APPENDIX A

Summary of Available and Relevant Toxicity Data from Ecological Risk Assessment Literature Review for Diquat

Appendix A

Summary of Available and Relevant Toxicity Data from Ecological Risk Assessment Literature Review for Diquat

Introduction

A literature review and ecological data evaluation was conducted on nine herbicides that are currently being used or are proposed for use by the Bureau of Land Management (BLM) for vegetation management on 261 million acres of public lands in the Western U.S., including Alaska. The information gathered from this evaluation will be included along with other collected data to derive toxicity reference values for use in the ecological risk assessment (ERA; ENSR 2005). The ERA was conducted in conjunction with the Vegetation Treatments Programmatic Ecological Impact Statement (PEIS) for the BLM. Scientific papers were gathered during this process to provide data on acute and chronic toxicity of selected herbicides to the non-target species. The review process included consideration of U.S. Fish and Wildlife Service (USFWS) draft literature search guidance. The nine herbicides that were investigated during this evaluation were as follows:

- Diflufenzopyr
- Diquat
- Fluridone
- Imazapic
- Sulfometuron-methyl
- Bromacil
- Chlorsulfuron
- Diuron
- Tebuthiuron

This review process was carried out in three tiers: Tier I – Literature search and preliminary review to select individual manuscripts; Tier II – Screening to determine whether the manuscript is acceptable; and Tier III – Thorough review to obtain data for possible toxicity reference value (TRV) use. This report provides information for diquat; the other chemicals are discussed in separate reports.

Literature Search Methodology

The literature review process was initiated by conducting a keyword search pertaining to each of the nine chemicals in selected databases. The keyword search for all databases, except for one (Chemical Abstracts/Scifinder Scholar), included the herbicide name but not the commercial name (i.e., some commercial names are common words). The search parameters for Chemical Abstracts consisted of the herbicide name and chemical abstracts service (CAS) registry number. The open literature search was conducted at Colorado State University, Fort Collins, CO. The search period for diquat was from 1970 to 2002. The 12 databases selected and searched were:

- AGRICOLA
- ASFA (Aquatic Sciences and Fisheries Abstracts)
- Biological Sciences
- BIOSIS / Biological Abstracts
- Chemical Abstracts / Scifinder Scholar
- Environmental Science and Pollution Management
- MedLine

- Safety Science and Risk
- Toxline
- Water Resources Abstracts
- Web of Science / Science Citation Index
- Zoological Records

All of the documents obtained in the open literature searches were then evaluated by a Senior Toxicologist to select manuscripts pertaining to the specific objectives of this project (Tier I). Relevant studies were those that were judged, to the extent possible while searching literature databases (i.e., relying on title and abstract, when available), to provide useful data for conducting the ERA. Relevant studies contained the following information at a minimum:

- Acute (mortality vs. survival) or chronic (largely growth or reproduction, although other sublethal data—if available—were also considered potentially relevant) toxicity data for the active ingredient.

- Verifiable numeric endpoint values (e.g., LC_{50}, NOEC) that could be used in the risk characterization process.

- Toxicity data for clinical test species (e.g., mice, rats) and species used for screening non-human impacts (all other mammals, birds, invertebrates, algae, plants).

- Field or mesocosm studies were also included, but only if effects from exposure to the single herbicide in question could be identified and separated from other stressors.

Literature that was excluded as part of this initial literature gathering process included:

- analytical chemistry studies;

- methods papers without specific toxicity data;

- modeling studies that contained no empirically-derived data; and

- reviews or reports that were not primary toxicity data sources (except as a source for obtaining primary literature).

These search criteria enhanced the ability to screen scientific papers for the type of toxicity information needed in the ERA. Hard copies of all manuscripts that met these criteria were then obtained for further evaluation. Once articles were obtained, they were incorporated into a comprehensive management database (EndNote®). There were 243 documents identified from this process and obtained for further consideration. The bibliography list of articles obtained for diquat is included in this report (Appendix A.1).

Literature Review Methodology

A cursory review (Tier II) was performed on each manuscript after a hard copy was obtained. Exclusion and inclusion criteria to determine acceptability for further review were developed prior to the process in conjunction with the BLM. Manuscripts were excluded that dealt only with the following subjects:

- Human health effects
- Effects on microorganisms: (e.g., fungi, bacteria)
- Genotoxic effects (mutagenic, carcinogenic)
- Bioassays on cells of a whole organism (e.g., rat hepatocytes, rat liver S9)
- Effects on target plants (efficacy testing)
- Non-toxic effects (e.g., fate, transport, leaching, analytical methods)

- Mixtures including herbicides other than the nine being reviewed

In addition, manuscripts that solely included data on marine receptors were originally excluded; however, these data were later included because marine ecosystems could be adjacent to application areas on BLM lands.

Inclusion criteria and rating (on a scale of 1 [weak] to 5 [strong]) of issues that were to be emphasized (requiring a subsequent review step) were as follows:

1. Effects on nontarget receptors related to ERA protocol
2. Chronic, sub-lethal, or reproductive effects that may have adverse effects on populations
3. Effects form inerts, degradates, and metabolites
4. Studies with mixtures that include diflufenzopyr and any of the 8 other herbicides (i.e., not containing other herbicides)
5. Indirect effects to food supply or cover

Additional criteria that were used in reviewing papers (reviewers answered 'Yes' or 'No') are listed below:

- Were the corroborating studies described in sufficient detail (i.e., weight of evidence)?
- Did the study have a proper exposure dose, mechanism, and duration?
- Did the test include proper sample size, statistical analysis, and especially statistical endpoints (e.g., NOAEL, EC_{50}) or dose response curves?
- Were proper controls used and were they acceptable?
- Were the data published in a peer-reviewed journal?

Each of the 243 identified papers was scored on the selection criteria listed above, including documentation of the number of test organisms, statistical analysis, proper use, and performance of controls, and the study was classified as either "adequate" on "not adequate".

In Tier III, papers that were found to be acceptable for use were evaluated more thoroughly based on criteria developed with the BLM, and the following information is included as a second review form page for each manuscript (Appendix A.2):

- Author(s).
- Date of publication.
- Title of publication.
- Name of publication.
- Herbicide(s) used in the study.
- Receptor category: 20 g mammal, honey bee, 70 kg herbivore, small bird, large bird, non-target plants (monocot and dicot), warmwater fish, coldwater fish, aquatic invertebrate, aquatic plant, aquatic macrophyte). The specific life history stage was also recorded when available.
- Exposure conditions specifying the formulation, concentration, or amount of active ingredient and medium.
- Effect: Acute or sublethal effect end points of product formulations and breakdown products, and/or their component chemicals, such as: larval and embryonic developmental effects, endocrine disruption, reproductive impairment, changes in behavioral traits such as predator avoidance, feeding/appetite, lethargy or excitement, homing ability, swimming speed, or attraction to or repulsion from the chemicals.
- Toxicity endpoints (e.g., NOAEL, EC_{50}, LC_{50}, or dose response curve).
- Degradates, inerts, if available.
- Ecological conditions of study (e.g., mescosm, static/flow-through, water quality parameters).
- Comments (e.g., mixture effects: additive, synergistic, or antagonistic effect end points of multiple products, other observations).

The Tier II review for diquat was conducted by only one senior toxicologist, while in the subsequent review process (Tier III), two senior toxicologist independently reviewed papers and determined data adequacy. The reviews were then compiled, and the pertinent information was entered into a master spreadsheet documenting

review findings for possible use in TRV derivation. The documents used in this TRV derivation are designated in **bold** in the bibliography (Appendix A.1), and the derivation of TRVs from all available sources is reported in the ERA (ENSR 2005).

Results

There were 125 papers discovered in the review of the open literature for diquat, and of these, 46 were reviewed as part of Tier III. Data from 38 manuscripts were incorporated into the spreadsheet for TRV derivation for diquat (Table 1; Appendix A.3).

TABLE 1

Summary of the Results of the Open Literature Review for Diquat

Total number of papers obtained for diquat	125
Total number of papers accepted for Tier II review	46
Total number of papers used in TRV derivation	38

Information from the open literature review for diquat is contained in the TRV spreadsheet as well (Appendix A.3). The data collected during this review resulted in toxicity information for aquatic plants, crustaceans (amphipods, isopods, ostracods, fairy shrimp, cladocerans, copepods), phytoplankton (green algae, diatoms, euglena), fish (striped bass, smallmouth bass, largemouth bass, walleye, mosquitofish, carp, rainbow trout, brown trout), eel, amphibians (frogs, toads, newts), birds (mallard duck, ringneck pheasant, japanese quail, bobwhite quail), and small mammals (mice and rats). There were multiple studies for some species. Data were available on the chronic toxicity of diquat to several species including mice (Anderson et al. 1976), newts (Cooke 1977), cladocerans and copepods (Draxl et al. 1991), algae (Melendez et al. 1993), and mallard ducks (Sewalk et al. 2001). There were no studies found that examined the effects of degradation products of diquat or mixtures of diquat with any of the other eight herbicides evaluated. Several studies examined the indirect effects of diquat on food supply via changes in alga density (Philips et al. 1992; Melendez et al. 1993), duckweed growth (Peterson et al. 1994; Peterson et al. 1997), and aquatic macrophyte biomass (Cragg and Fry 1984).

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APPENDIX A.1

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APPENDIX A.2

TIER II AND III LITERATURE REVIEW FORMS

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-3-03 PJD
Title of Paper/Report:	Toxicity of some herbicides to major carp fingerlings
Author(s)	S. P. Singh + N. K Yadav.
Journal/Year/Vol:Pages	J. Ecol / 1978 / 5: 141-147

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Study did not apparently follow appropriate scientific procedures - methods mentioned elsewhere (Oser 1971) - presents results in figs as % mortality - don't calc endpts eg. LC50, NOEC, etc

dequat
diuron

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Determination of genotoxicity of the metabolites of the ....
Author(s)	R. G. Shah et al.
Journal/Year/Vol:Pages	Molecular and Cellular Biochem / 1997 / 168: 177-184

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Yes
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	NA
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: diquat	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Invertebrate behavior as an indicator of contaminated water and sediment
Author(s)	E.H. Smith and D.T. Logan
Journal/Year/Vol:Pages	Environ. Toxicol and Risk Assess./1993/2nd Ed. ASTM STP 1216. pp 48-

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2- behavioral
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Unknown
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	N/A
Were proper controls used and was control performance acceptable?	N/A
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection: Does not appear to present new data; behavioral data discussed - not appropriate for this study	

digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	A review article on placental transfer of pesticides
Author(s)	A. K. Salama et al
Journal/Year/Vol:Pages	J. Occup. Med. Toxicol. / 1993 / 2: 383-387

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Review - no new data - deals only with placental transfer	

digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	RBW 10/15/03
Title of Paper/Report:	Developments in the use of herbicides for the control of aquatic macrophytes
Author(s)	Robson
Journal/Year/Vol:Pages	Water Treatment & Examination 1969 327-337 18(4)

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	NA
Chronic effects (e.g., reproductive) that may affect populations	↓
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Not evaluate
Was the test of proper exposure dose, mechanism, & duration?	↓
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	

digest review · no new data

diuron

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	RJN 10/11/03
Title of Paper/Report:	Comparative dietary toxicities of pesticides to birds
Author(s)	~~Heat~~ Heath et al
Journal/Year/Vol:Pages	~~Book~~ Report 1972 No: 152 1-57

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	↓
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	↓
Effects to target plants (efficacy testing)	↓
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	↓
Mixtures including non-BLM herbicides	↓
Marine receptors	↓

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	5
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	Na
Mixtures of any of the five herbicides	↓
Indirect effects (food supply, cover)	↓

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	yes
Was the test of proper exposure dose, mechanism, & duration?	yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	yes
Were proper controls used and was control performance acceptable?	yes
Are the data presented in a peer-reviewed journal?	No - internal review

Should evaluation of this paper continue in Task 2?	yes
Additional comments regarding acceptance/rejection:	USFW pub mod-high ranking

Task 2: Data Evaluation

Reviewer/Date:	LJW 10/11/03
Partial Title of Paper/Report:	Comparative dietary toxicities of pesticides...

Herbicides tested:	diquat diuron

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: ring-necked pheasants (Phasianus colchicus)	
Test Species:	bobwhites quail (Colinus virginianus) mallard (Anas platyrhynchos) Japanese quail (Coturnix coturnix)		
Life Stage:	2-3 wk old birds		
Duration:	5d exposure to diet / 3 d extra for observation		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	diet (ad lib. tum) mixed w/ corn oil or propyl glycol
Test Concentrations (if appropriate):	6 concs spaced geometrically
Test System (e.g., flow-thru, mesocosm, etc.):	

1 pen / conc w/ 6-15 birds depending on availability

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	diquat in dry diet LC50/EC50	diuron ~~IC~~ (LC50)	NOEC/NOAEC	LOEC	Other ( )
Mortality/Survival CV	715	1730			
Growth CL	333	> 5000 (14% mort)			
Reproduction PC	634	> 5000 (33% mort @ 4200, repellent @ 5000)			
Embryo/Larval Develop. AP	510	> 5000 (30% mort)			

Degradates/Inerts:	
Additional Comments and Observations:	- acclimated to untoxed diet - stats mentioned

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	RJN 10/13/03
Title of Paper/Report:	Lethal dietary toxicities of environmental pollutants to birds
Author(s)	Hill et al
Journal/Year/Vol:Pages	USFWS Special Scientific Rpt 1975 #191: 1-61

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	NA
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Not evaluated
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection:	SAME data as in Heath 1972

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	MBN 10/17/03
Title of Paper/Report:	The tolerance of grass carp Ctenopharyngodon Della Val., to aquatic herbicides
Author(s)	Tooby, Lucey & Stott
Journal/Year/Vol:Pages	J Fish Biol 1980 16:591-597

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	NO
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	3
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	NA
Mixtures of any of the five herbicides	↓
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	yes
Was the test of proper exposure dose, mechanism, & duration?	yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	yes n=?
Were proper controls used and was control performance acceptable?	NR
Are the data presented in a peer-reviewed journal?	yes

Should evaluation of this paper continue in Task 2?	yes
Additional comments regarding acceptance/rejection:	- Nominal logs - not sure about replication - acetone conc higher than present daty guidelines

~~A~~ low-mod rank

Task 2: Data Evaluation

Reviewer/Date:	RZW 10/17/03
Partial Title of Paper/Report:	The tolerance of grass carp, Ctenopharyngodon...

Herbicides tested:	diuron diquat

20 g Mammal	Honey Bee	70 kg ~~Herbivore~~	Large Bird
Small Bird	Aquatic Invertebrate	~~Warmwater Fish~~	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Grass ~~ca.~~ carp	
Test Species:	Ctenopharyngodon idella		
Life Stage:	9.5 cm 15.8 g 1+yr		
Duration:	5d		

Exposure Conditions	
Formulation:	diuron technical grade (97%) Aquacide diquat commercial formulation
Concentration/amount of active ingredient:	100% 13.5%
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	geometric series
Test System (e.g., flow-thru, mesocosm, etc.):	40L glass aquaria flow-thru (10 L/h) 10 fish/aq

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	13°c-diuron	Organic Carbon (D or T):	
pH:	8.1	Ammonia:	
Other ( ):	declorinated tap H_2O	Other ( ):	
Other (hard):	270 mg/L	Other ( ):	

96 h

Biological and Statistical Endpoints					
Endpoint	LC50/EC50	IC ( )	NOEC/NOAEC	LOEC	Other ( )
Mortality/Survival diquat	1718 (560-5275)				
Growth diuron	31 (28-34)				
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	- 1 wk acclimation - fed during study - diuron - solvent control (acetone) - 1000 mg/L - highest conc. - also present 24 & 48h LC_{50}s - reps?

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Deleterious changes induced by the fungicide ethylenebis et al.
Author(s)	K.V. Prahlad and R.J. Anderson
Journal/Year/Vol:Pages	Cytobios / 1975 / 14:63-74

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	Histopathology
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes - Histo.
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Mixture incl. non-BLM herbicide	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Influence of trophic status on the toxic effects of a herbicide: a microcosm study
Author(s)	J. R. Pratt and R. Barreiro
Journal/Year/Vol:Pages	Arch. Environ. Contam. Toxicol. / 1998 / 35: 404-411

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3- Microbial communities
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	3- Microbes For Food

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	- Only one dose
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection: digest	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Effect of sediment on estimates of diquat toxicity . . . .
Author(s)	J. R. Pratt et al.
Journal/Year/Vol:Pages	Water Research / 1990 / 24: 51-57

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes - but also eff. of sed.
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes - Fate w. Sediment
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 3 cell growth
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	3

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	~~Yes~~ / NO
Additional comments regarding acceptance/rejection:	Could be very important regarding the effects of sediment on toxicity - results are to microbial community - No further review PJN

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Predicting the ecological effects of herbicides
Author(s)	J. R. Pratt et al.
Journal/Year/Vol:Pages	Ecol. Applications / 1997 / 7: 1117-1124

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	NA
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	NA
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	Yes?

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No, new toxicity data presented — discusses modeling only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Effect of diquat on the distribution of iron in Rat Liver
Author(s)	D. W. Reif et al.
Journal/Year/Vol:Pages	Toxicol. Appl. Pharm. / 1988 / 93: 506-510

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes (via Rat studies)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: No environ. toxicity.	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Environ. Behavior of Aquatic Herbicides in Sediments
Author(s)	K. H. Reinert
Journal/Year/Vol:Pages	SSSA Special Publ. No 22 / 1989 / 335-348 Soil Science Society of America

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	|
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	|
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	|
Were proper controls used and was control performance acceptable?	|
Are the data presented in a peer-reviewed journal?	?

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Does not present toxicity data; does present info on how flonicdone acts in the presence of sediment digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Age-Associated Increase in Ferritin Content of Male Rat Liver . . . .
Author(s)	L. E. Rikans et al.
Journal/Year/Vol:Pages	ARCH Biochem and Biophysics / 1997 / 344:85-93

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Effects of isolated cells only.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Age-Assoc. Enhancement of diquat-induced lipid peroxidation...
Author(s)	L. E. Rikans and Y. Cai
Journal/Year/Vol:Pages	The J. of Pharm. Exp. Therapeutics / 1992 / 262: 271-278

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes (Rat Liver)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Rat liver study only.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Diquat-Induced Oxidative Damage in BCNU-Pretreated . . . .
Author(s)	L.E. Rikans and Y. Cai
Journal/Year/Vol:Pages	Toxicol Applied Pharm./1993/118:263-270

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Effects in isolated cells only.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Age-related susceptibility to hepatotoxicants
Author(s)	L. E. Rikans and K. R. Hornbrook
Journal/Year/Vol:Pages	Environ. Toxicol. & Pharm. / 1997 / 4: 339-344

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No original data - summarizes previous isolated cell studies

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard/5-26-03
Title of Paper/Report:	Characterizing aquatic ecological risk from pesticides . . . .
Author(s)	A. M. Ritter et al.
Journal/Year/Vol:Pages	ET+C / 2000 / 19:749-759

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	N/A
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	~~Yes~~ No
Additional comments regarding acceptance/rejection: No new data - presents modeling to evaluate possible environ. exposure	

Not put in database - no relevant info

Task 2: Data Evaluation

Reviewer/Date:	MDN 10/1/03
Partial Title of Paper/Report:	Characterizing aquatic ecological risks from pesticides...

Herbicides tested:	

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	– presents physicochemical properties – fate

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Effect of some herbicides on freshwater algae
Author(s)	T. O. Robson
Journal/Year/Vol:Pages	Pesticide Sci / 1976 / 7: 391-402

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	Possibly - algae
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	3 - algal Growth

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Only a few
Was the test of proper exposure dose, mechanism, & duration?	No - 1 dose diquat
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	Unknown
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	~~No~~ yes ~~(field data)~~ / conc level
Additional comments regarding acceptance/rejection:	-Only one dose used in a ~~field~~ lab experiment - No statistical analysis

Task 2: Data Evaluation

Reviewer/Date:	RZN 9/30/03
Partial Title of Paper/Report:	Effect of some herbicides on freshwater algae

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: algae (filamentous)	
Test Species:	Vaucheria dichotoma		
Life Stage:	20 filaments/chamber 15-30 cm long		
Duration:	3 wks		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	growth media
Test Concentrations (if appropriate):	2 mg/L
Test System (e.g., flow-thru, mesocosm, etc.):	3L

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					
V. dichotoma	all dead after 1 wk @		2 mg/L		

Degradates/Inerts:	
Additional Comments and Observations:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Toxicity Assessment of Pesticides using the Microtox Test . . . .
Author(s)	M. J. Ruiz et al.
Journal/Year/Vol:Pages	Bull. Environ Contam Toxicol / 1997 / 59:619-625

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	Yes X (Microtox)

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Paper only looks @ Microtox effects - No effects to ~~prokary~~ eukaryotes. diquat	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	The effect of bipyridyl herbicides on the loss of nutrients from fungi
Author(s)	I. B. Sahid et al.
Journal/Year/Vol:Pages	New Phytologist / 1981 / 89: 401-409

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	/
Genotoxic effects (mutagenic, carcinogenic)	/
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	/
Effects to target plants (efficacy testing)	/
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	/
Marine receptors	/

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Dealt with how diquat impacts loss of nutrients in fungi - no toxicity data.	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Acute toxicity and some hematological changes in grass carp exposed to diquat
Author(s)	M.A. Salah El-Deen & W.A. Rogers
Journal/Year/Vol:Pages	J. Aquat. Ani. Health / 1992 / 4:277-280

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Partially - No separate "real" reps
Were proper controls used and was control performance acceptable?	No evidence of controls in tox test
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	~~No~~ yes
Additional comments regarding acceptance/rejection:	No evidence of controls in the toxicity test; no replicates

(presented 96h LC_{50} so reviewed) RBW

Task 2: Data Evaluation

Reviewer/Date:	RJN 8/20/03
Partial Title of Paper/Report:	Acute toxicity and some hematological ...

