UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

PC Code No.: 110003
DP Barcode: 358851, 358852

MEMORANDUM Date: May 4, 2009

Subject: EFED Risk Assessment for the Proposed IR-4 Use of the Spinosad product Entrust® on Pomegranate and Dates, PC Code: 110003 DP Barcodes: 358851 and 358852.

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To: Richard Gebken, RM 13 (305-6701)
Kimberly Nesci, RM Reviewer
Registration Division (PY1 S7237)

From: Joseph DeCant, Ecologist
Larry Liu, Ph.D., Chemist
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Through: Mah Shamim, Ph.D., Chief
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Environmental Fate and Effects Division (7507C)

The current ecological risk assessment for IR-4 registrations requested for the use of spinosad products on pomegranate and dates is attached. The following previous assessment for mint can be used in place of a new assessment for both pomegranate and dates since the application rates are the same. A listing of endangered species is also attached.

Species Listing by State with Use Criteria

No species were excluded
Minimum of 1 Acre.
All Medium Types Reported
Mammal, Bird, Amphibian, Reptile, Fish, Arachnid, Insect, Dicot, Monocot
dates

Arizona (23) species:

		Taxa	Critical Habitat
Frog, Chiricahua Leopard	Threatened	Amphibian	No
(Rana chiricahuensis)		Freshwater, Terrestrial	
Bobwhite, Masked	Endangered	Bird	No
(Colinus virginianus ridgwayi)		Terrestrial	
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Owl, Mexican Spotted	Threatened	Bird	Yes
(Strix occidentalis lucida)		Terrestrial	
Pygmy-owl, Cactus Ferruginous	Endangered	Bird	No
(Glaucidium brasilianum cactorum)		Terrestrial	
Rail, Yuma Clapper	Endangered	Bird	No
(Rallus longirostris yumanensis)		Terrestrial	
Blue-star, Kearney's	Endangered	Dicot	No
(Amsonia kearneyana)		Terrestrial	
Cactus, Arizona Hedgehog	Endangered	Dicot	No
(Echinocereus triglochidiatus var. arizonicus)		Terrestrial	
Cactus, Nichol's Turk's Head	Endangered	Dicot	No
(Echinocactus horizonthalonius var. nicholii)		Terrestrial	
Cactus, Pima Pineapple	Endangered	Dicot	No
(Coryphantha scheeri var. robustispina)		Terrestrial	
Cliffrose, Arizona	Endangered	Dicot	No
(Purshia (=cowania) subintegra)		Terrestrial	
Umbel, Huachuca Water	Endangered	Dicot	Yes
(Lilaeopsis schaffneriana var. recurva)		Terrestrial, Freshwater	
Chub, Gila	Endangered	Fish	Yes
(Gila intermedia)		Freshwater	
Minnow, Loach	Threatened	Fish	Yes
(Tiaroga cobitis)		Freshwater	
Pupfish, Desert	Endangered	Fish	Yes
(Cyprinodon macularius)		Freshwater	
Spikedace	Threatened	Fish	Yes
(Meda fulgida)		Freshwater	
Sucker, Razorback	Endangered	Fish	Yes
(Xyrauchen texanus)		Freshwater	
Topminnow, Gila (Yaqui)	Endangered	Fish	No
(Poeciliopsis occidentalis)		Freshwater	
Bat, Lesser (=Sanborn's) Long-nosed	Endangered	Mammal	No
(Leptonycteris curasoae yerbabuenae)		Subterraneous, Terrestrial	
Jaguar	Endangered	Mammal	No
(Panthera onca)		Terrestrial	
Ocelot	Endangered	Mammal	No

(Leopardus (=Felis) pardalis)		Terrestrial	
Pronghorn, Sonoran	Endangered	Mammal	No
(Antilocapra americana sonoriensis)		Terrestrial	
Wolf, Gray	Endangered	Mammal	Yes
(Canis lupus)		Terrestrial	

California (131) species:

		Taxa	Critical Habitat
Frog, California Red-legged	Threatened	Amphibian	Yes
(Rana aurora draytonii)		Terrestrial, Freshwater	
Frog, Mountain Yellow-legged	Endangered	Amphibian	No
(Gopherus agassizii)		Terrestrial, Freshwater	
Salamander, California Tiger	Endangered	Amphibian	No
(Ambystoma californiense)		Terrestrial, Vernal pool	
Salamander, Desert Slender	Endangered	Amphibian	No
(Batrachoseps aridus)		Freshwater, Terrestrial	
Toad, Arroyo Southwestern	Endangered	Amphibian	Yes
(Bufo californicus (=microscaphus))		Freshwater, Terrestrial	
Condor, California	Endangered	Bird	Yes
(Gymnogyps californianus)		Terrestrial	
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Gnatcatcher, Coastal California	Threatened	Bird	Yes
(Polioptila californica californica)		Terrestrial	
Murrelet, Marbled	Threatened	Bird	Yes
(Brachyramphus marmoratus marmoratus)		Freshwater, Terrestrial, Saltwater	
Pelican, Brown	Endangered	Bird	No
(Pelecanus occidentalis)		Terrestrial	
Plover, Western Snowy	Threatened	Bird	Yes
(Charadrius alexandrinus nivosus)		Terrestrial	
Rail, California Clapper	Endangered	Bird	No
(Rallus longirostris obsoletus)		Terrestrial	
Rail, Light-footed Clapper	Endangered	Bird	No
(Rallus longirostris levipes)		Terrestrial	
Rail, Yuma Clapper	Endangered	Bird	No
(Rallus longirostris yumanensis)		Terrestrial	
Shrike, San Clemente Loggerhead	Endangered	Bird	No
(Lanius ludovicianus mearnsi)		Terrestrial	
Sparrow, San Clemente Sage	Threatened	Bird	No
(Amphispiza belli clementeae)		Terrestrial	
Tern, California Least	Endangered	Bird	No
(Sterna antillarum browni)		Terrestrial	
Towhee, Inyo Brown	Threatened	Bird	Yes
(Pipilo crissalis eremophilus)		Terrestrial	
Vireo, Least Bell's	Endangered	Bird	Yes
(Vireo bellii pusillus)		Terrestrial	
Ambrosia, San Diego	Endangered	Dicot	No
(Ambrosia pumila)		Terrestrial	
Barberry, Nevin's	Endangered	Dicot	No
(Berberis nevinii)		Terrestrial	
Bird's-beak, Palmate-bracted	Endangered	Dicot	No
(Cordylanthus palmatus)		Terrestrial	
Bird's-beak, salt marsh	Endangered	Dicot	No

(Cordylanthus maritimus ssp. maritimus)		Saltwater		
Bird's-beak, Soft	Endangered		Dicot	No
(Cordylanthus mollis ssp. mollis)		Brackish, Saltwater		
Bladderpod, San Bernardino Mountains	Endangered		Dicot	Yes
(Lesquerella kingii ssp. bernardina)		Terrestrial		
Bluecurls, Hidden Lake	Threatened		Dicot	No
(Trichostema austromontanum ssp. compactum)		Terrestrial		
Broom, San Clemente Island	Endangered		Dicot	No
(Lotus dendroideus ssp. traskiae)		Terrestrial		
Buckwheat, Cushenbury	Endangered		Dicot	Yes
(Eriogonum ovalifolium var. vineum)		Terrestrial		
Buckwheat, Southern Mountain Wild	Threatened		Dicot	No
(Eriogonum kennedyi var. austromontanum)		Terrestrial		
Bush-mallow, San Clemente Island	Endangered		Dicot	No
(Malacothamnus clementinus)		Terrestrial		
Button-celery, San Diego	Endangered		Dicot	No
(Eryngium aristulatum var. parishii)		Terrestrial		
Cactus, Bakersfield	Endangered		Dicot	No
(Opuntia treleasei)		Terrestrial		
Ceanothus, Vail Lake	Threatened		Dicot	No
(Ceanothus ophiochilus)		Terrestrial		
Centaury, Spring-loving	Threatened		Dicot	Yes
(Centaurium namophilum)		Terrestrial		
Checker-mallow, Pedate	Endangered		Dicot	No
(Sidalcea pedata)		Terrestrial		
Clover, Fleshy Owl's	Threatened		Dicot	Yes
(Castilleja campestris ssp. succulenta)		Vernal pool		
Crownscale, San Jacinto Valley	Endangered		Dicot	No
(Atriplex coronata var. notatior)		Terrestrial		
Daisy, Parish's	Threatened		Dicot	Yes
(Erigeron parishii)		Freshwater		
Dudleya, Marcescent	Threatened		Dicot	No
(Dudleya cymosa ssp. marcescens)		Terrestrial		
Dudleya, Santa Monica Mountains	Threatened		Dicot	No
(Dudleya cymosa ssp. ovatifolia)		Terrestrial		
Evening-primrose, Eureka Valley	Endangered		Dicot	No
(Oenothera avita ssp. eurekensis)		Terrestrial		
Fiddleneck, Large-flowered	Endangered		Dicot	Yes
(Amsinckia grandiflora)		Terrestrial		
Goldfields, Contra Costa	Endangered		Dicot	Yes
(Lasthenia conjugens)		Terrestrial		
Gumplant, Ash Meadows	Threatened		Dicot	Yes
(Grindelia fraxino-pratensis)		Terrestrial		
Ivesia, Ash Meadows	Threatened		Dicot	Yes
(Ivesia kingii var. eremica)		Terrestrial		
Jewelflower, California	Endangered		Dicot	No
(Caulanthus californicus)		Terrestrial		
Larkspur, San Clemente Island	Endangered		Dicot	No
(Delphinium variegatum ssp. kinkiense)		Terrestrial		
Mallow, Kern	Endangered		Dicot	No
(Eremalche kernensis)		Terrestrial		

Milk-vetch, Braunton's	Endangered		Dicot	No
(Astragalus brauntonii)		Terrestrial		
Milk-vetch, Coachella Valley	Endangered		Dicot	Yes
(Astragalus lentiginosus var. coachellae)		Terrestrial		
Milk-vetch, Cushenbury	Endangered		Dicot	Yes
(Astragalus albens)		Terrestrial		
Milk-vetch, Fish Slough	Threatened		Dicot	No
(Astragalus lentiginosus var. piscinensis)		Terrestrial		
Milk-vetch, Lane Mountain	Endangered		Dicot	Yes
(Astragalus jaegerianus)		Terrestrial		
Milk-vetch, Pierson's	Threatened		Dicot	Yes
(Astragalus magdalenae var. peirsonii)		Terrestrial		
Milk-vetch, Triple-ribbed	Endangered		Dicot	No
(Astragalus tricarinatus)		Terrestrial		
Mint, Otay Mesa	Endangered		Dicot	No
(Pogogyne nudiuscula)		Terrestrial		
Mountain-mahogany, Catalina Island	Endangered		Dicot	No
(Cercocarpus traskiae)		Terrestrial		
Mustard, Slender-petaled	Endangered		Dicot	No
(Thelypodium stenopetalum)		Terrestrial		
Navarretia, Few-flowered	Endangered		Dicot	No
(Navarretia leucocephala ssp. pauciflora (=N. pauciflora))		Vernal pool, Terrestrial		
Navarretia, Many-flowered	Endangered		Dicot	No
(Navarretia leucocephala ssp. plieantha)		Terrestrial, Vernal pool		
Navarretia, Spreading	Threatened		Dicot	No
(Navarretia fossalis)		Vernal pool		
Niterwort, Amargosa	Endangered		Dicot	Yes
(Nitrophila mohavensis)		Terrestrial		
Oxytheca, Cushenbury	Endangered		Dicot	Yes
(Oxytheca parishii var. goodmaniana)		Terrestrial		
Paintbrush, Ash-grey Indian	Threatened		Dicot	No
(Castilleja cinerea)		Terrestrial		
Paintbrush, San Clemente Island Indian	Endangered		Dicot	No
(Castilleja grisea)		Terrestrial		
Pentachaeta, Lyon's	Endangered		Dicot	No
(Pentachaeta lyonii)		Terrestrial		
Rock-cress, Santa Cruz Island	Endangered		Dicot	No
(Sibara filifolia)		Terrestrial		
Rush-rose, Island	Threatened		Dicot	No
(Helianthemum greenei)		Terrestrial		
Sandwort, Bear Valley	Threatened		Dicot	No
(Arenaria ursina)		Terrestrial		
Spineflower, Slender-horned	Endangered		Dicot	No
(Dodecahema leptoceras)		Terrestrial		
Stonecrop, Lake County	Endangered		Dicot	No
(Parvisedum leiocarpum)		Vernal pool		
Taraxacum, California	Endangered		Dicot	No
(Taraxacum californicum)		Terrestrial		
Thistle, Suisun	Endangered		Dicot	No
(Cirsium hydrophilum var. hydrophilum)		Brackish, Terrestrial		
Watercress, Gambel's	Endangered		Dicot	No

(Rorippa gambellii)		Terrestrial, Brackish, Freshwater	
Woodland-star, San Clemente Island	Endangered	Dicot	No
(Lithophragma maximum)		Terrestrial	
Woolly-star, Santa Ana River	Endangered	Dicot	No
(Eriastrum densifolium ssp. sanctorum)		Terrestrial	
Woolly-threads, San Joaquin	Endangered	Dicot	No
(Monolopia (=Lembertia) congdonii)		Terrestrial	
Chub, Bonytail	Endangered	Fish	Yes
(Gila elegans)		Freshwater	
Chub, Mohave Tui	Endangered	Fish	No
(Gila bicolor mohavensis)		Freshwater	
Chub, Owens Tui	Endangered	Fish	Yes
(Gila bicolor snyderi)		Freshwater	
Dace, Ash Meadows Speckled	Endangered	Fish	Yes
(Rhinichthys osculus nevadensis)		Freshwater	
Goby, Tidewater	Endangered	Fish	Yes
(Eucyclogobius newberryi)		Freshwater	
Pupfish, Desert	Endangered	Fish	Yes
(Cyprinodon macularius)		Freshwater	
Pupfish, Owens	Endangered	Fish	No
(Cyprinodon radiosus)		Freshwater	
Salmon, Chinook (Central Valley Fall Run)	Threatened	Fish	No
(Oncorhynchus (=Salmo) tshawytscha)		Brackish, Freshwater, Saltwater	
Salmon, Chinook (Central Valley Spring Run)	Threatened	Fish	Yes
(Oncorhynchus (=Salmo) tshawytscha)		Brackish, Saltwater, Freshwater	
Salmon, Chinook (Sacramento River Winter Run)	Endangered	Fish	No
(Oncorhynchus (=Salmo) tshawytscha)		Saltwater, Freshwater, Brackish	
Smelt, Delta	Threatened	Fish	Yes
(Hypomesus transpacificus)		Freshwater, Brackish	
Squawfish, Colorado	Endangered	Fish	Yes
(Ptychocheilus lucius)		Freshwater	
Steelhead, (California Central Valley population)	Threatened	Fish	Yes
(Oncorhynchus (=Salmo) mykiss)		Brackish, Freshwater, Saltwater	
Steelhead, (Central California Coast population)	Threatened	Fish	Yes
(Oncorhynchus (=Salmo) mykiss)		Freshwater, Saltwater, Brackish	
Steelhead, (Southern California population)	Endangered	Fish	Yes
(Oncorhynchus (=Salmo) mykiss)		Brackish, Saltwater, Freshwater	
Stickleback, Unarmored Threespine	Endangered	Fish	No
(Gasterosteus aculeatus williamsoni)		Freshwater	
Sturgeon, green	Threatened	Fish	No
(Acipenser medirostris)			
Sucker, Razorback	Endangered	Fish	Yes
(Xyrauchen texanus)		Freshwater	
Sucker, Santa Ana	Threatened	Fish	Yes
(Catostomus santaanae)		Freshwater	
Trout, Lahontan Cutthroat	Threatened	Fish	No
(Oncorhynchus clarki henshawi)		Freshwater	
Beetle, Delta Green Ground	Threatened	Insect	Yes
(Elaphrus viridis)		Vernal pool, Terrestrial	
Beetle, Valley Elderberry Longhorn	Threatened	Insect	Yes
(Desmocerus californicus dimorphus)		Terrestrial	

Butterfly, El Segundo Blue *(Euphilotes battoides allyni)*	Endangered	Insect Terrestrial	No	
Butterfly, Palos Verdes Blue *(Glaucopsyche lygdamus palosverdesensis)*	Endangered	Insect Terrestrial		Yes
Butterfly, Quino Checkerspot *(Euphydryas editha quino (=E. e. wrighti))*	Endangered	Insect Terrestrial		Yes
Fly, Delhi Sands Flower-loving *(Rhaphiomidas terminatus abdominalis)*	Endangered	Insect Terrestrial		No
Moth, Kern Primrose Sphinx *(Euproserpinus euterpe)*	Threatened	Insect Terrestrial		No
Fox, San Joaquin Kit *(Vulpes macrotis mutica)*	Endangered	Mammal Terrestrial		No
Fox, Santa Catalina Island *(Urocyon littoralis catalinae)*	Endangered	Mammal Terrestrial		Yes
Kangaroo Rat, Giant *(Dipodomys ingens)*	Endangered	Mammal Terrestrial		No
Kangaroo Rat, San Bernardino Merriam's *(Dipodomys merriami parvus)*	Endangered	Mammal Terrestrial		Yes
Kangaroo Rat, Stephens' *(Dipodomys stephensi (incl. D. cascus))*	Endangered	Mammal Terrestrial		No
Kangaroo Rat, Tipton *(Dipodomys nitratoides nitratoides)*	Endangered	Mammal Terrestrial		No
Mouse, Pacific Pocket *(Perognathus longimembris pacificus)*	Endangered	Mammal Terrestrial		No
Mouse, Salt Marsh Harvest *(Reithrodontomys raviventris)*	Endangered	Mammal Terrestrial		No
Rabbit, Riparian Brush *(Sylvilagus bachmani riparius)*	Endangered	Mammal Terrestrial		No
Sheep, Peninsular Bighorn *(Ovis canadensis)*	Endangered	Mammal Terrestrial		Yes
Sheep, Sierra Nevada Bighorn *(Ovis canadensis californiana)*	Endangered	Mammal Terrestrial		No
Shrew, Buena Vista Lake Ornate *(Sorex ornatus relictus)*	Endangered	Mammal Terrestrial		Yes
Vole, Amargosa *(Microtus californicus scirpensis)*	Endangered	Mammal Terrestrial		Yes
Woodrat, Riparian *(Neotoma fuscipes riparia)*	Endangered	Mammal Terrestrial		No
Bluegrass, San Bernardino *(Poa atropurpurea)*	Endangered	Monocot Terrestrial		No
Brodiaea, Thread-leaved *(Brodiaea filifolia)*	Threatened	Monocot Terrestrial		Yes
Grass, California Orcutt *(Orcuttia californica)*	Endangered	Monocot Vernal pool, Terrestrial		No
Grass, Colusa *(Neostapfia colusana)*	Threatened	Monocot Vernal pool		No
Grass, Eureka Dune *(Swallenia alexandrae)*	Endangered	Monocot Terrestrial		No
Grass, San Joaquin Valley Orcutt *(Orcuttia inaequalis)*	Threatened	Monocot Vernal pool		Yes
Grass, Solano	Endangered	Monocot		Yes

(Tuctoria mucronata)		Vernal pool, Terrestrial	
Onion, Munz's	Endangered	Monocot	No
(Allium munzii)		Terrestrial	
Lizard, Blunt-nosed Leopard	Endangered	Reptile	No
(Gambelia silus)		Terrestrial	
Lizard, Coachella Valley Fringe-toed	Threatened	Reptile	Yes
(Uma inornata)		Terrestrial	
Lizard, Island Night	Threatened	Reptile	No
(Xantusia riversiana)		Terrestrial	
Snake, Giant Garter	Threatened	Reptile	No
(Thamnophis gigas)		Freshwater, Terrestrial	
Tortoise, Desert	Threatened	Reptile	Yes
(Gopherus agassizii)		Terrestrial	

No species were selected for exclusion.

Dispersed species included in report.

Species Listing by State with Use Criteria

No species were excluded
Minimum of 1 Acre.
All Medium Types Reported
Mammal, Bird, Amphibian, Reptile, Fish, Arachnid, Insect, Dicot, Monocot
pomegranates

Arizona (21) species:

		Taxa	Critical Habitat
Frog, Chiricahua Leopard	Threatened	Amphibian	No
(Rana chiricahuensis)		Freshwater, Terrestrial	
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Owl, Mexican Spotted	Threatened	Bird	Yes
(Strix occidentalis lucida)		Terrestrial	
Pygmy-owl, Cactus Ferruginous	Endangered	Bird	No
(Glaucidium brasilianum cactorum)		Terrestrial	
Rail, Yuma Clapper	Endangered	Bird	No
(Rallus longirostris yumanensis)		Terrestrial	
Cactus, Arizona Hedgehog	Endangered	Dicot	No
(Echinocereus triglochidiatus var. arizonicus)		Terrestrial	
Cactus, Nichol's Turk's Head	Endangered	Dicot	No
(Echinocactus horizonthalonius var. nicholii)		Terrestrial	
Cliffrose, Arizona	Endangered	Dicot	No
(Purshia (=cowania) subintegra)		Terrestrial	
Chub, Gila	Endangered	Fish	Yes
(Gila intermedia)		Freshwater	
Minnow, Loach	Threatened	Fish	Yes
(Tiaroga cobitis)		Freshwater	
Pupfish, Desert	Endangered	Fish	Yes
(Cyprinodon macularius)		Freshwater	

Spikedace	Threatened	Fish	Yes
(Meda fulgida)		Freshwater	
Sucker, Razorback	Endangered	Fish	Yes
(Xyrauchen texanus)		Freshwater	
Topminnow, Gila (Yaqui)	Endangered	Fish	No
(Poeciliopsis occidentalis)		Freshwater	
Trout, Apache	Threatened	Fish	No
(Oncorhynchus apache)		Freshwater	
Bat, Lesser (=Sanborn's) Long-nosed	Endangered	Mammal	No
(Leptonycteris curasoae yerbabuenae)		Subterraneous, Terrestrial	
Jaguar	Endangered	Mammal	No
(Panthera onca)		Terrestrial	
Jaguarundi, Sinaloan	Endangered	Mammal	No
(Herpailurus (=Felis) yagouaroundi tolteca)		Terrestrial	
Ocelot	Endangered	Mammal	No
(Leopardus (=Felis) pardalis)		Terrestrial	
Pronghorn, Sonoran	Endangered	Mammal	No
(Antilocapra americana sonoriensis)		Terrestrial	
Squirrel, Mount Graham Red	Endangered	Mammal	Yes
(Tamiasciurus hudsonicus grahamensis)		Terrestrial	

California (229) species:

