Appendix F. Summary of Avian and Mammalian EEC and RQ values After Maximum S-Methoprene Application

Table F.1. T-REX Analysis of Maximum S-Methoprene Application Rate Flowable Concentrarte to Ornamental Woody Plants (0.5829 lbs ai/A; 7 day interval, 4 applications)

Upper Bound Kenaga Residues For RQ Calculation

Chemical Name:	s-methoprene	
Use	wood shrubs	
Formulation	liquid	
Application Rate	0.5829	lbs a.i./acre
Half-life	7	days
Application Interval	7	days
Maximum # Apps./Year	4	
Length of Simulation	1	year

Endpoints

Avian	Mallard duck	LD50 (mg/kg-bw)	2000.00
	Bobwhite quail	LC50 (mg/kg-diet)	10000.00
	Mallard duck	NOAEL(mg/kg-bw)	30.00
	Bobwhite quail	NOAEC (mg/kg-diet)	0.00
Mammals		LD50 (mg/kg-bw)	10000.00
		LC50 (mg/kg-diet)	2000.00
		NOAEL (mg/kg-bw)	2500.00
		NOAEC (mg/kg-diet)	50000.00

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs

Table X. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs			
		Short Grass	Tall Grass	Broadleaf Plants/ Small Insects	Fruits/Pods/ Seeds/ Large Insects

		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	1038.45	298.74	0.29	136.92	0.13	168.04	0.16	18.67	0.02
100	1322.00	170.35	0.13	78.08	0.06	95.82	0.07	10.65	0.01
1000	1867.37	76.27	0.04	34.96	0.02	42.90	0.02	4.77	0.00

Table X. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
10000	262.31	0.03	120.22	0.01	147.55	0.01	16.39	0.00

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	262.31	#####	120.22	#####	147.55	#####	16.39	#####

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	21978.31	250.09	0.01	114.62	0.01	140.67	0.01	15.63	0.00	3.47	0.00
35	17782.79	172.84	0.01	79.22	0.00	97.22	0.01	10.80	0.00	2.40	0.00
1000	7691.61	40.07	0.01	18.37	0.00	22.54	0.00	2.50	0.00	0.56	0.00

Table X. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

LC50	EECs and RQs

(ppm)	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
2000	262.31	0.13	120.22	0.06	147.55	0.07	16.39	0.01

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients

NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
50000	262.31	0.01	120.22	0.00	147.55	0.00	16.39	0.00

Size class not used for dietary risk quotients

Table X. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	5494.58	250.09	0.05	114.62	0.02	140.67	0.03	15.63	0.00	3.47	0.00
35	4445.70	172.84	0.04	79.22	0.02	97.22	0.02	10.80	0.00	2.40	0.00
1000	1922.90	40.07	0.02	18.37	0.01	22.54	0.01	2.50	0.00	0.56	0.00

Table F.2. T-Rex Printout for Granular Application Representing a Maximum of 0.06 lbs ai/A Broadcast to an Open Field (size of the granule is 0.425 mg, 30 day exposure in the environment).

Characterization of Granular LD50/Square Foot Results

Estimation of the number of granules needed to achieve toxicity thresholds	
No. of granules needed to achieve adjusted LD50	114984.17
No. of granules needed to achieve Acute LOC exceedance (1/2 adjusted LD50)	57492.09
No. of granules needed to achieve Endangered Species LOC exceedance	11498.42

(1/10 adjusted LD50)	

Minimum Foraging Area Needed to Allow for Ingestion of Sufficient Mass of a.i. to Achieve LOC Exceedance	
Foraging area (square feet) needed to achieve LOC exceedance assuming 100% feeding efficiency	3.32
Foraging area (square feet) needed to achieve LOC exceedance assuming 50% feeding efficiency	6.65
Foraging area (square feet) needed to achieve LOC exceedance assuming 10% feeding efficiency	33.24

<u>ASSESSING TERRESTRIAL INVERTEBRATE EXPOSURE TO PESTICIDES:</u>

In addition to the normal uncertainties associated with using one surrogate species to represent all members within its taxa (*e.g.*, using a rat to represent 'mammals'), here are some things to consider when using, or considering to use, T-REX and bee contact studies to estimate exposure to terrestrial invertebrates – **<u>CAUTION:</u>** This is ***NOT*** an exhaustive list.

Is contact expected to be the most sensitive route of exposure (*e.g.*, if the most toxic route of exposure is through ingestion, what can a bee contact study tell you? Are more appropriate data, *e.g.*, dietary data, available from ECOTOX)?

Is the chemical expected to be equally toxic to all insect life stages (*e.g.*, if the chemical affects molting, larvae may be particularly sensitive to it, while adults may not be affected by the chemical at all).

Is there some specific reason(s) – based on its mode of action or available data - to suspect that some insect taxa may be more sensitive to a chemical than bees?

Is the toxicity from a dab of the chemical on the thorax of a bee representative of the toxicity due to a more uniform distribution of the chemical over the exposed parts of the entire insect?

And related to this, how representative is a bee to insects with large surface areas per volume (*e.g.*, butterflies and moths)?

<u>Method to estimate terrestrial insect exposure:</u>

For terrestrial invertebrates, normally the only submitted data we have are LD_{50} values for honeybees based on acute contact (a dab of the chemical on the thorax of a honeybee); sometimes we have LD_{50} values from an oral dose of the chemical. Occasionally we may have open literature (ECOTOX) data for dietary exposure, *etc*., for different insect species.

One potential way to estimate exposure (modified from methods originally in Metolachlor salmonid assessment) is:

1) Estimate residue concentrations on fruits/seeds/pods/large insects using T-REX (version 1.2.3) for the particular use(s) being assessed (the EEC values are reported in 'ppm', which is equal to 'µg a.i./g of insect'). The EEC for fruits/seeds/pods/**large insects** should be from one of the non-body-weight-adjusted tables, that is, from a "dietary"-based table in TREX output. To bound the risk, use the broadleaf plant/small insect EEC from a dietary table. The resulting RQ should be approximately 9 times as high, assuming the same body weight and LD50 data.

If no other toxicity data are available for insects, use honey bees as a surrogate for terrestrial insects; otherwise use most sensitive terrestrial insect.

Estimate the residue for a bee (µg a.i./bee) using an adult honey bee weight of 0.128 g (i.e., multiply the EEC for seeds and pods in T-REX by '0.128'). Which equals the exposure in µg a.i./bee.

If toxicity data are available from more sensitive non-bee insect species, use the weight for an individual of that species (in grams) as the multiplier.

Another way to think about it:

Based upon an average fresh weight per honey bee of 128 milligrams, the LD_{50} of honey bees (:g/bee) can be multiplied by 7.8 to determine the ppm toxicity. (Mayer, D. & C. Johansen. 1990. *Pollinator Protection: A Bee & Pesticide Handbook.*Wicwas Press. Cheshire, Conn. p. 161)

µg/g = ppm

µg/bee = µg/128 mg = µg/0.128 g = 7.8 µg/g = 7.8 ppm

To convert ppm to µg/bee, the ppm value would be divided by 7.8.