe, *Superweeds and Suspect Seeds: Does the Genetically-Engineered Crop Deregulation Process Put American Agriculture at Risk?*, 1 U. BALT. J. LAND & DEV. 109, 110–11 (2012); Monsanto Co. v. Geertson Seed Farms, 561 U.S. 139, 146, 168. (2010).

14. Schwember, *supra* note 12.

15. *See* ENLIST EIS, *supra* note 4, at 3.

16. *See id.*; McCabe, *supra* note 13, at 110–11; *Monsanto Co.*, 561 U.S. at 146, 168; Geertson Seed Farms v. Johanns, No. C 06–01075 CRB, 2007 WL 518624, at *3, 9–10 (N.D. Cal. Feb. 13, 2007).

introduction of genetically engineered crops caused a 383 million pound increase in herbicide use from 1996 to 2008.[17]

Although the spread of herbicide-resistant weeds is itself troubling, the increased use of herbicides also poses grave risks to human health.[18] Studies reveal that accidental ingestion of certain herbicides can cause aggressive or bizarre behavior, skeletal injury, neuromuscular effects and renal failure.[19] Intentional ingestion of herbicides has caused erosion of the gastrointestinal tract, dysphagia, gastrointestinal hemorrhage, and even death.[20] Studies reveal that ingredients in certain herbicides can kill human cells, particularly embryonic, placental and umbilical cord cells,[21] and cause reproductive effects including decreased viability.[22] For some herbicides, the extent of human carcinogenicity is simply unknown.[23] Moreover, whether an existing herbicide or a newlymarketed one, the toxic effects of herbicide use are often underestimated.[24]

B. Enlist™ Background

The development of the Enlist™ corn and soybean varieties is representative of this cycle. In the past fifteen to twenty years, agricultural companies have begun to engineer herbicide-resistant corn and soybean varieties.[25] "By far,

17. Rebecca M. Bratspies, *Is Anyone Regulating? The Curious State of GMO Governance in the United States*, 37 VT. L. REV. 923, 941–42 (2013).

18. *See* Crystal Gammon, *Weed-Whacking Herbicide Proves Deadly to Human Cells*, SCI. AM. (JUNE 23, 2009), *available at* http://www.scientificamerican.com/article/weed-whacking-herbicide-p/ [http://perma.cc/DRB9-H3Y4]; 2,4-D TECHNICAL FACT SHEET, *supra* note 5.

19. 2,4-D TECHNICAL FACT SHEET, *supra* note 5; NATIONAL PESTICIDE INFORMATION CENTER, GLYPHOSATE TECHNICAL FACT SHEET, *available at* http://npic.orst.edu/factsheets/glyphotech.html [http://perma.cc/2X6U-5DUV].

20. GLYPHOSATE TECHNICAL FACT SHEET, *supra* note 19.

21. Gammon, *supra* note 18.

22. *See* 2,4-D TECHNICAL FACT SHEET, *supra* note 5.

23. *See id.*

24. *See* Gammon, *supra* note 18; Robin Mesnage et al., *Ethoxylated Adjuvants of Glyphosate-Based Herbicides Are Active Principles of Human Cell Toxicity*, 313 TOXICOLOGY 122 (2013); Carsten A. Brühl et al., *Terrestrial Pesticide Exposure of Amphibians: An Underestimated Cause of Global Decline?*, NATURE (Jan. 24, 2013) *available at* http://www.nature.com/srep/2013/130124/srep01135/full/srep01135.html [http://perma.cc/E366-HQBL].

25. *See* ENLIST EIS, *supra* note 4, at iii.

Roundup Ready® crops have been the most widely adopted by growers."[26] Roundup Ready® crops are designed to be resistant to Roundup®, in which the active ingredient is glyphosate.[27] "Roundup Ready® crops were so successful that many growers grew only Roundup Ready® crops on their farms."[28]

The almost exclusive use of glyphosate on farms led to the selection of glyphosate-resistant weeds, which could survive an application of the herbicide that would have killed earlier generations.[29] The spread of glyphosate-resistant weeds has reduced the efficacy of the Roundup Ready® system.[30] Consequently, growers have turned to other herbicides and are increasingly adopting crops engineered to be resistant to different herbicides.[31]

The main purpose of the Enlist™ corn and soybean varieties is to help growers manage glyphosate-resistant weeds.[32] Each of the Enlist™ varieties has a trait that makes the plant resistant to 2,4-D.[33] However, research on 2,4-D, an ingredient in the Vietnam War defoliant Agent Orange, indicates that the herbicide can have devastating effects on human health.[34]

While occupational studies have not assessed symptoms caused by exposure to 2,4-D under normal usage,[35] case reports and observational studies reveal the toxicological effects of 2,4-D.[36] Symptoms following dermal exposure may include irritation, and inhalation exposure may lead to coughing and burning sensations as well as dizziness.[37] Symptoms of acute oral exposure to 2,4-D include vomiting, headache, confusion, and aggressive or bizarre behavior.[38] "Skeletal muscle injury and renal failure may also occur."[39] Researchers compiled the

26. *Id.*
27. *Id.*
28. *Id.*
29. *Id.*
30. *Id.* at iv.
31. *Id.*
32. *Id.*
33. *Id.*
34. *See* 2,4-D TECHNICAL FACT SHEET, *supra* note 5, at 1, 3–7.
35. *Id.* at 3.
36. *See id.*; *see generally* ENLIST DUO™ DECISION, *supra* note 3, at 2 (summarizing the toxicological effects of 2,4-D choline salt).
37. 2,4-D TECHNICAL FACT SHEET, *supra* note 5, at 3.
38. *Id.*
39. *Id.*

medical cases of sixty-nine people who ingested 2,4-D and related herbicides and observed that twenty-three of these patients died.[40] Inquiries into the human carcinogenicity of 2,4-D have been inconclusive.[41] Finally, reports indicate that occupational exposure to herbicides related to 2,4-D has harmful effects on human reproduction, including a temporary reduction in fertility.[42]

III. THE REGULATORY FRAMEWORK

The current statutory framework divides the regulation of herbicides and herbicide-resistant crops between APHIS and EPA. APHIS has the authority to regulate herbicide-resistant crops if they fall within the confines of the Plant Protection Act ("PPA") of 2000.[43] Meanwhile, EPA regulates all herbicides under FIFRA.[44]

A. The Regulation of Herbicide-Resistant Crops by APHIS

APHIS has the power to regulate an herbicide-resistant crop if it qualifies as a "plant pest" under the PPA.[45] The PPA defines a "plant pest" as an organism that falls within one of the PPA's specified categories of organisms and that causes physical harm to plants through injury, damage, or disease.[46]

In addition to crops that fit the definition of a plant pest, APHIS can also regulate herbicide-resistant crops that were developed through genetic engineering techniques that utilized an organism defined as a plant pest.[47] This authority captures most genetically engineered plants because they are engineered using material that falls within the definition of a plant pest, such as a virus or bacterium.[48] For instance,

40. *Id.*
41. *Id.* at 5.
42. *Id.* at 6.
43. *See* 7 U.S.C. §§ 7701–7772 (2012).
44. *See* 7 U.S.C. §§ 136–136y (2012).
45. *See* 7 U.S.C. § 7711 (2012).
46. 7 U.S.C. § 7702(14) (2012).
47. 7 C.F.R. § 340.2 (2015).
48. Emily Montgomery, *Genetically Modified Plants and Regulatory Loopholes and Weaknesses Under the Plant Protection Act*, 37 VT. L. REV. 351, 351 (2012).