		Taxa	Critical Habitat
Frog, California Red-legged	Threatened	Amphibian	Yes
(Rana aurora draytonii)		Terrestrial, Freshwater	
Frog, Mountain Yellow-legged	Endangered	Amphibian	No
(Gopherus agassizii)		Terrestrial, Freshwater	
Salamander, California Tiger	Endangered	Amphibian	No
(Ambystoma californiense)		Terrestrial, Vernal pool	
Salamander, Desert Slender	Endangered	Amphibian	No
(Batrachoseps aridus)		Freshwater, Terrestrial	
Salamander, Santa Cruz Long-toed	Endangered	Amphibian	No
(Ambystoma macrodactylum croceum)		Freshwater, Vernal pool, Terrestrial	
Toad, Arroyo Southwestern	Endangered	Amphibian	Yes
(Bufo californicus (=microscaphus))		Freshwater, Terrestrial	
Condor, California	Endangered	Bird	Yes
(Gymnogyps californianus)		Terrestrial	
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Gnatcatcher, Coastal California	Threatened	Bird	Yes
(Polioptila californica californica)		Terrestrial	
Murrelet, Marbled	Threatened	Bird	Yes
(Brachyramphus marmoratus marmoratus)		Freshwater, Terrestrial, Saltwater	
Owl, Northern Spotted	Threatened	Bird	Yes
(Strix occidentalis caurina)		Terrestrial	
Pelican, Brown	Endangered	Bird	No
(Pelecanus occidentalis)		Terrestrial	
Plover, Western Snowy	Threatened	Bird	Yes
(Charadrius alexandrinus nivosus)		Terrestrial	
Rail, California Clapper	Endangered	Bird	No
(Rallus longirostris obsoletus)		Terrestrial	
Rail, Light-footed Clapper	Endangered	Bird	No
(Rallus longirostris levipes)		Terrestrial	

Rail, Yuma Clapper	Endangered		Bird	No
(Rallus longirostris yumanensis)		Terrestrial		
Shrike, San Clemente Loggerhead	Endangered		Bird	No
(Lanius ludovicianus mearnsi)		Terrestrial		
Sparrow, San Clemente Sage	Threatened		Bird	No
(Amphispiza belli clementeae)		Terrestrial		
Tern, California Least	Endangered		Bird	No
(Sterna antillarum browni)		Terrestrial		
Vireo, Least Bell's	Endangered		Bird	Yes
(Vireo bellii pusillus)		Terrestrial		
Adobe Sunburst, San Joaquin	Threatened		Dicot	No
(Pseudobahia peirsonii)		Terrestrial		
Allocarya, Calistoga	Endangered		Dicot	No
(Plagiobothrys strictus)		Vernal pool		
Ambrosia, San Diego	Endangered		Dicot	No
(Ambrosia pumila)		Terrestrial		
Baccharis, Encinitas	Threatened		Dicot	No
(Baccharis vanessae)		Terrestrial		
Barberry, Island	Endangered		Dicot	No
(Berberis pinnata ssp. insularis)		Terrestrial		
Barberry, Nevin's	Endangered		Dicot	No
(Berberis nevinii)		Terrestrial		
Bedstraw, El Dorado	Endangered		Dicot	No
(Galium californicum ssp. sierrae)		Terrestrial		
Bedstraw, Island	Endangered		Dicot	No
(Galium buxifolium)		Terrestrial		
Bird's-beak, Palmate-bracted	Endangered		Dicot	No
(Cordylanthus palmatus)		Terrestrial		
Bird's-beak, Pennell's	Endangered		Dicot	No
(Cordylanthus tenuis ssp. capillaris)		Terrestrial		
Bird's-beak, salt marsh	Endangered		Dicot	No
(Cordylanthus maritimus ssp. maritimus)		Saltwater		
Bird's-beak, Soft	Endangered		Dicot	No
(Cordylanthus mollis ssp. mollis)		Brackish, Saltwater		
Bladderpod, San Bernardino Mountains	Endangered		Dicot	Yes
(Lesquerella kingii ssp. bernardina)		Terrestrial		
Bluecurls, Hidden Lake	Threatened		Dicot	No
(Trichostema austromontanum ssp. compactum)		Terrestrial		
Broom, San Clemente Island	Endangered		Dicot	No
(Lotus dendroideus ssp. traskiae)		Terrestrial		
Buckwheat, Cushenbury	Endangered		Dicot	Yes
(Eriogonum ovalifolium var. vineum)		Terrestrial		
Buckwheat, Ione (incl. Irish Hill)	Endangered		Dicot	No
(Eriogonum apricum (incl. var. prostratum))		Terrestrial		
Buckwheat, Southern Mountain Wild	Threatened		Dicot	No
(Eriogonum kennedyi var. austromontanum)		Terrestrial		
Bush-mallow, San Clemente Island	Endangered		Dicot	No
(Malacothamnus clementinus)		Terrestrial		
Bush-mallow, Santa Cruz Island	Endangered		Dicot	No
(Malacothamnus fasciculatus var. nesioticus)		Terrestrial		
Butterweed, Layne's	Threatened		Dicot	No

(Senecio layneae)		Terrestrial		
Button-celery, San Diego	Endangered		Dicot	No
(Eryngium aristulatum var. parishii)		Terrestrial		
Cactus, Bakersfield	Endangered		Dicot	No
(Opuntia treleasei)		Terrestrial		
Ceanothus, Coyote	Endangered		Dicot	No
(Ceanothus ferrisae)		Terrestrial		
Ceanothus, Pine Hill	Endangered		Dicot	No
(Ceanothus roderickii)		Terrestrial		
Ceanothus, Vail Lake	Threatened		Dicot	No
(Ceanothus ophiochilus)		Terrestrial		
Checker-mallow, Keck's	Endangered		Dicot	Yes
(Sidalcea keckii)		Terrestrial		
Checker-mallow, Kenwood Marsh	Endangered		Dicot	No
(Sidalcea oregana ssp. valida)		Terrestrial		
Checker-mallow, Pedate	Endangered		Dicot	No
(Sidalcea pedata)		Terrestrial		
Clarkia, Pismo	Endangered		Dicot	No
(Clarkia speciosa ssp. immaculata)		Terrestrial		
Clarkia, Presidio	Endangered		Dicot	No
(Clarkia franciscana)		Terrestrial		
Clarkia, Springville	Threatened		Dicot	No
(Clarkia springvillensis)		Terrestrial		
Clarkia, Vine Hill	Endangered		Dicot	No
(Clarkia imbricata)		Terrestrial		
Clover, Fleshy Owl's	Threatened		Dicot	Yes
(Castilleja campestris ssp. succulenta)		Vernal pool		
Clover, Showy Indian	Endangered		Dicot	No
(Trifolium amoenum)		Terrestrial		
Crownbeard, Big-leaved	Threatened		Dicot	No
(Verbesina dissita)		Terrestrial		
Crownscale, San Jacinto Valley	Endangered		Dicot	No
(Atriplex coronata var. notatior)		Terrestrial		
Daisy, Parish's	Threatened		Dicot	Yes
(Erigeron parishii)		Freshwater		
Dudleya, Conejo	Threatened		Dicot	No
(Dudleya abramsii ssp. parva)		Terrestrial		
Dudleya, Marcescent	Threatened		Dicot	No
(Dudleya cymosa ssp. marcescens)		Terrestrial		
Dudleya, Santa Clara Valley	Endangered		Dicot	No
(Dudleya setchellii)		Terrestrial		
Dudleya, Santa Cruz Island	Threatened		Dicot	No
(Dudleya nesiotica)		Terrestrial		
Dudleya, Santa Monica Mountains	Threatened		Dicot	No
(Dudleya cymosa ssp. ovatifolia)		Terrestrial		
Dudleya, Verity's	Threatened		Dicot	No
(Dudleya verityi)		Terrestrial		
Evening-primrose, Antioch Dunes	Endangered		Dicot	Yes
(Oenothera deltoides ssp. howellii)		Terrestrial		
Fiddleneck, Large-flowered	Endangered		Dicot	Yes
(Amsinckia grandiflora)		Terrestrial		

Flannelbush, Mexican	Endangered		Dicot	No
(Fremontodendron mexicanum)		Terrestrial		
Flannelbush, Pine Hill	Endangered		Dicot	No
(Fremontodendron californicum ssp. decumbens)		Terrestrial		
Fringepod, Santa Cruz Island	Endangered		Dicot	No
(Thysanocarpus conchuliferus)		Terrestrial		
Gilia, Hoffmann's Slender-flowered	Endangered		Dicot	No
(Gilia tenuiflora ssp. hoffmannii)		Terrestrial		
Golden Sunburst, Hartweg's	Endangered		Dicot	No
(Pseudobahia bahiifolia)		Terrestrial		
Goldfields, Burke's	Endangered		Dicot	No
(Lasthenia burkei)		Terrestrial		
Goldfields, Contra Costa	Endangered		Dicot	Yes
(Lasthenia conjugens)		Terrestrial		
Grass, Hairy Orcutt	Endangered		Dicot	Yes
(Orcuttia pilosa)		Vernal pool		
Grass, Sacramento Orcutt	Endangered		Dicot	Yes
(Orcuttia viscida)		Vernal pool		
Grass, Slender Orcutt	Threatened		Dicot	Yes
(Orcuttia tenuis)		Vernal pool		
Jewelflower, California	Endangered		Dicot	No
(Caulanthus californicus)		Terrestrial		
Larkspur, Baker's	Endangered		Dicot	Yes
(Delphinium bakeri)		Terrestrial		
Larkspur, San Clemente Island	Endangered		Dicot	No
(Delphinium variegatum ssp. kinkiense)		Terrestrial		
Larkspur, Yellow	Endangered		Dicot	Yes
(Delphinium luteum)		Terrestrial		
Layia, Beach	Endangered		Dicot	No
(Layia carnosa)		Terrestrial, Coastal (neritic)		
Liveforever, Laguna Beach	Threatened		Dicot	No
(Dudleya stolonifera)		Terrestrial		
Liveforever, Santa Barbara Island	Endangered		Dicot	No
(Dudleya traskiae)		Terrestrial		
Lupine, Clover	Endangered		Dicot	No
(Lupinus tidestromii)		Coastal (neritic)		
Lupine, Nipomo Mesa	Endangered		Dicot	No
(Lupinus nipomensis)		Coastal (neritic)		
Malacothrix, Island	Endangered		Dicot	No
(Malacothrix squalida)		Terrestrial		
Malacothrix, Santa Cruz Island	Endangered		Dicot	No
(Malacothrix indecora)		Terrestrial		
Mallow, Kern	Endangered		Dicot	No
(Eremalche kernensis)		Terrestrial		
Manzanita, Del Mar	Endangered		Dicot	No
(Arctostaphylos glandulosa ssp. crassifolia)		Terrestrial		
Manzanita, Ione	Threatened		Dicot	No
(Arctostaphylos myrtifolia)		Terrestrial		
Manzanita, Morro	Threatened		Dicot	No
(Arctostaphylos morroensis)		Terrestrial		
Manzanita, Pallid	Threatened		Dicot	No

(Arctostaphylos pallida)		Terrestrial		
Manzanita, Santa Rosa Island	Endangered		Dicot	No
(Arctostaphylos confertiflora)		Terrestrial		
Meadowfoam, Butte County	Endangered		Dicot	Yes
(Limnanthes floccosa ssp. californica)		Vernal pool		
Meadowfoam, Sebastopol	Endangered		Dicot	No
(Limnanthes vinculans)		Freshwater, Terrestrial		
Milk-vetch, Braunton's	Endangered		Dicot	No
(Astragalus brauntonii)		Terrestrial		
Milk-vetch, Clara Hunt's	Endangered		Dicot	No
(Astragalus clarianus)		Terrestrial		
Milk-vetch, Coachella Valley	Endangered		Dicot	Yes
(Astragalus lentiginosus var. coachellae)		Terrestrial		
Milk-vetch, Cushenbury	Endangered		Dicot	Yes
(Astragalus albens)		Terrestrial		
Milk-vetch, Lane Mountain	Endangered		Dicot	Yes
(Astragalus jaegerianus)		Terrestrial		
Milk-vetch, Triple-ribbed	Endangered		Dicot	No
(Astragalus tricarinatus)		Terrestrial		
Milk-vetch, Ventura Marsh	Endangered		Dicot	Yes
(Astragalus pycnostachyus var. lanosissimus)		Terrestrial, Freshwater		
Mint, Otay Mesa	Endangered		Dicot	No
(Pogogyne nudiuscula)		Terrestrial		
Mint, San Diego Mesa	Endangered		Dicot	No
(Pogogyne abramsii)		Terrestrial		
Monardella, Willowy	Endangered		Dicot	No
(Monardella linoides ssp. viminea)		Terrestrial		
Morning-glory, Stebbins	Endangered		Dicot	No
(Calystegia stebbinsii)		Terrestrial		
Mountainbalm, Indian Knob	Endangered		Dicot	No
(Eriodictyon altissimum)		Terrestrial		
Mountain-mahogany, Catalina Island	Endangered		Dicot	No
(Cercocarpus traskiae)		Terrestrial		
Mustard, Slender-petaled	Endangered		Dicot	No
(Thelypodium stenopetalum)		Terrestrial		
Navarretia, Few-flowered	Endangered		Dicot	No
(Navarretia leucocephala ssp. pauciflora (=N. pauciflora))		Vernal pool, Terrestrial		
Navarretia, Many-flowered	Endangered		Dicot	No
(Navarretia leucocephala ssp. plieantha)		Terrestrial, Vernal pool		
Navarretia, Spreading	Threatened		Dicot	No
(Navarretia fossalis)		Vernal pool		
Oxytheca, Cushenbury	Endangered		Dicot	Yes
(Oxytheca parishii var. goodmaniana)		Terrestrial		
Paintbrush, Ash-grey Indian	Threatened		Dicot	No
(Castilleja cinerea)		Terrestrial		
Paintbrush, San Clemente Island Indian	Endangered		Dicot	No
(Castilleja grisea)		Terrestrial		
Paintbrush, Soft-leaved	Endangered		Dicot	No
(Castilleja mollis)		Terrestrial		
Paintbrush, Tiburon	Endangered		Dicot	No
(Castilleja affinis ssp. neglecta)		Terrestrial		

Pentachaeta, Lyon's	Endangered		Dicot	No
(Pentachaeta lyonii)		Terrestrial		
Pentachaeta, White-rayed	Endangered		Dicot	No
(Pentachaeta bellidiflora)		Terrestrial		
Phacelia, Island	Endangered		Dicot	No
(Phacelia insularis ssp. insularis)		Terrestrial		
Polygonum, Scott's Valley	Endangered		Dicot	Yes
(Polygonum hickmanii)		Terrestrial		
Pussypaws, Mariposa	Threatened		Dicot	No
(Calyptridium pulchellum)		Terrestrial		
Rock-cress, Hoffmann's	Endangered		Dicot	No
(Arabis hoffmannii)		Terrestrial		
Rock-cress, Santa Cruz Island	Endangered		Dicot	No
(Sibara filifolia)		Terrestrial		
Rush-rose, Island	Threatened		Dicot	No
(Helianthemum greenei)		Terrestrial		
Sandwort, Bear Valley	Threatened		Dicot	No
(Arenaria ursina)		Terrestrial		
Sandwort, Marsh	Endangered		Dicot	No
(Arenaria paludicola)		Freshwater, Terrestrial		
Sea-blite, California	Endangered		Dicot	No
(Suaeda californica)		Terrestrial		
Spineflower, Ben Lomond	Endangered		Dicot	No
(Chorizanthe pungens var. hartwegiana)		Terrestrial		
Spineflower, Monterey	Threatened		Dicot	Yes
(Chorizanthe pungens var. pungens)		Terrestrial		
Spineflower, Orcutt's	Endangered		Dicot	No
(Chorizanthe orcuttiana)		Terrestrial		
Spineflower, Robust	Endangered		Dicot	Yes
(Chorizanthe robusta var. robusta)		Terrestrial		
Spineflower, Scotts Valley	Endangered		Dicot	Yes
(Chorizanthe robusta var. hartwegii)		Terrestrial		
Spineflower, Slender-horned	Endangered		Dicot	No
(Dodecahema leptoceras)		Terrestrial		
Spineflower, Sonoma	Endangered		Dicot	No
(Chorizanthe valida)		Terrestrial		
Spurge, Hoover's	Threatened		Dicot	Yes
(Chamaesyce hooveri)		Vernal pool		
Stickyseed, Baker's	Endangered		Dicot	No
(Blennosperma bakeri)		Vernal pool		
Stonecrop, Lake County	Endangered		Dicot	No
(Parvisedum leiocarpum)		Vernal pool		
Taraxacum, California	Endangered		Dicot	No
(Taraxacum californicum)		Terrestrial		
Tarplant, Gaviota	Endangered		Dicot	Yes
(Deinandra increscens ssp. villosa)		Terrestrial		
Tarplant, Otay	Threatened		Dicot	Yes
(Deinandra (=Hemizonia) conjugens)		Terrestrial		
Tarplant, Santa Cruz	Threatened		Dicot	Yes
(Holocarpha macradenia)		Terrestrial		
Thistle, Chorro creek Bog	Endangered		Dicot	No

(Cirsium fontinale var. obispoense)			Terrestrial, Freshwater	
Thistle, Fountain	Endangered		Dicot	No
(Cirsium fontinale var. fontinale)			Terrestrial	
Thistle, La Graciosa	Endangered		Dicot	Yes
(Cirsium loncholepis)			Coastal (neritic), Freshwater,	
Thornmint, San Diego	Threatened		Dicot	No
(Acanthomintha ilicifolia)			Terrestrial	
Tuctoria, Green's	Endangered		Dicot	Yes
(Tuctoria greenei)			Vernal pool	
Wallflower, Ben Lomond	Endangered		Dicot	No
(Erysimum teretifolium)			Terrestrial	
Wallflower, Contra Costa	Endangered		Dicot	Yes
(Erysimum capitatum var. angustatum)			Terrestrial	
Watercress, Gambel's	Endangered		Dicot	No
(Rorippa gambellii)			Terrestrial, Brackish, Freshwater	
Woodland-star, San Clemente Island	Endangered		Dicot	No
(Lithophragma maximum)			Terrestrial	
Woolly-star, Santa Ana River	Endangered		Dicot	No
(Eriastrum densifolium ssp. sanctorum)			Terrestrial	
Woolly-threads, San Joaquin	Endangered		Dicot	No
(Monolopia (=Lembertia) congdonii)			Terrestrial	
Yerba Santa, Lompoc	Endangered		Dicot	Yes
(Eriodictyon capitatum)			Terrestrial	
Chub, Bonytail	Endangered		Fish	Yes
(Gila elegans)			Freshwater	
Chub, Mohave Tui	Endangered		Fish	No
(Gila bicolor mohavensis)			Freshwater	
Goby, Tidewater	Endangered		Fish	Yes
(Eucyclogobius newberryi)			Freshwater	
Pupfish, Desert	Endangered		Fish	Yes
(Cyprinodon macularius)			Freshwater	
Salmon, Chinook (California Coastal Run)	Threatened		Fish	Yes
(Oncorhynchus (=Salmo) tshawytscha)			Freshwater, Saltwater, Brackish	
Salmon, Chinook (Central Valley Fall Run)	Threatened		Fish	No
(Oncorhynchus (=Salmo) tshawytscha)			Brackish, Freshwater, Saltwater	
Salmon, Chinook (Central Valley Spring Run)	Threatened		Fish	Yes
(Oncorhynchus (=Salmo) tshawytscha)			Brackish, Saltwater, Freshwater	
Salmon, Chinook (Sacramento River Winter Run)	Endangered		Fish	No
(Oncorhynchus (=Salmo) tshawytscha)			Saltwater, Freshwater, Brackish	
Salmon, Coho (Central California Coast population)	Endangered		Fish	No
(Oncorhynchus (=Salmo) kisutch)			Saltwater, Brackish, Freshwater	
Smelt, Delta	Threatened		Fish	Yes
(Hypomesus transpacificus)			Freshwater, Brackish	
Squawfish, Colorado	Endangered		Fish	Yes
(Ptychocheilus lucius)			Freshwater	
Steelhead, (California Central Valley population)	Threatened		Fish	Yes
(Oncorhynchus (=Salmo) mykiss)			Brackish, Freshwater, Saltwater	
Steelhead, (Central California Coast population)	Threatened		Fish	Yes
(Oncorhynchus (=Salmo) mykiss)			Freshwater, Saltwater, Brackish	
Steelhead, (Northern California population)	Threatened		Fish	No
(Oncorhynchus (=Salmo) mykiss)			Saltwater, Brackish, Freshwater	

Steelhead, (South-Central California population)	Threatened	Fish	Yes
(Oncorhynchus (=Salmo) mykiss)		Freshwater, Saltwater, Brackish	
Steelhead, (Southern California population)	Endangered	Fish	Yes
(Oncorhynchus (=Salmo) mykiss)		Brackish, Saltwater, Freshwater	
Stickleback, Unarmored Threespine	Endangered	Fish	No
(Gasterosteus aculeatus williamsoni)		Freshwater	
Sturgeon, green	Threatened	Fish	No
(Acipenser medirostris)			
Sucker, Razorback	Endangered	Fish	Yes
(Xyrauchen texanus)		Freshwater	
Sucker, Santa Ana	Threatened	Fish	Yes
(Catostomus santaanae)		Freshwater	
Trout, Lahontan Cutthroat	Threatened	Fish	No
(Oncorhynchus clarki henshawi)		Freshwater	
Trout, Little Kern Golden	Threatened	Fish	Yes
(Oncorhynchus aguabonita whitei)		Freshwater	
Trout, Paiute Cutthroat	Threatened	Fish	No
(Oncorhynchus clarki seleniris)		Freshwater	
Beetle, Mount Hermon June	Endangered	Insect	No
(Polyphylla barbata)		Subterraneous, Terrestrial	
Beetle, Ohlone Tiger	Endangered	Insect	No
(Cicindela ohlone)		Terrestrial	
Beetle, Valley Elderberry Longhorn	Threatened	Insect	Yes
(Desmocerus californicus dimorphus)		Terrestrial	
Butterfly, Bay Checkerspot (Wright's euphydryas)	Threatened	Insect	Yes
(Euphydryas editha bayensis)		Terrestrial	
Butterfly, Behren's Silverspot	Endangered	Insect	No
(Speyeria zerene behrensii)		Terrestrial	
Butterfly, Callippe Silverspot	Endangered	Insect	No
(Speyeria callippe callippe)		Terrestrial	
Butterfly, El Segundo Blue	Endangered	Insect	No
(Euphilotes battoides allyni)		Terrestrial	
Butterfly, Lange's Metalmark	Endangered	Insect	No
(Apodemia mormo langei)		Terrestrial	
Butterfly, Myrtle's Silverspot	Endangered	Insect	No
(Speyeria zerene myrtleae)		Terrestrial	
Butterfly, Palos Verdes Blue	Endangered	Insect	Yes
(Glaucopsyche lygdamus palosverdesensis)		Terrestrial	
Butterfly, Quino Checkerspot	Endangered	Insect	Yes
(Euphydryas editha quino (=E. e. wrighti))		Terrestrial	
Fly, Delhi Sands Flower-loving	Endangered	Insect	No
(Rhaphiomidas terminatus abdominalis)		Terrestrial	
Grasshopper, Zayante Band-winged	Endangered	Insect	Yes
(Trimerotropis infantilis)		Terrestrial	
Moth, Kern Primrose Sphinx	Threatened	Insect	No
(Euproserpinus euterpe)		Terrestrial	
Skipper, Laguna Mountain	Endangered	Insect	No
(Pyrgus ruralis lagunae)		Terrestrial	
Fox, San Joaquin Kit	Endangered	Mammal	No
(Vulpes macrotis mutica)		Terrestrial	
Fox, San Miguel Island	Endangered	Mammal	Yes