Herbicides tested:	diquat dibromide

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	(Warmwater Fish)	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Grass carp		
Life Stage:	$\bar{x}$=23.5g & 10.5 cm length (acclimated to lab for 2 wks)		
Duration:	96h acute study / 168h biomarker study		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	35.3% a.i.
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	15, 25, 62, 70, & 117 mg/L - 96h exposure
Test System (e.g., flow-thru, mesocosm, etc.):	static (250 L tanks)

Test System Monitoring			
Dissolved Oxygen:	>7.4 mg/L	Conductivity:	
Temperature:	20-22°C	Organic Carbon (D or T):	
pH:	7.0-7.6	Ammonia:	
Other (Alk):	26 mg/L	Other (photoperiod):	16h light : 8h dark
Other (hard):	21 mg/L	Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50** 96h	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	53.0 mg/L	probit analysis 95% CI		46.02-61.05	
Growth					
Reproduction					
Embryo/Larval Develop.					
increased hematocrit				168h @ 2 mg/L	
"				48h @ 53 mg/L	

Degradates/Inerts:	
Additional Comments and Observations:	- neither exposure scenario (for hematocrits) altered hemoglobin concs for 168hs - off feed 48h prior to exposure. - mortality <1% during acclimation - measured concs of a.i. (no methods presented) - presents LC_{50}s for other species in RED from other studies (on back) - no control data mentioned in 96h acute study

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Changes in total protein and transaminase activities ...
Author(s)	M. A. Salah El-Deen + W.A. Rogers
Journal/Year/Vol:Pages	J. Aquat. Anim. Health / 1993 / 5: 280-286

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes – Biomarkers
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	- No toxicity data – biomarker information

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Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	Toxicities of some herbicides to Six species of freshwater crustaceans
Author(s)	H. O. Sanders
Journal/Year/Vol:Pages	J. W.P.C.F. / 1970 / 42: 1544-1550

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Unknown
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	Unknown
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	No 425
Additional comments regarding acceptance/rejection:	No reps apparently used. Found it in text. diquat data not presented -

bioassay methods presented elsewhere (Sanders & Cope 1968 & 1969)

Task 2: Data Evaluation

Reviewer/Date:	RZN 8/21/03
Partial Title of Paper/Report:	Toxicities of some herbicides to six species of freshwater crustaceans

Herbicides tested:	diquat
	diuron

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	(Aquatic Invertebrate)	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Gammarus fasciatus		
Life Stage:	early instar		
Duration:	≤ 96 h		

Exposure Conditions	
Formulation: technical	(Diuron) & emulsifiable concentrate (diquat)
Concentration/amount of active ingredient:	~~Diuron technical~~
Medium (water, food, soil, etc.): dissolved	in EtOH (< 1 ml/L of H_2O)
Test Concentrations (if appropriate):	4-5 not specified (with appropriate controls
Test System (e.g., flow-thru, mesocosm, etc.):	static 4 L of exposure H_2O

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	15.5°C	Organic Carbon (D or T):	
pH:	7.4	Ammonia:	
Other (TDS):	361 mg/L	Other (hardness):	272 mg/L Ca = 176 mg/L Mg = 96 mg/L
Other (Alk):	260 mg/L	Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50** (95% CI)	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	1.8 (0.80-5.2) (48h)	} Diuron	mg/L		
~~Growth~~ "	0.7 (0.19-8.2) (96h)				
Reproduction					
Embryo/Larval Develop.					
Mortal	> 100 mg/L	for diquat			

~~Mu~~ Data on scud (diquat & diuron) from a # of bioassays → methods not clearly presented

Degradates/Inerts:	
Additional Comments and Observations:	< 10% mortality 4 d prior to testing - n = 1 (?) with 10 organisms/chamber - 2 h acclimation period in chamber prior to intro of herbicide - prelim tests used to set test concs

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Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Cytotoxicity of the redox cycling compound diquat . . . .
Author(s)	M. S. Sandy et al.
Journal/Year/Vol:Pages	Arch. Biochem. and Biophysics / 1987 / 259: 28-37

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Does not address toxicity

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Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Disposition and toxicokinetics of diquat in channel catfish
Author(s)	I.R. Schultz et al.
Journal/Year/Vol:Pages	Aquatic Toxicol. / 1995 / 33 : 297-310

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes-Accumulation
Mixtures including non-BLM herbicides	No
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No-Not much variation in doses
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Unknown
Were proper controls used and was control performance acceptable?	Unable to determine
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes (considered) no tox data
Additional comments regarding acceptance/rejection:	Does include tissue residue data for diquat. Might be useful in ERA & toxicokinetics

Tissue residue
Toxicokinetics

Task 2: Data Evaluation

Reviewer/Date:	RJN 9/25/03
Partial Title of Paper/Report:	Disposition and toxicokinetics of diquat in channel catfish

Herbicides tested:	diquat (C^{14} labelled)

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			
Duration:	6 d		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	5 & 20 µg/ml
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	- steady state plasma conc (0.6 % exposure H_2O) achieved in 24 h - steady state tissue conc reached by 72 h - highest tissue conc - trunk kidney (100 x that in plasma) - conc in white muscle was low & similar to plasma levels

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Literature Review Form

Reviewer/Date:	Pilland / 5-27-03
Title of Paper/Report:	Mutagenic and embryotoxic effects of Paraquat and diquat
Author(s)	A. Selypos et al.
Journal/Year/Vol:Pages	Bull. Environ. Contam Toxicol / 1980/25:513-517

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No, but mostly mutagenic!
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4- Effects to embryos
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: Contains data on mammalian reproductive effects, which could be useful in an ERA.	

Task 2: Data Evaluation

Reviewer/Date:	RJN 9/9/03
Partial Title of Paper/Report:	Mutagenic and embryotoxic effects of paraquat and diquat

Herbicides tested:	diquat

CFLP strain male mice for mutagenic exps.

20 g Mammal 35g	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	CFLP strain mice		
Life Stage:	male - mutagenic exps female - teratogenic exps		
Duration:			

Exposure Conditions	
Formulation:	Reglone (20% diquat) split to 4 smaller doses
Concentration/amount of active ingredient:	20% diquat in doses
Medium (water, food, soil, etc.):	OS & IP
Test Concentrations (if appropriate):	i.p. 22 mg/kg (i.p. LD_{50}) & 1/3 (7.3 mg/kg), 1/6 (3.6 mg/kg) &
Test System (e.g., flow-thru, mesocosm, etc.):	o.s. 90.0 mg/kg (1/2 LD_{50}) 1/30 of LD_{50} (0.73 mg/kg

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival i.p.	LD50 22 mg/kg				
~~Growth~~ survival o.s.	LD50 180 mg/kg				
Reproduction					
Embryo/Larval Develop.					
Mutagenic i.p.			i.p. 1x 22 mg/kg or	2x 7.3 mg/kg or 2x 3.6 mg/kg or	
" o.s.			o.s. 1x 90 mg/kg	5x 0.73 mg/kg	
embryonic				11 mg/kg (i.p.)	
Degradates/Inerts:				2x 2.7 mg/kg (i.p.)	

Additional Comments	- control organisms used - in liver cells of embryos diquat (& paraquat) were not mutagenic - diquat had an embryotoxic effect on bone structure of mice at both concs tested 1x 11 mg/kg i.p. & 4 x 2.7 mg/kg i.p.

Nothing put in database

No stats

Mutagenic is eliminated based on criteria.

Can't tell what is sigly diff from control in

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Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Effects of diquat, an aquatic herbicide, on the development ....
Author(s)	C. J. Sewalk et al
Journal/Year/Vol:Pages	J. Toxicol. Environ. Health, Pt. A / 2001 / 62: 33-45

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4 - embryo exposure
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	RSN / 9/9/05
Partial Title of Paper/Report:	Effects of diquat, an aquatic herbicide, on the ...

Herbicides tested:	diquat dibromide

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird (Mallard)
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Anas platyrhynchos (mallard)		
Life Stage:	eggs		
Duration:	10 s		

Exposure Conditions	
Formulation:	Diquat Herbicide H/A
Concentration/amount of active ingredient:	448 g/L of diquat bromide salt (240 g cation/L)
Medium (water, food, soil, etc.):	distilled H_2O
Test Concentrations (if appropriate):	0.88, 3.5, 7, 14, 56 g/L on either day 4 ~~or 21~~ (n=21)
Test System (e.g., flow-thru, mesocosm, etc.):	0.88, 3.5 or 7 g/L exposed on day 21 (n=20) of incubation

Test System Monitoring			
Dissolved Oxygen:	N.R.	Conductivity:	N.R.
Temperature:	37.6° C (incubator)	Organic Carbon (D or T):	N.R.
pH:	N.R.	Ammonia:	N.R.
Other (rel. humidity):	70%	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	9.6 g/L	for day 4 exposure	NOEC = 3.5	LOEC = 7.0	
~~Growth~~ mortality	12.6 g/L	for day 21 exposure → ~~so~~ did not			produce deformities
Reproduction					
Embryo/Larval Develop.					
growth (~~day~~ exp)	day 4 exp		14 g/L	56	
Mortality day 21d			3.5	7.0	
growth day 21d			≥ 7.0	—	

Degradates/Inerts:	
Additional Comments and Observations:	- removed weak/dead embryos on day 3 (candling) - included control group - initial range-finding test done previously - ~~Many~~ Many biochemical measurements

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03
Title of Paper/Report:	A Rebuttal to: "The toxicity of diquat, Endothall, and Fluridone...."
Author(s)	J. L. Shaw & M. J. Hamon
Journal/Year/Vol:Pages	J. Freshwater Ecol / (19) 10: 303-308

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	NA
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No toxicity data are presented - just a rebuttal

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	Toxicity of diquat and cutrine to fingerling brown trout
Author(s)	H.A. Simonin and J.C. Skea
Journal/Year/Vol:Pages	NY Fish + Game J. / 1977 / 24: 38-45

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - (TLm)
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	?

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	R. NADDY / 9/9/03
Partial Title of Paper/Report:	Toxicity of diquat/~~to~~ cutrine to fingerling BT

Herbicides tested:	Diquat
	cutrine (7.1% Cu)

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Brown trout		
Life Stage:	40.3 mm fingerlings		
Duration:	96 h		

Exposure Conditions	
Formulation:	35.3 % diquat ~~b~~. dibromide
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water (Spring water)
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	Static 16 L (in 20 L glass jars)

Test System Monitoring			
Dissolved Oxygen:	5.6 – 11.2 mg/L	Conductivity:	
Temperature:	18.3°C (65°F)	Organic Carbon (D or T):	
pH:	7.5	Ammonia:	
Other (Alk):	100 mg/L	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	96h TLm of 20.4 mg/L	diquat cation			
~~Growth~~	48h TLm 22.4 mg/L	"			
~~Reproduction~~	24h TLm 32.6 mg/L	"			
Emb~~ryo/Larval Develop~~.		96h survival	NOEC < 5.5 mg/L		

Degradates/Inerts:	
Additional Comments and Observations:	- More water than data presented in Burdick et al 1954 in refs - fish acclimatized for ≥ 7d prior to testing - unfed 3 d prior to use - present control mortality (< 10%) - n = 4 (5 fish / jar, 20 / trtmnt) - present all data from acute study @ 24, 48 & 96 h - also did (synergistic) mixture of 2 chemicals - report other endpts of diquat tox (on back)

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Dillard / 6-3-03
Title of Paper/Report:	Persistence of diquat in the aquatic environment
Author(s)	G.V. Simsiman and G. Chesters
Journal/Year/Vol:Pages	Water Res / 1976 / 10: 105-112

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	N/A
Chronic effects (e.g., reproductive) that may affect populations	N/A
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No toxicity data

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-26-03 P-3N
Title of Paper/Report:	~~Residue~~ Diquat and endothall: Their fates in the environment
Author(s)	G.V. Simsiman et al
Journal/Year/Vol:Pages	Residue Reviews / 1976 / 62: 131-174

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	2
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	Yes No review paper
Additional comments regarding acceptance/rejection: Paper is a review, with no new data, however, provides a good summary of fate & effects, w some chronic info.	

Ck on original data / rpts / manuscripts

b) Fish and aquatic invertebrates

Diquat contamination of the aquatic environment through runoff from treated lands and from direct application to control weed nuisances poses concern regarding its effect on aquatic life. Because of this concern studies have been undertaken to determine the toxicity of diquat not only on fish but also on invertebrates. Invertebrates represent an extremely important link in the food chain.

Table IV shows the acute toxicities of diquat to fish. The median tolerance limit (TL_{50}) appears to be influenced by species, exposure time, and water hardness. Certain species tend to be less tolerant to high diquat concentrations in soft water. LAWRENCE *et al.* (1965) found that the threshold toxicity level for diquat on bluegills, largemouth bass, fathead minnows, channel catfish, and rainbow trout was generally in excess of 10 mg/L of the cation. Also, HILTIBRAN (1967) reported that bluegills tolerated 10 mg/L of diquat during a 12-day exposure. WILSON and BOND (1969) studied the acute toxicities of diquat to 5 insect species and an amphipod species (Table IV). The amphipods were very sensitive to low levels of diquat while insects tolerated very high levels of the herbicide. CROSBY and TUCKER (1966) reported median immobilization concentrations (IC_{50}) of 7.1 mg/L diquat to a Cladoceran species, *Daphnia magna*.

Data indicate that the normal recommended rates of diquat (0.5 to 3.0 mg/L) for aquatic weed control appear to be well below the toxicity level for many species of fish and invertebrates. A weed-control experiment in a reservoir demonstrated that addition of diquat up to 1.0 mg/L did not harm smallmouth bass, green sunfish, mosquitofish, and golden shiner minnows (YEO 1967). Similar results were observed in growth pools treated with 0.5 to 4.0 mg/L diquat except for the death of some mosquitofish. No mortality of fingerlings and adult bluegills occurred in artificial growth ponds treated with 1 and 3 mg/L diquat at various frequencies (GILDERHUS 1967). In a 3-year testing of diquat as an aquatic herbicide, rates as high as 2.5 mg/L showed no toxicity to fish (BLACKBURN and WELDON 1963). Diquat application during the spawning season may prove harmful to fish eggs and fry. JONES (1965) reported that 90% of the fry of largemouth bass, bluegills, and channel catfish survived 3 days of exposure to 1, 4, and 10 mg/L diquat, respectively. A diquat concentration of 1.3 to 2.5 mg/L caused the death of bluegill fry, lake chubsucker, and smallmouth bass within 1 to 4 days of exposure (HILTIBRAN 1967). BEASLEY (1966) detected no toxicity of 1 mg/L diquat to eggs of channel catfish.

Although diquat residues have been detected in fish (BEASLEY 1966, GILDERHUS 1967, CALDERBANK 1968), accumulation in tissues and organs is negligible except in the digestive tract. As mentioned earlier, evidence indicates that the ingested chemical is excreted readily as demonstrated by its disappearance when residue-containing fish were transferred to nontreated water.

Table IV. Acute toxicity of diquat to fish and aquatic invertebrates.

Species	Median tolerance limit (TL_{50}) in mg/L			Reference
	24 hr	48 hr	96 hr	
Fish				
Chinook salmon (*Onchorynchus tshawytscha*)	29.5	28.5	—	BOND *et al.* (1960)
Salmon	—	28.5	—	BOHMONT (1967)
Bluegills (*Lepomis macrochirus*)	—	—	35[a]	GILDERHUS (1967)
Bluegills	—	19[b]	—	COPE (1966)
Bluegills				
In soft water	91	80	72	SURBER & PICKERING (1962)
In hard water	410	210	140	SURBER & PICKERING (1962)
Fathead minnows (*Pimephales promelas*)				
In soft water	> 56 to 140	23 to 26	14	SURBER & PICKERING (1962)
In hard water	260	220	130	SURBER & PICKERING (1962)
Largemouth bass (*Micropterus salmoides*)				
In soft water	24	11	7.8	SURBER & PICKERING (1962)
Striped bass (*Roccus saxatilis*)	—	—	80	WELLHORN (1969)
Lake emerald shiners (*Notropis atherinoides*)	15.7 to > 180	11.7 to 86.2	9.1 to 25	SWABEY & SCHENK (1963)
Rainbow trout (*Salmo gairdneri*)	—	—	11.2[a]	GILDERHUS (1967)
Rainbow trout	—	20[b]	—	COPE (1966)
Rainbow trout	—	70	—	ALABASTER (1969)
Northern pike (*Esox lucius*)	—	—	16[a]	GILDERHUS (1967)
Goldfish (*Carassius auratus*)	—	—	35[a]	GILDERHUS (1967)
Walleyes (*Stizostedion vitreum*)	—	—	2.1[a]	GILDERHUS (1967)
Aquatic invertebrates				
Amphipod (*Hyalella azteca*)	0.58	0.12	0.048	WILSON & BOND (1969)
Mayfly (*Callibaetis* sp.)	> 100	37	16.4	WILSON & BOND (1969)
Caddisfly (*Limnephilus* sp.)	> 100	65	33	WILSON & BOND (1969)
Tendipedid	> 100	> 100	> 100	WILSON & BOND (1969)
Damselfly (*Enallagma* sp.)	> 100	> 100	> 100	WILSON & BOND (1969)
Dragonfly (*Libellula* sp.)	> 100	> 100	> 100	WILSON & BOND (1969)
Clam (*Cardium edule*)	—	> 10	—	PORTMANN & WILSON (1971)
Sand shrimp (*Crangon crangon*)	—	> 10	—	PORTMANN & WILSON (1971)

[a] Data presented as mean lethal concentration (LC_{50}).
[b] Data presented as mean effective concentration (EC_{50}).
— No data available.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 6-4-03
Title of Paper/Report:	Effect of BCNU pretreatment on digoxin-induced oxidant stress and hepatotoxicity
Author(s)	C.V. Smith
Journal/Year/Vol:Pages	Biochem. & Biophys. Res. Commun. / 1987 / 144: 415-421

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Primarily *
Mixtures including non-BLM herbicides	No
Marine receptors	No

*Some acute data

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Study targets effects of a chemical on inhibition of hepatic glutathione reductase	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-3-03 RJN 9/11/03
Title of Paper/Report:	Oxidant stress and hepatic necrosis in rats treated with digoxin.
Author(s)	C.V. Smith et al.
Journal/Year/Vol:Pages	J. Pharm. Exper. Therapeutics/1985/235:172-177

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes - Hepatic Necrosis *
Mixtures including non-BLM herbicides	No
Marine receptors	No

*Also incl. mortality

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 (Liver effects)
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	~~Yes~~ No
Additional comments regarding acceptance/rejection: Continue evaluation since an acute endpoint is presented.	

Data are biochemical alterations so no further review

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-27-03
Title of Paper/Report:	The breakdown of paraquat + diquat by soil Fungi
Author(s)	S. N. Smith et al.
Journal/Year/Vol:Pages	New Phytol. / 1976 / 77: 735-740

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 - Fungal Growth
Inerts, degradates, metabolite effects	~~2~~ 4
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Unknown
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	Unknown
Are the data presented in a peer-reviewed journal?	Yes?

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Study examines CO_2 production in fungus + equates it to degradation	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-5-03
Title of Paper/Report:	Comparative assessment of herbicide phytotoxicity . . . .
Author(s)	D. St-Laurent et al.
Journal/Year/Vol:Pages	Environ. Toxicol. + Wat. Qual / 1992 / 7: 35-48

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes *
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

* S. capricornutum, a std. test species

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	4 - algae

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	R.Z. NADDY 9/11/03
Partial Title of Paper/Report:	Comparative Assessment of herbicide phytotox to S.c. ...

