

Cal/Ecotox Toxicity Data for Great Horned Owl (*Bubo virginianus*)*

Page 1

Chemical	Tox Exposure	Endpoint Type	Endpoint Description	Endpoint Value	Note	Reference
ALDRIN; CARBOFURAN; CHLORDANE; DIELDRIN; ENDRIN; FAMPHUR; FENTHION; PHORATE; STRYCHNINE		TOX-MORT - mortality in the field	summaries of mortality due to organochlorine, anticholinesterase, anticoagulant, strychnine pesticides	review	a	1
ALDRIN; DIELDRIN	4 oz aldrin/100 lbs seeds	TOX-EXP IND - accumulation	post-mortem concentrations	6.1 ppm (brain), 10.7 ppm (body remainder) dieldrin, wet wt	b	2
AROCLOL 1254; DDE (4,4'-); DIELDRIN; HEPTACHLOR EPOXIDE; OXYCHLORDANE	3.0 (DDE), 1.7 (dieldrin), 0.1 (heptachlor epoxide), 3.1 (Arochlor 1254/60), 0.2 (oxychlordane) ppm (wet wt) in 4 eggs	TOX-REPRO - physiology	eggshell thickness index compared with reference eggs	5% decrease	c	3
CARBARYL; CARBOFURAN; DDE (4,4'-)		TOX-REPRO - reproductive success		review	d	1
CHLOROPHACINONE	3.2 ppm in voles maintained on treated food	TOX-EXP IND - accumulation	total carcass residues 28 d after removal from treatment	99 ug	e	4
CHLOROPHACINONE	3.2 ppm in voles maintained on treated food	TOX-Non-Repro-Sublethal - whole animal	occurrence of external bleeding or internal abnormalities after removal from treated diet	no effect	f	4
DDD (4,4'-); DDE (4,4'-); DDT (4,4'-); DIELDRIN; HEPTACHLOR EPOXIDE; MIREX; OXYCHLORDANE; POLYCHLORINATED BIPHENYLS	13-96 (DDE), 0.01-0.65 (DDD), 0.03-0.17 (DDT, 2.83-71.0 (PCBs), 0.50-9.89 (dieldrin), 0.012-0.27 (HCB), 0.02-1.99 (Mirex), 0.12-7.74 (heptachlor epoxide), 0.98-8.68 (oxychlordane), 0.50-2.29 (trans-n	TOX-MORT - mortality in the field	mortality due to pesticide exposure based on history, ante-mortem signs, and gross pathology	increased	g	5
DDD (4,4'-); DDE (4,4'-); DDT (4,4'-); DIELDRIN; HEPTACHLOR EPOXIDE	0.74 (DDE), 0.07 (DDD + DDT), 0.16 (dieldrin), 0.11 (heptachlor epoxide) ppm, wet wt., in viable eggs	TOX-REPRO - physiology	eggshell thickness compared to pre-1946 museum specimens	no effect	h	6
DDE (4,4'-); DIELDRIN; HEPTACHLOR EPOXIDE; OXYCHLORDANE; POLYCHLORINATED BIPHENYLS	28.0 (DDE), 0.8 (dieldrin), 5.1 (hexachlorobenzene), 5.8 (heptachlor epoxide), 3.7 (oxychlordane), 0.1 (cis-chlordane), 0.1 (trans-onachlor), 8.2 (PCBs) ppm wet wt in brain	TOX-MORT - mortality in the field	occurrence of mortality as a result of organochlorine poisoning	increased	i	7
DDE (4,4'-); DIELDRIN; HEPTACHLOR EPOXIDE; OXYCHLORDANE; POLYCHLORINATED BIPHENYLS	3.96-75.7 (DDE), <0.01-49.6 (PCBs), 0.44-14.6 (heptachlor epoxide), 1.16-5.87 (oxychlordane), 0.02-1.36 (trans-nonachlor), <0.01-10.3 (dieldrin) wet wt in brain	TOX-MORT - mortality in the field	occurrence of wild birds dying diagnosed with organochlorine poisoning	increased	j	8
DDE (4,4'-); POLYCHLORINATED BIPHENYLS	44.7 (DDE), 357 (PCB) ppm wet wt in brain	TOX-MORT - mortality in the field	mortality due to PCB intoxication, based on brain residues	increased	k	9
DIELDRIN	0.18 ppm (uncontaminated), 1.15 ppm (contaminated) in soil within adult home ranges	TOX-EXP IND - accumulation	mean (+/- SE) concentrations in plasma	0.07 +/- 0.03 ppm (uncontaminated site); 0.34 +/- 0.21 ppm (contaminated site)	l	10
DIELDRIN	0.18 ppm (uncontaminated), 1.15 ppm (contaminated) in soil within adult home ranges	TOX-EXP IND - accumulation	mean (+/- SE) concentrations in plasma	0.01 +/- 0.003 ppm (uncontaminated site); 0.22 +/- 0.03 ppm (contaminated site)	m	10
DIELDRIN	0.18 ppm (uncontaminated), 1.15 ppm (contaminated) in soil within adult home ranges	TOX-MORT - mortality in the field	daily and interval survival estimates on uncontaminated versus contaminated sites	no effect	n	10
DIELDRIN	0.18 ppm (uncontaminated), 1.15 ppm (contaminated) in soil within adult home ranges	TOX-MORT - mortality in the field	daily survival rates on uncontaminated versus contaminated sites	no effect	o	10
DIELDRIN	0.01 ppm (uncontaminated), 0.22 ppm (contaminated) in plasma	TOX-MORT - mortality in the field	relationship between residue in plasma and survival	negative correlation	p	10
DIELDRIN	0.18 ppm (uncontaminated), 1.15 ppm (contaminated) in soil within adult home ranges	TOX-REPRO - reproductive success	productivity in contaminated versus uncontaminated sites	no effect	q	10