(Urocyon littoralis littoralis)			Terrestrial	
Fox, Santa Catalina Island	Endangered		Mammal	Yes
(Urocyon littoralis catalinae)			Terrestrial	
Fox, Santa Cruz Island	Endangered		Mammal	Yes
(Urocyon littoralis santacruzae)			Terrestrial	
Fox, Santa Rosa Island	Endangered		Mammal	Yes
(Urocyon littoralis santarosae)			Terrestrial	
Kangaroo Rat, Fresno	Endangered		Mammal	Yes
(Dipodomys nitratoides exilis)			Terrestrial	
Kangaroo Rat, Giant	Endangered		Mammal	No
(Dipodomys ingens)			Terrestrial	
Kangaroo Rat, Morro Bay	Endangered		Mammal	Yes
(Dipodomys heermanni morroensis)			Terrestrial	
Kangaroo Rat, San Bernardino Merriam's	Endangered		Mammal	Yes
(Dipodomys merriami parvus)			Terrestrial	
Kangaroo Rat, Stephens'	Endangered		Mammal	No
(Dipodomys stephensi (incl. D. cascus))			Terrestrial	
Kangaroo Rat, Tipton	Endangered		Mammal	No
(Dipodomys nitratoides nitratoides)			Terrestrial	
Mouse, Pacific Pocket	Endangered		Mammal	No
(Perognathus longimembris pacificus)			Terrestrial	
Mouse, Salt Marsh Harvest	Endangered		Mammal	No
(Reithrodontomys raviventris)			Terrestrial	
Sheep, Peninsular Bighorn	Endangered		Mammal	Yes
(Ovis canadensis)			Terrestrial	
Sheep, Sierra Nevada Bighorn	Endangered		Mammal	No
(Ovis canadensis californiana)			Terrestrial	
Shrew, Buena Vista Lake Ornate	Endangered		Mammal	Yes
(Sorex ornatus relictus)			Terrestrial	
Vole, Amargosa	Endangered		Mammal	Yes
(Microtus californicus scirpensis)			Terrestrial	
Alopecurus, Sonoma	Endangered		Monocot	No
(Alopecurus aequalis var. sonomensis)			Terrestrial	
Amole, Cammatta Canyon	Threatened		Monocot	Yes
(Chlorogalum purpureum var. reductum)			Terrestrial	
Amole, Purple	Threatened		Monocot	Yes
(Chlorogalum purpureum var. purpureum)			Terrestrial	
Bluegrass, Napa	Endangered		Monocot	No
(Poa napensis)			Terrestrial, Freshwater	
Bluegrass, San Bernardino	Endangered		Monocot	No
(Poa atropurpurea)			Terrestrial	
Brodiaea, Thread-leaved	Threatened		Monocot	Yes
(Brodiaea filifolia)			Terrestrial	
Grass, California Orcutt	Endangered		Monocot	No
(Orcuttia californica)			Vernal pool, Terrestrial	
Grass, Colusa	Threatened		Monocot	No
(Neostapfia colusana)			Vernal pool	
Grass, San Joaquin Valley Orcutt	Threatened		Monocot	Yes
(Orcuttia inaequalis)			Vernal pool	
Lily, Pitkin Marsh	Endangered		Monocot	No
(Lilium pardalinum ssp. pitkinense)			Freshwater	

Onion, Munz's		Endangered	Monocot	No
	(Allium munzii)		Terrestrial	
Sedge, White		Endangered	Monocot	No
	(Carex albida)		Freshwater, Terrestrial	
Lizard, Blunt-nosed Leopard		Endangered	Reptile	No
	(Gambelia silus)		Terrestrial	
Lizard, Coachella Valley Fringe-toed		Threatened	Reptile	Yes
	(Uma inornata)		Terrestrial	
Lizard, Island Night		Threatened	Reptile	No
	(Xantusia riversiana)		Terrestrial	
Sea turtle, olive ridley		Threatened	Reptile	No
	(Lepidochelys olivacea)		Saltwater	
Snake, Giant Garter		Threatened	Reptile	No
	(Thamnophis gigas)		Freshwater, Terrestrial	
Snake, San Francisco Garter		Endangered	Reptile	No
	(Thamnophis sirtalis tetrataenia)		Freshwater, Terrestrial	
Tortoise, Desert		Threatened	Reptile	Yes
	(Gopherus agassizii)		Terrestrial	
Whipsnake (=Striped Racer), Alameda		Threatened	Reptile	Yes
	(Masticophis lateralis euryxanthus)		Terrestrial	

Hawaii (103) species:

		Taxa	Critical Habitat
'Akepa, Maui	Endangered	Bird	No
(Loxops coccineus ochraceus)		Terrestrial	
Coot, Hawaiian (=Alae keo keo)	Endangered	Bird	No
(Fulica americana alai)		Terrestrial	
Creeper, Molokai (Kakawahie)	Endangered	Bird	No
(Paroreomyza flammea)		Terrestrial	
Goose, Hawaiian (Nene)	Endangered	Bird	No
(Branta (=Nesochen) sandvicensis)		Terrestrial, Freshwater	
Honeycreeper, Crested ('Akohekohe)	Endangered	Bird	No
(Palmeria dolei)		Terrestrial	
Moorhen, Hawaiian Common	Endangered	Bird	No
(Gallinula chloropus sandvicensis)		Terrestrial	
Nuku Pu'u	Endangered	Bird	No
(Hemignathus lucidus)		Terrestrial	
Parrotbill, Maui	Endangered	Bird	No
(Pseudonestor xanthophrys)		Terrestrial	
Petrel, Hawaiian Dark-rumped	Endangered	Bird	No
(Pterodroma phaeopygia sandwichensis)		Terrestrial	
Po'ouli	Endangered	Bird	No
(Melamprosops phaeosoma)		Terrestrial	
Stilt, Hawaiian (=Ae'o)	Endangered	Bird	No
(Himantopus mexicanus knudseni)		Terrestrial	
Thrush, Molokai (Oloma'o)	Endangered	Bird	No
(Myadestes lanaiensis rutha)		Terrestrial	
Abutilon eremitopetalum (ncn)	Endangered	Dicot	Yes
(Abutilon eremitopetalum)		Terrestrial	
A'e (Zanthoxylum hawaiiense)	Endangered	Dicot	Yes
(Zanthoxylum hawaiiense)		Terrestrial	
'Akoko (Chamaesyce skottsbergii var. skottsbe	Endangered	Dicot	No
(Chamaesyce skottsbergii var. kalaeloana)		Terrestrial	

Alani (Melicope adscendens)	Endangered		Dicot	Yes
(Melicope adscendens)		Terrestrial		
Alani (Melicope balloui)	Endangered		Dicot	Yes
(Melicope balloui)		Terrestrial		
Alani (Melicope knudsenii)	Endangered		Dicot	Yes
(Melicope knudsenii)		Terrestrial		
Alani (Melicope mucronulata)	Endangered		Dicot	Yes
(Melicope mucronulata)		Terrestrial		
Alani (Melicope munroi)	Endangered		Dicot	No
(Melicope munroi)		Terrestrial		
Alani (Melicope ovalis)	Endangered		Dicot	Yes
(Melicope ovalis)		Terrestrial		
Alani (Melicope reflexa)	Endangered		Dicot	Yes
(Melicope reflexa)		Terrestrial		
'Awikiwiki (Canavalia molokaiensis)	Endangered		Dicot	Yes
(Canavalia molokaiensis)		Terrestrial		
'Awiwi (Centaurium sebaeoides)	Endangered		Dicot	Yes
(Centaurium sebaeoides)		Terrestrial		
Bonamia menziesii (ncn)	Endangered		Dicot	Yes
(Bonamia menziesii)		Terrestrial		
Geranium, Hawaiian Red-flowered	Endangered		Dicot	Yes
(Geranium arboreum)		Terrestrial		
Gouania hillebrandii (ncn)	Endangered		Dicot	Yes
(Gouania hillebrandii)		Terrestrial		
Haha (Cyanea copelandii ssp. haleakalaensis)	Endangered		Dicot	Yes
(Cyanea copelandii ssp. haleakalaensis)		Terrestrial		
Haha (Cyanea dunbarii)	Endangered		Dicot	Yes
(Cyanea dunbarii)		Terrestrial		
Haha (Cyanea glabra)	Endangered		Dicot	Yes
(Cyanea glabra)		Terrestrial		
Haha (Cyanea grimesiana ssp. grimesiana)	Endangered		Dicot	Yes
(Cyanea grimesiana ssp. grimesiana)		Terrestrial		
Haha (Cyanea hamatiflora ssp. hamatiflora)	Endangered		Dicot	Yes
(Cyanea hamatiflora ssp. hamatiflora)		Terrestrial		
Haha (Cyanea Macrostegia var. gibsonii)	Endangered		Dicot	No
(Cyanea macrostegia ssp. gibsonii)		Terrestrial		
Haha (Cyanea mannii)	Endangered		Dicot	Yes
(Cyanea mannii)		Terrestrial		
Haha (Cyanea mceldowneyi)	Endangered		Dicot	Yes
(Cyanea mceldowneyi)		Terrestrial		
Haha (Cyanea procera)	Endangered		Dicot	Yes
(Cyanea procera)		Terrestrial		
Ha'Iwale (Cyrtandra munroi)	Endangered		Dicot	Yes
(Cyrtandra munroi)		Terrestrial		
Hesperomannia arborescens (ncn)	Endangered		Dicot	Yes
(Hesperomannia arborescens)		Terrestrial		
Hesperomannia arbuscula (ncn)	Endangered		Dicot	Yes
(Hesperomannia arbuscula)		Terrestrial		
Kamakahala (Labordia tinifolia var. lanaiensis)	Endangered		Dicot	No
(Labordia tinifolia var. lanaiensis)		Terrestrial		
Kamakahala (Labordia triflora)	Endangered		Dicot	No

(Labordia triflora)		Terrestrial		
Kanaloa kahoolawensis (ncn)	Endangered		Dicot	Yes
(Kanaloa kahoolawensis)		Terrestrial		
Kio'Ele (Hedyotis coriacea)	Endangered		Dicot	Yes
(Hedyotis coriacea)		Terrestrial		
Koki'o Ke'oke'o (Hibiscus arnottianus ssp. immaculatus)	Endangered		Dicot	Yes
(Hibiscus arnottianus ssp. immaculatus)		Terrestrial		
Ko'oko'olau (Bidens micrantha ssp. kalealaha)	Endangered		Dicot	Yes
(Bidens micrantha ssp. kalealaha)		Terrestrial		
Ko'oko'olau (Bidens wiebkei)	Endangered		Dicot	Yes
(Bidens wiebkei)		Terrestrial		
Ko'oloa'ula (Abutilon menziesii)	Endangered		Dicot	No
(Abutilon menziesii)		Terrestrial		
Kopa (Hedyotis schlechtendahliana var. remyi)	Endangered		Dicot	No
(Hedyotis schlechtendahliana var. remyi)		Terrestrial		
Kulu'I (Nototrichium humile)	Endangered		Dicot	Yes
(Nototrichium humile)		Terrestrial		
Laukahi Kuahiwi (Plantago princeps)	Endangered		Dicot	Yes
(Plantago princeps)		Terrestrial		
Lysimachia lydgatei (ncn)	Endangered		Dicot	Yes
(Lysimachia lydgatei)		Terrestrial		
Lysimachia maxima (ncn)	Endangered		Dicot	Yes
(Lysimachia maxima)		Terrestrial		
Mahoe (Alectryon macrococcus)	Endangered		Dicot	Yes
(Alectryon macrococcus)		Terrestrial		
Makou (Peucedanum sandwicense)	Threatened		Dicot	Yes
(Peucedanum sandwicense)		Terrestrial		
Ma'o Hau Hele (Hibiscus brackenridgei)	Endangered		Dicot	Yes
(Hibiscus brackenridgei)		Terrestrial		
Mehamehame (Flueggea neowawraea)	Endangered		Dicot	Yes
(Flueggea neowawraea)		Terrestrial		
Na'ena'e (Dubautia plantaginea ssp. humilis)	Endangered		Dicot	Yes
(Dubautia plantaginea ssp. humilis)		Terrestrial		
Na'u (Gardenia brighamii)	Endangered		Dicot	No
(Gardenia brighamii)		Terrestrial		
Naupaka, Dwarf (Scaevola coriacea)	Endangered		Dicot	No
(Scaevola coriacea)		Terrestrial		
Nehe (Lipochaeta kamolensis)	Endangered		Dicot	Yes
(Lipochaeta kamolensis)		Terrestrial		
Neraudia sericea (ncn)	Endangered		Dicot	Yes
(Neraudia sericea)		Terrestrial		
Nohoanu (Geranium multiflorum)	Endangered		Dicot	Yes
(Geranium multiflorum)		Terrestrial		
'Oha Wai (Clermontia lindseyana)	Endangered		Dicot	Yes
(Clermontia lindseyana)		Terrestrial		
'Oha Wai (Clermontia oblongifolia ssp. brevipes)	Endangered		Dicot	Yes
(Clermontia oblongifolia ssp. brevipes)		Terrestrial		
'Oha Wai (Clermontia oblongifolia ssp. mauiensis)	Endangered		Dicot	Yes
(Clermontia oblongifolia ssp. mauiensis)		Terrestrial		
'Oha Wai (Clermontia samuelii)	Endangered		Dicot	Yes
(Clermontia samuelii)		Terrestrial		

'Ohai (Sesbania tomentosa)	Endangered		Dicot	Yes
(Sesbania tomentosa)		Terrestrial		
Phyllostegia mannii (ncn)	Endangered		Dicot	Yes
(Phyllostegia mannii)		Terrestrial		
Phyllostegia mollis (ncn)	Endangered		Dicot	Yes
(Phyllostegia mollis)		Terrestrial		
Pilo (Hedyotis mannii)	Endangered		Dicot	Yes
(Hedyotis mannii)		Terrestrial		
Po'e (Portulaca sclerocarpa)	Endangered		Dicot	Yes
(Portulaca sclerocarpa)		Terrestrial		
Pua'ala (Brighamia rockii)	Endangered		Dicot	Yes
(Brighamia rockii)		Terrestrial		
Remya, Maui	Endangered		Dicot	Yes
(Remya mauiensis)		Terrestrial		
Sandalwood, Lanai (='Iliahi)	Endangered		Dicot	No
(Santalum freycinetianum var. lanaiense)		Terrestrial		
Sanicula purpurea (ncn)	Endangered		Dicot	Yes
(Sanicula purpurea)		Terrestrial		
Schiedea haleakalensis (ncn)	Endangered		Dicot	Yes
(Schiedea haleakalensis)		Terrestrial		
Schiedea lydgatei (ncn)	Endangered		Dicot	Yes
(Schiedea lydgatei)		Terrestrial		
Schiedea sarmentosa (ncn)	Endangered		Dicot	Yes
(Schiedea sarmentosa)		Terrestrial		
Silene alexandri (ncn)	Endangered		Dicot	Yes
(Silene alexandri)		Terrestrial		
Silene lanceolata (ncn)	Endangered		Dicot	Yes
(Silene lanceolata)		Terrestrial		
Silversword, Haleakala ('Ahinahina)	Threatened		Dicot	Yes
(Argyroxiphium sandwicense ssp. macrocephalum)		Terrestrial		
Silversword, Mauna Kea ('Ahinahina)	Endangered		Dicot	No
(Argyroxiphium sandwicense ssp. sandwicense)		Terrestrial		
Spermolepis hawaiiensis (ncn)	Endangered		Dicot	Yes
(Spermolepis hawaiiensis)		Terrestrial		
Stenogyne bifida (ncn)	Endangered		Dicot	Yes
(Stenogyne bifida)		Terrestrial		
Tetramolopium capillare (ncn)	Endangered		Dicot	Yes
(Tetramolopium capillare)		Terrestrial		
Tetramolopium remyi (ncn)	Endangered		Dicot	Yes
(Tetramolopium remyi)		Terrestrial		
Tetramolopium rockii (ncn)	Threatened		Dicot	Yes
(Tetramolopium rockii)		Coastal (neritic), Terrestrial		
Uhiuhi (Caesalpinia kavaiensis)	Endangered		Dicot	No
(Caesalpinia kavaiense)		Terrestrial		
Ulihi (Phyllostegia glabra var. lanaiensis)	Endangered		Dicot	No
(Phyllostegia glabra var. lanaiensis)		Terrestrial		
Vigna o-wahuensis (ncn)	Endangered		Dicot	Yes
(Vigna o-wahuensis)		Terrestrial		
Viola lanaiensis (ncn)	Endangered		Dicot	No
(Viola lanaiensis)		Terrestrial		
Moth, Blackburn's Sphinx	Endangered		Insect	Yes

(Manduca blackburni)		Terrestrial	
Bat, Hawaiian Hoary	Endangered	Mammal	No
(Lasiurus cinereus semotus)		Terrestrial, Subterraneous	
Gahnia Lanaiensis (ncn)	Endangered	Monocot	No
(Gahnia lanaiensis)		Terrestrial	
Hilo Ischaemum (Ischaemum byrone)	Endangered	Monocot	Yes
(Ischaemum byrone)		Terrestrial	
Kamanomano (Cenchrus agrimonioides)	Endangered	Monocot	Yes
(Cenchrus agrimonioides)		Terrestrial	
Lo`ulu (Pritchardia munroi)	Endangered	Monocot	Yes
(Pritchardia munroi)		Terrestrial	
Mariscus fauriei (ncn)	Endangered	Monocot	Yes
(Mariscus fauriei)		Terrestrial	
Mariscus pennatiformis (ncn)	Endangered	Monocot	Yes
(Mariscus pennatiformis)		Terrestrial	
Panicgrass, Carter's (Panicum fauriei var.carteri)	Endangered	Monocot	Yes
(Panicum fauriei var. carteri)		Terrestrial	
Platanthera holochila (ncn)	Endangered	Monocot	Yes
(Platanthera holochila)		Terrestrial	
Sea turtle, green	Endangered	Reptile	No
(Chelonia mydas)		Saltwater	
Sea turtle, hawksbill	Endangered	Reptile	Yes
(Eretmochelys imbricata)		Saltwater	

Nevada (10) species:

		Taxa	Critical Habitat
Flycatcher, Southwestern Willow	Endangered	Bird	Yes
(Empidonax traillii extimus)		Terrestrial	
Rail, Yuma Clapper	Endangered	Bird	No
(Rallus longirostris yumanensis)		Terrestrial	
Chub, Bonytail	Endangered	Fish	Yes
(Gila elegans)		Freshwater	
Chub, Virgin River	Endangered	Fish	Yes
(Gila seminuda (=robusta))		Freshwater	
Dace, Moapa	Endangered	Fish	No
(Moapa coriacea)		Freshwater	
Poolfish, Pahrump (= Pahrump Killifish)	Endangered	Fish	No
(Empetrichthys latos)		Freshwater	
Pupfish, Devils Hole	Endangered	Fish	No
(Cyprinodon diabolis)		Freshwater	
Sucker, Razorback	Endangered	Fish	Yes
(Xyrauchen texanus)		Freshwater	
Woundfin	Endangered	Fish	Yes
(Plagopterus argentissimus)		Freshwater	
Tortoise, Desert	Threatened	Reptile	Yes
(Gopherus agassizii)		Terrestrial	

Texas (7) species:

		Taxa	Critical Habitat
Toad, Houston	Endangered	Amphibian	Yes
(Bufo houstonensis)		Terrestrial, Freshwater	
Crane, Whooping	Endangered	Bird	Yes
(Grus americana)		Terrestrial, Freshwater	
Plover, Piping	Endangered	Bird	Yes

(Charadrius melodus)		Terrestrial		
Prairie-chicken, Attwater's Greater	Endangered		Bird	No
(Tympanuchus cupido attwateri)		Terrestrial		
Tern, Interior (population) Least	Endangered		Bird	No
(Sterna antillarum)		Terrestrial		
Vireo, Black-capped	Endangered		Bird	No
(Vireo atricapilla)		Terrestrial		
Warbler (=Wood), Golden-cheeked	Endangered		Bird	No
(Dendroica chrysoparia)		Terrestrial		

Utah (10) species:

			Taxa	Critical Habitat
Flycatcher, Southwestern Willow	Endangered		Bird	Yes
(Empidonax traillii extimus)		Terrestrial		
Owl, Mexican Spotted	Threatened		Bird	Yes
(Strix occidentalis lucida)		Terrestrial		
Bear-poppy, Dwarf	Endangered		Dicot	No
(Arctomecon humilis)		Terrestrial		
Cactus, Siler Pincushion	Threatened		Dicot	No
(Pediocactus (=Echinocactus,=Utahia) sileri)		Terrestrial		
Milk-vetch, Holmgren	Endangered		Dicot	No
(Astragalus holmgreniorum)		Terrestrial		
Milk-vetch, Shivwits	Endangered		Dicot	No
(Astragalus ampullarioides)		Terrestrial		
Chub, Virgin River	Endangered		Fish	Yes
(Gila seminuda (=robusta))		Freshwater		
Woundfin	Endangered		Fish	Yes
(Plagopterus argentissimus)		Freshwater		
Prairie Dog, Utah	Threatened		Mammal	No
(Cynomys parvidens)		Terrestrial, Subterraneous		
Tortoise, Desert	Threatened		Reptile	Yes
(Gopherus agassizii)		Terrestrial		

No species were selected for exclusion.

Dispersed species included in report.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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MEMORANDUM

Date: September 27, 2005

Subject: EFED Risk Assessment for the Proposed IR-4 Uses of Spinosad Products on production of non-grass animal feed, legumes grown for seed, mint, green onion, pasture and rangeland.

To: Dan Rosenblatt, RM 05 (308-9366)
Sidney Jackson, RM Team Reviewer (305-7610)
Registration Division (7505C)

From: N.E. Federoff, Wildlife Biologist, Team Leader
Larry Liu, Ph.D., Chemist
Ron Parker, Ph.D., Water Modeling
Environmental Risk Branch V
Environmental Fate and Effects Division (7507C)

Through: Mah Shamim, Ph.D., Chief
Environmental Risk Branch V
Environmental Fate and Effects Division (7507C)

The IR-4 registrations requested for spinosad products is currently being proposed for the following new uses: production of non-grass animal feed, legumes grown for seed, mint, green onion, pasture and rangeland.

Major Exposure and Risk Concerns

No acute level of concern is exceeded for freshwater or estuarine/marine fish or invertebrates. Also, no chronic levels of concern were exceeded for freshwater and estuarine/marine fish or estuarine/marine invertebrates. However, chronic RQs (1.50-2.20) for endangered and non-endangered freshwater free-swimming and sediment dwelling invertebrates exceed the LOC for mint and green onion. Also, since spinosad is toxic to honeybees, risk to beneficial terrestrial invertebrates is assumed. Low risk was found for birds, mammals and plants.

Environmental fate data and modeling results indicate that spinosad is expected to dissipate rapidly in the environment with a low potential to leach or runoff to surface water. However, if spinosad residues do reach sediment, they are likely to be moderately persistent (half-live >25 days).

Endocrine Disruption

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally-occurring estrogen, or other such endocrine effects as the Administrator may designate." Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was scientific basis for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program (EDSP).

When the appropriate screening and or testing protocols being considered under the Agency's Endocrine Disruptor Screening Program have been developed, spinosad may be subjected to additional screening and/ or testing to better characterize effects related to endocrine disruption.
Possible endocrine mediated effects were found in a chronic freshwater invertebrate study with *Daphnia magna*, where a NOAEC of 0.62 ppb was established based on a statistically significant reduction in egg production at the highest concentration tested, 2.19 ppb. Egg production is an endocrine-mediated process. Also, there were increases in thyroid weights as well as increased thyroid, parathyroid and pituitary gland cell vacuolation in mammalian studies. Thus, EFED will ask for additional testing when such testing is required.