Agrobacterium, a known plant pest, is the mechanism for transformation for many genetically engineered plants.[49]

"APHIS regulations prohibit the 'introduction,' including both movement into or through the United States and 'release into the environment,' of 'regulated article[s]' without APHIS authorization."[50] A party can receive APHIS authorization by complying with a notification process, by receiving a permit, or by qualifying for a conditional exemption from permit requirements.[51] Any regulated article introduced into the environment without APHIS authorization is subject to the application of remedial measures or safeguards that an "inspector determines necessary to prevent the introduction of such plant pests."[52]

Any party can petition APHIS to discontinue the regulation of a plant pest.[53] The party must submit to APHIS information sufficient to establish that the plant is unlikely to cause injury, damage, or disease to plants or plant products.[54] If APHIS concludes that a presumptive plant pest does not exhibit any risk of plant pest harm, APHIS must deregulate it.[55]

In the case of an herbicide-resistant crop, when a decision of nonregulated status has been issued, the crop may be introduced into the environment without APHIS's regulatory oversight.[56] Additionally, the seeds of that crop can be marketed for planting, and growers are able to plant, harvest, and move their crop into commerce for food and feed without further authorization from APHIS.[57]

B. The Regulation of Herbicides by EPA

The authority to regulate the herbicides that are used in conjunction with herbicide-resistant crops belongs to EPA.[58]

49. Bratspies, *supra* note 17, at 932.

50. John Charles Kunich, *Mother Frankenstein, Doctor Nature, and the Environmental Law of Genetic Engineering*, 74 S. CAL. L. REV. 807, 838 (2001) (footnote omitted).

51. *See* 7 C.F.R. § 340.0(a) (2015).

52. 7 C.F.R. § 340.0(b) (2015).

53. ENLIST EIS, *supra* note 4, at iii.

54. *See* 7 C.F.R. § 340.6 (2015).

55. Ctr. for Food Safety v. Vilsack, 718 F.3d 829, 835 (9th Cir. 2013).

56. ENLIST EIS, *supra* note 4, at ii.

57. *Id.*

58. *See* 7 U.S.C. §§ 136–136y (2012).

EPA governs the use, sale, and labeling of herbicides applied to all plants pursuant to its authority under FIFRA.[59] An herbicide must first be "registered" by EPA before it can be distributed or sold in the United States.[60] EPA is directed to approve the registration of an herbicide if, among other things, "when used in accordance with widespread and commonly recognized practice it will not generally cause unreasonable adverse effects on the environment."[61] EPA sets the conditions for the herbicide's use and places them in labeling instructions that a user must follow.[62]

An herbicide product remains registered until EPA or the registrant cancels it.[63] EPA may commence cancellation proceedings if it appears that the herbicide, its labeling, or other submitted material does not comply with FIFRA, or if EPA determines that the herbicide, when commonly used, causes "unreasonable adverse effects on the environment."[64]

EPA reevaluates each herbicide every fifteen years as part of a reregistration process, during which the agency determines if it should continue allowing the herbicide's use.[65] If EPA determines that an herbicide should not be reregistered, FIFRA provides that EPA "shall take appropriate regulatory action."[66]

C. Problems with the Regulatory Framework

Critics have claimed that this regulatory framework fails to adequately consider the impact of the introduction of genetically engineered crops. These critics believe that this failure is a result of inherent gaps and omissions in the regulatory system.[67] They assert that the regulatory inquiry does not address systemic environmental issues such as the cumulative effects of multiple genetically engineered crops on

59. *Id.*
60. *Id.* §§ 136a(a), 136j(a)(2)(F).
61. 7 U.S.C. § 136a(c)(5)7; U.S.C. § 136a(c)(5)(C), (D).
62. *See* 7 U.S.C. 136j(a)(2)(G).
63. *See* Reckitt Benckiser, Inc. v. EPA, 613 F.3d 1131, 1133–34 (D.C. Cir. 2010) (citing 7 U.S.C. § 136a(a), (c) – (e)).
64. 7 U.S.C. § 136d(b).
65. *Id.* § 136a(g)(1)(A)(iv).
66. *Id.* § 136a–1(g)(2)(D).
67. *See* Bratspies, *supra* note 17, at 940–41.

the evolution of pest resistance and increased herbicide use.[68] These critics believe that the consequence of this regulatory system is the development of herbicide-resistant weeds, the use of herbicides with greater toxicity, and more frequent spraying.[69]

IV. NATIONAL ENVIRONMENTAL POLICY ACT

The decision-making of APHIS and EPA, like that of all federal agencies, is subject to the requirements of the National Environmental Policy Act and its implementing regulations. Section 101 of NEPA declares a national commitment to protecting and promoting environmental quality.[70] The policy goals of NEPA are realized through a set of "action-forcing" procedures that require that agencies take a "hard look" at environmental consequences.[71]

A. Requirement to Prepare an Environmental Impact Statement

NEPA's main action-forcing procedure is its requirement that a federal agency prepare a detailed Environmental Impact Statement ("EIS") for all "major Federal actions significantly affecting the quality of the human environment."[72] Under NEPA, a threshold question is whether agency action will "significantly affect" the environment, thereby necessitating the preparation of an EIS.[73] As a preliminary step, an agency may prepare an Environmental Assessment ("EA") to decide whether the environmental impact of a proposed action is significant enough to warrant preparation of an EIS.[74] If the agency concludes in its EA that its action will not significantly impact the environment, the agency issues a "Finding of No Significant Impact," and the agency can proceed with its proposed action without preparing an EIS.[75]

68. *See id.*
69. *Id.* at 925.
70. 42 U.S.C. § 4331(a) (2012).
71. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989).
72. *See* 42 U.S.C. § 4332(2)(C) (2012).
73. *See id.*
74. *See* 40 C.F.R. § 1501.4.
75. *See id.*

In determining whether agency action will "significantly" affect the quality of the human environment and therefore trigger the preparation of an EIS, regulations by the Council on Environmental Quality ("CEQ") require an agency to assess the action's "context" and "intensity."[76] Context refers to the setting in which the proposed action takes place.[77] Intensity refers to "the severity of the impact."[78] Several factors must be considered in evaluating intensity, including the impact on public health and safety, the extent to which the possible effects are uncertain or involve unknown risks, whether the action is related to other actions with cumulatively significant impacts, and the effect on endangered or threatened species.[79]

B. Requirements for a Sufficient EIS

NEPA requires that an EIS address, among other things, "the environmental impact of the proposed action," and "alternatives to the proposed action."[80] In considering alternatives to the proposed action, CEQ regulations require the agency to "[r]igorously explore and objectively evaluate all reasonable alternatives" and "[i]nclude the alternative of no action."[81] The range of alternatives that an agency must consider is not infinite and is "bounded by some notion of feasibility."[82] However, the agency must assess all "reasonable" alternatives to the proposed action.[83]

When assessing the environmental impact of the proposal, CEQ regulations state that the agency must include an assessment of both the direct effects and indirect effects of the proposed action.[84] Direct effects are "caused by the action and occur at the same time and place."[85] Indirect effects, meanwhile, are "caused by the action and are later in time or

76. *See id.* § 1508.27.
77. *See id.* § 1508.27(a).
78. *Id.* § 1508.27(b).
79. *Id.*
80. 42 U.S.C. § 4332 (2012).
81. 40 C.F.R. § 1502.14 (2015).
82. Vermont Yankee Nuclear Power Co. v. NRDC, 435 U.S. 519, 551 (1978).
83. Utahns for Better Transp. v. U.S. Dep't of Transp., 305 F.3d 1152, 1166 (10th Cir. 2002).
84. 40 C.F.R. § 1502.16 (2015).
85. *Id.* § 1508.8.