Toxicity Data for Great Horned Owl (*Bubo virginianus*)*

Page 2

Chemical	Tox Exposure	Endpoint Type	Endpoint Description	Endpoint Value	Note	Reference
DIPHACINONE	4.1-5.5 mg total consumed in mice fed a 0.01% bait	TOX-MORT - toxicity benchmarks	doses resulting in symptoms and death in 2/3 birds within 14 days	4.1-5.5 mg	r	11
DIPHACINONE	4.1-5.5 mg total consumed in mice fed a 0.01% bait	TOX-Non-Repro-Sublethal - organ/system effects	time to coagulation in blood sampled 3 days after treatment ended	increased	s	11
ENDRIN	1.3-1.7 kg/ha	TOX-EXP IND - accumulation	tissue endrin residues	breast muscle=0.02 ppm, wet wt	t	12
ENDRIN	1.3-1.7 kg/ha	TOX-EXP IND - accumulation	tissue endrin residues	brain=greater than or equal to 0.8 ppm, wet wt	u	12
FAMPHUR	15 ppm in post-mortem stomach contents	TOX-EXP IND - biomarkers	post-mortem brain cholinesterase activity compared to control	85% decrease	v	13
STRYCHNINE	1.8 mg injected into mouse	TOX-Non-Repro-Sublethal - behavioral effects	occurrence (compared with pre-dose values) of uncoordinated movement, tremors, loss of perching ability and ability to stand on the ground	increased	w	14
STRYCHNINE	1.0 mg injected into mouse	TOX-Non-Repro-Sublethal - behavioral effects	occurrence (compared with pre-dose values) of uncoordinated movement, tremors, loss of perching ability and ability to stand on the ground	increased	x	14
STRYCHNINE	0.4 mg injected into mouse	TOX-Non-Repro-Sublethal - behavioral effects	occurrence of errors (compared with pre-test values) in a reversal learning test	increased	y	14
STRYCHNINE; ZINC PHOSPHIDE		TOX-Non-Repro-Sublethal - whole animal	summaries of sublethal effects due to organochlorine, anticholinesterase, anticoagulant, strychnine pesticides	review	z	1
TERBUFOS	1.45 kg terbufos/ha	TOX-EXP IND - biomarkers	occurrence of pesticide metabolites in fecal-urate samples	no effect	aa	15
TERBUFOS	1.45 kg terbufos/ha	TOX-EXP IND - biomarkers	plasma cholinesterase activity after pesticide applications	decreased (>2 standard deviations of control mean) in 3 samples	ab	15

