Ecological Soil Screening Levels for Selenium

Interim Final

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1.0 INTRODUCTION

Ecological Soil Screening Levels (Eco-SSLs) are concentrations of contaminants in soil that are protective of ecological receptors that commonly come into contact with and/or consume biota that live in or on soil. Eco-SSLs are derived separately for four groups of ecological receptors: plants, soil invertebrates, birds, and mammals. As such, these values are presumed to provide adequate protection of terrestrial ecosystems. Eco-SSLs are derived to be protective of the conservative end of the exposure and effects species distribution, and are intended to be applied at the screening stage of an ecological risk assessment. These screening levels should be used to identify the contaminants of potential concern (COPCs) that require further evaluation in the site-specific baseline ecological risk assessment that is completed according to specific guidance (U.S. EPA, 1997, 1998, and 1999). The Eco-SSLs are not designed to be used as cleanup levels and the United States (U.S.) Environmental Protection Agency (EPA) emphasizes that it would be inappropriate to adopt or modify the intended use of these Eco-SSLs as national cleanup standards.

The detailed procedures used to derive Eco-SSL values are described in separate documentation (U.S. EPA, 2003, 2005). The derivation procedures represent the collaborative effort of a multi-stakeholder group consisting of federal, state, consulting, industry, and academic participants led by what is now the U.S. EPA Office of Solid Waste and Emergency Response (OSWER).

This document provides the Eco-SSL values for selenium and the documentation for their derivation. This document provides guidance and is designed to communicate national policy on identifying selenium concentrations in soil that may present an unacceptable ecological risk to terrestrial receptors. The document does not, however, substitute for EPA's statutes or regulations, nor is it a regulation itself. Thus, it does not impose legally-binding requirements on EPA, states, or the regulated community, and may not apply to a particular situation based upon the circumstances of the site. EPA may change this guidance in the future, as appropriate. EPA and state personnel may use and accept other technically sound approaches, either on their own initiative, or at the suggestion of potentially responsible parties, or other interested parties. Therefore, interested parties are free to raise questions and objections about the substance of this document and the appropriateness of the application of this document to a particular situation. EPA welcomes public comments on this document at any time and may consider such comments in future revisions of this document.

2.0 SUMMARY OF ECO-SSLs FOR SELENIUM

Selenium is a naturally occurring element found in all environmental media: air, soil, sediment, and water. In nature it is found in the sulfide ores of heavy metals and predominates in approximately 40 minerals including clausthalite, naumannite, tiemannite, and berzelianite (Budavari, 1996; Fishbein, 1991). Selenium is also found in volcanic rock, sandstone, shale, carbonates, bedrock, coal oil, and mineral oil (Kent and Spycher, 1994; Langer, 1993).

Selenium may be released to the environment from natural sources such as volcanic eruptions, leaching and weathering of rocks, and volatilization as a result of biomethylation by plants and bacteria (ATSDR, 1996). Anthropogenic releases of selenium may result from use in the manufacture and production of glass, pigments, rubber, metal alloys, textiles, petroleum, medical therapeutic agents, anti-dandruff shampoos, veterinary medicines, fungicides, gaseous insulators, and photographic emulsions (USDOI, 1985; ATSDR, 1996). The burning of coal, oil and solid waste may also contribute to selenium in the environment (NRC, 1976; ATSDR, 1996).

Background concentrations reported for many metals in U.S. soils are described in Attachment 1-4 of the Eco-SSL guidance (U.S. EPA, 2003). Typical background concentrations of selenium in U.S. soils are plotted in Figure 2-1 for both eastern and western U.S. soils.

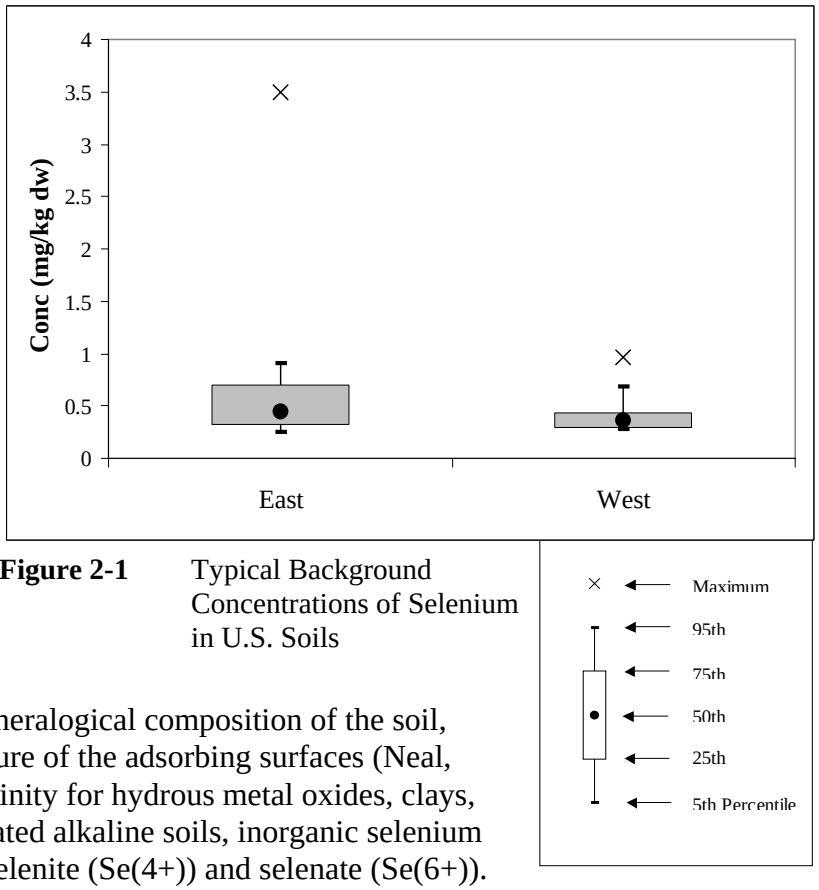

Figure 2-1 Typical Background Concentrations of Selenium in U.S. Soils

In soils, the chemical forms of selenium are largely dependent on pH and oxidation-reduction potentials (McNeal and Balistrieri, 1989). Selenium can exist in the 2-, 0, 4+, and 6+ oxidation states (McNeal and Balistrieri, 1989). Speciation of selenium in soils is also influenced by the chemical and mineralogical composition of the soil, microbial intervention, and the nature of the adsorbing surfaces (Neal, 1990). Selenium has a sorptive affinity for hydrous metal oxides, clays, and organic materials. In well-aerated alkaline soils, inorganic selenium exists primarily as the oxyanions selenite (Se(4+)) and selenate (Se(6+)). Selenite is soluble, but can strongly adsorb to soil minerals and organic material (Tokunaga et al., 1997), while selenate is the most mobile of selenium compounds because of its high water solubility and inability to adsorb to soil particles (ATSDR 1996). Alkaline soils formed from parent materials high in selenium are also high in biologically available selenium (Mayland et al., 1989). In poorly aerated soils, inorganic Se predominates as the relatively soluble selenide and

elemental forms (Mayland et al.,1989).

Transformations of selenium in soils appear to be microbially mediated. Many fungi, bacteria, and actinomycetes that occur in soils are capable of reducing inorganic selenium salts either to elemental forms or to organic compounds (Neal, 1990). Oxidized forms of selenium are affiliated with increased availability and toxicity. Immobilization of selenium involves the formation of many organic compounds including amino acids, proteins, selenium compounds and selenides (Neal, 1990). Selenium is also transformed by mineralization and methylation. Volatilization of selenium from soils is influenced by a variety of factors including microbial activity, temperature, moisture, time, and the concentration of water soluble selenium (HSDB).

In plants, selenium is an essential element for growth. In the environment, uptake and accumulation by plants is influenced by the concentration and form of selenium present in soils (Neal, 1990). The most bio-available forms of selenium are considered to be those fractions which are soluble (McNeal and Balistrieri, 1989). Other factors that influence selenium content in plants include pH, soil mineralogical composition, and plant species (Neal, 1990).

Some species that readily absorb selenium from soils include many species of Astragalus, Machaeranthera, Haploapappus, and Stanleya. These plants are often regarded as primary selenium indicators as their growth is restricted to seleniferous areas (Rosenfeld and Beath, 1964). Primary indicator plants often demonstrate an offensive odor, the intensity of which may be a qualitative indicator of selenium concentration (Rosenfeld and Beath, 1964). Other species of plants including grains and grasses accumulate surprisingly low levels of selenium (Mayland et al., 1989). In general, agricultural crops have a low tolerance for selenium (Mikkelsen et al., 1989).

Phytotoxicity from Se(4+) and Se (6+) occurs when selenium is absorbed, translocated, and incorporated into selenium analogs of essential sulfur compounds (Mikkelsen et al., 1989). Toxicity is demonstrated by stunted growth, chlorosis, pink leaf veins, and pink root tissue (Mikkelsen et al. 1989). Younger plants demonstrate increased susceptibility to selenium toxicity compared to mature plants (Rosenfeld and Beath, 1964).

Selenium is an essential trace element in animals and has been shown to be a natural component in the enzyme glutathione peroxidase and other proteins. Selenium toxicity is most likely to occur in animals grazing on seleniferous forage, or as a result of including seleniferous grain in their diet (James et al, 1989). Acute effects in animals following the ingestion of plants containing high levels of selenium include abnormal posture and movement, watery diarrhea, labored respiration, abdominal pain, prostration, and death (James et al., 1989). Chronic effects in animals include alkali disease and bind staggers. In wildlife, elevated selenium concentrations in the diet are associated with adverse reproductive and developmental effects including reduced growth or survival of young (Ohlendorf, 1989).

The Eco-SSL values derived to date for selenium are summarized in Table 2.1.

Table 2.1 Selenium Eco-SSLs (mg/kg dry weight in soil)			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian	**Mammalian**
0.52	4.1	1.2	0.63

Eco-SSL values were derived for all receptor groups. The Eco-SSL values for selenium range from 0.52 mg/kg dry weight (dw) for plants to 4.1 mg/kg dw for soil invertebrates. With the exception of the plant and mammalian values, these values are higher than the 95th percentile of reported background soil concentrations of selenium in eastern and western U.S. soils (Figure 2.1). The Eco-SSLs for plants and mammalian wildlife are higher than the median value for eastern U.S. soils and the 75th percentile for western U.S. soils.

3.0 ECO-SSL FOR TERRESTRIAL PLANTS

Of the papers identified from the literature search process, 184 papers were selected for acquisition for further review. Of those papers acquired, 16 met all 11 Study Acceptance Criteria (U.S. EPA, 2003; Attachment 3-1). Each of these papers were reviewed and the studies were scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 3-2). Seventeen study results received an Evaluation Score greater than ten (U.S. EPA, 2003; Attachment 3-1). These studies are listed in Table 3.1.

The studies in Table 3.1 are sorted by bioavailability score. There are 8 studies eligible for Eco-SSL derivation with a bioavailability score of two. These results are used to derive the plant Eco-SSL for selenium (U.S. EPA, 2003; Attachment 3-2). The Eco-SSL is the geometric mean of the maximum acceptable toxicant concentration (MATC) and 20% effective concentration (EC_{20}) values for 6 species under different test conditions (pH and % organic matter (OM)) and is equal to 0.52 mg/kg dw.

4.0 ECO-SSL FOR SOIL INVERTEBRATES

Of the papers identified from the literature search process, 33 papers were selected for acquisition for further review. Of those papers acquired, one met all 11 Study Acceptance Criteria (U.S. EPA 2003; Attachment 3-1). Each of these papers were reviewed and the studies were scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 3-2). Three study results received an Evaluation Score greater than ten (U.S. EPA, 2003; Attachment 3-1). These studies are listed in Table 4.1.

The studies in Table 4.1 are sorted by bioavailability score. There are three studies eligible for Eco-SSL derivation with a bioavailability score of two. These results are used to derive the soil invertebrate Eco-SSL for selenium (U.S. EPA, 2003; Attachment 3-2). The Eco-SSL is the geometric mean of the 20% effective concentration (EC_{20}) values for three test species and is equal to 4.1 mg/kg dw.

Table 3.1 Plant Toxicity Data - Selenium

Reference	IP Number	Study ID	Test Organism		Soil pH	OM%	Bio-availability Score	ERE	Tox Parameter	Tox Value (Soil Conc at mg/kg dw)	Total Evaluation Score	Eligible for Eco-SSL Derivation?	Used for Eco-SSL?
TN & Associates, 2000	56444	V	Alfalfa	*Medicago sativa*	6.3	0.1	2	GRO	EC_{20}	0.1	18	Y	Y
TN & Associates, 2000	56444	W	Barley	*Hordeum vilgare*	6.3	0.1	2	GRO	EC_{20}	0.2	18	Y	Y
TN & Associates, 2000	56444	X	Brassica	*Brassica rapa*	6.3	0.1	2	GRO	EC_{20}	0.2	18	Y	Y
Singh et al., 1980b	21715		Raya	*Brassica juncea*	7.9	0.17	2	GRO	MATC	1.4	13	Y	Y
Singh et al., 1980a	21716		Berseem	*Trifolium alexandrinum*	8	0.14	2	GRO	MATC	1.6	12	Y	Y
Wan et al., 1988	7562	g	Alfalfa	*Medicago sativa* L.	5.6	1.3	2	GRO	MATC	0.9	12	Y	Y
Wan et al., 1988	7562	h	Alfalfa	*Medicago sativa* L.	6.9	1.1	2	GRO	MATC	0.9	12	Y	Y
Singh and Singh, 1979	21714		Cowpea	*Vigna sinensis*	8	0.1	2	GRO	MATC	0.8	11	Y	Y
									Geometric Mean	0.52			
Data Not Used to Derive Plant Eco-SSL													
Wan et al., 1988	7562	a	alfalfa	*Medicago sativa* L.	7.2	0.8	2	GRO	NOAEC	1.5	12	N	N
Wan et al., 1988	7562	b	barley	*Hordeum vulgare* L.	7.2	0.8	2	GRO	NOAEC	1.5	12	N	N
Wan et al., 1988	7562	c	beet	*Beta vulgaris* L.	7.2	0.8	2	GRO	NOAEC	1.5	12	N	N
Wan et al., 1988	7562	d	tomato	*Lycopersicon esculentum* Mill.	7.2	0.8	2	GRO	NOAEC	1.5	12	N	N
Wan et al., 1988	7562	e	alfalfa	*Medicago sativa* L.	6.7	1.1	2	GRO	LOAEC	0.5	12	N	N
Wan et al., 1988	7562	f	alfalfa	*Medicago sativa* L.	6.8	0.9	2	GRO	NOAEC	3.0	12	N	N
TN & Associates, 2000	56444	S	Alfalfa	*Medicago sativa*	5.0	5.0	0	GRO	EC_{20}	1	16	Y	N
TN & Associates, 2000	56444	T	Barley	*Hordeum vilgare*	5.0	5.0	0	GRO	EC_{20}	3	16	Y	N
TN & Associates, 2000	56444	U	Brassica	*Brassica rapa*	5.0	5.0	0	GRO	EC_{20}	1	16	Y	N

EC_{10} = Effect concentration for 10% of test population
EC_{20} = Effect concentration for 10% of test population
EC_{50} = Effect concentration for 50% of test population
ERE = Ecologically relevant endpoint
GRO = Growth
LOAEC = Lowest observed adverse effect concentration
MATC = Maximum acceptable toxicant concentration. Geometric mean of NOAEC and LOAEC.
N = No
NOAEC = No observed adverse effect concentration
ns = Not specified
OM = Organic matter content
REP = Reproduction
Y = Yes
Bioavailability Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)
Total Evaluation Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)

Table 4.1 Invertebrate Toxicity Data - Selenium

Reference	IP Number	Study ID	Test Organism		Soil pH	OM%	Bio-availability Score	ERE	Tox Parameter	Tox Value (Soil Conc at mg/kg dw)	Total Evaluation Score	Eligible for Eco-SSL Derivation?	Used for Eco-SSL?
Checkai et al., 2004	92935		Earthworm	*Eisenia fetida*	7.1	1.0	2	REP	EC_{20}	3.4	18	Y	Y
Checkai et al., 2004	92935		Enchytraeidae	*Enchytraeis crypticus*	7.1	1.0	2	REP	EC_{20}	4.4	18	Y	Y
Checkai et al., 2004	92935		Springtail	*Folsomia candida*	7.1	1.0	2	REP	EC_{20}	4.7	18	Y	Y
									Geometric Mean	4.1			

EC_{20} = Effect concentration for 10% of test population
ERE = Ecologically relevant endpoint
N = No
OM = Organic matter content
REP = Reproduction
Y = Yes
Bioavailability Score described in *Guidance for Developing Eco-SSLs* (U.S.EPA, 2003)
Total Evaluation Score described in *Guidance for Developing Eco-SSLs* (U.S. EPA, 2003)

5.0 ECO-SSL FOR AVIAN WILDLIFE

The derivation of the Eco-SSL for avian wildlife was completed as two parts. First, the toxicity reference value (TRV) was derived according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5). Second, the Eco-SSL (soil concentration) was back-calculated for each of three surrogate species representing different trophic levels based on the wildlife exposure model and the TRV (U.S. EPA, 2003).

5.1 Avian TRV

The literature search completed according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-1) identified 1,734 papers with possible toxicity data for either avian or mammalian species. Of these studies, 1,534 were rejected for use as described in Section 7.5. Of the remaining studies, 69 contained data for avian test species. These papers were reviewed and the data were extracted and scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-3 and 4-4). The results of the data extraction and review are provided as Table 5.1. The complete results are included as Appendix 5-1.

Within the reviewed papers, there are 219 results for biochemical (BIO), behavior (BEH), physiology (PHY), pathology (PTH), reproduction (REP), growth (GRO), and survival (MOR) effects that meet the Data Evaluation Score of >65 for use to derive the TRV (U.S. EPA, 2003; Attachment 4-4). These data are plotted in Figure 5.1 and correspond directly with the data presented in Table 5.1. The no-observed adverse effect level (NOAEL) results for growth and reproduction are used to calculate a geometric mean. This result is examined in relationship to the lowest bounded lowest-observed adverse effect level (LOAEL) for reproduction, growth, and survival to derive the TRV according to procedures in the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5).

A geometric mean of the NOAEL values for reproduction and growth was calculated at 0.606 mg selenium/kg bw/day. This value, however, is higher than the lowest bounded LOAEL for reproduction, growth, or survival. Therefore, the TRV is equal to the highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth or survival and is equal to 0.290 mg selenium/kg bw/day.

Table 5.1
Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
Biochemical (BIO)																		
1	Hoffman et al, 1991	1374	Mallard (*Anas platyrhynchos*)	7	U	FD	14	w	2	yr	AD	M	ENZ	GLPX	PL	0.0550	0.110	76
2	Stone and Soares, 1976	2898	Japanese Quail (*Coturnix japonica*)	2	U	FD	32	d	NR	NR	SM	F	CHM	HEME	BL	0.120		70
3	Hoffman et al 1989	1373	Mallard (*Anas platyrhynchos*)	4	U	FD	6	w	1	d	JV	NR	CHM	GLTH	LI	1.34	2.68	75
4	Dafalla and Adam, 1986	1273	Chicken (*Gallus domesticus*)	3	U	FD	4	w	7	d	JV	B	ENZ	GLAD	SR		0.0676	70
5	Gregory and Edds, 1984	1321	Turkey (*Meleagris gallopavo*)	2	U	FD	18	d	16	d	JV	M	ENZ	GLPX	LI		0.116	69
6	Van Vleet et al, 1981	80	Duck (*Anas platyrhynchos*)	2	U	FD	15	d	1	d	JV	M	ENZ	GLPX	BL		0.268	69
7	Stanley et al, 1996	1569	Mallard (*Anas platyrhynchos*)	2	UX	FD	122	d	1	yr	AD	B	CHM	HMGL	BL		0.382	74
8	Hoffman and Heinz, 1998	25896	Mallard (*Anas platyrhynchos*)	2	M	FD	10	w	19	mo	AD	M	CHM	GENZ	BL		0.481	68
9	Elzubeir and Davis, 1988	1294	Chicken (*Gallus domesticus*)	2	U	FD	24	d	14	d	JV	M	ENZ	GLPX	LI		0.788	70
10	Hoffman et al, 1991	1377	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	ENZ	GLPX	PL		1.13	75
11	Hoffman et al, 1992	1376	Duck (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	ENZ	GLPX	LI		1.20	75
12	Hoffman et al, 1992	1378	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	ENZ	GLPX	LI		1.23	75
13	Hoffman et al 1989	1373	Mallard (*Anas platyrhynchos*)	4	U	FD	6	w	1	d	JV	NR	CHM	GLTH	LI		1.34	69
14	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		3.04	71
15	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		3.23	71
16	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		3.23	71
17	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		4.16	71
18	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		7.73	71
19	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ENZ	GLPX	LI		8.14	71
20	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ENZ	GLPX	PL		8.46	71
Behavior (BEH)																		
21	Echevarria et al., 1988	1289	Chicken (*Gallus domesticus*)	4	U	FD	3	w	1	d	JV	M	FDB	FCNS	WO	0.213	0.426	78
22	Cantor et al., 1984	1245	Chicken (*Gallus domesticus*)	4	U	DR	7	d	6	d	JV	M	FDB	FCNS	WO	0.717	1.43	74
23	Hoffman et al, 1992	1378	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	FDB	FCNS	WO	1.23	4.94	82
24	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	1	w	1	d	JV	NR	FDB	FCNS	WO	1.56	3.13	85
25	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	3	w	1	d	JV	NR	FDB	FCNS	WO	2.13	4.26	85
26	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	FDB	FCNS	WO	2.40	4.81	74
27	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	1	w	1	d	JV	NR	FDB	FCNS	WO	3.49	6.99	80
28	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	FDB	FCNS	WO	4.16	8.32	80
29	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	4	w	1	d	JV	B	FDB	FCNS	WO		0.0912	73
30	Poley et al., 1937	3787	Chicken (*Gallus domesticus*)	2	M	FD	1	w	NR	NR	SM	F	FDB	FCNS	WO		0.127	73
31	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	3	U	FD	4	w	1	d	JV	B	FDB	FCNS	WO		0.130	73
32	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	4	w	1	d	JV	B	FDB	FCNS	WO		0.180	73
33	Santolo et al 1999	1535	American Kestrel (*Falco sparverius*)	3	M	FD	11	w	NR	mo	AD	B	FDB	FCNS	WO		0.708	73
34	Elzubeir and Davis, 1988	1294	Chicken (*Gallus domesticus*)	2	U	FD	24	d	14	d	JV	M	FDB	FCNS	WO		0.788	73
35	Davis et al, 1996	1278	Chicken (*Gallus domesticus*)	2	U	FD	21	d	14	d	JV	M	FDB	FCNS	WO		0.855	73
36	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	NR	FDB	FCNS	WO		3.04	68
Physiology (PHY)																		
37	Jensen, 1986	1402	Chicken (*Gallus domesticus*)	4	U	FD	3	w	1	d	JV	M	PHY	FDCV	WO	0.0740	0.370	71
38	Hegazy and Adachi, 2000	7725	Chicken (*Gallus domesticus*)	2	U	FD	15	d	1	d	JV	NR	PHY	FDCV	WO	0.0859		66
39	O'Toole and Raisbeck 1997	1476	Mallard (*Anas platyrhynchos*)	4	U	FD	150	d	NR	NR	JV	M	PHY	IRRI	NK	0.518	1.29	79
40	Albers et al 1996	1208	Duck (*Anas platyrhynchos*)	5	U	FD	16	w	1	yr	AD	M	PHY	GPHY	FE	1.29	2.58	75
41	Cantor et al., 1984	1245	Chicken (*Gallus domesticus*)	4	U	DR	7	d	9	d	JV	B	PHY	FDCV	WO	1.45	2.90	74
42	Elzubeir and Davis, 1988	1294	Chicken (*Gallus domesticus*)	2	U	FD	24	d	14	d	JV	M	PHY	FDCV	WO		0.788	73
43	Lowry and Baker, 1989	1445	Chicken (*Gallus domesticus*)	2	U	FD	14	d	8	d	JV	M	PHY	FDCV	WO		1.55	73
44	Donaldson and McGowan, 1989	1285	Chicken (*Gallus domesticus*)	3	U	FD	20	d	1	d	JV	M	PHY	FDCV	WO		2.27	73
Pathology (PTH)																		
45	Hegazy and Adachi, 2000	7725	Chicken (*Gallus domesticus*)	2	U	FD	15	d	1	d	JV	NR	ORW	SMIX	TS	0.0859		66
46	Stone and Soares, 1976	2898	Japanese Quail (*Coturnix japonica*)	2	U	FD	32	d	NR	NR	AD	F	ORW	SMIX	LI	0.120		66
47	Van Vleet et al, 1981	80	Duck (*Anas platyrhynchos*)	2	U	FD	28	d	1	d	JV	M	HIS	NCRO	GZ	0.153		72
48	Stanley et al, 1996	1569	Mallard (*Anas platyrhynchos*)	3	UX	FD	122	d	1	yr	AD	B	ORW	ORWT	WO	0.212	0.425	83
49	Heinz and Hoffman 1998	1353	Mallard (*Anas platyrhynchos*)	2	M	FD	75	d	18	mo	SM	F	GRS	BDWT	WO	0.456		71
50	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	6	UX	FD	3	w	NR	NR	SM	F	GRS	BDWT	WO	0.468	0.937	80
51	Heinz and Hoffman 1996	1352	Mallard (*Anas platyrhynchos*)	2	M	FD	4	w	NR	mo	AD	B	ITX	GITX	WO	0.508		70
52	Heinz and Hoffman 1996	1352	Mallard (*Anas platyrhynchos*)	2	M	FD	4	w	NR	mo	AD	B	ITX	GITX	WO	0.563		70
53	Sell and Horani, 1976	1550	Chicken (*Gallus domesticus*)	2	U	FD	23	d	8	d	JV	M	ITX	GITX	WO	0.629		74
54	Smith et al, 1988	1562	Black-crowned night-heron (*Nycticorax nycti*	3	UX	FD	92	d	NR	NR	AD	B	GRS	BDWT	WO	0.675	2.03	79
55	O'Toole and Raisbeck 1997	1476	Mallard (*Anas platyrhynchos*)	4	U	FD	86	d	NR	NR	JV	M	HIS	GHIS	FO	0.728	1.82	75
56	Hoffman et al, 1991	1374	Mallard (*Anas platyrhynchos*)	7	U	FD	14	w	2	yr	AD	M	ORW	SMIX	LI	0.903	1.81	79
57	Sell and Horani, 1976	1550	Japanese Quail (*Coturnix japonica*)	2	U	FD	23	d	8	d	JV	B	ITX	GITX	WO	0.909		73
58	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	2	UX	FD	41	d	1	yr	AD	M	GRS	BDWT	WO	1.00		72

Table 5.1
Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
59	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	6	UX	FD	57	d	2	yr	SM	B	GRS	BDWT	WO	1.03	2.58	81
60	Hoffman et al, 1991	1377	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	ORW	ORWT	LI	1.13	4.53	82
61	Hoffman et al, 1992	1376	Duck (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	ORW	ORWT	LI	1.20	4.80	82
62	Green and Albers, 1997	1319	Mallard (*Anas platyrhynchos*)	5	U	FD	16	w	14	mo	AD	M	HIS	GHIS	LI	1.22	2.44	78
63	Albers et al 1996	1208	Duck (*Anas platyrhynchos*)	5	U	FD	16	w	1	yr	AD	M	GRS	BDWT	WO	1.29	2.58	75
64	Yamamoto and Santolo, 2000	25901	American Kestrel (*Falco sparverius*)	3	M	FD	77	d	NR	NR	AD	B	GRS	BDWT	WO	1.53		69
65	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	6	w	1	d	JV	NR	ORW	ORWT	LI	1.60		79
66	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI	3.04		70
67	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI	3.23	6.45	80
68	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI	4.16	8.32	80
69	Wiemeyer and Hoffman, 1996	1622	Owl (*Otus asio*)	3	M	FD	3	mo	3	yr	LB	B	GRS	BDWT	WO	4.49	15.3	83
70	Jensen et al., 1977	1404	Chicken (*Gallus domesticus*)	5	U	FD	2	w	1	d	JV	B	ORW	SMIX	LI	6.34	11.9	73
71	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI	6.94		72
72	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI	8.14		74
73	Dafalla and Adam, 1986	1273	Chicken (*Gallus domesticus*)	3	U	FD	4	w	7	d	JV	B	HIS	NCRO	LI		0.0676	73
74	Heinz and Fitzgerald 1993	1350	Mallard (*Anas platyrhynchos*)	5	UX	FD	1	w	NR	mo	AD	M	GRS	BDWT	WO		0.563	74
75	Santolo et al 1999	1535	American Kestrel (*Falco sparverius*)	3	M	FD	11	w	NR	NR	AD	M	GRS	BDWT	WO		0.708	73
76	Elzubeir and Davis, 1988	1294	Chicken (*Gallus domesticus*)	2	U	FD	24	d	14	d	JV	M	ORW	SMIX	LI		0.788	73
77	Davis, el. al. 1996	1278	Chicken (*Gallus domesticus*)	2	U	FD	21	d	14	d	JV	M	ORW	ORWT	LI		0.855	73
78	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	2	UX	FD	3	w	NR	NR	SM	F	GRS	BDWT	WO		0.962	71
79	Hoffman et al, 1992	1378	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	HIS	GHIS	LI		1.23	78
80	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	6	w	1	d	JV	NR	ORW	ORWT	LI		1.56	79
81	Donaldson and McGowan, 1989	1285	Chicken (*Gallus domesticus*)	3	U	FD	20	d	1	d	JV	M	ORW	ORWT	LI		2.27	73
82	Heinz 1993	1347	Duck (*Anas platyrhynchos*)	2	U	FD	5	w	NR	mo	AD	M	GRS	BDWT	WO		5.75	66
83	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI		7.73	74
84	Hoffman et al, 1996	1375	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	B	ORW	ORWT	LI		8.46	74
Reproduction (REP)																		
85	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	76	w	1	d	LB	F	EGG	EGWT	EG	0.092	0.368	83
86	Stanley et al, 1996	1569	Mallard (*Anas platyrhynchos*)	3	UX	FD	122	d	1	yr	AD	B	REP	HTCH	WO	0.212	0.425	89
87	Poley and Moxon, 1937	3788	Chicken (*Gallus domesticus*)	4	U	FD	1	w	NR	NR	LB	F	REP	RSUC	WO	0.214	0.429	85
88	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	6	UX	FD	46	d	NR	NR	LB	B	REP	PROG	WO	0.219	0.438	90
89	Ort and Latshaw, 1978	1489	Chicken (*Gallus domesticus*)	4	U	FD	28	w	32	w	LB	F	REP	HTCH	WO	0.247	0.412	85
90	Hoffman and Heinz, 1988	1372	Mallard (*Anas platyrhynchos*)	5	UX	FD	6	w	NR	NR	LB	B	REP	RSUC	WO	0.273	0.546	89
91	Moksnes and Norheim, 1982	1465	Chicken (*Gallus domesticus*)	4	U	FD	31	w	20	w	LB	B	REP	PROG	WO	0.284		70
92	Moksnes, 1983	1464	Chicken (*Gallus domesticus*)	6	U	FD	18	w	20	w	LB	F	EGG	EGWT	EG	0.292		79
93	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	105	w	1	d	LB	F	REP	PROG	WO	0.378		70
94	Albers et al 1996	1208	Duck (*Anas platyrhynchos*)	5	U	FD	16	w	1	yr	AD	M	REP	TEWT	TE	0.644	1.29	81
95	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	2	UX	FD	49	d	NR	NR	LB	B	REP	PROG	WO	0.890		70
96	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	U	FD	10	w	2	w	LB	B	EGG	ESTH	WO	0.896		75
97	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	6	UX	FD	57	w	2	yr	LB	F	REP	NDAY	WO	1.03	2.58	87
98	Santolo et al 1999	1535	American Kestrel (*Falco sparverius*)	3	M	FD	11	w	NR	mo	LB	F	EGG	EGWT	EM	1.37		83
99	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	M	FD	10	w	NR	NR	JV	B	EGG	ESTH	WO	3.64		80
100	Arnold et al, 1973	69	Chicken (*Gallus domesticus*)	3	U	FD	24	w	1	d	LB	F	EGG	EGWT	EG		0.0911	79
101	Kaantee and Kurkela, 1980	36819	Chicken (*Gallus domesticus*)	3	M	FD	2	w	18	mo	LB	F	REP	PROG	WO		0.0988	85
102	Stone and Soares, 1976	2898	Japanese Quail (*Coturnix japonica*)	2	U	FD	32	d	NR	NR	LB	F	REP	PROG	WO		0.120	79
103	Poley et al., 1937	3787	Chicken (*Gallus domesticus*)	2	M	FD	1	w	NR	NR	LB	F	REP	HTCH	WO		0.127	79
104	Stanley et al., 1994	1570	Mallard (*Anas platyrhynchos*)	2	M	FD	93	d	1	yr	LB	B	REP	TERA	EM		0.355	83
105	Heinz and Hoffman 1998	1353	Mallard (*Anas platyrhynchos*)	2	M	FD	75	d	18	mo	LB	F	REP	TERA	EM		0.456	84
106	Heinz and Hoffman 1996	1352	Mallard (*Anas platyrhynchos*)	2	M	FD	4	w	NR	mo	LB	F	REP	TERA	EM		0.524	83
107	Hoffman and Heinz, 1988	1372	Mallard (*Anas platyrhynchos*)	2	UX	FD	6	w	NR	NR	LB	B	REP	ABNM	WO		0.546	83
108	Heinz and Hoffman 1996	1352	Mallard (*Anas platyrhynchos*)	2	M	FD	4	w	NR	mo	LB	F	REP	TERA	EM		0.580	83
109	Heinz and Hoffman 1996	1352	Mallard (*Anas platyrhynchos*)	2	M	FD	4	w	NR	mo	LB	F	REP	TPRD	EM		0.614	77
110	Smith et al, 1988	1562	Black-crowned night-heron (*Nycticorax nycti*	2	UX	FD	92	d	NR	NR	LB	B	REP	ODVP	WO		0.675	76
111	El-Begerami et al, 1977	1291	Japanese Quail (*Coturnix japonica*)	3	U	FD	16	w	1	d	JV	B	REP	ABNM	WO		0.702	78
112	El-Begearmi et al, 1982	6433	Japanese Quail (*Coturnix japonica*)	2	U	FD	16	w	NR	NR	LB	F	REP	HTCH	WO		0.780	78
113	Stoewsand et al., 1978	1575	Japanese Quail (*Coturnix japonica*)	2	U	FD	5	w	15	d	JV	F	REP	EGPN	WO		0.826	78
114	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	2	UX	FD	41	d	2	yr	LB	F	REP	PROG	WO		0.898	85
115	Heinz and Fitzgerald, 1993	36813	Mallard (*Anas platyrhynchos*)	2	M	FD	21	w	NR	NR	LB	F	REP	PROG	WO		1.19	84
116	Wiemeyer and Hoffman, 1996	1622	Owl (*Otus asio*)	3	M	FD	3	mo	3	yr	LB	B	REP	PLBR	WO		4.49	85
Growth (GRO)																		
117	Colnago et al, 1984	9356	Chicken (*Gallus domesticus*)	3	M	FD	24	d	1	d	JV	M	GRO	BDWT	WO	0.0632		73
118	Jensen, 1986	1402	Chicken (*Gallus domesticus*)	4	U	FD	3	w	1	d	JV	M	GRO	BDWT	WO	0.0740	0.370	75

Table 5.1
Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
119	Hegazy and Adachi, 2000	7725	Chicken (*Gallus domesticus*)	2	U	FD	15	d	1	d	JV	NR	GRO	BDWT	WO	0.0859		70
120	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	4	w	1	d	JV	B	GRO	BDWT	WO	0.180	0.721	81
121	Hill 1979	397	Chicken (*Gallus domesticus*)	4	U	FD	5	w	1	d	JV	F	GRO	BDWT	WO	0.204	0.408	77
122	Echevarria et al., 1988	1289	Chicken (*Gallus domesticus*)	4	U	FD	3	w	1	d	JV	M	GRO	BDWT	WO	0.213	0.426	82
123	Moksnes and Norheim, 1982	1465	Chicken (*Gallus domesticus*)	4	U	FD	31	w	20	w	JV	B	GRO	BDWT	WO	0.284		68
124	Moksnes, 1983	1464	Chicken (*Gallus domesticus*)	6	U	FD	18	w	20	w	SM	F	GRO	BDWT	WO	0.292		77
125	Moksnes and Norheim, 1982	1465	Chicken (*Gallus domesticus*)	4	U	FD	6	w	1	d	JV	B	GRO	BDWT	WO	0.319		68
126	Arnold et al, 1973	69	Chicken (*Gallus domesticus*)	3	U	FD	104	w	1	d	JV	B	GRO	BDWT	WO	0.371		68
127	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	105	w	1	d	JV	F	GRO	BDWT	WO	0.379		68
128	Poley and Moxon, 1937	3788	Chicken (*Gallus domesticus*)	4	U	FD	6	w	NR	NR	SM	F	GRO	BDWT	WO	0.429		68
129	Hill, 1974	1369	Chicken (*Gallus domesticus*)	6	U	FD	2	w	1	d	JV	B	GRO	BDWT	WO	0.429	0.859	82
130	Jensen et al., 1977	1404	Chicken (*Gallus domesticus*)	5	U	FD	2	w	1	d	JV	B	GRO	BDWT	WO	0.617	1.23	77
131	O'Toole and Raisbeck 1997	1476	Mallard (*Anas platyrhynchos*)	4	U	FD	21	d	NR	NR	JV	M	GRO	BDWT	WO	0.690	1.73	79
132	Cantor et al., 1984	1245	Chicken (*Gallus domesticus*)	4	U	DR	7	d	6	d	JV	M	GRO	BDWT	WO	0.718	1.44	78
133	Sell and Horani, 1976	1550	Japanese Quail (*Coturnix japonica*)	2	U	FD	23	d	8	d	JV	B	GRO	BDWT	WO	0.909		69
134	Yamamoto et al, 1998	1636	American Kestrel (*Falco sparverius*)	3	M	FD	77	d	NR	NR	MA	M	GRO	BDWT	WO	1.06		68
135	Hoffman et al, 1991	1377	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	GRO	BDWT	WO	1.13	4.53	86
136	Hoffman et al, 1992	1378	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	GRO	BDWT	WO	1.23	4.94	86
137	Ansari and Britton, 1974	36789	Chicken (*Gallus domesticus*)	2	U	FD	10	d	1	d	JV	M	GRO	BDWT	WO	1.38		67
138	Howell and Hill, 1978	1387	Chicken (*Gallus domesticus*)	2	U	FD	20	d	1	d	JV	B	GRO	BDWT	WO	1.42		67
139	Cantor et al., 1984	1245	Chicken (*Gallus domesticus*)	4	U	DR	7	d	9	d	JV	B	GRO	BDWT	WO	1.45	2.90	78
140	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	3	w	1	d	JV	NR	GRO	BDWT	WO	1.74	3.48	89
141	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	3	w	1	d	JV	NR	GRO	BDWT	WO	2.13	4.26	89
142	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	NR	GRO	BDWT	WO	3.04		72
143	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	GRO	BDWT	WO	4.16	8.32	84
144	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	1	w	1	d	JV	NR	GRO	BDWT	WO	5.75	11.5	84
145	Jensen et al., 1977	1404	Chicken (*Gallus domesticus*)	5	U	FD	2	w	1	d	JV	B	GRO	BDWT	WO	6.34	11.9	77
146	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	GRO	BDWT	WO	7.31		72
147	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	4	w	1	d	JV	B	GRO	BDWT	WO		0.0912	77
148	Poley et al., 1937	3787	Chicken (*Gallus domesticus*)	2	M	FD	1	w	NR	NR	SM	F	GRO	BDWT	WO		0.127	77
149	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	3	U	FD	4	w	1	d	JV	B	GRO	BDWT	WO		0.130	77
150	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	4	w	1	d	JV	B	GRO	BDWT	WO		0.180	77
151	Fairbrother and Fowles, 1990	1297	Mallard (*Anas platyrhynchos*)	3	U	DR	9	d	9	mo	JV	M	GRO	BDWT	WO		0.275	72
152	Dafalla and Adam, 1986	1273	Chicken (*Gallus domesticus*)	3	U	FD	2	w	7	d	JV	B	GRO	BDWT	WO		0.306	77
153	Khan et al, 1993	1415	Chicken (*Gallus domesticus*)	2	U	GV	28	d	43	d	JV	B	GRO	BDWT	WO		0.50	84
154	Khan et al, 1993	5483	Chicken (*Gallus domesticus*)	2	U	OR	4	w	NR	NR	JV	B	GRO	BDWT	WO		0.50	79
155	Sell and Horani, 1976	1550	Chicken (*Gallus domesticus*)	2	U	FD	28	d	1	d	JV	M	GRO	BDWT	WO		0.629	78
156	Elzubeir and Davis, 1988	1294	Chicken (*Gallus domesticus*)	2	U	FD	24	d	14	d	JV	M	GRO	BDWT	WO		0.788	77
157	Davis, el. al. 1996	1278	Chicken (*Gallus domesticus*)	2	U	FD	21	d	14	d	JV	M	GRO	BDWT	WO		0.855	77
158	Hill, 1979	1370	Chicken (*Gallus domesticus*)	2	U	FD	2	w	1	d	JV	B	GRO	BDWT	WO		0.859	71
159	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	U	FD	10	w	2	w	JV	B	GRO	BDWT	WO		0.896	77
160	Heinz and Fitzgerald, 1993	36813	Mallard (*Anas platyrhynchos*)	2	M	FD	21	w	NR	NR	SM	B	GRO	BDWT	WO		1.08	75
161	Hoffman et al, 1992	1376	Duck (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	GRO	BDWT	WO		1.20	82
162	Berg and Martinson, 1972	93	Chicken (*Gallus domesticus*)	3	U	FD	2	w	1	d	JV	NR	GRO	BDWT	WO		1.38	77
163	Lowry and Baker, 1989	1445	Chicken (*Gallus domesticus*)	2	U	FD	14	d	8	d	JV	M	GRO	BDWT	WO		1.55	77
164	Hill, 1979	1370	Chicken (*Gallus domesticus*)	2	U	FD	2	w	1	d	JV	B	GRO	BDWT	WO		1.72	71
165	Howell and Hill, 1978	1387	Chicken (*Gallus domesticus*)	2	U	FD	21	d	1	d	JV	B	GRO	BDWT	WO		1.78	76
166	Donaldson and McGowan, 1989	1285	Chicken (*Gallus domesticus*)	3	U	FD	20	d	1	d	JV	M	GRO	BDWT	WO		2.27	77
167	Hill, 1980	395	Chicken (*Gallus domesticus*)	2	U	FD	1	w	1	d	JV	F	GRO	BDWT	WO		2.76	71
168	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	M	FD	10	w	NR	NR	JV	B	GRO	BDWT	WO		3.64	82
Survival (MOR)																		
169	Arnold et al, 1973	69	Chicken (*Gallus domesticus*)	3	U	FD	24	w	1	d	JV	F	MOR	MORT	WO	0.093	0.371	82
170	Van Vleet et al, 1981	80	Duck (*Anas platyrhynchos*)	2	U	FD	15	d	1	d	JV	M	MOR	MORT	WO	0.153		77
171	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	0.290	0.579	84
172	Moksnes, 1983	1464	Chicken (*Gallus domesticus*)	6	U	FD	18	w	20	w	SM	F	MOR	MORT	WO	0.292		78
173	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	76	w	1	d	JV	F	MOR	MORT	WO	0.368		78
174	Thapar et al 1969	1592	Chicken (*Gallus domesticus*)	3	U	FD	105	w	1	d	JV	B	MOR	MORT	WO	0.378		77
175	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	3	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	0.412	0.823	84
176	Heinz and Fitzgerald 1993	1350	Mallard (*Anas platyrhynchos*)	5	UX	FD	13	w	NR	mo	AD	M	MOR	MORT	WO	0.563	1.13	85
177	El-Begearmi and Combs, 1982	1290	Chicken (*Gallus domesticus*)	4	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	0.572	1.14	84
178	Stoewsand et al., 1974	1577	Japanese Quail (*Coturnix japonica*)	2	U	FD	4	w	1	d	JV	B	MOR	MORT	WO	0.610		77
179	Sell and Horani, 1976	1550	Chicken (*Gallus domesticus*)	2	U	FD	28	d	1	d	JV	M	MOR	MORT	WO	0.629		79