Herbicides tested:	diquat dibromide & others (not relevant)

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Algae	
Test Species:	Selenastrum capricornutum		
Life Stage:	4-7 d old cells used for bioassy inoculations		
Duration:			

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	stock in milliQ 15 mg/L
Medium (water, food, soil, etc.):	0.625X algal assay procedure medium
Test Concentrations (if appropriate):	n=3
Test System (e.g., flow-thru, mesocosm, etc.):	static · 40 ml in 125 ml Erlenmeyer flask

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	24 ± 2°C	Organic Carbon (D or T):	
pH:		Ammonia:	
Other (light):	73 ± 9 $\mu E \cdot m^{-2} \cdot s^{-1}$	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth	34.2 (25.0-43.6)				
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	- comparison betw 2 methods - only interested in EPA method - isolate to ensure purity regularly - extra care for glassware cleaning discussed - 6 control reps - ~~conc~~ measured conc - ~~cant~~ not sure if results based on nominal or measured

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-5-03
Title of Paper/Report:	Bipyridylium herbicide toxicity: effects of Paraquat and diquat on isolated rat hepatocytes
Author(s)	S. A. Suleiman and J. B. Stevens
Journal/Year/Vol:Pages	J. Environ. Pathology, Toxicol., and Oncology / 1987 / 7: 73-84

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Toxicity (dye uptake, loss of cell respiration, etc) to isolated hepatocytes only	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-5-03
Title of Paper/Report:	The risk to freshwater fisheries from the use of aquatic herbicides
Author(s)	T. E. Tooby
Journal/Year/Vol:Pages	In: Lectures fr. Training Course / 1975 /

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	NO

Should evaluation of this paper continue in Task 2?	~~Yes~~ No
Additional comments regarding acceptance/rejection:	This is a review paper. It does have acute data for diquat, but it is from Wilson & Bond 1969. Enough primary data should be available.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-5-03
Title of Paper/Report:	Lethal injury by diquat redox cycling in an isolated hepatocyte model
Author(s)	J. O. Tsokos-Kuhn
Journal/Year/Vol:Pages	Arch. Biochem. Biophysics / 1988 / 265: 415-424

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	/
Genotoxic effects (mutagenic, carcinogenic)	/
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	/
Mixtures including non-BLM herbicides	/
Marine receptors	/

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Study on isolated cells only.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-5-03
Title of Paper/Report:	Mutagenicity of a bipyridylium herbicide in an N_2-fixing cyanobacterium
Author(s)	A. Vaishampayan
Journal/Year/Vol:Pages	Environ. Internat. / 1983 / 10: 285-290

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	Yes
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	/
Inerts, degradates, metabolite effects	/
Mixtures of any of the five herbicides	/
Indirect effects (food supply, cover)	/

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Deals only with mutagenicity in a blue-green bacterium

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 6-5-03
Title of Paper/Report:	Diquat Intoxication Report of two cases and review of the literature
Author(s)	R. VanHolden et al.
Journal/Year/Vol:Pages	The Amer. J. Med / 1981 / 70: 1267-1271

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	N/A
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Human Health only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	RJN 10/22/03
Title of Paper/Report:	The toxicity of nine therapeutic and herbicidal compounds to striped bass
Author(s)	Wellborn
Journal/Year/Vol:Pages	The Progressive Fish Culturist ~~#~~ 1969 January 27-32

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	↓
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	↓
Effects to target plants (efficacy testing)	↓
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	↓
Mixtures including non-BLM herbicides	↓
Marine receptors	↓

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	~~1~~ 3
Chronic effects (e.g., reproductive) that may affect populations	↓
Inerts, degradates, metabolite effects	NA
Mixtures of any of the five herbicides	↓
Indirect effects (food supply, cover)	↓

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	yes
Was the test of proper exposure dose, mechanism, & duration?	yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	yes
Were proper controls used and was control performance acceptable?	~~yes~~ NR
Are the data presented in a peer-reviewed journal?	yes

Should evaluation of this paper continue in Task 2?	yes
Additional comments regarding acceptance/rejection:	

- No measured LOAC
- ~~Art~~ low - mod fish

Task 2: Data Evaluation

Reviewer/Date:	ASN 10/22/03
Partial Title of Paper/Report:	The toxicity of nine therapeutic and herbicidal ...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Striped bass	
Test Species:	Roccus Saxatilis		
Life Stage:	fingerlings avg wt = 2.7g avg length = 60 mm		
Duration:	96h		

Exposure Conditions	
Formulation:	commercial formulation
Concentration/amount of active ingredient:	3.78 lbs salt/gal : 2 lbs diquat cation
Medium (water, food, soil, etc.):	dechlorinated tap water
Test Concentrations (if appropriate):	5-6 conc
Test System (e.g., flow-thru, mesocosm, etc.):	55L glass aquaria, 40L soln

10 fish / aquaria n=3 → 2 controls /

Test System Monitoring			
Dissolved Oxygen:	7.8 mg/L	Conductivity:	
Temperature:	21°C	Organic Carbon (D or T):	
pH:	8.2	Ammonia:	
Other (hard):	35 mg/L	Other ( ):	
Other (Alk):	64	Other ( ):	

96h

Biological and Statistical Endpoints					
Endpoint	LC50/EC50	~~EC~~ (LC)16	NOEC/NOAEC	LOEC	Other ( )
Mortality/Survival	80 mg/L	70			
Growth CI	(74-86)				
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	- acclimated for 1 wk prior to testing - stats described - results as commercial formulation - results also at 24 & 48h

Conversion / diquat bromide salt → diquat cation

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-10-03
Title of Paper/Report:	Diquat poisoning of dairy cattle by topical application
Author(s)	T. L. Whiting
Journal/Year/Vol:Pages	Canadian Veterinary J. / 2001 / 42: 799-801

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	Yes *
Marine receptors	NO

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NO
Was the test of proper exposure dose, mechanism, & duration?	|
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	|
Were proper controls used and was control performance acceptable?	|
Are the data presented in a peer-reviewed journal?	Yes ?

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection:	* Accidental application of diquat mixed w insecticide - no dose data.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-18-03
Title of Paper/Report:	Toxicity of the herbicides endothall and diquat to benthic crustacea
Author(s)	E. H. Williams et al.
Journal/Year/Vol:Pages	Bull. Environ. Contam. Toxicol / 1984 / 33: 419-422

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	Proper replicates + controls used.

Task 2: Data Evaluation

Reviewer/Date:	Rami Waddy 8/19/03
Partial Title of Paper/Report:	Toxicity of the herbicide endothall and diquat to benthic crustacea

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Hyalella azteca (Sarsamp)	Asellus communis (Say) – isopod	
Life Stage:	2 1 mm (passed thru 1 mm sieve)		field collected
Duration:	5d		

Exposure Conditions	
Formulation: diquat dibromide	
Concentration/amount of active ingredient:	0, 1, 3, 10 mg/L / 35.3% a.i.
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	0, 1, 3, & 10 mg/L
Test System (e.g., flow-thru, mesocosm, etc.):	flow thru 12 L/d, turnover rate of 20/d

Test System Monitoring			
Dissolved Oxygen:	10 mg/L	Conductivity:	265-290 µmhos/cm
Temperature:	17°C	Organic Carbon (D or T):	
pH:	6.5 - 7.3	Ammonia:	
Other (light:dark): photoperiod	11:13hr light:dark	Other ( ):	
Other ( ):		Other ( ):	4 reps/conc

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50 (48h) IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**	
Mortality/Survival	3.4 for H.a.			20% mortality to A.c. in high treatment	
Growth					
Reproduction					
Embryo/Larval Develop.					
control mortality < 10%					
10 amphipods per chamber, 2 or 3 isopods per chamber					

Degradates/Inerts:	
Additional Comments and Observations:	Wilson & Bond 1969 96h tolerance limit of diquat to H. azteca 0.048 mg/l other info in discussion presented as well

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-18-03
Title of Paper/Report:	Field and laboratory evaluation of the influence of copper-diquat . . . .
Author(s)	P. V. Wingen et al.
Journal/Year/Vol:Pages	ET&C / 1984 / 3: 408-424

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	See Comments
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	?-Not clearly explained
Were proper controls used and was control performance acceptable?	?-Not clearly explained
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Most data on copper or copper/diquat combos	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 6-22-03
Title of Paper/Report:	Worker exposure to paraquat + diquat
Author(s)	G.A. Wojeck et al.
Journal/Year/Vol:Pages	Arch. Environ. Contam. Toxicol / 1983 / 12:65-70

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Human health, incidental exposure only - generally an indication of no residue.	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-22-03
Title of Paper/Report:	Bipyridylium herbicide toxicity in vitro: comparative study of the . . .
Author(s)	R.C. Wong & J.B. Stevens
Journal/Year/Vol:Pages	J. Toxicol. Environ. Health / 1986 / 18: 393-407

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Yes
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	|
Chronic effects (e.g., reproductive) that may affect populations	|
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	|
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	|
Were proper controls used and was control performance acceptable?	|
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Isolated Rat cells only.	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-22-03
Title of Paper/Report:	Effects of selected herbicides on bacterial populations. . .
Author(s)	O. Yazar et al.
Journal/Year/Vol:Pages	Wat. Res. Bull / 1975 / 11: 294 - 299

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No (No reps)
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Bacteria only; true reps apparently not used; no stats	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-22-03
Title of Paper/Report:	Dissipation of diquat & paraquat, and effects on aquatic weeds and fish
Author(s)	R. R. Yeo
Journal/Year/Vol:Pages	Unknown / Unknown / Unknown: 42-46 Weeds 1967 15

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Proper experimental setup apparently not conducted Mesocosm studies with tox data	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6-22-03
Title of Paper/Report:	Acute toxicity of a herbicidal combination of diquat plus copper ion . . . .
Author(s)	R. R. Yeo and N. Dechoretz
Journal/Year/Vol:Pages	Unknown Journal / Unknown Year / Unknown Hyacinth Control Journal 15? ~~Vol~~: 57 - 60 p

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	NO
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	|
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	N/A
Was the test of proper exposure dose, mechanism, & duration?	|
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	|
Were proper controls used and was control performance acceptable?	|
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Evaluates a mixture only	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Avoidance chamber responses of mayfly Nymphs. . . .
Author(s)	L. C. Folman
Journal/Year/Vol:Pages	Bull. Environ. Contam Toxic. / 1978 / 19: 312-318

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3 - Avoidance
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	Not sure
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	- No Control? No
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: digest	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-02
Title of Paper/Report:	Acute toxicity of pesticides in adult and weanling rats
Author(s)	T. B. Gaines & R. E. Linder
Journal/Year/Vol:Pages	Fund. & Appl. Toxicol. / 1986 / 7:299-308

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes (LD50
Were proper controls used and was control performance acceptable?	could not determine
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pilland / 7-22-03 PSN
Partial Title of Paper/Report:	Acute toxicity of pesticides in adult ...

Herbicides tested:	diquat bromacil diuron

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	(Other:) Sherman - strain rat	
Test Species:	Rat		
Life Stage:	≥ 90 days (adult tests); 4-6 wks (weanlings)		

Exposure Conditions	
Formulation:	9,10-Dihydro-8a,10a-diazonia phenanthrene dibromide monohydrate
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water/oil CAS 638562-2
Test Concentrations (if appropriate):	Multiple doses used, but not presented
Test System (e.g., flow-thru, mesocosm, etc.):	Oral dosing or dermal dosing

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
PpH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

LD50

Biological and Statistical Endpoints					
Endpoint	~~**LC50/EC50**~~	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Adult ♂ Mortality/Survival Oral	~~27 (26-29) mg/kg~~		147 (138-155 mg/kg)		
Adult ♀ ~~Growth~~ Surv. Oral	121 (108-136 mg/kg)				
Adult ♂ ~~Reproduction~~ Surv. Dermal	433 (344-568)				
Embryo/Larval Develop.					
diuron < Adult ♂	1258	adult ♂	791	bromacil	
diuron < Adult ♀	1182	♀	641	bromacil	
		weanling ♂	1737	bromacil	

Degradates/Inerts:	
Additional Comments and Observations:	Oral application as dissolved in water or peanut oil. Diquat in water was used for dermal application.

PSN 10/8/03 PSN — See Table 2 p 304 for data on bromacil & diuron dermal for both ♂ + ♀ > 2500 mg/kg

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-11-03
Title of Paper/Report:	The w/w SMART assay of Drosophila melanogaster ...
Author(s)	I. Gaivão et al
Journal/Year/Vol:Pages	Mutation Research / 1999 / 440: 139-145

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Yes
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Mutation only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-11-03
Title of Paper/Report:	Sex Differences in Diquat-Induced Hepatic Necrosis + ...
Author(s)	S. Gupta et al.
Journal/Year/Vol:Pages	Toxicological Sciences / 2000 / 54: 203-211

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes? - using Rats
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Hepatic damage
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	|
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Paper only describes a study looking a hepatic damage in rats	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-11-03
Title of Paper/Report:	Effects of herbicides & microbial insecticides on the .....
Author(s)	K. H. Haag & G. R. Buckingham
Journal/Year/Vol:Pages	J. Aquat Plant Manage / 1991 / 29: 55-57

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - 5 reps
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	Mean % mortality in various trmts tested for significance using Students t-test

Task 2: Data Evaluation

Reviewer/Date:	Pillard/ 7-23-03
Partial Title of Paper/Report:	Effects of herbicides and microbial...

Herbicides tested:	Diquat*/Fluridone

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Bagous affinis (weevil); Hydrellia pakistanae (Diptera)		
Life Stage:	B. affinis (adult); H. pakistanae (larva)		
Duration:			

Fluridone	**Exposure Conditions**
Formulation:	1-methyl-3-phenyl-5-[3-(trifluoromethyl) phenyl]-4(1H)-pyridinone
Concentration/amount of active ingredient:	4 lbs Active/gallon
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	1.8 L/ha or 3.6 L/ha (4.6 + 9.2 ppm)
Test System (e.g., flow-thru, mesocosm, etc.):	Static?

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival B. affinis			9.2 ppm		
~~Growth~~ Mortality H. pakistanae				4.6 ppm[a]	
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	*Diquat was combined with cheleted copper; data are therefore excluded. [a] Death of H. pakistanae may be associated with loss of habitat (hydrilla leaf death) + not direct toxicity.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	~~Halfon~~ Pillard / 5-11-03
Title of Paper/Report:	Selection of Priority Properties to assess environmental . . . .
Author(s)	E. Halfon et al.
Journal/Year/Vol:Pages	Chemosphere / 1996 / 33 : 1543-1562

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	NA
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Modeling - no new data

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-11-03
Title of Paper/Report:	Effects of a diquat plus cutrine combination on . . .
Author(s)	R.S. Hestand and B.E. May
Journal/Year/Vol:Pages	Hyacinth Control J. / 1972 / 10: 40-43

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 5
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-11-03
Title of Paper/Report:	Toxicity of ten commonly used chemicals to American eels
Author(s)	M. J. Hinton + A. G. Eversole
Journal/Year/Vol:Pages	Proc. Annual Conf. SE Assoc. of Fish and Wildlife Agencies / 1978 / 32 : 599-604.

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes (LC_{50} only)
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	LC_{50} data should be representative

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-23-03
Partial Title of Paper/Report:	Toxicity of ten commonly used . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	6,7-dihydrodipyrido [1,2-a: 2',1'-c] pyrazinediium dibromide
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate): (mg/L)	0, 25, 30, 35, 40, 45, 50, 65
Test System (e.g., flow-thru, mesocosm, etc.):	3 L of water - unknown system

Test System Monitoring			
Dissolved Oxygen:	> 40% saturation	Conductivity:	
Temperature:	22° C	Organic Carbon (D or T):	
pH:		Ammonia:	
Other (hardness):	40-48 mg/L $CaCO_3$	Other ( ):	
Other (Alkalinity):	30-35 mg/L $CaCO_3$	Other ( ):	

96-H **Biological and Statistical Endpoints**					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	30.72 (26.85 - 34.43) mg/L				
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-11-03
Title of Paper/Report:	Determination of Dose-Time-Response Relationships . . .
Author(s)	W-H. Hong et al.
Journal/Year/Vol:Pages	ET&C / 1988 / 7 : 221-226

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Modelling Only
Mixtures including non-BLM herbicides	No
Marine receptors	NO

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 - Models Toxicity
Inerts, degradates, metabolite effects	~~NA~~ 1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	NA
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	|
Were proper controls used and was control performance acceptable?	|
Are the data presented in a peer-reviewed journal?	|

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Does not present new data - Modelling only Dqint	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-11-03
Title of Paper/Report:	The effects of the herbicide diquat on Gambusia affini
Author(s)	C. R. Johnson & P. A. Gieke
Journal/Year/Vol:Pages	Proceed & Papers: Annual Conf. Calif. Mosquito Control Assoc. / 1977 / 59-60

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No - only 1 nom. dose
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: 42% mortality of G affinis at 12% mortality of ♀ after 48 hr. @ a treatment conc. of 0.5ppm (nominal), but no analytical chemistry or statistics.	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-11-03
Title of Paper/Report:	Mechanisms of Toxicity, Clinical Features, and Management...
Author(s)	G. M. Jones & J. A. Vale
Journal/Year/Vol:Pages	Clinical Toxicology / 2000 / 38: 123-128

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: - Human health - toxicity mechanisms only	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	Genotoxicity testing of five herbicides in the. . . .
Author(s)	B. Kaya et al
Journal/Year/Vol:Pages	Mutation Research / 2000 / 465: 77-84

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Yes
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Mutagenic effects only digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	Toxicity of diquat pulse exposure to tropical . . . .
Author(s)	S. D. Kevan & R. G. Pearson
Journal/Year/Vol:Pages	Bull Environ. Contam Toxic/1993/564-567

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	Toxicity of diquat pulse exposure...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Caridina nilotica		
Life Stage:	Adult		
Duration:	2-h exposure followed by 15 min. in clean water		

Exposure Conditions	
Formulation:	Dig. Dibromide Monohy., ICI Australia Operations
Concentration/amount of active ingredient:	Active Const: 200g/L Dig. Dibromide Monohydrate
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate): Nominal	62.5, 125, 250, 500 mg Active Constit./Liter
Test System (e.g., flow-thru, mesocosm, etc.):	Static

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	0.200 mS/cm
Temperature:	23.4 ± 0.5°C	Organic Carbon (D or T):	
pH:	7.6	Ammonia:	0.014 mg/L
Other (Turbidity):	1.6	Other (Chloride):	29.8 mg/L
Other (TSS):	<0.5	Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival Test 1	241.7 (178.6-327.2 mg/L)				
~~Growth~~ Survival Test 2	200.4 (154.8-259.3 mg/L)				
~~Reproduction~~ Surv. Test 3	185.9 (146.4-236.0 mg/L)				
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Measured concn: Test(1): 59.8, 136, 275, 318 mg/L Test 2: 54.4, 113, 265, 389 Test 3: 57.7, 122, 231, ~~68~~ 468 mg/L

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-11-03
Title of Paper/Report:	Interaction of humic substances with bipyridylium herbicides
Author(s)	S. U. Khan
Journal/Year/Vol:Pages	Can. J. Soil Sci / 1973 / 53: 199-204

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No toxicity data. dquit

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	Herbicide inhibition of grass carp feeding on Hydrilla
Author(s)	K.M. Kracko & R.L. Noble
Journal/Year/Vol:Pages	J. Aquat. Plant Manage/ 1993/ 31: 273-275

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3-Feeding rates
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	2

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-24-03
Partial Title of Paper/Report:	Herbicide inhibition of grass carp feeding...

Herbicides tested:	Diquat ; Fluridone

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	(Warmwater Fish)	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Ctenopharyngodon idella (Triploid)		
Life Stage:	200-300 mm in length		
Duration:	Microcosms w sediment (Fluridone) + wo sediment (Diquat)		

Exposure Conditions	
Formulation:	Sonar 5P®
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Food - Hydrilla
Test Concentrations (if appropriate):	Plants treated w 2 ppm Diquat + 90 ug/L
Test System (e.g., flow-thru, mesocosm, etc.):	Active Ingred. Fluri.

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	24°C (Air)	Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					
Reduced Food consumpt	- Diquat			2 ppm	Diquat - Nom.
" " "	- Fluridone			90 ug/L	Flur - Active Ing.

Degradates/Inerts:	
Additional Comments and Observations:	This test indicates that these application rates will reduce consumption of the plant by grass carp. Actual concns in the plants or fish were not measured.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	Inhibition of In vivo and in vitro epoxidation....
Author(s)	R. I. Kreiger and P. W. Lee
Journal/Year/Vol:Pages	Arch. Environ. Contam. Toxicol / 1973 / 1: 112-121

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Interaction of digest on other herbicides only	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	Herbicide - induced radical damage and antioxidative systems . . .
Author(s)	K. J. Kunert and A. D. Dodge
Journal/Year/Vol:Pages (Book)	Target Sites of Herbicide Action / 1989 / Chap. 3 p 45-63

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	Sort of
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	NA
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: A chapter describing mechanisms for toxicity - no new data	

dquist

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-13-03
Title of Paper/Report:	A comparison of the effects of paraquat + diquat . . . .
Author(s)	H. F. Lam et al.
Journal/Year/Vol:Pages	Toxicology / 1980 / 18: 111-123

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No (Rats)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3 - Body weight
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - for this study
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	A comparison of the effects of paraquat...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Sprague-Dawley Rats	
Test Species:			
Life Stage:	6-8 weeks old		
Duration:	72 hours		

Exposure Conditions	
Formulation:	Not Given
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Intratracheal or intraperitoneal
Test Concentrations (if appropriate):	27 mg/kg (i.p.), 0.5 mg/kg (i.t.)
Test System (e.g., flow-thru, mesocosm, etc.):	One-time dose

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth				27 mg/kg IP	
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Appeared to be a decrease in body wt. as soon as 12 hr after treatment. Greatest diff. was seen 72 h after treatment.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-13-03
Title of Paper/Report:	Diquat distribution in water after application to submersed weeds
Author(s)	K.A. Langeland etal.
Journal/Year/Vol:Pages	Wat. Res. Bull / 1994 / 30: 93-97

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	NO
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Fate - Yes
Mixtures including non-BLM herbicides	NO
Marine receptors	NO

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No toxicity date - Fate data only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard/ 5-12-03
Title of Paper/Report:	Persistence of diquat, endothall, and Fluridone in ponds
Author(s)	K. A Langeland and J. P. Warner
Journal/Year/Vol:Pages	J. Aquat. Plant Manage./1986/24:43-46

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	1
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	NA
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	NA
Were proper controls used and was control performance acceptable?	NA
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No toxicity data - persistance data only.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-12-03
Title of Paper/Report:	The metabolism of digoat in hens and residues in eggs and tissues
Author(s)	J.P. Leahey & R.J. Hemingway
Journal/Year/Vol:Pages	Environ. Qual. & Safety Supplement / 1975 / 3:157-162

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Tissue Residue only
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2(?) Tissue residue
Inerts, degradates, metabolite effects	4
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	|

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	NA
Were proper controls used and was control performance acceptable?	Not apparent
Are the data presented in a peer-reviewed journal?	Yes?

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	Good for possible use in risk assessment

Tissue residues & metabolites

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	The metabolism of diquat in hens . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Hen & eggs	
Test Species:	Chicken (hen)		
Life Stage:	Adult / Embryo		
Duration:	4-5 ug/g (2 hens) & 0.4-0.5 ug/g (Hen 3)		

	Exposure Conditions
Formulation:	1,1'-^{14}C-ethylene 2,2'-bipyridylium bromide[1]
Concentration/amount of active ingredient:	29 mCi/mM - Radiochemical Centre, Amst.
Medium (water, food, soil, etc.):	Oral doses, ^{14}C-Diquat
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	Two metabolites were found in Faeces.
Additional Comments and Observations:	(1) Purified to >99.7% purity - Residues, no toxicity data

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-13-03
Title of Paper/Report:	Toxicities of two herbicides (Basagran, Diquat) and an . . . .
Author(s)	Tat-Sing Leung et al.
Journal/Year/Vol:Pages	Environ. Pollut / 1983 / 30: 153-160

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 4 (LC_{10})
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-31-03
Partial Title of Paper/Report:	Toxicities of two herbicides . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	~~70 kg Herbivore~~	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Mosquitofish (Gambusia affinis)		
Life Stage:	Not given		
Duration:	96 h		

Exposure Conditions	
Formulation:	Technical Grade Diquat (Ortho-Chevron)
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	0-1500 ppm
Test System (e.g., flow-thru, mesocosm, etc.):	Not Given

Test System Monitoring			
Dissolved Oxygen:	8.0 ppm	Conductivity:	
Temperature:	20°C	Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival 96-h	2.89 (39-329)	ppm			
~~Growth~~ Surv. 24-h	723 (772-830)	ppm			
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Three reps, good control performance. No indication that concentrations were analytically verified.