Notes

- a NR; CANADA; USA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=309-00-2; TOX - Chemical=1563-66-2; TOX - Chemical=57-74-9; TOX - Chemical=60-57-1; TOX - Chemical=72-20-8; TOX - Chemical=52-85-7; TOX - Chemical=55-38-9; TOX - Chemical=298-02-2; TOX - Chemical=57-24-9
- b NR; TX; NR; Species - California (R)=*Bubo virginianus*; Species - California (R)=*Zenaidura macroura*; TOX - Chemical=309-00-2; TOX - Chemical=60-57-1; N=1 bird; Tox Exp Tech=pesticide application; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR; See citation for other species and contaminants measured.
- c Adult; OH; F; Species - California (R)=*Bubo virginianus*; TOX - Chemical=11097-69-1; TOX - Chemical=72-55-9; TOX - Chemical=60-57-1; TOX - Chemical=1024-57-3; TOX - Chemical=27304-13-8; N=18 eggs, 15 clutches; Butler, Delaware, Hamilton Counties; Tox Exp Tech=site contamination; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR; Cause of decreased eggshell thickness was not conclusively determined to be pesticide residues.
- d Species - California (R)=*Speotyto cunicularia*; Species - California (R)=*Bubo virginianus*; TOX - Chemical=63-25-2; TOX - Chemical=1563-66-2; TOX - Chemical=72-55-9
- e Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=3691-35-8; N=1 owl; Tox Exp Tech=diet; Tox Exp Dur=6 d; Tox Study Dur=34 d; Tox Stat Sig=NR; Calculated total amount of compound consumed was 1,009 ug.
- f Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=3691-35-8; N=1 owl; Tox Exp Tech=diet; Tox Exp Dur=6 d; Tox Study Dur=34 d; Tox Stat Sig=NR
- g NR; NY; PA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-54-8; TOX - Chemical=72-55-9; TOX - Chemical=50-29-3; TOX - Chemical=60-57-1; TOX - Chemical=1024-57-3; TOX - Chemical=2385-85-5; TOX - Chemical=27304-13-8; TOX - Chemical=1336-36-3; N=8 owls; Tox Exp Tech=NR; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR; See citation for residues in individual birds, and residue data for birds in which organochlorine pesticide residues may have been a contributing mortality factor.
- h Adult; MT; F; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-54-8; TOX - Chemical=72-55-9; TOX - Chemical=50-29-3; TOX - Chemical=60-57-1; TOX - Chemical=1024-57-3; N=3 eggs; south-central Montana; Tox Exp Tech=parent; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=N; See citation for contaminant concentrations in muscle tissue from an adult owl.
- i Adult; OR; F; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-55-9; TOX - Chemical=60-57-1; TOX - Chemical=1024-57-3; TOX - Chemical=27304-13-8; TOX - Chemical=1336-36-3; N=1 owl; 6 km s. of Corvallis; Tox Exp Tech=NR; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR
- j Both Adult and Juv.; NY; B; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-55-9; TOX - Chemical=60-57-1; TOX - Chemical=1024-57-3; TOX - Chemical=27304-13-8; TOX - Chemical=1336-36-3; N=13 owls; Tox Exp Tech=NR; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR

- k Adult; NY; F; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-55-9; TOX - Chemical=1336-36-3; N=1 owl; Greene County; Tox Exp Tech=NR; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR; See citation for residues found in other owls found dead or dying in New York state.
- l Adult; CO; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=2 birds on contaminated sites; 5 birds on uncontaminated sites; Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=2 yr; Tox Stat Sig=NR
- m Juvenile; CO; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=6 birds on contaminated sites; 10 birds on uncontaminated sites; Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=2 yr; Tox Stat Sig=NR
- n Juvenile; CO; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=14 birds on contaminated sites; 41 birds on uncontaminated sites; Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=3 yr; Tox Stat Sig=N; Data were collected on radiotagged birds.
- o Adult; CO; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=9 birds on contaminated sites; 11 birds on uncontaminated sites; Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=3 yr; Tox Stat Sig=N; Data are reported for radiotagged birds. Two adult birds died of dieldrin poisoning (see paper for dieldrin concentrations in post-mortem tissues).
- p Juvenile; CO; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=6 birds (contaminated sites), 10 birds (uncontaminated sites); Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=2 yr; Tox Stat Sig=N
- q Adult; CO; B; Species - California (R)=*Bubo virginianus*; TOX - Chemical=60-57-1; N=3-4 nests on contaminated sites; 5-9 nests on uncontaminated sites; Rocky Mountain Arsenal National Wildlife Refuge; Tox Exp Tech=habitat contamination; Tox Exp Dur=NR; Tox Study Dur=3 yr; Tox Stat Sig=N
- r Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=82-66-6; N=3 owls; Tox Exp Tech=diet; Tox Exp Dur=5 days; Tox Study Dur=14 d; Tox Stat Sig=NR; One bird survived after a dose of 5.5 mg.
- s Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=82-66-6; N=3 owls; Tox Exp Tech=diet; Tox Exp Dur=5 days; Tox Study Dur=14 d; Tox Stat Sig=NR
- t NR; WA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=72-20-8; N=1 animal; Wenatchee; Tox Exp Tech=pesticide application (late fall); Tox Exp Dur=NR; Tox Study Dur=approx. 10 mo.; Tox Stat Sig=NR; Samples were taken from apparently healthy individuals, collected in orchards.
- u NR; WA; NR; Species - California (R)=*Bubo virginianus*; Species - California (R)=*Zenaidura macroura*; Species - California (R)=*Colaptes auratus*; TOX - Chemical=72-20-8; N=1-3 animals; Wenatchee; Tox Exp Tech=pesticide application (late fall); Tox Exp Dur=NR; Tox Study Dur=approx. 10 mo.; Tox Stat Sig=NR; Sample was taken from individual in which cause of death was diagnosed as endrin poisoning (0.8 ppm was assumed to be a lethal concentration for brain).
- v NR; OR; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=52-85-7; N=1 owl; March; Malheur County; Tox Exp Tech=diet; Tox Exp Dur=NR; Tox Study Dur=NR; Tox Stat Sig=NR; Bird died due to tertiary poisoning after eating a secondarily poisoned red-tailed hawk.
- w Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=57-24-9; N=1 bird; Tox Exp Tech=diet; Tox Exp Dur=single exposure; Tox Study Dur=390 min; Tox Stat Sig=NR; Recovery was observed at 330-390 minutes post-dose.
- x Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=57-24-9; N=1 bird; Tox Exp Tech=diet; Tox Exp Dur=single exposure; Tox Study Dur=390 min; Tox Stat Sig=NR; Recovery was observed at 330-390 minutes post-dose.
- y Adult; Lab; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=57-24-9; N=1 bird; Tox Exp Tech=diet; Tox Exp Dur=single exposure; Tox Study Dur=390 min; Tox Stat Sig=NR
- z NR; CANADA; USA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=57-24-9; TOX - Chemical=1314-84-7
- aa NR; IA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=013071-79-9; N=29 owls; Tox Exp Tech=pesticide application; Tox Exp Dur=NR; Tox Study Dur=2 yr; Tox Stat Sig=N
- ab NR; IA; NR; Species - California (R)=*Bubo virginianus*; TOX - Chemical=013071-79-9; N=6 samples; Tox Exp Tech=pesticide application; Tox Exp Dur=NR; Tox Study Dur=2 yr; Tox Stat Sig=Y; Cholinesterase depression greater than 2 standard deviations below control was considered indicative of organophosphate pesticide exposure.