Endangered Species

The Agency's chronic level of concern for endangered and threatened freshwater free-swimming and sediment dwelling invertebrates was exceeded for the proposed use of spinosad on mint and green onion, should exposure occur. Also, since spinosad is toxic to honeybees, risk to endangered and threatened beneficial invertebrates is assumed for all uses.

Outstanding Data Requirements

OPPTS 850.1735: Whole Sediment Acute Toxicity Invertebrates, Freshwater. This is a 28 day test that measures survival, growth and emergence of *Chironomus riparius* that have been exposed to pesticide spiked sediment. EFED is requesting this acute sediment toxicity test because spinosad is toxic to aquatic invertebrates, persistent in the environment, and binds to sediment over time.

OPPTS 850.1740: Whole Sediment Acute Toxicity Invertebrates, Estuarine and Marine -

Testing with estuarine/marine invertebrates using the TGAI is required for spinosad because it is toxic to aquatic invertebrates, persistent in the environment, binds to sediment over time. and the end-use product is expected to reach the marine/estuarine environment because of it use in coastal counties.

EFED Label Recommendations

Manufacturing Use Product

Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

***End Use Product*s**

This product is toxic to aquatic invertebrates. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high-water mark. Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Do not apply where runoff is likely to occur. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Apply this product only as specified on the label.

For products applied as a foliar spray, EFED recommends the following labeling statement:
"This product is toxic to bees exposed to treatment. Do not apply this product to blooming, pollen-shedding or nectar-producing parts of plants if bees may forage on the plants during this time period, unless the application is made in response to a public health emergency declared by appropriate state or federal authorities."

Label statements for spray drift management:

Do not allow this product to drift onto neighboring crops or non crop areas or use in a manner or at a time other than in accordance with label directions because animal, plant or crop injury, illegal residues or other undesirable results may occur.

AVOIDING SPRAY DRIFT AT THE APPLICATION SITE IS THE RESPONSIBILITY OF THE APPLICATOR. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator is responsible for considering all these factors when making decisions. Where states have more stringent regulations, they should be observed.

Data Requirement Tables A & B

Table of Ecological Toxicity Data Requirements				
Guideline #	Data Requirement	MRID #	Classification	Is more data needed?
71-1	Avian acute oral LD_{50}			
	(mallard duck)	434145-29	Supplemental	No
	(bobwhite quail)	434145-28	Supplemental	No
71-2	Avian subacute dietary LC_{50}			
	(bobwhite quail)	434145-31	Core	No
	(mallard duck)	434145-30	Core	No
71-4	Avian reproduction			
	(bobwhite quail)	434145-33	Core	No
	(mallard duck)	434145-32	Core	No
72-1	Freshwater fish acute LC_{500}			
	(rainbow trout)			
	TGAI	434441-03	Core	No
	DEG			
	(bluegill sunfish)	434145-34	Core	No
	TGAI			
72-2	Freshwater invertebrate acute EC_{50}			
	(daphnia)			
	TGAI	434145-37	Core	
		445977-31	Supplemental	No
	DEG	465053-12	Acceptable	No
		465053-04	Acceptable	No
		465053-07	Acceptable	No
		465053-09	Acceptable	No
				No
OPPTS 850.1735	Acute Freshwater Invertebrate Sediment Toxicity			
	TGAI	N/A	N/A	N/A
72-3a	Estuarine/marine fish acute LC_{50}			
	(sheepshead minnow)	434145-40	Core	No
72-3b	Estuarine/marine invertebrate acute EC_{50}		Core	
	(eastern oyster)	434441-04/435712-03		No
	(mysid)		Supplemental	
	(other)	434145-39		No
72-4a	Freshwater fish early life stage	434145-41	Core	No
72-4b	Freshwater invertebrate life cycle	465053-03	Supplemental	No
	(daphnia)	465053-06	Supplemental	No
	DEG	465053-01	Invalid	No
		465053-11	Invalid	No
72-4c	Estuarine/marine fish early life stage	444206-01	Core	No
72-4d	Estuarine/marine life cycle			
	(mysid)	444206-02	Core	No

Table of Ecological Toxicity Data Requirements				
Guideline #	Data Requirement	MRID #	Classification	Is more data needed?
OPPTS 850.1740	Acute Freshwater Invertebrate Sediment Toxicity TGAI	N/A	N/A	N/A
72-7	Aquatic Field Study	N/A	N/A	N/A
81-1	Acute mammalian oral LD_{50}			
	(rat)	437707-01	Acceptable	No
	(rat)	434145-15	Acceptable	No
83-1	Mammalian Chronic			
	(rat)	437015-06	Acceptable	No
122-1(a)	Seedling Emergence - Tier I	438488-02	Core	No
122-1(b)	Vegetative Vigor - Tier I	445977-32	Core	No
122-2	Aquatic plant algae TGAI			
			Core	No
		434145-42	Core	No
		434145-43	Core	No
		434145-44	Core	No
		434145-46		
123-2	Aquatic plant acute EC_{50}	434145-45	Core	No
	DEG	465053-10	Supplemental	No
		465053-08	Supplemental	No
		465053-05	Supplemental	No
		465053-02	Supplemental	No
141-1	Acute honey bee contact LD_{50}	434145-47	Core	No
		453408-01	Invalid	No
141-2	Honey Bee Residue on Foliage			
		450077-01	Core	No
		450077-02	Supplemental	No
		450077-03	Invalid	No
141-5	Honey Bee Field Testing for Pollinators	457082-01	Supplemental	No
		457088-01	Supplemental	No
Non-guideline	Earthworm Chronic			
	Midge Chronic			
	21 day tox to Rainbow trout (DEG)			
	28 day Midge Sediment Chronic (DEG)	434145-48	Supplemental	No
	28 day Midge Sediment Chronic (DEG)	448284-02	Supplemental	No
		465053-13	Supplemental	No
	28 day Midge Sediment Chronic (DEG)	465053-14	Supplemental	No
		465053-15	Supplemental	No
	28 day Midge Sediment Chronic (DEG)	465053-16	Supplemental	No
		465053-17	Supplemental	No

Environmental Fate Data Requirements for Spinosad:

Guideline Number		Data Requirement	MRID	Study Classification	Notes
161-1	835.2120	Hydrolysis	43507301	ACCEPTABLE	Spinosad Factors A and D (2 ppm) were stable in pH 5, 7, and 9 buffers at 25 ± 1°C for 30 days.
161-2	835.2240	Photodegradation in Water	43507302	ACCEPTABLE	Aglycone ring-labeled [U-^{14}C]spinosad Factor A and Factor D (2 ppm) degraded with half-lives of 0.8-0.9 days in pH 7 buffer irradiated under natural sunlight at 25 ± 1°C for 48 hours. The respective ß-isomer of the 13,14-dihydro of the pseudoaglycone of each factor was identified. [U-^{14}C]Spinosad Factors A and D were stable in the dark controls.
161-2	835.2240	Photodegradation in Water	44597735	UNACCEPTABLE	Spinosad Factor A (2 ppm) and Factor D (0.2 ppm) degraded with half-lives of 0.54-0.55 days in pond water (pH 9.2) irradiated outdoors under natural sunlight at 25 ± 1°C for 48 hours. Degradate Factor B in Factor A-treated pond water and N-demethyl Factor D in Factor D-treated pond water were identified. Spinosad Factors A and D were stable in the dark controls.
161-3	835.2410	Photodegradation on Soil	44597733	ACCEPTABLE	Aglycone ring-labeled [U-^{14}C]spinosad Factor A (1004 g/ha) degraded with a half-life of 13.6 days in Commerce silt loam soil irradiated under natural sunlight at 25.0 ± 1.0°C for 30 days. Degradate Factor B (N-demethylated Factor A) was identified. [U-^{14}C]Spinosad Factor A was stable in the dark control.
161-3	835.2410	Photodegradation on Soil	43507303	ACCEPTABLE	Aglycone ring-labeled [U-^{14}C]spinosad Factor A and Factor D, at 1015 g/ha, degraded with half-lives of 74 and 41 days, respectively, in Commerce silt loam irradiated at 25.0 ± 1.0°C under natural sunlight for 30 days. Factor B (demethylated Factor A) was a minor degradate of Factor A and D1 and D2 (Compound 202149) were minor degradates of Factor D. Factors A and D were stable in the dark controls.
161-4	835.2370	Photodegradation in Air	---	WAIVED	
162-1	835.4100	Aerobic Soil Metabolism	43507304	ACCEPTABLE	Aglycone ring-labeled [U-^{14}C]spinosad Factor A and Factor D, at a rate of 0.1-0.4 mg/kg, degraded with half-lives of 17.3 and 14.5 days, respectively, in Commerce silt loam, incubated in the dark at 75% of MHC and 25.0 ± 1.0°C, for 1 year posttreatment. In Hanford sandy loam, Factor A degraded with a half-life of 9.4 days. Factor B (N-demethylated Factor A) was the major degradate of Factor A and N-demethylated Factor D (the Factor D analogue of Factor B) was the major degradate of Factor D.
162-2	835.4200	Anaerobic Soil Metabolism	---	162-3 replaces	

Guideline Number		Data Requirement	MRID	Study Classification	Notes
162-3	835.4400	Anaerobic Aquatic Metabolism	43507305	ACCEPTABLE	Aglycone ring-labeled [U-^{14}C]spinosad Factor A and Factor D, at a rate of 0.6 µg/mL, degraded with half-lives of 161 and 250 days, respectively, in anaerobic flooded clay sediment incubated in the dark at 25 ± 2°C for up to 1 year. Three degradates of Factor A were identified: Factor B (N-demethylated Factor A), reversepseudoaglycone (806643), and ketoreversepseudoaglycone (814426). One degradate of Factor D was identified: N-demethylated Factor D (the Factor D analogue of Factor B).
162-4	835.4300	Aerobic Aquatic Metabolism	---	N/A	
163-1	835.1240	Adsorption/Desorption	43507306	ACCEPTABLE	(Factor A) K_{oc} of sand, loamy sand, sandy loam, silt loam, and clay loam was 2,862, 831, 4,237, 134,583, and 21,938, respectively (reviewer-calculated). K_{ads} of sand, loamy sand, sandy loam, silt loam, and clay loam was 8.3, 5.4. 25, 323, and 283, respectively.
163-1	835.1240	Adsorption/Desorption	43816602	ACCEPTABLE	(Factor B) K_{oc} of sand, loamy sand, sandy loam, and silt loam was 2,138, 662, 2,881, and 74,583, respectively (reviewer-calculated values). K_{ads} of sand, loamy sand, sandy loam, and silt loam was 6.2, 4.3, 17, and 179, respectively.
163-2	835.1410	Volatility (Lab)	---	WAIVED	
163-3	835.8100	Volatility (Field)	---	WAIVED	
164-1	835.6100	Terrestrial Field Dissipation	43714301	SUPPLEMENTAL	[^{14}C]Spinosad Factor A, at 500 g/ha (0.45 lb a.i./A), dissipated with half-lives of 0.5 and 0.3 days on Commerce silt loam and Hanford loam soil, respectively. Degradates A0, A1, and A2, isolated in both soils, represent groups of multiple minor degradates consisting of mono-di, and tetra-hydroxylated derivatives of Factor A and B.
164-2	835.6200	Aquatic Field Dissipation	---	N/A	
164-3	835.6300	Forestry Dissipation	---	N/A	
164-4	835.6400	Combination and tank mixes Dissipation	---	N/A	
164-5		TFD, long term	---	WAIVED	
165-4	850.1730	Accumulation - Laboratory Fish	43557601	SUPPLEMENTAL	Rainbow trout were exposed to aglycone ring-labeled [U-^{14}C]spinosad Factor A at 19.0 or 5.0 ng/mL. Maximum BCFs for parent were 28.8, 7.5, and 21.1 mL/g for nonedible, edible, and whole fish tissues,

Guideline Number		Data Requirement	MRID	Study Classification	Notes
					respectively.
165-4	850.1730	Accumulation - Laboratory Fish	44537734	SUPPLEMENTAL	Rainbow trout were exposed to aglycone ring-labeled [U-^{14}C]spinosad Factor D at 33.0 and 8.2 ng/mL. At 33.0 ng/L, maximum BCFs for parent were 42, 20.5, and 41.9 mL/g for nonedible, edible, and whole fish tissues, respectively. Major metabolites were 15-Pk4, 20-Pk4 [N-monomethylated, O-demethylated spinosad Factor D], 15-Pk6, and 20-Pk6 [N-monomethylated, O-demethylated spinosad Factor D], spinosad Factor L, and spinosad Factor O.
165-5	850.1950	Accumulation - Aquatic Nontarget	---	N/A	
166-1	835.7100	Ground Water Monitoring -Small Scale Prospective	---	N/A	
201-1	840.1100	Droplet Size Spectrum	---		
201-2	840.1200	Drift Field Evaluation	---		
Non-guideline		Aquatic microcosm dissipation	43848803	SUPPLEMENTAL	Spinosad (480 g/L suspension concentrate, ratio of A:D about 85:15) was surface-applied at 100g/ha to surface to outdoor tanks containing pond water. Parent spinosad dissipated from the water with a half-life of 1.5 days. Total spinosad residues dissipated from the water with half-life of 4 days. In the clay loam sediment, spinosad Factors A and B were maximum averages of 14.9 ppb (4 days) and 11.1 ppb (15 days), respectively; Spinosad Factor D was ≤4.2 ppb and Factor B of D was not detected. Maximum total spinosad residues in sediment were 56.0 ppb (8 days).

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I. Executive Summary

No acute or chronic level of concern was exceeded for terrestrial organisms. However, since spinosad is toxic to honeybees, risk to beneficial insects is assumed.

No acute level of concern is exceeded for freshwater or estuarine/marine fish or invertebrates. Also, no chronic levels of concern were exceeded for freshwater and estuarine/marine fish or estuarine/marine invertebrates. However, chronic RQs (1.50-2.20) for freshwater free-swimming and sediment dwelling invertebrates exceed the LOC for mint and green onion. Low risk was found for terrestrial and aquatic plants.

Endangered and threatened chronic levels of concern were exceeded for freshwater invertebrates for mint and green onion uses and since spinosad is toxic to honeybees, risk to beneficial insects for all uses is possible, should exposure actually occur.

Possible endocrine mediated effects were found in a chronic freshwater invertebrate study with *Daphnia magna*, where a NOAEC of 0.62 ppb was established based on a statistically significant reduction in egg production at the highest concentration tested (2.19 ppb). Egg production is an endocrine-mediated process. Also, there were increases in thyroid weights as well as increased thyroid, parathyroid and pituitary gland cell vacuolation in mammalian studies. Thus, EFED will ask for additional testing when such testing is required.

II. Physical/Chemical Properties Characterization

Pesticide Type, Class, Mode of Action

Spinosad belongs to the class of microbial insecticides. It is a secondary metabolite from the aerobic fermentation of *S. spinosa* on nutrient media. Spinosad is a mixture of two active naturally occurring metabolites (Spinosad Factors A and D) produced by the actinomycetes *Saccharopolyspora spinosa*. The IUPAC chemical name of Spinosad Factor A is: (2R,3aS,5aR,5bS,9S,13S,14R,16aS,16bR)-2-(6-deoxy-2,3,4-tri-O-methyl-∝-L-mannopyranosyloxy)-13-(4-dimethylamino-2,3,4,6-tetradeoxy-β-D-erythropyranosyloxy)-9-ethyl-2,3,3a,5a,6,7,9,10,11,12,13,14,15,16a,16b-hexadecahydro-14-methyl-1H-8-oxacyclododeca[b]as-indacene-7,15-dione. The IUPAC chemical name of Spinosad Factor D is: (2R,3aS,5aR,5bS,9S,13S,14R,16aS,16bR)-2-(6-deoxy-2,3,4-tri-O-methyl-∝-L-mannopyranosyloxy)-13-(4-dimethylamino-2,3,4,6-tetradeoxy-β-D-erythropyranosyloxy)-9-ethyl-2,3,3a,5a,6,7,9,10,11,12,13,14,15,16a,16b-hexadecahydro-4,14-dimethyl-1H-8-oxacyclododeca[b]as-indacene-7,15-dione. Trade names include Tracer, Naturalyte, and SpinTor. The primary mode of action of spinosad is the excitation of the neurons in the central nervous system. Spinosad causes involuntary muscle contractions and tremors by widespread excitation of motor neurons. The prolonged hyperexcitation causes neuromuscular fatigue, resulting in paralysis. Within minutes of field application, insects are paralyzed and feeding ceases. Spinosad has limited translaminar movement in leaf tissue; however, the addition of a penetrating surfactant increases translaminar movement and activity on pests that forage leaves.

III. Use Characterization

Application Rates
The following table is a summary of the rates for the proposed uses submitted to EFED by RD.

Use of Spinosad on various crops for this assessment.					
Crop	**Appl. Rate (lb ai/A)**	**Max # Appl**	**Max Yr. Rate (lbs ai/A)**	**Min. Interval (days)**	**Application Methods**
Mint	0.062-0.156	3	0.450	5	aerial or ground
Green onion	0.047-0.094	5	0.450	5	aerial or ground
Grass Forages, Grass Grown for Seed, Pastures and Rangeland	0.031-0.062	6	0.186	7	aerial or ground
Legume Forage Hay and Alfalfa Seed	0.031-0.062	6	0.186	7	aerial or ground

IV. Problem Formulation

The planning stage for an ecological risk assessment entails initial discussions between risk assessor and risk manager in order to define time lines, management goals, and the problem formulation. The management goals for the registration of the new uses of Spinosad is the protection of terrestrial and aquatic environments from unreasonable adverse effects (death or injury).

Problem formulation is the critical first step in establishing the direction and scope of an ecological risk assessment. Part A of the Guidelines for Ecological Risk assessment states that "in problem formulation, the purpose for the assessment is articulated, the problem defined, and a plan for analyzing and characterizing risk is determined." The analysis plan and rationale for developing a risk assessment for Spinosad is an iterative procedure for determining if the proposed new uses of this compound could result in residue exposure that has the potential for unreasonable adverse effects (risk) to non-target organisms, as well as endangered/threatened organisms. The portion of the problem formulation which is an explicit statement of the characteristic of the environment to be protected is encompassed in a delineation of endpoints. These endpoints can include a particular species, a functional group of species, a community, or an ecosystem.

Environmental fate data and modeling results indicate that spinosad can be expected to dissipate rapidly in the environment with low potential to impact water resources. In the case of this assessment, EFED relied on the hazard assessment which considers standard single chemical toxicity testing (acute and chronic endpoints) submitted by the registrant and reviewed by the Agency. EFED used this information for selection of the most sensitive species tested in order to

generate RQ values. Effects data are included under the section "Characterization of Ecological Effects," and represent registrant submitted data. The effects database is mostly complete for freshwater and estuarine/marine aquatic organisms and thus is suitable for a screening level risk assessment. The possible major endpoints related to aquatic environments at issue are:

(a). Direct effects to aquatic invertebrates in the water column via acute toxicity.
(b). Direct effects to benthic aquatic organisms dwelling in the sediment and/or pore water via acute and/or chronic toxicity.
(c). Indirect effects to benthic community assemblages (i.e. reductions in diversity and abundance) dwelling in the sediment and/or pore-water.
(d). Indirect effects to aquatic ecosystems from benthic community disturbances.

In addition to the concern for aquatic ecosystems, EFED is also concerned with potential impacts to terrestrial species and functional groups, including pollinators; nectar and fruit eating birds, mammals, and insects; and soil-inhabiting invertebrates and mammals (i.e. earthworms, burrowing mammals). Available effects data are included under the section "Characterization of Ecological Effects," and represent registrant submitted data. Although EFED does not conduct RQ based risk assessments on beneficial insects, there is potential for direct toxic effects to honey bees as suggested by the toxicity data. The terrestrial effects database for these species and functional groups is incomplete and thus recommendations are made for additional studies or assessments to fill data gaps needed for a suitable screening level risk assessment. The possible major endpoints related to terrestrial environments are:

(a). Direct effects to mammals, insects, and soil invertebrates via acute toxicity.
(b). Direct effects on reproduction to birds (eggshell thinning, etc), mammals, and insects via chronic toxicity.
(c). Direct effects to insects via toxicity of residues on foliage.
(d). Direct effects to foraging activity of pollinators
(e). Indirect effects from soil ecosystem alterations
(f). Indirect effects from reduced crop yield from impact to pollinators.

Problem formulation focused mainly on laboratory and field studies which indicate that spinosad's potential to contaminate surface water and ground water is relatively low. Thus, the initial emphasis of the screening risk assessment was primarily about possible risk to freshwater and estuarine/marine fish and invertebrates as well as to terrestrial birds, mammals, and invertebrates and beneficial insects which may be exposed to Spinosad after applications.

Toxicity Profiles

Terrestrial Species

Spinosad is categorized as slightly toxic to avian species on an acute oral basis. Both the mallard duck and the bobwhite quail $LD_{50's}$ are >1333 mg/kg (MRIDs 434145-28 and 434145-29). Spinosad is categorized as practically nontoxic to avian species on a subacute dietary basis. Both the mallard duck and the bobwhite quail LC_{50} are >5156 ppm (MRIDs 434145-28 and 434145-29). Reproductive parameters (eggs laid, live 3-week embryos, normal hatchlings, 14 day-old survivors, etc.) were significantly reduced in both mallard ducks and bobwhite quail at 1100 ppm (MRIDs 434145-32 and 434145-33). The NOAEC for both species is 550 ppm.

Based on mammalian data in Hazard Evaluation Division's toxicity one-liner database, the rat acute oral LD_{50} is >5000mg/kg, categorizing spinosad as practically non-toxic to small mammals. A reproductive study with rats identified a NOAEC of 200 ppm or 10 mg/kg/day, based on reproductive toxicity (reduced litter size, offspring body weights, and survival of F2 generation) at 2000 ppm.

Developmental studies with rats and rabbits showed no evidence of toxicity. The NOAEC in the rat study (MRID 435575-05) was ≥4000 ppm or ≥200 mg/kg/day, the highest dose tested. The NOAEC in the rabbit study (MRID 434145-21) was ≥1650 ppm or ≥50 mg/kg/day.

No toxicity was shown to earthworms in soil (based on reduction in biomass). The 14-day LC_{50} was >970 mg/kg (MRID 434145-48).

Acute contact toxicity tests showed that spinosad is highly toxic toward honey bees when exposed to the TGAI. The LD_{50} is 0.0029 µg formulation/bee for the TGAI (MRID 434145-47). Data were submitted on the toxicity of formulated product residues on foliage toward honey bees (MRID 450077-01). The residual time required to reduce the activity of spinosad and elicit 25% mortality in caged bees exposed to field-weathered spray deposits (RT_{25}) was less than three hours at a single application rate of 0.16 lb/A.

Tier I studies were submitted for seedling emergence and vegetative vigor testing. The TGAI or formulated product caused no phytotoxic effects greater than 25% (based on shoot weight and shoot length) for all terrestrial plant species tested (cucumber, oat, onion, radish, soybean, sunflower, tomato, wheat, carrot, and corn). Both studies estimated the EC_{25} at a level greater than the single dose rate (>0.178 lb/A for TGAI-MRID 438488-02) and (>0.5 lb/A for the formulated product [44.2%]-MRID 445977-32). Based on these results, terrestrial plant risk is considered minimal, and further plant tests (Tier II) are not required.