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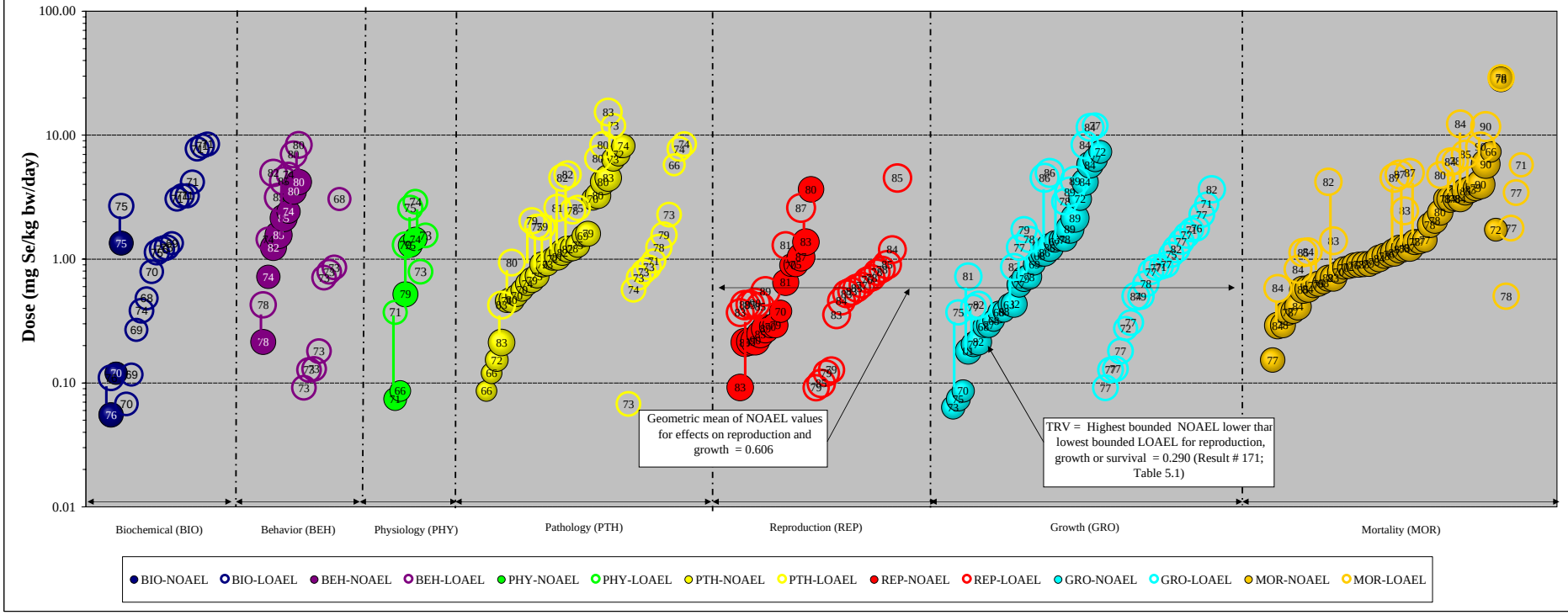
Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

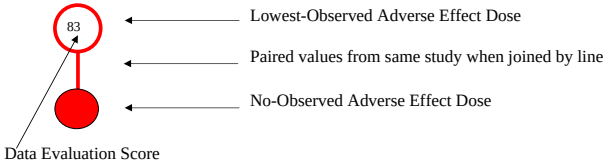
Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
180	Echevarria et al., 1988	1289	Chicken (*Gallus domesticus*)	4	U	FD	3	w	1	d	JV	M	MOR	MORT	WO	0.64		68
181	O'Toole and Raisbeck 1997	1476	Mallard (*Anas platyrhynchos*)	4	U	FD	50	d	NR	NR	AD	M	MOR	MORT	WO	0.699	4.19	82
182	El-Begerami et al, 1977	1291	Japanese Quail (*Coturnix japonica*)	3	U	FD	12	w	1	d	JV	B	MOR	SURV	WO	0.702	1.40	83
183	El-Begearmi et al, 1982	6433	Japanese Quail (*Coturnix japonica*)	2	U	FD	16	w	NR	NR	NR	B	MOR	SURV	WO	0.780		70
184	Heinz 1993	1347	Duck (*Anas platyrhynchos*)	2	U	FD	21	w	NR	NR	AD	M	MOR	MORT	WO	0.844		70
185	Hill, 1979	1370	Chicken (*Gallus domesticus*)	2	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	0.859		72
186	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	2	UX	FD	49	d	NR	NR	SM	B	MOR	MORT	WO	0.890		76
187	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	U	FD	10	w	2	w	JV	B	MOR	MORT	WO	0.896		78
188	Sell and Horani, 1976	1550	Japanese Quail (*Coturnix japonica*)	2	U	FD	23	d	8	d	JV	B	MOR	MORT	WO	0.909		78
189	Heinz et. al., 1989	1354	Duck (*Anas platyrhynchos*)	6	UX	FD	46	w	NR	NR	SM	B	MOR	MORT	WO	0.910		79
190	Yamamoto et al, 1998	1636	American Kestrel (*Falco sparverius*)	2	M	FD	77	d	NR	NR	MA	B	MOR	MORT	WO	0.944		75
191	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	2	UX	FD	41	d	2	yr	SM	F	MOR	MORT	WO	1.01		84
192	Yamamoto et al, 1998	1636	American Kestrel (*Falco sparverius*)	3	M	FD	77	d	NR	NR	MA	B	MOR	MORT	WO	1.06		78
193	Heinz and Fitzgerald, 1993	36813	Mallard (*Anas platyrhynchos*)	2	M	FD	21	w	NR	NR	SM	B	MOR	MORT	WO	1.08		76
194	Hoffman et al, 1991	1377	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	MOR	SURV	WO	1.13	4.53	87
195	Hoffman et al, 1992	1376	Duck (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	MOR	SURV	WO	1.20	4.80	87
196	Green and Albers, 1997	1319	Mallard (*Anas platyrhynchos*)	5	U	FD	16	w	14	mo	AD	M	MOR	MORT	WO	1.22	2.44	83
197	Hoffman et al, 1992	1378	Mallard (*Anas platyrhynchos*)	3	UX	FD	4	w	1	d	JV	B	MOR	SURV	WO	1.23	4.94	87
198	Santolo et al 1999	1535	American Kestrel (*Falco sparverius*)	3	M	FD	11	w	NR	mo	AD	B	MOR	MORT	WO	1.37		78
199	Ansari and Britton, 1974	36789	Chicken (*Gallus domesticus*)	2	U	FD	10	d	1	d	JV	M	MOR	MORT	WO	1.38		77
200	Howell and Hill, 1978	1387	Chicken (*Gallus domesticus*)	2	U	FD	20	d	1	d	JV	B	MOR	MORT	WO	1.42		77
214	Hill, 1979	1370	Chicken (*Gallus domesticus*)	2	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	1.72		72
201	Hoffman et al, 1991	1374	Mallard (*Anas platyrhynchos*)	7	U	FD	14	w	2	yr	AD	M	MOR	SURV	WO	1.87		78
202	Smith et al, 1988	1562	Black-crowned night-heron (*Nycticorax nycti*	3	UX	FD	92	d	NR	NR	AD	B	MOR	MORT	WO	2.03		78
203	Albers et al 1996	1208	Duck (*Anas platyrhynchos*)	5	U	FD	16	w	1	yr	AD	M	MOR	MORT	WO	2.38	4.75	80
204	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	2	U	FD	2	w	1	d	JV	NR	MOR	SURV	WO	3.04		73
205	Donaldson and McGowan, 1989	1285	Chicken (*Gallus domesticus*)	3	U	FD	18	d	1	d	JV	M	MOR	MORT	WO	3.04	6.08	84
206	Jensen et al., 1977	1404	Chicken (*Gallus domesticus*)	5	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	3.07	6.14	78
207	Heinz and Hoffman, 1987	1356	Mallard (*Anas platyrhynchos*)	6	UX	FD	57	d	2	yr	SM	B	MOR	MORT	WO	3.08	12.3	84
208	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	1	w	1	d	JV	NR	MOR	SURV	WO	3.49	6.99	85
209	Stoewsand, etl al, 1977	1574	Japanese Quail (*Coturnix japonica*)	2	M	FD	10	w	2	w	JV	B	MOR	MORT	WO	3.64		83
210	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	MOR	SURV	WO	3.72		79
211	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	3	w	1	d	JV	NR	MOR	MORT	WO	3.99	7.98	90
212	Heinz et al 1988	1355	Mallard (*Anas platyrhynchos*)	5	UX	FD	2	w	1	d	JV	NR	MOR	MORT	WO	5.84	11.7	90
213	Heinz et al 1996	1357	Mallard (*Anas platyrhynchos*)	3	U	FD	2	w	1	d	JV	NR	MOR	SURV	WO	7.31		66
215	Jensen et al., 1977	1404	Chicken (*Gallus domesticus*)	5	U	FD	2	w	1	d	JV	B	MOR	MORT	WO	28.2	29.0	78
216	Khan et al, 1993	1415	Chicken (*Gallus domesticus*)	2	U	GV	28	d	43	d	JV	F	MOR	MORT	WO		0.50	78
217	Howell and Hill, 1978	1387	Chicken (*Gallus domesticus*)	2	U	FD	21	d	1	d	JV	B	MOR	MORT	WO		1.78	77
218	Hill, 1974	1369	Chicken (*Gallus domesticus*)	2	U	FD	2	w	1	d	JV	B	MOR	MORT	WO		3.44	77
219	Heinz 1993	1347	Duck (*Anas platyrhynchos*)	2	U	FD	5	w	NR	NR	AD	M	MOR	MORT	WO		5.75	71

ABNM = abnormal; B = both; BDWT = body weight changes; BEH = behavior; BIO = biochemical; BL = blood; bw = body weight; CHM = chemical changes; d = day; DR = drinking water; EG = egg; EGG = egg; EGPN = eggs per nest; EGWT = egg weight; EM = embryo; ENZ = enyzme level changes; ESTH = eggshell thickness; F = female; FCNS = food consumption; FD = food; FDB = feeding behavior; FDCV = food conversion efficiency; FO = foot; GCHM = general biochemical changes; GENZ = general enzyme changes; GHIS = general histology; GITX = general intoxication; GLAD = glutamic acid dehydrogenase; GLPX = glutathione peroxidase; GLSN = gross lesions; GLTH = glutathione; GPHY = general pysiology changes; GRO = growth; GV = gavage; GZ = gizzard; HEME = heme content; HIS = histological changes; HMGL = hemoglobin; HTCH = hatch; IRRI = skin irritation; ITX = intoxication; JV = juvenile; kg = kilograms; KI = kidney; LB = egg-laying bird; LI = liver; LIPD = lipid; LOAEL = lowest observed adverse effect level; mg = milligrams; mo = months; M = male; M = measured; MOR = effects on mortality and survival; MORT = mortality; NCRO = necrosis; NDAY = number of days between eggs laid; NK = neck; NOAEL = No Observed Advese Effect Level; NR = Not reported; ODVP = offspring development; OR = other oral; ORW = organ weight changes; ORWT = organ weight changes; OV = ovaries; PHY = physiology; PL = plasma; PLBR = pairs with litter or brood; PR = proventriculus; PROG = progeny counts/numbers; PTH = pathology; REP = reproduction; RSUC = reproductive success (general); SK = skin; SM = sexually mature; SMIX = weight relative to body weight; SP = spleen; SR = serum; SURV = survival; TE = testes; TERA = teratogenic measurements; TEWT = testes weight; TPRD = total production; U = unmeasured; UX = measured but values not reported; w = weeks; WO = whole organism; yr = year.

*NOAEL and LOAEL values that are equal and from the same reference represent different experimental designs.
These are designated with different Phase numbers in Appendix 5.1.

Figure 5.1 Avian TRV Derivation for Selenium





Wildlife TRV Derivation Process

1) There are at least three results available for two test species within the growth, reproduction, and mortality effect groups. There are enough data to derive a TRV.

2) There are at least three NOAEL results available within the growth and reproduction effect groups for calculation of a geometric mean.

3) The geometric mean is equal to 0.606 mg selenium/kg bw/d. However, this value is higher than the lowest bounded LOAEL for results within the reproduction, growth, and survival (MOR) effect groups.

3) The avian wildlife TRV for selenium is equal to 0.290 mg selenium/kg bw/day which is the highest NOAEL value lower than the lowest bounded LOAEL value for effects on reproduction, growth or survival.

5.2 Estimation of Dose and Calculation of the Eco-SSL

Three separate Eco-SSL values were calculated for avian wildlife, one for each of three surrogate receptor species representing different trophic levels. The avian Eco-SSLs were calculated according to the Eco-SSL guidance (U.S. EPA, 2003) and are summarized in Table 5.2.

Table 5.2 Calculation of the Avian Eco-SSLs for Selenium

Surrogate Receptor Group	TRV for Selenium (mg dw/kg bw/d) [1]	Food Ingestion Rate (FIR)[2] (kg dw/kg bw/d)	Soil Ingestion as Proportion of Diet (P_s)[2]	Concentration of Selenium in Biota Type (i)[2,3] (B_i) (mg/kg dw)	Eco-SSL (mg/kg dw)[4]
Avian herbivore (dove)	0.290	0.190	0.139	$\ln(B_i) = 1.104 * \ln(Soil_j) - 0.677$ where i = plants	2.2
Avian ground insectivore (woodcock)	0.290	0.214	0.164	$\ln(B_i) = 0.733 * \ln(Soil_j) - 0.075$ where i = earthworms	1.2
Avian carnivore (hawk)	0.290	0.0353	0.057	$\ln(B_i) = 0.3764 * \ln(Soil_j) - 0.4158$ where i = mammals	83

[1] The process for derivation of wildlife TRVs is described in Attachment 4-5 of U.S. EPA (2003).
[2] Parameters (FIR, P_s, B_i values, regressions) are provided in U.S. EPA (2003) Attachment 4-1 (revised February 2005).
[3] B_i = Concentration in biota type (i) which represents 100% of the diet for the respective receptor.
[4] $HQ = [FIR * (Soil_j * P_s + B_i)] / TRV$ solved for HQ=1 where $Soil_j$ = Eco-SSL (Equation 4-2; U.S. EPA, 2003).

6.0 ECO-SSL FOR MAMMALIAN WILDLIFE

The derivation of the Eco-SSL for mammalian wildlife was completed as two parts. First, the TRV was derived according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5). Second, the Eco-SSL (soil concentration) was back-calculated for each of three surrogate receptor species based on the wildlife exposure model and the TRV (U.S. EPA, 2003).

6.1 Mammalian TRV

The literature search was completed according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-2) and identified 1,734 papers with possible toxicity data for selenium for either avian or mammalian species. Of these studies, 1,532 were rejected for use as described in Section 7.5. Of the remaining papers, 132 contained data for mammalian test species. These papers were reviewed and the data were extracted and scored according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-3 and 4-4). The results of the data extraction and review are summarized in Table 6.1. The complete results are provided as Appendix 6-1.

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
Biochemical (BIO)																		
1	Meyer et al 1982	662	Rat (*Rattus norvegicus*)	2	U	FD	30	d	NR	NR	JV	M	ENZ	GLPX	LI	0.0642		71
2	Bauersachs et al., 1993	1221	Rat (*Rattus norvegicus*)	2	U	FD	44	d	NR	mo	JV	M	ENZ	GLPX	LI	0.0771		69
3	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	CHM	LMPH	BL	0.0776	0.128	86
4	Hu et al., 1984	1389	Rat (*Rattus norvegicus*)	2	U	FD	7	mo	1	mo	JV	F	CHM	HMGL	BL	0.0912		69
5	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	ENZ	GLPX	WO	0.137	0.273	72
6	Liu et al., 1994	1442	Rat (*Rattus norvegicus*)	4	M	FD	2	w	45	d	JV	F	CHM	GLTH	LI	0.151	0.304	82
7	Jenkins and Hidiroglou, 1986	1401	Cattle (*Bos taurus*)	5	U	FD	6	w	3	d	JV	M	CHM	PCLV	BL	0.165	0.330	76
8	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	ENZ	GLPX	SR	0.170	0.510	82
9	Goehring et. al. 1983	1313	Pig (*Sus scrofa*)	6	M	FD	5	w	NR	NR	JV	B	CHM	GLPX	BL	0.173	0.323	82
10	Yeh et al, 1997	1640	Rat (*Rattus norvegicus*)	4	U	FD	8	w	NR	NR	JV	B	ENZ	GLPX	PL	0.181	0.362	76
11	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	ENZ	GLPX	SR	0.183	0.548	82
12	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	CHM	PCLV	BL	0.217	0.470	81
13	Chen et al., 1982	1254	Rat (*Rattus norvegicus*)	3	U	FD	4	w	NR	NR	JV	M	ENZ	P450	LI	0.227	0.680	76
14	Tsunoda et al, 2000	36834	Mouse (*Mus musculus*)	4	U	DR	14	d	7-8	w	JV	M	HRM	DOPA	BR	0.240	0.580	72
15	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	6	w	NR	NR	JV	B	CHM	PCLV	BL	0.265		67
16	Ishikawa et al, 1992	1392	Mouse (*Mus musculus*)	5	U	DR	12	w	5	w	JV	M	ENZ	NCCR	LI	0.273	0.547	70
17	Gronbaek et al., 1995	1323	Rat (*Rattus norvegicus*)	2	U	DR	35	d	3-4	w	JV	M	CHM	GLUC	SR	0.360		66
18	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	ENZ	GLPX	SR	0.367	0.489	72
19	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	CHM	PCLV	BL	0.388	0.776	77
20	Johnson, et al., 2000	36818	Mouse (*Mus musculus*)	4	U	DR	14	d	6-7	w	JV	M	CHM	RBCE	BL	0.438	1.31	71
21	Davies, et al, 1987	10867	Rat (*Rattus norvegicus*)	3	U	FD	6	w	8	w	JV	M	ENZ	P450	LI	0.457		66
22	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	17	w	NR	NR	JV	B	CHM	PCLV	BL	0.464		67
23	Jacobs and Forst 1981	1393	Rat (*Rattus norvegicus*)	6	U	DR	35	d	5, 12	w	JV	F	ENZ	GOTR	BL	0.464	0.928	70
24	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	F	ENZ	GLPX	LI	0.532		67
25	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	8	U	FD	6	w	NR	NR	JV	M	CHM	HMGL	BL	0.576	0.720	70
26	Reiter and Wendel, 1985	1526	Mouse (*Mus musculus*)	3	U	FD	4	mo	NR	mo	JV	M	ENZ	GSTR	LI	0.654	1.31	75
27	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	CHM	PCLV	BL	0.715		66
28	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	66	d	NR	NR	GE	F	HRM	PRGS	SR	0.780		66
29	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	66	d	NR	mo	GE	F	HRM	PRGS	SR	0.945		66
30	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	B	CHM	HMCT	BL	1.51		77
31	Wilson et al 1988	1629	Pig (*Sus scrofa*)	4	U	OR	31	d	6	w	JV	M	CHM	GBCM	BL	1.92		68
32	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	M	CHM	HMCT	BL	2.28		80
33	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	7	U	DR	46	d	7-18	w	JV	B	ENZ	ALPH	SR	4.55	9.09	70
34	Sayato et al 1993	1538	Mouse (*Mus musculus*)	5	U	GV	30	d	5	w	JV	M	ENZ	ASAT	BL	10.0	20.0	78
35	Glattre et al, 1995	11361	Rat (*Rattus norvegicus*)	2	U	DR	4	w	NR	NR	JV	M	HRM	TRII	SR		0.090	69
36	Fredriksson et al., 1993	1304	Rat (*Rattus norvegicus*)	2	M	FD	8	w	NR	NR	GE	F	ENZ	GLPX	BL		0.108	74
37	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	CHM	HMGL	BL		0.130	80
38	Boylan et al, 1990	1239	Mouse (*Mus musculus*)	2	M	FD	6	mo	NR	NR	JV	F	ENZ	GLPX	LI		0.156	75
39	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	ENZ	GLPX	LI		0.163	70
40	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	ENZ	GLPX	LI		0.166	70
41	Gunter et al, 2003	25959	Cattle (*Bos taurus*)	2	U	FD	42	w	NR	NR	GE	F	ENZ	GLPX	SR		0.173	70
42	Nehru et al., 1997	2788	Rat (*Rattus norvegicus*)	2	U	GV	8	w	NR	NR	JV	F	CHM	PRTL	BR		0.175	72
43	Coudray, et. al. 1996	1271	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	CHM	RGSH	BL		0.198	69
44	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	ENZ	ALPH	BL		0.205	74
45	Whanger and Butler, 1988	1618	Rat (*Rattus norvegicus*)	4	U	FD	9	w	NR	NR	JV	M	ENZ	GLPX	BL		0.245	71
46	LeBoeuf et al., 1985	1433	Rat (*Rattus norvegicus*)	3	U	FD	2	w	NR	NR	JV	M	CHM	GBCM	LI		0.261	69
47	Turan et al., 1997	1602	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	12	w	NR	NR	JV	B	ENZ	GLPX	BL		0.277	70
48	Wahlstrom et al., 1984	1612	Pig (*Sus scrofa*)	2	U	FD	6	w	5-6	w	JV	M	ENZ	GLPX	PL		0.303	75
49	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	CHM	PCLV	BL		0.307	74
50	Scott et al., 1977	1546	Rat (*Rattus norvegicus*)	2	U	FD	3	mo	NR	NR	NR	F	ENZ	GLPX	BL		0.337	69
51	Ip, 1984	1390	Mouse (*Mus musculus*)	2	U	FD	2	w	8	w	JV	F	ENZ	GSTR	LI		0.337	69
52	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	ENZ	ASAT	BL		0.352	74
53	Yeh et al., 1995	1638	Rat (*Rattus norvegicus*)	2	U	FD	6	w	4	w	JV	M	CHM	GBCM	MU		0.365	70
54	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	B	ENZ	GLPX	LI		0.374	71
55	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	1	w	NR	NR	JV	M	CHM	GBCM	LI		0.390	69
56	Jaffe and Mondragon, 1975	1396	Rat (*Rattus norvegicus*)	3	U	FD	5	w	21	d	JV	B	CHM	PCLV	BL		0.391	69
57	Das et al., 1989	1274	Guinea pig (*Cavia porcellus*)	2	M	FD	60	d	21-25	d	JV	B	CHM	HMCT	BL		0.399	68
58	Das et al., 1989	1275	Guinea pig (*Cavia porcellus*)	2	M	FD	20	d	21-25	d	JV	B	CHM	GLUC	BL		0.399	68
59	Liu and Boylan, 1994	1443	Rat (*Rattus norvegicus*)	2	M	FD	8	w	NR	NR	JV	M	CHM	CHOL	PL		0.420	75
60	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	1	w	NR	NR	JV	M	CHM	GBCM	LI		0.441	69
61	Birt et al., 1986	1232	Hamster (*Mesocricetus auratus*)	2	U	FD	50	w	4	w	JV	B	ENZ	GLPX	WO		0.490	70

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
62	LeBoeuf and Hoekstra, 1983	1432	Rat (*Rattus norvegicus*)	2	U	FD	6	w	NR	NR	JV	M	ENZ	G6PD	LI		0.521	69
63	Kaur et al., 1999	1522	Rat (*Rattus norvegicus*)	3	U	FD	6	w	2-3	mo	JV	M	CHM	LIPD	TE		0.549	70
64	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	1	w	NR	NR	JV	M	CHM	GBCM	LI		0.589	69
65	Turan et al 1997	1603	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	14	w	NR	NR	JV	B	ENZ	GLPX	BL		0.652	70
66	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	5	U	FD	21	d	4	w	JV	B	ENZ	GLPX	ER		0.762	71
67	Rastogi et al., 1976	1523	Rat (*Rattus norvegicus*)	2	U	DR	8	w	1	mo	JV	B	ENZ	ALAD	BL		0.953	66
68	Das et al., 1989	1275	Guinea pig (*Cavia porcellus*)	2	U	FD	20	d	21-25	d	JV	B	CHM	GLUC	BL		1.07	69
69	Das et al., 1989	1274	Guinea pig (*Cavia porcellus*)	2	U	FD	23	d	21-25	d	JV	B	CHM	HMCT	BL		1.07	69
70	Yilmaz et al, 1997	14273	Rat (*Rattus norvegicus*)	2	U	FD	5	w	5	w	JV	M	CHM	CHOL	TE		1.25	70
71	Sc hroeder, 1968	15506	Rat (*Rattus norvegicus*)	2	U	DR	422	d	21-23	d	JV	B	CHM	CHOL	SR		1.43	69
72	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	100	d	28	d	JV	B	CHM	HMGL	BL		1.79	74
73	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	35	d	28	d	JV	B	CHM	HMGL	BL		3.54	74
74	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	21	d	28	d	JV	B	CHM	HMGL	BL		3.74	71
75	Debski et al., 1992	1280	Rat (*Rattus norvegicus*)	2	U	FD	2	w	NR	NR	JV	M	ENZ	GLPX	BL		0.110	74
			Behavior (BEH)															
76	Shull and Checke, 1973	1557	Rat (*Rattus norvegicus*)	3	U	FD	8	w	NR	NR	JV	M	FDB	FCNS	WO	0.0530	0.265	78
77	Meyer et al 1982	662	Rat (*Rattus norvegicus*)	2	U	FD	30	d	NR	NR	JV	M	FDB	FCNS	WO	0.0642		74
78	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	FDB	WCON	WO	0.0776	0.128	89
79	Kim and Mahan, 2001	25957	Pig (*Sus scrofa*)	6	U	FD	12	w	NR	NR	JV	B	FDB	FCNS	WO	0.112	0.157	80
80	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	FDB	WCON	WO	0.130	0.196	89
81	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	FDB	FCNS	WO	0.137	0.273	80
82	Mahan and Moxon, 1984	1450	Pig (*Sus scrofa*)	7	U	FD	37	d	4	w	JV	B	FDB	FCNS	WO	0.143	0.215	80
83	Johnson, et al., 2000	36818	Mouse (*Mus musculus*)	4	U	DR	14	d	6-7	w	JV	M	FDB	WCON	WO	0.145	0.436	74
84	Liu and Milner, 1992	12370	Rat (*Rattus norvegicus*)	2	M	FD	14	d	41	d	JV	F	FDB	FCNS	WO	0.153		72
85	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	2	UX	FD	14	w	NR	NR	JV	F	FDB	FCNS	WO	0.155	0.221	85
86	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	FDB	FCNS	WO	0.170	0.510	85
87	Goehring et. al. 1983	1313	Pig (*Sus scrofa*)	6	M	FD	5	w	NR	NR	JV	B	FDB	FCNS	WO	0.173	0.323	85
88	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	FDB	WCON	WO	0.181		72
89	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	FDB	FCNS	WO	0.183	0.548	85
90	Mandisodza et al., 1979	1454	Pig (*Sus scrofa*)	3	M	FD	61	d	5-7	w	JV	B	FDB	FCNS	WO	0.184		69
91	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	FDB	WCON	WO	0.191		72
92	Moxon and Mahan, 1982	1468	Pig (*Sus scrofa*)	8	UX	FD	14	d	NR	NR	JV	NR	FDB	FCNS	WO	0.227	0.340	85
93	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	4	UX	FD	14	w	NR	NR	JV	F	FDB	FCNS	WO	0.236		70
94	Tsunoda et al, 2000	36834	Mouse (*Mus musculus*)	4	U	DR	14	d	7-8	w	JV	M	FDB	WCON	WO	0.240	0.580	75
95	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	4	U	DR	47	w	6	w	JV	F	FDB	WCON	WO	0.250	0.784	72
96	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	3	mo	NR	NR	JV	NR	FDB	FEFF	WO	0.254		74
97	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	B	FDB	WCON	WO	0.256	0.416	86
98	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	6	w	NR	NR	JV	B	FDB	FCNS	WO	0.265		70
99	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	FDB	FCNS	WO	0.271	0.407	75
100	Liu et al., 1994	1442	Rat (*Rattus norvegicus*)	4	M	FD	2	w	45	d	JV	F	FDB	FCNS	WO	0.328		70
101	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	B	FDB	FCNS	WO	0.356	0.712	80
102	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	M	FDB	FCNS	WO	0.374	0.747	80
103	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	FDB	FCNS	WO	0.388	0.776	80
104	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	M	FDB	WCON	WO	0.447	0.781	89
105	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	17	w	NR	NR	JV	B	FDB	FCNS	WO	0.464		70
106	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	M	FDB	FCNS	WO	0.610	1.21	88
107	Birt et al., 1983	1233	Hamster (*Mesocricetus auratus*)	3	U	FD	25	w	4	w	JV	B	FDB	FCNS	WO	0.652		74
108	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	FDB	FCNS	WO	0.653	0.980	80
109	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	8	U	FD	6	w	NR	NR	JV	M	FDB	WCON	WO	0.744	0.892	73
110	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	F	FDB	FCNS	WO	1.26		73
111	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	5	U	FD	21	d	4	w	JV	B	FDB	FCNS	WO	1.85	3.70	80
112	Tsunoda et al, 2000	36834	Mouse (*Mus musculus*)	4	U	DR	14	d	7-8	w	JV	M	FDB	WCON	WO	1.96		67
113	Lalor and Llewellyn, 1979	36822	Gerbil (*Meriones unguiculatus*)	3	U	DR	1	w	NR	NR	JV	M	FDB	WCON	WO		0.0637	69
114	Lalor and Llewellyn, 1979	36822	Gerbil (*Meriones unguiculatus*)	3	U	DR	1	w	NR	NR	JV	M	FDB	WCON	WO		0.0796	69
115	Boylan et al, 1990	1239	Mouse (*Mus musculus*)	2	M	FD	6	mo	NR	NR	JV	F	BEH	ACTV	WO		0.156	78
116	Miller, 1938	14492	Pig (*Sus scrofa*)	5	U	FD	63	d	4	mo	JV	B	FDB	FCNS	WO		0.235	74
117	Hadjimarkos, 1967	1327	Rat (*Rattus norvegicus*)	2	U	DR	21	d	NR	NR	JV	M	FDB	WCON	WO		0.242	69
118	Das et al., 1989	1275	Guinea pig (*Cavia porcellus*)	2	M	FD	60	d	21-25	d	JV	B	FDB	FCNS	WO		0.399	71
119	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	7	d	21	d	JV	M	FDB	WCON	WO		0.441	74
120	Carmichael and Fowler, 1980	1249	Rat (*Rattus norvegicus*)	2	U	DR	22	w	NR	NR	JV	M	FDB	FCNS	WO		0.454	69
121	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	7	d	21	d	JV	M	FDB	WCON	WO		0.455	74
122	Raisbeck et al., 1996	1521	Pronghorn (*Antilocapra americana*)	2	M	FD	164	d	6-96	mo	JV	M	FDB	FCNS	WO		0.493	77

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
123	Salbe et al., 1990	1532	Rat (*Rattus norvegicus*)	3	U	DR	21	d	21	d	JV	F	FDB	FCNS	WO		0.498	68
124	Parshad and Sud, 1989	1500	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	FDB	FCNS	WO		0.550	73
125	Gronbaek et al., 1995	1323	Rat (*Rattus norvegicus*)	2	U	DR	6	d	3-4	w	JV	M	FDB	FCNS	WO		0.639	69
126	Hadjimarkos, 1970	14488	Hamster (*Mesocricetus auratus*)	4	U	DR	4	w	NR	NR	JV	M	FDB	WCON	WO		0.680	72
127	Cabe, et al., 1979	1244	Rat (*Rattus norvegicus*)	2	U	DR	13	w	50	d	JV	M	FDB	WCON	WO		0.769	68
128	Das et al., 1989	1275	Guinea pig (*Cavia porcellus*)	2	U	FD	23	d	21-25	d	JV	B	FDB	FCNS	WO		1.07	72
129	Rastogi et al., 1976	1523	Rat (*Rattus norvegicus*)	2	U	DR	1	w	1	mo	JV	B	FDB	FCNS	WO		1.59	69
130	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	65	d	28	d	JV	M	FDB	FCNS	WO		1.79	77
131	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	5	d	28	d	JV	B	FDB	FCNS	WO		3.54	77
132	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	5	d	28	d	JV	B	FDB	FCNS	WO		3.74	74
Physiology (PHY)																		
133	Meyer et al 1982	662	Rat (*Rattus norvegicus*)	2	U	FD	30	d	NR	NR	JV	M	PHY	FDCV	WO	0.0642		74
134	Kim and Mahan, 2001	25957	Pig (*Sus scrofa*)	6	U	FD	12	w	NR	NR	JV	B	PHY	FDCV	WO	0.112	0.157	80
135	Bioulac-Sage et al., 1992	1228	Rat (*Rattus norvegicus*)	3	U	FD	2	mo	NR	NR	JV	M	PHY	BLPR	WO	0.157	0.314	79
136	Jenkins and Hidiroglou, 1986	1401	Cattle (*Bos taurus*)	5	U	FD	6	w	3	d	JV	M	PHY	FDCV	WO	0.165	0.330	79
137	Schoening, 1936	14495	Pig (*Sus scrofa*)	3	M	FD	1	mo	9	mo	JV	M	PHY	RPRT	WO	0.171	0.343	78
138	Mandisodza et al., 1979	1454	Pig (*Sus scrofa*)	3	M	FD	61	d	5-7	w	JV	B	PHY	FDCV	WO	0.189		70
139	Coudray, et. al. 1996	1271	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	PHY	HTRT	WO	0.198		73
140	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	2	UX	FD	14	w	NR	NR	JV	F	PHY	FDCV	WO	0.225		70
141	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	4	UX	FD	14	w	NR	NR	JV	F	PHY	FDCV	WO	0.236		70
142	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	PHY	FDCV	WO	0.254	0.381	80
143	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	6	w	NR	NR	JV	B	PHY	FDCV	WO	0.265		70
144	Perry et al, 1980	21131	Rat (*Rattus norvegicus*)	2	U	DR	18	mo	NR	NR	JV	F	PHY	BLPR	WO	0.396		67
145	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	17	w	NR	NR	JV	B	PHY	FDCV	WO	0.464		70
146	Pathak and Datta 1984	1501	Goat (*Capra hircus*)	4	U	OR	17	d	6	mo	AD	NR	PHY	RPRT	WO	3.0	6.0	82
147	Demirel-Yilmaz et al., 1998	1281	Rat (*Rattus norvegicus*)	2	M	FD	18	w	NR	NR	JV	B	PHY	GPHY	KI		0.358	78
148	Turan et al 1997	1603	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	14	w	NR	NR	JV	B	PHY	GPHY	IN		0.652	73
Pathology (PTH)																		
149	Jenkins and Hidiroglou, 1986	1401	Cattle (*Bos taurus*)	5	U	FD	6	w	3	d	JV	M	ORW	ORWT	KI	0.0329	0.0986	79
150	Meyer et al 1982	662	Rat (*Rattus norvegicus*)	2	U	FD	30	d	NR	NR	JV	M	ORW	SMIX	HE	0.0642		74
151	Mahan and Moxon, 1984	1450	Pig (*Sus scrofa*)	7	U	FD	37	d	4	w	JV	B	HIS	GHIS	HA	0.0716	0.143	80
152	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	HIS	GLSN	KI	0.0776	0.128	89
153	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	3	M	FD	4	w	NR	NR	JV	NR	ORW	ORWT	LI	0.0838	0.763	82
154	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	HIS	GLSN	KI	0.130	0.196	89
155	Johnson, et al., 2000	36818	Mouse (*Mus musculus*)	4	U	DR	14	d	6-7	w	JV	M	ORW	SMIX	TS	0.145	0.436	74
156	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	17	w	NR	NR	JV	B	ORW	SMIX	LI	0.148	0.319	85
157	OToole and Raisbeck 1995	1477	Cattle (*Bos taurus*)	4	U	FD	120	w	10-12	mo	JV	M	HIS	HYPL	FO	0.150	0.280	83
158	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	ORW	SMIX	LI	0.163		73
159	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	ORW	SMIX	WO	0.166		73
160	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	HIS	GLSN	FO	0.170	0.510	85
161	Nehru et al., 1997	2788	Rat (*Rattus norvegicus*)	2	U	GV	8	w	NR	NR	JV	F	ORW	SMIX	BR	0.175		68
162	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	HIS	GLSN	FO	0.183	0.548	85
163	Coudray, et. al. 1996	1271	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	ORW	ORWT	HE	0.198		73
164	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	ORW	SMIX	LI	0.215	0.467	84
165	Yaeger et al 1998	1635	Cattle (*Bos taurus*)	3	UX	FD	4	mo	NR	NR	GE	F	ITX	GITX	WO	0.268		78
166	OToole and Raisbeck 1995	1477	Cattle (*Bos taurus*)	4	U	FD	120	d	10-12	mo	JV	M	HIS	GHIS	FO	0.280	0.80	83
167	Spallholz et al., 1973	1566	Mouse (*Mus musculus*)	10	U	FD	5	w	NR	NR	JV	B	ORW	ORWT	SP	0.314	0.384	79
168	Liu et al., 1994	1442	Rat (*Rattus norvegicus*)	4	M	FD	2	w	45	d	JV	F	ORW	ORWT	LI	0.328		70
169	Ip, 1984	1390	Mouse (*Mus musculus*)	2	U	FD	2	w	8	w	JV	F	ORW	SMIX	LI	0.337		72
170	Thorlacius-Ussing et al., 1988	1597	Rat (*Rattus norvegicus*)	2	U	DR	21	d	25	d	JV	F	HIS	GLSN	WO	0.378		68
171	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	ORW	ORWT	LI	0.388	0.776	80
172	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	B	ORW	ORWT	KI	0.416	0.735	86
173	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	8	U	FD	6	w	NR	NR	JV	M	ORW	SMIX	SP	0.425	0.567	73
174	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	1	w	NR	NR	JV	M	ORW	ORWT	LI	0.426	1.28	78
175	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	1	w	NR	NR	JV	M	ORW	SMIX	LI	0.441	0.881	78
176	Chen et al., 1985	1256	Rat (*Rattus norvegicus*)	4	U	DR	32	d	NR	NR	JV	M	ITX	GITX	WO	0.480	0.959	74
177	Raisbeck et al., 1996	1521	Pronghorn (*Antilocapra americana*)	2	M	FD	164	d	6-96	mo	JV	M	ITX	GITX	WO	0.493		77
178	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	M	HIS	USTR	LI	0.610	1.21	88
179	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	F	HIS	USTR	LI	0.630	1.26	88
180	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	ORW	SMIX	LI	0.763		69
181	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	3	U	FD	12	w	NR	NR	JV	F	HIS	GHIS	LI	0.996	1.59	78
182	Ishikawa et al, 1992	1392	Mouse (*Mus musculus*)	5	U	DR	12	w	5	w	JV	M	ORW	ORWT	LI	1.09		68

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
183	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	6	U	GV	8	d	64	d	JV	F	ITX	ATAX	WO	1.14	2.28	86
184	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	4	U	DR	50	w	6	w	JV	F	HIS	GLSN	LI	1.21		68
185	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	3	U	FD	12	w	NR	NR	JV	F	HIS	GHIS	LI	1.59		72
186	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	2	U	GV	8	d	64	d	GE	F	ITX	GITX	WO	1.60		80
187	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	5	U	FD	21	d	4	w	JV	B	ORW	ORWT	KI	4.33	8.65	78
188	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	7	U	DR	46	d	6	d	JV	F	HIS	NCRO	LI	4.55	9.09	73
189	Sayato et al 1993	1538	Mouse (*Mus musculus*)	5	U	GV	30	d	5	w	JV	M	HIS	GLSN	LI	20.0	30.0	81
190	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	6	w	NR	NR	JV	B	ORW	SMIX	LI		0.0816	79
191	Bioulac-Sage et al., 1992	1228	Rat (*Rattus norvegicus*)	3	U	FD	2	mo	NR	NR	JV	M	ORW	SMIX	LI		0.157	73
192	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	5	w	NR	NR	JV	NR	ITX	GITX	WO		0.163	74
193	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	d	JV	B	ITX	GITX	WO		0.205	77
194	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	M	ORW	ORWT	KI		0.230	83
195	Miller, 1938	14492	Pig (*Sus scrofa*)	5	U	FD	63	d	4	mo	JV	B	HIS	GHIS	MT		0.235	74
196	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	3	mo	NR	NR	JV	NR	ITX	GITX	WO		0.254	74
197	Schroeder, 1967	1540	Mouse (*Mus musculus*)	2	U	DR	339	d	21	d	JV	B	HIS	GHIS	LI		0.263	68
198	Schroeder, 1967	1540	Rat (*Rattus norvegicus*)	2	U	DR	16	d	21	d	JV	B	HIS	GHIS	LI		0.275	68
199	Turan et al., 1997	1602	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	12	w	NR	NR	JV	B	HIS	GHIS	BO		0.277	73
200	Wahlstrom and Olson, 1959	14497	Pig (*Sus scrofa*)	2	U	FD	239	d	8	w	GE	F	HIS	GHIS	FO		0.296	73
201	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	ITX	GITX	WO		0.307	77
202	Wahlstrom et al., 1984	1612	Pig (*Sus scrofa*)	2	U	FD	6	w	5-6	w	JV	M	ITX	GITX	WO		0.343	78
203	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	ITX	GITX	WO		0.352	77
204	Gronbaek et al., 1995	1323	Rat (*Rattus norvegicus*)	2	U	DR	35	d	3-4	w	JV	M	ORW	ORWT	KI		0.360	69
205	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	2	U	FD	1	w	NR	NR	JV	M	ORW	SMIX	LI		0.375	72
206	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	5	w	NR	NR	JV	M	ORW	ORWT	LI		0.390	72
207	Jaffe and Mondragon, 1975	1396	Rat (*Rattus norvegicus*)	3	U	FD	5	w	21	d	JV	B	ORW	SMIX	SP		0.391	72
208	Salbe et al., 1990	1532	Rat (*Rattus norvegicus*)	3	U	DR	21	d	21	d	JV	B	ORW	ORWT	DT		0.498	68
209	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	5	U	FD	3	w	NR	NR	JV	M	ORW	SMIX	LI		0.514	67
210	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	3	w	NR	NR	JV	M	ORW	SMIX	LI		0.589	72
211	Wilson et al 1988	1629	Pig (*Sus scrofa*)	4	U	OR	20	d	6	w	JV	M	HIS	GHIS	WO		0.639	80
212	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	ORW	SMIX	KI		0.653	74
213	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	ORW	ORWT	KI		0.704	72
214	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	4	w	NR	NR	JV	M	ORW	ORWT	KI		0.754	73
215	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	ORW	ORWT	LI		0.794	78
216	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	HIS	USTR	BR		0.794	72
217	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	HIS	USTR	BR		0.794	66
218	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	HIS	USTR	BR		0.794	72
219	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	ORW	ORWT	LI		0.809	78
220	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	ORW	ORWT	LI		0.817	78
221	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	ORW	ORWT	KI		0.823	73
222	Obermeyer et al, 1971	12934	Rat (*Rattus norvegicus*)	2	U	FD	4	w	NR	NR	JV	NR	ORW	SMIX	LI		0.903	73
223	Rastogi et al., 1976	1523	Rat (*Rattus norvegicus*)	2	U	DR	8	w	1	mo	JV	B	ORW	SMIX	BR		0.953	69
224	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	ORW	SMIX	LI		0.984	73
225	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	ORW	SMIX	LI		1.02	73
226	Wilson et al 1983	1630	Pig (*Sus scrofa*)	3	U	FD	15	d	NR	mo	JV	B	HIS	GHIS	HE		1.06	73
227	Cutler, 1974	21137	Rat (*Rattus norvegicus*)	2	U	DR	5	mo	NR	NR	JV	M	ORW	SMIX	LI		1.11	68
228	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	F	HIS	GHIS	LI		1.59	72
229	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	M	FD	18	d	NR	NR	NR	M	ORW	SMIX	LI		1.94	67
230	Seidenberg et al 1986	113	Mouse (*Mus musculus*)	2	U	GV	4	d	NR	NR	GE	F	GRS	BDWT	WO		5.01	80
Reproduction (REP)																		
231	Nobunaga et al., 1979	1473	Mouse (*Mus musculus*)	3	U	DR	56	d	60	d	GE	F	REP	PRWT	WO	0.072	0.145	81
232	Fredriksson et al., 1993	1304	Rat (*Rattus norvegicus*)	2	M	FD	14	w	NR	NR	GE	F	REP	ODVP	WO	0.108		74
233	Gunter et al, 2003	25959	Cattle (*Bos taurus*)	2	U	FD	42	w	NR	NR	GE	F	REP	PRWT	WO	0.173		70
234	Nebbia et al., 1987	1471	Rat (*Rattus norvegicus*)	4	U	DR	240	d	NR	NR	JV	M	REP	TEWT	TE	0.384	0.768	80
235	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	REP	SPCL	GO	0.388	0.776	86
236	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	UX	DR	13	w	6	w	JV	F	REP	GREP	WO	0.393	0.763	95
237	Halverson, 1974	1329	Rat (*Rattus norvegicus*)	5	U	FD	42	d	90	d	GE	F	REP	PROG	WO	0.456		71
238	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	UX	DR	13	w	6	w	JV	M	REP	GREP	WO	0.735	1.51	92
239	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	88	d	NR	mo	GE	F	REP	PRWT	WO	0.780		77
240	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	88	d	NR	NR	GE	F	REP	PRWT	WO	0.945		69
241	Hau et al., 1987	1344	Mouse (*Mus musculus*)	4	U	DR	29	d	8	w	GE	F	REP	PRWT	WO	1.21	6.03	78
242	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	2	U	GV	8	d	64	d	GE	F	REP	PRWT	WO	1.60		86
243	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	UX	DR	13	w	6	w	JV	B	REP	SPCL	TE	2.28		85