farther removed in distance, but are still reasonably foreseeable."[86] NEPA does not require an agency to analyze every effect of its proposed action, but only the effect on the physical environment.[87] Moreover, although a "but for" causal relationship is insufficient to make an agency responsible for a particular effect, an agency must analyze a certain effect as long as there is a "reasonably close" relationship between the effect and the proposed action.[88] However, an agency need not discuss an effect where the agency has no ability to prevent that effect due to its limited statutory authority over relevant actions.[89]

In a sufficient EIS, an agency must also evaluate cumulative impacts arising from the proposed action.[90] A cumulative impact analysis must assess the incremental impacts of past, present, and reasonably foreseeable future actions "regardless of what agency . . . undertakes such other actions."[91] This assessment must give a "sufficiently detailed catalogue" of past, present and future actions and provide adequate analysis about how these actions are thought to have impacted the environment.[92] A cumulative impact analysis also needs some "quantified or detailed information" to "assist the decisionmaker in deciding whether, or how, to alter the program to lessen cumulative impacts."[93]

NEPA requires that when several proposals for action will have "cumulative or synergistic environmental impact," their environmental consequences must be considered together.[94] CEQ regulations also require that cumulative actions be

86. *Id.*

87. Metro. Edison Co. v. People Against Nuclear Energy, 460 U.S. 766, 773–74 (1983).

88. Dep't of Transp. v. Public Citizen, 541 U.S. 752, 767 (2004).

89. *Id.* at 769–70.

90. *See* 40 C.F.R. § 1508.7 (2015).

91. *Id.*; *see also* Kern v. U.S. Bureau of Land Mgmt., 284 F.3d 1062, 1075 (9th Cir. 2002).

92. Te-Moak Tribe of W. Shoshone of Nev. v. U.S. Dep't of the Interior, 608 F.3d 592, 603 (9th Cir. 2010).

93. *Kern*, 284 F.3d at 1075; Churchill Cnty. v. Norton, 276 F.3d 1060, 1080 (9th Cir. 2001); Muckleshoot Indian Tribe v. U.S. Forest Serv., 177 F.3d 800, 809–10 (9th Cir. 1999).

94. Sierra Club v. Penfold, 664 F. Supp. 1299, 1303 (D. Alaska 1987) (quoting Kleppe v. Sierra Club, 427 U.S. 390 (1976)).

discussed in a single EIS.[95] Cumulative actions are "actions, which when viewed with other proposed actions, have cumulatively significant impacts."[96]

CEQ regulations additionally mandate that connected actions be discussed in a single EIS.[97] Connected actions, among other things, "cannot or will not proceed unless other actions are taken previously or simultaneously" or "are interdependent parts of a larger action and depend on the larger action for their justification."[98] Many Circuits have employed an "independent utility" test to determine if two actions are connected actions under the CEQ regulations.[99] The crux of the independent utility test is "whether each of two projects would have taken place with or without the other."[100] The CEQ regulations imply that two actions can be connected even if they are overseen by two different agencies.[101]

V. ENLIST™ AND NEPA

Dow AgroSciences ("Dow") designed the three Enlist™ corn and soybean varieties to be resistant to 2,4-D to help manage glyphosate-resistant weeds.[102] Since Dow created the Enlist™ crops through genetic engineering techniques that used a known plant pest, *Agrobacterium*, all three varieties are plant pests under the PPA and consequently are regulated by APHIS.[103]

95. *See* 40 C.F.R. § 1508.25 (2015).

96. *Id.*

97. *Id.*

98. *Id.*

99. *See* Wilderness Workshop v. U.S. Bureau of Land Mgmt., 531 F.3d 1220, 1228–29 (10th Cir. 2008); Nw. Res. Info. Ctr., Inc. v. Nat'l Marine Fisheries Serv., 56 F.3d 1060, 1068–69 (9th Cir. 1995).

100. *Wilderness Workshop*, 531 F.3d at 1229; Great Basin Mine Watch v. Hankins, 456 F.3d 955, 969 (9th Cir. 2006).

101. *See* 40 C.F.R. § 1501 (2015).

102. ENLIST EIS, *supra* note 4, at iii.

103. Mark S. Krieger, *Petition for Determination of Nonregulated Status for Herbicide Tolerant DAS-44406-9 Soybean* 17 (2011) [hereinafter Krieger, *DAS-44406-9*], http://www.aphis.usda.gov/brs/aphisdocs/11_23401p.pdf [http://perma.cc/LE3S-RGNF]; Mark S. Krieger, *Petition for Determination of Nonregulated Status for Herbicide Tolerant DAS-68416-4 Soybean* 15 (2010) [hereinafter Krieger, *DAS-68416-4*], http://www.aphis.usda.gov/brs/aphisdocs/09_34901p.pdf [http://perma.cc/7TXU-HQ8J].

From 2009 to 2011, Dow petitioned APHIS for the deregulation of all three of the Enlist™ crops.[104] In each petition, Dow expected that the introduction of the 2,4-D-resistant crop would have "[n]o significant impact" on the environment because it did not possess new "phenotypic characteristics" different from the "conventional" crop.[105]

APHIS prepared Draft Environmental Assessments in response to two of the nonregulated status petitions.[106] In reviewing the petitions, the agency identified the selection of herbicide-resistant weeds as a potential environmental impact.[107] APHIS decided to complete an EIS for the deregulation of all three of the Enlist™ crops, citing a need to perform an analysis of the potential selection of 2,4-D-resistant weeds and to assess other potential environmental impacts.[108] The agency noted that an EIS would allow the agency to "examine the broad and cumulative environmental impacts of making determinations of nonregulated status" for the Enlist™ crops.[109]

However, in January of 2014, APHIS released an EIS that did not consider the "broad and cumulative impacts" of deregulating the Enlist™ crops.[110] In fact, APHIS failed to include several elements necessary for a complete NEPA analysis.[111] Specifically, APHIS failed to consider the indirect effects of introducing 2,4-D-resistant crops; evaluate the

104. *See* Krieger, *DAS-44406-9*, *supra* note 103; Krieger, *DAS-68416-4*, *supra* note 103.

105. *See* Krieger, *DAS-44406-9*, *supra* note 103, at 154; Krieger, *DAS-68416-4*, *supra* note 103, at 133.

106. *See* Dow AgroSciences Petition for Determination of Nonregulated Status of Event DAS-68416-4—Draft Environmental Assessment (May 2012), *available at* http://www.aphis.usda.gov/brs/aphisdocs/09_34901p_dea.pdf [http://perma.cc/VC7Q-FXCF]; Dow AgroSciences Petition (09-233-01p) for Determination of Nonregulated Status of Herbicide-Tolerant DAS-40278-9 Corn, *Zea mays*, Event DAS-40278-9—Draft Environmental Assessment (Oct. 2011), *available at* http://www.aphis.usda.gov/brs/aphisdocs/09_23301p_dea.pdf [http://perma.cc/4PFD-YUDB].

107. *See* Dow AgroSciences LLC, Notice of Intent To Prepare an Environmental Impact Statement for Determination of Nonregulated Status of Herbicide Resistant Corn and Soybeans, and Notice of Virtual Public Meeting, 78 Fed. Reg. 28,798, 28,799, *available at* http://www.aphis.usda.gov/brs/fedregister/fr_noi_eis_aphis_13_042_1.pdf [http://perma.cc/9U2W-F8V9].

108. *Id.*

109. *Id.*

110. *See* ENLIST EIS, *supra* note 4.

111. *See id.*

cumulative impacts arising from the introduction of 2,4-D-resistant crops; discuss the cumulative action of registering Enlist Duo™, the 2,4-D-based herbicide developed to be used on the Enlist™ crops; and discuss the connected action of registering Enlist Duo™.