Aquatic species

Spinosad is slightly toxic to rainbow trout (MRID 43444103) and moderately toxic to bluegill sunfish (MRID 434145-34) on an acute basis. The rainbow trout LC_{50} is 30.0 mg/L and the bluegill sunfish LC_{50} is 5.94 mg/L for the technical grade active ingredient (TGAI). Data were submitted for the freshwater fish early life-stage test using rainbow trout (MRID 434145-41). Significant reductions occurred in mean hatch at 0.962 ppm, survival (at 1.89 ppm), and length and weight (at 3.76 ppm). The NOAEC is 0.498 ppm.

Spinosad is categorized as moderately toxic to estuarine fish on an acute basis. The sheepshead minnow LC_{50} is 7.87 ppm for the TGAI (MRID 434145-40). Data were submitted for the estuarine fish early life-stage test using sheepshead minnow (MRID 444206-01). Spinosad reduced fish growth at 2.38 ppm. The NOAEC is 1.15 ppm.

The TGAI of spinosad is slightly toxic to freshwater invertebrates on an acute basis (*Daphnia magna* EC_{50} is 14.0 mg/L; MRID 434145-37 & 435712-02). Spinosad Factor B (the major transformation product of Factor A), is moderately toxic to daphnids on an acute basis (EC_{50} is 6.39 mg/L; MRID 44597731). Data were submitted for a chronic test with *Daphnia magna* (MRID 438488-01). Spinosad reduced daphnid growth at 0.00115 ppm and reproduction at 0.00219 ppm. The NOAEC is 0.00062.

Spinosad is categorized as highly toxic to mollusks on an acute basis. The Eastern oyster EC_{50} is 0.3 ppm (MRID 435712-03) for the TGAI. The EC_{50} for the mysid is >9.76 ppm. Data were submitted for the estuarine invertebrate life-cycle study using mysid shrimp (MRID 444206-02). Spinosad reduced the number of young per female after 28 days of exposure at 0.173 ppm. The NOAEC is 0.0842 ppm.

Data were submitted to assess the toxicity of spinosad in sediment to chironomid larvae (MRID 448284-02). Spinosad reduced adult emergence at 0.001328 ppm. The NOAEC is 0.000622 ppm.

Four other non-guideline 28-day chronic studies (MRIDs 465053-14, -15, -16 and -17) of toxicity to midge larvae, *Chironomus riparius*, were submitted. The tests were conducted under static conditions in overlying water-spiked exposures (sediment was not spiked). Endpoints assessed included development rate (male, female, and combined sexes) and percent emerged (combined sexes). The results were as follows:

MRID 465053-14. Spinosyn A. No, statistically significant reductions ($p<0.05$) in treatment male and female development rates compared to the pooled control were identified at any treatment level tested. No, statistically significant ($p<0.05$) or biologically significant reductions in treatment male and female developments rates and percent emerged compared to the pooled control were identified at any treatment level tested. No additional sub-lethal effects (abnormal behavior) were reported for the controls or treatment groups during the exposure period. Consequently, the 28 Day NOAEC, LOAEC, and EC_{50} for development rate (male and female) and percent emerged were 0.0734, >0.0734, and >0.0734 ppm metabolite, respectively, based on the mean-measured pore water treatment concentrations.

MRID 465053-15. N-demethylated Spinosyn D. Since development rates were not significantly reduced compared to the pooled control at any level tested, the Day-28 NOAEC, LOAEC and EC_{50} for development rates (male, female, and combined sexes) was 0.14, >0.14, and >0.14 ppb a.i., respectively, based on the mean-measured pore water treatment concentrations. No additional sub-lethal effects (abnormal behavior) were reported for the controls or treatment groups during the exposure period.

MRID 465053-16. β-13,14-Dihydropseudoaglycone of Spinosyn D. No, statistically significant ($p<0.05$) or biologically significant reductions in treatment male and female developments rates and percent emerged compared to the pooled control were identified at any treatment level tested. No additional sub-lethal effects (abnormal behavior) were reported for the controls or treatment groups during the exposure period. Consequently, the 28 Day NOAEC, LOAEC, and EC_{50} for development rate (male and female) and percent emerged were 0.0388, >0.0388, and >0.0388 ppm metabolite, respectively, based on the mean-measured pore water treatment concentrations.

MRID 465053-17. Spinosyn B. Development rates were not significantly reduced compared to the pooled control at any level tested, the Day-28 NOAEC, LOAEC and EC_{50} for development rates (male, female, and combined sexes) was 0.41, >0.41, and >0.41 ppb a.i., respectively, based on the mean-measured pore water treatment concentrations. No additional sub-lethal effects (abnormal behavior) were reported for the controls or treatment groups during the exposure period.

The freshwater diatom, *Navicula pelliculosa*, is the most sensitive nonvascular aquatic species (EC_{50} of 0.089 ppm) in Tier II aquatic non-vascular plant tests. The vascular plant (duckweed) EC_{50} is 10.6 ppm.

V. Analysis

Analysis is a process that examines the two primary components of risk, exposure and effects, and their relationships between each other and site characteristics. The objective is to provide the ingredients necessary for determining or predicting ecological responses to pesticide uses under exposure conditions of interest. The products of analysis provide the basis for estimating and describing risks in risk characterization.

Tier I Aquatic Assessment

Risk Conclusions

EFED found chronic risk to free-swimming and sediment dwelling freshwater invertebrates (Chronic RQ range 1.50-2.20) and low risk to freshwater or estuarine/marine fish or estuarine/marine invertebrates. Low risk was also found for aquatic plants.

The Tier II PRZM/EXAMS standard ecological assessment pond modeling scenario was used to generate expected environmental concentrations to estimate exposure to aquatic organisms.

Tier II PRZM/EXAMS Surface Water EECs for Spinosad

Crop	Application Rate lb a.i./A	Number of Applications (Interval)	Acute Conc g/L	96 Hour Conc g/L	21 Day Conc g/L	60 Day Conc g/L

Legume Forage Hay and Alfalfa Seed	0.031-0.062	6/7da	0.27	0.24	0.20	0.16
Grass Forages, Grass Grown for Seed, Pastures and Rangeland	0.031-0.062	6/7da	0.27	0.24	0.20	0.16
Mint	0.062-0.156	3/5da	1.31	1.15	0.87	0.59
Bulb Vegetables (Green Onions)	0.047-0.094	5/5da	2.15	1.91	1.32	1.12

Selection of Aquatic Toxicological Endpoints Used to Calculate Risk Quotients for Spinosad

Type of Toxicity	Organism	Species	Toxicological Endpoint	MRID #
Acute	Freshwater Fish	Bluegill sunfish	5.94 ppm	434145-34
Chronic		Rainbow trout	0.498 ppm	434145-41
Acute	Freshwater Invertebrates	Daphnid	14 ppm	434145-37
Chronic		Daphnid	0.0006 ppm	438488-01
Acute	Estuarine Fish	Sheepshead minnow	7.87 ppm	434145-40
Chronic		Sheepshead minnow	1.15 ppm	444206-01
Acute	Estuarine Invertebrates	Eastern oyster	0.3 ppm	434441-04
Chronic		Mysid	0.0842 ppm	444206-02
Plants	Freshwater Diatom	Diatom	0.09 ppm	434145-43

Terrestrial Exposure and Risk Assessment

Risk Conclusions

EFED found low risk to birds and small mammals. No endpoints were affected in the studies.

For spinosad use on registered sites, terrestrial exposure is normally evaluated using estimated environmental concentrations generated from FATE5 or T-REX, spreadsheet-based models that calculate the decay of a chemical applied to foliar surfaces for single and multiple applications. The models assume initial concentrations on plant surfaces for single and multiple applications.

The models assume initial concentrations on plant surfaces based on Kenaga predicted maximum residues as modified by Fletcher, *et al.* (1994) and assumes 1st order dissipation.

To assess acute risk in birds and mammals, EECs on food items following product application were compared to LC_{50} values. To assess chronic risk in birds and mammals, EECs were compared to the NOAEC values.

Selection of Terrestrial Toxicological Endpoints Used to Calculate Risk Quotients for Spinosad

Type Of Toxicity	Organism	Species	Toxicological Endpoint	MRID #
Oral Acute	Bird	Bobwhite/Mallard	1333 mg/kg	434145-29/ 434145-28
Dietary		Bobwhite/Mallard	>5156 ppm	434145-31/ 434145-30
Chronic		Bobwhite/Mallard	550 ppm	434145-33/ 434145-32
Oral Acute	Mammal	Rat	LOAEL >5000 ppm [1]	437015-01
Chronic		Rat	NOAEL >1100 ppm [2]	437015-06

[1]Increased heart, kidney, liver, spleen, and thyroid weights (both sexes); corroborative histopathology in the spleen and thyroid (both sexes), hear and kidney (males only), and histopathologic lesions in the lungs and mesenteric lymph nodes (both sexes), stomach (females only), and prostate.

[2]Decreases in litter size, survival (F2 litters only), offspring body weights, and increased incidence of dystocia and/or vaginal bleeding after parturition with associated increases in dam mortality.

Environmental Fate Characterization

Summary

Environmental fate data and modeling results indicate that spinosad can be expected to dissipate rapidly in the environment with a low potential to impact water resources. Spinosad Factors A and D degrade in aerobic laboratory soil with half-lives of approximately 9-17 days. They photodegrade readily in sterile water (<1 day at pH 7) and on soil (about 10 days). Spinosad Factor A has a low to moderate water solubility and a low to slight mobility in sandy soils, and is immobile in silt loam and clay loam soils. Although no mobility data are available for Spinosad Factor D, it is 180x less soluble than Factor A and therefore would be expected to be less likely to leach in the soil. In terrestrial field dissipation studies with Spinosad Factor A on bareground plots, the half-life was <1 day, no leaching was observed, and 3.1% of the applied was recovered in runoff.

Although spinosad photodegrades rapidly in water, it is persistent in sediment. Spinosad has a high affinity for sediment and moves rapidly from the water to the sediment phases. In

anaerobic aquatic metabolism studies, spinosad had a half-life of 161-250 days. In an aquatic microcosm dissipation outdoor study, spinosad residues in the sediment peaked at 8 days and had an observed half-life of >>25 days. Spinosad has a relatively low bio-concentration factor (BCF's of the parent 7.5X, 28.8X, and 21.1X for muscle, viscera, and whole fish, respectively), and a relatively rapid rate of depuration (half-life of about one day). These factors generally would prevent substantial bio-concentration of the material in the food web.

Degradation and Metabolism
Spinosad Factors A and D were relatively stable in pH 5, 7, and 9 sterile aqueous buffer solutions that were incubated in the dark at 25°C.

In sterile buffered (pH 7) solutions, Spinosad Factors A and D photodegraded with half-lives of 0.8-0.9 days. The β-isomers of the 13,14-dihydro of the pseudoaglycone of Factor A and of Factor D were detected at a maximum of 20.2-24.9% of the applied at 48 hours (study termination). In alkaline (pH 9.2) pond water, Factors A and D degraded rapidly with half-lives of 0.54-0.55 days. On soil, Factors A and D had photodegradation half-life of 8.68-9.71 days. The only degradate present at >5 % of the applied was Factor B (N–demethylated Factor A), which reached 14.8% of the applied at 18 days posttreatment.

In aerobic silt loam soil, Spinosad Factors A and D degraded with initial half-lives of 17.3 and 14.5 days, respectively. Factor A degraded with a half-life of 9.4 days in sandy loam soil incubated under similar conditions. Approximately 75-90% of the applied spinosad dissipated by 28 days. The major degradate of Factor A was Factor B (N-demethylated Factor A), which accumulated to a maximum 51-61% of the applied at 14-28 days posttreatment, then decreased to 12.27-21.72% at 9 months and 2.77-5.96% at 1 year. The major degradate of Factor D was N-demethylated Factor D (the Factor D analogue of Factor B), which accumulated to a maximum 68% of the applied at 28 days posttreatment and approximately 50% at 6 months. Several minor degradates, each <10% of the applied, were isolated but not conclusively identified.

In anaerobic flooded clay sediment, Factors A and D degraded with half-lives of 161 and 250 days. By 7 days posttreatment, >90% of the applied radioactivity was associated with the sediment fraction. Three major degradates of Factor A, each present at a maximum 8-12% of the applied, were identified: Factor B (N-demethylated Factor A), reversepseudoaglycone (806643), and ketoreversepseudoaglycone (814426). One major degradate of Factor D, N-demethylated Factor D (the Factor D analogue of Factor B), was present at a maximum 6.5% of the applied.

The mobility of Factor A is expected to be very low. At nominal concentrations of 0.04-5.0 µg/mL, it was investigated in sand, loamy sand, sandy loam, silt loam, and clay loam soils. K_{oc} values were 2,862, 831, 4,237, 134,583, and 21,938, respectively. Freundlich K_{des} values for both desorption phases for the sand, loamy sand, sandy loam, and silt loam soils were 8.4-9.2, 6.6-8.2, 27-30, 288-357 and 292-296, respectively; corresponding 1/n values ranged from 0.826-0.921. The reviewer-calculated coefficients of determination (r^2) for the relationships K_{ads} *vs.* organic matter, K_{ads} *vs.* pH and K_{ads} *vs.* clay content were 0.0647, 0.0498, and 0.8114, respectively.

Soil sorption and mobility
The mobility of Factor B, the major degradate of Factor A, is expected to be very low. It was investigated at 0.05-5.0 µg/mL in sand, loamy sand, sandy loam, and silt loam soils. K_{oc} values were 2,138, 662, 2,881, and 74,583, respectively. Freundlich K_{des} values for both desorption phases for the sand, loamy sand, sandy loam, and silt loam soils were 6.3-6.5, 5.3-6.3, 19-20, and 171-179, respectively; corresponding 1/n values ranged from 0.775-0.880. The reviewer-calculated coefficients of determination (r^2) for the relationships K_{ads} *vs*. organic matter, K_{ads} *vs*. pH and K_{ads} *vs*. clay content were 0.425, 0.235 and 0.957, respectively.

Factors A and D are not volatile; vapor pressures (25°C) are 2.0 to 3.0 x 10^{-11} kPa. CO_2 was the only volatile compound detected in metabolism studies.

Field dissipation
Factor A, formulated as an emulsifiable concentrate, degraded with half-lives of 0.5 days in bareground plots of silt loam soil in Mississippi and 0.3 days in loam soil in California. Approximately 2-3% remained after 3-5 days. No degradates were identified. Spinosad Factor A and its degradates were not detected below the 6-inch soil depth. Unextracted [^{14}C]residues increased to a maximum of 34-58% by 38-40 days. At the Mississippi site, total radioactivity in the runoff accounted for 3.1% of the applied radioactivity.

Pond water (pH 7.6, ca. surface area 2.2 m^2, depth 47.5-50 cm) and clay loam sediment (ca. depth 5.5-6 cm) maintained in outdoor tanks were treated once with a broadcast-spray application of the suspension concentrate at 100 g/ha to the water surface. Spinosad (Factors A + D) dissipated rapidly from the water with a calculated half-life of 1.5 days, and total spinosad residues dissipated from the water with a calculated half-life of 4 days. In the water, the degradates Factors B and B of D were detected at maximums of 2.3 ppb (8 hours) and 3.6 ppb (0 hour), respectively, and were <0.5 ppb at 15 days. In the sediment, Factor A was detected at a maximum average 14.9 ppb at 4 days and was 14.3 ppb at 35 days. Factor B was detected at a maximum average 11.1 at 15 days and was ≤9.4 ppb at 35 days. Factors D was ≤4.2 ppb and B of D was not detected (LOD 11.3 ppb) at any interval in the sediment. Total spinosad residues in the water had an observed half-life of <1 days. Total spinosad residues in the sediment reached a maximum concentration at 8 days posttreatment and had decreased by approximately 25% by 35 days.

Accumulation
[^{14}C]Factors A and D accumulated at low concentrations in rainbow trout held under laboratory flow-through conditions for up to 28 days. In the high concentration experiments (19.0 ng/L for Factor A and 33.0 ng/L for Factor D), maximum BCFs for Factor A were 28.8 mL/g (at Day 28) for the nonedible tissue, 7.5 mL/g (at Day 25) for the edible tissue, and 21.1 mL/g (at Day 7) for the whole fish tissue; and for Factor D were 42 mL/g (at Day 11) for the nonedible tissue, 20.5 mL/g (at Day 11) for the edible tissue, and 41.9 mL/g (at Day 7) for the whole fish tissue. Registrant-calculated BCFs for total [^{14}C]residues were 103-152, 16-47, and 84-115 mL/g for the nonedible, edible, and whole fish tissues, respectively.

Aglycone ring-labeled [U-^{14}C]spinosad Factor D, at 33.0 and 8.2 ng/mL, accumulated at low

concentrations in rainbow trout held under laboratory flow-through conditions for up to 28 days. BCFs for total [^{14}C]residues were 118-142, 32-47, and 100-115 mL/g for the nonedible, edible, and whole fish tissues, respectively.

Aquatic Exposure Characterization

Estimated Environmental Concentrations (EECs) for Aquatic Ecological Effects
The Tier II PRZM/EXAMS MS POND modeling scenario was used to generate expected environmental concentrations to estimate exposure to aquatic organisms.

Surface water EECs (ppm) for ecological risk assessment of Spinosad.

Crop	Application rate (lbs ai/A)	Number of applications	Peak (ppm)	21 day (ppm)	60 day (ppm)
Legume Forage Hay and Alfalfa Seed	0.031	6	0.0003	0.0002	0.00016
Grass Forages, Grass Grown for Seed, Pastures and Rangeland	0.031	6	0.0003	0.0002	0.00016
Mint	0.150	3	0.00131	0.0009	0.0006
Bulb Vegetables (Green onions)	0.090	5	0.00215	0.00132	0.00112

VI. Risk Characterization

Risk Estimation
A means of integrating the results of exposure and eco-toxicity data is called the deterministic method. For this method, risk quotients (RQs) are calculated by dividing exposure estimates by eco-toxicity values, both acute and chronic.

RQ = EXPOSURE/TOXICITY

RQs are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action.

The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories: (1) **acute high** - potential for acute risk is high, regulatory action may be warranted in addition to restricted use classification (2) **acute restricted use** - the potential for acute risk is high, but this may be mitigated through restricted use classification (3) **acute endangered species** - the potential for acute risk to endangered species is high, regulatory action may be warranted, and (4) **chronic risk** - the potential for chronic risk is high, regulatory action may be warranted. Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to non-target insects, or chronic risk from granular/bait formulations to mammalian or avian species.

The eco-toxicity test values (i.e., measurement endpoints) used in the acute and chronic risk quotients are derived from the results of required studies. Examples of eco-toxicity values derived from the results of short-term laboratory studies that assess acute effects are: (1) LC50 (fish and birds) (2) LD50 (birds and mammals) (3) EC50 (aquatic plants and aquatic invertebrates) and (4) EC25 (terrestrial plants). An example of a toxicity test effect level derived from the results of long-term laboratory studies that assess chronic effects is: (1) NOAEC (birds, fish and aquatic invertebrates).

Risk presumptions, along with the corresponding RQs and LOCs are tabulated below:

Risk Presumptions for Terrestrial Animals

Risk Presumption	*RQ*	*LOC*
Birds:		
Acute High Risk	EEC[1]/LC50 or LD50/sqft[2] or LD50/day[3]	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOAEC	1
Wild Mammals:		
Acute High Risk	EEC/LC50 or LD50/sqft or LD50/day	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOAEC	1

EEC=abbreviation for Estimated Environmental Concentration (ppm) on avian/mammalian food items

$$\frac{mg/ft^2}{LD50 * wt.\ of\ bird} \qquad \frac{mg\ of\ toxicant\ consumed/day}{LD50 * wt.\ of\ bird}$$

Risk Presumptions for Aquatic Animals

Risk Presumption	*RQ*	*LOC*
Acute High Risk	EEC[1]/LC50 or EC50	0.5
Acute Restricted Use	EEC/LC50 or EC50	0.1
Acute Endangered Species	EEC/LC50 or EC50	0.05
Chronic Risk	EEC/MATC or NOAEC	1

[1] EEC = (ppm or ppb) in water

Risk Presumptions for Plants

Risk Presumption	*RQ*	*LOC*
Terrestrial and Semi-Aquatic Plants:		
Acute High Risk	EEC[1]/EC25	1
Acute Endangered Species	EEC/EC05 or NOAEC	1
Aquatic Plants:		
Acute High Risk	EEC[2]/EC50	1
Acute Endangered Species	EEC/EC05 or NOAEC	1

[1] EEC = lbs ai/A
[2] EEC = (ppb/ppm) in water

Aquatic Risk Quotients and Comparison to LOCs

Exposure and Risk to Nontarget Freshwater Aquatic Animals

Non-target aquatic organisms (freshwater and estuarine/marine fishes and invertebrates) can be exposed to spinosad by spray drift and runoff into surface water.

The risk quotients for freshwater fish and invertebrates are tabulated below.

RQs for Freshwater Fish Based On a Bluegill LC50 of 5.94 ppm and a Rainbow Trout NOAEC of 0.498 ppm

Site	LC50 (ppm)	NOAEC (ppm)	EEC Initial/Peak (ppm)	EEC 60-Day (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Legume forage hay and alfalfa seed	5.94	0.498	0.0003	0.00016	0.00	0.00
Grass forage, pasture and rangeland	5.94	0.498	0.0003	0.00016	0.00	0.00
Mint	5.94	0.498	0.00131	0.0006	0.00	0.00
Green onion	5.94	0.498	0.00215	0.00112	0.00	0.00

RQs for Freshwater Invertebrates Based On a Daphnid EC50 of 14 ppm and NOAEC of 0.0006 ppm

Site	EC50 (ppm)	NOAEC (ppm)	EEC Initial/Peak (ppm)	EEC 21-Day Average (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOAEC)
Legume forage hay and alfalfa seed	14	0.0006	0.0003	0.0002	0.00	0.33
Grass forage, pasture and rangeland	14	0.0006	0.0003	0.0002	0.00	0.33
Mint	14	0.0006	0.00131	0.0009	0.00	**1.50**
Green Onion	14	0.0006	0.00215	0.00132	0.00	**2.20**

The results indicate no acute level of concern is exceeded for freshwater fish or invertebrates. However, chronic RQs (1.50-2.20) for freshwater invertebrates exceed the LOC for mint and green onion. No chronic LOCs were exceeded for freshwater fish.

The risk quotients for estuarine fish and invertebrates are tabulated below.

RQs for Estuarine/Marine Fish Based on a Sheepshead Minnow LC50 of 7.87 ppm and NOAEC of 1.15 ppm

Site	LC50 (ppm)	NOAEC (ppm)	EEC Initial/ Peak (ppm)	EEC 60-Day Average (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOAEC)
Legume forage hay and alfalfa seed	7.87	1.15	0.0003	0.00016	0.00	0.00
Grass forage, pasture and rangeland	7.87	1.15	0.0003	0.00016	0.00	0.00
Mint	7.87	1.15	0.00131	0.0006	0.00	0.00
Green onion	7.87	1.15	0.00215	0.00112	0.00	0.00

RQs for Estuarine/Marine Aquatic Invertebrates Based on an Oyster EC50 of 0.3 ppm and Mysid NOAEC of 0.0842 ppm

Site	EC50 (ppm)	NOAEC (ppm)	EEC Initial/ Peak (ppm)	EEC 21-Day Average (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOAEC)
Legume forage hay and alfalfa seed	0.3	0.0842	0.0003	0.0002	0.00	0.00
Grass forage, pasture and rangeland	0.3	0.0842	0.0003	0.0002	0.00	0.00
Mint	0.3	0.0842	0.00131	0.0009	0.00	0.01
Green onion	0.3	0.0842	0.00215	0.00132	0.00	0.02

The results indicate no acute or chronic level of concern is exceeded for estuarine fish or invertebrates.