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
244	Webster, 1979	823	Mouse (*Mus musculus*)	5	U	FD	19	d	4	mo	GE	F	REP	PRWT	WO	2.54	25.4	78
245	Hardin et al., 1987	1335	Mouse (*Mus musculus*)	5	U	GV	8	d	6-8	w	GE	F	REP	PRWT	WO	3.20	6.39	87
246	Plasterer et al., 1985	1509	Mouse (*Mus musculus*)	2	U	GV	8	d	61-71	d	GE	F	REP	PRWT	WO	3.20		86
247	Booth et al. 1983	1234	Mouse (*Mus musculus*)	2	U	GV	8	d	NR	NR	GE	F	REP	PROG	WO	7.0		90
248	Kaur and Parshad, 1994	1411	Rat (*Rattus norvegicus*)	3	U	FD	5	w	NR	NR	JV	M	REP	SPCV	TE		0.089	79
249	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	UX	DR	13	w	6	w	JV	F	REP	GREP	WO		0.130	89
250	Wahlstrom and Olson, 1959	14497	Pig (*Sus scrofa*)	2	U	FD	239	d	8	w	GE	F	REP	PRWT	WO		0.296	79
251	Schroeder and Mitchener, 1971	66	Mouse (*Mus musculus*)	2	U	DR	6	mo	21	d	JV	F	REP	DEYO	WO		0.434	73
252	Thorlacius-Ussing, 1990	1595	Rat (*Rattus norvegicus*)	3	U	DR	21	d	NR	NR	LC	F	REP	PRWT	WO		0.504	73
253	Parshad and Sud, 1989	1500	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	REP	TEWT	TE		0.550	79
254	Thorlacius-Ussing et al., 1987	1596	Rat (*Rattus norvegicus*)	2	U	DR	21	d	NR	mo	LC	F	REP	PRWT	WO		0.749	73
255	Chermoff and Kavlock, 1982	1259	Mouse (*Mus musculus*)	2	U	GV	5	d	60	d	GE	F	REP	PROG	WO		4.18	86
256	Gray and Kavlock, 1984	1316	Mouse (*Mus musculus*)	2	U	OR	5	d	90	d	GE	F	REP	PROG	WO		4.57	81
257	Seidenberg et al 1986	113	Mouse (*Mus musculus*)	2	U	GV	4	d	NR	NR	GE	F	REP	PROG	WO		5.01	86
								Growth (GRO)										
258	Shull and Checke, 1973	1557	Rat (*Rattus norvegicus*)	3	U	FD	8	w	NR	NR	JV	M	GRO	BDWT	WO	0.053	0.265	82
259	Meyer et al 1982	662	Rat (*Rattus norvegicus*)	2	U	FD	30	d	NR	NR	JV	M	GRO	BDWT	WO	0.0642		78
260	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	3	M	FD	4	w	NR	NR	JV	NR	GRO	BDWT	WO	0.0838	0.763	86
261	Chen et al., 1990	1255	Rat (*Rattus norvegicus*)	2	U	FD	2	w	NR	NR	JV	M	GRO	BDWT	WO	0.0869		77
262	Glattre et al, 1995	11361	Rat (*Rattus norvegicus*)	2	U	DR	4	w	NR	NR	JV	M	GRO	BDWT	WO	0.090		67
263	Debski et al., 1992	1280	Rat (*Rattus norvegicus*)	2	U	FD	2	w	NR	NR	JV	M	GRO	BDWT	WO	0.110		81
264	Kim and Mahan, 2001	25957	Pig (*Sus scrofa*)	6	U	FD	12	w	NR	NR	JV	B	GRO	BDWT	WO	0.112	0.157	84
265	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	GRO	BDWT	WO	0.137	0.273	84
266	Mahan and Moxon, 1984	1450	Pig (*Sus scrofa*)	7	U	FD	37	d	4	w	JV	B	GRO	BDWT	WO	0.143	0.215	84
267	Goehring et. al. 1983	1313	Pig (*Sus scrofa*)	6	M	FD	5	w	NR	NR	JV	B	GRO	BDWT	WO	0.146	0.273	89
268	Liu et al., 1994	1442	Rat (*Rattus norvegicus*)	4	M	FD	2	w	45	d	JV	F	GRO	BDWT	WO	0.151	0.304	89
269	Liu and Milner, 1992	12370	Rat (*Rattus norvegicus*)	2	M	FD	2	w	41	d	JV	F	GRO	BDWT	WO	0.153		76
270	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	2	UX	FD	14	w	NR	NR	JV	F	GRO	BDWT	WO	0.155	0.221	89
271	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	GRO	BDWT	WO	0.163		77
272	Jenkins and Hidiroglou, 1986	1401	Cattle (*Bos taurus*)	5	U	FD	6	w	3	d	JV	M	GRO	BDWT	WO	0.165	0.330	83
273	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	GRO	BDWT	WO	0.170	0.510	89
274	Gunter et al, 2003	25959	Cattle (*Bos taurus*)	2	U	FD	42	w	NR	NR	GE	F	GRO	BDWT	WO	0.173		68
275	Nehru et al., 1997	2788	Rat (*Rattus norvegicus*)	2	U	GV	8	w	NR	NR	JV	F	GRO	BDWT	WO	0.175		79
276	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	GRO	BDWT	WO	0.181		76
277	Mahan and Magee, 1991	1448	Pig (*Sus scrofa*)	3	UX	FD	35	d	23	d	JV	B	GRO	BDWT	WO	0.183	0.548	89
278	Mandisodza et al., 1979	1454	Pig (*Sus scrofa*)	3	M	FD	61	d	5-7	w	JV	B	GRO	BDWT	WO	0.189		74
279	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	GRO	BDWT	WO	0.191		78
280	Coudray, et. al. 1996	1271	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	GRO	BDWT	WO	0.198		77
281	Mandisodza et al., 1979	1454	Pig (*Sus scrofa*)	3	M	FD	61	d	5-7	w	JV		GRO	BDWT	WO	0.202		68
282	Salbe and Levander, 1990	1533	Rat (*Rattus norvegicus*)	3	UX	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO	0.214		82
283	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	GRO	BDWT	WO	0.217	0.435	82
284	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	GRO	BDWT	WO	0.217	0.470	88
285	Salbe and Levander, 1990	1533	Rat (*Rattus norvegicus*)	3	UX	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO	0.217		82
286	Moxon and Mahan, 1982	1468	Pig (*Sus scrofa*)	8	UX	FD	37	d	NR	NR	JV	NR	GRO	BDWT	WO	0.227	0.340	89
287	Kim and Mahan, 2001	25958	Pig (*Sus scrofa*)	4	UX	FD	14	w	NR	NR	JV	F	GRO	BDWT	WO	0.236		74
288	Tsunoda et al, 2000	36834	Mouse (*Mus musculus*)	4	U	DR	14	d	7-8	w	JV	M	GRO	BDWT	WO	0.240	0.580	79
289	Lane et al., 1984	1429	Mouse (*Mus musculus*)	2	U	FD	26	w	4	w	JV	F	GRO	BDWT	WO	0.254		77
290	LeBoeuf et al., 1985	1433	Rat (*Rattus norvegicus*)	3	U	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO	0.261	0.521	82
291	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	6	w	NR	NR	JV	B	GRO	BDWT	WO	0.265		74
292	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	7	d	21	d	JV	M	GRO	BDWT	WO	0.274	0.540	84
293	Turan et al., 1997	1602	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	12	w	NR	NR	JV	B	GRO	BDWT	WO	0.277		73
294	Wahlstrom and Olson, 1959	14497	Pig (*Sus scrofa*)	2	U	FD	239	d	8	w	GE	F	GRO	BDWT	WO	0.296		68
295	Bioulac-Sage et al., 1992	1228	Rat (*Rattus norvegicus*)	3	U	FD	2	mo	NR	NR	JV	M	GRO	BDWT	WO	0.318		70
296	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	B	GRO	BDWT	WO	0.356	0.712	84
297	Kim and Mahan, 2001	25948	Pig (*Sus scrofa*)	4	U	FD	12	w	8	w	JV	B	GRO	BDWT	WO	0.367	0.489	79
298	Yeh et al, 1997	1640	Rat (*Rattus norvegicus*)	4	U	FD	8	w	NR	NR	JV	B	GRO	BDWT	WO	0.367		77
299	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	GRO	BDWT	WO	0.368	0.564	93
300	Kiremidjian-Schumacher et al., 1	1422	Mouse (*Mus musculus*)	2	U	FD	8	w	6	w	JV	M	GRO	BDWT	WO	0.371		69
301	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	3	U	FD	21	d	4	w	JV	M	GRO	BDWT	WO	0.374	0.747	84
302	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	2	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO	0.375		76
303	Spallholz et al., 1973	1566	Mouse (*Mus musculus*)	10	U	FD	5	w	NR	NR	JV	B	GRO	BDWT	WO	0.384	0.523	83
304	Nebbia et al., 1987	1471	Rat (*Rattus norvegicus*)	4	U	DR	240	d	NR	NR	JV	M	GRO	BDWT	WO	0.384	0.768	78

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
305	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO	0.388	0.776	84
306	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	U	DR	13	w	6	w	JV	F	GRO	BDWT	WO	0.393	0.763	93
307	Schroeder and Mitchener, 1972	3725	Mouse (*Mus musculus*)	2	U	DR	360	d	NR	lf	JV	M	GRO	BDWT	WO	0.407		68
308	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	8	U	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO	0.425	0.567	77
309	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	2	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO	0.426		74
310	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	7	U	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO	0.432	0.577	83
311	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	GRO	BDWT	WO	0.435	0.869	82
312	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	GRO	BDWT	WO	0.435	0.869	82
313	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	GRO	BDWT	WO	0.435	0.869	82
314	Johnson, et al., 2000	36818	Mouse (*Mus musculus*)	4	U	DR	14	d	6-7	w	JV	M	GRO	BDWT	WO	0.438	1.31	78
315	Jacobs and Forst 1981	1393	Rat (*Rattus norvegicus*)	6	U	DR	35	d	5, 12	w	JV	B	GRO	BDWT	WO	0.452	0.904	77
316	Goehring et al., 1984	1312	Pig (*Sus scrofa*)	4	M	FD	17	w	NR	NR	JV	B	GRO	BDWT	WO	0.464		74
317	Whanger and Butler, 1988	1618	Rat (*Rattus norvegicus*)	4	U	FD	9	w	NR	NR	JV	M	GRO	BDWT	WO	0.490		78
318	Whanger and Butler, 1988	1618	Rat (*Rattus norvegicus*)	4	U	FD	9	w	NR	NR	JV	M	GRO	BDWT	WO	0.500		78
319	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	5	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO	0.515	1.54	77
320	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	M	GRO	BDWT	WO	0.610	1.21	92
321	Turan et al 1997	1603	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	14	w	NR	NR	JV	B	GRO	BDWT	WO	0.652		68
322	Hadjimarkos, 1970	14488	Hamster (*Mesocricetus auratus*)	4	U	DR	4	w	NR	NR	JV	M	GRO	BDWT	WO	0.680	0.88	82
323	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	M	GRO	BDWT	WO	0.735	1.51	90
324	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	88	d	NR	NR	GE	F	GRO	BDWT	WO	0.780		73
325	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	U	DR	13	w	6	w	JV	B	GRO	BDWT	WO	0.781	1.23	93
326	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	4	U	DR	47	w	6	w	JV	F	GRO	BDWT	WO	0.784	1.21	78
327	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	5	U	FD	21	d	4	w	JV	B	GRO	BDWT	WO	0.810	1.62	84
328	Panter et al., 1995	1498	Sheep (*Ovis aries*)	2	M	FD	88	d	NR	NR	GE	F	GRO	BDWT	WO	0.945		67
329	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	3	U	FD	8	w	NR	NR	JV	F	GRO	BDWT	WO	0.996	1.59	82
330	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	3	U	FD	8	w	NR	NR	JV	F	GRO	BDWT	WO	0.996	1.59	82
331	Ishikawa et al, 1992	1392	Mouse (*Mus musculus*)	5	U	DR	12	w	5	w	JV	M	GRO	BDWT	WO	1.09		72
332	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	7	U	DR	46	d	7	w	JV	M	GRO	BDWT	WO	1.14	2.27	77
333	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	F	GRO	BDWT	WO	1.26		77
334	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	2	U	GV	8	d	64	d	GE	F	GRO	BDWT	WO	1.60		84
335	Tsunoda et al, 2000	36834	Mouse (*Mus musculus*)	4	U	DR	14	d	7-8	w	JV	M	GRO	BDWT	WO	1.96		71
336	Hardin et al., 1987	1335	Mouse (*Mus musculus*)	5	U	GV	8	d	6-8	w	JV	F	GRO	BDWT	WO	3.20	6.39	85
337	Plasterer et al., 1985	1509	Mouse (*Mus musculus*)	2	U	GV	8	d	61-71	d	GE	F	GRO	BDWT	WO	3.20		84
338	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	6	U	GV	8	d	64	d	JV	F	GRO	BDWT	WO	4.57		84
339	Plasterer et al., 1985	1509	Mouse (*Mus musculus*)	4	U	GV	8	d	61-71	d	JV	F	GRO	BDWT	WO	4.57		84
340	Booth et al. 1983	1234	Mouse (*Mus musculus*)	4	U	GV	8	d	68-81	d	JV	F	GRO	BDWT	WO	10.0		90
341	Sayato et al 1993	1538	Mouse (*Mus musculus*)	5	U	GV	30	d	5	w	JV	M	GRO	BDWT	WO	10.0	20.0	85
342	Kaur and Parshad, 1994	1411	Rat (*Rattus norvegicus*)	3	U	FD	1	w	NR	NR	JV	M	GRO	BDWT	WO		0.0908	77
343	Spallholz et al., 1973	1566	Mouse (*Mus musculus*)	3	U	FD	5	w	NR	NR	JV	B	GRO	BDWT	WO		0.0968	77
344	Boylan et al, 1990	1239	Mouse (*Mus musculus*)	2	M	FD	6	mo	NR	NR	JV	F	GRO	BDWT	WO		0.156	82
345	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	108	d	NR	NR	JV	NR	GRO	BDWT	WO		0.163	78
346	Behne et al., 1992	1224	Rat (*Rattus norvegicus*)	2	U	FD	110	d	30	d	JV	M	GRO	BDWT	WO		0.166	77
347	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	GRO	BDWT	WO		0.205	81
348	Rhian and Moxon, 1943	14494	Dog (*Canis familiaris*)	2	U	FD	8	w	150	d	JV	F	GRO	BDWT	WO		0.209	77
349	Goehring et al., 1984	1312	Rat (*Rattus norvegicus*)	4	M	FD	4	w	NR	NR	JV	M	GRO	BDWT	WO		0.215	82
350	Chen et al., 1985	1256	Rat (*Rattus norvegicus*)	4	U	DR	32	d	NR	NR	JV	M	GRO	BDWT	WO		0.232	72
351	Miller, 1938	14492	Pig (*Sus scrofa*)	5	U	FD	63	d	4	mo	JV	B	GRO	BDWT	WO		0.235	78
352	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	3	mo	NR	NR	JV	NR	GRO	BDWT	WO		0.254	78
353	Schroeder, 1967	1540	Rat (*Rattus norvegicus*)	2	U	DR	30	d	21	d	JV	B	GRO	BDWT	WO		0.267	72
354	Schroeder, 1967	1540	Mouse (*Mus musculus*)	2	U	DR	99	d	21	d	JV	F	GRO	BDWT	WO		0.274	72
355	Schroeder, 1967	1540	Rat (*Rattus norvegicus*)	2	U	DR	30	d	21	d	JV	B	GRO	BDWT	WO		0.276	72
356	Mercado and Bibby 1973	757	Rat (*Rattus norvegicus*)	2	U	DR	50	d	23	d	JV	M	GRO	BDWT	WO		0.282	71
357	Wahlstrom et al., 1984	1612	Pig (*Sus scrofa*)	2	U	FD	6	w	5-6	w	JV	M	GRO	BDWT	WO		0.303	82
358	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	GRO	BDWT	WO		0.307	81
359	Wahlstrom et al, 1956	14498	Pig (*Sus scrofa*)	2	U	FD	98	d	NR	NR	JV	NR	GRO	BDWT	WO		0.323	78
360	Birt et al., 1983	1233	Hamster (*Mesocricetus auratus*)	3	U	FD	25	w	4	w	JV	F	GRO	BDWT	WO		0.345	82
361	Baker et al., 1989	1219	Pig (*Sus scrofa*)	2	M	FD	9	w	8-14	w	JV	B	GRO	BDWT	WO		0.352	81
362	Thorlacius-Ussing et al., 1988	1597	Rat (*Rattus norvegicus*)	2	U	DR	21	d	25	d	JV	F	GRO	BDWT	WO		0.378	72
363	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	3	w	NR	NR	JV	M	GRO	BDWT	WO		0.390	76
364	Thorlacius-Ussing et al., 1988	1598	Rat (*Rattus norvegicus*)	2	U	DR	21	d	21	d	JV	M	GRO	BDWT	WO		0.411	72
365	Liu and Boylan, 1994	1443	Rat (*Rattus norvegicus*)	2	M	FD	8	w	NR	NR	JV	M	GRO	BDWT	WO		0.420	82
366	Schroeder and Mitchener, 1972	3725	Mouse (*Mus musculus*)	2	U	DR	90	d	NR	lf	JV	M	GRO	BDWT	WO		0.425	72

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
367	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO		0.441	76
368	Carmichael and Fowler, 1980	1249	Rat (*Rattus norvegicus*)	2	U	DR	22	w	NR	NR	JV	M	GRO	BDWT	WO		0.454	73
369	Birt et al., 1986	1232	Hamster (*Mesocricetus auratus*)	2	U	FD	10	w	4	w	JV	M	GRO	BDWT	WO		0.490	77
370	Raisbeck et al., 1996	1521	Pronghorn (*Antilocapra americana*)	2	M	FD	164	d	6-96	mo	JV	M	GRO	BDWT	WO		0.493	81
371	Salbe et al., 1990	1532	Rat (*Rattus norvegicus*)	3	U	DR	21	d	21	d	JV	B	GRO	BDWT	WO		0.498	72
372	LeBoeuf and Hoekstra, 1983	1432	Rat (*Rattus norvegicus*)	2	U	FD	6	w	NR	NR	JV	M	GRO	BDWT	WO		0.521	76
373	Thorlacius-Ussing, 1990	1595	Rat (*Rattus norvegicus*)	2	U	DR	21	d	21	d	JV	B	GRO	BDWT	WO		0.543	71
374	Parshad and Sud, 1989	1500	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	GRO	BDWT	WO		0.550	77
375	Gronbaek et al., 1995	1323	Rat (*Rattus norvegicus*)	2	U	DR	14	d	3-4	w	JV	M	GRO	BDWT	WO		0.570	73
376	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	3	w	NR	NR	JV	M	GRO	BDWT	WO		0.589	76
377	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	5	w	NR	NR	JV	M	GRO	BDWT	WO		0.653	78
378	Hadjimarkos, 1967	1327	Rat (*Rattus norvegicus*)	2	U	DR	21	d	NR	NR	JV	M	GRO	BDWT	WO		0.667	73
379	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	GRO	BDWT	WO		0.704	76
380	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	4	w	NR	NR	JV	M	GRO	BDWT	WO		0.754	77
381	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	7	d	21	d	JV	M	GRO	BDWT	WO		0.767	78
382	Cabe, et al., 1979	1244	Rat (*Rattus norvegicus*)	2	U	DR	13	w	50	d	JV	M	GRO	BDWT	WO		0.769	72
383	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	GRO	BDWT	WO		0.794	70
384	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	GRO	BDWT	WO		0.794	76
385	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	GRO	BDWT	WO		0.794	82
386	Panter et al., 1996	1499	Pig (*Sus scrofa*)	2	U	FD	6	w	8-10	w	JV	B	GRO	BDWT	WO		0.794	76
387	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	GRO	BDWT	WO		0.809	82
388	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	GRO	BDWT	WO		0.817	82
389	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	GRO	BDWT	WO		0.823	77
390	Obermeyer et al, 1971	12934	Rat (*Rattus norvegicus*)	2	U	FD	4	w	NR	NR	JV	NR	GRO	BDWT	WO		0.903	77
391	Halverson and Monty, 1960	36812	Rat (*Rattus norvegicus*)	2	U	FD	28	d	NR	NR	JV	M	GRO	BDWT	WO		0.968	77
392	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	GRO	BDWT	WO		0.984	77
393	Halverson and Monty, 1960	36812	Rat (*Rattus norvegicus*)	2	U	FD	28	d	NR	NR	JV	M	GRO	BDWT	WO		0.988	77
394	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	GRO	BDWT	WO		1.02	77
395	Cutler, 1974	21137	Rat (*Rattus norvegicus*)	2	U	DR	5	mo	NR	NR	JV	M	GRO	BDWT	WO		1.11	72
396	Hermann, et.al. 1991	1364	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	F	GRO	BDWT	WO		1.59	76
397	Rastogi et al., 1976	1523	Rat (*Rattus norvegicus*)	2	U	DR	1	w	1	mo	JV	B	GRO	BDWT	WO		1.59	73
398	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	65	d	28	d	JV	B	GRO	BDWT	WO		1.79	81
399	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	M	FD	18	d	NR	NR	NR	M	GRO	BDWT	WO		1.94	71
400	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	5	d	28	d	JV	M	GRO	BDWT	WO		3.54	81
401	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	5	d	28	d	JV	B	GRO	BDWT	WO		3.74	78
402	Chermoff and Kavlock, 1982	1259	Mouse (*Mus musculus*)	2	U	GV	5	d	60	d	GE	F	GRO	BDWT	WO		4.18	84
Survival (MOR)																		
403	Spallholz et al., 1973	1566	Mouse (*Mus musculus*)	3	U	FD	5	w	NR	NR	JV	B	MOR	SURV	WO	0.0961	0.385	82
404	Spallholz et al., 1973	1566	Mouse (*Mus musculus*)	10	U	FD	5	w	NR	NR	JV	B	MOR	SURV	WO	0.101	0.168	84
405	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	MOR	MORT	WO	0.181		79
406	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	3	M	DR	42	d	21	d	JV	M	MOR	MORT	WO	0.186		79
407	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	MOR	MORT	WO	0.217	0.435	83
408	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	MOR	MORT	WO	0.217	0.435	83
409	Schroeder, 1967	1540	Rat (*Rattus norvegicus*)	2	U	DR	180	d	21	d	JV	B	MOR	MORT	WO	0.221		73
410	Gronbaek and Thorlacius-Ussing	1324	Rat (*Rattus norvegicus*)	4	U	DR	2	w	NR	NR	NR	M	MOR	SURV	WO	0.239		68
411	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	21	d	21	d	JV	M	MOR	MORT	WO	0.274	0.540	85
412	Jenkins and Hidiroglou, 1986	1401	Cattle (*Bos taurus*)	5	U	FD	6	w	3	d	JV	M	MOR	MORT	WO	0.334		78
413	Birt et al., 1983	1233	Hamster (*Mesocricetus auratus*)	2	U	FD	25	w	4	w	JV	B	MOR	MORT	WO	0.350		79
414	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	2	U	FD	3	w	NR	NR	JV	M	MOR	SURV	WO	0.375		77
415	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	UX	DR	13	w	6	w	JV	F	MOR	MORT	WO	0.393	0.763	94
416	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	3	w	NR	NR	JV	M	MOR	MORT	WO	0.426	1.28	83
417	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	MOR	MORT	WO	0.435	0.869	83
418	McAdam and Levander, 1987	1457	Rat (*Rattus norvegicus*)	4	U	FD	6	w	21	d	JV	M	MOR	MORT	WO	0.435	0.869	83
419	Moxon and Mahan, 1982	1468	Pig (*Sus scrofa*)	8	UX	FD	37	d	NR	NR	JV	NR	MOR	MORT	WO	0.474	0.632	90
420	Abdo, 1994	1475	Rat (*Rattus norvegicus*)	6	UX	DR	13	w	6	w	JV	F	MOR	MORT	WO	0.564	0.769	94
421	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	8	U	FD	4	w	NR	NR	JV	M	MOR	MORT	WO	0.576	0.720	78
422	Halverson et al 1966	1332	Rat (*Rattus norvegicus*)	7	U	FD	4	w	NR	NR	JV	M	MOR	MORT	WO	0.587	0.733	84
423	Palmer and Olson, 1974	1497	Rat (*Rattus norvegicus*)	4	M	DR	21	d	21	d	JV	M	MOR	MORT	WO	0.595	0.892	85
424	Wilson et al 1988	1629	Pig (*Sus scrofa*)	4	U	OR	9	d	6	w	JV	M	MOR	MORT	WO	0.639	1.19	91
425	Birt et al., 1983	1233	Hamster (*Mesocricetus auratus*)	3	U	FD	25	w	4	w	JV	B	MOR	MORT	WO	0.652		72
426	Turan et al 1997	1603	Rabbit (*Oryctolagus cuniculus*)	2	U	FD	14	w	NR	NR	JV	B	MOR	MORT	WO	0.652		78
427	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	22	d	NR	NR	JV	M	MOR	MORT	WO	0.653	0.980	85

Table 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Result #	Reference	Ref No.	Test Organism	# of Conc/ Doses	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Effect Type	Effect Measure	Response Site	NOAEL Dose* (mg/kg bw/day)	LOAEL Dose* (mg/kg bw/day)	Total
428	Chen et al., 1982	1254	Rat (*Rattus norvegicus*)	3	U	FD	4	w	NR	NR	JV	M	MOR	MORT	WO	0.680		78
429	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	M	MOR	MORT	WO	0.704		77
430	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	4	w	NR	NR	JV	M	MOR	MORT	WO	0.754		78
431	Cabe, et al., 1979	1244	Rat (*Rattus norvegicus*)	2	U	DR	18	w	50	d	JV	M	MOR	MORT	WO	0.769		73
432	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	MOR	MORT	WO	0.794		83
433	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	3	M	FD	4	w	NR	NR	JV	NR	MOR	MORT	WO	0.820		83
434	Kezhou et al., 1987	1413	Rat (*Rattus norvegicus*)	4	U	FD	22	d	NR	NR	JV	M	MOR	MORT	WO	0.857	1.71	85
435	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	3	w	NR	NR	JV	M	MOR	SURV	WO	0.881		77
436	Jacobs and Forst 1981	1393	Rat (*Rattus norvegicus*)	6	U	DR	35	d	5, 12	w	JV	B	MOR	SURV	WO	0.904	1.81	78
437	Rastogi et al., 1976	1523	Rat (*Rattus norvegicus*)	2	U	DR	8	w	1	mo	JV	B	MOR	MORT	WO	0.953		74
438	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	6	U	GV	8	d	64	d	JV	F	MOR	MORT	WO	1.14	2.28	91
439	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	3	U	FD	3	w	NR	NR	JV	M	MOR	MORT	WO	1.17		77
440	Hadjimarkos, 1970	14488	Hamster (*Mesocricetus auratus*)	4	U	DR	4	w	NR	NR	JV	M	MOR	MORT	WO	1.17		77
441	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	4	U	DR	47	w	6	w	JV	F	MOR	MORT	WO	1.21		73
442	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	M	MOR	MORT	WO	1.21		87
443	Beems and van Beek, 1985	1223	Hamster (*Mesocricetus auratus*)	5	M	FD	42	d	NR	NR	JV	F	MOR	MORT	WO	1.26		87
444	Miller, 1938	14492	Pig (*Sus scrofa*)	5	U	FD	63	d	4	mo	JV	B	MOR	MORT	WO	1.49	5.96	83
445	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	UX	DR	13	w	6	w	JV	M	MOR	MORT	WO	1.51		85
446	Piccirillo et al 1983	1507	Mouse (*Mus musculus*)	2	U	GV	8	d	64	d	GE	F	MOR	MORT	WO	1.60		85
447	Jacobs and Forst, 1981	1394	Mouse (*Mus musculus*)	7	U	DR	46	d	7	w	JV	B	MOR	MORT	WO	2.27	4.55	78
448	Abdo, 1994	1475	Mouse (*Mus musculus*)	6	UX	DR	13	w	6	w	JV	B	MOR	MORT	WO	2.28		88
449	Plasterer et al., 1985	1509	Mouse (*Mus musculus*)	6	U	GV	8	d	61-71	d	JV	F	MOR	MORT	WO	2.28	4.57	91
450	Pathak and Datta 1984	1501	Goat (*Capra hircus*)	4	U	OR	17	d	6	mo	MA	NR	MOR	MORT	WO	3.0	6.0	87
451	Julius et al, 1983	1408	Hamster (*Mesocricetus auratus*)	5	U	FD	21	d	4	w	JV	B	MOR	MORT	WO	3.18	6.36	85
452	Hardin et al., 1987	1335	Mouse (*Mus musculus*)	5	U	GV	8	d	6-8	w	GE	F	MOR	MORT	WO	3.20	6.39	86
453	Plasterer et al., 1985	1509	Mouse (*Mus musculus*)	2	U	GV	8	d	61-71	d	GE	F	MOR	SURV	WO	3.20		85
454	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	4	U	FD	3	w	NR	NR	JV	M	MOR	SURV	WO	3.53		77
455	Chermoff and Kavlock, 1982	1259	Mouse (*Mus musculus*)	2	U	GV	5	d	60	d	GE	F	MOR	MORT	WO	4.18		85
456	Booth et al. 1983	1234	Mouse (*Mus musculus*)	6	U	GV	8	d	68-81	d	JV	F	MOR	MORT	WO	10.0	20	97
457	Dausch and Fullerton, 1993	1276	Rat (*Rattus norvegicus*)	5	U	FD	3	w	NR	NR	JV	M	MOR	SURV	WO	15.4		78
458	Schroeder, 1967	1540	Rat (*Rattus norvegicus*)	2	U	DR	16	d	21	d	JV	B	MOR	MORT	WO		0.275	73
459	Jacobs and Forst 1981	1393	Rat (*Rattus norvegicus*)	2	U	DR	10	w	5	w	JV	M	MOR	SURV	WO		0.440	73
460	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	MOR	MORT	WO		0.809	83
461	Palmer et al., 1982	1496	Rat (*Rattus norvegicus*)	2	M	FD	4	w	NR	NR	JV	NR	MOR	MORT	WO		0.817	83
462	Palmer et al 1983	15262	Rat (*Rattus norvegicus*)	2	U	FD	8	w	NR	NR	JV	M	MOR	SURV	WO		0.823	72
463	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	MOR	MORT	WO		0.975	78
464	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	U	FD	18	d	NR	NR	NR	M	MOR	MORT	WO		0.984	78
465	Cutler, 1974	21137	Rat (*Rattus norvegicus*)	2	U	DR	5	mo	NR	NR	JV	M	MOR	MORT	WO		1.11	73
466	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	100	d	28	d	JV	M	MOR	MORT	WO		1.79	82
467	Halverson et al., 1962	14489	Rat (*Rattus norvegicus*)	2	M	FD	18	d	NR	NR	NR	M	MOR	MORT	WO		1.94	72
468	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	100	d	28	d	JV	B	MOR	MORT	WO		3.54	82
469	Franke and Moxon 1937	14508	Rat (*Rattus norvegicus*)	2	U	FD	100	d	28	d	JV	B	MOR	MORT	WO		3.74	79
470	Davidson-York et al, 1999	1277	Pig (*Sus scrofa*)	2	M	FD	19	d	NR	NR	NR	B	MOR	MORT	WO		4.17	76
471	Seidenberg et al 1986	113	Mouse (*Mus musculus*)	2	U	GV	4	d	NR	NR	GE	F	MOR	MORT	WO		5.01	85

AD = adult; ACTV = activity, general; ALAD = (delta) -aminolevulinic acid dehydrogenase; ALPH = alkaline phosphatase; ASAT = aspartate aminotransferase; ATAX = ataxia, B = both; BDWT = body weight changes; BEH = behavior; BI = bile; BIO = biochemical; BL = blood; BLPR = blood pressure; BO = bone; BR = brain; bw = body weight; CHM = chemical changes; CHOL = cholesterol; d = day; DEYO = development of young; DOPA = dopamine; DR = Drinking water; DT - digestive tract; ENZ = enyzme level changes; ER = erthryocyte; F = female; FCNS = food consumption; FD = food; FDB = feeding behavior; FDCV = food conversion efficiency; FEFF = feeding efficiency; FO = foot; G6PD = glucose-6-phosphate dehydrogenase; GBCM = general biochemical changes; GE = gestation; GENZ = general enzyme changes; GGTR = (gamma) Y-glutamyltransferase; GHIS = general histology; GITX = general intoxication; GLPX = glutathione peroxidase; GLSN = gross lesions; GLTH = glutathione; GLUC = glucose; GO = gonads; GOTR = glutamic-oxaloacetic transaminase; GPHY = general pysiology changes; GREP = general reproduction; GRO = growth; GRS = gross body weight changes; GSTR = glutathione S-transferase; GT = gastrointestinal tract; GV = gavage; HA = hair; HE = heart; HIS = histological changes; HMCT = hematocrit; HMGL = hemoglobin; HRM = hormone changes; HTRT = heart rate; HYPL = hyperplasia; IN = intestinal tract; ITX = intoxication; JV = juvenile; kg = kilograms; KI = kidney; LC = lactation; LI = liver; LIPD = lipid; LMPH = lymphocyte; LOAEL = lowest observed adverse effect level; mg = milligrams; mo = months; M = male; M = measured; MK = milk, lactating females; MOR = effects on mortality and survival; MORT = mortality; MPH = morphology; MT = multiple; MU = muscle; NCCR = NADPH cytochrome C reductase; NCRO = necrosis; NOAEL = No Observed Advese Effect Level; NCRO = necrosis; NR = Not reported; NMVM = number of movements; ODVP = offspring development; OR = other oral; ORW = organ weight changes; ORWT = organ weight changes; P450 = cytochrome P450; PCLV = packed cell volume; PHY = physiology; PL = plasma; PRGS = progesterone; PROG = progeny numbers/counts; PRTL = protein, total; PRWT = progeny weight; PTH = pathology; RBCE = red blood cell count; REP = reproduction; RGSH = reduced gluthione; RPRT = respiratory rate; SM = sexually mature; SMIX = weight relative to body weight; SP = spleen; SPCL = sperm cell counts; SPCV = sperm cell volume; SURV = survival; TE = testes; TEWT = testes weight; TRII = tridothyronine; TS = thymus; U = unmeasured; USTR = ultrastructural changes; w = weeks; WCON = water consumption; WO = whole organism; yr = year.

*NOAEL and LOAEL values that are equal and from the same reference represent different experimental designs. These are designated with different Phase numbers in Appendix 6.1.

Within the reviewed papers there are 471 results for biochemical (BIO), behavior (BEH), physiology (PHY), pathology (PTH), reproduction (REP), growth (GRO), and survival (MOR) endpoints with a total Data Evaluation Score >65 that were used to derive the TRV (U.S. EPA 2003; Attachment 4-4). These data are plotted in Figure 6.1 and correspond directly with the data presented in Table 6.1. The NOAEL results for growth and reproduction are used to calculate a geometric mean NOAEL. This geometric mean is examined in relationship to the lowest bounded LOAEL for reproduction, growth, and survival to derive the TRV according to the Eco-SSL guidance (U.S. EPA 2003; Attachment 4-5).

A geometric mean of the NOAEL values for reproduction and growth was calculated at 0.437 mg selenium/kg bw/day. However, this value is higher than the lowest bounded LOAEL for reproduction, growth, or mortality results. Therefore, the TRV is equal to the highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival, and is equal to 0.143 mg selenium/kg bw/day.

6.2 Estimation of Dose and Calculation of the Eco-SSL

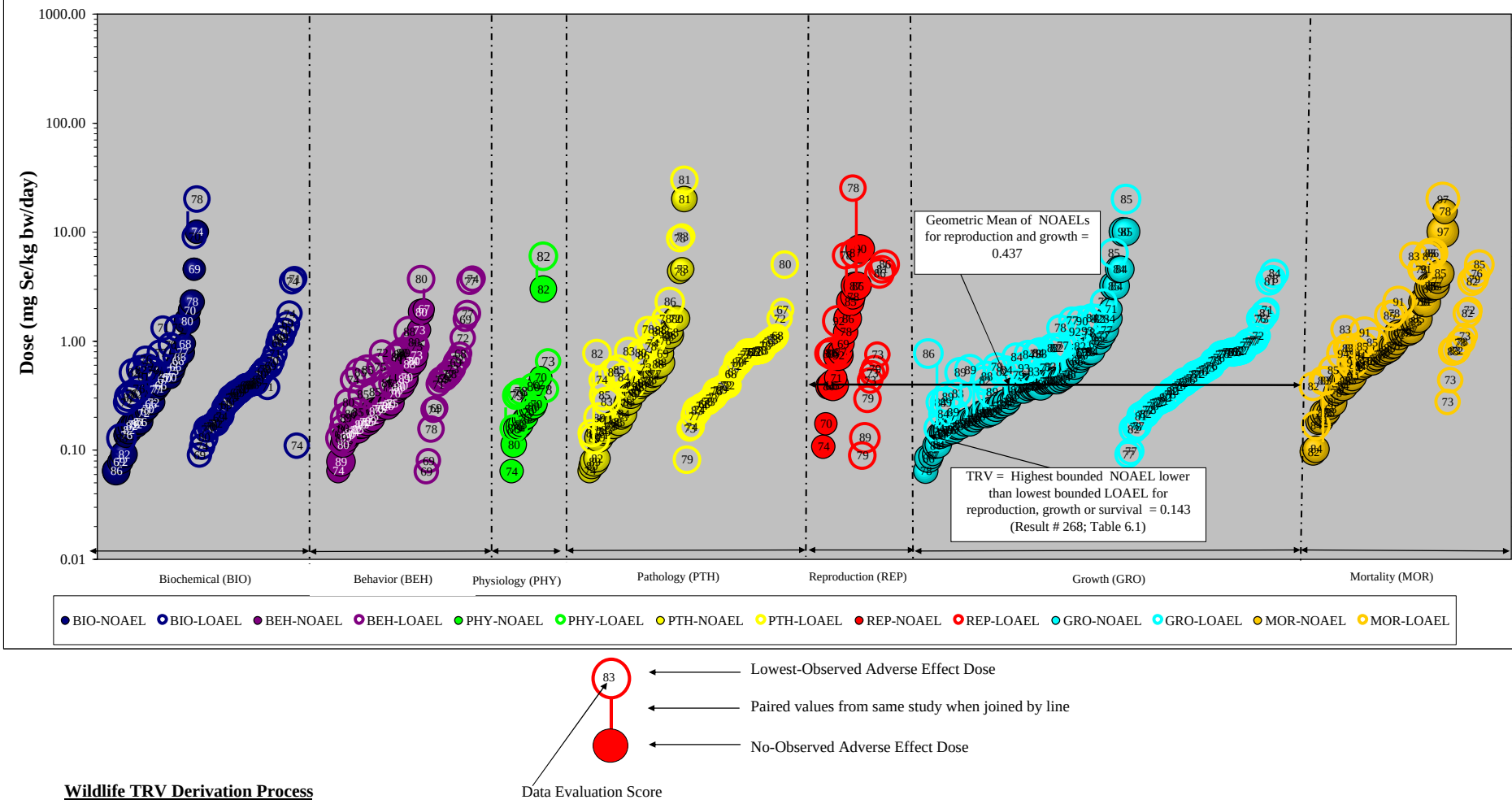
Three separate Eco-SSL values were calculated for mammalian wildlife, one for each of three surrogate receptor groups representing different trophic levels. The mammalian Eco-SSLs derived for selenium were calculated according to the Eco-SSL guidance (U.S. EPA, 2003; Attachment 4-5) and are summarized in Table 6.2.

Table 6.2 Calculation of the Mammalian Eco-SSLs for Selenium

Surrogate Receptor Group	TRV for Selenium (mg dw/kg bw/d) [1]	Food Ingestion Rate (FIR)[2] (kg dw/kg bw/d)	Soil Ingestion as Proportion of Diet (P_s)[2]	Concentration of Selenium in Biota Type (i)[2,3] (B_i) (mg/kg dw)	Eco-SSL (mg/kg dw)[4]
Mammalian herbivore (vole)	0.143	0.0875	0.032	$\ln(B_i) = 1.104 * \ln(Soil_j) - 0.677$ where i = plants	2.7
Mammalian ground insectivore (shrew)	0.143	0.209	0.030	$\ln(B_i) = 0.733 * \ln(Soil_j) - 0.075$ where i = earthworms	0.63
Mammalian carnivore (weasel)	0.143	0.130	0.043	$\ln(B_i) = 0.3764 * \ln(Soil_j) - 0.4158$ where i = mammals	2.8

[1] The process for derivation of wildlife TRVs is described in Attachment 4-5 of U.S. EPA (2003).
[2] Parameters (FIR, P_s, B_i values, regressions) are provided in U.S. EPA (2003) Attachment 4-1 (revised February 2005).
[3] B_i = Concentration in biota type (i) which represents 100% of the diet for the respective receptor.
[4] HQ = [FIR * ($Soil_j$ * P_s + B_i)] / TRV) solved for HQ=1 where $Soil_j$ = Eco-SSL (Equation 4-2; U.S. EPA, 2003).

Figure 6.1 Mammalian TRV Derivation for Selenium



Wildlife TRV Derivation Process

1) There are at least three results available for two test species within the growth, reproduction, and mortality effect groups. There are enough data to derive a TRV.

2) There are three NOAEL results available within the growth and reproduction effect groups for calculation of a geometric mean.

3) The geometric mean is equal to 0.437 mg selenium/kg bw/d. However, this value is higher than the lowest bounded LOAEL for results within the reproduction, growth, and survival (MOR) effect groups.

4) The mammalian wildlife TRV for selenium is equal to 0.143 mg selenium/kg bw/day which is the highest NOAEL value lower than the lowest LOAEL value for reproduction and growth.

