

Appendix D. Risk Quotient Method (RQ) and Levels of Concern (LOCs)

The primary method used to assess risk in this assessment is the risk quotient (RQ) as outlined in the EPA Overview Document (US EPA, 2004). The RQ is the primary risk value for the screening level assessment and is the result of comparing measures of exposure to measures of effect. A commonly used measure of exposure is the estimated exposure concentration (EEC) and commonly used measures of effect include toxicity values such as the median lethal dose (LD₅₀) or the no-observed adverse effect concentration (NOAEC). Assessment endpoints and their respective measures of exposure and measures of effect are listed in **Table D1**. The resulting RQ is then compared to a specified level of concern (LOC), which represents a point of departure for concern; if the RQ exceeds the LOC, then risks are triggered. Although not necessarily a true estimate of risk since there is no estimated probability of effect, in general, the higher the RQ, the more certain the potential risks.

Levels of concern are the policy tool for interpreting risks from direct pesticide effects and have a magnitude, duration, frequency, and spatial extent. The magnitude is set by the risk presumption for each endpoint (described below). The frequency of potential risk is once every ten years for aquatic endpoints and one in every ten foliage samples for terrestrial risk. The spatial extent is defined by the use area, and the areas downstream and areas potentially affected by spray drift.

To evaluate the potential risk to non-target organisms from the use of rotenone, RQs are calculated from the ratio of EECs to toxicity values. Risk quotients are then compared to the LOCs to indicate potential risk to non-target organisms and the consequent need to consider regulatory action. Risk presumptions, along with the corresponding RQs, equations, and LOCs are summarized in **Table D1**. The exposure estimates in this screening assessment are derived using maximum treatment rates for the piscicidal use in lotic and lentic waters.

Table D1. Risk presumptions for aquatic animals.

Risk Presumption	RQ	LOC
Acute	EEC ¹ /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/NOEC	1

¹EEC = (ppm or ppb) in water

Generation of robust RQs is dependent on the quality of data from both fate and toxicological studies. These studies should be conducted following Agency guidelines and are subjected to extensive review to ensure data quality.

Although the lowest toxicity value from available studies is used for RQ calculations, typically, only data from a few species are available. For example, the Agency usually receives avian toxicity studies for bobwhite quail and mallard ducks. Of the 650 avian species in the United States, bobwhite quail or mallard ducks may not be the most sensitive. These species, in fact,

were chosen primarily because they are easy to maintain and rear in the laboratory and they have some value as game species. The same argument holds for all toxicity estimates; in all likelihood the representative species are not the most sensitive. Similarly, for reptiles and amphibians, typically no toxicity data are available. In accordance with the EPA guidance (US EPA, 2004), birds are used as surrogates for terrestrial amphibians and reptiles and fish are used as surrogates for aquatic amphibians. This is thought to result in conservative estimates of risk for herpetofauna; however, due to the lack of available data, it is difficult to determine whether this is the case or not.

Exposure estimates are generated from chemical fate studies and label information, particularly maximum treatment rates for lentic and lotic waters. Although exposure estimates using maximum label rates, actual use rates may vary over the labeled range, particularly for certain targeted fish species.