References

- 1 Blus, Lawrence J. 1996. Effects of pesticides on owls in North America. *J. Raptor Res.* 30(4):198-206.
- 2 Flickinger, Edward L. and Kirke A. King. 1972. Some effects of aldrin-treated rice on gulf coast wildlife. *J. Wildl. Manage.* 36(3):706-727.
- 3 Springer, Mark A. 1980. Pesticide levels, egg and eggshell parameters of great horned owls. *Ohio J. Sci.* 80(4):184-187.
- 4 Askham, L.R. and R.M. Poche. 1992. Biodeterioration of chlorophacinone in voles, hawks and an owl. *Mammalia.* 56(1):145-150.
- 5 Stone, Ward B. and Joseph C. Okoniewski. 1988. Organochlorine pesticide-related mortalities of raptors and other birds in New York, 1982-1986., Ch. 42. In: Cade, Tom J., James H. Enderson, Carl G. Thelander, and Clayto, eds. *Peregrine Falcon Populations: Their Management and Recovery.* Boise, ID: The Peregrine Fund, Inc. p 429-438.
- 6 Seidensticker, John C. and Harry V. Reynolds. 1971. The nesting, reproductive performance, and chlorinated hydrocarbon residues in the red-tailed hawk and great horned owl in south-central Montana. *Wilson Bull.* 83(4):408-418.
- 7 Blus, Lawrence J. and Charles J. Henny. 1983. First records of chlordane-related mortality in wild birds. *J. Wildl. Manage.* 47(1):196-198.
- 8 Okoniewski, Joseph C. and Elizabeth Novesky. 1993. Bird poisonings with cyclodienes in suburbia: Links to historic use on turf. *J. Wildl. Manage.* 57(3):630-639.
- 9 Stone, Ward B., and Joseph C. Okoniewski. 1983. Organochlorine toxicants in great horned owls from New York, 1981-82. *Northeast. Environ. Sci.* 2(1):1-7.
- 10 Frank, Rosemary A. and R. Scott Lutz. 1999. Productivity and survival of great horned owls exposed to dieldrin. *Condor.* 101:331-339.
- 11 Mendenhall, V.M. and L.F. Pank. 1980. Secondary poisoning of owls by anticoagulant rodenticides. *Wildl. Soc. Bull.* 8(4):311-315.
- 12 Blus, Lawrence J., Charles J. Henny, T. Earl Kaiser and Robert A. Grove. 1983. Effects on wildlife from use of endrin in Washington state orchards. *Trans. North Am. Wildl. Nat. Resour. Conf.* 48:159-174.
- 13 Henny, Charles J., Elizabeth J. Kolbe, Elwood F. Hill and Lawrence J. Blus. 1987. Case histories of bald eagles and other raptors killed by organophosphorous insecticides topically applied to livestock. *J. Wildl. Dis.* 23(2):292-295.
- 14 Cheney, Carl D., Stephen B. Vander Wall and Ruthe J. Poehlmann. 1987. Effects of strychnine on the behavior of great horned owls and red-tailed hawks. *J. Raptor Res.* 21(3):103-110.
- 15 Buck, Jeremy A., Larry W. Brewer, Michael J. Hooper, George P. Cobb and Ronald J. Kendall. 1996. Monitoring great horned owls for pesticide exposure in southcentral Iowa. *J. Wildl. Manage.* 60(2):321-331.

* Cal/EPA, OEHHA and the University of California Regents are not responsible for damages of any kind resulting from the use of or reliance on information in this report. Users are encouraged to consult the original data. Updated: February 1999.