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Literature Rejection Categories		
Rejection Criteria	**Description**	**Receptor**
ABSTRACT (Abstract)	Abstracts of journal publications or conference presentations.	Wildlife Plants and Soil Invertebrates
ACUTE STUDIES (Acu)	Single oral dose or exposure duration of three days or less.	Wildlife
AIR POLLUTION (Air P)	Studies describing the results for air pollution studies.	Wildlife Plants and Soil Invertebrates
ALTERED RECEPTOR (Alt)	Studies that describe the effects of the contaminant on surgically-altered or chemically-modified receptors (e.g., right nephrectomy, left renal artery ligature, hormone implant, etc.).	Wildlife
AQUATIC STUDIES (Aquatic)	Studies that investigate toxicity in aquatic organisms.	Wildlife Plants and Soil Invertebrates
ANATOMICAL STUDIES (Anat)	Studies of anatomy. Instance where the contaminant is used in physical studies (e.g., silver nitrate staining for histology).	Wildlife
BACTERIA (Bact)	Studies on bacteria or susceptibility to bacterial infection.	Wildlife Plants and Soil Invertebrates
BIOACCUMULATION SURVEY (Bio Acc)	Studies reporting the measurement of the concentration of the contaminant in tissues.	Wildlife Plants and Soil Invertebrates
BIOLOGICAL PRODUCT (BioP)	Studies of biological toxicants, including venoms, fungal toxins, *Bacillus thuringiensis*, other plant, animal, or microbial extracts or toxins.	Wildlife Plants and Soil Invertebrates
BIOMARKER (Biom)	Studies reporting results for a biomarker having no reported association with an adverse effect and an exposure dose (or concentration).	Wildlife
CARCINOGENICITY STUDIES (Carcin)	Studies that report data only for carcinogenic endpoints such as tumor induction. Papers that report systemic toxicity data are retained for coding of appropriate endpoints.	Wildlife Plants and Soil Invertebrates
CHEMICAL METHODS (Chem Meth)	Studies reporting methods for determination of contaminants, purification of chemicals, etc. Studies describing the preparation and analysis of the contaminant in the tissues of the receptor.	Wildlife Plants and Soil Invertebrates
CONFERENCE PROCEEDINGS (CP)	Studies reported in conference and symposium proceedings.	Wildlife Plants and Soil Invertebrates
DEAD (Dead)	Studies reporting results for dead organisms. Studies reporting field mortalities with necropsy data where it is not possible to establish the dose to the organism.	Wildlife Plants and Soil Invertebrates
DISSERTATIONS (Diss)	Dissertations are excluded. However, dissertations are flagged for possible future use.	Wildlife
DRUG (Drug)	Studies reporting results for testing of drug and therapeutic effects and side-effects. Therapeutic drugs include vitamins and minerals. Studies of some minerals may be included if there is potential for adverse effects.	Wildlife Plants and Soil Invertebrates
DUPLICATE DATA (Dup)	Studies reporting results that are duplicated in a separate publication. The publication with the earlier year is used.	Wildlife Plants and Soil Invertebrates

Literature Rejection Categories		
Rejection Criteria	**Description**	**Receptor**
ECOLOGICAL INTERACTIONS (Ecol)	Studies of ecological processes that do not investigate effects of contaminant exposure (e.g., studies of "silver" fox natural history; studies on ferrets identified in iron search).	Wildlife Plants and Soil Invertebrates
EFFLUENT (Effl)	Studies reporting effects of effluent, sewage, or polluted runoff.	Wildlife Plants and Soil Invertebrates
ECOLOGICALLY RELEVANT ENDPOINT (ERE)	Studies reporting a result for endpoints considered as ecologically relevant but is not used for deriving Eco-SSLs (e.g., behavior, mortality).	Plants and Soil Invertebrates
CONTAMINANT FATE/METABOLISM (Fate)	Studies reporting what happens to the contaminant, rather than what happens to the organism. Studies describing the intermediary metabolism of the contaminant (e.g., radioactive tracer studies) without description of adverse effects.	Wildlife Plants and Soil Invertebrates
FOREIGN LANGUAGE (FL)	Studies in languages other than English.	Wildlife Plants and Soil Invertebrates
FOOD STUDIES (Food)	Food science studies conducted to improve production of food for human consumption.	Wildlife
FUNGUS (Fungus)	Studies on fungus.	Wildlife Plants and Soil Invertebrates
GENE (Gene)	Studies of genotoxicity (chromosomal aberrations and mutagenicity).	Wildlife Plants and Soil Invertebrates
HUMAN HEALTH (HHE)	Studies with human subjects.	Wildlife Plants and Soil Invertebrates
IMMUNOLOGY (IMM)	Studies on the effects of contaminants on immunological endpoints.	Wildlife Plants and Soil Invertebrates
INVERTEBRATE (Invert)	Studies that investigate the effects of contaminants on terrestrial invertebrates are excluded.	Wildlife
IN VITRO (In Vit)	*In vitro* studies, including exposure of cell cultures, excised tissues and/or excised organs.	Wildlife Plants and Soil Invertebrates
LEAD SHOT (Lead shot)	Studies administering lead shot as the exposure form. These studies are labeled separately for possible later retrieval and review.	Wildlife
MEDIA (Media)	Authors must report that the study was conducted using natural or artificial soil. Studies conducted in pore water or any other aqueous phase (e.g., hydroponic solution), filter paper, petri dishes, manure, organic or histosoils (e.g., peat muck, humus), are not considered suitable for use in defining soil screening levels.	Plants and Soil Invertebrates
METHODS (Meth)	Studies reporting methods or methods development without usable toxicity test results for specific endpoints.	Wildlife Plants and Soil Invertebrates
MINERAL REQUIREMENTS (Mineral)	Studies examining the minerals required for better production of animals for human consumption, unless there is potential for adverse effects.	Wildlife
MIXTURE (Mix)	Studies that report data for combinations of single toxicants (e.g. cadmium and copper) are excluded. Exposure in a field setting from contaminated natural soils or waste application to soil may be coded as Field Survey.	Wildlife Plants and Soil Invertebrates

Literature Rejection Categories		
Rejection Criteria	**Description**	**Receptor**
MODELING (Model)	Studies reporting the use of existing data for modeling, i.e., no new organism toxicity data are reported. Studies which extrapolate effects based on known relationships between parameters and adverse effects.	Wildlife Plants and Soil Invertebrates
NO CONTAMINANT OF CONCERN (No COC)	Studies that do not examine the toxicity of Eco-SSL contaminants of concern.	Wildlife Plants and Soil Invertebrates
NO CONTROL (No Control)	Studies which lack a control or which have a control that is classified as invalid for derivation of TRVs.	Wildlife Plants and Soil Invertebrates
NO DATA (No Data)	Studies for which results are stated in text but no data is provided. Also refers to studies with insufficient data where results are reported for only one organism per exposure concentration or dose (wildlife).	Wildlife Plants and Soil Invertebrates
NO DOSE or CONC (No Dose)	Studies with no usable dose or concentration reported, or an insufficient number of doses/concentrations are used based on Eco-SSL SOPs. These are usually identified after examination of full paper. This includes studies which examine effects after exposure to contaminant ceases. This also includes studies where offspring are exposed in utero and/or lactation by doses to parents and then after weaning to similar concentrations as their parents. Dose cannot be determined.	Wildlife Plants and Soil Invertebrates
NO DURATION (No Dur)	Studies with no exposure duration. These are usually identified after examination of full paper.	Wildlife Plants and Soil Invertebrates
NO EFFECT (No Efct)	Studies with no relevant effect evaluated in a biological test species or data not reported for effect discussed.	Wildlife Plants and Soil Invertebrates
NO ORAL (No Oral)	Studies using non-oral routes of contaminant administration including intraperitoneal injection, other injection, inhalation, and dermal exposures.	Wildlife
NO ORGANISM (No Org) or NO SPECIES	Studies that do not examine or test a viable organism (also see in vitro rejection category).	Wildlife Plants and Soil Invertebrates
NOT AVAILABLE (Not Avail)	Papers that could not be located. Citation from electronic searches may be incorrect or the source is not readily available.	Wildlife Plants and Soil Invertebrates
NOT PRIMARY (Not Prim)	Papers that are not the original compilation and/or publication of the experimental data.	Wildlife Plants and Soil Invertebrates
NO TOXICANT (No Tox)	No toxicant used. Publications often report responses to changes in water or soil chemistry variables, e.g., pH or temperature. Such publications are not included.	Wildlife Plants and Soil Invertebrates
NO TOX DATA (No Tox Data)	Studies where toxicant used but no results reported that had a negative impact (plants and soil invertebrates).	Plants and Soil Invertebrates
NUTRIENT (Nutrient)	Nutrition studies reporting no concentration related negative impact.	Plants and Soil Invertebrates
NUTRIENT DEFICIENCY (Nut def)	Studies of the effects of nutrient deficiencies. Nutritional deficient diet is identified by the author. If reviewer is uncertain then the administrator should be consulted. Effects associated with added nutrients are coded.	Wildlife
NUTRITION (Nut)	Studies examining the best or minimum level of a chemical in the diet for improvement of health or maintenance of animals in captivity.	Wildlife
OTHER AMBIENT CONDITIONS (OAC)	Studies which examine other ambient conditions: pH, salinity, DO, UV, radiation, etc.	Wildlife Plants and Soil Invertebrates

Literature Rejection Categories		
Rejection Criteria	**Description**	**Receptor**
OIL (Oil)	Studies which examine the effects of oil and petroleum products.	Wildlife Plants and Soil Invertebrates
OM, pH (OM, pH)	Organic matter content of the test soil must be reported by the authors, but may be presented in one of the following ways; total organic carbon (TOC), particulate organic carbon (POC), organic carbon (OC), coarse particulate organic matter (CPOM), particulate organic matter (POM), ash free dry weight of soil, ash free dry mass of soil, percent organic matter, percent peat, loss on ignition (LOI), organic matter content (OMC). With the exception of studies on non-ionizing substances, the study must report the pH of the soil, and the soil pH should be within the range of $4 and #8.5. Studies that do not report pH or report pH outside this range are rejected.	Plants and Soil Invertebrates
ORGANIC METAL (Org Met)	Studies which examine the effects of organic metals. This includes tetraethyl lead, triethyl lead, chromium picolinate, phenylarsonic acid, roxarsone, 3-nitro-4-phenylarsonic acid,, zinc phosphide, monomethylarsonic acid (MMA), dimethylarsinic acid (DMA), trimethylarsine oxide (TMAO), or arsenobetaine (AsBe) and other organo metallic fungicides. Metal acetates and methionines are not rejected and are evaluated.	Wildlife
LEAD BEHAVIOR OR HIGH DOSE MODELS (Pb Behav)	There are a high number of studies in the literature that expose rats or mice to high concentrations of lead in drinking water (0.1, 1 to 2% solutions) and then observe behavior in offspring, and/or pathology changes in the brain of the exposed dam and/or the progeny. Only a representative subset of these studies were coded. Behavior studies examining complex behavior (learned tasks) were also not coded.	Wildlife
PHYSIOLOGY STUDIES (Phys)	Physiology studies where adverse effects are not associated with exposure to contaminants of concern.	Wildlife
PLANT (Plant)	Studies of terrestrial plants are excluded.	Wildlife
PRIMATE (Prim)	Primate studies are excluded.	Wildlife
PUBL AS (Publ as)	The author states that the information in this report has been published in another source. Data are recorded from only one source. The secondary citation is noted as Publ As.	Wildlife Plants and Soil Invertebrates
QSAR (QSAR)	Derivation of Quantitative Structure-Activity Relationships (QSAR) is a form of modeling. QSAR publications are rejected if raw toxicity data are not reported or if the toxicity data are published elsewhere as original data.	Wildlife Plants and Soil Invertebrates
REGULATIONS (Reg)	Regulations and related publications that are not a primary source of data.	Wildlife Plants and Soil Invertebrates
REVIEW (Rev)	Studies in which the data reported in the article are not primary data from research conducted by the author. The publication is a compilation of data published elsewhere. These publications are reviewed manually to identify other relevant literature.	Wildlife Plants and Soil Invertebrates

Literature Rejection Categories		
Rejection Criteria	**Description**	**Receptor**
SEDIMENT CONC (Sed)	Studies in which the only exposure concentration/dose reported is for the level of a toxicant in sediment.	Wildlife Plants and Soil Invertebrates
SCORE (Score)	Papers in which all studies had data evaluation scores at or lower then the acceptable cut-off (#10 of 18) for plants and soil invertebrates).	Plants and Soil Invertebrates
SEDIMENT CONC (Sed)	Studies in which the only exposure concentration/dose reported is for the level of a toxicant in sediment.	Wildlife Plants and Soil Invertebrates
SLUDGE	Studies on the effects of ingestion of soils amended with sewage sludge.	Wildlife Plants and Soil Invertebrates
SOIL CONC (Soil)	Studies in which the only exposure concentration/dose reported is for the level of a toxicant in soil.	Wildlife
SPECIES	Studies in which the species of concern was not a terrestrial invertebrate or plant or mammal or bird.	Plants and Soil Invertebrates Wildlife
STRESSOR (QAC)	Studies examining the interaction of a stressor (e.g., radiation, heat, etc.) and the contaminant, where the effect of the contaminant alone cannot be isolated.	Wildlife Plants and Soil Invertebrates
SURVEY (Surv)	Studies reporting the toxicity of a contaminant in the field over a period of time. Often neither a duration nor an exposure concentration is reported.	Wildlife Plants and Soil Invertebrates
REPTILE OR AMPHIBIAN (Herp)	Studies on reptiles and amphibians. These papers flagged for possible later review.	Wildlife Plants and Soil Invertebrates
UNRELATED (Unrel)	Studies that are unrelated to contaminant exposure and response and/or the receptor groups of interest.	Wildlife
WATER QUALITY STUDY (Wqual)	Studies of water quality.	Wildlife Plants and Soil Invertebrates
YEAST (Yeast)	Studies of yeast.	Wildlife Plants and Soil Invertebrates

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Appendix 5-1

Avian Toxicity Data Extracted and Reviewed for Wildlife Toxicity Reference Value (TRV) - Selenium

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July 2007

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Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																										Effects						Conversion to mg/kg bw/day				Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	Endpoint Number	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
Biochemical																																																		
1	1374	Hoffman et al, 1991	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	7	0/1/2/4/8/16/32	mg/kg diet	Y	1	ADL	U	FD	14	w	2	yr	AD	M	C	4	BIO	ENZ	GLPX	PL	1	2	Y	1.175	N	0.06464	0.0550	0.110	10	10	5	10	6	1	10	10	10	4	76
2	2898	Stone and Soares, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	32	d	NR	NR	SM	F	C	4	BIO	CHM	HEME	BL	1		Y	0.127	N	0.01519	0.120		10	10	5	10	6	1	4	10	10	4	70
3	1373	Hoffman et al 1989	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	4	0/10/20/40	mg/kg diet	N	na	DLY	U	FD	6	w	1	d	JV	NR	C	1	BIO	CHM	GLTH	LI	10	20	N	0.092	N	0.01231	1.34	2.68	10	10	5	10	5	1	10	10	10	4	75
4	1273	Dafalla and Adam, 1986	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/1/3	mg/kg diet	N	na	ADL	U	FD	4	w	7	d	JV	B	C	3	BIO	ENZ	GLAD	SR		1	Y	0.65	N	0.04397		0.0676	10	10	5	10	6	1	4	10	10	4	70
5	1321	Gregory and Edds, 1984	Sodium selenite	100	Turkey (*Meleagris gallopavo*)	1	2	0/2	mg/kg diet	N		ADL	U	FD	18	d	16	d	JV	M	C	1	BIO	ENZ	GLPX	LI		2	N	1	N	0.05820		0.116	10	10	5	10	5	1	4	10	10	4	69
6	80	Van Vleet et al, 1981	Sodium selenite	100	Duck (*Anas platyrhynchos*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	15	d	1	d	JV	M	C	2	BIO	ENZ	GLPX	BL		2	N	0.092	N	0.01231		0.268	10	10	5	10	5	1	4	10	10	4	69
7	1569	Stanley et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/7	mg/kg diet	Y	10	ADL	UX	FD	122	d	1	yr	AD	B	C	1	BIO	CHM	HMGL	BL		7	N	1.2	N	0.06553		0.382	10	10	10	10	5	1	4	10	10	4	74
8	25896	Hoffman and Heinz, 1998	Seleno-D,L-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/8.8	mg/kg diet	Y	10	ADL	M	FD	10	w	19	mo	AD	M	V	1	BIO	CHM	GENZ	BL		8.8	N	1.2	N	0.06553		0.481	10	10	10	5	5	1	4	10	3	10	68
9	1294	Elzubeir and Davis, 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	2	0/10.0	mg/kg diet	N	na	ADL	U	FD	24	d	14	d	JV	M	C	3	BIO	ENZ	GLPX	LI		10	Y	0.42	N	0.03309		0.788	10	10	5	10	6	1	4	10	10	4	70
10	1377	Hoffman et al, 1991	Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	4	BIO	ENZ	GLPX	PL		15	Y	0.566	N	0.04018		1.13	10	10	10	10	6	1	4	10	10	4	75
11	1376	Hoffman et al, 1992	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	4	BIO	ENZ	GLPX	LI		15	Y	0.479	N	0.03604		1.20	10	10	10	10	6	1	4	10	10	4	75
12	1378	Hoffman et al, 1992	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/060	mg/kg diet	Y	16	ADL	UX	FD	4	w	1	d	JV	B	C	4	BIO	ENZ	GLPX	LI		15	Y	0.611	N	0.04223		1.23	10	10	10	10	6	1	4	10	10	4	75
13	1373	Hoffman et al 1989	sodium selenite	100	Mallard (*Anas platyrhynchos*)	2	4	0/10/20/40	mg/kg diet	N	na	DLY	U	FD	6	w	1	d	JV	NR	C	1	BIO	CHM	GLTH	LI		10	N	0.092	N	0.01231		1.34	10	10	5	10	5	1	4	10	10	4	69
14	1375	Hoffman et al, 1996	Se in food (selenized wheat)	100	Mallard (*Anas platyrhynchos*)	4	2	0/15	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	BIO	ENZ	GLPX	PL		15	Y	0.163	Y	0.0330		3.04	10	10	5	10	7	1	4	10	10	4	71
15	1375	Hoffman et al, 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	2	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	BIO	ENZ	GLPX	PL		15	Y	0.172	Y	0.0370		3.23	10	10	5	10	7	1	4	10	10	4	71
16	1375	Hoffman et al, 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	BIO	ENZ	GLPX	PL		15	Y	0.181	Y	0.0390		3.23	10	10	5	10	7	1	4	10	10	4	71
17	1375	Hoffman et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	BIO	ENZ	GLPX	PL		15	Y	0.191	Y	0.0530		4.16	10	10	5	10	7	1	4	10	10	4	71
18	1375	Hoffman et al, 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	6	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	2	BIO	ENZ	GLPX	PL		30	Y	0.194	Y	0.0500		7.73	10	10	5	10	7	1	4	10	10	4	71
19	1375	Hoffman et al, 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	7	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	2	BIO	ENZ	GLPX	LI		30	Y	0.236	Y	0.0640		8.14	10	10	5	10	7	1	4	10	10	4	71
20	1375	Hoffman et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	5	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	2	BIO	ENZ	GLPX	PL		30	Y	0.188	Y	0.0530		8.46	10	10	5	10	7	1	4	10	10	4	71
Behavior																																																	
21	1289	Echevarria et al., 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/3/6/9	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	2	BEH	FDB	FCNS	WO	3	6	N	0.564	N	0.04009	0.213	0.426	10	10	5	10	5	4	10	10	10	4	78
22	1245	Cantor et al., 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1/2/4	mg/L	N	na	ADL	U	DR	7	d	6	d	JV	M	C	2	BEH	FDB	FCNS	WO	2	4	N	0.084	Y	0.03011	0.717	1.43	10	5	5	10	6	4	10	10	10	4	74
23	1378	Hoffman et al, 1992	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/060	mg/kg diet	Y	16	ADL	UX	FD	4	w	1	d	JV	B	C	5	BEH	FDB	FCNS	WO	15	60	Y	0.611	N	0.04223	1.23	4.94	10	10	10	10	6	4	8	10	10	4	82
24	1355	Heinz et al 1988	Sodium selenite	97	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	7	DLY	UX	FD	1	w	1	d	JV	NR	C	2	BEH	FDB	FCNS	WO	10	20	Y	0.1	Y	0.0150	1.56	3.13	10	10	10	10	7	4	10	10	10	4	85
25	1355	Heinz et al 1988	Selenomethionine	99	Mallard (*Anas platyrhynchos*)	2	5	0/10/20/40/80	mg/kg diet	Y	7	NR	UX	FD	3	w	1	d	JV	NR	C	2	BEH	FDB	FCNS	WO	10	20	Y	0.45	Y	0.090	2.13	4.26	10	10	10	10	7	4	10	10	10	4	85
26	1357	Heinz et al 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	1	BEH	FDB	FCNS	WO	15	30	Y	0.181	Y	0.0290	2.40	4.81	10	10	5	4	7	4	10	10	10	4	74
27	1357	Heinz et al 1996	seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	2	3	0/15/30	ug/g diet	N	na	DLY	U	FD	1	w	1	d	JV	NR	C	1	BEH	FDB	FCNS	WO	15	30	Y	0.073	Y	0.0170	3.49	6.99	10	10	5	10	7	4	10	10	10	4	80
28	1357	Heinz et al 1996	seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	1	BEH	FDB	FCNS	WO	15	30	Y	0.191	Y	0.0530	4.16	8.32	10	10	5	10	7	4	10	10	10	4	80
29	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	1	BEH	FDB	FCNS	WO		25	N	1.042	Y	0.00380		0.0912	10	10	5	10	6	4	4	10	10	4	73
30	3787	Poley et al., 1937	Selenium	100	Chicken (*Gallus domesticus*)	1	2	0/15.15	mg/kg diet	N	na	ADL	M	FD	1	w	NR	NR	SM	F	C	2	BEH	FDB	FCNS	WO		15.15	Y	1.48	Y	0.012430		0.127	10	10	10	4	7	4	4	10	10	4	73
31	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	1	BEH	FDB	FCNS	WO		25	N	1.042	Y	0.00540		0.130	10	10	5	10	6	4	4	10	10	4	73
32	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	3	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	1	BEH	FDB	FCNS	WO		25	N	1.042	Y	0.00750		0.180	10	10	5	10	6	4	4	10	10	4	73
33	1535	Santolo et al 1999	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.0/11.6	mg/kg diet	N	na	DLY	M	FD	11	w	NR	mo	AD	B	C	1	BEH	FDB	FCNS	WO		6	N	0.132	N	0.01557		0.708	10	10	10	10	5	4	4	10	6	4	73
34	1294	Elzubeir and Davis, 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	2	0/10.0	mg/kg diet	N	na	ADL	U	FD	24	d	14	d	JV	M	C	2	BEH	FDB	FCNS	WO		10	Y	0.42	N	0.03309		0.788	10	10	5	10	6	4	4	10	10	4	73
35	1278	Davis et al, 1996	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	21	d	14	d	JV	M	C	2	BEH	FDB	FCNS	WO		10	Y	0.332	N	0.02839		0.855	10	10	5	10	6	4	4	10	10	4	73
36	1357	Heinz et al 1996	Se in food (High selenium wheat)	100	Mallard (*Anas platyrhynchos*)	4	2	0/15	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	1	BEH	FDB	FCNS	WO		15	Y	0.163	Y	0.0330		3.04	10	10	5	4	7	4	4	10	10	4	68
Physiology																																																	
37	1402	Jensen, 1986	Selenium	100	Chicken (*Gallus domesticus*)	1	4	0/0.25/1/5	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	1	PHY	PHY	FDCV	WO	1	5	Y	0.503	N	0.037209	0.0740	0.370	10	10	5	4	6	4	8	10	10	4	71
38	7725	Hegazy and Adachi, 2000	Selenium (unspecified)	100	Chicken (*Gallus domesticus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	15	d	1	d	JV	NR	C	3	PHY	PHY	FDCV	WO	1		N	0.328	N	0.02817	0.0859		10	10	5	4	5	4	4	10	10	4	66
39	1476	O'Toole and Raisbeck 1997	Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	1	4	0/10/25/60	ug/g diet	Y	25	DLY	U	FD	150	d	NR	NR	JV	M	C	3	PHY	PHY	IRRI	NK	10	25	Y	1.4	N	0.07245	0.518	1.29379	10	10	5	10	6	4	10	10	10	4	79
40	1208	Albers et al 1996	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	12.5	DLY	U	FD	16	w	1	yr	AD	M	C	4	PHY	PHY	GPHY	FE	20	40	Y	1.096	N	0.06178	1.29	2.58	10	10	5	10	6	4	10	10	6	4	75
41	1245	Cantor et al., 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	4	0/2/4/8	mg/L	N	na	ADL	U	DR	7	d	9	d	JV	B	C	2	PHY	PHY	FDCV	WO	2	4	N	0.084	Y	0.0609	1.45	2.90	10	5	5	10	6	4	10	10	10	4	74
42	1294	Elzubeir and Davis, 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	2	0/10.0	mg/kg diet	N	na	ADL	U	FD	24	d	14	d	JV	M	C	4	PHY	PHY	FDCV	WO		10	Y	0.42	N	0.03309		0.788	10	10	5	10	6	4	4	10	10	4	73
43	1445	Lowry and Baker, 1989	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/15	mg/kg diet	N	na	ADL	U	FD	14	d	8	d	JV	M	C	2	PHY	PHY	FDCV	WO		15	Y	0.193	N	0.01994		1.55	10	10	5	10	6	4	4	10	10	4	73
44	1285	Donaldson and McGowan, 1989	Sodium selenate	100	Chicken (*Gallus domesticus*)	1	3	0/20/40	mg/kg diet	N	na	NR	U	FD	20	d	1	d	JV	M	C	4	PHY	PHY	FDCV	WO		20	Y	0.147	N	0.01671		2.27	10	10	5	10	6	4	4	10	10	4	73
Pathology																																																	
45	7725	Hegazy and Adachi, 2000	Selenium (unspecified)	100	Chicken (*Gallus domesticus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	15	d	1	d	JV	NR	C	2	PTH	ORW	SMIX	TS	1		N	0.328	N	0.02817	0.0859		10	10	5	4	5	4	4	10	10	4	66
46	2898	Stone and Soares, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	32	d	NR	NR	AD	F	C	2	PTH	ORW	SMIX	LI	1		Y	0.127	N	0.01519	0.120		10	10	5	10	6	4	4	3	10	4	66
47	80	Van Vleet et al, 1981	Sodium selenite	100	Duck (*Anas platyrhynchos*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	28	d	1	d	JV	M	C	1	PTH	HIS	NCRO	GZ	2		N	0.46	N	0.03511	0.153		10	10	5	10	5	4	4	10	10	4	72
48	1569	Stanley et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/3.5/7	mg/kg diet	Y	10	ADL	UX	FD	122	d	1	yr	AD	B	C	1	PTH	ORW	ORWT	WO	3.5	7	N	1.2	N	0.06553	0.212	0.425	10	10	10	10	5	4	10	10	10	4	83
49	1353	Heinz and Hoffman 1998	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/8.8	mg/kg diet	N	na	NR	M	FD	75	d	18	mo	SM	F	V	1	PTH	GRS	BDWT	WO	8.8		Y	1.394	N	0.07225	0.456		10	10	10	10	6	4	4	10	3	4	71
50	1354	Heinz et. al., 1989	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	6	0/1/2/4/8/16	mg/kg diet	Y	1	ADL	UX	FD	3	w	NR	NR	SM	F	C	1	PTH	GRS	BDWT	WO	8	16	Y	1.012	N	0.05865	0.468	0.937	10	10	10	10	6	4	10	10	6	4	80
51	1352	Heinz and Hoffman 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/9.3	mg/kg diet	N	na	ADL	M	FD	4	w	NR	mo	AD	B	C	1	PTH	ITX	GITX	WO	9.3		N	1.2	N	0.06553	0.508		10	10	10	10	5	4	4	10	3	4	70
52	1352	Heinz and Hoffman 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/10.3	mg/kg diet	N	na	ADL	M	FD	4	w	NR	mo	AD	B	C	1	PTH	ITX	GITX	WO	10.3		N	1.2	N	0.06553	0.563		10	10	10	10	5	4	4	10	3	4	70

Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																								Effects						Conversion to mg/kg bw/day				Result		Data Evaluation Score												
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	Endpoint Number	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
53	1550	Sell and Horani, 1976	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/8	mg/kg diet	N	na	ADL	U	FD	23	d	8	d	JV	M	C	1	PTH	ITX	GITX	WO	8		Y	0.267	Y	0.0210	0.629		10	10	5	10	7	4	4	10	10	4	74
54	1562	Smith et al, 1988	Seleno-DL-methionine	100	Black-crowned night-heron (*Nycticora*	1	3	0/10/30	mg/kg diet	Y	10	ADL	UX	FD	92	d	NR	NR	AD	B	C	1	PTH	GRS	BDWT	WO	10	30	N	0.883	N	0.05367	0.675	2.03	10	10	10	10	5	4	10	10	6	4	79
55	1476	O'Toole and Raisbeck 1997	Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	1	4	0/10/25/60	ug/g diet	Y	25	DLY	U	FD	86	d	NR	NR	JV	M	C	1	PTH	HIS	GHIS	FO	10	25	Y	1.2	N	0.06553	0.728	1.82	10	10	5	10	6	4	10	10	6	4	75
56	1374	Hoffman et al, 1991	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	7	0/1/2/4/8/16/32	mg/kg diet	Y	1	ADL	U	FD	14	w	2	yr	AD	M	C	3	PTH	ORW	SMIX	LI	16	32	Y	1.093	N	0.06167	0.903	1.81	10	10	5	10	6	4	10	10	10	4	79
57	1550	Sell and Horani, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	3	2	0/8	mg/kg diet	N	na	ADL	U	FD	23	d	8	d	JV	B	C	2	PTH	ITX	GITX	WO	8		N	0.103	Y	0.01170	0.909		10	10	5	10	6	4	4	10	10	4	73
58	1356	Heinz and Hoffman, 1987	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/10	mg/kg diet	Y	11	ADL	UX	FD	41	d	1	yr	AD	M	C	1	PTH	GRS	BDWT	WO	10		Y	1.12	Y	0.10	1.00		10	10	10	10	7	4	4	10	3	4	72
59	1356	Heinz and Hoffman, 1987	Sodium selenite	100	Mallard (*Anas platyrhynchos*)	1	6	0/1/5/10/25/100	mg/kg diet	Y	11	ADL	UX	FD	57	d	2	yr	SM	B	C	1	PTH	GRS	BDWT	WO	10	25	Y	1.088	Y	0.10	1.03	2.58	10	10	10	10	7	4	10	10	6	4	81
60	1377	Hoffman et al, 1991	Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	3	PTH	ORW	ORWT	LI	15	60	Y	0.566	N	0.04018	1.13	4.53	10	10	10	10	6	4	8	10	10	4	82
61	1376	Hoffman et al, 1992	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	3	PTH	ORW	ORWT	LI	15	60	Y	0.479	N	0.03604	1.20	4.80	10	10	10	10	6	4	8	10	10	4	82
62	1319	Green and Albers, 1997	Seleno-DL-methinonine	100	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	10.5	ADL	U	FD	16	w	14	mo	AD	M	C	2	PTH	HIS	GHIS	LI	20	40	N	1.2	N	0.06553	1.22	2.44	10	10	5	10	5	4	10	10	10	4	78
63	1208	Albers et al 1996	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	12.5	DLY	U	FD	16	w	1	yr	AD	M	C	3	PTH	GRS	BDWT	WO	20	40	Y	1.096	N	0.06178	1.29	2.58	10	10	5	10	6	4	10	10	6	4	75
64	25901	Yamamoto and Santolo, 2000	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.3/12	mg/kg diet	N	na	DLY	M	FD	77	d	NR	NR	AD	B	C	1	PTH	GRS	BDWT	WO	12		Y	0.1051	N	0.01343	1.53		10	10	10	5	6	4	4	10	6	4	69
65	1355	Heinz et al 1988	Selenomethionine	99	Mallard (*Anas platyrhynchos*)	2	5	0/10/20/40/80	mg/kg diet	Y	7	NR	UX	FD	6	w	1	d	JV	NR	C	4	PTH	ORW	ORWT	LI	10		Y	0.9	Y	0.1350	1.60		10	10	10	10	7	4	4	10	10	4	79
66	1375	Hoffman et al, 1996	Se in food (selenized wheat)	100	Mallard (*Anas platyrhynchos*)	4	2	0/15	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	PTH	ORW	ORWT	LI	15		Y	0.163	Y	0.0330	3.04		10	10	5	10	7	4	4	6	10	4	70
67	1375	Hoffman et al, 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	2	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	PTH	ORW	ORWT	LI	15	30	Y	0.172	Y	0.0370	3.23	6.45	10	10	5	10	7	4	10	10	10	4	80
68	1375	Hoffman et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	PTH	ORW	ORWT	LI	15	30	Y	0.191	Y	0.0530	4.16	8.32	10	10	5	10	7	4	10	10	10	4	80
69	1622	Wiemeyer and Hoffman, 1996	Seleno-DL-methionine	100	Owl (*Otus asio*)	1	3	0/8.81/30	mg/kg diet	N	na	1 per d	M	FD	3	mo	3	yr	LB	B	C	1	PTH	GRS	BDWT	WO	8.81	30	Y	0.196	Y	0.100	4.49	15.3	10	10	10	10	7	4	8	10	10	4	83
70	1404	Jensen et al., 1977	Selenium	100	Chicken (*Gallus domesticus*)	2	5	0/0.78/1.46/1.89/1.94	mg/org/d	N	na	ADL	U	FD	2	w	1	d	JV	B	C	3	PTH	ORW	SMIX	LI	0.78	1.46	Y	0.123	N	0.01487	6.34	11.9	10	10	5	4	6	4	10	10	10	4	73
71	1375	Hoffman et al, 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	3	0/15/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	PTH	ORW	ORWT	LI	30		Y	0.16	Y	0.0370	6.94		10	10	5	10	7	4	4	8	10	4	72
72	1375	Hoffman et al, 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	7	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	1	PTH	ORW	ORWT	LI	30		Y	0.236	Y	0.0640	8.14		10	10	5	10	7	4	4	10	10	4	74
73	1273	Dafalla and Adam, 1986	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/1/3	mg/kg diet	N	na	ADL	U	FD	4	w	7	d	JV	B	C	4	PTH	HIS	NCRO	LI		1	Y	0.65	N	0.04397		0.0676	10	10	5	10	6	4	4	10	10	4	73
74	1350	Heinz and Fitzgerald 1993	seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	ug/g diet	N	na	ADL	UX	FD	1	w	NR	mo	AD	M	C	2	PTH	GRS	BDWT	WO		10	Y	1.1	N	0.06193		0.563	10	10	10	10	6	4	4	10	6	4	74
75	1535	Santolo et al 1999	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.0/11.6	mg/kg diet	N	na	DLY	M	FD	11	w	NR	NR	AD	M	C	3	PTH	GRS	BDWT	WO		6	N	0.132	N	0.01557		0.708	10	10	10	10	5	4	4	10	6	4	73
76	1294	Elzubeir and Davis, 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	2	0/10.0	mg/kg diet	N	na	ADL	U	FD	24	d	14	d	JV	M	C	5	PTH	ORW	SMIX	LI		10	Y	0.42	N	0.03309		0.788	10	10	5	10	6	4	4	10	10	4	73
77	1278	Davis, el. al. 1996	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	21	d	14	d	JV	M	C	3	PTH	ORW	ORWT	LI		10	Y	0.332	N	0.02839		0.855	10	10	5	10	6	4	4	10	10	4	73
78	1354	Heinz et. al., 1989	Seleno-DL-cysteine	100	Duck (*Anas platyrhynchos*)	3	2	0/16	mg/kg diet	Y	1	ADL	UX	FD	3	w	NR	NR	SM	F	C	1	PTH	GRS	BDWT	WO		16	Y	0.938	N	0.05582		0.962	10	10	10	10	6	4	4	10	3	4	71
79	1378	Hoffman et al, 1992	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/060	mg/kg diet	Y	16	ADL	UX	FD	4	w	1	d	JV	B	C	3	PTH	HIS	GHIS	LI		15	Y	0.611	N	0.04223		1.23	10	10	10	10	6	4	4	10	10	4	78
80	1355	Heinz et al 1988	Sodium selenite	97	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	7	DLY	UX	FD	6	w	1	d	JV	NR	C	4	PTH	ORW	ORWT	LI		10	Y	0.9	Y	0.1350		1.56	10	10	10	10	7	4	4	10	10	4	79
81	1285	Donaldson and McGowan, 1989	Sodium selenate	100	Chicken (*Gallus domesticus*)	1	3	0/20/40	mg/kg diet	N	na	NR	U	FD	20	d	1	d	JV	M	C	3	PTH	ORW	ORWT	LI		20	Y	0.147	N	0.01671		2.27	10	10	5	10	6	4	4	10	10	4	73
82	1347	Heinz 1993	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	2	0/100	mg/kg diet	N	na	DLY	U	FD	5	w	NR	NR	AD	M	C	2	PTH	GRS	BDWT	WO		100	Y	1.2	N	0.06553		5.75	10	10	5	10	6	4	4	10	3	4	66
83	1375	Hoffman et al, 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	6	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	1	PTH	ORW	ORWT	LI		30	Y	0.194	Y	0.0500		7.73	10	10	5	10	7	4	4	10	10	4	74
84	1375	Hoffman et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	5	2	0/30	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	V	1	PTH	ORW	ORWT	LI		30	Y	0.188	Y	0.0530		8.46	10	10	5	10	7	4	4	10	10	4	74
Reproduction																																																	
85	1592	Thapar et al 1969	Selenous acid	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	76	w	1	d	LB	F	C	3	REP	EGG	EGWT	EG	2	8	Y	1.967	N	0.09040	0.092	0.368	10	10	5	10	6	10	8	10	10	4	83
86	1569	Stanley et al, 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/3.5/7	mg/kg diet	Y	10	ADL	UX	FD	122	d	1	yr	AD	B	C	3	REP	REP	HTCH	WO	3.5	7	N	1.2	N	0.06553	0.212	0.425	10	10	10	10	5	10	10	10	10	4	89
87	3788	Poley and Moxon, 1937	Se in food (seleniferous grain)	100	Chicken (*Gallus domesticus*)	1	4	0/2.5/5/10	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	LB	F	C	3	REP	REP	RSUC	WO	5	10	Y	2.4	N	0.1029	0.214	0.429	10	10	5	10	6	10	10	10	10	4	85
88	1354	Heinz et. al., 1989	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	6	0/1/2/4/8/16	mg/kg diet	Y	1	ADL	UX	FD	46	d	NR	NR	LB	B	C	3	REP	REP	PROG	WO	4	8	Y	1.225	N	0.06642	0.219	0.438	10	10	10	10	6	10	10	10	10	4	90
89	1489	Ort and Latshaw, 1978	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1/3/5	mg/kg diet	N	na	ADL	U	FD	28	w	32	w	LB	F	C	1	REP	REP	HTCH	WO	3	5	N	1.6	Y	0.1320	0.247	0.412	10	10	5	10	6	10	10	10	10	4	85
90	1372	Hoffman and Heinz, 1988	Sodium selenite	100	Mallard (*Anas platyrhynchos*)	1	5	0/1/5/10/25	mg/kg diet	Y	1	ADL	UX	FD	6	w	NR	NR	LB	B	C	1	REP	REP	RSUC	WO	5	10	N	1.2	N	0.06553	0.273	0.546	10	10	10	10	5	10	10	10	10	4	89
91	1465	Moksnes and Norheim, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	4	0/1.0/3.0/6.0	ug/g diet	N	na	ADL	U	FD	31	w	20	w	LB	B	C	2	REP	REP	PROG	WO	6		Y	1.8	N	0.08533	0.284		10	10	5	10	6	10	4	1	10	4	70
92	1464	Moksnes, 1983	Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	1	6	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	N	na	NR	U	FD	18	w	20	w	LB	F	C	2	REP	EGG	EGWT	EG	6		Y	1.671	N	0.08130	0.292		10	10	5	10	6	10	4	10	10	4	79
93	1592	Thapar et al 1969	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	105	w	1	d	LB	F	C	3	REP	REP	PROG	WO	8		Y	1.82	N	0.08595	0.378		10	10	5	10	6	10	4	1	10	4	70
94	1208	Albers et al 1996	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	12.5	DLY	U	FD	16	w	1	yr	AD	M	C	6	REP	REP	TEWT	TE	10	20	Y	1.096	N	0.06178	0.644	1.29	10	10	5	10	6	10	10	10	6	4	81
95	1354	Heinz et. al., 1989	Seleno-DL-cysteine	100	Duck (*Anas platyrhynchos*)	3	2	0/16	mg/kg diet	Y	1	ADL	UX	FD	49	d	NR	NR	LB	B	C	3	REP	REP	PROG	WO	16		Y	1.172	N	0.06453	0.890		10	10	10	10	6	10	4	3	3	4	70
96	1574	Stoewsand, etl al, 1977	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	10	w	2	w	LB	B	C	3	REP	EGG	ESTH	WO	7		Y	0.1044	N	0.01337	0.896		10	10	5	10	6	10	4	6	10	4	75
97	1356	Heinz and Hoffman, 1987	Sodium selenite	100	Mallard (*Anas platyrhynchos*)	1	6	0/1/5/10/25/100	mg/kg diet	Y	11	ADL	UX	FD	57	w	2	yr	LB	F	C	3	REP	REP	NDAY	WO	10	25	Y	1.088	Y	0.10	1.03	2.58	10	10	10	10	7	10	10	10	6	4	87
98	1535	Santolo et al 1999	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.0/11.6	mg/kg diet	N	na	DLY	M	FD	11	w	NR	mo	LB	F	C	4	REP	EGG	EGWT	EM	11.6		N	0.132	N	0.01557	1.37		10	10	10	10	5	10	4	10	10	4	83
99	1574	Stoewsand, etl al, 1977	Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	2	2	0/28	mg/kg diet	N	na	ADL	M	FD	10	w	NR	NR	JV	B	C	3	REP	EGG	ESTH	WO	28		Y	0.1001	N	0.01301	3.64		10	10	10	10	6	10	4	6	10	4	80
100	69	Arnold et al, 1973	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	NR	U	FD	24	w	1	d	LB	F	C	3	REP	EGG	EGWT	EG		2	Y	2.02	N	0.09198		0.0911	10	10	5	10	6	10	4	10	10	4	79
101	36819	Kaantee and Kurkela, 1980	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/1.3/2.0	mg/kg diet	N	na	NR	M	FD	2	w	18	mo	LB	F	C	1	REP	REP	PROG	WO		2	N	1.6	N	0.07903		0.0988	10	10	10	10	5	10	4	10	10	4	85
102	2898	Stone and Soares, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	32	d	NR	NR	LB	F	C	3	REP	REP	PROG	WO		1	Y	0.127	N	0.01519		0.120	10	10	5	10	6	10	4	10	10	4	79
103	3787	Poley et al., 1937	Selenium	100	Chicken (*Gallus domesticus*)	1	2	0/15.15	mg/kg diet	N	na	ADL	M	FD	1	w	NR	NR	LB	F	C	1	REP	REP	HTCH	WO		15.15	Y	1.48	Y	0.012430		0.127	10	10	10	4	7	10	4	10	10	4	79
104	1570	Stanley et al., 1994	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/6.5	ug/g diet	N	na	NR	M	FD	93	d	1	yr	LB	B	C	1	REP	REP	TERA	EM		6.5	N	1.2	N	0.06553		0.355	10	10	10	10	5	10	4	10	10	4	83
105	1353	Heinz and Hoffman 1998	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/8.8	mg/kg diet	N	na	NR	M	FD	75	d	18	mo	LB	F	V	2	REP	REP	TERA	EM		8.8	Y	1.394	N	0.07225		0.456	10	10	10	10	6	10	4	10	10	4	84
106	1352	Heinz and Hoffman 1996	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/9.3	mg/kg diet	N	na	ADL	M	FD	4	w	NR	mo	LB	F	C	2	REP	REP	TERA	EM		9.3	N	1.1	N	0.06193		0.524	10	10	10	10	5	10	4	10	10	4	83
107	1372	Hoffman and Heinz, 1988	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/10	mg/kg diet	Y	1	ADL	UX	FD	6	w	NR	NR	LB	B	C	1	REP	REP	ABNM	WO		10	N	1.2	N	0.06553		0.546	10	10	10	10	5	10	4	10	10	4	83

Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																								Effects						Conversion to mg/kg bw/day				Result		Data Evaluation Score												
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	Endpoint Number	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
108	1352	Heinz and Hoffman 1996	Seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/10.3	mg/kg diet	N	na	ADL	M	FD	4	w	NR	mo	LB	F	C	2	REP	REP	TERA	EM		10.3	N	1.1	N	0.06193		0.580	10	10	10	10	5	10	4	10	10	4	83
109	1352	Heinz and Hoffman 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	2	0/10.9	mg/kg diet	N	na	ADL	M	FD	4	w	NR	mo	LB	F	C	2	REP	REP	TPRD	EM		10.9	N	1.1	N	0.06193		0.614	10	10	10	4	5	10	4	10	10	4	77
110	1562	Smith et al, 1988	Seleno-DL-methionine	100	Black-crowned night-heron (*Nycticora*	2	2	0/10	mg/kg diet	Y	10	ADL	UX	FD	92	d	NR	NR	LB	B	C	1	REP	REP	ODVP	WO		10	N	0.883	N	0.05367		0.675	10	10	10	10	5	10	4	10	3	4	76
111	1291	El-Begerami et al, 1977	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	3	0/6/12	mg/kg diet	N	na	ADL	U	FD	16	w	1	d	JV	B	C	4	REP	REP	ABNM	WO		6	N	0.135	N	0.01580		0.702	10	10	5	10	5	10	4	10	10	4	78
112	6433	El-Begearmi et al, 1982	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/6	mg/kg diet	N	na	ADL	U	FD	16	w	NR	NR	LB	F	C	1	REP	REP	HTCH	WO		6	N	0.1	N	0.01300		0.780	10	10	5	10	5	10	4	10	10	4	78
113	1575	Stoewsand et al., 1978	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/7	mg/kg diet	N	na	NR	U	FD	5	w	15	d	JV	F	C	1	REP	REP	EGPN	WO		7	N	0.132	N	0.01557		0.826	10	10	5	10	5	10	4	10	10	4	78
114	1356	Heinz and Hoffman, 1987	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/10	mg/kg diet	Y	10	ADL	UX	FD	41	d	2	yr	LB	F	C	3	REP	REP	PROG	WO		10	Y	1.114	Y	0.10		0.898	10	10	10	10	7	10	4	10	10	4	85
115	36813	Heinz and Fitzgerald, 1993	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/19.8	mg/kg diet	Y	10	ADL	M	FD	21	w	NR	NR	LB	F	C	3	REP	REP	PROG	WO		19.8	Y	0.912	N	0.05481		1.19	10	10	10	10	6	10	4	10	10	4	84
116	1622	Wiemeyer and Hoffman, 1996	Seleno-DL-methionine	100	Owl (*Otus asio*)	1	3	0/8.81/30	mg/kg diet	N	na	1 per d	M	FD	3	mo	3	yr	LB	B	C	3	REP	REP	PLBR	WO		8.81	Y	0.196	Y	0.100		4.49	10	10	10	10	7	10	4	10	10	4	85
Growth																																																	
117	9356	Colnago et al, 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/0.31/0.97	mg/kg diet	N	na	NR	M	FD	24	d	1	d	JV	M	C	1	GRO	GRO	BDWT	WO	0.97		Y	0.723	N	0.04712	0.06322		10	10	10	10	6	8	4	1	10	4	73
118	1402	Jensen, 1986	Selenium	100	Chicken (*Gallus domesticus*)	1	4	0/0.25/1/5	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	2	GRO	GRO	BDWT	WO	1	5	Y	0.503	N	0.037209	0.0740	0.370	10	10	5	4	6	8	8	10	10	4	75
119	7725	Hegazy and Adachi, 2000	Selenium (unspecified)	100	Chicken (*Gallus domesticus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	15	d	1	d	JV	NR	C	1	GRO	GRO	BDWT	WO	1		N	0.328	N	0.02817	0.0859		10	10	5	4	5	8	4	10	10	4	70
120	1592	Thapar et al 1969	Selenous acid	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	4	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	2	8	Y	0.286	N	0.02576	0.180	0.721	10	10	5	10	6	8	8	10	10	4	81
121	397	Hill 1979	Selenium dioxide	71.16	Chicken (*Gallus domesticus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	1	d	JV	F	C	1	GRO	GRO	BDWT	WO	5	10	N	1.042	N	0.05978	0.204	0.408	10	10	5	5	5	8	10	10	10	4	77
122	1289	Echevarria et al., 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/3/6/9	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	1	GRO	GRO	BDWT	WO	3	6	N	0.564	N	0.04009	0.213	0.426	10	10	5	10	5	8	10	10	10	4	82
123	1465	Moksnes and Norheim, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	4	0/1.0/3.0/6.0	ug/g diet	N	na	ADL	U	FD	31	w	20	w	JV	B	C	1	GRO	GRO	BDWT	WO	6		Y	1.8	N	0.08533	0.284		10	10	5	10	6	8	4	1	10	4	68
124	1464	Moksnes, 1983	Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	1	6	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	N	na	NR	U	FD	18	w	20	w	SM	F	C	3	GRO	GRO	BDWT	WO	6		Y	1.671	N	0.08130	0.292		10	10	5	10	6	8	4	10	10	4	77
125	1465	Moksnes and Norheim, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1.0/3.0/6.0	mg/kg diet	N	na	ADL	U	FD	6	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	6		Y	1.3	N	0.06904	0.319		10	10	5	10	6	8	4	1	10	4	68
126	69	Arnold et al, 1973	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	NR	U	FD	104	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	8		Y	1.91	N	0.09579	0.371		10	10	5	10	6	8	4	1	10	4	68
127	1592	Thapar et al 1969	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	105	w	1	d	JV	F	C	1	GRO	GRO	BDWT	WO	8		Y	1.82	N	0.08595	0.379		10	10	5	10	6	8	4	1	10	4	68
128	3788	Poley and Moxon, 1937	Se in food (seleniferous grain)	100	Chicken (*Gallus domesticus*)	1	4	0/2.5/5/10	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	SM	F	C	2	GRO	GRO	BDWT	WO	10		Y	2.4	N	0.1029	0.429		10	10	5	10	6	8	4	1	10	4	68
129	1369	Hill, 1974	Selenium dioxide	100	Chicken (*Gallus domesticus*)	1	6	0/2.5/5/10/20/40	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	5	10	N	0.328	N	0.02817	0.429	0.859	10	10	5	10	5	8	10	10	10	4	82
130	1404	Jensen et al., 1977	Selenium	100	Chicken (*Gallus domesticus*)	1	5	0/5/10/20/40	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	5	10	Y	0.116	N	0.01432	0.617	1.23	10	10	5	4	6	8	10	10	10	4	77
131	1476	OToole and Raisbeck 1997	Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	1	4	0/10/25/60	ug/g diet	Y	25	DLY	U	FD	21	d	NR	NR	JV	M	C	2	GRO	GRO	BDWT	WO	10	25	Y	1.4	N	0.07245	0.690	1.72506	10	10	5	10	6	8	10	10	6	4	79
132	1245	Cantor et al., 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1/2/4	mg/L	N	na	ADL	U	DR	7	d	6	d	JV	M	C	1	GRO	GRO	BDWT	WO	2	4	N	0.084	Y	0.03014	0.718	1.44	10	5	5	10	6	8	10	10	10	4	78
133	1550	Sell and Horani, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	3	2	0/8	mg/kg diet	N	na	ADL	U	FD	23	d	8	d	JV	B	C	1	GRO	GRO	BDWT	WO	8		Y	0.103	Y	0.01170	0.909		10	10	5	10	7	8	4	1	10	4	69
134	1636	Yamamoto et al, 1998	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/5.1/9.0	mg/kg diet	N	na	DLY	M	FD	77	d	NR	NR	MA	M	C	1	GRO	GRO	BDWT	WO	9		N	0.132	N	0.01557	1.06		10	10	10	10	5	8	4	1	6	4	68
135	1377	Hoffman et al, 1991	Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO	15	60	Y	0.566	N	0.04018	1.13	4.53	10	10	10	10	6	8	8	10	10	4	86
136	1378	Hoffman et al, 1992	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/060	mg/kg diet	Y	16	ADL	UX	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO	15	60	Y	0.611	N	0.04223	1.23	4.94	10	10	10	10	6	8	8	10	10	4	86
137	36789	Ansari and Britton, 1974	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	10	d	1	d	JV	M	C	2	GRO	GRO	BDWT	WO	10		N	0.084	N	0.01160	1.38		10	10	5	10	5	8	4	1	10	4	67
138	1387	Howell and Hill, 1978	Selenous acid	100	Chicken (*Gallus domesticus*)	2	2	0/20	mg/kg diet	N	na	ADL	U	FD	20	d	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	20		N	0.564	N	0.04009	1.42		10	10	5	10	5	8	4	1	10	4	67
139	1245	Cantor et al., 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	4	0/2/4/8	mg/L	N	na	ADL	U	DR	7	d	9	d	JV	B	C	3	GRO	GRO	BDWT	WO	2	4	N	0.084	Y	0.06086	1.45	2.90	10	5	5	10	6	8	10	10	10	4	78
140	1355	Heinz et al 1988	Sodium selenite	97	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	7	DLY	UX	FD	3	w	1	d	JV	NR	C	3	GRO	GRO	BDWT	WO	10	20	Y	0.45	Y	0.0750	1.74	3.48	10	10	10	10	7	8	10	10	10	4	89
141	1355	Heinz et al 1988	Selenomethionine	99	Mallard (*Anas platyrhynchos*)	2	5	0/10/20/40/80	mg/kg diet	Y	7	NR	UX	FD	3	w	1	d	JV	NR	C	3	GRO	GRO	BDWT	WO	10	20	Y	0.45	Y	0.090	2.13	4.26	10	10	10	10	7	8	10	10	10	4	89
142	1357	Heinz et al 1996	Se in food (High selenium wheat)	100	Mallard (*Anas platyrhynchos*)	4	2	0/15	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	2	GRO	GRO	BDWT	WO	15		Y	0.163	Y	0.0330	3.04		10	10	5	4	7	8	4	10	10	4	72
143	1357	Heinz et al 1996	seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	2	GRO	GRO	BDWT	WO	15	30	Y	0.191	Y	0.0530	4.16	8.32	10	10	5	10	7	8	10	10	10	4	84
144	1357	Heinz et al 1996	seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	2	3	0/15/30	ug/g diet	N	na	DLY	U	FD	1	w	1	d	JV	NR	C	3	GRO	GRO	BDWT	WO	15	30	Y	0.073	Y	0.0280	5.75	11.5	10	10	5	10	7	8	10	10	10	4	84
145	1404	Jensen et al., 1977	Selenium	100	Chicken (*Gallus domesticus*)	2	5	0/0.78/1.46/1.89/1.94	mg/org/d	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO	0.78	1.46	Y	0.123	N	0.01487	6.34	11.9	10	10	5	4	6	8	10	10	10	4	77
146	1357	Heinz et al 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	2	GRO	GRO	BDWT	WO	30		Y	0.16	Y	0.0390	7.31		10	10	5	4	7	8	4	10	10	4	72
147	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO		25	N	1.042	Y	0.00380		0.0912	10	10	5	10	6	8	4	10	10	4	77
148	3787	Poley et al., 1937	Selenium	100	Chicken (*Gallus domesticus*)	1	2	0/15.15	mg/kg diet	N	na	ADL	M	FD	1	w	NR	NR	SM	F	C	3	GRO	GRO	BDWT	WO		15.15	Y	1.48	Y	0.012430		0.127	10	10	10	4	7	8	4	10	10	4	77
149	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO		25	N	1.042	Y	0.00540		0.130	10	10	5	10	6	8	4	10	10	4	77
150	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	3	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO		25	N	1.042	Y	0.00750		0.180	10	10	5	10	6	8	4	10	10	4	77
151	1297	Fairbrother and Fowles, 1990	Sodium selenite	100	Mallard (*Anas platyrhynchos*)	3	3	0/0.5/5.0	mg/L	N	na	ADL	U	DR	9	d	9	mo	JV	M	C	1	GRO	GRO	BDWT	WO	0.5	5	Y	1.24	N	0.06815		0.275	10	5	5	10	6	8	4	10	10	4	72
152	1273	Dafalla and Adam, 1986	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/1/3	mg/kg diet	N	na	ADL	U	FD	2	w	7	d	JV	B	C	1	GRO	GRO	BDWT	WO		3	Y	0.20	N	0.02041		0.306	10	10	5	10	6	8	4	10	10	4	77
153	1415	Khan et al, 1993	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/0.5	mg/kg bw/d	N	na	EOD	U	GV	28	d	43	d	JV	B	C	1	GRO	GRO	BDWT	WO		0.5	N	1.6	N	0.07903		0.50	10	8	10	10	10	8	4	10	10	4	84
154	5483	Khan et al, 1993	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/0.5	mg/kg bw/d	N	na	EOD	U	OR	4	w	NR	NR	JV	B	C	1	GRO	GRO	BDWT	WO		0.5	Y	1.368	N	0.07137		0.50	10	8	5	10	10	8	4	10	10	4	79
155	1550	Sell and Horani, 1976	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/8	mg/kg diet	N	na	ADL	U	FD	28	d	1	d	JV	M	C	1	GRO	GRO	BDWT	WO		8	Y	0.267	Y	0.0210		0.629	10	10	5	10	7	8	4	10	10	4	78
156	1294	Elzubeir and Davis, 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	2	0/10.0	mg/kg diet	N	na	ADL	U	FD	24	d	14	d	JV	M	C	1	GRO	GRO	BDWT	WO		10	Y	0.42	N	0.03309		0.788	10	10	5	10	6	8	4	10	10	4	77
157	1278	Davis, el. al. 1996	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	21	d	14	d	JV	M	C	1	GRO	GRO	BDWT	WO		10	Y	0.332	N	0.02839		0.855	10	10	5	10	6	8	4	10	10	4	77
158	1370	Hill, 1979	Selenium dioxide	100	Chicken (*Gallus domesticus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO		10	N	0.328	N	0.02817		0.859	10	10	5	5	5	8	4	10	10	4	71
159	1574	Stoewsand, etl al, 1977	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	10	w	2	w	JV	B	C	1	GRO	GRO	BDWT	WO		7	Y	0.1044	N	0.01337		0.896	10	10	5	10	6	8	4	10	10	4	77
160	36813	Heinz and Fitzgerald, 1993	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/19.8	mg/kg diet	Y	10	ADL	M	FD	21	w	NR	NR	SM	B	C	2	GRO	GRO	BDWT	WO		19.8	Y	1.198	N	0.05481		1.08	10	10	10	10	6	8	4	10	3	4	75
161	1376	Hoffman et al, 1992	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	2	GRO	GRO	BDWT	WO		15	Y	0.479	N	0.03604		1.20	10	10	10	10	6	8	4	10	10	4	82
162	93	Berg and Martinson, 1972	Sodium selenate	100	Chicken (*Gallus domesticus*)	1	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	NR	C	1	GRO	GRO	BDWT	WO		10	Y	0.084	N	0.01160		1.38	10	10	5	10	6	8	4	10	10	4	77

Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																								Effects						Conversion to mg/kg bw/day				Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	Endpoint Number	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
163	1445	Lowry and Baker, 1989	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/15	mg/kg diet	N	na	ADL	U	FD	14	d	8	d	JV	M	C	1	GRO	GRO	BDWT	WO		15	Y	0.193	N	0.01994		1.55	10	10	5	10	6	8	4	10	10	4	77
164	1370	Hill, 1979	Selenium dioxide	100	Chicken (*Gallus domesticus*)	1	2	0/20	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	GRO	GRO	BDWT	WO		20	N	0.328	N	0.02817		1.72	10	10	5	5	5	8	4	10	10	4	71
165	1387	Howell and Hill, 1978	Selenous acid	100	Chicken (*Gallus domesticus*)	1	2	0/25	mg/kg diet	N	na	ADL	U	FD	21	d	1	d	JV	B	C	1	GRO	GRO	BDWT	WO		25	N	0.564	N	0.04009		1.78	10	10	5	10	5	8	4	10	10	4	76
166	1285	Donaldson and McGowan, 1989	Sodium selenate	100	Chicken (*Gallus domesticus*)	1	3	0/20/40	mg/kg diet	N	na	NR	U	FD	20	d	1	d	JV	M	C	1	GRO	GRO	BDWT	WO		20	Y	0.147	N	0.01671		2.27	10	10	5	10	6	8	4	10	10	4	77
167	395	Hill, 1980	Selenium oxide	100	Chicken (*Gallus domesticus*)	1	2	0/20	mg/kg diet	N	na	NR	U	FD	1	w	1	d	JV	F	C	1	GRO	GRO	BDWT	WO		20	N	0.084	N	0.01160		2.76	10	10	5	5	5	8	4	10	10	4	71
168	1574	Stoewsand, etl al, 1977	Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	2	2	0/28	mg/kg diet	N	na	ADL	M	FD	10	w	NR	NR	JV	B	C	1	GRO	GRO	BDWT	WO		28	Y	0.1001	N	0.01301		3.64	10	10	10	10	6	8	4	10	10	4	82
Survival																																																
169	69	Arnold et al, 1973	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	NR	U	FD	24	w	1	d	JV	F	C	2	MOR	MOR	MORT	WO	2	8	Y	1.91	N	0.09198	0.093	0.371	10	10	5	10	6	9	8	10	10	4	82
170	80	Van Vleet et al, 1981	Sodium selenite	100	Duck (*Anas platyrhynchos*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	15	d	1	d	JV	M	C	3	MOR	MOR	MORT	WO	2		N	0.46	N	0.03511	0.153		10	10	5	10	5	9	4	10	10	4	77
171	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	3	MOR	MOR	MORT	WO	25	50	N	0.328	Y	0.00380	0.290	0.579	10	10	5	10	6	9	10	10	10	4	84
172	1464	Moksnes, 1983	Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	1	6	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	N	na	NR	U	FD	18	w	20	w	SM	F	C	4	MOR	MOR	MORT	WO	6		Y	1.671	N	0.08130	0.292		10	10	5	10	6	9	4	10	10	4	78
173	1592	Thapar et al 1969	Selenous acid	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	76	w	1	d	JV	F	C	2	MOR	MOR	MORT	WO	8		Y	1.967	N	0.09040	0.368		10	10	5	10	6	9	4	10	10	4	78
174	1592	Thapar et al 1969	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/2/8	mg/kg diet	N	na	DLY	U	FD	105	w	1	d	JV	B	C	2	MOR	MOR	MORT	WO	8		N	1.82	N	0.08595	0.378		10	10	5	10	5	9	4	10	10	4	77
175	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	3	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	3	MOR	MOR	MORT	WO	25	50	N	0.328	Y	0.00540	0.412	0.823	10	10	5	10	6	9	10	10	10	4	84
176	1350	Heinz and Fitzgerald 1993	seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	ug/g diet	N	na	ADL	UX	FD	13	w	NR	mo	AD	M	C	1	MOR	MOR	MORT	WO	10	20	Y	1.1	N	0.06193	0.563	1.13	10	10	10	10	6	9	10	10	6	4	85
177	1290	El-Begearmi and Combs, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	3	4	0/25/50/75	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	3	MOR	MOR	MORT	WO	25	50	N	0.328	Y	0.00750	0.572	1.14	10	10	5	10	6	9	10	10	10	4	84
178	1577	Stoewsand et al., 1974	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/5	mg/kg diet	N	na	NR	U	FD	4	w	1	d	JV	B	C	1	MOR	MOR	MORT	WO	5		N	0.12	N	0.01464	0.610		10	10	5	10	5	9	4	10	10	4	77
179	1550	Sell and Horani, 1976	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/8	mg/kg diet	N	na	ADL	U	FD	28	d	1	d	JV	M	C	3	MOR	MOR	MORT	WO	8		Y	0.267	Y	0.02100	0.629		10	10	5	10	7	9	4	10	10	4	79
180	1289	Echevarria et al., 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/3/6/9	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	4	MOR	MOR	MORT	WO	9		N	0.564	N	0.04009	0.64		10	10	5	10	5	9	4	1	10	4	68
181	1476	O'Toole and Raisbeck 1997	Seleno-L-methione	100	Mallard (*Anas platyrhynchos*)	1	4	0/10/25/60	ug/g diet	Y	25	DLY	U	FD	50	d	NR	NR	AD	M	C	4	MOR	MOR	MORT	WO	10	60	Y	1.35	N	0.07076	0.699	4.19302	10	10	5	10	6	9	8	10	10	4	82
182	1291	El-Begearmi et al, 1977	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	3	0/6/12	mg/kg diet	N	na	ADL	U	FD	12	w	1	d	JV	B	C	1	MOR	MOR	SURV	WO	6	12	N	0.135	N	0.01580	0.702	1.40	10	10	5	10	5	9	10	10	10	4	83
183	6433	El-Begearmi et al, 1982	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/6	mg/kg diet	N	na	ADL	U	FD	16	w	NR	NR	NR	B	C	2	MOR	MOR	SURV	WO	6		N	0.1	N	0.01300	0.780		10	10	5	10	5	9	4	10	3	4	70
184	1347	Heinz 1993	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	2	2	0/15	mg/kg diet	N	na	DLY	U	FD	21	w	NR	NR	AD	M	C	1	MOR	MOR	MORT	WO	15		N	1.1	N	0.06193	0.844		10	10	5	10	5	9	4	10	3	4	70
185	1370	Hill, 1979	Selenium dioxide	100	Chicken (*Gallus domesticus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	MOR	MOR	MORT	WO	10		N	0.328	N	0.02817	0.859		10	10	5	5	5	9	4	10	10	4	72
186	1354	Heinz et. al., 1989	Seleno-DL-cysteine	100	Duck (*Anas platyrhynchos*)	3	2	0/16	mg/kg diet	Y	1	ADL	UX	FD	49	d	NR	NR	SM	B	C	2	MOR	MOR	MORT	WO	16		Y	1.172	N	0.06453	0.890		10	10	10	10	6	9	4	10	3	4	76
187	1574	Stoewsand, etl al, 1977	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	10	w	2	w	JV	B	C	2	MOR	MOR	MORT	WO	7		Y	0.1044	N	0.01337	0.896		10	10	5	10	6	9	4	10	10	4	78
188	1550	Sell and Horani, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	3	2	0/8	mg/kg diet	N	na	ADL	U	FD	23	d	8	d	JV	B	C	3	MOR	MOR	MORT	WO	8		N	0.103	Y	0.01170	0.909		10	10	5	10	6	9	4	10	10	4	78
189	1354	Heinz et. al., 1989	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	6	0/1/2/4/8/16	mg/kg diet	Y	1	ADL	UX	FD	46	w	NR	NR	SM	B	C	2	MOR	MOR	MORT	WO	16		Y	1.1	N	0.06193	0.910		10	10	10	10	6	9	4	10	6	4	79
190	1636	Yamamoto et al, 1998	Natural selenium	100	American Kestrel (*Falco sparverius*)	2	2	0/8.0	mg/kg diet	N	na	DLY	M	FD	77	d	NR	NR	MA	B	C	2	MOR	MOR	MORT	WO	8		N	0.132	N	0.01557	0.944		10	10	10	10	5	9	4	10	3	4	75
191	1356	Heinz and Hoffman, 1987	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/10	mg/kg diet	Y	11	ADL	UX	FD	41	d	2	yr	SM	F	C	2	MOR	MOR	MORT	WO	10		Y	1.114	Y	0.10	1.01		10	10	10	10	7	9	4	10	10	4	84
192	1636	Yamamoto et al, 1998	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/5.1/9.0	mg/kg diet	N	na	DLY	M	FD	77	d	NR	NR	MA	B	C	2	MOR	MOR	MORT	WO	9		N	0.132	N	0.01557	0.706		10	10	10	10	5	9	4	10	6	4	78
193	36813	Heinz and Fitzgerald, 1993	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	2	0/19.8	mg/kg diet	Y	10	ADL	M	FD	21	w	NR	NR	SM	B	C	1	MOR	MOR	MORT	WO	19.8		Y	1.198	N	0.05481	1.08		10	10	10	10	6	9	4	10	3	4	76
194	1377	Hoffman et al, 1991	Seleno-DL-methionine	98	Mallard (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	1	MOR	MOR	SURV	WO	15	60	Y	0.566	N	0.04018	1.13	4.53	10	10	10	10	6	9	8	10	10	4	87
195	1376	Hoffman et al, 1992	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	3	0/15/60	mg/kg diet	Y	6	ADL	UX	FD	4	w	1	d	JV	B	C	1	MOR	MOR	SURV	WO	15	60	Y	0.479	N	0.03604	1.20	4.80	10	10	10	10	6	9	8	10	10	4	87
196	1319	Green and Albers, 1997	Seleno-DL-methinonine	100	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	10.5	ADL	U	FD	16	w	14	mo	AD	M	C	1	MOR	MOR	MORT	WO	20	40	N	1.2	N	0.06553	1.22	2.44	10	10	5	10	5	9	10	10	10	4	83
197	1378	Hoffman et al, 1992	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/060	mg/kg diet	Y	16	ADL	UX	FD	4	w	1	d	JV	B	C	1	MOR	MOR	SURV	WO	15	60	Y	0.611	N	0.04223	1.23	4.94	10	10	10	10	6	9	8	10	10	4	87
198	1535	Santolo et al 1999	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.0/11.6	mg/kg diet	N	na	DLY	M	FD	11	w	NR	mo	AD	B	C	2	MOR	MOR	MORT	WO	11.6		N	0.132	N	0.01557	1.37		10	10	10	10	5	9	4	10	6	4	78
199	36789	Ansari and Britton, 1974	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	10	d	1	d	JV	M	C	1	MOR	MOR	MORT	WO	10		N	0.084	N	0.01160	1.38		10	10	5	10	5	9	4	10	10	4	77
200	1387	Howell and Hill, 1978	Selenous acid	100	Chicken (*Gallus domesticus*)	2	2	0/20	mg/kg diet	N	na	ADL	U	FD	20	d	1	d	JV	B	C	2	MOR	MOR	MORT	WO	20		N	0.564	N	0.04009	1.42		10	10	5	10	5	9	4	10	10	4	77
201	1370	Hill, 1979	Selenium dioxide	100	Chicken (*Gallus domesticus*)	1	2	0/20	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	MOR	MOR	MORT	WO	20		N	0.328	N	0.02817	1.72		10	10	5	5	5	9	4	10	10	4	72
202	1374	Hoffman et al, 1991	Seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	7	0/1/2/4/8/16/32	mg/kg diet	Y	1	ADL	U	FD	14	w	2	yr	AD	M	C	1	MOR	MOR	SURV	WO	32		Y	0.986	N	0.05767	1.87		10	10	5	10	6	9	4	10	10	4	78
203	1562	Smith et al, 1988	Seleno-DL-methionine	100	Black-crowned night-heron (*Nycticora*	1	3	0/10/30	mg/kg diet	Y	10	ADL	UX	FD	92	d	NR	NR	AD	B	C	2	MOR	MOR	MORT	WO	30		N	0.883	N	0.05367	2.03		10	10	10	10	5	9	4	10	6	4	78
204	1208	Albers et al 1996	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	12.5	DLY	U	FD	16	w	1	yr	AD	M	C	1	MOR	MOR	MORT	WO	40	80	Y	0.944	N	0.05606	2.38	4.75	10	10	5	10	6	9	10	10	6	4	80
205	1357	Heinz et al 1996	Se in food (High selenium wheat)	100	Mallard (*Anas platyrhynchos*)	4	2	0/15	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	4	MOR	MOR	SURV	WO	15		Y	0.163	Y	0.0330	3.04		10	10	5	4	7	9	4	10	10	4	73
206	1285	Donaldson and McGowan, 1989	Sodium selenate	100	Chicken (*Gallus domesticus*)	1	3	0/20/40	mg/kg diet	N	na	NR	U	FD	18	d	1	d	JV	M	C	2	MOR	MOR	MORT	WO	20	40	Y	0.064	N	0.009722	3.04	6.08	10	10	5	10	6	9	10	10	10	4	84
207	1404	Jensen et al., 1977	Selenium	100	Chicken (*Gallus domesticus*)	1	5	0/5/10/20/40	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	MOR	MOR	MORT	WO	20	40	Y	0.062	N	0.009523	3.07	6.14	10	10	5	4	6	9	10	10	10	4	78
208	1356	Heinz and Hoffman, 1987	Sodium selenite	100	Mallard (*Anas platyrhynchos*)	1	6	0/1/5/10/25/100	mg/kg diet	Y	11	ADL	UX	FD	57	d	2	yr	SM	B	C	2	MOR	MOR	MORT	WO	25	100	Y	0.913	Y	0.10	3.08	12.3	10	10	10	10	7	9	8	10	6	4	84
209	1357	Heinz et al 1996	seleno-L-methionine	100	Mallard (*Anas platyrhynchos*)	2	3	0/15/30	ug/g diet	N	na	DLY	U	FD	1	w	1	d	JV	NR	C	4	MOR	MOR	SURV	WO	15	30	Y	0.073	Y	0.0170	3.49	6.99	10	10	5	10	7	9	10	10	10	4	85
210	1574	Stoewsand, etl al, 1977	Se in food (natural selenized wheat)	100	Japanese Quail (*Coturnix japonica*)	2	2	0/28	mg/kg diet	N	na	ADL	M	FD	10	w	2	w	JV	B	C	2	MOR	MOR	MORT	WO	28		Y	0.1001	N	0.01301	3.64		10	10	10	10	6	9	4	10	10	4	83
211	1357	Heinz et al 1996	seleno-DL-methionine	100	Mallard (*Anas platyrhynchos*)	1	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	3	MOR	MOR	SURV	WO	30		Y	0.121	Y	0.0150	3.72		10	10	5	10	7	9	4	10	10	4	79
212	1355	Heinz et al 1988	Selenomethionine	99	Mallard (*Anas platyrhynchos*)	2	5	0/10/20/40/80	mg/kg diet	Y	7	NR	UX	FD	3	w	1	d	JV	NR	C	1	MOR	MOR	MORT	WO	20	40	Y	0.40	Y	0.0750	3.99	7.98	10	10	10	10	7	9	10	10	10	4	90
213	1355	Heinz et al 1988	Sodium selenite	97	Mallard (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	7	DLY	UX	FD	2	w	1	d	JV	NR	C	1	MOR	MOR	MORT	WO	20	40	Y	0.125	Y	0.0350	5.84	11.7	10	10	10	10	7	9	10	10	10	4	90
214	1357	Heinz et al 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	3	0/15/30	ug/g diet	N	na	DLY	U	FD	2	w	1	d	JV	NR	C	3	MOR	MOR	SURV	WO	30		Y	0.16	Y	0.0390	7.31		10	10	5	4	7	9	4	3	10	4	66
215	1404	Jensen et al., 1977	Selenium	100	Chicken (*Gallus domesticus*)	2	5	0/0.78/1.46/1.89/1.94	mg/org/d	N	na	ADL	U	FD	2	w	1	d	JV	B	C	2	MOR	MOR	MORT	WO	1.89	1.94	Y	0.067	N	0.01002	28.2	29.0	10	10	5	4	6	9	10	10	10	4	78
216	1415	Khan et al, 1993	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/0.5	mg/kg bw/d	N	na	EOD	U	GV	28	d	43	d	JV	F	C	2	MOR	MOR	MORT	WO		0.5	N	1.6	N	0.07903		0.50	10	8	10	10	10	9	4	10	3	4	78
217	1387	Howell and Hill, 1978	Selenous acid	100	Chicken (*Gallus domesticus*)	1	2	0/25	mg/kg diet	N	na	ADL	U	FD	21	d	1	d	JV	B	C	2	MOR	MOR	MORT	WO		25	N	0.564	N	0.04009		1.78	10	10	5	10	5	9	4	10	10	4	77

Appendix 5.1 Avian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																								Effects						Conversion to mg/kg bw/day				Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	Endpoint Number	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg/day or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
218	1369	Hill, 1974	Selenium oxide	100	Chicken (*Gallus domesticus*)	2	2	0/40	mg/kg diet	N	na	ADL	U	FD	2	w	1	d	JV	B	C	1	MOR	MOR	MORT	WO		40	N	0.328	N	0.02817		3.44	10	10	5	10	5	9	4	10	10	4	77
219	1347	Heinz 1993	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	2	0/100	mg/kg diet	N	na	DLY	U	FD	5	w	NR	NR	AD	M	C	1	MOR	MOR	MORT	WO		100	Y	1.2	N	0.06553		5.75	10	10	5	10	6	9	4	10	3	4	71
Data Not Used to Derive TRV																																															
220	1297	Fairbrother and Fowles, 1990	Selenomethionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/2.2	mg/L	N	na	ADL	U	DR	12	w	9	mo	JV	M	C	2	BEH	FDB	WCON	WO	2.2		N	1.24	N	0.06815	0.121		10	5	5	10	5	4	4	1	10	4	58
221	1297	Fairbrother and Fowles, 1990	Selenomethionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/2.2	mg/L	N	na	ADL	U	DR	83	d	9	mo	JV	M	C	4	GRO	GRO	BDWT	WO	2.2		N	1.2	N	0.06667	0.122		10	5	5	10	5	8	4	1	10	4	62
222	1273	Dafalla and Adam, 1986	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	3	0/1/3	mg/kg diet	N		ADL	U	FD	4	w	7	d	JV	B	C	2	PHY	PHY	FDCV	WO	3		Y	0.65	N	0.04397	0.203		10	10	5	10	6	4	4	1	10	4	64
223	1465	Moksnes and Norheim, 1982	Sodium selenite	100	Chicken (*Gallus domesticus*)	2	4	0/1.0/3.0/6.0	ug/g diet	N		ADL	U	FD	31	w	20	w	JV	B	C	3	PTH	HIS	GHIS	WO	6		Y	1.8	N	0.08533	0.284		10	10	5	10	6	4	4	1	10	4	64
224	1464	Moksnes, 1983	Seleno-DL-methionine	100	Chicken (*Gallus domesticus*)	1	6	0/0.1/0.5/1.0/3.0/6.0	mg/kg diet	N		NR	U	FD	18	w	20	w	SM	F	C	1	PTH	HIS	GLSN	WO	6		Y	1.671	N	0.08130	0.292		10	10	5	10	6	4	4	1	10	4	64
225	1592	Thapar et al 1969	Selenous acid	100	Chicken (*Gallus domesticus*)	1	3	0/2/8	mg/kg diet	N		DLY	U	FD	76	w	1	d	JV	F	C	4	PTH	HIS	GLSN	WO	8		Y	1.967	N	0.09040	0.368		10	10	5	10	6	4	4	1	10	4	64
226	1489	Ort and Latshaw, 1978	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1/3/5	mg/kg diet	N		ADL	U	FD	28	w	32	w	SM	F	C	2	BEH	FDB	FCNS	WO	5		N	1.6	Y	0.1320	0.412		10	10	5	10	6	4	4	1	3	4	57
227	3788	Poley and Moxon, 1937	Se in food (seleniferous grain)	100	Chicken (*Gallus domesticus*)	1	4	0/2.5/5/10	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	SM	F	C	1	BEH	FDB	FCNS	WO	10		Y	2.4	N	0.1029	0.429		10	10	5	10	6	4	4	1	10	4	64
228	1352	Heinz and Hoffman 1996	Se in food (selenized yeast)	100	Mallard (*Anas platyrhynchos*)	3	2	0/10.9	mg/kg diet	N		ADL	M	FD	4	w	NR	mo	AD	B	C	1	PTH	ITX	GITX	WO	10.9		N	1.2	N	0.06553	0.595		10	10	10	4	5	4	4	10	3	4	64
229	1550	Sell and Horani, 1976	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/8	mg/kg diet	N	na	ADL	U	FD	28	d	1	d	JV	M	C	2	BEH	FDB	FCNS	WO	8		Y	0.267	Y	0.02100	0.629		10	10	5	10	7	4	4	1	10	4	65
230	1347	Heinz 1993	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	2	2	0/15	mg/kg diet	N	na	DLY	U	FD	5	w	NR	NR	AD	M	C	2	PTH	GRS	BDWT	WO	15		N	1.1	N	0.06193	0.844		10	10	5	10	5	4	4	1	3	4	56
231	1550	Sell and Horani, 1976	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	3	2	0/8	mg/kg diet	N	na	ADL	U	FD	23	d	8	d	JV	B	C	2	BEH	FDB	FCNS	WO	8		N	0.103	Y	0.01170	0.909		10	10	5	10	6	4	4	1	10	4	64
232	429	Donaldson, 1985	Selenium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N		ADL	U	FD	3	w	1	d	JV	M	C	1	BIO	CHM	FFTA	BL	10		Y	0.269	N	0.02476	0.920		10	10	5	10	6	1	4	1	10	4	61
233	1636	Yamamoto et al, 1998	Natural selenium	100	American Kestrel (*Falco sparverius*)	2	2	0/8.0	mg/kg diet	N	na	DLY	M	FD	77	d	NR	d	MA	M	C	1	GRO	GRO	BDWT	WO	8		N	0.132	N	0.01557	0.944		10	10	10	10	5	8	4	1	3	4	65
234	1636	Yamamoto et al, 1998	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/5.1/9.0	mg/kg diet	N	na	DLY	M	FD	77	d	NR	NR	MA	B	C	3	PTH	HIS	NCRO	LI	9		N	0.132	N	0.01557	1.06		10	10	10	10	5	4	4	1	6	4	64
235	36789	Ansari and Britton, 1974	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	2	0/10	mg/kg diet	N		ADL	U	FD	10	d	1	d	JV	M	C	3	PHY	PHY	FDCV	WO	10		N	0.084	N	0.01160	1.38		10	10	5	10	5	4	4	1	10	4	63
236	1245	Cantor et al., 1984	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/1/2/4	mg/L	N		ADL	U	DR	14	d	6	d	JV	M	C	3	PHY	PHY	FDCV	WO	4		N	0.084	Y	0.03020	1.44		10	5	5	10	6	4	4	1	10	4	59
237	25901	Yamamoto and Santolo, 2000	Seleno-L-methionine	100	American Kestrel (*Falco sparverius*)	1	3	0/6.3/12	mg/kg diet	N		DLY	M	FD	77	d	NR	NR	JV	B	C	2	BEH	FDB	FCNS	WO	12		Y	0.1051	N	0.01343	1.53		10	10	10	5	6	4	4	1	6	4	60
238	1208	Albers et al 1996	Seleno-DL-methionine	100	Duck (*Anas platyrhynchos*)	1	5	0/10/20/40/80	mg/kg diet	Y	12.5	DLY	U	FD	16	w	1	yr	AD	M	C	5	BIO	CHM	PCLV	BL	80		Y	0.636	N	0.04335	6.23		10	10	5	10	6	1	4	1	6	4	57
239	1289	Echevarria et al., 1988	Sodium selenite	100	Chicken (*Gallus domesticus*)	1	4	0/3/6/9	mg/kg diet	N	na	ADL	U	FD	3	w	1	d	JV	M	C	3	PHY	PHY	FDCV	WO	9		N	0.564	N	0.04009	0.64		10	10	5	10	5	4	4	1	10	4	63
240	1645	Zaki, 1993	Selenium	100	Chicken (*Gallus domesticus*)	1	2	0/1.5	mg/kg diet	N		DLY	U	FD	5	w	8	w	JV	NR	C	1	BIO	ENZ	GENZ	IN		1.5	N	1.6	N	0.07903		0.0741	10	10	5	4	5	1	4	10	3	4	56
241	1297	Fairbrother and Fowles, 1990	Selenomethionine	100	Mallard (*Anas platyrhynchos*)	2	2	0/2.2	mg/L	N	na	ADL	U	DR	83	d	9	mo	JV	M	C	3	BIO	ENZ	GLPX	PL		2.2	Y	1.24	N	0.06815		0.121	10	5	5	10	6	1	4	10	10	4	65
242	10934	Di Simplicio and Leonzio, 1989	Sodium selenite	100	Japanese Quail (*Coturnix japonica*)	1	4	0/2.5/5.0/10	ug/g diet	N	na	NR	U	FD	21	d	NR	NR	AD	M	V	1	BIO	ENZ	GLPX	LI		2.5	N	0.120	N	0.01464		0.305	10	10	5	10	5	1	4	10	6	4	65

All abbreviations and definitions are used in coding stuides are available from Attachment 4-3 of the Eco-SSL guidance (U.S. EPA 2003).

Duplicate values for NOAELs and LOAELs for the same reference represent results from different experimental designs and are identified by different Phase numbers.

Appendix 6-1

Mammalian Toxicity Data Extracted and Reviewed for Wildlife Toxicity Reference Value (TRV) - Selenium

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July 2007

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Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																								Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
Biochemical																																																
1	662	Meyer et al 1982	Selenous acid	100	Rat (*Rattus norvegicus*)	1	2	0/1.0	mg/kg diet	N	na	ADL	U	FD	30	d	NR	NR	JV	M	C	BIO	ENZ	GLPX	LI	1		Y	0.24	Y	0.01540	0.0642		10	10	5	10	7	1	4	10	10	4	71
2	1221	Bauersachs et al., 1993	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	44	d	NR	mo	JV	M	C	BIO	ENZ	GLPX	LI	1		N	0.523	N	0.04032	0.0771		10	10	5	10	5	1	4	10	10	4	69
3	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	na	ADL	U	DR	13	w	6	w	JV	F	C	BIO	CHM	LMPH	BL	0.17	0.28	Y	0.207	Y	0.01560	0.0776	0.128	10	5	10	10	10	1	10	10	10	10	86
4	1389	Hu et al., 1984	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	7	mo	1	mo	JV	F	C	BIO	CHM	HMGL	BL	1		N	0.204	N	0.01860	0.0912		10	10	5	10	5	1	4	10	10	4	69
5	25948	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	BIO	ENZ	GLPX	WO	5	10	Y	84.5	Y	2.310	0.137	0.273	10	10	5	5	7	1	10	10	10	4	72
6	1442	Liu et al., 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/0.509/2.003/4.05	mg/kg diet	N	na	ADL	M	FD	2	w	45	d	JV	F	C	BIO	CHM	GLTH	LI	2.003	4.05	Y	0.177	Y	0.01330	0.151	0.304	10	10	10	10	7	1	10	10	10	4	82
7	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	BIO	CHM	PCLV	BL	5	10	Y	61.5	N	2.030	0.165	0.330	10	10	5	10	6	1	10	10	10	4	76
8	1448	Mahan and Magee, 1991	Sodium selenite	100	Pig (*Sus scrofa*)	1	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	BIO	ENZ	GLPX	SR	5	15	Y	31.5	Y	1.070	0.170	0.510	10	10	10	10	7	1	10	10	10	4	82
9	1313	Goehring et. al. 1983	Sodium selenite	100	Pig (*Sus scrofa*)	1	6	0/4.20/7.84/11.27/16.43/20.45	ug/g diet	N	na	NR	M	FD	5	w	NR	NR	JV	B	C	BIO	CHM	GLPX	BL	4.2	7.84	Y	19.2	Y	0.790	0.173	0.323	10	10	10	10	7	1	10	10	10	4	82
10	1640	Yeh et al, 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	B	C	BIO	ENZ	GLPX	PL	2	4	Y	0.211	N	0.01807	0.181	0.362	10	10	5	10	6	1	10	10	10	4	76
11	1448	Mahan and Magee, 1991	Calcium selenite	100	Pig (*Sus scrofa*)	2	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	BIO	ENZ	GLPX	SR	5	15	Y	31.5	Y	1.151	0.183	0.548	10	10	10	10	7	1	10	10	10	4	82
12	1312	Goehring et al., 1984	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	BIO	CHM	PCLV	BL	2.63	5.69	Y	0.354	N	0.02926	0.217	0.470	10	10	10	10	6	1	10	10	10	4	81
13	1254	Chen et al., 1982	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2/6	mg/kg diet	N	na	NR	U	FD	4	w	NR	NR	JV	M	C	BIO	ENZ	P450	LI	2	6	Y	0.06	N	0.006801	0.227	0.680	10	10	5	10	6	1	10	10	10	4	76
14	36834	Tsunoda et al, 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/0.24/0.58/1.34	mg/kg bw/d	N	na	DLY	U	DR	14	d	7-8	w	JV	M	C	BIO	HRM	DOPA	BR	0.24	0.58	Y	0.024	N	0.003450	0.240	0.580	10	5	5	10	7	1	10	10	10	4	72
15	1312	Goehring et al., 1984	Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	1	4	0/2.58/5.60/8.4	mg/kg diet	N	na	ADL	M	FD	6	w	NR	NR	JV	B	C	BIO	CHM	PCLV	BL	8.4		Y	31.08	Y	0.980	0.265		10	10	10	10	7	1	4	1	10	4	67
16	1392	Ishikawa et al, 1992	Sodium selenite	100	Mouse (*Mus musculus*)	1	5	0/1/2/4/8	mg/L	N	na	NR	U	DR	12	w	5	w	JV	M	C	BIO	ENZ	NCCR	LI	2	4	N	0.03979	N	0.005438	0.273	0.547	10	5	5	10	5	1	10	10	10	4	70
17	1323	Gronbaek et al., 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3.3	mg/L	N	na	ADL	U	DR	35	d	3-4	w	JV	M	C	BIO	CHM	GLUC	SR	3.3		Y	0.22	Y	0.0240	0.360		10	5	5	10	7	1	4	10	10	4	66
18	25948	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	BIO	ENZ	GLPX	SR	15	20	Y	83	Y	2.030	0.367	0.489	10	10	5	5	7	1	10	10	10	4	72
19	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	BIO	CHM	PCLV	BL	5	10	Y	0.2925	Y	0.02270	0.388	0.776	10	10	5	10	7	1	10	10	10	4	77
20	36818	Johnson, et al., 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	BIO	CHM	RBCE	BL	3	9	Y	0.02052	N	0.002996	0.438	1.31	10	5	5	10	6	1	10	10	10	4	71
21	10867	Davies, et al, 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	3	0/2.0/5.0	mg/kg diet	N	na	ADL	U	FD	6	w	8	w	JV	M	C	BIO	ENZ	P450	LI	5		Y	0.20	N	0.01830	0.457		10	10	5	10	6	1	4	6	10	4	66
22	1312	Goehring et al., 1984	Sodium selenite	100	Pig (*Sus scrofa*)	2	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	17	w	NR	NR	JV	B	C	BIO	CHM	PCLV	BL	8.33		Y	40.74	Y	2.270	0.464		10	10	10	10	7	1	4	1	10	4	67
23	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	6	0/1/4/8/16/64	mg/L	N	na	ADL	U	DR	35	d	5, 12	w	JV	F	C	BIO	ENZ	GOTR	BL	4	8	N	0.204	N	0.02368	0.464	0.928	10	5	5	10	5	1	10	10	10	4	70
24	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	F	C	BIO	ENZ	GLPX	LI	10		Y	0.111	Y	0.00590	0.532		10	10	5	10	7	1	4	6	10	4	67
25	1332	Halverson et al 1966	Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	2	8	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	BIO	CHM	HMGL	BL	6.4	8	Y	0.22	N	0.01979	0.576	0.720	10	10	5	4	6	1	10	10	10	4	70
26	1526	Reiter and Wendel, 1985	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/5/10	mg/kg diet	N	na	ADL	U	FD	4	mo	NR	mo	JV	M	C	BIO	ENZ	GSTR	LI	5	10	N	0.02695	N	0.003523	0.654	1.31	10	10	5	10	5	1	10	10	10	4	75
27	1312	Goehring et al., 1984	Se in food (seleniferous wheat and corn)	100	Rat (*Rattus norvegicus*)	3	4	0/2.58/5.6/8.4	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	BIO	CHM	PCLV	BL	8.4		Y	0.2994	N	0.02549	0.715		10	10	10	10	6	1	4	1	10	4	66
28	1498	Panter et al., 1995	Sodium selenate	100	Sheep (*Ovis aries*)	1	2	0/24	mg/kg diet	N	na	ADL	M	FD	66	d	NR	NR	GE	F	C	BIO	HRM	PRGS	SR	24		Y	67	N	2.178	0.780		10	10	10	10	6	1	4	1	10	4	66
29	1498	Panter et al., 1995	Selenium	100	Sheep (*Ovis aries*)	2	2	0/29	mg/kg diet	N	na	ADL	M	FD	66	d	NR	mo	GE	F	C	BIO	HRM	PRGS	SR	29		Y	66	N	2.151	0.945		10	10	10	10	6	1	4	1	10	4	66
30	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	BIO	CHM	HMCT	BL	3.31		Y	0.0338	Y	0.00310	1.51		10	5	10	10	7	1	4	10	10	10	77
31	1629	Wilson et al 1988	Sodium selenite	45.66	Pig (*Sus scrofa*)	1	4	0/1.4/2.6/4.2	mg/kg bw/d	N	na	DLY	U	OR	31	d	6	w	JV	M	C	BIO	CHM	GBCM	BL	4.2		Y	8.7	N	0.4067	1.92		10	8	10	10	10	1	4	1	10	4	68
32	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	BIO	CHM	HMCT	BL	5.45		Y	0.0302	Y	0.00250	2.28		10	5	10	10	10	1	4	10	10	10	80
33	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	1	7	0/1/4/8/16/32/64	mg/L	N	na	ADL	U	DR	46	d	7-18	w	JV	B	C	BIO	ENZ	ALPH	SR	32	64	N	0.02695	N	0.003829	4.55	9.09	10	5	5	10	5	1	10	10	10	4	70
34	1538	Sayato et al 1993	seleno-DL-cystine	100	Mouse (*Mus musculus*)	1	5	0/10/20/30/40	mg/kg bw/d	N	na	6 per w	U	GV	30	d	5	w	JV	M	V	BIO	ENZ	ASAT	BL	10	20	Y	0.032	N	0.00406	10.0	20.0	10	8	5	10	10	1	10	10	10	4	78
35	11361	Glattre et al, 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.09	mg/kg bw/d	N	na	NR	U	DR	4	w	NR	NR	JV	M	C	BIO	HRM	TRII	SR		0.09	Y	0.29	N	0.03249		0.090	10	5	5	10	10	1	4	10	10	4	69
36	1304	Fredriksson et al., 1993	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.3	mg/kg diet	N	na	ADL	M	FD	8	w	NR	NR	GE	F	C	BIO	ENZ	GLPX	BL		1.3	N	0.35	N	0.02899		0.108	10	10	10	10	5	1	4	10	10	4	74
37	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	BIO	CHM	HMGL	BL		0.31	Y	0.196	Y	0.01470		0.130	10	5	10	10	10	1	4	10	10	10	80
38	1239	Boylan et al, 1990	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/1.16	ug/g diet	N	na	ADL	M	FD	6	mo	NR	NR	JV	F	C	BIO	ENZ	GLPX	LI		1.16	Y	0.023	N	0.003092		0.156	10	10	10	10	6	1	4	10	10	4	75
39	1224	Behne et al., 1992	sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	BIO	ENZ	GLPX	LI		2	Y	0.382	N	0.03115		0.163	10	10	5	10	6	1	4	10	10	4	70
40	1224	Behne et al., 1992	L-Selenomethionine	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	BIO	ENZ	GLPX	LI		2	Y	0.34	N	0.02830		0.166	10	10	5	10	6	1	4	10	10	4	70
41	25959	Gunter et al, 2003	Sodium selenite	100	Cattle (*Bos taurus*)	1	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	BIO	ENZ	GLPX	SR		26	Y	498	N	3.318		0.173	10	10	5	10	6	1	4	10	10	4	70
42	2788	Nehru et al., 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.175	mg/kg bw	N	na	EOD	U	GV	8	w	NR	NR	JV	F	C	BIO	CHM	PRTL	BR		0.175	Y	0.195	N	0.01792		0.175	10	8	5	10	10	1	4	10	10	4	72
43	1271	Coudray, et. al. 1996	Sodium Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	BIO	CHM	RGSH	BL		2.5	N	0.455	N	0.03596		0.198	10	10	5	10	5	1	4	10	10	4	69
44	1219	Baker et al., 1989	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/12.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	BIO	ENZ	ALPH	BL		12.5	N	61	N	2.016		0.205	10	10	10	10	5	1	4	10	10	4	74
45	1618	Whanger and Butler, 1988	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	BIO	ENZ	GLPX	BL		2	Y	0.200	Y	0.02500		0.245	10	10	5	10	7	1	4	10	10	4	71
46	1433	LeBoeuf et al., 1985	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/3/6	mg/kg diet	N	na	ADL	U	FD	2	w	NR	NR	JV	M	C	BIO	CHM	GBCM	LI		3	N	0.267	N	0.02320		0.261	10	10	5	10	5	1	4	10	10	4	69
47	1602	Turan et al., 1997	Sodium selenite	45.66	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	BIO	ENZ	GLPX	BL		10	Y	2.006	N	0.1218		0.277	10	10	5	10	6	1	4	10	10	4	70
48	1612	Wahlstrom et al., 1984	sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/8.1	mg/kg diet	N	na	ADL	M	FD	6	w	5-6	w	JV	M	C	BIO	ENZ	GLPX	PL		8.1	Y	30.6	N	1.143		0.303	10	10	10	10	6	1	4	10	10	4	75
49	1219	Baker et al., 1989	Se in food (*Astragalus bisculatus*)	100	Pig (*Sus scrofa*)	1	2	0/18.7	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	BIO	CHM	PCLV	BL		18.7	N	61	N	2.016		0.307	10	10	10	10	5	1	4	10	10	4	74
50	1546	Scott et al., 1977	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/4	mg/kg diet	N	na	ADL	U	FD	3	mo	NR	NR	NR	F	C	BIO	ENZ	GLPX	BL		4	N	0.32	N	0.02693		0.337	10	10	5	10	5	1	4	10	10	4	69
51	1390	Ip, 1984	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	2	w	8	w	JV	F	C	BIO	ENZ	GSTR	LI		2.5	N	0.0225	N	0.003037		0.337	10	10	5	10	5	1	4	10	10	4	69
52	1219	Baker et al., 1989	Se in food (*Astragalus praelongus*)	100	Pig (*Sus scrofa*)	2	2	0/21.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	BIO	ENZ	ASAT	BL		21.5	N	61	N	2.016		0.352	10	10	10	10	5	1	4	10	10	4	74
53	1638	Yeh et al., 1995	Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/4	mg/kg diet	N	na	ADL	U	FD	6	w	4	w	JV	M	C	BIO	CHM	GBCM	MU		4	Y	0.2024	N	0.01848		0.365	10	10	5	10	6	1	4	10	10	4	70
54	1408	Julius et al, 1983	Selenomethionine	100	Hamster (*Mesocricetus auratus*)	3	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	BIO	CHM	GBCM	BL		5	Y	0.099	Y	0.00740		0.374	10	10	5	10	7	1	4	10	10	4	71
55	1276	Dausch and Fullerton, 1993	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	8	3	0/10/30	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	BIO	CHM	GBCM	LI		10	N	0.18	N	0.01678		0.390	10	10	5	10	5	1	4	10	10	4	69
56	1396	Jaffe and Mondragon, 1975	Selenium	100	Rat (*Rattus norvegicus*)	1	3	0/4.5/10	mg/kg diet	N	na	ADL	U	FD	5	w	21	d	JV	B	C	BIO	CHM	PCLV	BL		4.5	N	0.267	N	0.02320		0.391	10	10	5	10	5	1	4	10	10	4	69
57	1274	Das et al., 1989	Selenium	100	Guinea pig (*Cavia porcellus*)	1	2	0/5.1	mg/kg diet	N	na	ADL	M	FD	60	d	21-25	d	JV	B	C	BIO	CHM	HMCT	BL		5.1	N	0.48	N	0.03758		0.399	10	10	10	4	5	1	4	10	10	4	68