A. Indirect Effects

In the Enlist EIS, APHIS failed to consider the indirect effects of releasing 2,4-D-resistant crops into the environment. APHIS anticipated that the deregulation of the Enlist™ crops would result in a slightly farther removed but still reasonably foreseeable effect: a significant increase in 2,4-D use. Specifically, the agency predicted that 2,4-D use would increase by roughly 75% by 2020 regardless of agency action and would further increase by another 200 to 600% if APHIS deregulated all of the Enlist™ crops and if EPA registered Enlist Duo™.[112] APHIS also noted that if it deregulated the Enlist™ varieties, it was "reasonably foreseeable" that EPA would approve the registration of Enlist Duo™.[113] In fact, APHIS went so far as to stipulate the future use of Enlist Duo™, stating that "APHIS assumes that all 2,4-D treatments made to Enlist™ corn and soybean will also include glyphosate because stewardship agreements between [Dow] and growers will stipulate that Enlist Duo™ products . . . be used."[114]

However, in the Enlist EIS, APHIS did not analyze the effect on the physical environment caused by heightened 2,4-D use.[115] Indeed, APHIS specifically stated that the direct and indirect impacts of increased 2,4-D use were "outside the scope" of the EIS because the power to regulate the impacts of herbicide use resided with EPA under FIFRA.[116]

The power to regulate herbicides does reside with EPA under FIFRA,[117] and APHIS need not discuss an effect of an action where its statutory authority prevents it from refusing to

112. *Id.* at x.
113. *Id.* at ix.
114. *Id.* at 117.
115. *See id.* at vi.
116. *Id.*
117. *See* 7 U.S.C. §§ 136–136y (2012).

perform that action.[118] However, the increase in 2,4-D use anticipated by the deregulation of the Enlist™ crops is not such an effect because APHIS can choose whether to allow the introduction of crops that it expects will cause a spike in 2,4-D use. In this case, APHIS determined that an increase in 2,4-D use was reasonably foreseeable if it opted for deregulation. The increased use of 2,4-D was therefore an indirect effect of deregulating the Enlist™ crops, and APHIS needed to analyze this effect in the Enlist EIS.

B. Cumulative Impacts

The Enlist EIS also failed to evaluate the cumulative impacts arising from the deregulation of the Enlist™ crops. In the EIS, APHIS described the incremental impacts of registering herbicides and deregulating herbicide-resistant crops. Specifically, APHIS outlined how the registration of Roundup® and the deregulation of Roundup Ready® crops had led to the proliferation of Roundup® and the rise of Roundup®-resistant weeds.[119] To counteract the rise of Roundup®-resistant weeds, APHIS selected the deregulation of the Enlist™ crops as its preferred alternative in the Enlist EIS,[120] concluded that it was reasonably foreseeable that EPA would reach the "independent decision" to register Enlist Duo™,[121] and determined that use of 2,4-D would multiply.[122] APHIS predicted that the increased use of 2,4-D would create 2,4-D-resistant weeds[123] and implied that growers would employ new herbicides to combat these weeds.[124] Essentially, APHIS concluded that the deregulation of the Enlist™ crops, when combined with past, present, and reasonably foreseeable future APHIS and EPA regulation, would result in the increased use of 2,4-D and the creation of 2,4-D-resistant weeds.

However, APHIS did not complete a cumulative impacts analysis that comports with NEPA. APHIS recognized the

118. Dep't of Transp. v. Public Citizen, 541 U.S. 752, 769–70 (2004).
119. ENLIST EIS, *supra* note 4, at iii.
120. *Id.* at vii, viii.
121. *Id.* at ix.
122. *Id.* at x.
123. *Id.* at iv.
124. *Id.* at iii, vi, viii, ix.

creation of 2,4-D-resistant weeds as a potential cumulative impact and performed an analysis of associated impacts.[125] The agency also stated that it would produce an additional EIS to further analyze the selection of 2,4-D-resistant weeds and other related impacts.[126] Nevertheless, APHIS did not fulfill its duty under NEPA because it failed to evaluate the environmental impact of the increased 2,4-D use associated with deregulating the Enlist™ crops, the very cause of the 2,4-D-resistant weeds that the agency analyzed.[127] In fact, APHIS found the impacts of 2,4-D use to be outside the scope of the Enlist EIS because EPA regulates herbicides under FIFRA.[128]

APHIS erred in the Enlist EIS because the environmental impact of 2,4-D use was a cumulative impact of deregulating the Enlist™ crops, but the agency did not sufficiently analyze that impact. The definition of "cumulative impact" under the CEQ regulations specifically states that it is inconsequential which agency undertakes the actions that have a cumulative impact.[129] APHIS should have "catalogued" past, present, and reasonably foreseeable future actions, such as the reregistration of 2,4-D and registration of Enlist Duo™, and considered how those actions were thought to have impacted the environment.[130] In the Enlist EIS, APHIS recognized that the cycle of herbicide registration and herbicide-resistant crop deregulation caused herbicide use to increase but never analyzed the effects of this increase so as to enable the decision-maker to mitigate this cumulative impact.[131] APHIS therefore did not fully examine the cumulative impacts of deregulating the Enlist™ varieties.

C. Cumulative Action

APHIS also neglected to consider the cumulative action of EPA registering Enlist Duo™. In the Enlist EIS, APHIS stated that EPA was in the process of reviewing the use of 2,4-D on

125. *Id.* at 114–48.
126. *Id.* at vii.
127. *See id.*
128. *Id.* at v.
129. 40 C.F.R. § 1508.7 (2015).
130. *See* Te-Moak Tribe of W. Shoshone of Nev. v. U.S. Dep't of Interior, 608 F.3d 592, 603 (9th Cir. 2010).
131. *See* ENLIST EIS, *supra* note 4.

Enlist™ corn and soybean[132] and would likely register Enlist Duo™ for use on the Enlist™ crops.[133] Indeed, APHIS announced an intention to stipulate that Enlist Duo™ products be used on the Enlist™ crops.[134]

The proposed actions contemplated in the Enlist EIS, the deregulation of the Enlist™ crops and the registration of Enlist Duo™, have "cumulative or synergistic environmental impact" so as to require an analysis of both in the EIS.[135] As observed previously, the combination of the registration of Enlist Duo™ and the deregulation of Enlist™ corn and soy would result in a sizeable boost in 2,4-D use and the selection and distribution of 2,4-D-resistant weeds.[136] Therefore, the Enlist EIS raised "substantial questions" about whether there would be significant environmental impacts from these anticipated projects.[137]

However, in the Enlist EIS, APHIS overlooked the cumulatively significant impact of these two actions, determining that the registration of Enlist Duo™ was outside the purview of the EIS.[138] APHIS failed to recognize that CEQ regulations specify that cumulatively significant impacts do not depend on which agency undertakes the action.[139] APHIS therefore erred when it determined that the registration of Enlist Duo™ was "outside the scope" of the Enlist EIS. NEPA demanded that APHIS include a discussion of the cumulative action of registering Enlist Duo™ in the Enlist EIS.

D. Connected Action

APHIS also failed to assess the connected action of the registration of Enlist Duo™ in the Enlist EIS. The EIS reveals APHIS's belief that the deregulation of Enlist™ and the registration of Enlist Duo™ would not take place without each

132. *Id.* at ii.

133. *Id.* at 117.

134. *Id.*

135. *See* Sierra Club v. Penfold, 664 F. Supp. 1299, 1303 (D. Alaska 1987) (quoting Kleppe v. Sierra Club, 427 U.S. 390 (1976)).

