Appendix F. The Risk Quotient Method And Levels of Concern

The risks to terrestrial and aquatic organisms are determined based on a method by which risk quotients (RQs) are compared with levels of concern (LOCs). This method provides an indication of a chemical's potential to cause an effect in the field from effects observed in laboratory studies, when used as directed. Risk quotients are expressed as the ratio of the estimated environmental concentration (EEC) to the species-specific toxicity reference value (TRV):

$$RQ = \frac{EEC}{TRV}$$

Units for EEC and TRV should be the same (e.g., µg/L or ppb). The RQ is compared to the LOC as part of a risk characterization. Acute and chronic LOCs for terrestrial and aquatic organisms are given in recent Agency guidance (EPA, 2004) and summarized in the table below.

Level of concern (LOC) by risk presumption category (U.S. EPA 2004).

Risk Presumption	RQ	LOC
	Mammals and Birds	
Acute Risk [a]	EEC[b]/LC_{50} or LD_{50}/sqft[c] or LD_{50}/day [d]	0.5
Acute Restricted Use [e]	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day (or LD_{50} <50 mg/kg)	0.2
Acute Endangered Species [f]	EEC/LC_{50} or LD_{50}/sqft or LD_{50}/day	0.1
Chronic Risk	EEC/NOAEC	1
	Aquatic Animals	
Acute Risk	EEC[g]/LC_{50} or EC_{50}	0.5
Acute Restricted Use	EEC/LC_{50} or EC_{50}	0.1
Acute Endangered Species	EEC/LC_{50} or EC_{50}	0.05
Chronic Risk	EEC/NOAEC	1
	Terrestrial and Semi-aquatic Plants	
Acute Risk	EEC/EC_{25}	1
Acute Endangered Species	EEC/EC_{05} or NOAEC	1
	Aquatic Plants	
Acute Risk	EEC[h]/EC_{50}	1
Acute Endangered Species	EEC[g]/EC_{05} or NOAEC	1

[a]Potential for acute toxicity for receptor species if RQ > LOC (EPA, 2004).
[b]Estimated environmental concentration (ppm) on avian/mammalian food items
[c]mg/ft^2
[d]mg of toxicant consumed per day
[e]Potential for acute toxicity for receptor species, even considering restricted use classification, if RQ > LOC (EPA, 2004).
[f]Potential for acute toxicity for endangered species of receptor species if RQ > LOC (EPA, 2004).
[g]EEC = ppb or ppm in water
[h]EEC = lbs a.i./A

The LOCs are criteria used by OPP to indicate potential risk to non-target organisms and the need to consider regulatory action. The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on non-target organisms. LOCs currently address the following risk presumption categories: (1) acute - potential for acute risk to non-listed species; regulatory action may be warranted in addition to restricted use classification, (2) acute restricted use - potential for acute risk to non-

listed species; however, risk may be mitigated through restricted use classification, (3) acute endangered species - potential for acute risk to endangered species; regulatory action may be warranted, and (4) chronic risk - potential for chronic risk; regulatory action may be warranted. Currently, due to lack of modeling applications, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to non-target insects or chronic risk from granular/bait formulations to mammalian or avian species.

For acute studies on taxa where no effects were observed at any concentration level, the RQs are not calculated and a qualitative discussion is provided in the Risk Description section. For acute studies on taxa where an LC_{50}/LD_{50} is not established due to insufficient mortality but some mortality was observed in the study, again, the RQs are not calculated and the study is discussed further in the Risk Description section.

The ecotoxicity test values (i.e., measurement endpoints) used in the acute and chronic risk quotients are derived from the results of required studies. Examples of ecotoxicity values derived from the results of short-term laboratory studies that assess acute effects are: (1) LC_{50} (fish) (2) LD_{50} (birds and mammals) (3) EC_{50} (aquatic plants and aquatic invertebrates) and (4) EC_{25} (terrestrial plants). An example of a toxicity test effect level derived from the results of long-term laboratory study that assesses chronic effects is: NOAEC (No Observed Adverse Effect Level; birds, fish and aquatic invertebrates).