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Literature Review Form

Reviewer/Date:	Pillard / 5-13-03
Title of Paper/Report:	Effects of Selected herbicides on Smolting of Coho Salmon
Author(s)	H. W. Lorz et al.
Journal/Year/Vol:Pages	EPA-600/3-79-071/ 1979/ 102 p

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	No - EPA Report *

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	* EPA report was probably reviewed before it was published

Table 21 (pp 56-57) has large # of refs

Task 2: Data Evaluation

Reviewer/Date:	RJW 10/6/03
Partial Title of Paper/Report:	Effects of selected herbicides ...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Coho salmon (Oncorhynchus Kisutch)		
Life Stage:	yearling (12-17 mo old)		
Duration:	96 h & 12-15 d		

Exposure Conditions	
Formulation:	Ortho® diquat dibromide
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	5 conc
Test System (e.g., flow-thru, mesocosm, etc.):	~~static~~ fiberglass (1.5 m diam) (0.61 m) tanks flow through ↳ 85-20 of 120L exchanged 1X/d (static renew)

n = ~~12~~ 2 (210-225 ~~10~~ fish/tank)

Test System Monitoring			
Dissolved Oxygen:	> 8.5 mg/L	Conductivity:	
Temperature:	~~10°C~~ 9-12.3°C	Organic Carbon (D or T):	
pH:	7.03	Ammonia:	< 0.10 mg/L
Other (~~hard~~ alk):	70-83 mg/L	Other ( ):	
Other (~~alkalinity~~):	100 ~~85-93~~ mg/L	Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival 96h	30 mg/L				
Growth 144 h	19 mg/L				
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments	- analytical measurements confirmed (weekly composites) - acclimatized ≥ 27 d prior to testing - histological examination of fish - effect of diquat on downstream migration - see p 56 & 57 for other data - seawater challenge

Stats used to generate LC50s or determine diffs from control assume (or not) variance → they are

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Literature Review Form

Reviewer/Date:	Pilland / 5-13-03
Title of Paper/Report:	Interaction of toxicants and communities: The role of nutrients
Author(s)	R. Barreiro Lozano and J.R. Pratt
Journal/Year/Vol:Pages	ET&C / 1994 / 13: 361-368

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	Yes interaction w/ nut
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes-4- ch/a conc.
Inerts, degradates, metabolite effects	/
Mixtures of any of the five herbicides	/
Indirect effects (food supply, cover)	3- Food/algae

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Controls used - Perf. not elaborated
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	~~Yes~~ NO
Additional comments regarding acceptance/rejection:	Microcosm study → Microbial communities → Did not use

Task 2: Data Evaluation

Reviewer/Date:	RJW 10/6/03
Partial Title of Paper/Report:	Interaction of toxicants...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
PpH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	endpts are Chl A, protein levels & enzymatic responses alkaline phosphatase activity (APA) & electron-transport-system activity (ETSA) not very useful for this review (?)

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Literature Review Form

Reviewer/Date:	Pillard / 5-13-03 RJN
Title of Paper/Report:	Effect on the planktonic community of the chemical program...
Author(s)	A. Lugo et al.
Journal/Year/Vol:Pages	Aquat. Ecosyst. Health Manage. / 1998 / 1: 333-343

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No (Zooplankton)
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	water hyacinth
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 3 (Meas. populations)
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	4

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	~~Yes~~ Unknown

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Improper controls used. - Unsure of 'real' concentration of herbicide.	

in situ study
digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-19-03
Title of Paper/Report:	Lung Fibrosis induced by diquat after intratracheal administration
Author(s)	J. Manabe + T. Ogata
Journal/Year/Vol:Pages	Arch. of Toxicol. / 1987 / 60:427-431

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes (via rats)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Yes
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Non ecological toxicity.

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Literature Review Form

Reviewer/Date:	Pilland / 5-20-03
Title of Paper/Report:	Comparative effects of diquat plus copper sulfate on aquatic organisms
Author(s)	B. E. May, R. S. Hestand + J. M. Van Dyke
Journal/Year/Vol:Pages	Weed Sci. / 1973 / 21: 249 - 253

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	comb. of herbicides (diquat + copper sulfate) in situ study

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-17-03
Title of Paper/Report:	Manual of acute toxicity: interpretation and data base for 410 chemicals . . .
Author(s)	F.L. Mayer, & M.R. Ellersieck
Journal/Year/Vol:Pages	US DOI, FWS/1986/ Res. Publ. 160

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	NR. followed ASTM guidelines
Are the data presented in a peer-reviewed journal?	NO

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	
Data base pub - summarizes many studies	

Task 2: Data Evaluation

Reviewer/Date:	RJN 10/6/03
Partial Title of Paper/Report:	Manual of acute tox: interpretation and...

Herbicides tested:	diquat fluridone diuron

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Various		
Life Stage:	Varies		
Duration:	48 - 96h		

Exposure Conditions	
Formulation: diquat 35.3%	~~FEDO~~ Summary of many studies
Concentration/amount of active ingredient:	fluridone (98% tech + 41% liquid)
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	NR
Test System (e.g., flow-thru, mesocosm, etc.):	static / static renewal / flow through

Test System Monitoring			
Dissolved Oxygen:	Various in appendix	Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	2800 - 9500 µg/L	Bluegill	Diuron		
Growth	115,000 - 498,000 µg/L	"	Diquat		
Reproduction					
Embryo/Larval Develop.			Diquat 18	LC50s	p 179
			fluridone 24	"	p 245
			diuron ~~48~~ 57	LC50s	p 182

Degradates/Inerts:	
Additional Comments and Observations:	also list 24 & 48h data for some studies

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Literature Review Form

Reviewer/Date:	~~EH~~ Pillard / 5-20-03
Title of Paper/Report:	Effects of diquat on freshwater microbial communities
Author(s)	A. L. Melendez et al.
Journal/Year/Vol:Pages	Arch. Environ. Cont. Toxicol / 1993 / 25: 95-101

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4 (algal populations)
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	3 - algae

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	micro- ~~meso~~cosm study; includes effects to algae, diatoms, protists

Task 2: Data Evaluation

Reviewer/Date:	ABW 10/6/03
Partial Title of Paper/Report:	

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: microorganism assemblage	
Test Species:	Various green algae, diatoms did not identify spe		
Life Stage:	allowed to colonize for 25c		
Duration:	21-d post-treatment		

Exposure Conditions	
Formulation:	Diquat H/A
Concentration/amount of active ingredient:	35.3% a.i.
Medium (water, food, soil, etc.):	water (7L)
Test Concentrations (if appropriate):	5 conc + ctrl (0, 0.3, 1, 3, 10 + 30 mg/L)
Test System (e.g., flow-thru, mesocosm, etc.):	~~Aquatic~~ microcosm static 35 x 25 x 15 cm PET tanks

n=3 5 spp (substrates) / microcosm

Test System Monitoring			
Dissolved Oxygen:	NR.	Conductivity:	
Temperature:	22.4°C (18.9-27.5°)	Organic Carbon (D or T):	
pH:	9.1	Ammonia:	
Other (light):	5000 lux	Other (hard):	39 mg/L
Other (photo period):	12h light : 12h dark	Other (alk):	37 mg/L

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	- Measured diquat concs. - some algal sp. bloomed after 14d post exposure to 10 + 30 mg/L trt - good for insitu analysis

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Literature Review Form

Reviewer/Date:	Pillard / 5-13-03
Title of Paper/Report:	The toxicity to Fish of diaquat - copper sulphate mixtures
Author(s)	R. J. Morrison
Journal/Year/Vol:Pages	Fiji Agri. J. / 1978 / 40: 105

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	~~No~~ Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillad / 5-20-03
Title of Paper/Report:	Toxicity of selected chemicals to the fairy shrimp . . . .
Author(s)	J. L. Moss
Journal/Year/Vol:Pages	The Progressive Fish-Culturist / 1978 / 40: 158-160

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	~~No~~ yes
Additional comments regarding acceptance/rejection:	Statistical analysis = plotting linear regression of time against arcsin transformation of % mortality GD Control mortality @ 18%

Task 2: Data Evaluation

Reviewer/Date:	RJN 10/6/03
Partial Title of Paper/Report:	Toxicity of selected chemicals to the ...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	fairy shrimp (Streptocephalus sealii)		
Life Stage:	Adult		
Duration:	48 h		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	35.3 % a.i.
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	glass gallon jars

n=3 25 organisms/chamber Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	24 ± 1 °C	Organic Carbon (D or T):	
pH:	8.5	Ammonia:	
Other (hard):	120 mg/L	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	>2.0 mg/L		2.0 mg/L		
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	control mortality > 10% (18.5% @ 48h)

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Responses and LC_{50} values for selected microcrustaceans . . . .
Author(s)	S. M. Naqvi and R. H. Hawkins
Journal/Year/Vol:Pages	Bull. Environ. Contam. Toxicol / 1989 / 43: 386-393

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes (Multicellular Crust.)
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	4 - Zooplankton

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No reps - LC_{50}s
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	RZW 10/5/03
Partial Title of Paper/Report:	Responses and LC50 values for ...

Herbicides tested:	flurtamone (Sonar®)
	diquat dibromide (Weedtrine DA) oust (sulfometuron methyl)

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte) (Diaptomus sp)	Other:	
Test Species:	copepod (Eucyclops sp) cladocerans (Alonella sp) ostracod (Cypria sp)		
Life Stage:			
Duration:	48 h		

100-150 organisms/jar n=3	**Exposure Conditions**
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	Sonar 1.0-25 mg/L / diquat 12-100 mg/L / oust 100-2 mg/L
Test System (e.g., flow-thru, mesocosm, etc.):	3.8 L jars w/ 3 L soln

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	Sonar **LC50/EC50**	Sonar ~~IC~~ LC50	**NOEC/NOAEC**	oust ~~LOEC~~	diquat **Other ( )**
~~Mortality/Survival~~ Eucy	8.0 mg/L	1320 mg/L		<10.0	46.6 mg/L
Growth Alon	13.0	802		<10.0	
Reproduction Cypria	13.0	2241		13.8 mg/L	
Embryo/Larval Develop.					
Diaptomus	12.0	1315		<10.0	

Degradates/Inerts:	
Additional Comments and Observations:	- Mortality rates of controls acceptable for acclimation & testing - organisms acclimated 96h prior to testing - no solvents used for mixing - field collected organisms

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Toxicities of paraquat + diquat herbicides to freshwater ....
Author(s)	S. M. Naqvi et al
Journal/Year/Vol:Pages	Bull. Environ. Contam Toxicol / 1980 / 25: 918-920

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes (LC 50)
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	NO

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	MBN 10/5/03
Partial Title of Paper/Report:	Toxicities of paraquat & diquat herb...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Zooplankton	
Test Species:	Copepod (Diaptomus sp & Eucyclops)		
Life Stage:	comprised 90% of population ↓10% of pop		
Duration:	48 h		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	0, 5, 10, 20, 30, 50, 60, 70, 90, 100, 120, 140 mg/L
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
	n=3 7.2		
Dissolved Oxygen:	5.62 ~~6.7~~ mg/L	Conductivity:	
Temperature:	18~~20~~-22°C	Organic Carbon (D or T):	
pH:	6.5-7.0	Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
	48 h				
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	19 (12-28)	mg/L			
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	~~field collected organism acclimated to lab for 96 h prior to testing~~ - also report 24 h values - do not discuss effect on individual sp. genera - do not discuss measured values - not sure of ~~other~~ were? - stock solns prepared fresh each time - static renewal? - soln's aerated continuously

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Binding of diquat and paraquat to humic acid in aquatic environments.
Author(s)	D. R. Narine and R. D. Goy
Journal/Year/Vol:Pages	Soil Science / 1982 / 133: 356 - 363

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	NO

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	N/A
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	No tox data

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Toxicity of diquat to the crustacean amphipod . . . .
Author(s)	S. A. Nicholson and R. J. Clerman
Journal/Year/Vol:Pages	Environ. Letters / 1974 / 7:215-227

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	3 (Hyalella is food for some fish)

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	TLm is given
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	~~Need to acquire missing pages.~~

low rank

Task 2: Data Evaluation

Reviewer/Date:	AJN 10/5/03
Partial Title of Paper/Report:	Toxicity of diquat to the crustacean amphipod ...

Herbicides tested:	91 diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Hyalella Hyalella sp. (likely H. azteca) subsample		
Life Stage:			
Duration:	(108 h → control survival problems) 48-h data - ok		

Exposure Conditions	
Formulation:	ortho commercial product
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	0.30 - 4.02 mg/L (cation)
Test System (e.g., flow-thru, mesocosm, etc.):	600 ml beakers

10 Hyalella / beaker

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	20° C	Organic Carbon (D or T):	
pH:	7.06 - 8.90	Ammonia:	
Other (Alk):	44.4 - 53.7	Other (Mg):	7.7 mg/L
Other (Ca):	17.6 - 26.5 mg/L	Other (light:dark):	12h : 12h

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	24h TL_{50} = 1.26 mg/L	(0.67 mg/L cation)			
Growth				1.00 mg/L @ 48h } lake water	
Reproduction				1 mg/L @ 48h in tap water	
Embryo/Larval Develop.					
			No stats visual interp (AJN)		

Degradates/Inerts:	
Additional Comments and Observations:	Poor survival in controls @ 108hs (60%) (83% @ 24h), + 92% @ 48h

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Ocular injury caused by preoglo x-4, a herbicide containing
Author(s)	M. Nirei et al.
Journal/Year/Vol:Pages	Jpn. J. Opthalmol / 1993 / 37: 43-46

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	human impacts only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Effect of a herbicidal control of water hyacinth. . . .
Author(s)	V. F. Olaleye and E. A. Akintunde
Journal/Year/Vol:Pages	J. Environ. Manage/ 1993/ 38: 85-97

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 - In situ studies
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	?
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - Little stats data
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes ?

Should evaluation of this paper continue in Task 2?	~~Yes~~ NO
Additional comments regarding acceptance/rejection:	in situ study results only deal w/ fish (i.e. numbers pre & post spraying) digest

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard /5-20-03
Title of Paper/Report:	The toxicity of diquat, endothall, and fluridone to the . . .
Author(s)	E.A. Paul et al.
Journal/Year/Vol:Pages	J. Fresh. Ecol. / 1994 / 9: 229-

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Controls not mentioned
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	RBN 10/3/03
Partial Title of Paper/Report:	The toxicity of diquat, endothall, and fluridone...

Herbicides tested:	diquat fluridone

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	(Warmwater Fish)	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: smallmouth bass (M. dolomieu)	
Test Species:	walleyes (Stizostedion vitreum) largemouth bass (Micropterus salmo		
Life Stage:	walleye 3 age groups 1) 8-10 d posthatch 2) 41-43 d posthatch 3) 84-86 d pH		
Duration:	96 h		

Exposure Conditions	
Formulation:	commercial formulations Diquat HA (Valent) / Sonar
Concentration/amount of active ingredient:	240 g diquat cation / L / 479 g fluridone / L
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	Static non-renewal 2 L glass w/ 1.5 L soln

n=3, 84-d walleye n=2 84-d walleye 20 L jars w/ 16 L soln

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	~~15.6°C ± 0.5°C~~	Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

see back for info

96 h mg/L Biological and Statistical Endpoints 96 h mg/L

Endpoint	LC50/EC50	~~IC ( )~~	NOEC/NOAEC	LOEC	Other ( )	
~~Mortality/Survival~~	0.75		0.48	0.93	walleye 8-10 d	diquat
~~Growth~~	1.5		0.90	1.9	" 41-43 d	diquat
~~Reproduction~~	4.9		2.6	4.4	" 84-86 d	diquat
~~Embryo/Larval Develop.~~	3.9		1.6	3.4	SMB	diquat
	4.9		1.8	3.6	LMB	diquat
	1.8		0.78	1.2	walleye 8-12 d	fluridone
	7.6		4.5	6.2	SMB 4-8	fluridone
Degradates/Inerts:	13		9.6	12	LMB 10-14	fluridone

Additional Comments and Observations:	- analytical confirmed at beginning & end of each exp. - present analytical methods - 1/2 life study (photolysis/hydrolysis of diquat) - no appreciable decrease over 4-8 - also present 24, 48 & 72 h values (LC50s & NOEC/LOECs)

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Toxicity of hexazinone and diquat to green algae, ...
Author(s)	H. G Peterson et al.
Journal/Year/Vol:Pages	Aquat. Toxicol / 1997 / 39: 111-134

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	(some microorg)
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 3 - Plant Growth
Inerts, degradates, metabolite effects	/
Mixtures of any of the five herbicides	/
Indirect effects (food supply, cover)	3 - Plant

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - but minimal
Were proper controls used and was control performance acceptable?	Unknown
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	- other data presented in discussion - see p 129

Task 2: Data Evaluation

Reviewer/Date:	RJN 10/3/03
Partial Title of Paper/Report:	Toxicity of hexazinone and diquat to green algae, diatoms...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	~~Aquatic Plant (Macrophyte)~~	Other: algae / diatoms / cyanobacteria not presented here	
Test Species:	diatoms: Nitzschia Cyclotella meneghiana algae: Scenedesmus quadricauda Selenastrum capricornutum	Lemna minor	
Life Stage:	L.m. 3 mature leaves / plant		
Duration:	7d L. minor	Algae 6h preincubation w/ pest, 16h incubation w/ 14C	

Exposure Conditions	
Formulation:	technical
Concentration/amount of active ingredient:	25% diquat ion
Medium (water, food, soil, etc.):	ATM Type I & culture media (Table 2) Lemna only
Test Concentrations (if appropriate):	~~0.73~~ 0.73 mg/L → 0.367 µg/L, 3.67, 36.7, 367, 733 µg/L (0.5% 5% 50% 100%)
Test System (e.g., flow-thru, mesocosm, etc.):	algae 7 ml borosilicate glass microplates – L.m.

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	25°C / 15°C for diatoms	Organic Carbon (D or T):	
pH:		Ammonia:	
Other (light):	75 µEinstein cm^{-2} s^{-1}	Other ( ):	
Other (photoperiod):	24h light	Other ( ):	

algae n = 3 / repeated 2x L.m. n=3-84

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50** (µg/L)	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival C.m.	92				
Growth Nit sp.	65				
Reproduction Sq	652				
Embryo/Larval Develop. Sc	492				
Lm	4				

Degradates/Inerts:	
Additional Comments and Observations:	– focus on measured concentrations, i.e. concentrations measured – endpts algae: ^{14}C uptake – inhibition of L. minor: increase in leaf #

– other data in discussion (on back) refs

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Aquatic phyto-toxicity of 23 pesticides applied at expected . . . .
Author(s)	H. G. Peterson et al.
Journal/Year/Vol:Pages	Aquat. Toxicol. / ~~23~~ 1994 / 28: 275-292

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3- Plant Growth
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	3 - Algae, duck weed

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Not presented
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	-only test 1 conc - Est environ. conc.

Task 2: Data Evaluation

Reviewer/Date:	PSN 10/3/03
Partial Title of Paper/Report:	Aquatic phyto-toxicity of 23 pesticides applied at expected...
Herbicides tested:	~~Sulfometuron-methyl~~ ~~Metsulfuron-methyl~~ (Oust) tebuthiuron diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	~~Aquatic Invertebrate~~	Warmwater Fish	~~Coldwater Fish~~
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: ~~diatoms~~ algae & cyanobacteria	not inclu
Test Species:	diatoms: Cyclotella meneghiana Nitzschia sp. algae: Scenedesmus quadricauda Selenastrum capricornutum		Lemna minor (duck wee
Life Stage:	L. minor (3 mature leaves / plant)		
Duration:	7-d (L. minor) 22h algae	6h incubation w/ pesticide 16h incubation w/ 14C	

Exposure Conditions	
Formulation:	technical / analytical grade
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	3 µg/L Oust / 0.733 mg/L diquat / 5.867 mg/L teb.
Test System (e.g., flow-thru, mesocosm, etc.):	algae test tube 7ml / L. minor 12 ml Microplat

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other (reps):	n=3 algae n=4 duckweed	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	~~LC50/EC50~~	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**~~Other (~~)**
Mortality/Survival	Species	% inhibition		% inhibition (tebuthiuron)	
Growth	S. capri	27 *	3 µg/L Oust	~~Gm~~ C.M.	98% *
Reproduction	L. minor	63 *		N.sp	99% *
Embryo/Larval Develop.	C.M.	99 *		S.q.	90 *
	N. sp	100 *		S.c.	100 *
	S.q.	53 *	diquat	L.m.	100 *
	S.c.	69 *			
	L.m.	100 *			

Degradates/Inerts:	
Additional Comments and Observations:	endpt was uptake of herbicides at est. environ. conc. - one conc (EEC) was tested - compared to control - endpts Algae: uptake of 14C L. minor: increase in # leaves

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Review of strategies for modeling the environmental fate . . .
Author(s)	V. Petit et al.
Journal/Year/Vol:Pages	Environ. International / 1995 / 21: 167-176

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: digest	No new toxicity data - modeling only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-20-03
Title of Paper/Report:	Effect of the herbicide diquat on the growth of . . .
Author(s)	E. J. Philips et al.
Journal/Year/Vol:Pages	Bull. Environ. Contam Toxicol / 1992 / 49: 750-756

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4- Cell Growth
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	3- Algae

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes - EC_{50}
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: - Deals with Algae only, but may play a role in an ERA.	

Task 2: Data Evaluation

Reviewer/Date:	RJN 10/3/03
Partial Title of Paper/Report:	Effect of the herbicide diquat on the growth of microalgae...