136. ENLIST EIS, *supra* note 4, at x, 117.

137. *See* Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt., 387 F.3d 989, 999 (9th Cir. 2004).

138. ENLIST EIS, *supra* note 4, at vi, 116.

139. *See* 40 C.F.R. § 1508.7 (2015).

other.[140] For instance, in considering the environmental impact of deregulating the Enlist™ crops, APHIS noted that EPA had conducted "independent assessments of direct and indirect effects associated with the use of 2,4-D" on the Enlist™ crops "concurrent with the development of this EIS."[141] APHIS then concluded that it was "reasonably foreseeable" that EPA would register Enlist Duo™ for use on Enlist™ corn and soy.[142] In fact, APHIS announced an intention to require that growers use Enlist Duo™ on the Enlist™ varieties by stewardship agreement.[143] This intention presupposed that EPA would register Enlist Duo™ and the signing of those stewardship agreements would necessitate the registration of Enlist Duo™. Further, in the EIS, APHIS went so far as to assess the likelihood that use of Enlist Duo™ would select for 2,4-D-resistant weeds.[144] Therefore, in the EIS, APHIS indicated that the registration of Enlist Duo™ and the deregulation of the Enlist™ crops did not have independent utility.[145]

Nevertheless, APHIS did not discuss the registration of Enlist Duo™ in the Enlist EIS.[146] The agency deemed the registration of Enlist Duo™ to be "outside the scope" of the Enlist EIS because EPA regulates herbicides.[147] However, CEQ regulations suggest that an agency's regulatory purview does not curtail its obligation to consider connected actions, regardless of which agency oversees that action, in the same EIS.[148] Specifically, the regulations state that a lead agency should supervise the preparation of an EIS if more than one agency is involved in a group of actions with "functional interdependence."[149] In the Enlist EIS, APHIS suggested that the registration of Enlist Duo™ and the deregulation of the

140. *See* Wilderness Workshop v. U.S. Bureau of Land Mgmt., 531 F.3d 1220, 1229 (10th Cir. 2008); Great Basin Mine Watch v. Hankins, 456 F.3d 955, 969 (9th Cir. 2006).

141. ENLIST EIS, *supra* note 4, at 116.

142. *Id.* at ix.

143. ENLIST EIS, *supra* note 4, at 117.

144. *See id.* at 138–39.

145. *See* Nw. Res. Info. Ctr., Inc. v. Nat'l Marine Fisheries Serv., 56 F.3d 1060, 1068–69 (9th Cir. 1995); *Wilderness Workshop*, 531 F.3d at 1228–29.

146. *See* ENLIST EIS, *supra* note 4.

147. *Id.* at vi.

148. *See* 40 C.F.R. § 1501 (2015).

149. *See id.* § 1501.5.

Enlist™ varieties did not have independent utility but, instead, were functionally interdependent. Consequently, APHIS was required to discuss the connected action of registering Enlist Duo™ in the Enlist EIS.

E. Conclusion

By limiting the scope of the Enlist EIS, APHIS avoided assessing the full environmental impact of the deregulation of Enlist™ corn and soy. The application of herbicides is part and parcel with the introduction of herbicide-resistant crops. Yet, in the Enlist EIS, APHIS neglected to assess the impact of the increased use of the relevant herbicides. In so doing, APHIS violated NEPA by not assessing the indirect effects of deregulating the Enlist™ crops, not evaluating the cumulative impacts of deregulating the Enlist™ varieties, not discussing the cumulative action of registering Enlist Duo™, and not including the connected action of registering Enlist Duo™.

VI. EPA'S ANALYSIS OF 2,4-D AND ENLIST DUO™

Although APHIS stated that the impacts of 2,4-D use associated with the deregulation of Enlist™ corn and soy were outside the scope of the Enlist EIS because EPA regulates herbicides under FIFRA, EPA did not assess the effects of 2,4-D use in its decisions to reregister 2,4-D and register Enlist Duo™ either. Courts have found that EPA need not perform a NEPA analysis when registering pesticides, stating that FIFRA procedures were intended to replace NEPA.[150] The courts have found sufficient FIFRA's constraint that the herbicide does not have "unreasonable adverse effects on the environment."[151] However, EPA does not consider the environmental effects of registering an herbicide when conducting a FIFRA analysis.[152] In the 2,4-D and Enlist Duo™ decisions, EPA did not assess whether the registration of those herbicides would have an adverse effect on the environment.[153] The perfunctory analysis that the agency did perform lacked key elements that NEPA

150. *See* Merrell v. Thomas, 807 F.2d 776, 776 (9th Cir. 1986).
151. *See id.* at 781–82.
152. *See 2,4-D Decision*, *supra* note 3; *see* ENLIST DUO DECISION, *supra* note 3.
153. *See 2,4-D Decision*, *supra* note 3; *see* ENLIST DUO DECISION, *supra* note 3.

would have required, such as a consideration of direct and indirect effects and alternatives.[154] As a result, neither EPA nor APHIS assessed the effects of the increased 2,4-D use associated with registering 2,4-D and Enlist Duo™ and deregulating Enlist™ corn and soy.

A. EPA's Reregistration of 2,4-D

i. Reregistration Eligibility Decision for 2,4-D

On August 8, 2004, EPA issued a Reregistration Eligibility Decision for 2,4-D that continued the extensive usage of the herbicide.[155] EPA's decision to reregister 2,4-D consisted of three main steps: first, EPA's Environmental Fate and Effects Division ("EFED") completed a Risk Assessment for the 2,4-D reregistration decision;[156] second, EPA's Health Effects Division ("HED") performed a Risk Assessment for the reregistration decision;[157] and third, EPA's Reregistration Division rendered the Reregistration Eligibility Decision for 2,4-D.[158]

In the Reregistration Eligibility Decision for 2,4-D ("2,4-D Decision"), EPA never stated that 2,4-D met the "no unreasonable adverse effects" balancing test of FIFRA.[159] Rather, EPA concluded that 2,4-D products presented risks inconsistent with FIFRA but that the risk mitigation measures identified in the 2,4-D Decision, if incorporated into product labels and followed by users, would adequately mitigate the

154. *See 2,4-D Decision*, *supra* note 3; *see* ENLIST DUO DECISION, *supra* note 3.

155. *2,4-D Decision*, *supra* note 3, at xi.

156. ENVTL. PROT. AGENCY, ENVIRONMENTAL FATE AND EFFECTS DIVISION REVISED PRELIMINARY RISK ASSESSMENT FOR THE 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) REREGISTRATION ELIGIBILITY DOCUMENT (Nov. 9, 2004) [hereinafter "EFED RISK ASSESSMENT"], *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2004-0167-0092 [http://perma.cc/6H8J-QCLZ].

157. ENVTL. PROT. AGENCY, 2,4-D. HED'S REVISED HUMAN HEALTH RISK ASSESSMENT FOR THE REREGISTRATION ELIGIBILITY DECISION (RED) REVISED TO REFLECT PUBLIC COMMENTS (Jan. 5, 2005) [hereinafter "HED RISK ASSESSMENT"], *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2004-0167-0080 [http://perma.cc/F4NJ-7SKH].

158. ENVTL. PROT. AGENCY, 2,4-D REREGISTRATION ELIGIBILITY DECISION (Aug. 8, 2005) [hereinafter "2,4-D REGISTRATION DECISION"], *available at* http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2004-0167-0243 [http://perma.cc/6W8M-24VH].