Terrestrial Risk Quotients and Comparison to LOCs

Avian and Terrestrial Mammals

There were low risks to avian and mammalian species from the current proposed uses of Spinosad. The greatest EEC/most toxic endpoint did not produce any RQ that exceeded any acute or chronic LOC.

Nontarget Insects and Plants

Insects

Currently, EFED does not assess risk to non-target insects using an RQ method. Results of acceptable studies are used for recommending appropriate label precautions. Since spinosad is toxic to honeybees, risk to non-target and endangered/threatened beneficial insects is assumed.

Plants

No terrestrial plant species in the Tier I Seedling Emergence and Vegetative Vigor Toxicity Tests, showed more than 25% detrimental effect after application of spinosad (MRIDs 438488-02 and 445977-32). The EC_{25} for the TGAI was >0.178 and the EC_{25} for a formulated product (44.2% NAF-85) was >0.5. As a result, Tier II plant tests were not necessary. Guidelines 122-1(a) and (b) have been satisfied (MRIDs 438488-02 and 445977-32). Application to mint presents the highest rates of the uses presented. Thus, the application to mint is below levels expected to cause effects to terrestrial plants.

Acute risk quotients for aquatic plants are tabulated below.

Acute RQs for Aquatic Plants based on a nonvascular plant (most toxic was the freshwater diatom) EC50 of 0.09 ppm

Site	Test Species	EC50 (ppm)	EEC (ppm)	RQ (EEC/ EC50)
Legume forage hay and alfalfa seed	freshwater diatom	0.09	0.0003	0.00
Grass, Pastures and Rangeland	freshwater diatom	0.09	0.0003	0.00
Mint	freshwater diatom	0.09	0.00131	0.01
Green onion	freshwater diatom	0.09	0.00215	0.02

The results indicate that no acute or endangered species level of concern is exceeded for aquatic plants.

Risk Description Characterization

No acute level of concern is exceeded for freshwater or estuarine/marine fish or invertebrates. Also, no chronic levels of concern were exceeded for freshwater and estuarine/marine fish or estuarine/marine invertebrates. However, chronic RQs (1.50-2.20) for endangered and non-

endangered freshwater free-swimming and sediment dwelling invertebrates exceed the LOC for mint and green onion. Also, since spinosad is toxic to honeybees, risk to beneficial terrestrial invertebrates is assumed. Low risk was found for birds, mammals and plants.

Endangered and threatened chronic levels of concern were exceeded for freshwater invertebrates for mint and green onion uses and since spinosad is toxic to honeybees, risk to beneficial insects for all uses is possible, should exposure actually occur.

Key Fate and Transport Conclusions

Spinosad is a mixture of two active naturally occurring isomers (Spinosad Factors A and D). Although there are more information on Factor A than Factor D, due to their similarity in chemical structures and properties, they are expected to behave very similarly in the environment and in toxicity. Therefore, spinosad is used to represent both Factors A and D.

Spinosad Factors A and D degrade in aerobic laboratory soil with half-lives of 13 and 14 days, respectively. They photodegrade readily in sterile water (<1 day at pH 7) and on soil (about 10 days). Based on McCall's relative mobility comparison, Factor A has a low to slight mobility in sandy soils and is immobile in silt loam and clay loam soils. Although no mobility data have been provided for Factor D, it is 180x less soluble than Factor A and therefore Factor D is less likely to leach in the soil or runoff to surface water. Spinosad is not volatile; vapor pressures (25°C) are 2.0 to 3.0 x 10^{-11} kPa. CO_2 is the only volatile degradate. In terrestrial field dissipation studies on bareground plots, the estimated half-life of Factor A, formulated as an emulsifiable concentrate, was 0.3-0.5 days, and residues accounted for 3.1% of the applied in the runoff but did not leach. When spinosad was applied directly to the water surface in outdoor aquatic microcosm dissipation studies, total spinosad residues in the water had an observed half-life of <1 day.

Spinosad Factors A and D are stable to hydrolysis in pH 5, 7, and 9 buffer solutions. In flooded sediment, spinosad moves readily from the water to the solid phases. Spinosad degrades slowly in anaerobic sediment with half-lives of 161-250 days. Degradation rates in aerobic sediment were not determined. In an aquatic microcosm study, spinosad residues in the sediment peaked at 8 days and had an observed half-life of >25 days.

The major transformation product of Factor A is Factor B (N-demethylated Factor A). The major transformation product of Factor D is N-demethylated Factor D (the Factor D analogue of Factor B). IUPAC names were not provided for either transformation product. In aerobic soil metabolism laboratory studies using the parent, both transformation products accumulated to >50% of the applied by 28 days and had observed half-lives of >6 months. Spinosad Factor B is relatively immobile; no information is available on the mobility of N-demethylated Factor D. Neither transformation product was identified in terrestrial field dissipation studies.

Risk Discussion

EFED's main concern is for beneficial terrestrial insects and freshwater aquatic invertebrates. Because spinosad is toxic to honeybees, risk is assumed. Chronic RQs (1.50-2.20) for endangered and non-endangered freshwater free-swimming and sediment dwelling invertebrates

exceed the LOC of 1.0 for mint and green onion. Because chronic exposure to freshwater free-swimming invertebrates may produce adverse effects, their vulnerability represents potential risk from accumulations of spinosad in sediments, thus possibly affecting benthic invertebrate populations. As a dynamic trophic level, invertebrates add to the diversity of an aquatic system. Many fish species rely on these invertebrate populations for survival. Environmental fate data and modeling results indicate that spinosad is expected to dissipate rapidly in the environment with a low potential to leach or runoff to surface water. However, if spinosad residues do reach sediment, they are likely to be moderately persistent (half-live >25 days). Since spinosad may persist somewhat in the sediment, sediment toxicity testing will be needed to address the uncertainty of possible risk to the assemblages of benthic communities in order to determine potential impacts to aquatic systems. The benthos is composed of a diversity of aquatic invertebrates (e.g., insect larvae, crustaceans, mollusks), species of fish (e.g., catfish, loachs), as well as certain critical life stages of organisms that reside in the water column. The benthos is also the initial breeding strata and nursery area for several species of fish, especially commercial species such as salmonids. The benthos can also be a source of food items for several species of fish that are actively feeding on the organisms in the sediment and/or capturing organisms that are emerging from this area. Exposure to compounds in the sediment is a result of chemical binding to particulate and organic carbon in the water column and the eventual settling-out and accumulation of these compounds in the benthos.

Incident Characterization

There were 4 incidents reported in the EIIS database. All incidents reported were plant related. No residue analysis was reported for any incidents.

Incident #	Date	Crop	State	Certainty	Legality	Application	Magnitude
IO13636-036	3.15.02	Orange	CA	2 -possible	RU	Broadcast	21 acres
IO12366-001	9.10.01	Corn	CA	2- possible	UN	UN	9000 acres
IO13550-002	6.22.01	Potato	DE	2- possible	RU	Spray	65 acres
IO10927-029	4.15.00	Tobacco	TN	1- unlikely	RU	Spray	45 acres

Endocrine Disruption

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally-occurring estrogen, or other such endocrine effects as the Administrator may designate." Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was scientific basis for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening

Program (EDSP).

When the appropriate screening and or testing protocols being considered under the Agency's Endocrine Disruptor Screening Program have been developed, spinosad may be subjected to additional screening and or testing to better characterize effects related to endocrine disruption. Possible endocrine mediated effects were found in a chronic freshwater invertebrate study with *Daphnia magna*, where a NOAEC of 0.62 ppb was established based on a statistically significant reduction in egg production at the highest concentration tested, 2.19 ppb. Egg production is an endocrine-mediated process. Also, there were increases in thyroid weights as well as increased thyroid, parathyroid and pituitary gland cell vacuolation in mammalian studies. Thus, EFED will ask for additional testing when such testing is required.

Threatened and Endangered Species Concerns

The following section discusses the screening level assessment for Federally listed threatened and endangered species (listed species).

Risk to Federally Listed Endangered and Threatened Species

Based on available screening-level information, there is a potential concern for chronic effects on listed freshwater aquatic and acute effects on listed terrestrial invertebrates should exposure actually occur. These findings are based solely on EPA's screening level assessment and do not constitute "may affect" findings under the ESA for any specific listed species.

The Agency has developed the Endangered Species Protection Program to identify pesticides whose use may cause adverse impacts on federally listed endangered and threatened species, and to implement mitigation measures that address these impacts. The Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize listed species or adversely modify designated critical habitat. To analyze the potential of registered pesticide uses that may affect any particular species, EPA uses basic toxicity and exposure data developed for the assessments and considers ecological parameters, pesticide use information, the geographic relationship between specific pesticide uses and species locations and biological requirements and behavioral aspects of the particular species. When conducted, this analysis will consider regulatory changes recommended in this assessment that are implemented at that time. A determination that there is a likelihood of potential effects to a listed species may result in limitations on the use of the pesticide, other measures to mitigate any potential effects, or consultations with the Fish and Wildlife Service or National Marine Fisheries Service as appropriate. Until that species specific analysis is completed, the risk mitigation measures being implemented through this assessment will reduce the likelihood that endangered and threatened species may be exposed to spinosad at levels of concern.

Applications

For scenarios used to evaluate risk to aquatic organisms, the LOC (1.0) for chronic effects to listed species of freshwater invertebrates (RQs ranged from 1.50 to 2.20) were exceeded for the mint and bulb vegetable uses under multiple application scenarios.

Endangered insects and other terrestrial invertebrates may also be at risk from all uses due to the toxicity profile for honeybees (spinosad is toxic to honeybees thus risk is assumed) should exposure actually occur.

Listed Species
The following table lists the number of listed species within taxonomic groups for which RQs exceed the listed species LOCs. Some of these listed species may not be at risk through exposure to Spinosad based on size, behavior, food items and habitat. The entire list of listed endangered/threatened species is given in the Appendix.

GREEN ONION

Arkansas

The taxa Insect has 1 species affected by indicated crops.

California

The taxa Insect has 22 species affected by indicated crops.

Colorado

The taxa Insect has 2 species affected by indicated crops.

Connecticut

The taxa Insect has 1 species affected by indicated crops.

Florida

The taxa Insect has 1 species affected by indicated crops.

Georgia

The taxa Insect has 1 species affected by indicated crops.

Hawaii

The taxa Insect has 1 species affected by indicated crops.

Illinois

The taxa Insect has 2 species affected by indicated crops.

Indiana

The taxa Insect has 2 species affected by indicated crops.

Kansas

The taxa Insect has 1 species affected by indicated crops.

Kentucky

The taxa Insect has 1 species affected by indicated crops.

Maryland

The taxa Insect has 2 species affected by indicated crops.

Massachusetts

The taxa Insect has 3 species affected by indicated crops.

Michigan

The taxa Insect has 4 species affected by indicated crops.

Minnesota

The taxa Insect has 2 species affected by indicated crops.

Missouri

The taxa Insect has 3 species affected by indicated crops.

Nevada

The taxa Insect has 2 species affected by indicated crops.

New Hampshire

The taxa Insect has 1 species affected by indicated crops.

New York

The taxa Insect has 1 species affected by indicated crops.

North Carolina

The taxa Insect has 1 species affected by indicated crops.

Ohio

The taxa Insect has 3 species affected by indicated crops.

Oklahoma

The taxa Insect has 1 species affected by indicated crops.

Oregon

The taxa Insect has 2 species affected by indicated crops.

Rhode Island

The taxa Insect has 1 species affected by indicated crops.

South Dakota

The taxa Insect has 1 species affected by indicated crops.

Texas

The taxa Insect has 9 species affected by indicated crops.

Virginia

The taxa Insect has 1 species affected by indicated crops.

Washington

The taxa Insect has 1 species affected by indicated crops.

Wisconsin

The taxa Insect has 3 species affected by indicated crops.

MINT

California

The taxa Amphibian has 4 species affected by indicated crops.

The taxa Fish has 12 species affected by indicated crops.

The taxa Insect has 3 species affected by indicated crops.

Idaho

The taxa Fish has 5 species affected by indicated crops.

The taxa Gastropod has 6 species affected by indicated crops.

Indiana

The taxa Bivalve has 3 species affected by indicated crops.

The taxa Insect has 1 species affected by indicated crops.

Michigan

The taxa Bivalve has 1 species affected by indicated crops.

The taxa Fish has 1 species affected by indicated crops.

The taxa Insect has 3 species affected by indicated crops.

Montana

The taxa Fish has 2 species affected by indicated crops.

Nevada

The taxa Fish has 3 species affected by indicated crops.

New Mexico

The taxa Fish has 2 species affected by indicated crops.

Ohio

The taxa Bivalve has 1 species affected by indicated crops.

Oregon

The taxa Fish has 19 species affected by indicated crops.

The taxa Insect has 2 species affected by indicated crops.

South Dakota

The taxa Fish has 1 species affected by indicated crops.

Utah

The taxa Fish has 1 species affected by indicated crops.

Washington

The taxa Fish has 9 species affected by indicated crops.

Wisconsin

The taxa Bivalve has 3 species affected by indicated crops.

The taxa Fish has 1 species affected by indicated crops.

The taxa Insect has 1 species affected by indicated crops.

Taxonomic Groups Potentially at Risk

For the freshwater aquatic invertebrate species evaluated in this risk assessment, RQs exceeded the LOCs for endangered species for the mint and bulb vegetable exposure scenarios considered. Also, since spinosad is toxic to honeybees, risk is assumed for beneficial terrestrial invertebrates.

Action Area

The Endangered Species Act defines the action area for a Federal action as being the footprint of possible effects stemming from the action, not necessarily limited to where the immediate action occurs. For screening-level purposes, the risk assessment conservatively assumes that listed species are co-located with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated field and aquatic organisms are assumed to be located in a surface water body adjacent to the treated field. This assumption places the listed species within an assumed area of high potential exposure to the pesticide. If these assumptions result in RQs that are below the listed species LOCs, a "no effect" conclusion is made. However, in situations where the screening assumptions lead to RQs in excess of the listed species LOCs, the potential for a "may affect" conclusion exists. In such cases, additional information on the biology of listed species, the locations of these species, and the locations of

use sites may be considered to determine the extent to which screening assumptions apply to a particular listed organism. These subsequent refinement steps would consider how this information would impact the action area for a particular listed organism and may include exposures that are downwind and downstream of the pesticide use site.

Indirect Effects Analysis

The Agency acknowledges that pesticides have the potential to exert indirect effects upon the listed organisms by, for example, perturbing forage or prey availability, altering the extent of nesting habitat, and creating gaps in the food chain. In conducting a screen for indirect effects, direct effect LOCs for each taxonomic group are used to make inferences concerning the potential for indirect effects upon listed species that rely upon non-endangered organisms in these taxonomic groups as resources critical to their life cycle. In the case of spinosad, there may be indirect effects to endangered fish from direct impacts from chronic exposure to freshwater invertebrates.

Because screening-level acute RQs exceed the endangered species acute LOCs, the Agency uses the dose response relationship from the toxicity study used for calculating the RQ to estimate the probability of acute effects associated with an exposure equivalent to the EEC (see Probit Analysis below). This information serves as a guide to establish the need for and extent of additional analysis that may be performed using Services-provided "species profiles" as well as evaluations of the geographical and temporal nature of the exposure to ascertain if a "not likely to adversely affect" determination can be made. The degree to which additional analyses are performed is commensurate with the predicted probability of adverse effects from the comparison of the dose response information with the EECs. The greater the probability that exposures will produce effects on a taxa, the greater the concern for potential indirect effects for listed species dependent upon that taxa, and therefore, the more intensive the analysis on the potential listed species of concern, their locations relative to the use site, and information regarding the use scenario (e.g., timing, frequency, and geographical extent of pesticide application).

Birds and Mammals

Screening-level chronic RQs for birds and mammals that feed on short grass, tall grass, broadleaf plants and small insects, and fruits, pods, and large insects that exceed the LOC may indicate a potential concern for indirect effects. The Agency considers this to be indicative of a potential for adverse effects to those listed species that rely either on a specific plant species (plant species obligate) or multiple plant species (plant dependent) for some important aspect of their life cycle. The Agency may determine if listed organisms for which plants are a critical component of their resource needs are within the pesticide use area. This is accomplished through a comparison of Service-provided "species profiles" and listed species location data. If no listed organisms that are either plant species obligates or plant dependent reside within the pesticide use area, a no effect determination on listed species is made. If plant species obligate or dependent organism may reside within the pesticide use area, the Agency may consider temporal and geographical nature of exposure, and the scope of the effects data, to determine if any potential effects can be determined to not likely adversely affect a plant species obligate or dependent listed organism.

Indirect effects to terrestrial animals may result from reduced food items to animals, behavior modifications from reduced or a modified habitat, and from alterations of habitats. Alterations of habitats can affect the reproductive capacity of some terrestrial animals.

Probit Slope Analysis

The probit slope response relationship is evaluated to calculate the chance of an individual event corresponding to the listed species acute LOCs. If information is unavailable to estimate a slope for a particular study, a default slope assumption of 4.5 is used as per original Agency assumptions of typical slope cited in Urban and Cook (1986).

a. Terrestrial Species

Data from avian and mammalian terrestrial acute toxicity studies for spinosad did not provide an estimate of slope. Neither the avian LC50 study (>5156 mg/kg) nor the mammalian acute study (LD50>5000 mg/kg) resulted in mortality.

b. Aquatic Species

Analysis of raw data from the aquatic acute toxicity studies for spinosad estimate slopes of 4.39 for freshwater fish, 1.62 for freshwater invertebrates, 7.62 for estuarine/marine fish, 2.2 for estuarine/marine invertebrates and 2.59 for aquatic plants. Based on these slopes, the corresponding estimate chance of individual mortality following spinosad exposure is 1 in 1.78 x 10^8 for freshwater fish, 1 in 57 for freshwater invertebrates, 1 in 1 x 10^{16} for estuarine/marine fish, 1 in 4.75 x 10^2 for estuarine/marine invertebrates and 1 in 2 for aquatic plants.

Critical Habitat

In the evaluation of pesticide effects on designated critical habitat, consideration is given to the physical and biological features (constituent elements) of a critical habitat identified by the U.S Fish and Wildlife and National Marine Fisheries Services as essential to the conservation of a listed species and which may require special management considerations or protection. The evaluation of impacts for a screening level pesticide risk assessment focuses on the biological features that are constituent elements and is accomplished using the screening-level taxonomic analysis (risk quotients, RQs) and listed species levels of concern (LOCs) that are used to evaluate direct and indirect effects to listed organisms.

The screening-level risk assessment has identified potential concerns for indirect effects on listed species. In light of the potential for indirect effects, the next step for EPA and the Service(s) is to identify which listed species and critical habitat are potentially implicated. Analytically, the identification of such species and critical habitat can occur in either of two ways. First, the agencies could determine whether the action area overlaps critical habitat or the occupied range of any listed species. If so, EPA would examine whether the pesticide's potential impacts on non-endangered species would affect the listed species indirectly or directly affect a constituent element of the critical habitat. Alternatively, the agencies could determine which listed species depend on biological resources, or have constituent elements that fall into, the taxa that may be directly or indirectly impacted by the pesticide. Then EPA would determine whether use of the pesticide overlaps the critical habitat or the occupied range of those listed species. At present, the information reviewed by EPA does not permit use of either analytical approach to make a

definitive identification of species that are potentially impacted indirectly or critical habitats that is potentially impacted directly by the use of the pesticide. EPA and the Service(s) are working together to conduct the necessary analysis.

This screening-level risk assessment for critical habitat provides a listing of potential biological features that, if they are constituent elements of one or more critical habitats, would be of potential concern. These correspond to the taxa identified above as being of potential concern for indirect effects. This list should serve as an initial step in problem formulation for further assessment of critical habitat impacts outlined above, should additional work be necessary.

Possible Risk Refinement Measures

Source control measures such as reduction in the application rate, reduction in the number of applications (especially in the presence of pollinators), and increasing the interval between applications may be implemented for Spinosad as possible risk reduction measures.

APPENDIX I. Ecological Effects Information

Summary:

This insecticide was practically non-toxic to avian species-(subacutely) and mammals (acutely and chronically). However, Spinosad was slightly toxic to avian species-(acutely), cold-water fish, and freshwater aquatic invertebrates. Spinosad was moderately toxic to warm-water fish, estuarine/marine fish(acutely) and estuarine shrimp. Furthermore, this insecticide was found to be highly toxic to estuarine/marine oysters and honey bees(acute studies)

Toxicity to Terrestrial Animal

The results of acute/subacute toxicity testing indicate that Spinosad is practically nontoxic to avian species on a subacute dietary basis and slightly toxic on an acute oral basis. Results of avian toxicity testing with spinosad are tabulated below.

Avian Acute/Subacute Toxicity

Species	% ai	LC50 (ppm)/ LD50 (ppm)	Toxicity Category	MRID No. Author/Year	Study Classification
Northern bobwhite quail *(Colinus virginianus)	**88**	**LD50 >1333**	**slightly toxic**	**43414529 A.G. Murray *et al* (1992)**	**Supplemental[1]**
Mallard duck *(Anas platyrhynchus)	**88**	**LD50 >1333**	**slightly toxic**	**43414528 A.G. Murray *et al* (1992)**	**Supplemental[1]**
Northern bobwhite quail *(Colinus virginianus)	**88**	**LC50 >5156**	**practically non-toxic**	**43414531 A.G. Murray *et al* (1992)**	**Core**
Mallard duck *(Anas platyrhynchus)	**88**	**LC50 >5156**	**practically non-toxic**	**43414530 A.G. Murray *et al* (1992)**	**Core**

[1] Study is classified supplemental, but does not need to be repeated (refer to Data Evaluation for details). Study is adequate for risk assessment purposes.

Avian Reproduction

Species	% ai	NOAEC/LOAEC (ppm)	Endpoints Affected	MRID No. Author/Year	Study Classification

Avian Reproduction

Species	% ai	NOAEC/LOAEC (ppm)	Endpoints Affected	MRID No. Author/Year	Study Classification
Northern bobwhite quail *(Colinus virginianus)	**88**	**550/1100**	**eggs laid, live 3-wk embryos, normal hatchlings, 14-day old survivors, hatchling weight**	**43414533 J. B. Beavers *et al* (1994)**	**Core**
Mallard duck *(Anas platyrhynchus)	**88**	**550/1100**	**eggs laid, eggshell thickness, viable embryos, live 3-wk embryos, normal hatchlings, 14-day old survivors, terminal female body weight**	**43414532 J. B. Beavers *et al* *(1994)***	**Core**

Mammals, Acute and Chronic

Wild mammal testing is required on a case-by-case basis, depending on the results of lower tier laboratory mammalian studies, intended use pattern and pertinent environmental fate characteristics. In most cases, rat or mouse toxicity values obtained from the Agency's Health Effects Division (HED) substitute for wild mammal testing. Based on a laboratory rat LD_{50} value of >5000 mg/kg, spinosad is practically nontoxic to small mammals on an acute oral basis. These toxicity values are reported below.