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	algae, diatoms ~~Navicula sp.~~ Skeletonema costatum, euglena (Euglena gracilis)		
Life Stage:	Chlorella vulgaris, Selenastrum capricornutum		
Duration:	10-d test only 3- & 7-d data presented		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	400 ml culture media modified Hoagland's
Test Concentrations (if appropriate): n=3	0, 12, 23, 46, 92, 184, 368, 735, 1,470, 2,940 µg
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	25°C	Organic Carbon (D or T):	
pH:	7.0	Ammonia:	
Other (light):	100 µmol photons m⁻² s⁻¹	Other ( ):	
Other ( ):		Other ( ):	

IC 25 = % of inhibition ~~ES~~ IC 25 IC ~~EC~~ 100 results are for cell density

Biological and Statistical Endpoints						
Endpoint		LC50/~~EC50~~	IC (~~EC~~) 0	~~NOEC~~/NOAEC	~~LOEC~~	Other ( )
~~Mortality/Survival~~	CV	307	<92	154	—	
~~Growth~~	SC	47	<24	32	>759	
Reproduction						
~~Embryo/Larval Develop.~~		EC50	- 3-d growth			
	CV	>2940				
	SC	73 (42-77)				

Degradates/Inerts:	
Additional Comments and Observations:	endpts: cell #, chlorophyll also report IEC0, IC25, IC100 for three days of exposure

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 8 May 2003
Title of Paper/Report:	Dominant lethal studies with Paraquat & Diquat in male CD-1 Mice
Author(s)	D. Anderson et al.
Journal/Year/Vol:Pages	Mutation Research / 1976 / 40 : 349-358

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No (Incl. Mutagenic)
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reporductive) that may affect populations	5 (fertility)
Inerts, degradates, metabolite effects	~~No~~ 1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: Discusses fertility & implantation success which has a direct impact on Population.	

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	Dominant lethal studies with. . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	CD-1 Mice, Mus musculus?		
Life Stage:	8-12 weeks old		
Duration:	5 oral doses (1 dose/day); obs. for 3 weeks		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	28.6% (w/v)
Medium (water, food, soil, etc.):	Oral doses
Test Concentrations (if appropriate):	0.01, 0.10, 1.0, ~~10.0~~ mg/kg body wt
Test System (e.g., flow-thru, mesocosm, etc.):	Oral doses

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival - Early deaths of preg. Females			1.0 mg/kg		
Growth					
Reproduction					
Embryo/Larval Develop.					
Mating Success			1.0 mg/kg		
Pregnancy Success			1.0 mg/kg		

Degradates/Inerts:	
Additional Comments and Observations:	No sign. deleterious effects up to 1.0 mg/kg

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 6 May 2003
Title of Paper/Report:	The deleterious effects of fungicides and herbicides on Xenopus laevis embryos
Author(s)	R. J. Anderson and K. V. Prahlad
Journal/Year/Vol:Pages	Arch of Environ. Contam. Toxicol / 1976 / 4: 312-323

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reporductive) that may affect populations	3
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No (No indication of reps.)
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Perhaps
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard 6/30/03
Partial Title of Paper/Report:	The deleterious effects of . . .

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Amphibian	
Test Species:	Xenopus laevis		
Life Stage:	< 24 h embryos		
Duration:	5 days		

Exposure Conditions	
Formulation:	Technical grade
Concentration/amount of active ingredient:	~~0.5~~
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	0.5, 0.75, 1.0, 1.25, 1.5, 2.0 ppm
Test System (e.g., flow-thru, mesocosm, etc.):	Static?

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival			=0.5ppm ①	0.75ppm ①	
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	① Concentrations are based on visual examination of figures. No stats apparently run. Could calculate an LC50 from data.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 7 May 2003
Title of Paper/Report:	Changes in protein content and activity of aspartate - - - .
Author(s)	A. Anguelov et al
Journal/Year/Vol:Pages	Veterinarski Archiv / 1997 / 67: 253-260

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reporductive) that may affect populations	2
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Unable to determine if replicates were used or if a control was included. No chronic effects	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 8 May 2003
Title of Paper/Report:	Effect of Aquatic Plant control on the Microdistribution . . .
Author(s)	M. B. Bain + S. E. Boltz
Journal/Year/Vol:Pages	Trans. Amer. Fish. Soc./1992/121:94-103

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Application included diquat + Komeen (copper ethylene diamine complex).	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-8-03
Title of Paper/Report:	Chronic action of diquat on lungs
Author(s)	A.I. Bainova & V.S. Vulchova
Journal/Year/Vol:Pages	Comptes rendus de l'Académie bulgare des Sciences / 1978 / 31: 1369 – 1372

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Yes ?
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Unable to determine
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Unable to determine
Were proper controls used and was control performance acceptable?	Unable to determine
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-8-03
Title of Paper/Report:	An ecosystem model for assessing ecological risks in Quebec rivers, lakes, & reservoirs
Author(s)	S. M. Bartell et al.
Journal/Year/Vol:Pages	Ecological Modeling / 1999 / 124: 43-67

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reporductive) that may affect populations	3 (Modeling only)
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	NA
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	NA
Were proper controls used and was control performance acceptable?	NA
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Possibly
Additional comments regarding acceptance/rejection: This presents a modeling approach for translating laboratory test results to the field - may have some application for digest.	

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	An ecosystem model for assessing...

Herbicides tested:	

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	No specific concns. or values given - risk calculations on a hypothetical ecosystem

BLM National Vegetation EIS

Literature Review Form overall Rating - 1

Reviewer/Date:	Pillard / 8 May 2003
Title of Paper/Report:	Characterizing aquatic ecolgical risks from pesticides . . .
Author(s)	S. M. Bartell et al
Journal/Year/Vol:Pages	Environ. Toxicol Chem / 2000 / 19: 1441-1453

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 5
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	NA
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	NA
Were proper controls used and was control performance acceptable?	NA
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Perhaps
Additional comments regarding acceptance/rejection: -Discusses ERA models - does predict effects.	

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	Characterizing Aquatic Ecologic. Risks...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:			
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	No new data - modeling only

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 8 May 2003
Title of Paper/Report:	Toxicity of Herbicides Diquat & Endothall to Gold Fish
Author(s)	C. R. Berry Jr
Journal/Year/Vol:Pages	Environ. Pollut. / 1984 / 34:251-258

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 - Behavior
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	No. Low concentrations
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Controls not adequately checked
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: Results not described in suff. detail - control information lacking	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / May 8, 2003
Title of Paper/Report:	Aquatic Macroinvertebrate Response to Field....
Author(s)	C. R. Berry Jr. et al.
Journal/Year/Vol:Pages	Bull. Environ. Contam / 1975 / 14: 374-379

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	?
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	Yes
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Mixture of diquat + endothall was used.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-8-03
Title of Paper/Report:	Respiratory stress in yellow perch induced by subtoxic concentrations of diquat
Author(s)	D. L. Bimbon et al.
Journal/Year/Vol:Pages	Ohio J Sci / 1976 / 76:87 - 89

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1 - Resp. Stress - Highly Invasive
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Reps not given - No
Were proper controls used and was control performance acceptable?	Yes - unknown
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection: Highly invasive procedure - respiratory stress not necessarily connected to population effects	

BLM National Vegetation EIS

Literature Review Form

Rating: 2

Reviewer/Date:	Pillard / May 8, 2003
Title of Paper/Report:	Effects of diquat on amphibian embryo development
Author(s)	D.L. Bimber & R.A. Mitchell
Journal/Year/Vol:Pages	Ohio J. of Sci. / 1978 / 78: 50 - 51

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 4
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes (No standard)
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Stats not described. Diffs in post-hatch survival w/ diquat noted but not stated to be sig. GD

Task 2: Data Evaluation

Reviewer/Date:	Dillard
Partial Title of Paper/Report:	Effects of diquat on amphibian...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Amphibian	
Test Species:	Rana pipiens		
Life Stage:	Eggs		

Exposure Conditions	
Formulation: No comm. product	1:1'-ethylene-2:2'-dipyridylium dibromide
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	100 ppm (assume as presented)
Test System (e.g., flow-thru, mesocosm, etc.):	Static

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
PpH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction (Egg survival @ 14 days, post exposure)				100ppm	
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	

BLM National Vegetation EIS

Literature Review Form Rating: 2

Reviewer/Date:	Pilland / 5-9-03
Title of Paper/Report:	Potential phytotoxicity of diquat accumulated by aquatic plants and sediments
Author(s)	B. C. Birmingham & B. Colman
Journal/Year/Vol:Pages	Water, Air, & Soil Pollution / 1983 / 19: 123-131

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No (Incl. Microorg.)
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	?
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3 (Plant Growth)
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	2

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	- Unclear
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: Some details lacking but further review is warranted.	

No description of stats in methods. Sig. diffs using GD

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	Potential phytotoxicity of diquat....

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Phytoplankton	
Test Species:	Chlorella vulgaris, Navicula pellicolosa, Anabaena flos-aquae, Anacystis nidulans, Lemna sp., Cladophora sp. Spirogyra sp., Myriophyllum spicatum		
Life Stage:	Algal cells / Fronds		
Duration:	Variable		

Exposure Conditions	
Formulation:	Reglone A - Chypman Chemicals, Ltd.
Concentration/amount of active ingredient:	200g/L
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	0.03 - 3mg active Ingred/L
Test System (e.g., flow-thru, mesocosm, etc.):	Static in Flasks

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
~~Growth~~ Chl a - Chlorella vulgaris		nidulans	3ppm		
~~Reproduction~~ Chla - Anacystis		~~vulgaris~~	<0.03ppm	0.03ppm	
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Also examined the residual toxicity of diquat taken up in sediment

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-9-03
Title of Paper/Report:	Role of Free Radicals in toxic injury II: Are Free - - - - -
Author(s)	J. A. Brent + B. H. Rumack
Journal/Year/Vol:Pages	Clinical Toxicology / 1993 / 31: 173-196

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	Some
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Appears to
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	Not appropriate. – no environ. effects.

BLM National Vegetation EIS

Literature Review Form Rating: 2

Reviewer/Date:	Pilland / 5-8-03
Title of Paper/Report:	Fetal toxicity and distribution of Paraquat and Diquat in Mice and Rats
Author(s)	J. S. Bus et al.
Journal/Year/Vol:Pages	Toxicol. & Applied Pharmac. / 1975 / 33: 450-460

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	5 (fetal reabsorption)
Inerts, degradates, metabolite effects	/
Mixtures of any of the five herbicides	/
Indirect effects (food supply, cover)	/

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Unclear - Not describ. well
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	Diffs noted (and notable) but no stats run GD

Task 2: Data Evaluation

Reviewer/Date:	Pilland
Partial Title of Paper/Report:	Fetal toxicity and distribution ....

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Nulliparous - ~~Swiss-Webster mice~~ + Sprague-Dawley ~~mice~~ rats		
Life Stage:	Fetuses		

Exposure Conditions	
Formulation:	diquat dibromide
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Intra-venous
Test Concentrations (if appropriate):	15 mg/kg
Test System (e.g., flow-thru, mesocosm, etc.):	IV to pregnant rats

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
PpH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival				~~15 mg/kg IV~~	
Growth					
Reproduction				15mg/kg IV	
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	(1) The dose appeared to decrease the # of viable Fetuses, but no statistics were apparently run.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Characterizing Aquatic Ecolog. Risks From Pesticides . . . .
Author(s)	K. R. Campbell, S. M. Bartell, J. L. Shaw.
Journal/Year/Vol:Pages	ET & C / 2000 / 19: 760-774

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	↓
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	↓
Effects to target plants (efficacy testing)	↓
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	↓
Mixtures including non-BLM herbicides	↓
Marine receptors	↓

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 4
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	- Summarizes data
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	N/A
Were proper controls used and was control performance acceptable?	N/A
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: This paper summarizes a substantial amount of data - may want to get primary research literature.	

A 2/4 page table for fish -> tox values for diquat
A 3/4 page table of TV for inverts & diquat

Task 2: Data Evaluation

Reviewer/Date:	R.B. NADDY /7/12/03
Partial Title of Paper/Report:	Characterizing aquatic ecological risks from pest...

Herbicides tested:	diquat dibromide

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Several		
Life Stage:	several		
Duration:	24-96h		

Exposure Conditions	
Formulation:	
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	water
Test Concentrations (if appropriate):	NA - review article
Test System (e.g., flow-thru, mesocosm, etc.):	?

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Table 1 has ~160 LC_{50} values for diff species, stages from other lit Do we have 1° lit?

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Response of Hydrilla (Hydrilla verticillata) to diquat . . . . .
Author(s)	K. Cassidy + J. H. Rodgers
Journal/Year/Vol:Pages	Environ. Tox. Chem / 1989 / 8 : 133-140

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	Yes ?
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	- Discusses primarily uptake, w/ a conditions - tissue burden.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Absorption of paraquat + diquat from the airways of a perfused rat lung
Author(s)	J. M. Charles et al.
Journal/Year/Vol:Pages	Toxicology / 1978 / 9: 59-67

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	Yes (via rats)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	Sort of
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	Yes
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No.
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Effects of chemically induced maternal toxicity on prenatal Devel. in the Rat
Author(s)	C N. Chernoff et al
Journal/Year/Vol:Pages	Teratology / 1990 / 42: 651-658

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No (Rats)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes - 4 (WE)
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes, but minimal
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	? - Sample size not clear
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	NADDY 7/12/03 / Pillard 7/18/03
Partial Title of Paper/Report:	Effects of chemically induced maternal tox ... Chernoff et al. 1990

Herbicides tested:	diquat
	2,4-Dichlorophenoxyacetic acid 2,4,5-Trichlorophenol

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Rat	
Test Species:	Sprague-Dawley strain		
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	diquat dibromide monohydrate From
Concentration/amount of active ingredient:	49.1% cation Chevron Chem. Co.
Medium (water, food, soil, etc.):	Oral garage
Test Concentrations (if appropriate):	LD_{50} was highest; actual concn. not given For
Test System (e.g., flow-thru, mesocosm, etc.):	Oral garage range Finding studies 65 mg/kg day - Develop. studies

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival			> 65 mg/kg/d	> 65 mg/kg/d	
Growth					
Reproduction - Fetal	toxicity		65 mg/kg/d	> 65	
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	A dose of 65 mg/kg/d did not cause an increase in Fetal toxicity. There were signif. changes in organ wts, but these changes didn't affect survival, or reproductive success.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Effect of Methamidophos on the growth rate .....
Author(s)	Y.N. Chin + K.I. Suddaruddin
Journal/Year/Vol:Pages	Environ. Pollut / 1979 / 18: 213-220

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-9-03
Partial Title of Paper/Report:	Effect of methamidophos on the ....

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Carp- Cyprinus carpio		
Life Stage:	Fingerlings, 6-9 wks old (9 for diquat)		
Duration:	4 days		

Exposure Conditions	
Formulation:	Not given
Concentration/amount of active ingredient:	0.029 - LC_{50}s based on active Ingred.
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	Not given
Test System (e.g., flow-thru, mesocosm, etc.):	Not given

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	29 ± 3°C	Organic Carbon (D or T):	
pH:	7 ± 0.1	Ammonia:	
Other (hardness):	22 mg/L $CaCO_3$	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**~~EC~~ (95% Limits)**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival	50.28	13.29 - 190.18			
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Effects of field applications of the herbicides digoat ..... on amphibians
Author(s)	A. S. Cooke
Journal/Year/Vol:Pages	Environ. Pollut / 1977 / 12:43 – 50

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	↓
Genotoxic effects (mutagenic, carcinogenic)	↓
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	↓
Effects to target plants (efficacy testing)	↓
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	↓
Mixtures including non-BLM herbicides	↓
Marine receptors	↓

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes – 4
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	5

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection: Field study – increased food supply	

Hypothesis testing used but test type(s) not described

GD

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-9-03
Partial Title of Paper/Report:	Effects of field applications of the . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Amphibian	
Test Species:	Rana temporaria; Bufo bufo; Triturus vulgaris (newt)		
Life Stage: Tadpoles	Frogs: 8.5-9.8 mm, stages III-V; Toads: 7-7.5mm, stages II-III		
Duration:	32 days Note: Length is snout to anus.		

Exposure Conditions	
Formulation:	Not given
Concentration/amount of active ingredient:	Not given
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	Sprayed w 1.0 mg/L diquat
Test System (e.g., flow-thru, mesocosm, etc.):	Mesocosm in ponds

Test System Monitoring			
Dissolved Oxygen:	4-12 mg/L	Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival			1 mg/L	> 1 mg/L	
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Diquat @ a measured concn. of 1 mg/L had no effect on tadpoles. However, as macrophytes died, algae grew at a faster rate, providing more food for the tadpoles

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Effects of diquat on the gastro intestinal Tracts of Rats
Author(s)	H.C. Crabtree et al.
Journal/Year/Vol:Pages	~~19~~ Toxicol. & Appl. Pharm / 1977 / 41: 585-595

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No ~~Yes~~ (via rats)
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

LD50s not recalculated for these studies but mortality described

Task 2: Data Evaluation

Reviewer/Date:	NADDY / 7/12/03 Dillard
Partial Title of Paper/Report:	Effects of diquat on the gastrointestinal tract of rats

Herbicides tested:	diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Rat	
Test Species:	Rats (male) Alderley Park (Wistar-derived)		
Life Stage:	150-200 g		
Duration:	8 wks - changes in H_2O content		

Exposure Conditions	
Formulation: crystalline diquat dichloride	Subcut. inject. / oral admin - via stomach tube
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	SC / PO (Water - oral Ingest or Subcut.)
Test Concentrations (if appropriate):	900 µmol/Kg (PO) ; 90 µmol/Kg (SC)
Test System (e.g., flow-thru, mesocosm, etc.):	

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	~~EC50~~ LD50/EC50	IC ( )	NOEC/NOAEC	LOEC	Other ( )
Mortality/Survival 14-d	900 µmol/Kg (PO) ; 90 µmol/Kg (SC)				
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	other endpts focused on water content / distended abdomens in various tissues
	Animals were exposed to LD50 doses, which were based on previous studies

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Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	The use of Microcosms to simulate Field experiments.....
Author(s)	B. A. Cragg & J. C. Fry
Journal/Year/Vol:Pages	J. Gen. Microbiology / 1984 / 130: 2309-2316

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes - Primary
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	Maybe - Elodea
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes - Maybe
Additional comments regarding acceptance/rejection: Microcosm study - effects to bacteria, but also Elodea.	

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-11-03
Partial Title of Paper/Report:	The use of microcosms to Simulato....

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Elodea canadensis		
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	Reglone 40 ICI
Concentration/amount of active ingredient:	1 mg/L in the Microcosms
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	1 mg/L → don't think I am were (think ensure! for calin was)
Test System (e.g., flow-thru, mesocosm, etc.):	Microcosm - Flow thru

Test System Monitoring			
Dissolved Oxygen:	as low as 1 mg/L	Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other (Alkalinity):	≈60 - 160 mg/L $CaCO_3$	Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival				1 mg/L	
Growth					
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	

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Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Effects of the bipyridylium herbicides diquat dibromide ....
Author(s)	B. Darvas et al.
Journal/Year/Vol:Pages	J. Econ. Entomology / 1990 / 83: 2175-2180

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	3 (metamorphosis)
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No - Stat Results not given
Were proper controls used and was control performance acceptable?	Yes ?
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Fathead Minnow Optomotor Response as a behavioral ---
Author(s)	A. de Peyster & W.F. Long
Journal/Year/Vol:Pages	Bull. Environ. Contam. Toxicol. / 51: 88-95 / 1993

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	NO
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Unknown
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes, but NOAEL not reported
Were proper controls used and was control performance acceptable?	Unknown
Are the data presented in a peer-reviewed journal?	Yes ?

Should evaluation of this paper continue in Task 2?	NO
Additional comments regarding acceptance/rejection:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	Lethal Effects of Diquat and Paraquat on Developing . . .
Author(s)	N. A. Dial and C. A. Baver Dial
Journal/Year/Vol:Pages	Bull Environ. Contam Toxicol / 1987 / 38: 1006-1011

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	~~Yes~~ No

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

Task 2: Data Evaluation

Reviewer/Date:	Pilland / 7-11-03
Partial Title of Paper/Report:	Lethal effects of diquat and . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Amphibians	
Test Species:	Rana pipiens		
Life Stage:	Early gastrula and 15 days old		
Duration:	Up to 16 days		

Exposure Conditions	
Formulation:	Not given - commercial source
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	0, 2.0, 5.0, 10.0 mg/L
Test System (e.g., flow-thru, mesocosm, etc.):	Static-renewal (renewed every other day)

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival (Gastrula stage)			2 mg/L	5 mg/L	@ 13 days
~~Growth~~ Survival (15 days old)			10 mg/L		@ 16 days
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	No effects on survival @ 10 mg/L diquat

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Modification of the Rheotropic response of rainbow trout....
Author(s)	J. J. Dodson & C. I. Mayfield
Journal/Year/Vol:Pages	Environ. Pollut / 1979 / 18: 147-157

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2 - 'swimming' response
Inerts, degradates, metabolite effects	/
Mixtures of any of the five herbicides	/
Indirect effects (food supply, cover)	/

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	Tissue residues

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-11-03
Partial Title of Paper/Report:	Modification of the rheotropic . . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other:	
Test Species:	Rainbow trout (Salmo gairdneri)*		
Life Stage:	1-year old		
Duration:	24 hours		

Exposure Conditions	
Formulation: Technical grade diquat; Reglone A (278 g/litre diquat dibromide)	
Concentration/amount of active ingredient:	278 g/L diquat dibromide
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	lowest Field Appl rate, highest appl. rate & 5 times Field Applic. rate
Test System (e.g., flow-thru, mesocosm, etc.):	Static

Chipman Chemicals, Ltd.

0, 0.5, 1.5, 5.0 ppm

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	15°C	Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					
Swimming Speed				0.5 ppm diquat	

Degradates/Inerts:	
Additional Comments and Observations:	*Now known as Oncorhynchus mykiss.

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Comparison of the ecological effects of diquat on - - - - .
Author(s)	R. Draxl et al.
Journal/Year/Vol:Pages	Verh. Intern. Verein. Limnol / 1991 / 24: 2269-2271

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	No
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4 Yes (zooplankton)
Inerts, degradates, metabolite effects	No - 1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	3 - Zooplankton

No statistical analysis but substantial effects seen

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	No
Was the test of proper exposure dose, mechanism, & duration?	- Maybe
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Outdoor FW system → No - No reps; Lab tests carried out in duplicate
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Unknown

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	- Discusses effects on zooplankton, a food animal for fish.

Task 2: Data Evaluation

Reviewer/Date:	Pillard / 7-11-03
Partial Title of Paper/Report:	Comparison of the ecological effects . . . .