159. *See id.*

risks.[160] While EPA did not specifically state why it reregistered 2,4-D in light of the risks associated with its use, the agency repeatedly cited the extensive use of 2,4-D by American growers.[161] However, in the 2,4-D Decision, EPA did not analyze the effects of the "extensive use of 2,4-D" that its decision would continue.[162] The agency only investigated the risks associated with the herbicide itself.[163]

ii. The Reregistration of 2,4-D Under a NEPA Analysis

While the courts have concluded that EPA does not need to perform a NEPA analysis when registering an herbicide, the 2,4-D Decision lacked an investigation into the direct and indirect effects of reregistering the herbicide, which NEPA would have required. In the 2,4-D Decision, EPA also did not consider alternatives to the registration of the herbicide. If not excused by the courts from conducting a NEPA analysis, the reregistration of 2,4-D would have required the preparation of an EIS and the 2,4-D Decision would have been insufficient.

a. Risk Assessments Indicate Need for EIS

The EFED Risk Assessment and the HED Risk Assessment indicated that the reregistration of 2,4-D might have a significant effect on the quality of the human environment so as to implicate the requirements of NEPA. In terms of context, EPA noted that annual domestic usage of 2,4-D was 46 million pounds and that 2,4-D was used extensively in the Midwest, Great Plains, and Northwestern United States.[164]

As to intensity, EPA determined that 2,4-D usage could affect public safety by causing developmental toxicity, reproductive toxicity, neurotoxicity, and liver toxicity; impacting hormone homeostasis; and posing a threat, albeit a small one, of human carcinogenicity.[165] EPA also concluded that the use of 2,4-D would pose risks to endangered species, including species of

160. *Id.* at 79.
161. *See id.* at xi, 8–14.
162. *See id.*
163. *See id.*
164. EFED RISK ASSESSMENT, *supra* note 156, at 10–11.
165. HED RISK ASSESSMENT, *supra* note 157, at 4–6.

fish, birds, mammals, aquatic plants, and non-target terrestrial plants.[166]

The EFED and HED Risk Assessments additionally indicated that the possible effects of 2,4-D usage on the human environment were highly uncertain. For example, EPA stated that the potential toxicity of degraded 2,4-D was unknown.[167] EPA also noted that plant reproduction abnormalities caused by exposure to 2,4-D could have "negative effects throughout the food chain," but did not analyze these effects.[168] The agency further disclosed that 2,4-D was detected in both ground and surface waters, but since the available monitoring data was not targeted to 2,4-D use, the agency needed additional data to capture peak runoff events.[169] Finally, EPA conceded that it had not performed an assessment of the cumulative risk of 2,4-D use to human health.[170]

The EFED Risk Assessment and the HED Risk Assessment therefore suggested that the reregistration of 2,4-D may have been a major action significantly affecting the quality of the human environment, which would have implicated the need to prepare an EIS if NEPA applied.

b. 2,4-D Decision Lacks Components of a Sufficient EIS

While the courts do not apply NEPA when EPA registers an herbicide,[171] the 2,4-D Decision lacks the sort of analysis that NEPA demands. Specifically, the 2,4-D decision did not consider alternatives and did not analyze direct and indirect effects.

1. Alternatives

In the 2,4-D Decision, EPA did not consider alternatives to the reregistration of 2,4-D.[172] Instead, EPA considered the "relevant data" and determined that the data were sufficient to support reregistration of all products containing 2,4-D.[173]

166. EFED RISK ASSESSMENT, *supra* note 156, at 1.
167. *Id.* at 78, 110–11.
168. *Id.* at 22.
169. *Id.* at 42–43.
170. HED RISK ASSESSMENT, *supra* note 157, at 72–73.
171. *See* Merrell v. Thomas, 807 F.2d 776, 776 (9th Cir. 1986).
172. *See id.*
173. HED RISK ASSESSMENT, *supra* note 157, at 79.

However, EPA had not even collected all of the relevant data.[174] EPA granted reregistration of 2,4-D-containing products on the condition that the agency address existing data gaps, including data on health and environmental effects.[175]

Despite finding this caveat necessary, EPA never considered that it would not reregister 2,4-D.[176] Indeed, EPA did not consider any alternatives to the reregistration of 2,4-D at all.[177] Rather, EPA decided to reregister 2,4-D despite finding that 2,4-D products would present risks inconsistent with FIFRA unless labeled and used as specified in the 2,4-D Decision.[178] The 2,4-D Decision therefore fell short of the "rigorous[]," "objective" and "detail[ed]" analysis of "all reasonable alternatives" that NEPA and its implementing regulations would have required.[179]

2. Direct and Indirect Effects

In the 2,4-D Decision, EPA also did not assess the direct and indirect effects of reregistering 2,4-D. In the Decision, EPA evaluated in detail the risk posed by 2,4-D to human health and the environment.[180] The agency also proposed methods by which to mitigate this risk, including modifications to the tolerances for 2,4-D.[181] Finally, the 2,4-D Decision outlined the procedures that registrants must follow to comply with FIFRA's labeling requirements.[182]

EPA did not, however, analyze the effects of reregistering 2,4-D.[183] Nowhere in the 2,4-D Decision did the agency assess whether reregistering 2,4-D would impact the usage of the herbicide and the environmental effects of such a change, if any.[184] EPA also did not evaluate farther removed but still reasonably foreseeable impacts of the reregistration of 2,4-D,

174. *Id.*
175. *Id.*
176. *See* 2,4-D REGISTRATION DECISION, *supra* note 158.
177. *See id.*
178. *Id.* at 79.
179. *See* 42 U.S.C. § 4332 (2012); 40 C.F.R. § 1502.14 (2015); Utahns for Better Transp. v. U.S. Dep't of Transp., 305 F.3d 1152, 1166 (10th Cir. 2002).
180. *See* 2,4-D REGISTRATION DECISION, *supra* note 158, at 15–78.
181. *See id.* at 79–107.
182. *See id.* at 108–52.
183. *See id.*
184. *See id.*

such as the development of 2,4-D resistant weeds.[185] These are effects on the physical environment with a "reasonably close" relationship with the reregistration of 2,4-D and therefore EPA would need to analyze them if performing a NEPA analysis.[186]

B. EPA's Registration of Enlist Duo™

EPA's recent Final Registration of Enlist Duo™ Herbicide ("Enlist Duo Decision") includes an analysis similar to the agency's 2,4-D Decision.[187] As with the 2,4-D Decision, the Enlist Duo Decision did not reach a finding that the registration would have "no unreasonable adverse effects" as required by FIFRA.[188] The Enlist Duo Decision also did not investigate direct and indirect effects or consider alternatives as a NEPA analysis would have required.[189]

i. Final Registration of Enlist Duo™ Herbicide

In registering Enlist Duo™, EPA did not even bother completing an EFED Risk Assessment or an HED Risk Assessment.[190] Rather, EPA relied on the EFED and HED Risk Assessments prepared only for the reregistration of 2,4-D.[191]

In the Enlist Duo Decision, EPA did not conclude that Enlist Duo™ met the "no unreasonable adverse effects" balancing test of FIFRA.[192] Instead, EPA concluded that approving the application for registration of Enlist Duo™ would "not increase the risk of any unreasonable adverse effects on human health

185. *See id.*

186. Dep't of Transp. v. Public Citizen, 541 U.S. 752, 767 (2004); Metro. Edison Co. v. People Against Nuclear Energy, 460 U.S. 766, 773–74 (1983).

187. *See generally* ENLIST DUO DECISION, *supra* note 3.

188. *Id.* at 23–24.

189. *See generally id.*

190. *See id.* at 2, 14.