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																						Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score												
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
58	1275	Das et al., 1989	Selenium	100	Guinea pig (*Cavia porcellus*)	1	2	0/5.1	mg/kg diet	N	na	ADL	M	FD	20	d	21-25	d	JV	B	C	BIO	CHM	GLUC	BL		5.1	N	0.48	N	0.03758		0.399	10	10	10	4	5	1	4	10	10	4	68
59	1443	Liu and Boylan, 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/4.37	mg/kg diet	N	na	ADL	M	FD	8	w	NR	NR	JV	M	C	BIO	CHM	CHOL	PL		4.37	Y	0.1523	N	0.01463		0.420	10	10	10	10	6	1	4	10	10	4	75
60	1276	Dausch and Fullerton, 1993	Selenocystine	47.27	Rat (*Rattus norvegicus*)	2	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	BIO	CHM	GBCM	LI		10	N	0.18	N	0.01678		0.441	10	10	5	10	5	1	4	10	10	4	69
61	1232	Birt et al., 1986	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/5	mg/kg diet	N	na	ADL	U	FD	50	w	4	w	JV	B	C	BIO	ENZ	GLPX	WO		5	Y	0.136	N	0.01333		0.490	10	10	5	10	6	1	4	10	10	4	70
62	1432	LeBoeuf and Hoekstra, 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/6	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	BIO	ENZ	G6PD	LI		6	N	0.267	N	0.02320		0.521	10	10	5	10	5	1	4	10	10	4	69
63	1522	Kaur et al., 1999	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/6/8	mg/kg diet	N	na	ADL	U	FD	6	w	2-3	mo	JV	M	C	BIO	CHM	LIPD	TE		6	Y	0.2	N	0.01830		0.549	10	10	5	10	6	1	4	10	10	4	70
64	1276	Dausch and Fullerton, 1993	Sodium selenide	63.2	Rat (*Rattus norvegicus*)	4	4	0/10/30/60	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	BIO	CHM	GBCM	LI		10	N	0.18	N	0.01678		0.589	10	10	5	10	5	1	4	10	10	4	69
65	1603	Turan et al 1997	Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	14	w	NR	NR	JV	B	C	BIO	ENZ	GLPX	BL		10	Y	1.34	N	0.08739		0.652	10	10	5	10	6	1	4	10	10	4	70
66	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/10/20/40/80	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	BIO	ENZ	GLPX	ER		10	Y	0.105	Y	0.0080		0.762	10	10	5	10	7	1	4	10	10	4	71
67	1523	Rastogi et al., 1976	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/128.6	ug/org/d	N	na	ADL	U	DR	8	w	1	mo	JV	B	C	BIO	ENZ	ALAD	BL		128.6	Y	0.135	N	0.01633		0.953	10	5	5	10	7	1	4	10	10	4	66
68	1275	Das et al., 1989	Sodium selenite	100	Guinea pig (*Cavia porcellus*)	2	2	0/13.68	mg/kg diet	N	na	ADL	U	FD	20	d	21-25	d	JV	B	C	BIO	CHM	GLUC	BL		13.7	N	0.48	N	0.03758		1.07	10	10	5	10	5	1	4	10	10	4	69
69	1274	Das et al., 1989	Sodium selenite	45.66	Guinea pig (*Cavia porcellus*)	2	2	0/30	mg/kg diet	N	na	ADL	U	FD	23	d	21-25	d	JV	B	C	BIO	CHM	HMCT	BL		30	N	0.48	N	0.03758		1.07	10	10	5	10	5	1	4	10	10	4	69
70	14273	Yilmaz et al, 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.2	mg/org/d	N	na	ADL	U	FD	5	w	5	w	JV	M	C	BIO	CHM	CHOL	TE		0.2	Y	0.16	N	0.01523		1.25	10	10	5	10	6	1	4	10	10	4	70
71	15506	Sc hroeder, 1968	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/1.430	mg/kg bw/d	N	na	ADL	U	DR	422	d	21-23	d	JV	B	C	BIO	CHM	CHOL	SR		1.43	N	0.51	N	0.05401		1.43	10	5	5	10	10	1	4	10	10	4	69
72	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.79	mg/kg bw/d	N	na	DLY	U	FD	100	d	28	d	JV	B	C	BIO	CHM	HMGL	BL		1.79	Y	0.063	Y	0.004260		1.79	10	10	5	10	10	1	4	10	10	4	74
73	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/3.54	mg/kg bw/d	N	na	DLY	U	FD	35	d	28	d	JV	B	C	BIO	CHM	HMGL	BL		3.54	Y	0.035	Y	0.00250		3.54	10	10	5	10	10	1	4	10	10	4	74
74	14508	Franke and Moxon 1937	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/50	mg/kg diet	N	na	DLY	U	FD	21	d	28	d	JV	B	C	BIO	CHM	HMGL	BL		50	Y	0.029	Y	0.002170		3.74	10	10	5	10	7	1	4	10	10	4	71
75	1280	Debski et al., 1992	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	2	0/110.1	mg/kg bw/d	N	na	ADL	U	FD	2	w	NR	NR	JV	M	C	BIO	ENZ	GLPX	BL		110.1	Y	0.2686	N	0.02332		0.110	10	10	5	10	10	1	4	10	10	4	74
Behavior																																																
76	1557	Shull and Checke, 1973	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	3	0/1/5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	1	5	Y	0.330	Y	0.0175	0.053	0.265	10	10	5	10	7	4	8	10	10	4	78
77	662	Meyer et al 1982	Selenous acid	100	Rat (*Rattus norvegicus*)	1	2	0/1.0	mg/kg diet	N	na	ADL	U	FD	30	d	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	1		Y	0.24	Y	0.01540	0.0642		10	10	5	10	7	4	4	10	10	4	74
78	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	BEH	FDB	WCON	WO	0.17	0.28	Y	0.207	Y	0.01560	0.0776	0.128	10	5	10	10	10	4	10	10	10	10	89
79	25957	Kim and Mahan, 2001	Sodium selenite or Se-yeast	100	Pig (*Sus scrofa*)	1	6	0/1.0/3.0/5.0/7.0/10.0	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	BEH	FDB	FCNS	WO	5	7	Y	104	Y	2.340	0.112	0.157	10	10	5	10	7	4	10	10	10	4	80
80	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	BEH	FDB	WCON	WO	0.31	0.47	Y	0.196	Y	0.01470	0.130	0.196	10	5	10	10	10	4	10	10	10	10	89
81	25948	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	BEH	FDB	FCNS	WO	5	10	Y	84.5	Y	2.310	0.137	0.273	10	10	5	10	7	4	10	10	10	4	80
82	1450	Mahan and Moxon, 1984	Sodium selenite	100	Pig (*Sus scrofa*)	1	7	0/2.5/5/7.5/10/20/40	mg/kg diet	N	na	ADL	U	FD	37	d	4	w	JV	B	C	BEH	FDB	FCNS	WO	5	7.5	Y	17.8	Y	0.510	0.143	0.215	10	10	5	10	7	4	10	10	10	4	80
83	36818	Johnson, et al., 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	BEH	FDB	WCON	WO	1	3	Y	0.02132	N	0.003101	0.145	0.436	10	5	5	10	6	4	10	10	10	4	74
84	12370	Liu and Milner, 1992	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2	mg/kg diet	N	na	ADL	M	FD	14	d	41	d	JV	F	C	BEH	FDB	FCNS	WO	2		Y	0.1658	Y	0.01270	0.153		10	10	10	10	7	4	4	3	10	4	72
85	25958	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	BEH	FDB	FCNS	WO	7	10	Y	100	Y	2.210	0.155	0.221	10	10	10	10	7	4	10	10	10	4	85
86	1448	Mahan and Magee, 1991	Sodium selenite	100	Pig (*Sus scrofa*)	1	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	BEH	FDB	FCNS	WO	5	15	Y	31.5	Y	1.070	0.170	0.510	10	10	10	10	7	4	10	10	10	4	85
87	1313	Goehring et. al. 1983	Sodium selenite	100	Pig (*Sus scrofa*)	1	6	0/4.20/7.84/11.27/16.43/20.45	ug/g diet	N	na	NR	M	FD	5	w	NR	NR	JV	B	C	BEH	FDB	FCNS	WO	4.2	7.84	Y	19.2	Y	0.790	0.173	0.323	10	10	10	10	7	4	10	10	10	4	85
88	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	2	3	0/2.09/3.01	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	BEH	FDB	WCON	WO	3.01		Y	0.248	Y	0.01495	0.181		10	5	10	10	7	4	4	8	10	4	72
89	1448	Mahan and Magee, 1991	Calcium selenite	100	Pig (*Sus scrofa*)	2	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	BEH	FDB	FCNS	WO	5	15	Y	31.5	Y	1.151	0.183	0.548	10	10	10	10	7	4	10	10	10	4	85
90	1454	Mandisodza et al., 1979	Sodium selenite	100	Pig (*Sus scrofa*)	2	3	0/2.8/5.2	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	BEH	FDB	FCNS	WO	5.2		Y	42.1	N	1.486	0.184		10	10	10	10	6	4	4	1	10	4	69
91	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2.11/2.99	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	BEH	FDB	WCON	WO	2.99		Y	0.26	Y	0.016600	0.191		10	5	10	10	7	4	4	8	10	4	72
92	1468	Moxon and Mahan, 1982	sodium selenite	100	Pig (*Sus scrofa*)	1	8	0/2.5/5.0/7.5/10/15/20/40	mg/kg diet	N	na	DLY	UX	FD	14	d	NR	NR	JV	NR	C	BEH	FDB	FCNS	WO	5	7.5	Y	17.43	Y	0.7906	0.227	0.340	10	10	10	10	7	4	10	10	10	4	85
93	25958	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	BEH	FDB	FCNS	WO	10		Y	101	Y	2.380	0.236		10	10	10	10	7	4	4	1	10	4	70
94	36834	Tsunoda et al, 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/0.24/0.58/1.34	mg/kg bw/d	N	na	DLY	U	DR	14	d	7-8	w	JV	M	C	BEH	FDB	WCON	WO	0.24	0.58	Y	0.024	N	0.003450	0.240	0.580	10	5	5	10	7	4	10	10	10	4	75
95	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/10.3/32.3/49.8	ug/org/d	N	na	ADL	U	DR	47	w	6	w	JV	F	C	BEH	FDB	WCON	WO	10.3	32.3	Y	0.0412	N	0.005611	0.250	0.784	10	5	5	10	6	4	8	10	10	4	72
96	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/10	mg/kg diet	N	na	ADL	U	FD	3	mo	NR	NR	JV	NR	C	BEH	FDB	FEFF	WO	10		Y	62.2	Y	1.580	0.254		10	10	5	10	7	4	4	10	10	4	74
97	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	BEH	FDB	WCON	WO	0.56	0.91	Y	0.0407	Y	0.00470	0.256	0.416	10	5	10	10	7	4	10	10	10	10	86
98	1312	Goehring et al., 1984	Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	1	4	0/2.58/5.60/8.4	mg/kg diet	N	na	ADL	M	FD	6	w	NR	NR	JV	B	C	BEH	FDB	FCNS	WO	8.4		Y	31.08	Y	0.980	0.265		10	10	10	10	7	4	4	1	10	4	70
99	25948	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	BEH	FDB	FCNS	WO	10	15	Y	83	Y	2.250	0.271	0.407	10	10	5	5	7	4	10	10	10	4	75
100	1442	Liu et al., 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/0.509/2.003/4.05	mg/kg diet	N	na	ADL	M	FD	2	w	45	d	JV	F	C	BEH	FDB	FCNS	WO	4.05		Y	0.164	Y	0.01330	0.328		10	10	10	10	7	4	4	1	10	4	70
101	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	BEH	FDB	FCNS	WO	5	10	Y	0.118	Y	0.00840	0.356	0.712	10	10	5	10	7	4	10	10	10	4	80
102	1408	Julius et al, 1983	Selenomethionine	100	Hamster (*Mesocricetus auratus*)	3	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	M	C	BEH	FDB	FCNS	WO	5	10	Y	0.099	Y	0.00740	0.374	0.747	10	10	5	10	7	4	10	10	10	4	80
103	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	5	10	Y	0.2925	Y	0.02270	0.388	0.776	10	10	5	10	7	4	10	10	10	4	80
104	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	BEH	FDB	WCON	WO	1.07	1.87	Y	0.039	Y	0.00470	0.447	0.781	10	5	10	10	10	4	10	10	10	10	89
105	1312	Goehring et al., 1984	Sodium selenite	100	Pig (*Sus scrofa*)	2	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	17	w	NR	NR	JV	B	C	BEH	FDB	FCNS	WO	8.33		Y	40.74	Y	2.270	0.464		10	10	10	10	7	4	4	1	10	4	70
106	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/0.1/0.31/0.61/1.21	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	0.61	1.21	Y	0.097	Y	0.00514	0.61	1.21	10	10	10	10	10	4	10	10	10	4	88
107	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	3	0/5.00/10.0	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	BEH	FDB	FCNS	WO	10		Y	0.158	Y	0.01030	0.652		10	10	5	10	7	4	4	10	10	10	4	74
108	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	4	0/10/15/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	10	15	Y	0.124	Y	0.00810	0.653	0.980	10	10	5	10	7	4	10	10	10	4	80
109	1332	Halverson et al 1966	Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	2	8	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	BEH	FDB	WCON	WO	8	9.6	Y	0.183	N	0.01701	0.744	0.892	10	10	5	4	6	4	10	10	10	4	73
110	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	5	0/0.10/0.30/0.63/1.26	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	F	C	BEH	FDB	FCNS	WO	1.26		N	0.2425	Y	0.006140	1.26		10	10	10	10	10	4	4	1	10	4	73
111	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/10/20/40/80	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	BEH	FDB	FCNS	WO	20	40	Y	0.092	Y	0.00850	1.85	3.70	10	10	5	10	7	4	10	10	10	4	80
112	36834	Tsunoda et al, 2000	Selenomethionine	100	Mouse (*Mus musculus*)	2	4	0/0.26/0.63/1.96	mg/kg bw/d	N	na	DLY	U	DR	14	d	7-8	w	JV	M	C	BEH	FDB	WCON	WO	1.96		Y	0.0245	N	0.003515	1.96		10	5	5	5	10	4	4	10	10	4	67
113	36822	Lalor and Llewellyn, 1979	Sodium selenite	45.66	Gerbil (*Meriones unguiculatus*)	2	3	0/2.5/5.0	mg/L	N	na	ADL	U	DR	1	w	NR	NR	JV	M	C	BEH	FDB	WCON	WO		2.5	Y	0.068	Y	0.003886		0.0637	10	5	5	10	7	4	4	10	10	4	69
114	36822	Lalor and Llewellyn, 1979	Sodium selenite	45.66	Gerbil (*Meriones unguiculatus*)	1	3	0/2.5/5.0	mg/L	N	na	ADL	U	DR	1	w	NR	NR	JV	M	C	BEH	FDB	WCON	WO		2.5	Y	0.052	Y	0.003714		0.0796	10	5	5	10	7	4	4	10	10	4	69

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																					Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score												
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
115	1239	Boylan et al, 1990	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/1.16	ug/g diet	N	na	ADL	M	FD	6	mo	NR	NR	JV	F	C	BEH	BEH	ACTV	WO		1.16	Y	0.023	N	0.003092		0.156	10	10	10	10	6	4	4	10	10	4	78
116	14492	Miller, 1938	Sodium selenite	100	Pig (*Sus scrofa*)	2	5	0/24.5/49/196/392	mg/kg diet	N	na	ADL	U	FD	63	d	4	mo	JV	B	C	BEH	FDB	FCNS	WO		24.5	Y	31.5	Y	0.3020		0.235	10	10	5	10	7	4	4	10	10	4	74
117	1327	Hadjimarkos, 1967	Soldium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	21	d	NR	NR	JV	M	C	BEH	FDB	WCON	WO		3	Y	0.1204	Y	0.00970		0.242	10	5	5	10	7	4	4	10	10	4	69
118	1275	Das et al., 1989	Selenium	100	Guinea pig (*Cavia porcellus*)	1	2	0/5.1	mg/kg diet	N	na	ADL	M	FD	60	d	21-25	d	JV	B	C	BEH	FDB	FCNS	WO		5.1	N	0.48	N	0.03758		0.399	10	10	10	4	5	4	4	10	10	4	71
119	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	4	0/3.09/6.08/8.87	mg/L	N	na	ADL	M	DR	7	d	21	d	JV	M	C	BEH	FDB	WCON	WO		3.09	Y	0.066	Y	0.009430		0.441	10	5	10	10	7	4	4	10	10	4	74
120	1249	Carmichael and Fowler, 1980	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/15	mg/L	N	na	ADL	U	DR	22	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO		15	Y	0.357	Y	0.01081		0.454	10	5	5	10	7	4	4	10	10	4	69
121	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	4	4	0/3.09/6.01/9.01	mg/L	N	na	ADL	M	DR	7	d	21	d	JV	M	C	BEH	FDB	WCON	WO		3.09	Y	0.065	Y	0.009570		0.455	10	5	10	10	7	4	4	10	10	4	74
122	1521	Raisbeck et al., 1996	Se in food	100	Pronghorn (*Antilocapra americana*)	1	2	0/14	mg/kg diet	N	na	ADL	M	FD	164	d	6-96	mo	JV	M	C	BEH	FDB	FCNS	WO		14	N	63	N	2.070		0.493	10	10	10	10	5	4	4	10	10	4	77
123	1532	Salbe et al., 1990	sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/4/6	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	F	C	BEH	FDB	FCNS	WO		4	Y	0.101	N	0.01258		0.498	10	5	5	10	6	4	4	10	10	4	68
124	1500	Parshad and Sud, 1989	Selenium	100	Rat (*Rattus norvegicus*)	1	2	0/12.5	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO		12.5	Y	0.1476	Y	0.00650		0.550	10	10	10	4	7	4	4	10	10	4	73
125	1323	Gronbaek et al., 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3.3	mg/L	N	na	ADL	U	DR	6	d	3-4	w	JV	M	C	BEH	FDB	FCNS	WO		3.3	Y	0.08	Y	0.01550		0.639	10	5	5	10	7	4	4	10	10	4	69
126	14488	Hadjimarkos, 1970	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	4	0/0.68/0.88/1.17	mg/kg bw/d	N	na	ADL	U	DR	4	w	NR	NR	JV	M	C	BEH	FDB	WCON	WO		0.68	Y	0.0919	N	0.01155		0.680	10	5	5	10	10	4	4	10	10	4	72
127	1244	Cabe, et al., 1979	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	13	w	50	d	JV	M	C	BEH	FDB	WCON	WO		10	Y	0.523	N	0.04023		0.769	10	5	5	10	6	4	4	10	10	4	68
128	1275	Das et al., 1989	Sodium selenite	100	Guinea pig (*Cavia porcellus*)	2	2	0/13.68	mg/kg diet	N	na	ADL	U	FD	23	d	21-25	d	JV	B	C	BEH	FDB	FCNS	WO		13.7	N	0.48	N	0.03758		1.07	10	10	5	10	5	4	4	10	10	4	72
129	1523	Rastogi et al., 1976	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/92.14	ug/org/d	N	na	ADL	U	DR	1	w	1	mo	JV	B	C	BEH	FDB	FCNS	WO		92.14	Y	0.039	N	0.007633		1.59	10	5	5	10	7	4	4	10	10	4	69
130	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.79	mg/kg bw/d	N	na	DLY	U	FD	65	d	28	d	JV	M	C	BEH	FDB	FCNS	WO		1.79	Y	0.063	Y	0.004260		1.79	10	10	5	10	10	4	4	10	10	4	77
131	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/3.54	mg/kg bw/d	N	na	DLY	U	FD	5	d	28	d	JV	B	C	BEH	FDB	FCNS	WO		3.54	Y	0.035	Y	0.00250		3.54	10	10	5	10	10	4	4	10	10	4	77
132	14508	Franke and Moxon 1937	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/50	mg/kg diet	N	na	DLY	U	FD	5	d	28	d	JV	B	C	BEH	FDB	FCNS	WO		50	Y	0.029	Y	0.002170		3.74	10	10	5	10	7	4	4	10	10	4	74
Physiology																																																
133	662	Meyer et al 1982	Selenous acid	100	Rat (*Rattus norvegicus*)	1	2	0/1.0	mg/kg diet	N	na	ADL	U	FD	30	d	NR	NR	JV	M	C	PHY	PHY	FDCV	WO	1		Y	0.24	Y	0.01540	0.0642		10	10	5	10	7	4	4	10	10	4	74
134	25957	Kim and Mahan, 2001	Sodium selenite or Se-yeast	100	Pig (*Sus scrofa*)	1	6	0/1.0/3.0/5.0/7.0/10.0	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	PHY	PHY	FDCV	WO	5	7	Y	104	Y	2.340	0.112	0.157	10	10	5	10	7	4	10	10	10	4	80
135	1228	Bioulac-Sage et al., 1992	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	2	mo	NR	NR	JV	M	C	PHY	PHY	BLPR	WO	2	4	Y	0.471	N	0.03700	0.157	0.314	10	10	5	10	6	4	10	10	10	4	79
136	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	PHY	PHY	FDCV	WO	5	10	Y	61.5	N	2.030	0.165	0.330	10	10	5	10	6	4	10	10	10	4	79
137	14495	Schoening, 1936	Selenium	100	Pig (*Sus scrofa*)	1	3	0/5/10	mg/kg diet	N	na	ADL	M	FD	1	mo	9	mo	JV	M	C	PHY	PHY	RPRT	WO	5	10	Y	49.89516	N	1.709	0.171	0.343	10	10	10	4	6	4	10	10	10	4	78
138	1454	Mandisodza et al., 1979	Sodium selenite	100	Pig (*Sus scrofa*)	2	3	0/2.8/5.2	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	PHY	PHY	FDCV	WO	5.2		Y	42.1	Y	1.530	0.189		10	10	10	10	7	4	4	1	10	4	70
139	1271	Coudray, et. al. 1996	Sodium Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	PHY	PHY	HTRT	WO	2.5		Y	0.455	N	0.03596	0.198		10	10	5	10	6	4	4	10	10	4	73
140	25958	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	PHY	PHY	FDCV	WO	10		Y	88	Y	1.980	0.225		10	10	10	10	7	4	4	1	10	4	70
141	25958	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	PHY	PHY	FDCV	WO	10		Y	101	Y	2.380	0.236		10	10	10	10	7	4	4	1	10	4	70
142	25948	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	PHY	PHY	FDCV	WO	10	15	Y	74.4	Y	1.890	0.254	0.381	10	10	5	10	7	4	10	10	10	4	80
143	1312	Goehring et al., 1984	Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	4	4	0/2.58/5.60/8.4	mg/kg diet	N	na	ADL	M	FD	6	w	NR	NR	JV	B	C	PHY	PHY	FDCV	WO	8.4		Y	31.08	Y	0.980	0.265		10	10	10	10	7	4	4	1	10	4	70
144	21131	Perry et al, 1980	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3.6	mg/L	N	na	ADL	U	DR	18	mo	NR	NR	JV	F	C	PHY	PHY	BLPR	WO	3.6		N	0.35	N	0.02105	0.396		10	5	5	10	5	4	4	10	10	4	67
145	1312	Goehring et al., 1984	Sodium selenite	100	Pig (*Sus scrofa*)	2	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	17	w	NR	NR	JV	B	C	PHY	PHY	FDCV	WO	8.33		Y	40.74	Y	2.270	0.464		10	10	10	10	7	4	4	1	10	4	70
146	1501	Pathak and Datta 1984	sodium selenite	100	Goat (*Capra hircus*)	1	4	0/3/6/10	mg/kg bw	N	na	DLY	U	OR	17	d	6	mo	AD	NR	C	PHY	PHY	RPRT	WO	3	6	Y	9	N	0.4182	3.0	6.0	10	8	10	10	10	4	10	10	6	4	82
147	1281	Demirel-Yilmaz et al., 1998	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/4.2	mg/kg diet	N	na	ADL	M	FD	18	w	NR	NR	JV	B	C	PHY	PHY	GPHY	KI		4.2	Y	0.3	N	0.02554		0.358	10	10	10	10	6	4	4	10	10	4	78
148	1603	Turan et al 1997	Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	14	w	NR	NR	JV	B	C	PHY	PHY	GPHY	IN		10	Y	1.34	N	0.08739		0.652	10	10	5	10	6	4	4	10	10	4	73
Pathology																																																
149	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	PTH	ORW	ORWT	KI	1	3	Y	62.76	N	2.037	0.0329	0.0986	10	10	5	10	6	4	10	10	10	4	79
150	662	Meyer et al 1982	Selenous acid	100	Rat (*Rattus norvegicus*)	1	2	0/1.0	mg/kg diet	N	na	ADL	U	FD	30	d	NR	NR	JV	M	C	PTH	ORW	SMIX	HE	1		Y	0.24	Y	0.01540	0.0642		10	10	5	10	7	4	4	10	10	4	74
151	1450	Mahan and Moxon, 1984	Sodium selenite	100	Pig (*Sus scrofa*)	1	7	0/2.5/5/7.5/10/20/40	mg/kg diet	N	na	ADL	U	FD	37	d	4	w	JV	B	C	PTH	HIS	GHIS	HA	2.5	5	Y	17.8	Y	0.510	0.0716	0.143	10	10	5	10	7	4	10	10	10	4	80
152	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	PTH	HIS	GLSN	KI	0.17	0.28	Y	207	Y	0.01560	0.0776	0.128	10	5	10	10	10	4	10	10	10	10	89
153	1496	Palmer et al., 1982	Selenium	100	Rat (*Rattus norvegicus*)	1	3	0/0.94/85.6	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	PTH	ORW	ORWT	LI	0.94	8.56	Y	0.232	N	0.02067	0.0838	0.763	10	10	10	10	6	4	8	10	10	4	82
154	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	PTH	HIS	GLSN	KI	0.31	0.47	Y	0.196	Y	0.01470	0.130	0.196	10	5	10	10	10	4	10	10	10	10	89
155	36818	Johnson, et al., 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	PTH	ORW	SMIX	TS	1	3	Y	0.02132	N	0.003101	0.145	0.436	10	5	5	10	6	4	10	10	10	4	74
156	1312	Goehring et al., 1984	Sodium selenite	100	Pig (*Sus scrofa*)	2	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	17	w	NR	NR	JV	B	C	PTH	ORW	SMIX	LI	2.63	5.69	Y	41.16	Y	2.310	0.148	0.319	10	10	10	10	7	4	10	10	10	4	85
157	1477	OToole and Raisbeck 1995	Selenomethionine	100	Cattle (*Bos taurus*)	1	4	0/0.15/0.28/0.8	mg/kg bw/d	N	na	DLY	U	FD	120	w	10-12	mo	JV	M	C	PTH	HIS	HYPL	FO	0.15	0.28	N	260	N	6.638	0.150	0.280	10	10	5	10	10	4	10	10	10	4	83
158	1224	Behne et al., 1992	sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	PTH	ORW	SMIX	LI	2		Y	0.382	N	0.03115	0.163		10	10	5	10	6	4	4	10	10	4	73
159	1224	Behne et al., 1992	L-Selenomethionine	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	PTH	ORW	SMIX	WO	2		Y	0.34	N	0.02830	0.166		10	10	5	10	6	4	4	10	10	4	73
160	1448	Mahan and Magee, 1991	Sodium selenite	100	Pig (*Sus scrofa*)	1	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	PTH	HIS	GLSN	FO	5	15	Y	31.5	Y	1.070	0.170	0.510	10	10	10	10	7	4	10	10	10	4	85
161	2788	Nehru et al., 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.175	mg/kg bw	N	na	EOD	U	GV	8	w	NR	NR	JV	F	C	PTH	ORW	SMIX	BR	0.175		Y	0.195	N	0.01792	0.175		10	8	5	10	10	4	4	3	10	4	68
162	1448	Mahan and Magee, 1991	Calcium selenite	100	Pig (*Sus scrofa*)	2	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	PTH	HIS	GLSN	FO	5	15	Y	31.5	Y	1.151	0.183	0.548	10	10	10	10	7	4	10	10	10	4	85
163	1271	Coudray, et. al. 1996	Sodium Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	PTH	ORW	ORWT	HE	2.5		Y	0.455	N	0.03596	0.198		10	10	5	10	6	4	4	10	10	4	73
164	1312	Goehring et al., 1984	Se in food (seleniferous wheat and corn)	100	Rat (*Rattus norvegicus*)	3	4	0/2.58/5.6/8.4	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI	2.58	5.6	Y	0.3372	N	0.02811	0.215	0.467	10	10	10	10	6	4	10	10	10	4	84
165	1635	Yaeger et al 1998	sodium selenite	100	Cattle (*Bos taurus*)	1	3	0/6/12	mg/kg diet	N	na	DLY	UX	FD	4	mo	NR	NR	GE	F	C	PTH	ITX	GITX	WO	12		Y	550	N	12.29	0.268		10	10	10	10	6	4	4	10	10	4	78
166	1477	OToole and Raisbeck 1995	Sodium selenite	100	Cattle (*Bos taurus*)	2	4	0/0.15/0.28/0.8	mg/kg bw/d	N	na	DLY	U	FD	120	d	10-12	mo	JV	M	C	PTH	HIS	GHIS	FO	0.28	0.8	N	260	N	6.638	0.280	0.80	10	10	5	10	10	4	10	10	10	4	83
167	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	2	10	0/0.75/1.25/1.75/2.25/3.75/5.0/7.5/10	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	PTH	ORW	ORWT	SP	2.25	2.75	Y	0.0187	N	0.002609	0.314	0.384	10	10	5	10	6	4	10	10	10	4	79
168	1442	Liu et al., 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/0.509/2.003/4.05	mg/kg diet	N	na	ADL	M	FD	2	w	45	d	JV	F	C	PTH	ORW	ORWT	LI	4.05		Y	0.164	Y	0.01330	0.328		10	10	10	10	7	4	4	1	10	4	70
169	1390	Ip, 1984	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	2	w	8	w	JV	F	C	PTH	ORW	SMIX	LI	2.5		N	0.0225	N	0.003037	0.337		10	10	5	10	5	4	4	10	10	4	72
170	1597	Thorlacius-Ussing et al., 1988	Sodium selenite pentahydrate	30.02	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	21	d	25	d	JV	F	C	PTH	HIS	GLSN	WO	10		Y	0.0902	N	0.01136	0.378		10	5	5	10	6	4	4	10	10	4	68

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																				Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
171	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	PTH	ORW	ORWT	LI	5	10	Y	0.2925	Y	0.02270	0.388	0.776	10	10	5	10	7	4	10	10	10	4	80
172	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	PTH	ORW	ORWT	KI	0.91	1.61	Y	0.0393	Y	0.00380	0.416	0.735	10	5	10	10	7	4	10	10	10	10	86
173	1332	Halverson et al 1966	Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	2	8	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	PTH	ORW	SMIX	SP	4.8	6.4	Y	0.239	N	0.02118	0.425	0.567	10	10	5	4	6	4	10	10	10	4	73
174	1276	Dausch and Fullerton, 1993	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	5	4	0/10/30/100	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	PTH	ORW	ORWT	LI	10	30	N	0.18	N	0.01678	0.426	1.28	10	10	5	10	5	4	10	10	10	4	78
175	1276	Dausch and Fullerton, 1993	Selenocystine	47.27	Rat (*Rattus norvegicus*)	2	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI	10	20	N	0.18	N	0.01678	0.441	0.881	10	10	5	10	5	4	10	10	10	4	78
176	1256	Chen et al., 1985	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/2/4/8	mg/L	N	na	ADL	U	DR	32	d	NR	NR	JV	M	C	PTH	ITX	GITX	WO	4	8	Y	0.147	N	0.01763	0.480	0.959	10	5	5	10	6	4	10	10	10	4	74
177	1521	Raisbeck et al., 1996	Se in food	100	Pronghorn (*Antilocapra americana*)	1	2	0/14	mg/kg diet	N	na	ADL	M	FD	164	d	6-96	mo	JV	M	C	PTH	ITX	GITX	WO	14		N	63	N	2.070	0.493		10	10	10	10	5	4	4	10	10	4	77
178	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/0.1/0.31/0.61/1.21	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	M	C	PTH	HIS	USTR	LI	0.610	1.21	N	0.097	Y	0.00514	0.610	1.21	10	10	10	10	10	4	10	10	10	4	88
179	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	5	0/0.10/0.30/0.63/1.26	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	F	C	PTH	HIS	USTR	LI	0.630	1.26	N	0.2425	Y	0.006	0.630	1.26	10	10	10	10	10	4	10	10	10	4	88
180	1312	Goehring et al., 1984	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI	8.33		Y	0.1994	N	0.01825	0.763		10	10	10	10	6	4	4	1	10	4	69
181	1364	Hermann, et.al. 1991	L-selenomethionine	100	Rat (*Rattus norvegicus*)	3	3	0/10/16	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	F	C	PTH	HIS	GHIS	LI	10	16	N	0.124	N	0.01235	0.996	1.59	10	10	5	10	5	4	10	10	10	4	78
182	1392	Ishikawa et al, 1992	Sodium selenite	100	Mouse (*Mus musculus*)	1	5	0/1/2/4/8	mg/L	N	na	NR	U	DR	12	w	5	w	JV	M	C	PTH	ORW	ORWT	LI	8		Y	0.03979	N	0.005438	1.09		10	5	5	10	6	4	4	10	10	4	68
183	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	6	0/2.5/5.0/10.0/20.0/40.0	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	JV	F	C	PTH	ITX	ATAX	WO	2.5	5	N	0.0265	N	0.003742	1.14	2.28	10	8	10	10	10	4	10	10	10	4	86
184	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/10.3/32.3/49.8	ug/org/d	N	na	ADL	U	DR	50	w	6	w	JV	F	C	PTH	HIS	GLSN	LI	49.8		Y	0.0412	N	0.005611	1.21		10	5	5	10	6	4	4	10	10	4	68
185	1364	Hermann, et.al. 1991	D-selenomethionine	100	Rat (*Rattus norvegicus*)	2	3	0/10/16	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	F	C	PTH	HIS	GHIS	LI	16		N	0.124	N	0.01235	1.59		10	10	5	10	5	4	4	10	10	4	72
186	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/3.5	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	GE	F	C	PTH	ITX	GITX	WO	3.5		Y	0.0456	N	0.005428	1.60		10	8	10	10	10	4	4	10	10	4	80
187	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/10/20/40/80	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	PTH	ORW	ORWT	KI	40	80	Y	0.078	N	0.008438	4.33	8.65	10	10	5	10	5	4	10	10	10	4	78
188	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	1	7	0/1/4/8/16/32/64	mg/L	N	na	ADL	U	DR	46	d	6	d	JV	F	C	PTH	HIS	NCRO	LI	32	64	N	0.02695	N	0.003829	4.55	9.09	10	5	5	10	5	4	10	10	10	4	73
189	1538	Sayato et al 1993	seleno-DL-cystine	100	Mouse (*Mus musculus*)	1	5	0/10/20/30/40	mg/kg bw/d	N	na	6 per w	U	GV	30	d	5	w	JV	M	V	PTH	HIS	GLSN	LI	20	30	Y	0.025	N	0.00331	20.0	30.0	10	8	5	10	10	4	10	10	10	4	81
190	1312	Goehring et al., 1984	Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	1	4	0/2.58/5.60/8.4	mg/kg diet	N	na	ADL	M	FD	6	w	NR	NR	JV	B	C	PTH	ORW	SMIX	LI		2.58	Y	33.18	Y	1.050		0.0816	10	10	10	10	7	4	4	10	10	4	79
191	1228	Bioulac-Sage et al., 1992	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	2	mo	NR	NR	JV	M	C	PTH	ORW	SMIX	LI		2	Y	0.471	N	0.03700	0.157	10	10	10	5	10	6	4	4	10	10	4	73
192	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	NR	C	PTH	ITX	GITX	WO		7	Y	74.39	Y	1.730		0.163	10	10	10	5	10	7	4	4	10	10	4	74
193	1219	Baker et al., 1989	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/12.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	d	JV	B	C	PTH	ITX	GITX	WO		12.5	N	61	N	2.016		0.205	10	10	10	10	5	4	4	10	10	4	77
194	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	PTH	ORW	ORWT	KI		0.55	Y	0.0386	Y	0.00490		0.230	10	5	10	10	10	4	4	10	10	10	83
195	14492	Miller, 1938	Sodium selenite	100	Pig (*Sus scrofa*)	2	5	0/24.5/49/196/392	mg/kg diet	N	na	ADL	U	FD	63	d	4	mo	JV	B	C	PTH	HIS	GHIS	MT		24.5	Y	31.5	Y	0.3020		0.235	10	10	5	10	7	4	4	10	10	4	74
196	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/10	mg/kg diet	N	na	ADL	U	FD	3	mo	NR	NR	JV	NR	C	PTH	ITX	GITX	WO		10	Y	62.2	Y	1.580		0.254	10	10	5	10	7	4	4	10	10	4	74
197	1540	Schroeder, 1967	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2	mg/L	N	na	ADL	U	DR	339	d	21	d	JV	B	C	PTH	HIS	GHIS	LI		2	Y	0.0587	N	0.00772		0.263	10	5	5	10	6	4	4	10	10	4	68
198	1540	Schroeder, 1967	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/L	N	na	ADL	U	DR	16	d	21	d	JV	B	C	PTH	HIS	GHIS	LI		2	Y	0.037	N	0.00509		0.275	10	5	5	10	6	4	4	10	10	4	68
199	1602	Turan et al., 1997	Sodium selenite	45.66	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	PTH	HIS	GHIS	BO		10	Y	2.006	N	0.1218		0.277	10	10	5	10	6	4	4	10	10	4	73
200	14497	Wahlstrom and Olson, 1959	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	239	d	8	w	GE	F	C	PTH	HIS	GHIS	FO		10	Y	113.3981	N	3.356		0.296	10	10	5	10	6	4	4	10	10	4	73
201	1219	Baker et al., 1989	Se in food (*Astragalus bisculatus*)	100	Pig (*Sus scrofa*)	1	2	0/18.7	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	PTH	ITX	GITX	WO		18.7	N	61	N	2.016		0.307	10	10	10	10	5	4	4	10	10	4	77
202	1612	Wahlstrom et al., 1984	sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/8.1	mg/kg diet	N	na	ADL	M	FD	6	w	5-6	w	JV	M	C	PTH	ITX	GITX	WO		8.1	Y	15.28	N	0.6461		0.343	10	10	10	10	6	4	4	10	10	4	78
203	1219	Baker et al., 1989	Se in food (*Astragalus praelongus*)	100	Pig (*Sus scrofa*)	2	2	0/21.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	PTH	ITX	GITX	WO		21.5	N	61	N	2.016		0.352	10	10	10	10	5	4	4	10	10	4	77
204	1323	Gronbaek et al., 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3.3	mg/L	N	na	ADL	U	DR	35	d	3-4	w	JV	M	C	PTH	ORW	ORWT	KI		3.3	Y	0.22	Y	0.0240		0.360	10	5	5	10	7	4	4	10	10	4	69
205	1276	Dausch and Fullerton, 1993	Selenomethionine	40.26	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI		10	N	0.18	N	0.01678		0.375	10	10	5	10	5	4	4	10	10	4	72
206	1276	Dausch and Fullerton, 1993	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	8	3	0/10/30	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	PTH	ORW	ORWT	LI		10	N	0.18	N	0.01678		0.390	10	10	5	10	5	4	4	10	10	4	72
207	1396	Jaffe and Mondragon, 1975	Selenium	100	Rat (*Rattus norvegicus*)	1	3	0/4.5/10	mg/kg diet	N	na	ADL	U	FD	5	w	21	d	JV	B	C	PTH	ORW	SMIX	SP		4.5	N	0.267	N	0.02320		0.391	10	10	5	10	5	4	4	10	10	4	72
208	1532	Salbe et al., 1990	sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/4/6	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	B	C	PTH	ORW	ORWT	DT		4	Y	0.101	N	0.01258		0.498	10	5	5	10	6	4	4	10	10	4	68
209	1276	Dausch and Fullerton, 1993	Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	3	5	0/10/30/100/300	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI		10	N	0.18	N	0.01678		0.514	10	10	5	5	5	4	4	10	10	4	67
210	1276	Dausch and Fullerton, 1993	Sodium selenide	63.2	Rat (*Rattus norvegicus*)	4	4	0/10/30/60	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	PTH	ORW	SMIX	LI		10	N	0.18	N	0.01678		0.589	10	10	5	10	5	4	4	10	10	4	72
211	1629	Wilson et al 1988	Sodium selenite	45.66	Pig (*Sus scrofa*)	1	4	0/1.4/2.6/4.2	mg/kg bw/d	N	na	DLY	U	OR	20	d	6	w	JV	M	C	PTH	HIS	GHIS	WO		1.4	Y	9.9	N	0.4522		0.639	10	8	10	10	10	4	4	10	10	4	80
212	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	4	0/10/15/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	PTH	ORW	SMIX	KI		10	Y	0.124	Y	0.00810		0.653	10	10	5	10	7	4	4	10	10	4	74
213	15262	Palmer et al 1983	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/7.8	ug/g diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	PTH	ORW	ORWT	KI		7.8	Y	0.21596	N	0.01949		0.704	10	10	10	4	6	4	4	10	10	4	72
214	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/8.0	ug/g diet	N	na	ADL	U	FD	4	w	NR	NR	JV	M	C	PTH	ORW	ORWT	KI		8	Y	0.16976	N	0.01599		0.754	10	10	5	10	6	4	4	10	10	4	73
215	1496	Palmer et al., 1982	Selenomethionine	100	Rat (*Rattus norvegicus*)	4	2	0/8.27	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	PTH	ORW	ORWT	LI		8.27	Y	0.153	N	0.01468		0.794	10	10	10	10	6	4	4	10	10	4	78
216	1499	Panter et al., 1996	Seleno-dl-methionine	100	Pig (*Sus scrofa*)	3	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	PTH	HIS	USTR	BR		25	N	31.5	N	1.171		0.794	10	10	5	10	5	4	4	10	10	4	72
217	1499	Panter et al., 1996	Sodium (plant form)	100	Pig (*Sus scrofa*)	2	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	PTH	HIS	USTR	BR		25	N	31.5	N	1.171		0.794	10	10	5	4	5	4	4	10	10	4	66
218	1499	Panter et al., 1996	Sodium selenate	100	Pig (*Sus scrofa*)	1	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	PTH	HIS	USTR	BR		25	N	31.5	N	1.171		0.794	10	10	5	10	5	4	4	10	10	4	72
219	1496	Palmer et al., 1982	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	2	0/8.22	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	PTH	ORW	ORWT	LI		8.22	Y	0.133	N	0.01308		0.809	10	10	10	10	6	4	4	10	10	4	78
220	1496	Palmer et al., 1982	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/8.28	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	PTH	ORW	ORWT	LI		8.28	Y	0.131	N	0.01292		0.817	10	10	10	10	6	4	4	10	10	4	78
221	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	2	0/10	ug/g diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	PTH	ORW	ORWT	KI		10	Y	0.3624	N	0.02983		0.823	10	10	5	10	6	4	4	10	10	4	73
222	12934	Obermeyer et al, 1971	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/9	mg/kg diet	N	na	ADL	U	FD	4	w	NR	NR	JV	NR	C	PTH	ORW	SMIX	LI		9	Y	0.1188	N	0.01192		0.903	10	10	5	10	6	4	4	10	10	4	73
223	1523	Rastogi et al., 1976	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/128.6	ug/org/d	N	na	ADL	U	DR	8	w	1	mo	JV	B	C	PTH	ORW	SMIX	BR		128.6	Y	0.135	N	0.01633		0.953	10	5	5	10	7	4	4	10	10	4	69
224	14489	Halverson et al., 1962	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	PTH	ORW	SMIX	LI		10	Y	0.133	N	0.01308		0.984	10	10	5	10	6	4	4	10	10	4	73
225	14489	Halverson et al., 1962	Potassium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	PTH	ORW	SMIX	LI		10	Y	0.1402	N	0.01366		1.02	10	10	5	10	6	4	4	10	10	4	73
226	1630	Wilson et al 1983	Sodium selenite	100	Pig (*Sus scrofa*)	1	3	0/25/52	mg/kg diet	N	na	ADL	U	FD	15	d	NR	mo	JV	B	C	PTH	HIS	GHIS	HE		25	Y	14.8	N	0.6294		1.06	10	10	5	10	6	4	4	10	10	4	73
227	21137	Cutler, 1974	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	2	0/24	mg/L	N	na	NR	U	DR	5	mo	NR	NR	JV	M	C	PTH	ORW	SMIX	LI		24	Y	0.321	N	0.03560		1.11	10	5	5	10	6	4	4	10	10	4	68
228	1364	Hermann, et.al. 1991	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/16	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	F	C	PTH	HIS	GHIS	LI		16	N	0.124	N	0.01235		1.59	10	10	5	10	5	4	4	10	10	4	72