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Zooplankton	
Test Species:			
Life Stage:			

Exposure Conditions	
Formulation:	Diquat (Natl. Physical Lab, Teddington, UK)
Concentration/amount of active ingredient:	
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	1.0 mg/L & 0.3 mg/L (measured)
Test System (e.g., flow-thru, mesocosm, etc.):	Microcosm - static? & Laboratory tanks

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
PpH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints					
Endpoint	**LC50/EC50**	**IC ( )**	**NOEC/NOAEC**	**LOEC**	**Other ( )**
Mortality/Survival					
Growth					
Reproduction					
Embryo/Larval Develop.					
Population of Zooplankton				0.3 mg/L	

Degradates/Inerts:	
Additional Comments and Observations:	0.3 mg/L appeared to have a substantial adverse effect on zooplankton density. However, no statistical analysis was completed.

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Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Pond enclosure evaluations of microbial products & chemical - - -
Author(s)	R. J. Duvall, L. W. J. Anderson, C. R. Goldman
Journal/Year/Vol:Pages	J. Agvat. Plant Manage. / 2001 / 39: 99-106

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	Yes
Genotoxic effects (mutagenic, carcinogenic)	No
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	No
Effects to target plants (efficacy testing)	No
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	No
Mixtures including non-BLM herbicides	No
Marine receptors	No

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	1
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection:	- Microbial effects only

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Literature Review Form Rating : 3

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Comparative sensitivity of Selenastrum capricornutum and Lemna minor....
Author(s)	JF Fairchild et al.
Journal/Year/Vol:Pages	Arch. Environ. Contam. Toxicol. / 1997 / 32: 353-357

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	|
Genotoxic effects (mutagenic, carcinogenic)	|
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	|
Effects to target plants (efficacy testing)	|
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	|
Mixtures including non-BLM herbicides	|
Marine receptors	|

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	4
Inerts, degradates, metabolite effects	|
Mixtures of any of the five herbicides	|
Indirect effects (food supply, cover)	4 - Lemna / Selenast

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	Yes
Was the test of proper exposure dose, mechanism, & duration?	Yes
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	Yes
Were proper controls used and was control performance acceptable?	Yes
Are the data presented in a peer-reviewed journal?	Yes

Should evaluation of this paper continue in Task 2?	Yes
Additional comments regarding acceptance/rejection:	

added chlorsulfuron 10/8/03

Task 2: Data Evaluation

Reviewer/Date:	Pillard/
Partial Title of Paper/Report:	Comparative Sensitivity of Selenastrum...

Herbicides tested:	Diquat Chlorsulfuron

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte)	Other: Alga - Selenastrum	
Test Species:	Lemna minor; Selenastrum capricornutum		
Life Stage:	cells / fronds (L. minor).		

Duration: 96h

Exposure Conditions	
Formulation:	~~Not Given~~ 1,1' ethylene-2,2' dipyridylium
Concentration/amount of active ingredient:	Not Given dibromide
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	
Test System (e.g., flow-thru, mesocosm, etc.):	Static

n=3

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:	25°C	Organic Carbon (D or T):	
PpH:		Ammonia:	
Other (light intensity)	400 fc	Other ( ):	
Other (photoperiod)	16:8 hr L:D	Other ( ):	

96-H Biological and Statistical Endpoints

Endpoint	LC50/EC50	IC ( )	NOEC/NOAEC	LOEC	Other ( )
diquat ~~Mortality/Survival~~ Selen.	80 (64-95)		44	88	µg/L
~~Growth~~ Lemna	18 (7-28)		<11	11	µg/L
~~Reproduction~~					
~~Embryo/Larval Develop.~~					
chlorsul S.c.	135 (109-161)		<19	19	µg/L
L.m.	0.07 (0.5-0.9)		0.4	0.7	µg/L

Degradates/Inerts:	
Additional Comments and Observations:	

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pilland / 5-10-03
Title of Paper/Report:	An Ecological Risk Assessment of the Potential . . .
Author(s)	J. F. Fairchild, L. C. Sappington, D. S. Ruessler
Journal/Year/Vol:Pages	USGS Report / 1999 / Wat-Res. Invest. Rpt 99-4018B

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	Yes
Inerts, degradates, metabolite effects	
Mixtures of any of the five herbicides	
Indirect effects (food supply, cover)	

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	NA
Was the test of proper exposure dose, mechanism, & duration?	
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	
Were proper controls used and was control performance acceptable?	
Are the data presented in a peer-reviewed journal?	

Should evaluation of this paper continue in Task 2?	Yes

Additional comments regarding acceptance/rejection: Review document - cites primary data

Diquat data is directly from Fairchild et al. 1997 (already in database)

Task 2: Data Evaluation

Reviewer/Date:	Pillard
Partial Title of Paper/Report:	An ecological risk assessment of tho...

Herbicides tested:	Diquat

20 g Mammal	Honey Bee	70 kg Herbivore	Large Bird
Small Bird	Aquatic Invertebrate	Warmwater Fish	Coldwater Fish
Non-Target Plants	Aquatic Plant (Macrophyte) Lemna	Other: Selenastrum	
Test Species:	Lemna & Selenastrum		
Life Stage:			
Duration:			

Exposure Conditions	
Formulation:	Not Given
Concentration/amount of active ingredient:	Not Given
Medium (water, food, soil, etc.):	Water
Test Concentrations (if appropriate):	Not Given
Test System (e.g., flow-thru, mesocosm, etc.):	Not Given

Test System Monitoring			
Dissolved Oxygen:		Conductivity:	
Temperature:		Organic Carbon (D or T):	
pH:		Ammonia:	
Other ( ):		Other ( ):	
Other ( ):		Other ( ):	

Biological and Statistical Endpoints

Endpoint	LC50/EC50	IC ( )	NOEC/NOAEC	LOEC	Other ( )
~~Mortality/Survival~~ Lemna	18 mg/L				
~~Growth~~ Selenastrum	80 mg/L				
Reproduction					
Embryo/Larval Develop.					

Degradates/Inerts:	
Additional Comments and Observations:	Review article - contains good characterization information (e.g., Koc) for several herbicides. Also apparently contains original data as well - see original paper by Fairchild et al 1997

BLM National Vegetation EIS

Literature Review Form

Reviewer/Date:	Pillard / 5-10-03
Title of Paper/Report:	Overt avoidance reaction of rainbow trout fry to nine herbicides.
Author(s)	L. C. Folmar
Journal/Year/Vol:Pages	Bull. Environ. Contam Toxicol / 1976 / 15: 509-514

Task 1: Application of Selection Criteria

A. Indicate if the paper meets these exclusion criteria

Issue (deals only with)	Indicate Yes or No
Human health effects	No
Effects to microorganisms	
Genotoxic effects (mutagenic, carcinogenic)	
Bioassays to cells of a whole organism (e.g., rate hepatocytes, rat liver S9)	
Effects to target plants (efficacy testing)	
Nontoxic effects (e.g., fate, transport, leaching, analytical methods)	
Mixtures including non-BLM herbicides	
Marine receptors	

B. Issues to be emphasized

Issue	Rate Paper from 1 (Weak emphasis) to 5 (Strong)
Effects on nontarget receptors related to ERA protocol	
Chronic effects (e.g., reproductive) that may affect populations	2- Avoidance
Inerts, degradates, metabolite effects	1
Mixtures of any of the five herbicides	1
Indirect effects (food supply, cover)	1

C. Other Criteria

Issue	Indicate Yes or No
Are corroborating studies described?	
Was the test of proper exposure dose, mechanism, & duration?	No
Did the test include proper sample size, statistical analysis (especially NOAEL, or dose response curve)?	No
Were proper controls used and was control performance acceptable?	No
Are the data presented in a peer-reviewed journal?	No

Should evaluation of this paper continue in Task 2?	No
Additional comments regarding acceptance/rejection: L. qual	

APPENDIX A.3

SPREADSHEET OF TOXICITY DATA FOR DIQUAT TRV

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
1:1'ethylene-2:2'-dipyridylium dibromide[3]		amphibian	Northern leopard frog	*Rana pipiens*	0-21 d	Static Renewal	Water	fertilization or 21 d	21 d	Post-hatch survival	LOEC	100	NR	mg/L	No/No				Bimber & Mitchell. 1978. Ohio J. of Sci. 78: 50-51.			Yes
6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediium		**amphibian**	**Northern leopard frog**	***Rana pipiens***	**early gastrula**	**Static-renewal**	**Water**	**16 d**	**16 d**	**Mortality**	**NOEC**	**2**	**NR**	**mg/L**	**No/No**				**Dial & Bauer Dial**			**Yes**
6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediium		**amphibian**	**Northern leopard frog**	***Rana pipiens***	**early gastrula**	**Static-renewal**	**Water**	**16 d**	**16 d**	**Mortality**	**LOEC[5]**	**5**	**NR**	**mg/L**	**No/No**				**Dial & Bauer Dial. 1987. Bull. Environ. Contam. Toxicol. 38: 1006-1011.**			**Yes**
6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediium		amphibian	Northern leopard frog	*Rana pipiens*	tadpole - 15 d	Static-renewal	Water	16 d	16 d	Mortality	NOEC	10	NR	mg/L	No/No				Dial & Bauer Dial. 1987. Bull. Environ. Contam. Toxicol. 38: 1006-1011.			Yes
6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediium		amphibian	Northern leopard frog	*Rana pipiens*	tadpole - 15 d	Static-renewal	Water	16 d	16 d	Mortality	LOEC	> 10	NR	mg/L	No/No				Dial & Bauer Dial. 1987. Bull. Environ. Contam. Toxicol. 38: 1006-1011.			Yes
Diquat		amphibian	frog	*Rana temporaria*	8.5-9.5 mm	Mesocosm[4]	Water	Sprayed on Day 0	32 d	Mortality/ Development	NOEC	1	NR	mg/L	Yes/Yes				Cooke. 1977. Environ. Poll. 12: 43-50.			Yes
Diquat		amphibian	frog	*Rana temporaria*	8.5-9.5 mm	Mesocosm	Water	Sprayed on Day 0	32 d	Mortality/ Development	LOEC	> 1	NR	mg/L	Yes/Yes				Cooke. 1977. Environ. Poll. 12: 43-50.			Yes
Diquat		amphibian	toad	*Bufo bufo*	7-7.5 mm	Mesocosm[4]	Water	Sprayed on Day 0	32 d	Mortality/ Development	NOEC	1	NR	mg/L	Yes/Yes				Cooke. 1977. Environ. Poll. 12: 43-50.			Yes
Diquat		amphibian	toad	*Bufo bufo*	7-7.5 mm	Mesocosm	Water	Sprayed on Day 0	32 d	Mortality/ Development	LOEC	> 1	NR	mg/L	Yes/Yes				Cooke. 1977. Environ. Poll. 12: 43-50.			Yes
Diquat		amphibian	smooth newt	*Triturus vulgaris*	all	Mesocosm[4]	Water	Unknown	15 m	Population number	LOEC	> 1	NR	mg/L	Yes/Yes				Cooke. 1977. Environ. Poll. 12: 43-50.			Yes
Diquat		aquatic invertebrate	cladocerans and copepods		All & nauplii	Microcosm[6]	Water	8 weeks	8 w	Zooplankton density	LOEC[7]	0.18	NR	mg/L	Yes/Yes				Draxl et al. 1991. Verh. Internat. Verein. Limnol. 1991. 24: 2269-2271.			Yes
Diquat		aquatic invertebrate	cladocerans and copepods		All & nauplii	Flow-thru?[6]	Water	8 weeks	8 w	Zooplankton density	LOEC[7]	0.24	NR	mg/L	Yes/Yes				Draxl et al. 1991. Verh. Internat. Verein. Limnol. 1991. 24: 2269-2271.			Yes
Diquat		aquatic invertebrate	copepod[11]		unknown	Static	Water	24 hr	24 hr	Mortality	LC_{50}	74	NR	mg/L	No/No				Naqvi et al. 1980. Bull. Environ. Contam. Toxicol. 25: 918-920.			Yes
Diquat		aquatic invertebrate	copepod[11]		unknown	Static	Water	48 hr	48 hr	Mortality	LC_{50}	19	NR	mg/L	No/No				Naqvi et al. 1980. Bull. Environ. Contam. Toxicol. 25: 918-920.			Yes
Diquat dibromide monohydrate		aquatic invertebrate	shrimp	*Caridina nilotica*	1.5 cm	Static	Water	2 hr	2.25 hr	Mortality	LC_{50}	NR	NR		Yes/Yes				Kevan & Pearson. 1993. Bull. Environ. Contam. Toxicl. 51: 564-567.			Yes
Diquat dibromide[14]	35.3	aquatic invertebrate	amphipod	*Hyalella azteca*	< 1 mm	Flowthru	Water[15]	5 d	5 d	Mortality	LC_{50}[16]	3.4	NR	mg/L	No/No				Williams et al. 1984. Bull. Environ. Contam. Toxicol. 33: 418-422.			Yes
Diquat dibromide[14]	35.3	aquatic invertebrate	isopod	*Asellus communis*	< 1 mm	Flowthru	Water[15]	5 d	5 d	Mortality	LC_{50}[17]	> 10	NR	mg/L	No/No				Williams et al. 1984. Bull. Environ. Contam. Toxicol. 33: 418-422.			Yes
Ortho commercial	53.5	aquatic invertebrate	amphipod	*Hyallela spp*	unknown	Static	Water[12]	24 hr	24 hr	Mortality	TL_{50}[13]	> 1.26	NR	mg/L	No/No				Nicholson & Clerman. 1974. Environmental Letters. 7: 215-227.			Yes
Weedtrine-D	8.53 [10]	aquatic invertebrate	calanoid copepod	*Diaptomus spp*	unknown	Static	Water	48 hr	48 hr	Mortality	LC_{50}	10	NR	mg/L	No/No				Naqvi & Hawkins. 1989. Bull. Environ. Contam. Toxicol. 43: 386-393.			Yes
Weedtrine-D	8.53 [10]	aquatic invertebrate	copepod	*Eucyclops spp*	unknown	Static	Water	48 hr	48 hr	Mortality	LC_{50}	46.6	NR	mg/L	No/No				Naqvi & Hawkins. 1989. Bull. Environ. Contam. Toxicol. 43: 386-393.			Yes
Weedtrine-D	8.53 [10]	aquatic invertebrate	cladoceran	*Alonella spp*	unknown	Static	Water	48 hr	48 hr	Mortality	LC_{50}	< 10	NR	mg/L	No/No				Naqvi & Hawkins. 1989. Bull. Environ. Contam. Toxicol. 43: 386-393.			Yes
Weedtrine-D	8.53 [10]	aquatic invertebrate	ostracod	*Cypria spp*	unknown	Static	Water	48 hr	48 hr	Mortality	LC_{50}	13.8	NR	mg/L	No/No				Naqvi & Hawkins. 1989. Bull. Environ. Contam. Toxicol. 43: 386-393.			Yes
Diquat	35.3	aquatic invertebrate	scud	*Gammarus fasciatus*	mature	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	> 100	NR	mg/L	Unknown/ No	FWS	MRID 40094602	FWS Res. Pub 160	Mayer & Ellersieck.1986.[9]	Johnson & Finley	1980	Yes
Diquat	35.3	aquatic invertebrate	apple snail		1 wk	Static	Water	96 hr	96 hr	Mortality	LC_{50}	1.8	NR	mg/L	Unknown/ No	FWS	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck.1986.[9]	Mayer & Ellersieck	1986	Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat	**35.3**	**aquatic invertebrate**	**fairy shrimp**	***Streptocephalus seali***	**adult**	**Static**	**Water**	**48 hr**	**48 hr**	**Mortality**	**NOEC**	**> 2**	**NR**	**mg/L**	**No/No**				**Moss. 1978. Progressive Fish Culturist. 40: 158-160.**			**Yes**
emulsifiable concentrate		aquatic invertebrate	scud	*Gammarus fasciatus*	early instar	Static	Water	48 hr	48 hr	Mortality	TL_{50}[13]	> 100	> NR	mg/L	No/No				Sanders. 1970. Water Pollution Control Fed. 42: 1544-1550.			Yes
Diquat	41.4	aquatic invertebrate	cladoceran	*Daphnia magna*		life cycle	Water				MATC	0.044	NR	mg/L			MRID 00115862		In USEPA 1995.			
Diquat	47	aquatic invertebrate	cladoceran	*Daphnia magna*	1st instar	Static	Water	48 hr	48 hr	Mortality	EC_{50}	1.17	NR	mg/L		CCC	MRID 00115576		1978. In USEPA 2003.	C. Lewis	1985	Yes
Diquat	35	aquatic invertebrate	cladoceran	*Daphnia magna*	1st instar	Static	Water	48 hr	48 hr	Mortality	EC_{50}	0.77	NR	mg/L		CCC	MRID 00235179		1978. In USEPA 2003.	D. McLane	1979	Yes
Diquat	technical grade	aquatic invertebrate	cladoceran	*Daphnia magna*	1st instar	Static	Water		26 hr	Mortality	EC_{50}	7.1	NR	mg/L		REF	MRID 00090862		1966. In USEPA 2003.	T. O'Brien	1978	Yes
Diquat	41.4	aquatic invertebrate	cladoceran	*Daphnia magna*	1st instar	Flow through	Water		21 d		LOEC	0.17	NR	mg/L		SBI	MRID 40380702		1987. In USEPA 2003.	C. Lewis	1990	Yes
Diquat	41.4	aquatic invertebrate	cladoceran	*Daphnia magna*	1st instar	Flow through	Water		21 d		NOEC	< 0.17	NR	mg/L		SBI	MRID 40380702		1987. In USEPA 2003.	C. Lewis	1990	Yes
Diquat		**aquatic invertebrate**	**amphipod**	***Hyallela spp***		**Static**	**Water**		**48 hr**		**EC_{50}**	**0.14**	**NR**	**mg/L**		**REF**	**MRID 00115862**		**1974. In USEPA 2003.**	**C. Lewis**	**1985**	**Yes**
1,1'ethylene-2,2'-bipyridyldiylium ion		aquatic plant	algae	*Vaucheria dichotoma*	cells	Static	Water	7 d	7 d	Mortality	100% mortality	2	NR	mg/L	No/No				Robson et al. 1976. Pesticide Science. 7: 391-402.			Yes
Diquat		aquatic plant	elodea	*Elodea canadensis*	plant	Flow-thru?[6]	Water	8	8 w[21]	Mortality	LOEC	NR	0.24	mg ai/L	Yes/Yes				Draxl et al. 1991. Verh. Internat. Verein. Limnol. 1991. 24: 2269-2271.			Yes
Diquat dibromide	technical grade	aquatic plant	Green algae	*Selenastrum capricornutum*	4-7 d-old cells	Static	Water	96 hr	96 hr	Growth	EC^{50}	34.2	NR	mg/L	No/No				St-Laurent et al. 1992. Environ. Toxicol. Water Qual. 7: 35-48.			Yes
Reglone 40, ICI		aquatic plant	elodea	*Elodea canadensis*	plant	Microcosm	Water	20-30 d	20-30 d	Biomass	LOEC	1	NR	mg/L	No/No				Cragg & Fry. 1984. J. General Microbiology. 130: 2309-2316.			Yes
Reglone A		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	2-7 d	2-7 d	Chl A	NOEC	NR	3	mg ai/L	No/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Reglone A		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	2-7 d	2-7 d	Chl A	LOEC	NR	> 3	mg ai/L	No/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Reglone A		aquatic plant	diatom	*Navicula pelliculosa*	cells	Static	Water[18]	2-7 d	2-7 d	Chl A	NOEC	NR	0.3	mg ai/L	No/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Reglone A		aquatic plant	diatom	*Navicula pelliculosa*	cells	Static	Water	2-7 d	2-7 d	Chl A	LOEC	NR	3	mg ai/L	No/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Reglone A		aquatic plant	duckweed	*Lemna sp.*	plant	Static	Sediment[19]	see Comment[19]	4 d	Chl A	NOEC[20]	NR	3.3	mg ai/L	Yes/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Reglone A		aquatic plant	duckweed	*Lemna sp.*	plant	Static	Sediment[19]	see Comment[19]	4 d	Chl A	LOEC[20]	NR	33.4	mg ai/L	Yes/No				Birmingham & Colman. 1983. Water Air Soil Pollut. 19: 123-131.			Yes
Diquat	technical grade; 25%	aquatic plant	diatom	*Cyclotella meneghiana*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	EC_{50}[20]	NR	92	ug ai/L	Yes/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical grade; 25%	aquatic plant	diatom	*Nitzschia spp*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	EC_{50}[20]	NR	65	ug ai/L	Yes/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical grade; 25%	aquatic plant	Green algae	*Scenedesmus quadricauda*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	EC_{50}[20]	NR	652	ug ai/L	Yes/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical grade; 25%	aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	EC_{50}[20]	NR	492	ug ai/L	Yes/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical grade; 25%	aquatic plant	duckweed	*Lemna minor*	plant	Static	Water	7 d	7 d	Frond growth	EC_{50}[20]	NR	4	ug ai/L	Yes/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Valent Diquat H/A	35.3	aquatic plant	algal community		various	Static	Water	Single application	21 d post	Total algal cell density	MATC[22]	5.5	NR	mg/L	Yes/Yes				Melendez et al. 1993. Arch. Environ. Contam. Toxicol. 25: 95-101.			Yes
Diquat	technical grade	aquatic plant	duckweed	*Lemna minor*	fronds	Static	Water	96 hr	96 hr	Growth	EC_{50}	18	NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes
Diquat	technical grade	aquatic plant	duckweed	*Lemna minor*	fronds	Static	Water	96 hr	96 hr	Growth	NOEC	< 11	NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes
Diquat	technical grade	aquatic plant	duckweed	*Lemna minor*	fronds	Static	Water	96 hr	96 hr	Growth	LOEC	11	NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes
Diquat	technical grade	aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	96 hr	96 hr	Growth	EC_{50}	80	NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product) [1]	Toxicity Value (ai) [1]		Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat	technical grade	aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	96 hr	96 hr	Growth	NOEC	44		NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes
Diquat	technical grade	aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	96 hr	96 hr	Growth	LOEC	88		NR	ug/L	No/No				Fairchild et al. 1997. Arch. Environ. Contam. Toxicol. 32: 353-357.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	92	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		154	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR		307	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	24	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		32	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR		47	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	7 d	7 d	Cell density	IC_{100}	NR	>	759	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	diatom	*Navicula spp*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	93	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	diatom	*Navicula spp*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		107	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	diatom	*Navicula spp*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR		127	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	diatom	*Navicula spp*	cells	Static	Water	7 d	7 d	Cell density	IC_{100}	NR	>	368	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	735	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		1531	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR	>	2940	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	cryptomonad	*Cryptomonas ozolini*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	12	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	cryptomonad	*Cryptomonas ozolini*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		38	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	cryptomonad	*Cryptomonas ozolini*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR		75	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	cryptomonad	*Cryptomonas ozolini*	cells	Static	Water	7 d	7 d	Cell density	IC_{100}	NR	>	175	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	7 d	7 d	Cell density	IC_0	NR	<	23	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	7 d	7 d	Cell density	IC_{25}	NR		67	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	7 d	7 d	Cell density	IC_{50}	NR		124	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	7 d	7 d	Cell density	IC_{100}	NR	>	368	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	3 d	3 d	Cell density	IC_0	NR	<	735	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	3 d	3 d	Cell density	IC_{25}	NR		1200	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Chlorella vulgaris*	cells	Static	Water	3 d	3 d	Cell density	IC_{50}	NR	>	2940	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	3 d	3 d	Cell density	IC_0	NR	<	24	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	3 d	3 d	Cell density	IC_{25}	NR		44	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	3 d	3 d	Cell density	IC_{50}	NR	96	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	3 d	3 d	Cell density	IC_{100}	NR	> 1472	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	3 d	3 d	Cell density	IC_{0}	NR	< 735	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	3 d	3 d	Cell density	IC_{25}	NR	1259	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Green algae	*Euglena gracilis*	cells	Static	Water	3 d	3 d	Cell density	IC_{50}	NR	> 2940	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	3 d	3 d	Cell density	IC_{0}	NR	< 12	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	3 d	3 d	Cell density	IC_{25}	NR	65	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	3 d	3 d	Cell density	IC_{50}	NR	136	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat		aquatic plant	Crysophyte	*Ochromonas danica*	cells	Static	Water	3 d	3 d	Cell density	IC_{100}	NR	> 368	ug ai/L	No/No[23]				Philips et al. 1992. Bull. Environ. Contam. Toxicol. 49: 750-756.			Yes
Diquat	technical or analytical	aquatic plant	diatom	*Cyclotella meneghiana*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	99% inhibition at EEC (733 ug/L)*	NR			No/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical or analytical	aquatic plant	diatom	*Nitzschia spp*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	100% inhibition at EEC (733	NR			No/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical or analytical	aquatic plant	Green algae	*Scenedesmus quadricauda*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	53% inhibition at EEC (733 ug/L)*	NR			No/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical or analytical	aquatic plant	Green algae	*Selenastrum capricornutum*	cells	Static	Water	22 hr	22 hr	^{14}C uptake	69% inhibition at EEC (733 ug/L)*	NR			No/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	technical or analytical	aquatic plant	duckweed	*Lemna minor*	plant	Static	Water	7 d	7 d	Frond growth	100% inhibition at EEC (733	NR			No/No				Peterson et al. 1997. Aquatic Toxicol. 39: 111-134.			Yes
Diquat	40	aquatic plant	algae	*Chlorococcum sp.*		Static	Water		10 d		EC^{50}	200	NR	mg/L		EPA	MRID 40228401		1986. In USEPA 2003.	F.L. Mayer	1986	Yes
Diquat	**35.3**	**aquatic plant**	**giant duckweed**	***Spirodela punctata***		**Static**	**Water**		**14 d**	**root zone**	EC^{50}	**0.00075**	**NR**	**mg/L**		**CCC**	**MRID 41883002**		**1990. In USEPA 1995, 2003.**	**M. Davy**	**1994**	**Yes**
Diquat	26.8	aquatic plant	Green algae	*Selenastrum capricornutum*		Static	Water	96 hr	96 hr		EC^{50}	9.4	NR	ug/L		ICI	MRID 43532703		1988. In USEPA 2003.	KBN	1988	Yes
Diquat	26.8	aquatic plant	Green algae	*Selenastrum capricornutum*		Static	Water	96 hr	96 hr		NOEL	6.8	NR	ug/L		ICI	MRID 43532703		1988. In USEPA 2003.	KBN	1988	Yes
Diquat	37	bird	bobwhite quail	*Colinus virginianus*	2-3 w	Acute dietary	Diet	5 d	8 d[24]	Survival	LC_{50}	2932	NR	ppm[25]	No/No	FWS	MRID 00022923	Wildlife No 152	Heath et al. 1972. Special Scientific Report. 152: 1-57.	Hill, E.F. et al	1985	Yes
Diquat	37	bird	Japanese quail	*Coturnix coturnix*	2-3 w	Acute dietary	Diet	5 d	8 d[24]	Survival	LC_{50}	1346	NR	ppm[25]	No/No	FWS	MRID 00022923	Wildlife No 152	Heath et al. 1972. Special Scientific Report. 152: 1-57.	Hill, E.F. et al	1985	Yes
Diquat	37	bird	Ring-necked pheasant	*Phasianus colchicus*	2-3 w	Acute dietary	Diet	5 d	8 d[24]	Survival	LC_{50}	3742	NR	ppm[25]	No/No	FWS	MRID 00022923	Wildlife No 152	Heath et al. 1972. Special Scientific Report. 152: 1-57.	Hill, E.F. et al	1985	Yes
Diquat	37	bird	Mallard duck	*Anas platyrhynchos*	2-3 w	Acute dietary	Diet	5 d	8 d[24]	Survival	LC_{50}[27]	> 5000	> NR	ppm[25]	No/No	FWS	MRID 00022923	Wildlife No 152	Heath et al. 1972. Special Scientific Report. 152: 1-57.	Hill, E.F. et al	1985	Yes
Diquat	37	bird	Mallard duck	*Anas platyrhynchos*	2-3 w	Acute dietary	Diet	5 d	8 d[24]	Survival	NOAEL	< 2500	< NR	ppm[25]	No/No	FWS	MRID 00022923	Wildlife No 152	Heath et al. 1972. Special Scientific Report. 152: 1-57.	Hill, E.F. et al	1985	Yes
Diquat	35.3	bird	bobwhite quail	*Colinus virginianus*	ErlyLf	Repro & Fert Test	Diet	1-generation		Reprod/ Develop	LOAEL	< 100	< NR	ppm		Wildlife International	MRID 00119988		1982. In USEPA 1995, 2003.	C. Lewis	1985	Yes
Diquat	30	bird	Mallard duck	*Anas platyrhynchos*		Acute oral	oral			Mortality	LD_{50}	NR	89.6	mg ai/kg		Wildlife International	MRID 00106559		In USEPA 1995.			Yes
Diquat	37	bird	bobwhite quail	*Colinus virginianus*		Acute dietary	Diet			Survival	LC_{50}	NR	575	ppm ai					In USEPA 1995.			Yes
Diquat	30	bird	Mallard duck	*Anas platyrhynchos*		Acute dietary	Diet			Survival	LC_{70}	NR	980	ppm ai					In USEPA 1995.			Yes
Diquat	**37**	**bird**	**Japanese quail**	***Coturnix coturnix***		**Acute dietary**	**Diet**			**Survival**	LC_{50}	**NR**	**264**	**ppm ai**			**MRID 00034769, MRID 00116565**		**In USEPA 1995.**			**Yes**