Mammalian acute toxicity

Species	% ai	Test Type	Toxicity Value	Affected Endpoints	MRID
Rat *(Rattus norvegicus)*	Tech	oral LD50	>5000 mg/kg	None	437707-01 434145-15

Mammalian chronic toxicity

Species	% ai	Test Type	Toxicity Value	Affected Endpoints	MRID
Laboratory mouse *(Rattus norvegicus)*	88	Rat Reproduction	>1100 ppm	None	437015-06

Terrestrial Invertebrates

Earthworm Toxicity

Species	% ai	LC50 (mg/kg)	NOAEC (mg/kg)	Endpoints Affected	MRID	Study Classification
*Earthworm	88	>970	970	weight decreases	434145-48	Supplemental

Insects

Based on a honey bee acute contact test LD_{50} of 0.0029 *ug* ai/bee, Spinosad is highly toxic to bees on an acute contact basis (43414547; K.A. Hoxter *et al* 1992). The results of spinosad testing using the honeybee are tabulated below:

Non-target insect toxicity

Species	% ai	Results	Toxicity Category/effects	MRID	Study Classification
*Honey bee *(Apis mellifera)*	88%	0.0029*ug*ai/bee	Highly Toxic	434145-47	Core
*Honey bee *(Apis mellifera)*	0.02	N/A	N/A	453408-01	Invalid
*Honey bee *(Apis mellifera)*	22.8%	N/A	N/A	450077-04	Invalid
*Honey bee *(Apis mellifera)*	24%	RT 25 = 3hrs	Mortality	450077-02	Supplemental
*Honey bee *(Apis mellifera)*	22.8%	N/A	N/A	450077-03	Invalid
*Honey bee (residue) *(Apis mellifera)*	23.5%	RT 25 = 3hrs	Mortality	450077-01	Core
*Honey bee (field trail) *(Apis mellifera)*	GF-120 Success fruit fly	No adverse effects at use rates	N/A	457082-01/457088-01	Supplemental

Toxicity to Aquatic Animals

The results of acute testing show that Spinosad is categorized as slightly toxic to cold-water freshwater fish and freshwater invertebrates, and moderately toxic to warm-water freshwater fish. Results of freshwater animal acute toxicity testing are tabulated below.

Freshwater Animal Acute Toxicity

Species	% ai	EC50/ LC50 (ppm)	Toxicity Category	MRID No. Author/Year	Study Classification
*Waterflea *(Daphnia magna)*	88	EC_{50}= 14 Slope=N/A	slightly toxic	434145-37 D.P. Milazzo *et al* (1994)	Core
*Waterflea *(Daphnia magna)*	100 Factor D Static	66.8	Slightly toxic	465053-04	Acceptable
*Waterflea *(Daphnia magna)*	96 Factor D static	3.8 Slope=1.62	moderately toxic	465053-09	Acceptable
*Waterflea *(Daphnia magna)*	99 Factor A	>197	practically non-toxic	465053-07	Acceptable
*Waterflea *(Daphnia magna)*	94 Factor B	6.5	moderately toxic	465053-12	Acceptable
*Waterflea *(Daphnia magna)*	94 Factor B	6.39/21.4 Slope=1.78	moderately toxic	445977-31	Supplemental
*Rainbow trout *(Oncorhynchus mykiss)*	88	LC_{50}= 30 Slope=4.39	slightly toxic	434441-03 J.T. Weinberg *et al* (1993)	Core
*Bluegill sunfish *(Lepomis macrochirus)*	88	LC_{50}= 5.94 Slope=N/A	moderately toxic	434145-34 J.L. Newsted and D.E. Brock (1992)	Core

Based on results above, technical Spinosad and its metabolites are considered slightly to moderately toxic to freshwater aquatic invertebrates on an acute toxicity basis. Studies with Spinosad Factors resulted in limited solubility.

Technical Spinosad impacted reproduction in fish at 0.49 ppm and in invertebrates at the 0.0006

ppm. The results of freshwater fish and invertebrate chronic testing are tabulated below.

Freshwater Aquatic Invertebrate Life-Cycle Toxicity and Fish Early Life-Stage Toxicity

Species	% ai	NOAEC/LOAEC (ppm)	MATC (ppm)	Endpoints Affected	MRID No.	Study Classification
Waterflea *(Daphnia magna)*	88	0.0006/0.0012	0.0008	growth and reproductive capacity	43848801	Core
*Waterflea *(Daphnia magna)*	96 Factor D Flow-through	1.0/1.7 ppb		survival, reproduction and growth	465053-01	Invalid
*Waterflea *(Daphnia magna)*	100 Factor D Static renewal	4.85/9.32		length	465053-03	Supplemental
*Waterflea *(Daphnia magna)*	99 Factor A	1.59/3.24 (21 da)		length	465053-06	Supplemental
*Waterflea *(Daphnia magna)*	93 Factor B Flow-through	0.95/2.1 ppb		survival/growth	465053-11	Invalid
*Midge (*Chironomus riparius*)	Factor A & D	0.622/1.328 ppb	0.909 ppb	% emergence	448284-02	Supplemental
*Midge (*Chironomus riparius*)	Dihydropsuedoaglycone of Spinosad 99%	0.252/>0.252 0.0734/>0.0734 (28 da)		% emergence, M & F developmental rates	465053-14	Supplemental
*Rainbow trout *(Oncorhynchus mykiss)*	Factor A & D Flow-through	1.2/2.1(21 da) LC50=4.9		Signs of toxicity mortality	465053-13	Supplemental
*Rainbow trout *(Oncorhynchus mykiss)*	88	0.498/0.962	0.692	growth, survival, day to mean hatch	434145-41 J.T. Weinberg *et al* (1993)	Core

The results show that Spinosad is categorized as moderately toxic to estuarine/marine fish and moderately to very highly toxic to estuarine/marine invertebrates on an acute basis. The results of acute toxicity testing with estuarine/marine species are tabulated below.

Estuarine/Marine Acute Toxicity

Species	% ai.	LC50/EC50 (ppm)	Toxicity Category	MRID No. Author/Year	Study Classification
*Sheepshead minnow (*Cypridon variegatus*)	87.9	LC50 =7.87 Slope=7.62	moderately toxic	434145-40	Core
*Eastern oyster (shell deposition or embryo-larvae) *(Crassostrea virginica)*	87.9	EC50 = 0.3 Slope=2.2	very highly toxic	434441-04/435712-03	Core
*Grass Shrimp *(Palaemonetes pugio*)	87.9	LC50>9.76 Slope=N/A	moderately toxic	434145-39	Supplemental
Mysid *(Americamysis bahia)*	87.9	LC50 >7.87	moderately toxic	434145-39	Supplemental[1]

[1] Although the mysid shrimp study was classified as supplemental (organisms should have been fed during the study), the study does not have to be repeated because the oyster was found to be the most sensitive invertebrate species tested, and will be used for risk assessment purposes in lieu of the mysid shrimp.

Spinosad reduced growth of sheepshead minnow with a MATC of 1.65 ppm. Reproduction is impacted at concentrations as low as 0.17 ppm in mysid shrimp. The results of estuarine animal chronic testing are tabulated below.

Estuarine/ Marine Chronic Toxicity

Species	% ai	NOAEC/LOAEC (ppm)	MATC (ppm)	Endpoints Affected	MRID No. Author/Year	Study Classification
*Sheepshead Minnow, *(Cyprinodon variegatus)*	88	1.15/2.38	1.65	growth (length and weight)	444206-01 R.L. Boeri *et al* (1997)	Core
*Mysid (*Mysidopsis bahia)*	88	0.0842/0.173	0.121	number of young.female after 28 days of exposure	444206-02 R.L. Boeri *et al* (1997)	Core

Toxicity to Terrestrial and Aquatic Plants

Radish was shown to be the most sensitive Dicot for the Tier I toxicity test. The results of Tier 1 toxicity tests are tabulated below.

Nontarget Terrestrial Plant Seedling Emergence/Vegetative Vigor Toxicity (Tier I)

Species	% ai	Dose (lb ai/A)	% Response and Endpoint Affected	MRID No. Author/Year	Study Classification
*6 Dicots/4 monocots	44.2%	0.5	No phytotoxic or other effects	445977-32 D. Schwab (1997)	Core
*Monocots- corn, oat, wheat, onion Dicots- carrot, cucumber, radish, soybean, sunflower, tomato	88%	200 grams ai/Hectare (0.18 lb/ai/A)	<25%	438488-02 D. Schwab (1994)	Core

The Tier II results indicate that the freshwater diatom is the most sensitive non-vascular aquatic plant. Aquatic plant testing (Tier II) results are tabulated below.

Nontarget Aquatic Plant Toxicity (Tier II)

Species	% ai	EC50 (ppm)	NOAEC (ppm)	MRID No. Author/Year	Study Classification
Vascular Plants					
*Duckweed *Lemna gibba*	88	10.6 Slope=1.2	1.86	434145-46 D. P. Milazzo *et al* (1994)	Core
Nonvascular Plants					
*Green algae	88.2	>105.5	4.3	434145-42	Core

Nontarget Aquatic Plant Toxicity (Tier II)

Species	% ai	EC50 (ppm)	NOAEC (ppm)	MRID No. Author/Year	Study Classification
Kirchneria subcapitata		Slope=N/A		D.E. Brock (1992)	
*Marine diatom *Skeletonema costatum*	88	0.227 Slope=4.03	0.167	434145-45 J.S. Hughes and M.M. Alexander (1993)	Core
*Freshwater diatom *Navicula pelliculosa*	88	0.09 Slope=2.59	0.05	434145-43 J.S. Hughes and M.M. Alexander (1994)	Core
*Freshwater diatom *Navicula pelliculosa*	99 Spinosin A	31 biomass	8.34 cell density	465053-05	Supplemental
*Freshwater diatom *Navicula pelliculosa*	94 Factor B	0.16 cell density	<0.019	465053-10	Supplemental
*Freshwater diatom *Navicula pelliculosa*	96 Factor D	0.22 cell density	0.17	465053-08	Supplemental
*Freshwater diatom *Navicula pelliculosa*	100 Spinosin D	19 biomass	14.2	465053-02	Supplemental
*Blue-green algae *Anabaena flos-aquae*	88	8.9 Slope=4.05	3.9	43414544 J.S. Hughes and M.M. Alexander (1993)	Core

APPENDIX II. Endangered Species listing

* Some species listings are not likely to be exposed due to to size, habitat, eating habits or other mitigating factors.

MINT

Minimum of 1 Acre.

California (19) species affected **Taxa** Critical Habitat

FROG, CALIFORNIA RED-LEGGED *(Rana aurora draytonii)*	Threatened	Amphibian	No
FROG, MOUNTAIN YELLOW-LEGGED *(Rana muscosa)*	Endangered	Amphibian	No
SALAMANDER, DESERT SLENDER *(Batrachoseps aridus)*	Endangered	Amphibian	No
TOAD, ARROYO SOUTHWESTERN *(Bufo californicus (=microscaphus))*	Endangered	Amphibian	Yes
CHUB, BONYTAIL *(Gila elegans)*	Endangered	Fish	Yes
CHUB, HUTTON TUI *(Gila bicolor ssp.)*	Threatened	Fish	No
PUPFISH, DESERT *(Cyprinodon macularius)*	Endangered	Fish	Yes
SALMON, CHINOOK (SACRAMENTO RIVER WINTER RUN) *(Oncorhynchus (=Salmo) tshawytscha)*	Endangered	Fish	No
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST) *(Oncorhynchus (=Salmo) kisutch)*	Threatened	Fish	No
SQUAWFISH, COLORADO *(Ptychocheilus lucius)*	Endangered	Fish	Yes
STEELHEAD, CALIFORNIA CENTRAL VALLEY POP *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
SUCKER, LOST RIVER *(Deltistes luxatus)*	Endangered	Fish	No
SUCKER, MODOC *(Catostomus microps)*	Endangered	Fish	Yes
SUCKER, RAZORBACK *(Xyrauchen texanus)*	Endangered	Fish	Yes
SUCKER, SANTA ANA *(Catostomus santaanae)*	Threatened	Fish	Yes

SUCKER, SHORTNOSE *(Chasmistes brevirostris)*	Endangered	Fish	No
BUTTERFLY, QUINO CHECKERSPOT *(Euphydryas editha quino (=E. e. wrighti))*	Endangered	Insect	Yes
FLY, DELHI SANDS FLOWER-LOVING *(Rhaphiomidas terminatus abdominalis)*	Endangered	Insect	No
SKIPPER, CARSON WANDERING *(Pseudocopaeodes eunus obscurus)*	Endangered	Insect	No

Idaho (11) species affected		**Taxa**	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER FALL RUN) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	No
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	Yes
STEELHEAD, SNAKE RIVER BASIN POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
TROUT, BULL *(Salvelinus confluentus)*	Threatened	Fish	No
TROUT, BULL (KLAMATH RIVER POPULATION) *(Salvelinus confluentus)*	Threatened	Fish	No
LIMPET, BANBURY SPRINGS *(Lanx sp.)*	Endangered	Gastropod	No
SNAIL, BLISS RAPIDS *(Taylorconcha serpenticola)*	Threatened	Gastropod	No
SNAIL, SNAKE RIVER PHYSA *(Physa natricina)*	Endangered	Gastropod	No
SNAIL, UTAH VALVATA *(Valvata utahensis)*	Endangered	Gastropod	No
SPRINGSNAIL, BRUNEAU HOT *(Pyrgulopsis bruneauensis)*	Endangered	Gastropod	No
SPRINGSNAIL, IDAHO *(Fontelicella idahoensis)*	Endangered	Gastropod	No

Indiana (4) species affected		**Taxa**	Critical Habitat
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve	No
Mussel, Pink Mucket Pearly *(Lampsilis abrupta)*	Endangered	Bivalve	No

PEARLYMUSSEL, TUBERCLED-BLOSSOM *(Epioblasma torulosa torulosa)*	Endangered	Bivalve	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*	Endangered	Insect	No

Michigan (5) species affected		**Taxa**	Critical Habitat
RIFFLESHELL, NORTHERN *(Epioblasma torulosa rangiana)*	Endangered	Bivalve	No
SHINER, TOPEKA *(Notropis topeka (=tristis))*	Endangered	Fish	Yes
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*	Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No

Montana (2) species affected		**Taxa**	Critical Habitat
TROUT, BULL *(Salvelinus confluentus)*	Threatened	Fish	No
TROUT, BULL (KLAMATH RIVER POPULATION) *(Salvelinus confluentus)*	Threatened	Fish	No

Nevada (3) species affected		**Taxa**	Critical Habitat
DACE, DESERT *(Eremichthys acros)*	Threatened	Fish	Yes
TROUT, BULL *(Salvelinus confluentus)*	Threatened	Fish	No
TROUT, LAHONTAN CUTTHROAT *(Oncorhynchus clarki henshawi)*	Threatened	Fish	No

New Mexico (2) species affected		**Taxa**	Critical Habitat
SQUAWFISH, COLORADO *(Ptychocheilus lucius)*	Endangered	Fish	Yes
SUCKER, RAZORBACK *(Xyrauchen texanus)*	Endangered	Fish	Yes

Ohio (1) species affected		**Taxa**	Critical Habitat
Mussel, Clubshell *(Pleurobema clava)*	Endangered	Bivalve	No

Oregon	(21) species affected	**Taxa**	Critical Habitat
CHUB, OREGON *(Oregonichthys crameri)*	Endangered	Fish	No
SALMON, CHINOOK (LOWER COLUMBIA RIVER) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	Yes
SALMON, CHINOOK (SNAKE RIVER FALL RUN) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	No
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	Yes
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING) *(Oncorhynchus (=Salmo) tshawytscha)*	Endangered	Fish	Yes
SALMON, CHINOOK (UPPER WILLAMETTE RIVER) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	Yes
SALMON, CHUM (COLUMBIA RIVER POPULATION) *(Oncorhynchus (=Salmo) keta)*	Threatened	Fish	Yes
SALMON, COHO (OREGON COAST POPULATION) *(Oncorhynchus (=Salmo) kisutch)*	Threatened	Fish	Yes
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST) *(Oncorhynchus (=Salmo) kisutch)*	Threatened	Fish	No
SALMON, SOCKEYE (SNAKE RIVER POPULATION) *(Oncorhynchus (=Salmo) nerka)*	Endangered	Fish	No
STEELHEAD, LOWER COLUMBIA RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
STEELHEAD, SNAKE RIVER BASIN POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
STEELHEAD, UPPER COLUMBIA RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Endangered	Fish	Yes
STEELHEAD, UPPER WILLAMETTE RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
SUCKER, LOST RIVER *(Deltistes luxatus)*	Endangered	Fish	No
SUCKER, SHORTNOSE *(Chasmistes brevirostris)*	Endangered	Fish	No
TROUT, BULL *(Salvelinus confluentus)*	Threatened	Fish	No

TROUT, BULL (KLAMATH RIVER POPULATION) *(Salvelinus confluentus)*	Threatened	Fish	No
BUTTERFLY, FENDER'S BLUE *(Icaricia icarioides fenderi)*	Endangered	Insect	No
BUTTERFLY, OREGON SILVERSPOT *(Speyeria zerene hippolyta)*	Threatened	Insect	Yes

South Dakota (1) species affected		**Taxa**	Critical Habitat
STURGEON, PALLID *(Scaphirhynchus albus)*	Endangered	Fish	No

Utah (1) species affected		**Taxa**	Critical Habitat
TROUT, LAHONTAN CUTTHROAT *(Oncorhynchus clarki henshawi)*	Threatened	Fish	No

Washington (9) species affected		**Taxa**	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER FALL RUN) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	No
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER) *(Oncorhynchus (=Salmo) tshawytscha)*	Threatened	Fish	Yes
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING) *(Oncorhynchus (=Salmo) tshawytscha)*	Endangered	Fish	Yes
SALMON, SOCKEYE (SNAKE RIVER POPULATION) *(Oncorhynchus (=Salmo) nerka)*	Endangered	Fish	No
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
STEELHEAD, SNAKE RIVER BASIN POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Threatened	Fish	Yes
STEELHEAD, UPPER COLUMBIA RIVER POPULATION *(Oncorhynchus (=Salmo) mykiss)*	Endangered	Fish	Yes
TROUT, BULL *(Salvelinus confluentus)*	Threatened	Fish	No
TROUT, BULL (KLAMATH RIVER POPULATION) *(Salvelinus confluentus)*	Threatened	Fish	No

Wisconsin (5) species affected		**Taxa**	Critical Habitat
Mussel, Pink Mucket Pearly *(Lampsilis abrupta)*	Endangered	Bivalve	No
MUSSEL, SCALESHELL *(Leptodea leptodon)*	Endangered	Bivalve	No

PEARLYMUSSEL, HIGGINS' EYE *(Lampsilis higginsii)*	Endangered	Bivalve	No
SHINER, TOPEKA *(Notropis topeka (=tristis))*	Endangered	Fish	Yes
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No

GREEN ONIONS, Cropland used only for pasture or grazing (acres)

Minimum of 1 Acre.

Arkansas (1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*	Endangered	Insect	No
California (22) species affected		**Taxa**	Critical Habitat
BEETLE, DELTA GREEN GROUND *(Elaphrus viridis)*	Threatened	Insect	Yes
BEETLE, MOUNT HERMON JUNE *(Polyphylla barbata)*	Endangered	Insect	No
BEETLE, OHLONE TIGER *(Cicindela ohlone)*	Endangered	Insect	No
BEETLE, VALLEY ELDERBERRY LONGHORN *(Desmocerus californicus dimorphus)*	Threatened	Insect	Yes
BUTTERFLY, BAY CHECKERSPOT *(Euphydryas editha bayensis)*	Threatened	Insect	Yes
BUTTERFLY, BEHREN'S SILVERSPOT *(Speyeria zerene behrensii)*	Endangered	Insect	No
BUTTERFLY, CALLIPPE SILVERSPOT *(Speyeria callippe callippe)*	Endangered	Insect	No
BUTTERFLY, EL SEGUNDO BLUE *(Euphilotes battoides allyni)*	Endangered	Insect	No
BUTTERFLY, LANGE'S METALMARK *(Apodemia mormo langei)*	Endangered	Insect	No
BUTTERFLY, LOTIS BLUE *(Lycaeides argyrognomon lotis)*	Endangered	Insect	No
BUTTERFLY, MISSION BLUE *(Icaricia icarioides missionensis)*	Endangered	Insect	No
BUTTERFLY, MYRTLE'S SILVERSPOT *(Speyeria zerene myrtleae)*	Endangered	Insect	No
BUTTERFLY, OREGON SILVERSPOT *(Speyeria zerene hippolyta)*	Threatened	Insect	Yes
BUTTERFLY, PALOS VERDES BLUE	Endangered	Insect	Yes

(Glaucopsyche lygdamus palosverdesensis)			
BUTTERFLY, QUINO CHECKERSPOT *(Euphydryas editha quino (=E. e. wrighti))*	Endangered	Insect	Yes
BUTTERFLY, SAN BRUNO ELFIN *(Callophrys mossii bayensis)*	Endangered	Insect	No
BUTTERFLY, SMITH'S BLUE *(Euphilotes enoptes smithi)*	Endangered	Insect	No
FLY, DELHI SANDS FLOWER-LOVING *(Rhaphiomidas terminatus abdominalis)*	Endangered	Insect	No
GRASSHOPPER, ZAYANTE BAND-WINGED *(Trimerotropis infantilis)*	Endangered	Insect	Yes
MOTH, KERN PRIMROSE SPHINX *(Euproserpinus euterpe)*	Threatened	Insect	No
SKIPPER, CARSON WANDERING *(Pseudocopaeodes eunus obscurus)*	Endangered	Insect	No
SKIPPER, LAGUNA MOUNTAIN *(Pyrgus ruralis lagunae)*	Endangered	Insect	No
Colorado (2) species affected		**Taxa**	Critical Habitat
BUTTERFLY, UNCOMPAHGRE FRITILLARY *(Boloria acrocnema)*	Endangered	Insect	No
SKIPPER, PAWNEE MONTANE *(Hesperia leonardus montana)*	Threatened	Insect	No
Connecticut (1) species affected		**Taxa**	Critical Habitat
BEETLE, PURITAN TIGER *(Cicindela puritana)*	Threatened	Insect	No
Florida (1) species affected		**Taxa**	Critical Habitat
BUTTERFLY, SCHAUS SWALLOWTAIL *(Heraclides aristodemus ponceanus)*	Endangered	Insect	No
Georgia (1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*	Endangered	Insect	No
Hawaii (1) species affected		**Taxa**	Critical Habitat
MOTH, BLACKBURN'S SPHINX *(Manduca blackburni)*	Endangered	Insect	Yes

Illinois	(2) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*		Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*		Endangered	Insect	No
Indiana	(2) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*		Endangered	Insect	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*		Endangered	Insect	No
Kansas	(1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
Kentucky	(1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
Maryland	(2) species affected		**Taxa**	Critical Habitat
BEETLE, NORTHEASTERN BEACH TIGER *(Cicindela dorsalis dorsalis)*		Threatened	Insect	No
BEETLE, PURITAN TIGER *(Cicindela puritana)*		Threatened	Insect	No
Massachusetts	(3) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
BEETLE, NORTHEASTERN BEACH TIGER *(Cicindela dorsalis dorsalis)*		Threatened	Insect	No
BEETLE, PURITAN TIGER *(Cicindela puritana)*		Threatened	Insect	No
Michigan	(4) species affected		**Taxa**	Critical Habitat
BEETLE, HUNGERFORD'S CRAWLING WATER *(Brychius hungerfordi)*		Endangered	Insect	No
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*		Endangered	Insect	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*		Endangered	Insect	No

DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No
Minnesota (2) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No
Missouri (3) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*	Endangered	Insect	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*	Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No
Nevada (2) species affected		**Taxa**	Critical Habitat
NAUCORID, ASH MEADOWS *(Ambrysus amargosus)*	Threatened	Insect	Yes
SKIPPER, CARSON WANDERING *(Pseudocopaeodes eunus obscurus)*	Endangered	Insect	No
New Hampshire (1) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
New York (1) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
North Carolina (1) species affected		**Taxa**	Critical Habitat
BUTTERFLY, SAINT FRANCIS' SATYR *(Neonympha mitchellii francisci)*	Endangered	Insect	No
Ohio (3) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*	Endangered	Insect	No
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No

Oklahoma	(1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
Oregon	(2) species affected		**Taxa**	Critical Habitat
BUTTERFLY, FENDER'S BLUE *(Icaricia icarioides fenderi)*		Endangered	Insect	No
BUTTERFLY, OREGON SILVERSPOT *(Speyeria zerene hippolyta)*		Threatened	Insect	Yes
Rhode Island	(1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
South Dakota	(1) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
Texas	(9) species affected		**Taxa**	Critical Habitat
BEETLE, AMERICAN BURYING *(Nicrophorus americanus)*		Endangered	Insect	No
BEETLE, COFFIN CAVE MOLD *(Batrisodes texanus)*		Endangered	Insect	No
BEETLE, COMAL SPRINGS DRYOPID *(Stygoparnus comalensis)*		Endangered	Insect	No
BEETLE, COMAL SPRINGS RIFFLE *(Heterelmis comalensis)*		Endangered	Insect	No
BEETLE, HELOTES MOLD *(Batrisodes venyivi)*		Endangered	Insect	Yes
BEETLE, KRETSCHMARR CAVE MOLD *(Texamaurops reddelli)*		Endangered	Insect	No
BEETLE, TOOTH CAVE GROUND *(Rhadine persephone)*		Endangered	Insect	No
RHADINE EXILIS (NCN) *(Rhadine exilis)*		Endangered	Insect	Yes
RHADINE INFERNALIS (NCN) *(Rhadine infernalis)*		Endangered	Insect	Yes

Virginia	(1) species affected		**Taxa**	Critical Habitat
BEETLE, NORTHEASTERN BEACH TIGER		Threatened	Insect	No

(Cicindela dorsalis dorsalis)			
Washington (1) species affected		**Taxa**	Critical Habitat
BUTTERFLY, OREGON SILVERSPOT *(Speyeria zerene hippolyta)*	Threatened	Insect	Yes
Wisconsin (3) species affected		**Taxa**	Critical Habitat
BUTTERFLY, KARNER BLUE *(Lycaeides melissa samuelis)*	Endangered	Insect	No
BUTTERFLY, MITCHELL'S SATYR *(Neonympha mitchellii mitchellii)*	Endangered	Insect	No
DRAGONFLY, HINE'S EMERALD *(Somatochlora hineana)*	Endangered	Insect	No

APPENDIX III. PRZM/EXAMS

Environmental Fate Input Parameters for PRZM/EXAMS Simulation.