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																						Effects						Conversion to mg/kg bw/day					Result		Data Evaluation Score												
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
229	14489	Halverson et al., 1962	Selenium	100	Rat (*Rattus norvegicus*)	3	2	0/20	mg/kg diet	N	na	ADL	M	FD	18	d	NR	NR	NR	M	C	PTH	ORW	SMIX	LI		20	Y	0.1456	N	0.01410		1.94	10	10	5	4	6	4	4	10	10	4	67
230	113	Seidenberg et al 1986	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/12	mg/kg bw/d	N	na	DLY	U	GV	4	d	NR	NR	GE	F	C	PTH	GRS	BDWT	WO		12	Y	0.0401	N	0.00488		5.01	10	8	10	10	10	4	4	10	10	4	80
Reproduction																																															
231	1473	Nobunaga et al., 1979	Sodium selenite pentahydrate	100	Mouse (*Mus musculus*)	1	3	0/3/6	mg/L	N	na	ADL	U	DR	56	d	60	d	GE	F	C	REP	REP	PRWT	WO	3	6	Y	0.170	Y	0.00410	0.072	0.145	10	5	5	10	7	10	10	10	10	4	81
232	1304	Fredriksson et al., 1993	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.3	mg/kg diet	N	na	ADL	M	FD	14	w	NR	NR	GE	F	C	REP	REP	ODVP	WO	1.3		N	0.35	N	0.02899	0.108		10	10	10	10	5	10	4	1	10	4	74
233	25959	Gunter et al, 2003	Sodium selenite	100	Cattle (*Bos taurus*)	1	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	REP	REP	PRWT	WO	26		Y	498	N	3.318	0.173		10	10	5	10	6	10	4	1	10	4	70
234	1471	Nebbia et al., 1987	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	4	0/4/8/16	mg/L	N	na	ADL	U	DR	240	d	NR	NR	JV	M	C	REP	REP	TEWT	TE	8	16	Y	0.550	N	0.05780	0.384	0.768	10	5	5	10	6	10	10	10	10	4	80
235	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	REP	REP	SPCL	GO	5	10	Y	0.2925	Y	0.02270	0.388	0.776	10	10	5	10	7	10	10	10	10	4	86
236	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	1	ADL	UX	DR	13	w	6	w	JV	F	C	REP	REP	GREP	WO	0.86	1.67	Y	0.188	Y	0.00920	0.393	0.763	10	5	10	10	10	10	10	10	10	10	95
237	1329	Halverson, 1974	sodium selenite	100	Rat (*Rattus norvegicus*)	1	5	0/0.1/1/2.5/5	mg/kg diet	N	na	ADL	U	FD	42	d	90	d	GE	F	C	REP	REP	PROG	WO	5		Y	0.204	N	0.01860	0.456		10	10	5	10	5	10	4	3	10	4	71
238	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	REP	REP	GREP	WO	1.61	3.31	Y	0.0338	Y	0.00470	0.735	1.51	10	5	10	10	7	10	10	10	10	10	92
239	1498	Panter et al., 1995	Sodium selenate	100	Sheep (*Ovis aries*)	1	2	0/24	mg/kg diet	N	na	ADL	M	FD	88	d	NR	mo	GE	F	C	REP	REP	PRWT	WO	24		Y	67	N	2.178	0.780		10	10	10	10	6	10	4	3	10	4	77
240	1498	Panter et al., 1995	Selenium	100	Sheep (*Ovis aries*)	2	2	0/29	mg/kg diet	N	na	ADL	M	FD	88	d	NR	NR	GE	F	C	REP	REP	PRWT	WO	29		Y	66	N	2.151	0.945		10	10	10	4	6	10	4	1	10	4	69
241	1344	Hau et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	4	0/7.6/66/330	ug/org/d	N	na	ADL	U	DR	29	d	8	w	GE	F	C	REP	REP	PRWT	WO	66	330	Y	0.025	N	0.003579	1.21	6.03	10	5	5	10	6	10	8	10	10	4	78
242	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/3.5	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	GE	F	C	REP	REP	PRWT	WO	3.5		Y	0.0456	N	0.005428	1.60		10	8	10	10	10	4	10	10	4	86
243	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	B	C	REP	REP	SPCL	TE	5.45		Y	0.0302	Y	0.0025	2.28		10	5	10	10	10	4	6	10	10	85
244	823	Webster, 1979	Sodium selenite	100	Mouse (*Mus musculus*)	1	5	0/0.05/2/20/200	mg/kg diet	N	na	ADL	U	FD	19	d	4	mo	GE	F	C	REP	REP	PRWT	WO	20	200	Y	0.032	N	0.004057	2.54	25.4	10	10	5	5	6	10	8	10	10	4	78
245	1335	Hardin et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	5	0/3.5/5/7/14	mg/kg bw/d	N	na	DLY	U	GV	8	d	6-8	w	GE	F	C	REP	REP	PRWT	WO	7	14	N	0.0225	N	0.003037	3.20	6.39	10	8	5	10	10	10	10	10	10	4	87
246	1509	Plasterer et al., 1985	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/7	mg/kg bw/d	N	na	DLY	U	GV	8	d	61-71	d	GE	F	C	REP	REP	PRWT	WO	7		Y	0.02022	N	0.002782	3.20		10	8	10	10	10	4	10	10	4	86
247	1234	Booth et al. 1983	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/7	mg/kg bw/d	N	na	DLY	U	GV	8	d	NR	NR	GE	F	C	REP	REP	PROG	WO	7		Y	0.027	N	0.003528	7.0		10	8	10	10	10	4	8	10	10	90
248	1411	Kaur and Parshad, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	REP	REP	SPCV	TE		2	Y	0.14	N	0.01365		0.0890	10	10	5	10	6	10	4	10	10	4	79
249	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	REP	REP	GREP	WO		0.31	Y	0.196	Y	0.01470		0.130	10	5	10	10	10	10	4	10	10	10	89
250	14497	Wahlstrom and Olson, 1959	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	239	d	8	w	GE	F	C	REP	REP	PRWT	WO		10	Y	113.3981	N	3.356		0.296	10	10	5	10	6	10	4	10	10	4	79
251	66	Schroeder and Mitchener, 1971	Sodium selenate	100	Mouse (*Mus musculus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	6	mo	21	d	JV	F	C	REP	REP	DEYO	WO		3	N	0.0225	N	0.003255		0.434	10	5	5	10	5	10	4	10	10	4	73
252	1595	Thorlacius-Ussing, 1990	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	3	0/10/15	mg/L	N	na	ADL	U	DR	21	d	NR	NR	LC	F	C	REP	REP	PRWT	WO		10	N	0.338	N	0.03730		0.504	10	5	5	10	5	10	4	10	10	4	73
253	1500	Parshad and Sud, 1989	Selenium	100	Rat (*Rattus norvegicus*)	1	2	0/12.5	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	REP	REP	TEWT	TE		12.5	Y	0.1476	Y	0.00650		0.550	10	10	10	4	7	10	4	10	10	4	79
254	1596	Thorlacius-Ussing et al., 1987	sodium selenite	45	Rat (*Rattus norvegicus*)	1	2	0/15	mg/L	N	na	ADL	U	DR	21	d	NR	mo	LC	F	C	REP	REP	PRWT	WO		15	N	0.32	N	0.03550		0.749	10	5	5	10	5	10	4	10	10	4	73
255	1259	Chermoff and Kavlock, 1982	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/10	mg/kg bw/d	N	na	DLY	U	GV	5	d	60	d	GE	F	C	REP	REP	PROG	WO		10	N	0.0225	N	0.003037		4.18	10	8	10	10	10	10	4	10	10	4	86
256	1316	Gray and Kavlock, 1984	sodium selenite	45.66	Mouse (*Mus musculus*)	1	2	0/10	mg/kg bw/d	N	na	DLY	U	OR	5	d	90	d	GE	F	C	REP	REP	PROG	WO		10	N	0.00215	N	0.0004408		4.57	10	8	5	10	10	10	4	10	10	4	81
257	113	Seidenberg et al 1986	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/12	mg/kg bw/d	N	na	DLY	U	GV	4	d	NR	NR	GE	F	C	REP	REP	PROG	WO		12	Y	0.0401	N	0.00488		5.01	10	8	10	10	10	4	4	10	10	4	86
Growth																																															
258	1557	Shull and Checke, 1973	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	3	0/1/5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	1	5	Y	0.330	Y	0.0175	0.053	0.265	10	10	5	10	7	8	8	10	10	4	82
259	662	Meyer et al 1982	Selenous acid	100	Rat (*Rattus norvegicus*)	1	2	0/1.0	mg/kg diet	N	na	ADL	U	FD	30	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	1		Y	0.24	Y	0.01540	0.0642		10	10	5	10	7	8	4	10	10	4	78
260	1496	Palmer et al., 1982	Selenium	100	Rat (*Rattus norvegicus*)	1	3	0/0.94/85.6	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO	0.94	8.56	Y	0.232	N	0.02067	0.0838	0.763	10	10	10	10	6	8	8	10	10	4	86
261	1255	Chen et al., 1990	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	2	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	1		Y	0.2671	N	0.02321	0.0869		10	10	5	10	6	8	4	10	10	4	77
262	11361	Glattre et al, 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.09	mg/kg bw/d	N	na	NR	U	DR	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	0.09		Y	0.29	N	0.03249	0.090		10	5	5	10	10	8	4	1	10	4	67
263	1280	Debski et al., 1992	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	2	0/110.1	mg/kg bw/d	N	na	ADL	U	FD	2	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	110.1		Y	0.2686	N	0.02332	0.110		10	10	5	10	10	8	4	10	10	4	81
264	25957	Kim and Mahan, 2001	Sodium selenite or Se-yeast	100	Pig (*Sus scrofa*)	1	6	0/1.0/3.0/5.0/7.0/10.0	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	5	7	Y	104	Y	2.340	0.112	0.157	10	10	5	10	7	8	10	10	10	4	84
265	25948	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	GRO	GRO	BDWT	WO	5	10	Y	84.5	Y	2.310	0.137	0.273	10	10	5	10	7	8	10	10	10	4	84
266	1450	Mahan and Moxon, 1984	Sodium selenite	100	Pig (*Sus scrofa*)	1	7	0/2.5/5/7.5/10/20/40	mg/kg diet	N	na	ADL	U	FD	37	d	4	w	JV	B	C	GRO	GRO	BDWT	WO	5	7.5	Y	17.8	Y	0.510	0.143	0.215	10	10	5	10	7	8	10	10	10	4	84
267	1313	Goehring et. al. 1983	Sodium selenite	100	Pig (*Sus scrofa*)	1	6	0/4.20/7.84/11.27/16.43/20.45	ug/g diet	N	na	NR	M	FD	5	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	4.2	7.84	Y	22.7	Y	0.790	0.146	0.273	10	10	10	10	7	8	10	10	10	4	89
268	1442	Liu et al., 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/0.509/2.003/4.05	mg/kg diet	N	na	ADL	M	FD	2	w	45	d	JV	F	C	GRO	GRO	BDWT	WO	2.003	4.05	Y	0.177	Y	0.01330	0.151	0.304	10	10	10	10	7	8	10	10	10	4	89
269	12370	Liu and Milner, 1992	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2	mg/kg diet	N	na	ADL	M	FD	2	w	41	d	JV	F	C	GRO	GRO	BDWT	WO	2		Y	0.1658	Y	0.01270	0.153		10	10	10	10	7	8	4	3	10	4	76
270	25958	Kim and Mahan, 2001	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	7	10	Y	100	Y	2.210	0.155	0.221	10	10	10	10	7	8	10	10	10	4	89
271	1224	Behne et al., 1992	sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	GRO	GRO	BDWT	WO	2		Y	0.382	N	0.03115	0.163		10	10	5	10	6	8	4	10	10	4	77
272	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	GRO	GRO	BDWT	WO	5	10	Y	61.5	N	2.030	0.165	0.330	10	10	5	10	6	8	10	10	10	4	83
273	1448	Mahan and Magee, 1991	Sodium selenite	100	Pig (*Sus scrofa*)	1	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	GRO	GRO	BDWT	WO	5	15	Y	31.5	Y	1.070	0.170	0.510	10	10	10	10	7	8	10	10	10	4	89
274	25959	Gunter et al, 2003	Sodium selenite	100	Cattle (*Bos taurus*)	1	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	GRO	GRO	BDWT	WO	26		Y	498	N	3.318	0.173		10	10	5	10	6	8	4	1	10	4	68
275	2788	Nehru et al., 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/0.175	mg/kg bw	N	na	EOD	U	GV	8	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	0.175		Y	0.195	N	0.01792	0.175		10	8	5	10	10	8	4	10	10	4	79
276	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	2	3	0/2.09/3.01	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	GRO	GRO	BDWT	WO	3.01		Y	0.248	Y	0.01495	0.181		10	5	10	10	7	8	4	8	10	4	76
277	1448	Mahan and Magee, 1991	Calcium selenite	100	Pig (*Sus scrofa*)	2	3	0/5.0/15.0	mg/kg diet	N	na	ADL	UX	FD	35	d	23	d	JV	B	C	GRO	GRO	BDWT	WO	5	15	Y	31.5	Y	1.151	0.183	0.548	10	10	10	10	7	8	10	10	10	4	89
278	1454	Mandisodza et al., 1979	Sodium selenite	100	Pig (*Sus scrofa*)	2	3	0/2.8/5.2	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	GRO	GRO	BDWT	WO	5.2		Y	42.1	Y	1.530	0.189		10	10	10	10	7	8	4	1	10	4	74
279	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2.11/2.99	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	GRO	GRO	BDWT	WO	2.99		Y	0.26	Y	0.01660	0.191		10	5	10	10	7	8	4	10	10	4	78
280	1271	Coudray, et. al. 1996	Sodium Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	2.5		Y	0.455	N	0.03596	0.198		10	10	5	10	6	8	4	10	10	4	77
281	1454	Mandisodza et al., 1979	Selenium	100	Pig (*Sus scrofa*)	1	3	0/3.4/6	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	GRO	GRO	BDWT	WO	6		Y	40.7	Y	1.370	0.202		10	10	10	4	7	8	4	1	10	4	68
282	1533	Salbe and Levander, 1990	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/0.5/2.5	ug/g diet	N	na	ADL	UX	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	2.5		Y	0.289	N	0.02746	0.214		10	10	10	10	6	8	4	10	10	4	82
283	1457	McAdam and Levander, 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	GRO	GRO	BDWT	WO	2.5	5	N	0.267	N	0.02320	0.217	0.435	10	10	5	10	5	8	10	10	10	4	82
284	1312	Goehring et al., 1984	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	2.63	5.69	Y	0.354	N	0.02926	0.217	0.470	10	10	10	10	6	8	10	10	10	4	88

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																				Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score													
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
285	1533	Salbe and Levander, 1990	Selenomethionine	100	Rat (*Rattus norvegicus*)	2	3	0/0.5/2.5	ug/g diet	N	na	ADL	UX	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	2.5		Y	0.270	N	0.02342	0.217		10	10	10	10	6	8	4	10	10	4	82
286	1468	Moxon and Mahan, 1982	sodium selenite	100	Pig (*Sus scrofa*)	1	8	0/2.5/5.0/7.5/10/15/20/40	mg/kg diet	N	na	DLY	UX	FD	37	d	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO	5	7.5	Y	17.43	Y	0.7906	0.227	0.340	10	10	10	10	7	8	10	10	10	4	89
287	25958	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/3/7/10	mg/kg diet	N	na	ADL	UX	FD	14	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	10		Y	101	Y	2.380	0.236		10	10	10	10	7	8	4	1	10	4	74
288	36834	Tsunoda et al, 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/0.24/0.58/1.34	mg/kg bw/d	N	na	DLY	U	DR	14	d	7-8	w	JV	M	C	GRO	GRO	BDWT	WO	0.24	0.58	Y	0.024	N	0.003450	0.240	0.580	10	5	5	10	7	8	10	10	10	4	79
289	1429	Lane et al., 1984	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	26	w	4	w	JV	F	C	GRO	GRO	BDWT	WO	2		Y	0.0316	N	0.004015	0.254		10	10	5	10	6	8	4	10	10	4	77
290	1433	LeBoeuf et al., 1985	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/3/6	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	3	6	N	0.267	N	0.02320	0.261	0.521	10	10	5	10	5	8	10	10	10	4	82
291	1312	Goehring et al., 1984	Se in food (seleniferous wheat and oats)	100	Pig (*Sus scrofa*)	1	4	0/2.58/5.60/8.4	mg/kg diet	N	na	ADL	M	FD	6	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	8.4		Y	31.08	Y	0.980	0.265		10	10	10	10	7	8	4	1	10	4	74
292	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	4	0/3.09/6.08/8.87	mg/L	N	na	ADL	M	DR	7	d	21	d	JV	M	C	GRO	GRO	BDWT	WO	3.09	6.08	Y	0.066	Y	0.009430	0.274	0.540	10	5	10	10	7	8	10	10	10	4	84
293	1602	Turan et al., 1997	Sodium selenite	45.66	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	10		Y	2.006	N	0.1218	0.277		10	10	5	10	6	8	4	6	10	4	73
294	14497	Wahlstrom and Olson, 1959	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	239	d	8	w	GE	F	C	GRO	GRO	BDWT	WO	10		Y	113.3981	N	3.356	0.296		10	10	5	10	6	8	4	1	10	4	68
295	1228	Bioulac-Sage et al., 1992	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	2	mo	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	4		Y	0.44	N	0.03498	0.318		10	10	5	10	6	8	4	3	10	4	70
296	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	GRO	GRO	BDWT	WO	5	10	Y	0.118	Y	0.00840	0.356	0.712	10	10	5	10	7	8	10	10	10	4	84
297	25948	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	GRO	GRO	BDWT	WO	15	20	Y	83	Y	2.030	0.367	0.489	10	10	5	5	7	8	10	10	10	4	79
298	1640	Yeh et al, 1997	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	4		Y	0.197	N	0.01807	0.367		10	10	5	10	6	8	4	10	10	4	77
299	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	GRO	GRO	BDWT	WO	0.88	1.35	Y	0.178	Y	0.00980	0.368	0.564	10	5	10	10	10	8	10	10	10	10	93
300	1422	Kiremidjian-Schumacher et al., 1992	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2	mg/kg diet	N	na	ADL	U	FD	8	w	6	w	JV	M	C	GRO	GRO	BDWT	WO	2		Y	0.02695	Y	0.0050	0.371		10	10	5	10	7	8	4	1	10	4	69
301	1408	Julius et al, 1983	Selenomethionine	100	Hamster (*Mesocricetus auratus*)	3	3	0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	M	C	GRO	GRO	BDWT	WO	5	10	Y	0.099	Y	0.00740	0.374	0.747	10	10	5	10	7	8	10	10	10	4	84
302	1276	Dausch and Fullerton, 1993	Selenomethionine	40.26	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	10		N	0.18	N	0.01678	0.375		10	10	5	10	5	8	4	10	10	4	76
303	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	2	10	0/0.75/1.25/1.75/2.25/3.75/5.0/7.5/10	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	2.75	3.75	Y	0.0187	N	0.002609	0.384	0.523	10	10	5	10	6	8	10	10	10	4	83
304	1471	Nebbia et al., 1987	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	4	0/4/8/16	mg/L	N	na	ADL	U	DR	240	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	8	16	Y	0.550	N	0.05780	0.384	0.768	10	5	5	10	6	8	10	10	10	4	78
305	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	5	10	Y	0.2925	Y	0.02270	0.388	0.776	10	10	5	10	7	8	10	10	10	4	84
306	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	1	ADL	UX	DR	13	w	6	w	JV	F	C	GRO	GRO	BDWT	WO	0.86	1.67	Y	0.188	Y	0.00920	0.393	0.763	10	5	10	10	10	8	10	10	10	10	93
307	3725	Schroeder and Mitchener, 1972	sodium selenate	100	Mouse (*Mus musculus*)	2	2	0/3	mg/L	N	na	DLY	U	DR	360	d	NR	lf	JV	M	C	GRO	GRO	BDWT	WO	3		Y	0.0426	N	0.005782	0.407		10	5	5	10	6	8	4	6	10	4	68
308	1332	Halverson et al 1966	Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	2	8	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	4.8	6.4	Y	0.239	N	0.02118	0.425	0.567	10	10	5	4	6	8	10	10	10	4	77
309	1276	Dausch and Fullerton, 1993	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	7	2	0/10	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	10		N	0.18	N	0.01678	0.426		10	10	5	10	5	8	4	8	10	4	74
310	1332	Halverson et al 1966	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	7	0/1.6/3.2/4.8/6.4/8.0/9.6	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	4.8	6.4	Y	0.218	N	0.01964	0.432	0.577	10	10	5	10	6	8	10	10	10	4	83
311	1457	McAdam and Levander, 1987	L-selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	GRO	GRO	BDWT	WO	5	10	N	0.267	N	0.02320	0.435	0.869	10	10	5	10	5	8	10	10	10	4	82
312	1457	McAdam and Levander, 1987	Sodium selenate	100	Rat (*Rattus norvegicus*)	4	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	GRO	GRO	BDWT	WO	5	10	N	0.267	N	0.02320	0.435	0.869	10	10	5	10	5	8	10	10	10	4	82
313	1457	McAdam and Levander, 1987	D-selenomethionine	100	Rat (*Rattus norvegicus*)	1	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	GRO	GRO	BDWT	WO	5	10	N	0.267	N	0.02320	0.435	0.869	10	10	5	10	5	8	10	10	10	4	82
314	36818	Johnson, et al., 2000	Sodium selenite	100	Mouse (*Mus musculus*)	1	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	GRO	GRO	BDWT	WO	3	9	Y	0.02052	N	0.002996	0.438	1.31	10	5	5	10	6	8	10	10	10	4	78
315	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	6	0/1/4/8/16/64	mg/L	N	na	ADL	U	DR	35	d	5, 12	w	JV	B	C	GRO	GRO	BDWT	WO	4	8	N	0.267	N	0.03016	0.452	0.904	10	5	5	10	5	8	10	10	10	4	77
316	1312	Goehring et al., 1984	Sodium selenite	100	Pig (*Sus scrofa*)	2	4	0/2.63/5.69/8.33	mg/kg diet	N	na	ADL	M	FD	17	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	8.33		Y	40.74	Y	2.270	0.464		10	10	10	10	7	8	4	1	10	4	74
317	1618	Whanger and Butler, 1988	Selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	4		Y	0.204	Y	0.02500	0.490		10	10	5	10	7	8	4	10	10	4	78
318	1618	Whanger and Butler, 1988	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	4		Y	0.2	Y	0.02500	0.500		10	10	5	10	7	8	4	10	10	4	78
319	1276	Dausch and Fullerton, 1993	Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	3	5	0/10/30/100/300	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	10	30	N	0.18	N	0.01678	0.515	1.54	10	10	5	5	5	8	10	10	10	4	77
320	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/0.1/0.31/0.61/1.21	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	0.610	1.21	Y	0.097	Y	0.00514	0.610	1.21	10	10	10	10	10	8	10	10	10	4	92
321	1603	Turan et al 1997	Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	14	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO	10		Y	1.34	N	0.08739	0.652		10	10	5	10	6	8	4	1	10	4	68
322	14488	Hadjimarkos, 1970	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	4	0/0.68/0.88/1.17	mg/kg bw/d	N	na	ADL	U	DR	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	0.68	0.88	Y	0.0919	N	0.01155	0.680	0.88	10	5	5	10	10	8	10	10	10	4	82
323	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	GRO	GRO	BDWT	WO	1.61	3.31	Y	0.0374	Y	0.00320	0.735	1.51	10	5	10	10	7	8	10	10	10	10	90
324	1498	Panter et al., 1995	Sodium selenate	100	Sheep (*Ovis aries*)	1	2	0/24	mg/kg diet	N	na	ADL	M	FD	88	d	NR	NR	GE	F	C	GRO	GRO	BDWT	WO	24		Y	67	N	2.178	0.780		10	10	10	10	6	8	4	1	10	4	73
325	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	GRO	GRO	BDWT	WO	1.87	2.95	Y	16.6922	Y	0.00390	0.781	1.23	10	5	10	10	10	8	10	10	10	10	93
326	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/10.3/32.3/49.8	ug/org/d	N	na	ADL	U	DR	47	w	6	w	JV	F	C	GRO	GRO	BDWT	WO	32.3	49.8	Y	0.0412	N	0.005611	0.784	1.21	10	5	5	10	6	8	10	10	10	4	78
327	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/10/20/40/80	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	GRO	GRO	BDWT	WO	10	20	Y	0.105	Y	0.00850	0.810	1.62	10	10	5	10	7	8	10	10	10	4	84
328	1498	Panter et al., 1995	Selenium	100	Sheep (*Ovis aries*)	2	2	0/29	mg/kg diet	N	na	ADL	M	FD	88	d	NR	NR	GE	F	C	GRO	GRO	BDWT	WO	29		Y	66	N	2.151	0.945		10	10	10	4	6	8	4	1	10	4	67
329	1364	Hermann, et.al. 1991	D-selenomethionine	100	Rat (*Rattus norvegicus*)	2	3	0/10/16	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	10	16	N	0.124	N	0.01235	0.996	1.59	10	10	5	10	5	8	10	10	10	4	82
330	1364	Hermann, et.al. 1991	L-selenomethionine	100	Rat (*Rattus norvegicus*)	3	3	0/10/16	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	10	16	N	0.124	N	0.01235	0.996	1.59	10	10	5	10	5	8	10	10	10	4	82
331	1392	Ishikawa et al, 1992	Sodium selenite	100	Mouse (*Mus musculus*)	1	5	0/1/2/4/8	mg/L	N	na	NR	U	DR	12	w	5	w	JV	M	C	GRO	GRO	BDWT	WO	8		Y	0.03979	N	0.005438	1.09		10	5	5	10	6	8	4	10	10	4	72
332	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	1	7	0/1/4/8/16/32/64	mg/L	N	na	ADL	U	DR	46	d	7	w	JV	M	C	GRO	GRO	BDWT	WO	8	16	N	0.02695	N	0.003829	1.14	2.27	10	5	5	10	5	8	10	10	10	4	77
333	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	5	0/0.10/0.30/0.63/1.26	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	F	C	GRO	GRO	BDWT	WO	1.26		N	0.2425	Y	0.006140	1.26		10	10	10	10	10	8	4	1	10	4	77
334	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/3.5	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	GE	F	C	GRO	GRO	BDWT	WO	3.5		Y	0.0456	N	0.005428	1.60		10	8	10	10	10	8	4	10	10	4	84
335	36834	Tsunoda et al, 2000	Selenomethionine	100	Mouse (*Mus musculus*)	2	4	0/0.26/0.63/1.96	mg/kg bw/d	N	na	DLY	U	DR	14	d	7-8	w	JV	M	C	GRO	GRO	BDWT	WO	1.96		Y	0.0245	N	0.003515	1.96		10	5	5	5	10	8	4	10	10	4	71
336	1335	Hardin et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	5	0/3.5/5/7/14	mg/kg bw/d	N	na	DLY	U	GV	8	d	6-8	w	JV	F	C	GRO	GRO	BDWT	WO	7	14	N	0.0225	N	0.003037	3.20	6.39	10	8	5	10	10	8	10	10	10	4	85
337	1509	Plasterer et al., 1985	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/7	mg/kg bw/d	N	na	DLY	U	GV	8	d	61-71	d	GE	F	C	GRO	GRO	BDWT	WO	7		Y	0.02022	N	0.002782	3.20		10	8	10	10	10	8	4	10	10	4	84
338	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	6	0/2.5/5.0/10.0/20.0/40.0	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	JV	F	C	GRO	GRO	BDWT	WO	10		Y	0.0265	N	0.003742	4.57		10	8	10	10	10	8	4	10	10	4	84
339	1509	Plasterer et al., 1985	Sodium selenite	45.66	Mouse (*Mus musculus*)	3	4	0/2.5/5/10	mg/kg bw/d	N	na	DLY	U	GV	8	d	61-71	d	JV	F	C	GRO	GRO	BDWT	WO	10		Y	0.02522	N	0.003336	4.57		10	8	10	10	10	8	4	10	10	4	84
340	1234	Booth et al. 1983	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/2.5/5.0/10.0	mg/kg bw/d	N	na	DLY	U	GV	8	d	68-81	d	JV	F	C	GRO	GRO	BDWT	WO	10		Y	0.02522	N	0.003336	10.0		10	8	10	10	10	8	4	10	10	10	90
341	1538	Sayato et al 1993	seleno-DL-cystine	100	Mouse (*Mus musculus*)	1	5	0/10/20/30/40	mg/kg bw/d	N	na	6 per w	U	GV	30	d	5	w	JV	M	V	GRO	GRO	BDWT	WO	10	20	Y	0.025	N	0.00331	10.0	20.0	10	8	5	10	10	8	5	10	10	4	85
342	1411	Kaur and Parshad, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		2	Y	0.125	N	0.01243		0.0908	10	10	5	10	6	8	4	10	10	4	77

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																						Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
343	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/0.7/2.8	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	GRO	GRO	BDWT	WO		0.7	Y	0.0196	N	0.002711		0.0968	10	10	5	10	6	8	4	10	10	4	77
344	1239	Boylan et al, 1990	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/1.16	ug/g diet	N	na	ADL	M	FD	6	mo	NR	NR	JV	F	C	GRO	GRO	BDWT	WO		1.16	Y	0.023	N	0.003092		0.156	10	10	10	10	6	8	4	10	10	4	82
345	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	108	d	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		7	Y	74.39	Y	1.730		0.163	10	10	5	10	7	8	4	10	10	4	78
346	1224	Behne et al., 1992	L-Selenomethionine	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/kg diet	N	na	ADL	U	FD	110	d	30	d	JV	M	C	GRO	GRO	BDWT	WO		2	Y	0.34	N	0.02830		0.166	10	10	5	10	6	8	4	10	10	4	77
347	1219	Baker et al., 1989	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/12.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	GRO	GRO	BDWT	WO		12.5	N	61	N	2.016		0.205	10	10	10	10	5	8	4	10	10	4	81
348	14494	Rhian and Moxon, 1943	Sodium selenite	45.66	Dog (*Canis familiaris*)	1	2	0/10	mg/kg diet	N	na	DLY	U	FD	8	w	150	d	JV	F	C	GRO	GRO	BDWT	WO		10	Y	9.8	N	0.4485		0.209	10	10	5	10	6	8	4	10	10	4	77
349	1312	Goehring et al., 1984	Se in food (seleniferous wheat and corn)	100	Rat (*Rattus norvegicus*)	3	4	0/2.58/5.6/8.4	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		2.58	Y	0.3372	N	0.02811		0.215	10	10	10	10	6	8	4	10	10	4	82
350	1256	Chen et al., 1985	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/2/4/8	mg/L	N	na	ADL	U	DR	32	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		2	Y	0.208	N	0.02409		0.232	10	5	5	10	6	8	4	10	10	4	72
351	14492	Miller, 1938	Sodium selenite	100	Pig (*Sus scrofa*)	2	5	0/24.5/49/196/392	mg/kg diet	N	na	ADL	U	FD	63	d	4	mo	JV	B	C	GRO	GRO	BDWT	WO		24.5	Y	31.5	Y	0.3020		0.235	10	10	5	10	7	8	4	10	10	4	78
352	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	3	2	0/10	mg/kg diet	N	na	ADL	U	FD	3	mo	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		10	Y	62.2	Y	1.580		0.254	10	10	5	10	7	8	4	10	10	4	78
353	1540	Schroeder, 1967	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/2	mg/L	N	na	ADL	U	DR	9	d	21	d	JV	B	C	GRO	GRO	BDWT	WO		2	Y	0.05	N	0.00668		0.267	10	5	5	10	6	8	4	10	10	4	72
354	1540	Schroeder, 1967	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/L	N	na	ADL	U	DR	9	d	21	d	JV	B	C	GRO	GRO	BDWT	WO		2	Y	0.037	N	0.00509		0.275	10	5	5	10	6	8	4	10	10	4	72
355	1540	Schroeder, 1967	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2	mg/L	N	na	ADL	U	DR	99	d	21	d	JV	F	C	GRO	GRO	BDWT	WO		2	Y	0.0356	N	0.00539		0.276	10	5	5	10	6	8	4	10	10	4	72
356	757	Mercado and Bibby 1973	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/L	N	na	ADL	U	DR	50	d	23	d	JV	M	C	GRO	GRO	BDWT	WO		2.5	N	0.267	N	0.03016		0.282	10	5	5	10	5	8	4	10	10	4	71
357	1612	Wahlstrom et al., 1984	sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/8.1	mg/kg diet	N	na	ADL	M	FD	6	w	5-6	w	JV	M	C	GRO	GRO	BDWT	WO		8.1	Y	30.6	N	1.143		0.303	10	10	10	10	6	8	4	10	10	4	82
358	1219	Baker et al., 1989	Se in food (*Astragalus bisculatus*)	100	Pig (*Sus scrofa*)	1	2	0/18.7	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	GRO	GRO	BDWT	WO		18.7	N	61	N	2.016		0.307	10	10	10	10	5	8	4	10	10	4	81
359	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	2	2	0/11	mg/kg diet	N	na	ADL	U	FD	98	d	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		11	Y	52.75	Y	1.550		0.323	10	10	5	10	7	8	4	10	10	4	78
360	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	3	0/5.00/10.0	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	F	C	GRO	GRO	BDWT	WO		5	Y	0.158	Y	0.01090		0.345	10	10	5	10	7	8	8	10	10	4	82
361	1219	Baker et al., 1989	Se in food (*Astragalus praelongus*)	100	Pig (*Sus scrofa*)	2	2	0/21.5	mg/org/d	N	na	ADL	M	FD	9	w	8-14	w	JV	B	C	GRO	GRO	BDWT	WO		21.5	N	61	N	2.016		0.352	10	10	10	10	5	8	4	10	10	4	81
362	1597	Thorlacius-Ussing et al., 1988	Sodium selenite pentahydrate	30.02	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	21	d	25	d	JV	F	C	GRO	GRO	BDWT	WO		10	Y	0.0902	N	0.01136		0.378	10	5	5	10	6	8	4	10	10	4	72
363	1276	Dausch and Fullerton, 1993	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	8	3	0/10/30	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	N	0.18	N	0.01678		0.390	10	10	5	10	5	8	4	10	10	4	76
364	1598	Thorlacius-Ussing et al., 1988	Sodium selenite pentahydrate	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	M	C	GRO	GRO	BDWT	WO		3	Y	0.0385	N	0.005279		0.411	10	5	5	10	6	8	4	10	10	4	72
365	1443	Liu and Boylan, 1994	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/4.37	mg/kg diet	N	na	ADL	M	FD	8	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		4.37	Y	0.1523	N	0.01463		0.420	10	10	10	10	6	8	4	10	10	4	82
366	3725	Schroeder and Mitchener, 1972	sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/3	mg/L	N	na	DLY	U	DR	90	d	NR	lf	JV	M	C	GRO	GRO	BDWT	WO		3	Y	0.0275	N	0.003900		0.425	10	5	5	10	6	8	4	10	10	4	72
367	1276	Dausch and Fullerton, 1993	Selenocystine	47.27	Rat (*Rattus norvegicus*)	2	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	N	0.18	N	0.01678		0.441	10	10	5	10	5	8	4	10	10	4	76
368	1249	Carmichael and Fowler, 1980	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/15	mg/L	N	na	ADL	U	DR	22	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		15	Y	0.357	Y	0.01081		0.454	10	5	5	10	7	8	4	10	10	4	73
369	1232	Birt et al., 1986	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/5	mg/kg diet	N	na	ADL	U	FD	10	w	4	w	JV	M	C	GRO	GRO	BDWT	WO		5	Y	0.136	N	0.01333		0.490	10	10	5	10	6	8	4	10	10	4	77
370	1521	Raisbeck et al., 1996	Se in food	100	Pronghorn (*Antilocapra americana*)	1	2	0/14	mg/kg diet	N	na	ADL	M	FD	164	d	6-96	mo	JV	M	C	GRO	GRO	BDWT	WO		14	N	63	N	2.070		0.493	10	10	10	10	5	8	4	10	10	4	81
371	1532	Salbe et al., 1990	sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/4/6	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	B	C	GRO	GRO	BDWT	WO		4	Y	0.101	N	0.01258		0.498	10	5	5	10	6	8	4	10	10	4	72
372	1432	LeBoeuf and Hoekstra, 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/6	mg/kg diet	N	na	ADL	U	FD	6	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		6	N	0.267	N	0.02320		0.521	10	10	5	10	5	8	4	10	10	4	76
373	1595	Thorlacius-Ussing, 1990	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	2	0/10	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	B	C	GRO	GRO	BDWT	WO		10	N	0.267	N	0.03016		0.543	10	5	5	10	5	8	4	10	10	4	71
374	1500	Parshad and Sud, 1989	Selenium	100	Rat (*Rattus norvegicus*)	1	2	0/12.5	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		12.5	Y	0.1476	Y	0.00650		0.550	10	10	10	4	7	8	4	10	10	4	77
375	1323	Gronbaek et al., 1995	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3.3	mg/L	N	na	ADL	U	DR	14	d	3-4	w	JV	M	C	GRO	GRO	BDWT	WO		3.3	Y	0.11	Y	0.0190		0.570	10	5	5	10	7	8	4	10	10	4	73
376	1276	Dausch and Fullerton, 1993	Sodium selenide	63.2	Rat (*Rattus norvegicus*)	4	4	0/10/30/60	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	N	0.18	N	0.01678		0.589	10	10	5	10	5	8	4	10	10	4	76
377	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	4	0/10/15/20	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	Y	0.124	Y	0.00810		0.653	10	10	5	10	7	8	4	10	10	4	78
378	1327	Hadjimarkos, 1967	Soldium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	21	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		3	Y	0.0436	Y	0.00970		0.667	10	5	5	10	7	8	4	10	10	4	73
379	15262	Palmer et al 1983	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/7.8	ug/g diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		7.8	Y	0.21596	N	0.01949		0.704	10	10	10	4	6	8	4	10	10	4	76
380	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/8.0	ug/g diet	N	na	ADL	U	FD	4	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		8	Y	0.16976	N	0.01599		0.754	10	10	5	10	6	8	4	10	10	4	77
381	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	4	4	0/3.09/6.01/9.01	mg/L	N	na	ADL	M	DR	7	d	21	d	JV	M	C	GRO	GRO	BDWT	WO		3.09	Y	0.065	Y	0.009570		0.767	10	5	10	10	7	8	4	10	10	4	78
382	1244	Cabe, et al., 1979	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	13	w	50	d	JV	M	C	GRO	GRO	BDWT	WO		10	Y	0.523	N	0.04023		0.769	10	5	5	10	6	8	4	10	10	4	72
383	1499	Panter et al., 1996	Sodium (plant form)	100	Pig (*Sus scrofa*)	2	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	GRO	GRO	BDWT	WO		25	N	31.5	N	1.171		0.794	10	10	5	4	5	8	4	10	10	4	70
384	1499	Panter et al., 1996	Seleno-dl-methionine	100	Pig (*Sus scrofa*)	3	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	GRO	GRO	BDWT	WO		25	N	31.5	N	1.171		0.794	10	10	5	10	5	8	4	10	10	4	76
385	1496	Palmer et al., 1982	Selenomethionine	100	Rat (*Rattus norvegicus*)	4	2	0/8.27	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		8.27	Y	0.153	N	0.01468		0.794	10	10	10	10	6	8	4	10	10	4	82
386	1499	Panter et al., 1996	Sodium selenate	100	Pig (*Sus scrofa*)	1	2	0/25	mg/org/d	N	na	ADL	U	FD	6	w	8-10	w	JV	B	C	GRO	GRO	BDWT	WO		25	N	31.5	N	1.171		0.794	10	10	5	10	5	8	4	10	10	4	76
387	1496	Palmer et al., 1982	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	2	0/8.22	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		8.22	Y	0.133	N	0.01308		0.809	10	10	10	10	6	8	4	10	10	4	82
388	1496	Palmer et al., 1982	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/8.28	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		8.28	Y	0.131	N	0.01292		0.817	10	10	10	10	6	8	4	10	10	4	82
389	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	2	0/10	ug/g diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	Y	0.3624	N	0.02983		0.823	10	10	5	10	6	8	4	10	10	4	77
390	12934	Obermeyer et al, 1971	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/9	mg/kg diet	N	na	ADL	U	FD	4	w	NR	NR	JV	NR	C	GRO	GRO	BDWT	WO		9	Y	0.1188	N	0.01192		0.903	10	10	5	10	6	8	4	10	10	4	77
391	36812	Halverson and Monty, 1960	Sodium selenate	100	Rat (*Rattus norvegicus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	28	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	Y	0.146	N	0.01413		0.968	10	10	5	10	6	8	4	10	10	4	77
392	14489	Halverson et al., 1962	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	GRO	GRO	BDWT	WO		10	Y	0.133	N	0.01308		0.984	10	10	5	10	6	8	4	10	10	4	77
393	36812	Halverson and Monty, 1960	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	28	d	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		10	Y	0.13	N	0.01284		0.988	10	10	5	10	6	8	4	10	10	4	77
394	14489	Halverson et al., 1962	Potassium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	GRO	GRO	BDWT	WO		10	Y	0.1402	N	0.01366		1.02	10	10	5	10	6	8	4	10	10	4	77
395	21137	Cutler, 1974	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	2	0/24	mg/L	N	na	NR	U	DR	5	mo	NR	NR	JV	M	C	GRO	GRO	BDWT	WO		24	Y	0.321	N	0.03560		1.11	10	5	5	10	6	8	4	10	10	4	72
396	1364	Hermann, et.al. 1991	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/16	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	F	C	GRO	GRO	BDWT	WO		16	N	0.124	N	0.01235		1.59	10	10	5	10	5	8	4	10	10	4	76
397	1523	Rastogi et al., 1976	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/92.14	ug/org/d	N	na	ADL	U	DR	1	w	1	mo	JV	B	C	GRO	GRO	BDWT	WO		92.14	Y	0.039	N	0.007633		1.59	10	5	5	10	7	8	4	10	10	4	73
398	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.79	mg/kg bw/d	N	na	DLY	U	FD	65	d	28	d	JV	B	C	GRO	GRO	BDWT	WO		1.79	Y	0.063	Y	0.004260		1.79	10	10	5	10	10	8	4	10	10	4	81
399	14489	Halverson et al., 1962	Selenium	100	Rat (*Rattus norvegicus*)	3	2	0/20	mg/kg diet	N	na	ADL	M	FD	18	d	NR	NR	NR	M	C	GRO	GRO	BDWT	WO		20	Y	0.1456	N	0.01410		1.94	10	10	5	4	6	8	4	10	10	4	71
400	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/3.54	mg/kg bw/d	N	na	DLY	U	FD	5	d	28	d	JV	M	C	GRO	GRO	BDWT	WO		3.54	Y	0.035	Y	0.00250		3.54	10	10	5	10	10	8	4	10	10	4	81