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product) [1]	Toxicity Value (ai) [1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat	**37**	**bird**	**Ring-necked pheasant**	***Phasianus colchicus***		**Acute dietary**	**Diet**			**Survival**	**LC_{50}**	**NR**	**734**	**ppm ai**			**MRID 00034769, MRID 00116565**		**In USEPA 1995.**			**Yes**
Diquat	35.3	bird	bobwhite quail	*Colinus virginianus*		Acute dietary	Diet			Survival	LC_{50}	NR	106	ppm ai					In USEPA 1995.			Yes
Diquat	**35.3**	**bird**	**bobwhite quail**	***Colinus virginianus***		**Repro & Fert Test**	**Diet**			**Reprod/ Develop**	**NOEL**	**NR**	**> 19.6**	**ppm ai**			**MRID 00119988**		**In USEPA 1995.**			**Yes**
Diquat	**35.3**	**bird**	**Mallard duck**	***Anas platyrhynchos***	**ErlyLf**	**Repro & Fert Test**	**Diet**	**1-generation**		**Reprod/ Develop**	**NOEL**	**NR**	**5**	**ppm ai**		**Wildlife International**	**MRID 00114230**		**1982. In USEPA 1995.**	**C. Lewis**	**1985**	**Yes**
Diquat	35.3	bird	Mallard duck	*Anas platyrhynchos*	ErlyLf	Repro & Fert Test	Diet	1-generation		Reprod/ Develop	LOEL	NR	25	ppm ai		Wildlife International	MRID 00114230		1982. In USEPA 1995, 2003.	C. Lewis	1985	Yes
Diquat	30	bird	Mallard duck	*Anas platyrhynchos*	3-4 months	Acute oral	Oral	14 d		Mortality	LD_{50}	564	NR	mg/kg		DWR	MRID 00160000		1984. In USEPA 1995, 2003.	Hudson, R.H. et al	1985	Yes
Diquat	45	bird	Mallard duck	*Anas platyrhynchos*		Acute oral	Oral	14 d		Mortality	LD_{50}	60.6	NR	mg/kg		Wildlife International	MRID 00106559		1982. In USEPA 1995, 2003.	C. Lewis	1985	Yes
Diquat	35.3	bird	bobwhite quail	*Colinus virginianus*	ErlyLf	Repro & Fert Test	Diet	1-generation		Reprod/ Develop	NOEL	5	NR	ppm		Wildlife International	MRID 00119988		1982. In USEPA 1995, 2003.	C. Lewis	1985	Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	14 d	Mortality	LC_{50}	NR	19.5	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	To hatch	Mortality	LC_{50}	NR	9.6	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	To hatch	Mortality	LOEC	NR	7.0	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	To hatch	Mortality	NOEC	NR	3.5	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	To hatch	Weight	LOEC	NR	56	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 4 of incubation	Topical	Water	10 s	To hatch	Weight	NOEC	NR	14	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 21 of incubation	Topical	Water	10 s	To hatch	Mortality	LC_{50}	NR	12.6	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 21 of incubation	Topical	Water	10 s	To hatch	Mortality	LOEC	NR	7.0	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 21 of incubation	Topical	Water	10 s	To hatch	Mortality	NOEC	NR	3.5	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
Diquat HA	240 g/L[28]	bird	Mallard duck	*Anas platyrhynchos*	Day 21 of incubation	Topical	Water	10 s	To hatch	Growth	NOEC	NR	> 7.0	g ai/L	No/No				Sewalk et al. 2001. J. Toxicol. Environ. Health Pt. A. 62: 33-45.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Static-Renewal	Water	96 hr	96 hr	Mortality	LC_{50}[32]	30	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Static-Renewal	Water	96 hr	96 hr	Mortality	LC_{50}[32]	19	NR	mg/L	Yes/Yes			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Static-Renewal	Water	96 hr	96 hr + release	Downstream Migration	NOEC*	< 0.5	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Static-Renewal	Water	96 hr	96 hr + release	Downstream Migration	LOEC[20]	0.5	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Flow-thru	Water	285 hr	285 hr + release	Downstream Migration	NOEC[20]	0.5	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Flow-thru	Water	285 hr	285 hr + release	Downstream Migration	LOEC[20]	1	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes
6,7-dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium ion		fish	Coho salmon	*Oncorhynchus kisutch*	12-17 mo - smolt	Flow-thru	Water	12 d	12 d	Condition Factor	NOEC[20]	3	NR	mg/L	Yes/No			EPA-600/3-79-071	Lorz et al. 1979.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
6,7-dihydrodipyrido [1,2-a: 2',1'-c] pyrazinediium dibromide		fish	American eel	*Anguilla rostrata*	glass eel stage	Static	Water	96 hr	96 hr	Mortality	LC_{50}	NR	NR	mg ai/L	No/No				Hinton & Eversole. 1978. Proc. Ann. Conf. SE Assoc. Fish & Wildl. Agencies. 32: 599-604.			Yes
Diquat		fish	Grass carp	*Ctenopharyngodon idella*	adult	Static	Food/ Hydrilla[31]	NA	5 d	Food consumption	LOEC	2	NR	mg/L	No/No				Kracko & Noble. 1993. J. Aquat. Plant Management. 31: 273-275.			Yes
Diquat	35.3 [10]	fish	brown trout	*Salmo trutta*	40.3 mm fingerling	Static	Water	96 hr	96 hr	Mortality	TLm[35]	NR	20.4	mg ai/L	No/No				Simonin & Skea. 1977. NY Fish & Game Journal. 24: 38-45.			No
Diquat	35.3 [10]	fish	brown trout	*Salmo trutta*	40.3 mm fingerling	Static	Water	96 hr	96 hr	Mortality	NOEC[35]	NR	< 5.5	mg ai/L	No/No				Simonin & Skea. 1977. NY Fish & Game Journal. 24: 38-45.			No
Diquat	35.3 [10]	fish	brown trout	*Salmo trutta*	40.3 mm fingerling	Static	Water	48 hr	48 hr	Mortality	TLm[35]	NR	22.4	mg ai/L	No/No				Simonin & Skea. 1977. NY Fish & Game Journal. 24: 38-45.			No
Diquat	**41**	**fish**	**Fathead minnow**	***Pimephales promelas***	**early life**	**Flow through**	**Water**		**34 d**		**NOEC**	**0.58**	**NR**	**mg/L**		**SBI**	**MRID 40380703**		**1987. In USEPA 2003.**	**C. Lewis**	**1990**	**Yes**
Diquat	40	fish	Longnose killifish	*Fundulus similis*	juvenile	Static	Water		48 hr	Mortality	LC_{50}	> 40	> NR	mg/L		EPA	MRID 40228401		1986. In USEPA 2003.	F.L. Mayer	1986	Yes
Diquat	19.6	fish	Striped bass	*Morone saxatilis*	fingerling	Static	Water		96 hr	Mortality	LC_{50}	43.2	NR	mg/L		REF	MRID 00028002		1969. In USEPA 2003.	C. Lewis	1985	Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	8-10 d	Static	Water	96 hr	96 hr[34]	Mortality	LOAEC	NR	> 0.93	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	8-10 d	Static	Water	96 hr	96 hr[34]	Mortality	NOAEC	NR	> 0.48	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat	35.3	fish	Rainbow trout	*Oncorhynchus mykiss*	fingerling	Static	Water	96 hr	96 hr	Mortality	LC_{50}	> 100	> NR	mg/L	Unknown/No	EPA	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Mayer & Ellersieck	1986	Yes
Diquat	35.3	fish	goldfish	*Carassius auratus*	fingerling	Static	Water	24 hr	24 hr	Mortality	LC_{50}	> 100	> NR	mg/L	Unknown/No	FWS	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Mayer & Ellersieck	1986	Yes
Diquat	35.3	fish	black bullhead	*Ameiurus melas*	0.8 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	170	NR	mg/L	Unknown/No	FWS	MRID 40094602	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Johnson & Finley	1985	Yes
Diquat	35.3	fish	black bullhead	*Ameiurus melas*	0.8 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	24.6	NR	mg/L	Unknown/No	FWS	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Mayer & Ellersieck	1986	Yes
Diquat	35.3	fish	bluegill sunfish	*Lepomis macrochirus*	1.1-1.3 g	Static	Water	96 hr	96 hr[8]	Mortality	LC50[33]	115	NR	mg/L	Unknown/No	FWS	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Mayer & Ellersieck	1986	Yes
Diquat	35.3	fish	bluegill sunfish	*Lepomis macrochirus*	1.1 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	508	NR	mg/L	Unknown/No			FWS Res. Pub 160	Mayer & Ellersieck. 1986.			Yes
Diquat	35.3	fish	bluegill sunfish	*Lepomis macrochirus*	1.1 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	870	NR	mg/L	Unknown/No			FWS Res. Pub 160	Mayer & Ellersieck. 1986.			Yes
Diquat	35.3	fish	Yellow perch	*Perca flavescens*	0.6 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	60	NR	mg/L	Unknown/No	FWS	MRID 40094602	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Johnson & Finley	1985	Yes
Diquat	35.3	fish	Yellow perch	*Perca flavescens*	0.6 g	Static	Water	96 hr	96 hr[8]	Mortality	LC_{50}	23.5	NR	mg/L	Unknown/No	FWS	MRID 40098001	FWS Res. Pub 160	Mayer & Ellersieck. 1986. In USEPA 2003.	Mayer & Ellersieck	1986	Yes
Diquat HA	**240 g/L**	**fish**	**Walleye**	***Stizostedion vitreum***	**8-10 d**	**Static**	**Water**	**96 hr**	**96 hr[34]**	**Mortality**	**LC_{50}**	**NR**	**0.75**	**mg ai/L**	**Yes/No**				**Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.**			**Yes**
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	41-43 d	Static	Water	96 hr	96 hr[34]	Mortality	LC_{50}	NR	1.5	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	41-43 d	Static	Water	96 hr	96 hr[34]	Mortality	LOAEC	NR	1.9	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	41-43 d	Static	Water	96 hr	96 hr[34]	Mortality	NOAEC	NR	0.9	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	84-86 d	Static	Water	96 hr	96 hr[34]	Mortality	LC_{50}	NR	4.9	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	84-86 d	Static	Water	96 hr	96 hr[34]	Mortality	LOAEC	NR	4.4	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Walleye	*Stizostedion vitreum*	84-86 d	Static	Water	96 hr	96 hr[34]	Mortality	NOAEC	NR	2.6	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Largemouth bass	*Micropterus salmoides*	9-13 d	Static	Water	96 hr	96 hr[34]	Mortality	LC_{50}	NR	4.9	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat HA	240 g/L	fish	Largemouth bass	*Micropterus salmoides*	9-13 d	Static	Water	96 hr	96 hr[34]	Mortality	LOAEC	NR	3.6	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Largemouth bass	*Micropterus salmoides*	9-13 d	Static	Water	96 hr	96 hr[34]	Mortality	NOAEC	NR	1.8	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Smallmouth bass	*Micropterus dolomieu*	6-8 d	Static	Water	96 hr	96 hr[34]	Mortality	LC_{50}	NR	3.9	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Smallmouth bass	*Micropterus dolomieu*	6-8 d	Static	Water	96 hr	96 hr[34]	Mortality	LOAEC	NR	3.4	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Diquat HA	240 g/L	fish	Smallmouth bass	*Micropterus dolomieu*	6-8 d	Static	Water	96 hr	96 hr[34]	Mortality	NOAEC	NR	1.6	mg ai/L	Yes/No				Paul et al. 1994. J. Freshwater Ecology. 9: 229-239.			Yes
Reglone A	278 g diquat dibromide/L	fish	Rainbow trout	*Salmo gairdneri*[29]	1 yr	Static exposure	Water	24 hr	15 min	Swimming speed	NOEC	NR	< 0.5	mg ai/L	Yes/Yes[30]				Dodson & Mayfield. 1979. Environmental Pollution. 18: 147-157.			Yes
Reglone A	278 g diquat dibromide/L	fish	Rainbow trout	*Salmo gairdneri*[29]	1 yr	Static exposure	Water	24 hr	15 min	Swimming speed	LOEC	NR	0.5	mg ai/L	Yes/Yes[30]				Dodson & Mayfield. 1979. Environmental Pollution. 18: 147-157.			Yes
Diquat	0.02	fish	common carp	*Cyprinus carpio*	6-9 weeks	Static	Water	96 hr	96 hr	Mortality	LC_{50}	NR	50.3	mg ai/L	No/No				Chin & Sudderuddin. 1979. Environmental Pollution. 18: 213-220.			Yes
Diquat	0.02	fish	common carp	*Cyprinus carpio*	6-9 weeks	Static	Water	96 hr	96 hr	Mortality	LC_{95}	NR	141.8	mg ai/L	No/No				Chin & Sudderuddin. 1979. Environmental Pollution. 18: 213-220.			Yes
Diquat	**technical grade**	**fish**	**Rainbow trout**	***Salmo gairdneri*[29]**	**1 yr**	**Static exposure**	**Water**	**24 hr**	**15 min**	**Swimming speed**	**NOEC**	**NR**	**< 0.5**	**mg ai/L**	**Yes/Yes[30]**				**Dodson & Mayfield. 1979. Environmental Pollution. 18: 147-157.**			**Yes**
Diquat	35.3 [10]	fish	brown trout	*Salmo trutta*	40.3 mm fingerling	Static	Water	24 hr	24 hr	Mortality	TLm[35]	NR	32.6	mg ai/L	No/No				Simonin & Skea. 1977. NY Fish & Game Journal. 24: 38-45.			No
Diquat	35.3	fish	Grass carp	*Ctenopharyngodon idella*	23.5 g	Static	Water	96 hr	96 hr	Mortality	LC_{50}	NR	53	mg ai/L	No/No				Salah El-Deen & Rogers. 1992. J. Aquatic Animal Health. 4: 277-280.			Yes
Aquacide (commercial form.)	13.5	fish	Grass carp	*Ctenopharyngodon idella*	1+ yr	Flow through	Water	96 h	5 d	Mortality	LC_{50}	1718	NR	mg/L	No/No				Tooby et al. 1980. J. Fish Biol. 16: 591-597.			Yes
Diquat	3.73 lb salt/gal; 2.0 lb diquat cation[14]	fish	Striped bass	*Morone saxatilis*	fingerling (2.7 g)	Static	Water	96 hr	96 hr	Mortality	LC_{50}[36]	80	NR	mg/L	No/No				Wellborn. 1969. Prog. Fish-Culturist. 31: 27-32.			Yes
Diquat	3.73 lb salt/gal; 2.0 lb diquat cation[14]	fish	Striped bass	*Morone saxatilis*	fingerling (2.7 g)	Static	Water	96 hr	96 hr	Mortality	LC_{16}[36]	70	NR	mg/L	No/No				Wellborn. 1969. Prog. Fish-Culturist. 31: 27-32.			Yes
Diquat	35.3	fish	bluegill sunfish	*Lepomis macrochirus*	1.3 g	Static	Water	96 hr	96 hr	Mortality	LC_{50}	245	NR	mg/L		FWS	MRID 40094602		1980. In USEPA 2033.	Johnson & Finley	1985	Yes
Diquat	19.8	fish	bluegill sunfish	*Lepomis macrochirus*	0.11 g	Static	Water	96 hr	96 hr	Mortality	LC_{50}	13.9	NR	mg/L		ABC	MRID 00138962		1980. In USEPA 2033.	C. Lewis	1985	Yes
Diquat	35.3	fish	bluegill sunfish	*Lepomis macrochirus*	0.85 g	Static	Water		72 hr	Mortality	LC_{50}	64.51	NR	mg/L		ARC	MRID 00115572		1965. In USEPA 2003.	C. Lewis	1985	Yes
Diquat	35.3	fish	brown trout	*Salmo trutta*	fingerling	Static	Water		96 hr	Mortality	LC_{50}	17.77	NR	mg/L		CCC	MRID 00115858		1977. In USEPA 2003.	C. Lewis	1985	Yes
Diquat		fish	Emerald Shiner	*Notropis atherinoides*		Static	Water		96 hr	Mortality	LC_{50}	25.8	NR	mg/L		REF	MRID 00027203		1963. In USEPA 2003.	C. Lewis	1985	Yes
Diquat	41	fish	Fathead minnow	*Pimephales promelas*	early life	Flow through	Water		34 d		LOEC	1.5	NR	mg/L		SBI	MRID 40380703		1987. In USEPA 2003.	C. Lewis	1990	Yes
Diquat	technical grade	fish	Rainbow trout	*Salmo gairdneri*[29]	1 yr	Static exposure	Water	24 hr	15 min	Swimming speed	LOEC	NR	0.5	mg ai/L	Yes/Yes[30]				Dodson & Mayfield. 1979. Environmental Pollution. 18: 147-157.			Yes
Diquat	technical grade	fish	Mosquitofish	*Gambusia affinis*	3 cm	Static	Water	24 hr	96 hr	Mortality	LC_{50}	723	NR	mg/L	No/No				Leung et al. 1983. Environmental Pollution. 30: 153-150.			Yes
Diquat	technical grade	fish	Mosquitofish	*Gambusia affinis*	3 cm	Static	Water	96 hr	96 hr	Mortality	LC_{50}	289	NR	mg/L	No/No				Leung et al. 1983. Environmental Pollution. 30: 153-150.			Yes
Diquat	**19.8**	**fish**	**Rainbow trout**	***Oncorhynchus mykiss***	**0.56 g**	**Static**	**Water**		**96 hr**	**Mortality**	**LC_{50}**	**14.83**	**NR**	**mg/L**		**ABC**	**MRID 00138961**		**1980. In USEPA 2003.**	**C. Lewis**	**1985**	**Yes**
Diquat	99.6	insect	Honeybee	*Apis mellifera*	Adult	Dermal	Dermal	48 hr		Mortality	LD_{50}	100	NR	ug/bee		UCR	MRID 00072012		In USEPA 2003.	C. Lewis		Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product) [1]	Toxicity Value (ai) [1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat	**technical grade**	**insect**	**Honeybee**	***Apis mellifera***	**Adult**	**Dermal**	**Dermal**	**5 d**		**Mortality**	**LD_{50}**	**47**	**NR**	**ug/bee**		**ICI**	**MRID 40208001**		**1987. In USEPA 2003.**	**C. Lewis**	**1990**	**Yes**
1,1'-ethylene-2,2'-bipyridylium		mammal	Rat	Sprague-Dawley rat	6-8 weeks	I.P. injection	Organism[38]	Single dose	72 hr	Weight	LOEC	27	NR	mg/kg	No/No				Lam et al. 1980. Toxicology 18: 111-123.			No
9,10 dihydro-8a,10a-diazoniaphenanthrene dibromide monohydrate	technical grade	mammal	Rat	Sherman strain rat	adult male	Oral	Organism	Single dose	at least 14 d	Mortality	LD_{50}	147	NR	mg/kg	No/No				Gaines & Linder. 1986. Fund. Appl. Toxicol. 7: 299-308.			Yes
9,10 dihydro-8a,10a-diazoniaphenanthrene dibromide monohydrate	**technical grade**	**mammal**	**Rat**	**Sherman strain rat**	**adult female**	**Oral**	**Organism**	**Single dose**	**at least 14 d**	**Mortality**	**LD_{50}**	**121**	**NR**	**mg/kg**	**No/No**				**Gaines & Linder. 1986. Fund. Appl. Toxicol. 7: 299-308.**			**Yes**
9,10 dihydro-8a,10a-diazoniaphenanthrene dibromide monohydrate	technical grade	mammal	Rat	**Sherman strain rat**	**adult male**	**Dermal**	**Organism**	**Single dose**	at least 14 d	Mortality	LD_{50}	433	NR	mg/kg	No/No				Gaines & Linder. 1986. Fund. Appl. Toxicol. 7: 299-308.			Yes
Crystalline diquat dichloride[37]		mammal	Rat	Alderley Park (Wistar-derived) rats	adult	Oral	Organism	Single oral dose	14 d	Mortality	LD_{50}[39]	900	NR	umol/kg	No/No				Crabtree et al. 1977. Toxicol. Appl. Pharmacol. 41: 585-595.			Yes
Crystalline diquat dichloride[37]		mammal	Rat	Alderley Park (Wistar-derived) rats	adult	Subcutaneous injection	Organism[38]	Single injection	14 d	Mortality	LD_{50}[39]	90	NR	umol/kg	No/No				Crabtree et al. 1977. Toxicol. Appl. Pharmacol. 41: 585-595.			No
Diquat		mammal	Rat			Acute	Oral				LD_{50}	NR	810 (m), 600 (f)	mg ai/kg					In USEPA 2002.			Yes
Diquat		mammal	Rabbit			Dermal	Dermal			Mortality	LD_{50}	NR	262 (m), 315 (f)	mg ai/kg			MRID 00100614		In USEPA 1995, 2002.			Yes
Diquat		mammal	Rat			Inhalation	air				LC_{50}	NR	0.80 (m), 1.09 (f)	mg ai/L					In USEPA 2002.			Yes
Diquat	20.64	mammal	Rat			Dermal	Dermal	21-28 d		Dermal	NOAEL	NR	5	mg ai/kg/d			MRID 4038101		In USEPA 2002.			Yes
Diquat	20.64	mammal	Rat			Dermal	Dermal	21-28 d		Dermal	LOAEL	NR	5	mg ai/kg/d			MRID 4038101		In USEPA 2002.			Yes
Diquat	20.64	mammal	Rat			Dermal	Dermal	21-28 d		Systemic	NOAEL	NR	5	mg ai/kg/d			MRID 4038101		In USEPA 2002.			Yes
Diquat	20.64	mammal	Rat			Dermal	Dermal	21-28 d		Systemic	LOAEL	NR	20	mg ai/kg/d			MRID 4038101		In USEPA 2002.			Yes
Diquat	20.64	mammal	Rabbit			Dermal	Dermal	20 d		Dermal	NOAEL	NR	< 20	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	20.64	mammal	Rabbit			Dermal	Dermal	20 d		Dermal	LOAEL	NR	20	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	20.64	mammal	Rabbit			Dermal	Dermal	20 d		Systemic	NOAEL	NR	20	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	20.64	mammal	Rabbit			Dermal	Dermal	20 d		Systemic	LOAEL	NR	40	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	26.2	mammal	Rat			Reproduction	Gavage	gestation days 7 to 16		Maternal	NOAEL	NR	4	mg ai/kg/d			MRID 41198902		In USEPA 1995, 2002.			Yes
Diquat	26.2	mammal	Rat			Reproduction	Gavage	gestation days 7 to 16		Maternal	LOAEL	NR	12	mg ai/kg/d			MRID 41198902		In USEPA 1995, 2002.			Yes
Diquat	26.2	mammal	Rat			Reproduction	Gavage	gestation days 7 to 16		Developmental	NOAEL	NR	12	mg ai/kg/d			MRID 41198902		In USEPA 1995, 2002.			Yes
Diquat	26.2	mammal	Rat			Reproduction	Gavage	gestation days 7 to 16		Developmental	LOAEL	NR	40	mg ai/kg/d			MRID 41198902		In USEPA 1995, 2002.			Yes
Diquat	26.2	mammal	Rabbit			Reproduction	Oral?			Maternal	NOAEL	NR	1	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	26.2	mammal	Rabbit			Reproduction	Oral?			Maternal	LOAEL	NR	3	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	26.2	mammal	Rabbit			Reproduction	Oral?			Developmental	NOAEL	NR	3	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	26.2	mammal	Rabbit			Reproduction	Oral?			Developmental	LOAEL	NR	10	mg ai/kg/d					In USEPA 2002.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product) [1]	Toxicity Value (ai) [1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat	unknown	mammal	Mouse			Prenatal Development	Oral?			Maternal	NOAEL	NR	1	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	unknown	mammal	Mouse			Prenatal Development	Oral?			Maternal	LOAEL	NR	2	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	unknown	mammal	Mouse			Prenatal Development	Oral?			Developmental	NOAEL	NR	2	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	unknown	mammal	Mouse			Prenatal Development	Oral?			Developmental	LOAEL	NR	4	mg ai/kg/d					In USEPA 2002.			Yes
Diquat	**20.09**	**mammal**	**Rat or Mouse**			**Reproduction**	**Oral?**			**Prenatal**	**NOAEL**	**NR**	**16 (0.8)**	**ppm ai (mg ai/kg/d)**			**MRID 41531301**		**In USEPA 2002.**			**Yes**
Diquat	20.09	mammal	Rat or Mouse			Repro & Fert Test	Oral?			Prenatal	LOAEL	NR	80 (4)	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	20.09	mammal	Rat or Mouse			Reproduction	Oral?			Reprod/ Develop	NOAEL	NR	80 (4)	ppm ai (mg ai/kg/d)			MRID 41531301		In USEPA 2002.			Yes
Diquat	20.09	mammal	Rat or Mouse			Repro & Fert Test	Oral?			Reprod/ Develop	LOAEL	NR	400/240e (12)	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	**26.7**	**mammal**	**Beagle dog**			**Chronic (52 w)**	**Diet**	**52 w**			**NOAEL**	**NR**	**0.5**	**mg ai/kg/d**			**MRID 41730301**		**In USEPA 2002.**			**Yes**
Diquat	26.7	mammal	Beagle dog			Chronic (52 w)	Diet	52 w			LOAEL	NR	2.5	mg ai/kg/d			MRID 41730301		In USEPA 2002.			Yes
Diquat	21.09	mammal	Mouse	CD-1		Carcin. Test (104 w)	Oral?	104 w			NOAEL	NR	30 (3.56/4.78)f	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	21.09	mammal	Mouse	CD-1		Carcin. Test (104 w)	Oral?	104 w			LOAEL	NR	100 (11.96/16.03)f	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	**26.5**	**mammal**	**Rat**			**Carcinogencity**	**Oral?**	**104 w**			**NOAEL**	**NR**	**15 (0.58/0.72)f**	**ppm ai (mg ai/kg/day)**			**MRID 41085601, MRID 00145855**		**In USEPA 2002.**			**Yes**
Diquat	26.5	mammal	Rat			Carcinogencity	Oral?	104 w			LOAEL	NR	75 (2.91/3.64)f	ppm ai (mg ai/kg/d)			MRID 41085601, MRID 00145855		In USEPA 2002.			Yes
Diquat	20.1	mammal	Rat			Neurotoxicity	Oral?				NOAEL	NR	75	mg ai/kg					In USEPA 2002.			Yes
Diquat	20.1	mammal	Rat			Neurotoxicity	Oral?				LOAEL	NR	150	mg ai/kg					In USEPA 2002.			Yes
Diquat	20.8	mammal	Rat	Alpk:APfSD Rat		Neurotoxicity	Oral?			Systemic	NOAEL	NR	100 (8.0/9.5)f	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	20.8	mammal	Rat	Alpk:APfSD Rat		Neurotoxicity	Oral?			Systemic	LOAEL	NR	400 (32.4/38.5)f	ppm ai (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat	technical grade	mammal	Rabbit			Dermal	Dermal			Mortality	LD_{50}	NR	288.5 (m&f)	mg ai/kg			MRID 00100614		In USEPA 1995			Yes
Diquat		mammal	Rat			Reproduction	Diet	gestation days 1 to 20		Maternal	LOAEL	NR	500 (32 -56)	ppm ai (mg ai/kg/day)			Accession 224405		In USEPA 1995			Yes
Diquat		mammal	Rat			Reproduction	Diet	gestation days 1 to 20		Maternal	NOAEL	NR	125 (8-14)	ppm ai (mg ai/kg/d)			Accession 224405		In USEPA 1995			Yes
Diquat		mammal	Rat			Reproduction	Diet	gestation days 1 to 20		Developmental	LOAEL	NR	500 (32 -56)	ppm ai (mg ai/kg/d)			Accession 224405		In USEPA 1995			Yes
Diquat		mammal	Rat			Reproduction	Diet	gestation days 1 to 20		Developmental	NOAEL	NR	125 (8-14)	ppm ai (mg ai/kg/d)			Accession 224405		In USEPA 1995			Yes
Diquat		mammal	Rabbit			Reproduction	Gavage	gestation days 1 to 28		Developmental	LOAEL	NR	2.5	mg ai/kg/d			MRID 00061635		In USEPA 1995			Yes
Diquat		mammal	Rabbit			Reproduction	Gavage	gestation days 1 to 28		Developmental	NOAEL	NR	5	mg ai/kg/d			MRID 00061635		In USEPA 1995			Yes
Diquat	technical grade	mammal	Rat			Neurotoxicity	gavage	single dose		Neurotoxicity	LOAEL	NR	75	mg ai/kg/d			MRID 42666801		In USEPA 1995			Yes
Diquat	technical grade	mammal	Rat			Neurotoxicity	gavage	single dose		Neurotoxicity	NOAEL	NR	25	mg ai/kg/d			MRID 42666801		In USEPA 1995			Yes
Diquat dibromide monohydrate	49.1	mammal	Rat	Sprague-Dawley rats	adult	Oral	Organism[40]	up to 10 d	up to 14 d	Maternal survival	NOEC	65	NR	mg/kg/d	No/No				Chernoff et al. 1990. Teratology. 42: 651-658.			Yes