191. *Compare id.* at 2, 14, *with* ENVTL. PROT. AGENCY, DOW AGROSCIENCES PETITIONS (09-233-01P, 09-349-01P, AND 11-234-01P) FOR DETERMINATIONS OF NONREGULATED STATUS FOR 2,4-D-RESISTANT CORN AND SOYBEAN VARIETIES – DRAFT ENVIRONMENTAL IMPACT STATEMENT—2013 192 (2013), *available at* http://yosemite.epa.gov/oeca/webeis.nsf/(EISDocs)/20140001/$file/2,4-D_Resistant_GE_Corn_and_Soybean_EIS.pdf?OpenElement [http://perma.cc/D5LA-LTZN].

192. *See* ENLIST DUO DECISION, *supra* note 3, at 23–24.

or the environment," provided the registrant followed certain requirements.[193]

Recognizing the cycle of increased herbicide use caused by 2,4-D application, EPA "impos[ed] a new, robust set of requirements" on Dow in the Enlist Duo Decision.[194] These requirements do not require any direct action by Dow, but merely impose a duty to investigate any complaints concerning the efficacy of Enlist Duo that Dow receives through a toll-free number.[195] Commencing January 15, 2016, Dow must then annually submit a report to EPA summarizing its investigations based on these phone calls.[196] If users do not call the toll-free number to report efficacy problems to Dow, Dow need not investigate on its own.[197] The only precautionary measures that EPA employed were geographic, registering Enlist Duo™ for only six states to begin, and temporal, limiting the initial registration to only six years.[198]

ii. Enlist Duo Decision Lacks Components of a Sufficient EIS

Although EPA realized that the registration of Enlist Duo™ would continue a cycle of increased herbicide use, the agency did not assess the impact of this increased use in the Enlist Duo Decision.[199] As with the 2,4-D Decision, if NEPA applied to the decision to register Enlist Duo™, the Enlist Duo Decision would lack key elements of an EIS analysis.[200] As EPA relied on the EFED and HED Risk Assessments for 2,4-D in registering Enlist Duo™, the decision to register Enlist Duo™ would raise the same need to prepare an EIS if NEPA applied. However, the Enlist Duo Decision did not consider alternatives and did not analyze direct and indirect effects.

193. *Id.*
194. *2,4-D Decision*, *supra* note 3; ENLIST DUO DECISION, *supra* note 3, at 21–22.
195. ENLIST DUO DECISION, *supra* note 3, at 21–22.
196. *Id.* at 22.
197. *See Id.* at 21–22.
198. *Id.* at 29.
199. *See generally id.*
200. *See generally id.*

a. Alternatives

EPA did not consider alternatives to the registration of Enlist Duo™ in the Enlist Duo Decision.[201] EPA observed that the "emergence of herbicide resistant weeds is an increasing problem that has become a significant economic issue to growers."[202] The agency also conceded that 2,4-D, a key component of Enlist Duo™, has been classified as having low acute toxicity via oral, dermal, and inhalation routes of exposure and can cause changes in the kidney, thyroid, liver, adrenal, eye, and ovaries/testes.[203] Further, EPA found it necessary to limit the scope of the registration in both time and place.[204] Nevertheless, the agency did not consider any alternatives to the registration of Enlist Duo™, such as not registering the herbicide.[205] Consequently, the Enlist Duo Decision did not contain the analysis of "all reasonable alternatives" that NEPA and its implementing regulations would have required.[206]

b. Direct and Indirect Effects

EPA also did not analyze the direct and indirect effects of registering Enlist Duo™.[207] In the Enlist Duo Decision, EPA assessed the risk to human health and the environment posed by Enlist Duo™.[208] The agency also acknowledged the emergence of herbicide-resistant weeds and required Dow, the registrant of Enlist Duo™, to develop a plan to "promote herbicide resistance management efforts."[209]

Nonetheless, EPA did not actually evaluate how registering Enlist Duo™ would change the usage of 2,4-D and glyphosate and the environmental effects caused by such a change.[210] Although EPA recognized that the development of herbicide-

201. *See generally id.*
202. *Id.* at 21.
203. *Id.* at 2.
204. *Id.* at 29.
205. *See generally id.*
206. *See* 42 U.S.C. § 4332 (2012); 40 C.F.R. § 1502.14 (2015); Utahns for Better Transp. v. U.S. Dep't of Transp., 305 F.3d 1152, 1166 (10th Cir. 2002).
207. *See generally* ENLIST DUO DECISION, *supra* note 3.
208. *See id.* at 2–21.
209. *Id.* at 21.
210. *See generally id.*

resistant weeds would likely be an indirect effect of registering Enlist Duo™, the agency did not evaluate this indirect effect itself.[211] Instead, EPA required the registrant to make a plan to "promote herbicide resistance management efforts" and designed a system in which the registrant might be able to collect data on herbicide-resistant weeds.[212] The increased use of certain herbicides, and the resultant development of herbicide-resistant weeds are effects on the physical environment with a "reasonably close" relationship with the registration of Enlist Duo™ and therefore EPA would need to analyze them if performing a NEPA analysis.[213]

C. Conclusion

NEPA and FIFRA have different aims and require different levels of analysis to achieve their respective purposes. Congress designed FIFRA to limit the negative impact of pesticides and herbicides through its "no unreasonable adverse effects" balancing test. Congress created NEPA, on the other hand, to force agencies to carefully consider the environmental consequences of their actions prior to acting. Consequently, it is no surprise that an environmental analysis under FIFRA does not comport with the mandates of NEPA and its implementing regulations. However, by exempting EPA from the requirements of NEPA when registering herbicides, the courts have perpetuated a cycle of herbicide registration and herbicide-resistant crop deregulation in which neither EPA nor APHIS fully contemplates the cumulative impact of their respective actions. In its registration decisions, EPA analyzes the risks posed by the herbicide at issue but not the effects of the decision to register, including the increased use of that herbicide. While APHIS avoids analyzing the effects of the increased use of an herbicide when deregulating an herbicide-resistant plant by asserting that EPA regulates herbicides, EPA does not evaluate the effects of the increased use of an herbicide associated with its decision to register because the courts have decided the agency is not required to do so.

211. *Id.* at 21.

212. *Id.* at 21–22.

213. *See* Dep't of Transp. v. Public Citizen, 541 U.S. 752, 767 (2004); Metro. Edison Co. v. People Against Nuclear Energy, 460 U.S. 766, 773–74 (1983).

VII. THE CYCLE

While the case of 2,4-D, the Enlist™ crops, and Enlist Duo™ is emblematic of the agencies' failure to consider the cumulative impact of registering herbicides and deregulating herbicide-resistant crops, other examples demonstrate that these decisions are but recent steps in an ongoing cycle. The creators of the Enlist™ varieties developed these 2,4-D-resistant crops because the proliferation of Roundup Ready® crops had rendered the Roundup® herbicide, glyphosate, ineffectual.[214] The registration of glyphosate and the deregulation of the Roundup Ready® crops mirror EPA's and APHIS's failures to consider the cumulative impact of their actions regarding 2,4-D, the Enlist™ crops, and Enlist Duo™.

A. Roundup Ready®, Glyphosate, and NEPA

The deregulation of Roundup Ready® crops, which are glyphosate-resistant, exhibited the same NEPA violations that occurred in the Enlist EIS. In several instances, APHIS has made a Finding of No Significant Impact after conducting an Environmental Assessment for the deregulation of glyphosate-resistant crops.[215] However, those EAs have not always been sufficient to comply with NEPA. In one instance, the Northern District of California found an EA completed for the deregulation of a Roundup Ready® sugar beet deficient for failing to consider the potential elimination of a farmer's choice to grow non-genetically engineered crops.[216] The court concluded that "an action that potentially eliminates or reduces the availability of a particular plant has a significant effect on the human environment" and therefore required preparation of an EIS.[217]

On the rare occasion that EPA has completed an EIS when deregulating Roundup Ready® crops,[218] the EIS has not always complied with NEPA. In *Geertson Seed Farms v. Johanns*, the

214. ENLIST EIS, *supra* note 4, at iii.

215. *Petitions Table*, USDA, *supra* note 7.