Parameter	**Spinosad A** Value	Source
PC Code	110003	N/A
Water Solubility (20°C, distilled water)	235 mg/L	
Molecular Weight	732 g/mol	
Hydrolysis Half-Life (pH 7)	Stable	MRID 43507301
Aerobic Soil Metabolism $t_{½}$ (mean value plus $t_{90, n-1} \times \sigma) / n^{1/2}$)	25.54 days	MRID 43507304
Aerobic Aquatic Metab. $t_{½}$, (2X the Aerob. Soil Metab.)	51.08 days	MRID 43507304
Anaerobic Aquatic Metab. $t_{½}$,	250 Days	
Aqueous Photolysis Half-Life (at pH 7)	0.93 days	MRID 43507302
Soil Water Partition Coefficient (Lowest non sand Koc)	4237	MRID 43507306
Vapor Pressure	2.4e-10 torr	
PCA	87%	Default Value
Depth of Incorporation (Aerial)	0.0	Product Label

PRZM/EXAMS Output Files

Legume Forage Hay and Alfalfa Seed

stored as OrSeedSP.out
Chemical: Spinosad
PRZM environment: ORgrassseedC.txt modified Saturday, 12 October 2002 at 17:18:50
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.23	0.1976	0.1501	0.113	0.1019	0.0425
1962	0.2564	0.2242	0.1766	0.1417	0.1304	0.07466
1963	0.2723	0.2404	0.192	0.1566	0.1446	0.08797
1964	0.269	0.2365	0.1897	0.1571	0.1453	0.09129
1965	0.2696	0.2368	0.1904	0.159	0.1466	0.09335
1966	0.2712	0.2387	0.1914	0.1579	0.1455	0.09223
1967	0.2653	0.2324	0.1858	0.1535	0.1404	0.08782
1968	0.2657	0.2332	0.1864	0.1536	0.146	0.09469

1969	0.2767	0.2441	0.1974	0.1646	0.1522	0.1018
1970	0.2709	0.2381	0.1918	0.1597	0.1478	0.09713
1971	0.2725	0.2397	0.1933	0.1629	0.1495	0.09986
1972	0.272	0.2391	0.1929	0.1619	0.149	0.09682
1973	0.2682	0.2354	0.1891	0.1573	0.1457	0.09423
1974	0.2748	0.2424	0.195	0.1615	0.1491	0.09598
1975	0.2711	0.2386	0.1918	0.1594	0.1477	0.09327
1976	0.2731	0.2407	0.1936	0.161	0.1491	0.09221
1977	0.2693	0.2369	0.1891	0.1547	0.1424	0.08907
1978	0.2657	0.2327	0.187	0.1531	0.1414	0.08921
1979	0.2642	0.2314	0.1851	0.1528	0.1411	0.09223
1980	0.2721	0.2394	0.1929	0.1617	0.1494	0.09483
1981	0.2744	0.2419	0.1947	0.1625	0.1492	0.09769
1982	0.2738	0.2414	0.194	0.1599	0.1479	0.09556
1983	0.2745	0.2419	0.195	0.1596	0.1471	0.0932
1984	0.2702	0.2374	0.191	0.1602	0.1471	0.0932
1985	0.2658	0.2326	0.1873	0.1584	0.1461	0.09283
1986	0.2723	0.2399	0.1922	0.1564	0.1435	0.0891
1987	0.3025	0.2658	0.2279	0.1664	0.153	0.09358
1988	0.2714	0.2386	0.1922	0.1608	0.1482	0.09448
1989	0.27	0.2378	0.19	0.155	0.1435	0.09007
1990	0.2644	0.2314	0.1855	0.1547	0.142	0.09145

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	0.3025	0.2658	0.2279	0.1664	0.153	0.1018
0.0645161290322581	0.2767	0.2441	0.1974	0.1646	0.1522	0.09986
0.0967741935483871	0.2748	0.2424	0.195	0.1629	0.1495	0.09769
0.129032258064516	0.2745	0.2419	0.195	0.1625	0.1494	0.09713
0.161290322580645	0.2744	0.2419	0.1947	0.1619	0.1492	0.09682
0.193548387096774	0.2738	0.2414	0.194	0.1617	0.1491	0.09598
0.225806451612903	0.2731	0.2407	0.1936	0.1615	0.1491	0.09556
0.258064516129032	0.2725	0.2404	0.1933	0.161	0.149	0.09483
0.290322580645161	0.2723	0.2399	0.1929	0.1608	0.1482	0.09469
0.32258064516129	0.2723	0.2397	0.1929	0.1602	0.1479	0.09448

0.354838709677419	0.2721	0.2394	0.1922	0.1599	0.1478	0.09423
0.387096774193548	0.272	0.2391	0.1922	0.1597	0.1477	0.09358
0.419354838709677	0.2714	0.2387	0.192	0.1596	0.1471	0.09335
0.451612903225806	0.2712	0.2386	0.1918	0.1594	0.1471	0.09327
0.483870967741936	0.2711	0.2386	0.1918	0.159	0.1466	0.0932
0.516129032258065	0.2709	0.2381	0.1914	0.1584	0.1461	0.0932
0.548387096774194	0.2702	0.2378	0.191	0.1579	0.146	0.09283
0.580645161290323	0.27	0.2374	0.1904	0.1573	0.1457	0.09223
0.612903225806452	0.2696	0.2369	0.19	0.1571	0.1455	0.09223
0.645161290322581	0.2693	0.2368	0.1897	0.1566	0.1453	0.09221
0.67741935483871	0.269	0.2365	0.1891	0.1564	0.1446	0.09145
0.709677419354839	0.2682	0.2354	0.1891	0.155	0.1435	0.09129
0.741935483870968	0.2658	0.2332	0.1873	0.1547	0.1435	0.09007
0.774193548387097	0.2657	0.2327	0.187	0.1547	0.1424	0.08921
0.806451612903226	0.2657	0.2326	0.1864	0.1536	0.142	0.0891
0.838709677419355	0.2653	0.2324	0.1858	0.1535	0.1414	0.08907
0.870967741935484	0.2644	0.2314	0.1855	0.1531	0.1411	0.08797
0.903225806451613	0.2642	0.2314	0.1851	0.1528	0.1404	0.08782
0.935483870967742	0.2564	0.2242	0.1766	0.1417	0.1304	0.07466
0.967741935483871	0.23	0.1976	0.1501	0.113	0.1019	0.0425

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.1	0.27477	0.24235	0.195	0.16286	0.14949	0.097634

Average of yearly averages: 0.0911

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: OrSeedSP
Metfile: w24232.dvf
PRZM scenario: ORgrassseedC.txt
EXAMS environment file: pond298.exv
Chemical Name: Spinosad

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	732	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	2.4e-10	torr	
Solubility	sol	235	mg/L	
Kd	Kd		mg/L	
Koc	Koc	4237	mg/L	
Photolysis half-life	kdp	0.93	days	Half-life
Aerobic Aquatic Metabolism	kbacw	25.54	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	250	days	Halfife
Aerobic Soil Metabolism	asm	51.08	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life
Hydrolysis:	pH 7	0	days	Half-life
Hydrolysis:	pH 9	0	days	Half-life
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:		DEPI		cm
Application Rate:	TAPP	0.0348		kg/ha
Application Efficiency:		APPEFF	0.99	fraction
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	01-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	7	days	Set to 0 or delete line for single app.
Interval 2	interval	7	days	Set to 0 or delete line for single app.
Interval 3	interval	30	days	Set to 0 or delete line for single app.
Interval 4	interval	7	days	Set to 0 or delete line for single app.
Interval 5	interval	7	days	Set to 0 or delete line for single app.
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

Mint
stored as OrMintSP.out

Chemical: Spinosad
PRZM environment: ORmintC.txt modified Satday, 12 October 2002 at 17:20:16
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.114	0.9509	0.6648	0.3996	0.3204	0.1264
1962	1.214	1.051	0.7652	0.4928	0.4097	0.2224
1963	1.268	1.106	0.8189	0.5464	0.461	0.2698
1964	1.285	1.123	0.8366	0.5596	0.4729	0.2855
1965	1.29	1.13	0.8443	0.5652	0.477	0.2905
1966	1.287	1.124	0.8386	0.5617	0.4742	0.2889
1967	1.282	1.117	0.8329	0.5532	0.4641	0.2818
1968	1.28	1.117	0.8316	0.5538	0.4754	0.2959
1969	1.3	1.136	0.8571	0.5972	0.5072	0.3185
1970	1.303	1.138	0.8539	0.573	0.485	0.3075
1971	1.309	1.148	0.8636	0.5868	0.4956	0.3117
1972	1.305	1.142	0.8564	0.5765	0.4871	0.3054
1973	1.298	1.135	0.8493	0.5701	0.4826	0.3001
1974	1.295	1.131	0.8464	0.5688	0.4814	0.2958
1975	1.293	1.131	0.8445	0.5671	0.4803	0.2935
1976	1.299	1.137	0.8503	0.5737	0.4867	0.2961
1977	1.289	1.125	0.8401	0.5629	0.4766	0.2941
1978	1.286	1.121	0.8368	0.5574	0.4707	0.29
1979	1.283	1.12	0.8346	0.5557	0.4688	0.2957
1980	1.304	1.144	0.8562	0.5778	0.4895	0.2999
1981	1.336	1.169	0.874	0.5859	0.4944	0.3026
1982	1.293	1.129	0.8444	0.5664	0.4796	0.2973
1983	1.29	1.128	0.8409	0.5659	0.4785	0.2918
1984	1.307	1.143	0.871	0.5872	0.495	0.298
1985	1.421	1.239	0.9369	0.6141	0.5165	0.3117
1986	1.295	1.13	0.846	0.5703	0.4823	0.2998
1987	1.279	1.114	0.8303	0.582	0.5007	0.3017
1988	1.3	1.137	0.8517	0.5723	0.4834	0.2975
1989	1.284	1.12	0.8349	0.5587	0.4731	0.2891
1990	1.287	1.124	0.838	0.558	0.469	0.2839

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	1.421	1.239	0.9369	0.6141	0.5165	0.3185
0.0645161290322581	1.336	1.169	0.874	0.5972	0.5072	0.3117
0.0967741935483871	1.309	1.148	0.871	0.5872	0.5007	0.3117
0.129032258064516	1.307	1.144	0.8636	0.5868	0.4956	

0.3075
0.161290322580645 1.305 1.143 0.8571 0.5859 0.495 0.3054
0.193548387096774 1.304 1.142 0.8564 0.582 0.4944 0.3026
0.225806451612903 1.303 1.138 0.8562 0.5778 0.4895
0.3017
0.258064516129032 1.3 1.137 0.8539 0.5765 0.4871
0.3001
0.290322580645161 1.3 1.137 0.8517 0.5737 0.4867
0.2999
0.32258064516129 1.299 1.136 0.8503 0.573 0.485 0.2998
0.354838709677419 1.298 1.135 0.8493 0.5723 0.4834 0.298
0.387096774193548 1.295 1.131 0.8464 0.5703 0.4826
0.2975
0.419354838709677 1.295 1.131 0.846 0.5701 0.4823 0.2973
0.451612903225806 1.293 1.13 0.8445 0.5688 0.4814
0.2961
0.483870967741936 1.293 1.13 0.8444 0.5671 0.4803
0.2959
0.516129032258065 1.29 1.129 0.8443 0.5664 0.4796
0.2958
0.548387096774194 1.29 1.128 0.8409 0.5659 0.4785
0.2957
0.580645161290323 1.289 1.125 0.8401 0.5652 0.477 0.2941
0.612903225806452 1.287 1.124 0.8386 0.5629 0.4766
0.2935
0.645161290322581 1.287 1.124 0.838 0.5617 0.4754 0.2918
0.67741935483871 1.286 1.123 0.8368 0.5596 0.4742 0.2905
0.709677419354839 1.285 1.121 0.8366 0.5587 0.4731 0.29
0.741935483870968 1.284 1.12 0.8349 0.558 0.4729 0.2891
0.774193548387097 1.283 1.12 0.8346 0.5574 0.4707
0.2889
0.806451612903226 1.282 1.117 0.8329 0.5557 0.469 0.2855
0.838709677419355 1.28 1.117 0.8316 0.5538 0.4688
0.2839
0.870967741935484 1.279 1.114 0.8303 0.5532 0.4641
0.2818
0.903225806451613 1.268 1.106 0.8189 0.5464 0.461 0.2698
0.935483870967742 1.214 1.051 0.7652 0.4928 0.4097
0.2224
0.967741935483871 1.114 0.9509 0.6648 0.3996 0.3204
0.1264

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.1	1.3088	1.1476	0.87026	0.58716	0.50019	0.31128

Average of yearly averages: 0.2881

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: OrMintSP
Metfile: w24232.dvf
PRZM scenario: ORmintC.txt
EXAMS environment file: pond298.exv
Chemical Name: Spinosad

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	732	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	2.4e-10	torr	
Solubility	sol	235	mg/L	
Kd	Kd		mg/L	
Koc	Koc	4237	mg/L	
Photolysis half-life	kdp	0.93	days	Half-life
Aerobic Aquatic Metabolism	kbacw	51.08	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	250	days	Halfife
Aerobic Soil Metabolism	asm	25.54	days	Halfife
Hydrolysis: pH 5	0	days	Half-life	
Hydrolysis: pH 7	0	days	Half-life	
Hydrolysis: pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual
Incorporation Depth:	DEPI		cm	
Application Rate:	TAPP	0.1685	kg/ha	
Application Efficiency:	APPEFF	0.99	fraction	
Spray Drift	DRFT	0.064	fraction of application rate applied to pond	
Application Date	Date	01-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	5	days	Set to 0 or delete line for single app.
Interval 2	interval	5	days	Set to 0 or delete line for single app.
Record 17:	FILTRA			
	IPSCND	1		
	UPTKF			
Record 18:	PLVKRT			
	PLDKRT			
	FEXTRC	0.5		
Flag for Index Res. Run	IR	Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

Green Onions

stored as GaOnionSP.out
Chemical: Spinosad

PRZM environment: GAOnionsC.txt modified Tueday, 4 May 2004 at 13:18:36
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w03822.dvf modified Sunday, 19 May 2002 at 06:54:12
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.7953	0.7332	0.5376	0.4501	0.4083	0.1877
1962	1.383	1.197	0.9446	0.8497	0.7726	0.4055
1963	2.08	1.899	1.39	1.117	0.9822	0.5395
1964	3.299	3.037	2.239	1.447	1.23	0.6743
1965	1.388	1.228	0.9421	0.8537	0.7747	0.548
1966	2.035	1.768	1.295	1.12	0.9862	0.5478
1967	1.126	1.036	0.8542	0.741	0.7019	0.4696
1968	1.399	1.269	0.974	0.7846	0.7116	0.4283
1969	2.161	1.93	1.273	1.018	0.9258	0.5118
1970	1.37	1.253	0.9329	0.8471	0.8243	0.5183
1971	1.554	1.393	1.153	1.011	0.9858	0.5769
1972	1.621	1.493	1.152	0.9183	0.871	0.5495
1973	2.22	1.91	1.279	0.9727	0.8651	0.5097
1974	0.9885	0.9217	0.7666	0.6702	0.6382	0.4104
1975	1.932	1.767	1.327	0.9104	0.7865	0.4535
1976	1.406	1.261	1.02	0.9325	0.8609	0.5254
1977	0.9176	0.815	0.6684	0.5942	0.5749	0.4232
1978	0.9898	0.8679	0.6366	0.5327	0.4967	0.3209
1979	1.828	1.688	1.208	0.8581	0.7748	0.4319
1980	1.05	0.9198	0.8064	0.7034	0.6188	0.3992
1981	1.496	1.354	1.079	0.7735	0.6765	0.4082
1982	1.831	1.618	1.225	1.152	1.028	0.5672
1983	1.381	1.293	1.084	0.9362	0.8477	0.5379
1984	1.264	1.194	0.9746	0.7189	0.6729	0.4419
1985	1.373	1.191	0.9423	0.7435	0.6924	0.4101
1986	1.141	0.9925	0.7862	0.7185	0.6471	0.3976
1987	1.208	1.095	0.9228	0.7879	0.7287	0.4485
1988	1.11	0.9692	0.7072	0.6074	0.5897	0.4115
1989	1.078	0.9647	0.857	0.7696	0.7227	0.4355
1990	0.873	0.7653	0.6215	0.5447	0.5315	0.3681

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	3.299	3.037	2.239	1.447	1.23	0.6743
0.0645161290322581	2.22	1.93	1.39	1.152	1.028	0.5769
0.0967741935483871	2.161	1.91	1.327	1.12	0.9862	0.5672
0.129032258064516	2.08	1.899	1.295	1.117	0.9858	0.5495
0.161290322580645	2.035	1.768	1.279	1.018	0.9822	0.548
0.193548387096774	1.932	1.767	1.273	1.011	0.9258	0.5478
0.225806451612903	1.831	1.688	1.225	0.9727	0.871	0.5395

0.258064516129032	1.828	1.618	1.208	0.9362	0.8651	0.5379
0.290322580645161	1.621	1.493	1.153	0.9325	0.8609	0.5254
0.32258064516129	1.554	1.393	1.152	0.9183	0.8477	0.5183
0.354838709677419	1.496	1.354	1.084	0.9104	0.8243	0.5118
0.387096774193548	1.406	1.293	1.079	0.8581	0.7865	0.5097
0.419354838709677	1.399	1.269	1.02	0.8537	0.7748	0.4696
0.451612903225806	1.388	1.261	0.9746	0.8497	0.7747	0.4535
0.483870967741936	1.383	1.253	0.974	0.8471	0.7726	0.4485
0.516129032258065	1.381	1.228	0.9446	0.7879	0.7287	0.4419
0.548387096774194	1.373	1.197	0.9423	0.7846	0.7227	0.4355
0.580645161290323	1.37	1.194	0.9421	0.7735	0.7116	0.4319
0.612903225806452	1.264	1.191	0.9329	0.7696	0.7019	0.4283
0.645161290322581	1.208	1.095	0.9228	0.7435	0.6924	0.4232
0.67741935483871	1.141	1.036	0.857	0.741	0.6765	0.4115
0.709677419354839	1.126	0.9925	0.8542	0.7189	0.6729	0.4104
0.741935483870968	1.11	0.9692	0.8064	0.7185	0.6471	0.4101
0.774193548387097	1.078	0.9647	0.7862	0.7034	0.6382	0.4082
0.806451612903226	1.05	0.9217	0.7666	0.6702	0.6188	0.4055
0.838709677419355	0.9898	0.9198	0.7072	0.6074	0.5897	0.3992
0.870967741935484	0.9885	0.8679	0.6684	0.5942	0.5749	0.3976
0.903225806451613	0.9176	0.815	0.6366	0.5447	0.5315	0.3681
0.935483870967742	0.873	0.7653	0.6215	0.5327	0.4967	0.3209
0.967741935483871	0.7953	0.7332	0.5376	0.4501	0.4083	0.1877

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.1	2.1529	1.9089	1.3238		1.1197	0.98616
					0.56543	

Average of yearly averages: 0.4619

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: GaOnionSP
Metfile: w03822.dvf
PRZM scenario: GAOnionsC.txt
EXAMS environment file: pond298.exv
Chemical Name: Spinosad

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt		732	g/mol	
Henry's Law Const.	henry			atm-m^3/mol	
Vapor Pressure	vapr		2.4e-10	torr	
Solubility	sol		235	mg/L	
Kd	Kd			mg/L	
Koc	Koc	4237		mg/L	
Photolysis half-life	kdp		0.93	days	Half-life
Aerobic Aquatic Metabolism			kbacw	51.08	days Halfife
Anaerobic Aquatic Metabolism			kbacs	250	days Halfife
Aerobic Soil Metabolism			asm	25.54	days Halfife
Hydrolysis:	pH 5		0	days	Half-life
Hydrolysis:	pH 7		0	days	Half-life
Hydrolysis:	pH 9		0	days	Half-life
Method:	CAM		2	integer	See PRZM manual
Incorporation Depth:			DEPI		cm
Application Rate:	TAPP		0.1011		kg/ha
Application Efficiency:			APPEFF		0.99 fraction
Spray Drift	DRFT	0.064	fraction of application rate applied to pond		
Application Date	Date		01-06	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval		5	days	Set to 0 or delete line for single app.
Interval 2	interval		5	days	Set to 0 or delete line for single app.
Interval 3	interval		30	days	Set to 0 or delete line for single app.
Interval 4	interval		5	days	Set to 0 or delete line for single app.
Record 17:	FILTRA				
	IPSCND	1			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run	IR		Pond		
Flag for runoff calc.	RUNOFF		none	none, monthly or total(average of entire run)	