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																						Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
401	14508	Franke and Moxon 1937	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/50	mg/kg diet	N	na	DLY	U	FD	5	d	28	d	JV	B	C	GRO	GRO	BDWT	WO		50	Y	0.029	Y	0.002170		3.74	10	10	5	10	7	8	4	10	10	4	78
402	1259	Chermoff and Kavlock, 1982	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/10	mg/kg bw/d	N	na	DLY	U	GV	5	d	60	d	GE	F	C	GRO	GRO	BDWT	WO		10	N	0.0225	N	0.003037		4.18	10	8	10	10	10	8	4	10	10	4	84
Survival																																														
403	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/0.7/2.8	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	MOR	MOR	SURV	WO	0.7	2.8	Y	0.0204	N	0.002802	0.0961	0.385	10	10	5	10	6	9	8	10	10	4	82
404	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	2	10	0/0.75/1.25/1.75/2.25/3.75/5.0/7.5/10	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	MOR	MOR	SURV	WO	0.75	1.25	Y	0.0227	N	0.003059	0.101	0.168	10	10	5	10	6	9	10	10	10	4	84
405	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	2	3	0/2.09/3.01	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	MOR	MOR	MORT	WO	3.01		Y	0.248	Y	0.01495	0.181		10	5	10	10	7	9	4	10	10	4	79
406	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2.11/2.99	mg/L	N	na	ADL	M	DR	42	d	21	d	JV	M	C	MOR	MOR	MORT	WO	2.99		Y	0.26	Y	0.01660	0.186		10	5	10	10	7	9	4	10	10	4	79
407	1457	McAdam and Levander, 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	MOR	MOR	MORT	WO	2.5	5	N	0.267	N	0.02320	0.217	0.435	10	10	5	10	5	9	10	10	10	4	83
408	1457	McAdam and Levander, 1987	L-selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	MOR	MOR	MORT	WO	2.5	5	N	0.267	N	0.02320	0.217	0.435	10	10	5	10	5	9	10	10	10	4	83
409	1540	Schroeder, 1967	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/2	mg/L	N	na	ADL	U	DR	180	d	21	d	JV	B	C	MOR	MOR	MORT	WO	2		Y	0.338	N	0.03730	0.221		10	5	5	10	6	9	4	10	10	4	73
410	1324	Gronbaek and Thorlacius-Ussing 1990	L-selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/0.75/1.5/2.25	mg/L	N	na	ADL	U	DR	2	w	NR	NR	NR	M	C	MOR	MOR	SURV	WO	2.25		N	0.5	N	0.05305	0.239		10	5	5	10	5	9	4	10	6	4	68
411	1497	Palmer and Olson, 1974	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	4	0/3.09/6.08/8.87	mg/L	N	na	ADL	M	DR	21	d	21	d	JV	M	C	MOR	MOR	MORT	WO	3.09	6.08	Y	0.19	Y	0.01686	0.274	0.540	10	5	10	10	7	9	10	10	10	4	85
412	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	MOR	MOR	MORT	WO	10		Y	57.72	N	1.927	0.334		10	10	5	10	6	9	4	10	10	4	78
413	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	2	0/5.00	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	MOR	MOR	MORT	WO	5		Y	0.177	Y	0.01240	0.350		10	10	5	10	7	9	4	10	10	4	79
414	1276	Dausch and Fullerton, 1993	Selenomethionine	40.26	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	SURV	WO	10		N	0.18	N	0.01678	0.375		10	10	5	10	5	9	4	10	10	4	77
415	1475	Abdo, 1994	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	2	6	0/0.17/0.28/0.50/0.86/1.67	mg/kg bw/d	N	1	ADL	UX	DR	13	w	6	w	JV	F	C	MOR	MOR	MORT	WO	0.86	1.67	Y	0.188	Y	0.00920	0.393	0.763	10	5	10	10	10	9	10	10	10	4	94
416	1276	Dausch and Fullerton, 1993	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	5	4	0/10/30/100	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	10	30	N	0.18	N	0.01678	0.426	1.28	10	10	5	10	5	9	10	10	10	4	83
417	1457	McAdam and Levander, 1987	Sodium selenate	100	Rat (*Rattus norvegicus*)	4	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	MOR	MOR	MORT	WO	5	10	N	0.267	N	0.02320	0.435	0.869	10	10	5	10	5	9	10	10	10	4	83
418	1457	McAdam and Levander, 1987	D-selenomethionine	100	Rat (*Rattus norvegicus*)	1	4	0/2.5/5/10	ug/g diet	N	na	ADL	U	FD	6	w	21	d	JV	M	C	MOR	MOR	MORT	WO	5	10	N	0.267	N	0.02320	0.435	0.869	10	10	5	10	5	9	10	10	10	4	83
419	1468	Moxon and Mahan, 1982	sodium selenite	100	Pig (*Sus scrofa*)	1	8	0/2.5/5.0/7.5/10/15/20/40	mg/kg diet	N	na	DLY	UX	FD	37	d	NR	NR	JV	NR	C	MOR	MOR	MORT	WO	15	20	Y	11.21	Y	0.3541	0.474	0.632	10	10	10	10	7	9	10	10	10	4	90
420	1475	Abdo, 1994	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	6	0/0.31/0.47/0.88/1.35/1.84	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	F	C	MOR	MOR	MORT	WO	1.35	1.84	Y	0.141	Y	0.06400	0.564	0.769	10	5	10	10	10	9	10	10	10	10	94
421	1332	Halverson et al 1966	Se in food (seleniferous wheat)	100	Rat (*Rattus norvegicus*)	2	8	0/1.6/3.2/4.8/6.4/8.0/9.6/11.2	mg/kg diet	N	na	ADL	U	FD	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	6.4	8	Y	0.22	N	0.01979	0.576	0.720	10	10	5	4	6	9	10	10	10	4	78
422	1332	Halverson et al 1966	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	7	0/1.6/3.2/4.8/6.4/8.0/9.6	mg/kg diet	N	na	ADL	U	FD	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	6.4	8	Y	0.198	N	0.01815	0.587	0.733	10	10	5	10	6	9	10	10	10	4	84
423	1497	Palmer and Olson, 1974	Sodium selenate	100	Rat (*Rattus norvegicus*)	4	4	0/3.09/6.01/9.01	mg/L	N	na	ADL	M	DR	21	d	21	d	JV	M	C	MOR	MOR	MORT	WO	6.01	9.01	Y	0.1	Y	0.00990	0.595	0.892	10	5	10	10	7	9	10	10	10	4	85
424	1629	Wilson et al 1988	Sodium selenite	45.66	Pig (*Sus scrofa*)	1	4	0/1.4/2.6/4.2	mg/kg bw/d	N	na	DLY	U	OR	9	d	6	w	JV	M	C	MOR	MOR	MORT	WO	1.4	2.6	Y	9.3	N	0.4296	0.639	1.19	10	8	10	10	10	9	10	10	10	4	91
425	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	3	0/5.00/10.0	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	MOR	MOR	MORT	WO	10		Y	0.158	Y	0.01030	0.652		10	10	5	10	7	9	4	3	10	4	72
426	1603	Turan et al 1997	Sodium selenite	100	Rabbit (*Oryctolagus cuniculus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	14	w	NR	NR	JV	B	C	MOR	MOR	MORT	WO	10		Y	1.34	N	0.08739	0.652		10	10	5	10	6	9	4	10	10	4	78
427	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	4	0/10/15/20	mg/kg diet	N	na	ADL	U	FD	22	d	NR	NR	JV	M	C	MOR	MOR	MORT	WO	10	15	Y	0.124	Y	0.00810	0.653	0.980	10	10	5	10	7	9	10	10	10	4	85
428	1254	Chen et al., 1982	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2/6	mg/kg diet	N	na	NR	U	FD	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	6		Y	0.06	N	0.006801	0.680		10	10	5	10	6	9	4	10	10	4	78
429	15262	Palmer et al 1983	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/7.8	ug/g diet	N	na	ADL	M	FD	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	7.8		Y	0.21596	N	0.01949	0.704		10	10	10	4	6	9	4	10	10	4	77
430	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/8.0	ug/g diet	N	na	ADL	U	FD	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	8		Y	0.16976	N	0.01599	0.754		10	10	5	10	6	9	4	10	10	4	78
431	1244	Cabe, et al., 1979	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	18	w	50	d	JV	M	C	MOR	MOR	MORT	WO	10		Y	0.523	N	0.04023	0.769		10	5	5	10	6	9	4	10	10	4	73
432	1496	Palmer et al., 1982	Selenomethionine	100	Rat (*Rattus norvegicus*)	4	2	0/8.27	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	MOR	MOR	MORT	WO	8.27		Y	0.153	N	0.01468	0.794		10	10	10	10	6	9	4	10	10	4	83
433	1496	Palmer et al., 1982	Selenium	100	Rat (*Rattus norvegicus*)	1	3	0/0.94/85.6	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	MOR	MOR	MORT	WO	8.56		Y	0.155	N	0.01484	0.820		10	10	10	10	6	9	4	10	10	4	83
434	1413	Kezhou et al., 1987	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/5/10/20	mg/kg diet	N	na	ADL	U	FD	22	d	NR	NR	JV	M	C	MOR	MOR	MORT	WO	10	20	Y	0.1576	Y	0.01350	0.857	1.71	10	10	5	10	7	9	10	10	10	4	85
435	1276	Dausch and Fullerton, 1993	Selenocystine	47.27	Rat (*Rattus norvegicus*)	2	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	SURV	WO	20		N	0.18	N	0.01678	0.881		10	10	5	10	5	9	4	10	10	4	77
436	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	6	0/1/4/8/16/64	mg/L	N	na	ADL	U	DR	35	d	5, 12	w	JV	B	C	MOR	MOR	SURV	WO	8	16	N	0.267	N	0.03016	0.904	1.81	10	5	5	10	5	9	10	10	10	4	78
437	1523	Rastogi et al., 1976	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/128.6	ug/org/d	N	na	ADL	U	DR	8	w	1	mo	JV	B	C	MOR	MOR	MORT	WO	128.6		Y	0.135	N	0.01633	0.953		10	5	5	10	7	9	4	10	10	4	74
438	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	6	0/2.5/5.0/10.0/20.0/40.0	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	JV	F	C	MOR	MOR	MORT	WO	2.5	5	Y	0.0273	N	0.003560	1.14	2.28	10	8	10	10	10	9	10	10	10	4	91
439	1276	Dausch and Fullerton, 1993	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	8	3	0/10/30	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	30		N	0.18	N	0.01678	1.17		10	10	5	10	5	9	4	10	10	4	77
440	14488	Hadjimarkos, 1970	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	4	0/0.68/0.88/1.17	mg/kg bw/d	N	na	ADL	U	DR	4	w	NR	NR	JV	M	C	MOR	MOR	MORT	WO	1.17		Y	0.0834	N	0.01058	1.17		10	5	5	10	10	9	4	10	10	4	77
441	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/10.3/32.3/49.8	ug/org/d	N	na	ADL	U	DR	47	w	6	w	JV	F	C	MOR	MOR	MORT	WO	49.8		Y	0.0412	N	0.005611	1.21		10	5	5	10	6	9	4	10	10	4	73
442	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/0.1/0.31/0.61/1.21	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	M	C	MOR	MOR	MORT	WO	1.21		N	0.097	Y	0.0050	1.21		10	10	10	10	10	9	4	10	10	4	87
443	1223	Beems and van Beek, 1985	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	5	0/0.10/0.30/0.63/1.26	mg/kg bw/d	N	na	ADL	M	FD	42	d	NR	NR	JV	F	C	MOR	MOR	MORT	WO	1.26		Y	0.2425	Y	0.006140	1.26		10	10	10	10	10	9	4	10	10	4	87
444	14492	Miller, 1938	Sodium selenite	100	Pig (*Sus scrofa*)	2	5	0/24.5/49/196/392	mg/kg diet	N	na	ADL	U	FD	63	d	4	mo	JV	B	C	MOR	MOR	MORT	WO	49	196	Y	10.43	Y	0.3170	1.49	5.96	10	10	5	10	7	9	8	10	10	4	83
445	1475	Abdo, 1994	Sodium selenite	45.66	Mouse (*Mus musculus*)	4	6	0/0.26/0.56/0.91/1.61/3.31	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	M	C	MOR	MOR	MORT	WO	3.31		Y	0.0338	Y	0.00470	1.51		10	5	10	10	7	9	4	10	10	10	85
446	1507	Piccirillo et al 1983	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/3.5	mg/kg bw/d	N	na	DLY	U	GV	8	d	64	d	GE	F	C	MOR	MOR	MORT	WO	3.5		Y	0.0456	N	0.005428	1.60		10	8	10	10	10	9	4	10	10	4	85
447	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	1	7	0/1/4/8/16/32/64	mg/L	N	na	ADL	U	DR	46	d	7	w	JV	B	C	MOR	MOR	MORT	WO	16	32	N	0.02695	N	0.003829	2.27	4.55	10	5	5	10	5	9	10	10	10	4	78
448	1475	Abdo, 1994	Sodium selenate	41.79	Mouse (*Mus musculus*)	3	6	0/0.55/1.07/1.87/2.95/5.45	mg/kg bw/d	N	na	ADL	UX	DR	13	w	6	w	JV	B	C	MOR	MOR	MORT	WO	5.45		Y	0.0302	Y	0.0025	2.28		10	5	10	10	10	9	4	10	10	10	88
449	1509	Plasterer et al., 1985	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	6	0/2.5/5/10/20/40	mg/kg bw/d	N	na	DLY	U	GV	8	d	61-71	d	JV	F	C	MOR	MOR	MORT	WO	5	10	Y	0.02522	N	0.003336	2.28	4.57	10	8	10	10	10	9	10	10	10	4	91
450	1501	Pathak and Datta 1984	sodium selenite	100	Goat (*Capra hircus*)	1	4	0/3/6/10	mg/kg bw	N	na	DLY	U	OR	17	d	6	mo	MA	NR	C	MOR	MOR	MORT	WO	3	6	Y	9	N	0.4182	3.0	6.0	10	8	10	10	10	9	10	6	4	87
451	1408	Julius et al, 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	5	0/10/20/40/80	mg/kg diet	N	na	ADL	U	FD	21	d	4	w	JV	B	C	MOR	MOR	MORT	WO	40	80	Y	0.078	Y	0.00620	3.18	6.36	10	10	5	10	7	9	10	10	10	4	85
452	1335	Hardin et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	5	0/3.5/5/7/14	mg/kg bw/d	N	na	DLY	U	GV	8	d	6-8	w	GE	F	C	MOR	MOR	MORT	WO	7	14	N	0.0225	N	0.003037	3.20	6.39	10	8	5	10	10	9	10	10	10	4	86
453	1509	Plasterer et al., 1985	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	2	0/7	mg/kg bw/d	N	na	DLY	U	GV	8	d	61-71	d	GE	F	C	MOR	MOR	SURV	WO	7		Y	0.02022	N	0.002782	3.20		10	8	10	10	10	9	4	10	10	4	85
454	1276	Dausch and Fullerton, 1993	Sodium selenide	63.2	Rat (*Rattus norvegicus*)	4	4	0/10/30/60	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	SURV	WO	60		N	0.18	N	0.01678	3.53		10	10	5	10	5	9	4	10	10	4	77
455	1259	Chermoff and Kavlock, 1982	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/10	mg/kg bw/d	N	na	DLY	U	GV	5	d	60	d	GE	F	C	MOR	MOR	MORT	WO	10		N	0.0225	N	0.003037	4.18		10	8	10	10	10	9	4	10	10	4	85
456	1234	Booth et al. 1983	Sodium selenite	100	Mouse (*Mus musculus*)	3	6	0/2.5/5.0/10.0/20.0/40.0	mg/kg bw/d	N	na	DLY	U	GV	8	d	68-81	d	JV	F	C	MOR	MOR	MORT	WO	10	20	Y	0.02522	N	0.003336	10.0	20	10	8	10	10	10	9	10	10	10	97
457	1276	Dausch and Fullerton, 1993	Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	3	5	0/10/30/100/300	mg/kg diet	N	na	ADL	U	FD	3	w	NR	NR	JV	M	C	MOR	MOR	SURV	WO	300		N	0.18	N	0.01678	15.4		10	10	5	5	5	9	10	10	10	4	78

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium
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Ref			Exposure																						Effects					Conversion to mg/kg bw/day					Result		Data Evaluation Score											
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
458	1540	Schroeder, 1967	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/2	mg/L	N	na	ADL	U	DR	16	d	21	d	JV	B	C	MOR	MOR	MORT	WO		2	Y	0.037	N	0.00509		0.275	10	5	5	10	6	9	4	10	10	4	73
459	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/4	mg/L	N	na	ADL	U	DR	10	w	5	w	JV	M	C	MOR	MOR	SURV	WO		4	Y	0.35	N	0.03849		0.440	10	5	5	10	6	9	4	10	10	4	73
460	1496	Palmer et al., 1982	Sodium selenite	100	Rat (*Rattus norvegicus*)	3	2	0/8.22	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	MOR	MOR	MORT	WO		8.22	Y	0.133	N	0.01308		0.809	10	10	10	10	6	9	4	10	10	4	83
461	1496	Palmer et al., 1982	Se in food (seleniferous corn)	100	Rat (*Rattus norvegicus*)	2	2	0/8.28	mg/kg diet	N	na	ADL	M	FD	4	w	NR	NR	JV	NR	C	MOR	MOR	MORT	WO		8.28	Y	0.131	N	0.01292		0.817	10	10	10	10	6	9	4	10	10	4	83
462	15262	Palmer et al 1983	Sodium selenite	100	Rat (*Rattus norvegicus*)	4	2	0/10	ug/g diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	MOR	MOR	SURV	WO		10	Y	0.3624	N	0.02983		0.823	10	10	5	4	6	9	4	10	10	4	72
463	14489	Halverson et al., 1962	Potassium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	MOR	MOR	MORT	WO		10	Y	0.1402	N	0.01366		0.975	10	10	5	10	6	9	4	10	10	4	78
464	14489	Halverson et al., 1962	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/10	mg/kg diet	N	na	ADL	U	FD	18	d	NR	NR	NR	M	C	MOR	MOR	MORT	WO		10	Y	0.133	N	0.01308		0.984	10	10	5	10	6	9	4	10	10	4	78
465	21137	Cutler, 1974	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	2	0/24	mg/L	N	na	NR	U	DR	5	mo	NR	NR	JV	M	C	MOR	MOR	MORT	WO		24	Y	0.321	N	0.03560		1.11	10	5	5	10	6	9	4	10	10	4	73
466	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1.79	mg/kg bw/d	N	na	DLY	U	FD	100	d	28	d	JV	M	C	MOR	MOR	MORT	WO		1.79	Y	0.063	Y	0.004260		1.79	10	10	5	10	10	9	4	10	10	4	82
467	14489	Halverson et al., 1962	Selenium	100	Rat (*Rattus norvegicus*)	3	2	0/20	mg/kg diet	N	na	ADL	M	FD	18	d	NR	NR	NR	M	C	MOR	MOR	MORT	WO		20	Y	0.1456	N	0.01410		1.94	10	10	5	4	6	9	4	10	10	4	72
468	14508	Franke and Moxon 1937	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/3.54	mg/kg bw/d	N	na	DLY	U	FD	100	d	28	d	JV	B	C	MOR	MOR	MORT	WO		3.54	Y	0.035	Y	0.00250		3.54	10	10	5	10	10	9	4	10	10	4	82
469	14508	Franke and Moxon 1937	Sodium selenate	100	Rat (*Rattus norvegicus*)	3	2	0/50	mg/kg diet	N	na	DLY	U	FD	100	d	28	d	JV	B	C	MOR	MOR	MORT	WO		50	Y	0.029	Y	0.002170		3.74	10	10	5	10	7	9	4	10	10	4	79
470	1277	Davidson-York et al, 1999	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/121.7	mg/kg diet	N	na	ADL	M	FD	19	d	NR	NR	NR	B	C	MOR	MOR	MORT	WO		121.7	Y	49.5	N	1.698		4.17	10	10	10	10	6	9	4	10	3	4	76
471	113	Seidenberg et al 1986	Sodium selenate	41.79	Mouse (*Mus musculus*)	1	2	0/12	mg/kg bw/d	N	na	DLY	U	GV	4	d	NR	NR	GE	F	C	MOR	MOR	MORT	WO		12	Y	0.0401	N	0.00488		5.01	10	8	10	10	10	9	4	10	10	4	85
Data Not Used to Derive TRV																																														
472	1389	Hu et al., 1984	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	7	mo	1	mo	JV	F	C	PHY	PHY	GPHY	BL	1		N	0.204	N	0.01860	0.0912		10	10	5	10	5	4	4	1	10	4	63
473	1255	Chen et al., 1990	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	2	0/1	mg/kg diet	N	na	ADL	U	FD	2	w	NR	NR	JV	M	C	BIO	ENZ	GLPX	LI	1		Y	0.2671	N	0.02321	0.0869		10	10	5	10	6	1	4	1	10	4	61
474	36822	Lalor and Llewellyn, 1979	Sodium selenite	45.66	Gerbil (*Meriones unguiculatus*)	2	3	0/2.5/5.0	mg/L	N	na	ADL	U	DR	30	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	5.0		Y	0.069	Y	0.003943	0.127		10	5	5	10	7	8	4	1	10	4	64
475	36822	Lalor and Llewellyn, 1979	Sodium selenite	45.66	Gerbil (*Meriones unguiculatus*)	1	3	0/2.5/5.0	mg/L	N	na	ADL	U	DR	30	w	NR	NR	JV	M	C	GRO	GRO	BDWT	WO	5.0		Y	0.0687	Y	0.003926	0.127		10	5	5	10	7	8	4	1	10	4	64
476	36822	Lalor and Llewellyn, 1979	Sodium selenite	45.66	Gerbil (*Meriones unguiculatus*)	1	3	0/2.5/5.0	mg/L	N	na	ADL	U	DR	30	w	NR	NR	JV	M	C	PHY	PHY	GPHY	WO	5.0		Y	0.0687	Y	0.003926	0.127		10	5	5	10	7	4	4	1	10	4	60
477	1473	Nobunaga et al., 1979	Sodium selenite pentahydrate	100	Mouse (*Mus musculus*)	1	3	0/3/6	mg/L	N	na	ADL	U	DR	56	d	60	d	GE	F	C	GRO	GRO	BDWT	WO	6		Y	0.170	Y	0.00410	0.145		10	5	5	10	7	8	4	1	10	4	64
478	1473	Nobunaga et al., 1979	Sodium selenite pentahydrate	100	Mouse (*Mus musculus*)	1	3	0/3/6	mg/L	N	na	ADL	U	DR	56	d	60	d	GE	F	C	BEH	FDB	WCON	WO	6		Y	0.170	Y	0.00410	0.145		10	5	5	10	7	4	4	6	10	4	65
479	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/7	mg/kg diet	N	na	ADL	U	FD	108	d	NR	NR	JV	NR	C	BEH	FDB	FEFF	WO	7		Y	74.39	Y	1.730	0.163		10	10	5	10	7	4	4	1	10	4	65
480	25959	Gunter et al, 2003	Sodium selenite	100	Cattle (*Bos taurus*)	1	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	BEH	FDB	FDNG	WO	26		Y	498	N	3.318	0.173		10	10	5	10	6	4	4	1	10	4	64
481	13650	Smith, et al, 1974	Selenomethionine	100	Rat (*Rattus norvegicus*)	1	2	0/2.0	mg/kg diet	N	na	NR	U	FD	5	w	NR	mo	JV	M	C	BIO	ENZ	GLPX	LI	2		N	0.267	N	0.02320	0.174		10	10	5	10	5	1	4	1	10	4	60
482	1454	Mandisodza et al., 1979	Selenium	100	Pig (*Sus scrofa*)	1	3	0/3.4/6	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	PHY	PHY	FDCV	WO	6		Y	40.7	Y	1.370	0.202		10	10	10	4	7	4	4	1	10	4	64
483	1454	Mandisodza et al., 1979	Selenium	100	Pig (*Sus scrofa*)	1	3	0/3.4/6	mg/kg diet	N	na	ADL	M	FD	61	d	5-7	w	JV	B	C	BEH	FDB	FCNS	WO	6		Y	40.7	Y	1.370	0.202		10	10	10	4	7	4	4	1	10	4	64
484	25957	Kim and Mahan, 2001	Sodium selenite or Se-yeast	100	Pig (*Sus scrofa*)	1	6	0/1.0/3.0/5.0/7.0/10.0	mg/kg diet	N	na	ADL	U	FD	12	w	NR	NR	JV	B	C	BIO	CHM	AMAC	HA	10		Y	92	Y	2.120	0.230		10	10	5	10	7	1	4	1	10	4	62
485	1423	Kise et al., 1991	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/44.3	ug/org/d	N	na	ADL	U	DR	31	w	4	w	JV	F	C	BIO	ENZ	GLPX	LI	44.3		Y	0.19	N	0.02221	0.233		10	5	5	10	6	1	4	1	10	4	56
486	1423	Kise et al., 1991	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/44.3	ug/org/d	N	na	ADL	U	DR	31	w	4	w	JV	F	C	GRO	GRO	BDWT	WO	44.3		Y	0.19	N	0.02221	0.233		10	5	5	10	6	8	4	1	10	4	63
487	1618	Whanger and Butler, 1988	Selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	BIO	ENZ	GLPX	BL	2		Y	0.204	Y	0.02500	0.250		10	10	5	10	7	1	4	1	10	4	62
488	1540	Schroeder, 1967	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/2	mg/L	N	na	ADL	U	DR	339	d	21	d	JV	B	C	MOR	MOR	MORT	WO	2		Y	0.0587	N	0.00772	0.263		10	5	5	10	6	9	4	1	10	4	64
489	1557	Shull and Checke, 1973	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	3	0/1/5	mg/kg diet	N	na	ADL	U	FD	8	w	NR	NR	JV	M	C	BIO	ENZ	GENZ	PS	5		Y	0.252	Y	0.0140	0.278		10	10	5	10	7	1	4	3	10	4	64
490	757	Mercado and Bibby 1973	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/2.5	mg/L	N	na	ADL	U	DR	50	d	23	d	JV	M	C	PHY	PHY	GPHY	TH	2.5		N	0.267	N	0.03016	0.282		10	5	5	10	5	4	4	1	10	4	58
491	1228	Bioulac-Sage et al., 1992	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/2/4	mg/kg diet	N	na	ADL	U	FD	2	mo	NR	NR	JV	M	C	BIO	ENZ	ALPH	LI	4		Y	0.44	N	0.03498	0.318		10	10	5	10	6	1	4	3	10	4	63
492	14498	Wahlstrom et al, 1956	Sodium selenite	100	Pig (*Sus scrofa*)	2	2	0/11	mg/kg diet	N	na	ADL	U	FD	98	d	NR	NR	JV	NR	C	BEH	FDB	FEFF	WO	11		Y	52.75	Y	1.550	0.323		10	10	5	10	7	4	4	1	10	4	65
493	1401	Jenkins and Hidiroglou, 1986	Sodium selenate	100	Cattle (*Bos taurus*)	1	5	0/1.0/3.0/5.0/10.0	mg/kg diet	N	na	ADL	U	FD	6	w	3	d	JV	M	C	BEH	FDB	FCNS	WO	10		Y	57.72	N	1.927	0.334		10	10	5	10	6	4	4	1	10	4	64
494	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	2	0/5.00	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	PTH	HIS	GHIS	MT	5		Y	0.177	Y	0.01240	0.350		10	10	5	10	7	4	4	1	10	4	65
495	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	2	2	0/5.00	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	BEH	FDB	FCNS	WO	5		Y	0.177	Y	0.01240	0.350		10	10	5	10	7	4	4	1	10	4	65
496	1566	Spallholz et al., 1973	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/0.7/2.8	mg/kg diet	N	na	ADL	U	FD	5	w	NR	NR	JV	B	C	PTH	ORW	ORWT	SP	2.8		Y	0.0204	N	0.002802	0.385		10	10	5	10	6	4	4	1	10	4	64
497	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/4	mg/L	N	na	ADL	U	DR	111	w	5	w	JV	M	C	PTH	HIS	GHIS	LI	4		Y	0.583	N	0.06092	0.418		10	5	5	10	6	4	4	1	10	4	59
498	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/4	mg/L	N	na	ADL	U	DR	111	w	5, 8	w	JV	M	C	GRO	GRO	BDWT	WO	4		Y	0.501	N	0.05315	0.424		10	5	5	10	6	8	4	1	10	4	63
499	1647	Zhang et al., 1996	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	3	0/2/4	ug/g diet	N	na	ADL	U	FD	18	d	NR	NR	JV	B	C	BIO	ENZ	GLPX	BR	4		Y	0.06	N	0.00680	0.453		10	10	5	10	6	1	4	1	10	4	61
500	1249	Carmichael and Fowler, 1980	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/15	mg/L	N	na	ADL	U	DR	22	w	NR	NR	JV	M	C	PTH	HIS	GLSN	LI	15		Y	0.357	Y	0.01081	0.454		10	5	5	10	7	4	4	1	10	4	60
501	1618	Whanger and Butler, 1988	Selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	PTH	ORW	ORWT	LI	4		Y	0.204	Y	0.02500	0.490		10	10	5	10	7	4	4	1	10	4	65
502	1618	Whanger and Butler, 1988	Selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	4		Y	0.204	Y	0.02500	0.490		10	10	5	10	7	4	4	1	10	4	65
503	1232	Birt et al., 1986	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/5	mg/kg diet	N	na	ADL	U	FD	1	lf	4	w	JV	B	C	BEH	FDB	FCNS	WO	5		Y	0.136	N	0.01333	0.490		10	10	5	10	6	4	4	1	10	4	64
504	1521	Raisbeck et al., 1996	Se in food	100	Pronghorn (*Antilocapra americana*)	1	2	0/14	mg/kg diet	N	na	ADL	M	FD	164	d	6-96	mo	JV	M	C	BIO	CHM	HMCT	BL	14		N	63	N	2.070	0.493		10	10	10	10	5	1	4	1	10	4	65
505	25948	Kim and Mahan, 2001	Se in food (selenium yeast)	100	Pig (*Sus scrofa*)	2	4	0/5/10/15/20	mg/kg diet	N	na	ADL	U	FD	12	w	8	w	JV	B	C	PHY	PHY	FDCV	WO	20		Y	68.9	Y	1.700	0.493		10	10	5	5	7	4	4	1	10	4	60
506	1618	Whanger and Butler, 1988	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	PTH	ORW	ORWT	LI	4		Y	0.200	Y	0.02500	0.50		10	10	5	10	7	4	4	1	10	4	65
507	1618	Whanger and Butler, 1988	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	4	0/1/2/4	mg/kg diet	N	na	ADL	U	FD	9	w	NR	NR	JV	M	C	BEH	FDB	FCNS	WO	4		Y	0.200	Y	0.02500	0.50		10	10	5	10	7	4	4	1	10	4	65
508	25959	Gunter et al, 2003	Se in food (selenium yeast)	100	Cattle (*Bos taurus*)	2	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	GRO	GRO	BDWT	WO	26		Y	506	N	11.48	0.590		10	10	5	5	6	8	4	1	10	4	63
509	25959	Gunter et al, 2003	Se in food (selenium yeast)	100	Cattle (*Bos taurus*)	2	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	REP	REP	PRWT	WO	26		Y	506	N	11.48	0.590		10	10	5	5	6	10	4	1	10	4	65
510	25959	Gunter et al, 2003	Se in food (selenium yeast)	100	Cattle (*Bos taurus*)	2	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	BEH	FDB	FCNS	WO	26		Y	506	N	11.48	0.590		10	10	5	5	6	4	4	1	10	4	59
511	1463	Mohan et al., 1976	Selenium dioxide	100	Sheep (*Ovis aries*)	1	3	0/10/20	mg/kg diet	N	na	ADL	U	FD	28	d	NR	NR	NR	NR	C	BIO	ENZ	SGOT	BL	20		N	65.1	N	2.127	0.653		10	10	5	10	5	1	4	10	6	4	65
512	1244	Cabe, et al., 1979	Sodium selenate	100	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	13	w	50	d	JV	M	C	PTH	ITX	INCO	WO	10		Y	0.523	N	0.04023	0.769		10	5	5	10	6	4	4	1	10	4	59
513	1233	Birt et al., 1983	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	3	0/5.00/10.0	mg/kg diet	N	na	ADL	U	FD	25	w	4	w	JV	B	C	PTH	HIS	GHIS	MT	10		Y	0.158	Y	0.01240	0.785		10	10	5	10	7	4	4	1	10	4	65
514	21137	Cutler, 1974	Sodium selenate	41.79	Rat (*Rattus norvegicus*)	1	2	0/24	mg/L	N	na	NR	U	DR	5	mo	NR	NR	JV	M	C	BIO	ENZ	GPTR	LI	24		Y	0.321	N	0.03560	1.11		10	5	5	10	6	1	4	1	10	4	56

Appendix 6.1 Mammalian Toxicity Data Extracted for Wildlife Toxicity Reference Value (TRV)
Selenium

Ref			Exposure																						Effects						Conversion to mg/kg bw/day					Result		Data Evaluation Score													
Result #	Ref N.	Reference	Chemical Form	MW%	Test Species	Phase #	# of Conc/ Doses	Conc/ Doses	Conc/Dose Units	Wet Weight Reported?	Percent Moisture	Application Frequency	Method of Analyses	Route of Exposure	Exposure Duration	Duration Units	Age	Age Units	Lifestage	Sex	Control Type	General Effect Group	Effect Type	Effect Measure	Response Site	Study NOAEL	Study LOAEL	Body Weight Reported?	Body Weight in kg	Ingestion Rate Reported?	Ingestion Rate in kg or L/day	NOAEL Dose (mg/kg/day)	LOAEL Dose (mg/kg/day)	Data Source	Dose Route	Test Concentrations	Chemical form	Dose Quantification	Endpoint	Dose Range	Statistical Power	Exposure Duration	Test Conditions	Total
515	1344	Hau et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	2	3	0/7.6/66	ug/org/d	N	na	ADL	U	DR	29	d	8	w	GE	F	C	BIO	CHM	GBCM	PL	66		Y	0.025	N	0.003579	1.21		10	5	5	10	6	1	4	1	10	4	56
516	36818	Johnson, et al., 2000	Seleno-L-methionine	100	Mouse (*Mus musculus*)	2	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	BIO	CHM	RBCE	BL	9		Y	0.0217	N	0.003151	1.31		10	5	5	5	6	1	4	8	10	4	58
517	36818	Johnson, et al., 2000	Seleno-L-methionine	100	Mouse (*Mus musculus*)	2	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	w	JV	M	C	GRO	GRO	BDWT	WO	9		Y	0.0217	N	0.003151	1.31		10	5	5	5	6	8	4	3	10	4	60
518	36818	Johnson, et al., 2000	Seleno-L-methionine	100	Mouse (*Mus musculus*)	2	4	0/1/3/9	mg/L	N	na	ADL	U	DR	14	d	6-7	d	JV	M	C	PTH	ORW	SMIX	LI	9		Y	0.0217	N	0.003151	1.31		10	5	5	5	6	4	4	10	10	4	63
519	25956	O'Grady et al, 2001	Se in food (selenium yeast (Selplex 50))	100	Cattle (*Bos taurus*)	1	2	0/9.8	mg/org/d	N	na	ADL	M	FD	55	d	NR	NR	JV	M	C	BIO	ENZ	GLPX	MU	9.8		Y	471	Y	10.30	2.08		10	10	10	5	7	1	4	1	10	4	62
520	1277	Davidson-York et al, 1999	Sodium selenite	100	Pig (*Sus scrofa*)	1	2	0/121.7	mg/kg diet	N	na	ADL	M	FD	19	d	NR	NR	NR	B	C	PTH	HIS	GHIS	MT	121.7		Y	49.5	N	1.698	4.17		10	10	10	10	6	4	4	1	3	4	62
521	1344	Hau et al., 1987	Sodium selenite	45.66	Mouse (*Mus musculus*)	1	4	0/7.6/66/330	ug/org/d	N	na	ADL	U	DR	29	d	8	w	GE	F	C	PTH	ORW	SMIX	PC	330		Y	0.025	N	0.003579	6.03		10	5	5	10	6	4	4	1	10	4	59
522	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	1	6	0/1/4/8/16/64	mg/L	N	na	ADL	U	DR	35	d	5, 12	w	JV	B	C	PTH	HIS	GHIS	LI	64		N	0.267	N	0.03016	7.23		10	5	5	10	5	4	4	1	10	4	58
523	1324	Gronbaek and Thorlacius-Ussing 1990	L-selenomethionine	100	Rat (*Rattus norvegicus*)	2	4	0/0.75/1.5/2.25	mg/L	N	na	ADL	U	DR	2	w	NR	NR	NR	M	C	PTH	HIS	GHIS	PI		0.75	N	0.5	N	0.05305		0.0796	10	5	5	10	5	4	4	10	6	4	63
524	1398	Jamall et al., 1987	Sodium selenite	100	Hamster (*Mesocricetus auratus*)	1	2	0/1	mg/L	N	na	ADL	U	DR	30	d	30	d	JV	M	C	BIO	ENZ	GENZ	HE		1	N	0.097	N	0.01213		0.125	10	5	5	10	5	1	4	10	10	4	64
525	1261	Chhabra and Rao, 1994	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/1/5	mg/L	N	na	ADL	U	DR	21	d	NR	NR	LC	F	C	BIO	ENZ	P450	LI		1	Y	0.03	N	0.0042174		0.141	10	5	5	10	6	1	4	10	10	4	65
526	1471	Nebbia et al., 1987	Sodium selenite	45.66	Rat (*Rattus norvegicus*)	1	4	0/4/8/16	mg/L	N	na	ADL	U	DR	240	d	NR	NR	JV	M	C	BIO	ENZ	SBDH	TE		4	Y	0.546	N	0.05743		0.192	10	5	5	10	6	1	4	10	10	4	65
527	1394	Jacobs and Forst, 1981	Sodium selenite	100	Mouse (*Mus musculus*)	2	4	0/10.3/32.3/49.8	ug/org/d	N	na	ADL	U	DR	25	w	6	w	JV	F	C	BIO	ENZ	GLPX	LI		10.3	Y	0.0412	N	0.005611		0.250	10	5	5	10	6	1	4	10	10	4	65
528	1324	Gronbaek and Thorlacius-Ussing 1990	L-selenomethionine	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	4	w	NR	NR	NR	M	C	MOR	MOR	MORT	WO		3	N	0.5	N	0.05305		0.318	10	5	5	10	5	9	4	1	3	4	56
529	1324	Gronbaek and Thorlacius-Ussing 1990	L-selenomethionine	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	4	w	NR	NR	NR	M	C	PTH	HIS	GHIS	PI		3	N	0.5	N	0.05305		0.318	10	5	5	10	5	4	4	10	3	4	60
530	1598	Thorlacius-Ussing et al., 1988	Sodium selenite pentahydrate	100	Rat (*Rattus norvegicus*)	1	2	0/3	mg/L	N	na	ADL	U	DR	42	d	21	d	JV	M	C	BIO	HRM	GTHH	SR		3	Y	0.1005	N	0.01252		0.374	10	5	5	10	6	1	4	10	10	4	65
531	1597	Thorlacius-Ussing et al., 1988	Sodium selenite pentahydrate	30.02	Rat (*Rattus norvegicus*)	1	2	0/10	mg/L	N	na	ADL	U	DR	21	d	25	d	JV	F	C	BIO	CHM	SOMC	SR		10	Y	0.0902	N	0.01136		0.378	10	5	5	10	6	1	4	10	10	4	65
532	3725	Schroeder and Mitchener, 1972	sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/3	mg/L	N	na	DLY	U	DR	519	d	NR	lf	JV	B	C	BIO	CHM	ASIS	KI		3	Y	0.0481	N	0.006450		0.402	10	5	5	10	6	1	4	10	10	4	65
533	3725	Schroeder and Mitchener, 1972	sodium selenate	100	Mouse (*Mus musculus*)	2	2	0/3	mg/L	N	na	DLY	U	DR	519	d	NR	lf	JV	B	C	BIO	CHM	ASIS	KI		3	Y	0.0426	N	0.005782		0.407	10	5	5	10	6	1	4	10	10	4	65
534	1393	Jacobs and Forst 1981	Sodium selenite	100	Rat (*Rattus norvegicus*)	2	2	0/4	mg/L	N	na	ADL	U	DR	13	w	8	w	JV	M	C	BIO	CHM	TWBC	BL		4	Y	0.441	N	0.04738		0.430	10	5	5	10	6	1	4	10	10	4	65
535	1322	Grillo et al., 1987	Selenite	100	Rat (*Rattus norvegicus*)	1	2	0/5.25	mg/kg diet	N	na	NR	U	FD	5	w	NR	NR	NR	NR	C	BIO	ENZ	GENZ	LI		5.25	Y	0.25	N	0.02198		0.462	10	10	5	10	6	1	4	10	3	4	63
536	1532	Salbe et al., 1990	sodium selenate	100	Rat (*Rattus norvegicus*)	1	3	0/4/6	mg/L	N	na	ADL	U	DR	21	d	21	d	JV	B	C	BIO	CHM	PRTL	DT		4	Y	0.101	N	0.01258		0.498	10	5	5	10	6	1	4	10	10	4	65
537	1276	Dausch and Fullerton, 1993	Selenium sulfide	55.19	Rat (*Rattus norvegicus*)	3	5	0/10/30/100/300	mg/kg diet	N	na	ADL	U	FD	1	w	NR	NR	JV	M	C	BIO	CHM	GBCM	LI		10	N	0.18	N	0.01678		0.514	10	10	5	5	5	1	4	10	10	4	64
538	25959	Gunter et al, 2003	Se in food (selenium yeast)	100	Cattle (*Bos taurus*)	2	2	0/26	mg/kg diet	N	na	ADL	U	FD	42	w	NR	NR	GE	F	C	BIO	ENZ	GLPX	SR		26	Y	506	N	11.48		0.590	10	10	5	5	6	1	4	10	10	4	65
Data Not Used to Derive Wildlife Toxicity Reference Value - Measurements of biochemical, behavioral and pathology changes in progeny of exposed parents																																																	
539	1318	Gray et al., 1986	Sodium selenite	100	Mouse (*Mus musculus*)	1	2	0/10	mg/kg bw/d	N	na	DLY	U	GV	5	d	NR	NR	GE	F	C	REP	REP	OTHR	PY	10		N	0.02875	N	0.003715	10.0		10	8	5	10	10	10	4	1	10	4	72
540	1261	Chhabra and Rao, 1994	Sodium selenite	100	Mouse (*Mus musculus*)	1	3	0/1/5	mg/L	N	na	ADL	U	DR	21	d	NR	NR	LC	F	C	REP	REP	OTHR	PY		1	Y	0.03	N	0.0042174		0.141	10	5	5	10	6	10	4	10	10	4	74

All abbreviations and definitions are used in coding stuides are available from Attachment 4-3 of the Eco-SSL guidance (U.S. EPA 2003).

Duplicate values for NOAELs and LOAELs for the same reference represent results from different experimental designs and are identified by different Phase numbers.