216. Ctr. for Food Safety v. Vilsack, No. 3:08-cv-00484, 2009 WL 3047227, at *4–5, 17 (N.D. Cal. Sept. 21, 2009).

217. *Id.* at *8.

218. *Petitions Table*, USDA, *supra* note 7.

Northern District of California determined that APHIS violated its NEPA obligations when deregulating Roundup Ready® alfalfa.[219] The court specifically found that APHIS, in a satisfactory EIS, had to consider the cumulative impact of increased glyphosate use associated with the introduction of the Roundup Ready® crops.[220] The court reached this conclusion despite APHIS's contention that it need not consider the effects of increased herbicide use because the regulation of herbicides belonged to EPA.[221] APHIS therefore made the same claim regarding its failure to consider the impact of increased herbicide use when deregulating the Enlist™ crops as it did when deregulating the Roundup Ready® crops, a claim the Northern District of California found unsatisfactory.[222]

EPA's reregistration of glyphosate consisted of a FIFRA analysis that did not include certain elements that a satisfactory NEPA review would have contained.[223] Like in the 2,4-D Decision, EPA did not consider alternatives to reregistering glyphosate.[224] EPA also did not evaluate the effects of reregistering glyphosate but only assessed the risks associated with glyphosate use and how to mitigate them.[225]

B. Conclusion

The regulation of glyphosate and glyphosate-resistant crops parallels the regulation of 2,4-D, Enlist Duo™, and 2,4-D-resistant crops. In both cases, APHIS violated its NEPA obligations by neglecting to evaluate the increased herbicide use associated with introducing the herbicide-resistant crop. Additionally, EPA did not consider the full environmental effects of registering the herbicide in its FIFRA analysis.

219. Geertson Seed Farms v. Johanns, No. C 06–01075 CRB, 2007 WL 518624, at *12 (N.D. Cal. Feb. 13, 2007).

220. *Id.* at *9–11.

221. *Id.*

222. *Id.*, at *12.

223. *See* ENVTL. PROT. AGENCY, GLYPHOSATE REREGISTRATION ELIGIBILITY DECISION (Sept. 1993) [hereinafter "GLYPHOSATE DECISION"], *available at* http://www.epa.gov/espp/litstatus/effects/glyphosate-red.pdf [http://perma.cc/4T29-L6A3].

224. *Id.*

225. *Id.*

VIII. POSSIBLE SOLUTIONS

In 1986, the White House Office of Science and Technology Policy ("OSTP") promulgated the federal government's Coordinated Framework for Regulation of Biotechnology, which specified that bioengineered products would generally be regulated under the then-existing statutory and regulatory structure.[226] As a result of the Coordinated Framework for Regulation of Biotechnology, EPA regulates herbicides under FIFRA while APHIS regulates certain herbicide-resistant crops under the PPA.[227] OSTP determined that the process of biotechnology was not inherently risky, and consequently, the products of biotechnology, rather than the process itself, needed oversight.[228] As evidenced by the Enlist™ crops, however, inadequate regulation of biotechnology poses risks to humanity. When the cumulative impact of pairing herbicides with herbicide-resistant crops is not addressed, herbicide-resistant weeds develop and utilization of toxic herbicides proliferates.

The existing statutory and regulatory framework allows APHIS and EPA to compartmentalize each regulatory action and to avoid acknowledging the broader implications of their decisions. Although the deregulation of herbicide-resistant crops presupposes increased use of a certain herbicide, APHIS sidesteps the effects of this increased herbicide use by contending that EPA regulates herbicides and therefore EPA must consider the effects of increased herbicide use when registering herbicides. When EPA does register an herbicide, however, the agency completes a FIFRA analysis that does not even consider the effects of registering the herbicide, let alone the effects of the increased use of that herbicide caused by the cultivation of herbicide-resistant crops.

To stem the propagation of toxic herbicides, either Congress must place the regulatory authority over both herbicides and herbicide-resistant crops in APHIS, or OSTP must press the

226. Gregory N. Mandel, *Gaps, Inexperience, Inconsistencies, and Overlaps: Crisis in the Regulation of Genetically Modified Plants and Animals*, 45 WM. & MARY L. REV. 2167, 2216 (2004).

227. *See* 7 U.S.C. §§ 136–136y (2012); 7 U.S.C. §§ 7701–72 (2012).

228. *See* 7 U.S.C. §§ 136–136y; 7 U.S.C. §§ 7701–72.

agencies to more thoroughly evaluate environmental effects when regulating herbicides and herbicide-resistant crops.

A. Congressional Action

The most effective way to stop the rise of toxic herbicide use would be for Congress to re-conceptualize the regulation of herbicides and herbicide-resistant crops as a single cycle and place the regulatory authority over that cycle in APHIS. Unlike EPA's registration of herbicides, APHIS must perform a NEPA analysis when deregulating herbicide-resistant crops.[229] APHIS typically avoids assessing the increased herbicide use presupposed by its decision to deregulate an herbicide-resistant crop by stating that the regulation of herbicides is "outside the scope" of the agency's authority.[230] By placing the regulatory authority over herbicides in APHIS, the herbicide use associated with herbicide-resistant crops would undeniably be within the scope of APHIS's authority. Consequently, the agency would likely pay greater attention to the cumulative impact of introducing crops engineered to be resistant to herbicides. In doing so, APHIS would come closer to fulfilling the primary goal of NEPA: to prompt agencies to take a "hard look" at the environmental consequences of their actions.[231]

B. CEQ Action

Short of Congressional action, pressure from OSTP, with assistance from CEQ, would be the best method to integrate the cumulative impact of pairing herbicides with herbicide-resistant crops into agency decision-making. The National Science and Technology Policy, Organization, and Priorities Act of 1976 empowers OSTP to coordinate agencies with overlapping missions and to press them in particular policy directions.[232] OSTP could therefore press APHIS to complete a more comprehensive EIS, one that considers the herbicide use associated with introducing herbicide-resistant crops. OSTP could also press EPA to consider environmental effects when

229. *Compare* Merrell v. Thomas, 807 F.2d 776, 776 (9th Cir. 1986), *with Petitions Table*, USDA, *supra* note 7.

230. ENLIST EIS, *supra* note 4, at v, viii.

231. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350 (1989).

232. 42 U.S.C. §§ 6614, 6617 (2012).

evaluating whether the registration of an herbicide would cause "unreasonable adverse effects on the environment" under FIFRA.[233]

IX. CONCLUSION

Contrary to the Northern District of California's assertion in *Geertson Seed Farms v. Johanns*, there is no federal agency currently considering the cumulative impact of the introduction of herbicide-resistant crops. When deregulating herbicide-resistant crops, APHIS fails to evaluate the associated increase in herbicide use and, in the process, fails to perform an adequate NEPA analysis. EPA, meanwhile, does not assess the environmental effects of registering herbicides at all. To prompt agency decision-makers to consider the cumulative impact of introducing herbicide-resistant crops, OSTP should assign the regulatory authority over both herbicides and herbicide-resistant crops to APHIS. This shift in authority would cause the agency to more closely scrutinize its decisions regarding herbicide-resistant crops. This enhanced scrutiny would, hopefully, cause the agency to think twice before opting for a path that leads to the release of more toxic herbicides.

233. *See* 7 U.S.C. § 136a(c)(5) (2012); 7 U.S.C. § 136a(c)(5)(C), (D) (2012).