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation
Diquat dibromide monohydrate	49.1	mammal	Rat	Sprague-Dawley rats	adult	Oral	Organism[40]	up to 10 d	up to 14 d	Maternal survival	LOEC	> 65	> NR	mg/kg/d	No/No				Chernoff et al. 1990. Teratology. 42: 651-658.			Yes
Diquat dibromide monohydrate	49.1	mammal	Rat	Sprague-Dawley rats	adult	Oral	Organism[40]	up to 10 d	up to 14 d	Fetal toxicity	NOEC	65	NR	mg/kg/d	No/No				Chernoff et al. 1990. Teratology. 42: 651-658.			Yes
Diquat dibromide monohydrate	49.1	mammal	Rat	Sprague-Dawley rats	adult	Oral	Organism[40]	up to 10 d	up to 14 d	Fetal toxicity	LOEC	> 65	> NR	mg/kg/d	No/No				Chernoff et al. 1990. Teratology. 42: 651-658.			Yes
Diquat[37]		mammal	Rat	Sprague-Dawley rats	fetus	Intravenous	Organism[38]	Single iv dose	1-14 d	Fetal viability	LOEC	15	NR	mg/kg	Yes/No				Bus et al. 1975. Toxicol. Appl. Pharmacol. 33: 450-460.			No
Diquat	28.6 (w/v)	mammal	Mouse	*Mus musculus*	10-12 w	Oral	Organism	5 d	3 w	Mortality	NOEC	1	NR	mg/kg BW/d	No/No				Anderson et al. 1976. Mutation Res. 40: 349-358.			Yes
Diquat	28.6 (w/v)	mammal	Mouse	*Mus musculus*	10-12 w	Oral	Organism	5 d	Variable	Mating Success	NOEC	1	NR	mg/kg BW/d	No/No				Anderson et al. 1976. Mutation Res. 40: 349-358.			Yes
Diquat	28.6 (w/v)	mammal	Mouse	*Mus musculus*	10-12 w	Oral	Organism	5 d	Variable	Pregnancy Success	NOEC	1	NR	mg/kg BW/d	No/No				Anderson et al. 1976. Mutation Res. 40: 349-358.			Yes
Diquat		terrestrial plant	crop species	10 species						seed emergence & germination	EC_{25}	NR	> 7.49	lb ai/acre					In USEPA 1995			Yes
Diquat		terrestrial plant	crop species	10 species						seed emergence & germination	NOEAC	NR	7.49	lb ai/acre					In USEPA 1995			Yes
Diquat		terrestrial plant	corn	*Zea mays*						desication	EC_{25}	NR	0.016	lb ai/acre					In USEPA 1995			Yes
Diquat	35.3	terrestrial plant	Wheat	*Triticum aestivum*		vegetative vigor				desication	EC_{25}	NR	0.016	lb ai/acre					In USEPA 1995			Yes
Diquat	**35.3**	**terrestrial plant**	**cotton**	***Gossypium spp.***		**vegetative vigor**				**vigor**	**EC_{25}**	**NR**	**0.0047**	**lb ai/acre**					**In USEPA 1995**			**Yes**
Diquat	**35.3**	**terrestrial plant**	**Soybean**	*Glycine max*	juvenile plant	vegetative vigor			**14 d**	**vigor**	**EC_{25}**	**NR**	**0.0100**	**lb ai/acre**		**CCI**	**MRID 41883001**		**1990. In USEPA 2003.**	**M. Davy**	**1994**	**Yes**
Diquat	35.3	terrestrial plant	Soybean	*Glycine max*	juvenile plant	vegetative vigor			14 d	vigor	NOEL	NR	0.0197	lb ai/acre		CCI	MRID 41883001		1990. In USEPA 2003.	M. Davy	1994	Yes
Diquat	35.3	terrestrial plant	Soybean	*Glycine max*		vegetative vigor				vigor	EC_{25}	NR	0.0074	lb ai/acre					In USEPA 1995.			Yes
Diquat		terrestrial plant	corn	*Zea mays*	juvenile plant	vegetative vigor			4 wks	vigor	EC_{25}	NR	0.04	lb ai/acre		Wildlife International	MRID 44755601		1999. In USEPA 2003.	GAI	2000	Yes
Diquat		terrestrial plant	corn	*Zea mays*						vigor	NOEAC	NR	0.01064	lb ai/acre					In USEPA 1995.			Yes
Diquat	35.3	terrestrial plant	Wheat	*Triticum aestivum*	juvenile plant	vegetative vigor			4 wks	vigor	EC_{25}	NR	0.1700	lb ai/acre		Wildlife International	MRID 44755601		1999. In USEPA 2003.	GAI	2000	Yes
Diquat	35.3	terrestrial plant	Wheat	*Triticum aestivum*	juvenile plant	vegetative vigor			4 wks	vigor	NOEAC	NR	0.1300	lb ai/acre		Wildlife International	MRID 44755601		1999. In USEPA 2003.	GAI	2000	Yes
Diquat		terrestrial plant	corn	*Zea mays*	juvenile plant	vegetative vigor			4 wks	vigor	NOEL	NR	0.031	lb ai/acre		Wildlife International	MRID 44755601		1999. In USEPA 2003.	GAI	2000	Yes
Diquat	35.3	terrestrial plant	cotton	*Gossypium spp.*	juvenile plant	vegetative vigor			14 d	vigor	NOEL	NR	0.0197	lb ai/acre		CCI	MRID 41883001		1990. In USEPA 2003.	M. Davy	1994	Yes
Diquat (c.)	21.6 & 23.5		Unknown			21 day chronic	Inhalation	21 d			NOAEL	NR	0.1 (0.024 (M), 0.026 (f)	g ai/L/day (mg ai/kg/d)					In USEPA 2002.			Yes
Diquat (c.)	21.6 & 23.5		Unknown			20 day chronic	Inhalation	20 d			LOAEL	NR	0.49 (0.117 (M), 0.128 (f)	g ai/L/day (mg ai/kg/d)					In USEPA 2002.			Yes

Boldface indicates study selected for derivation of toxicity reference value (TRV) used in risk assessment.

[1]Toxicity values relate the dose of a compound with a potentially adverse effect. Values are reported as they were presented in the reviewed sou

[2]See the bibliography of this ERA document, Appendix A of the associated Literature Review document, and source footnote for complete citations.

[3]tested product identifed as diquat

[4]diquat led to macrophyte die-off, faster algae growth rate, and increased tadpole food supply.

[5]at 13 days.

Abbreviations

m - male
f - female
a.i. - active ingredient
NR - Not reported.

Formulation	% purity/ai	General Taxonomic Group	Common Name	Scientific Name	Age	Test Type	Means of Exposure	Exposure Duration	Test Duration	Biological Endpoint	Statistical Endpoint	Toxicity Value (tested product)[1]	Toxicity Value (ai)[1]	Units	Chemical Analysis Done/ Reported	Lab	Study Number	Report Number	Data Source[2]	EPA Reviewer	Date Reviewed	Used for TRV derivation

[6]Diquat as a.i. Long-term application of diquat keeping concentration constant.
[7]no statistical analysis but substantial effects seen.
[8]24 h LC50 also available.
[9]As cited in USEPA 2003.
[10]diquat dibromide as active ingredient.
[11]Diaptomus spp comprised 90% of copepods; Eucyclops spp comprised 10%.
[12]Chautauqua Lake water.
[13]median tolerance limit.
[14]aka 6,7-dihydrodipyrido(1,2-a:2,1'-c) pyrazinedium dibromide.
[15]Sieved mud in test chambers.
[16]48-h value.
[17]20% mortality at highest concentration (10 ppm).
[18]Addition of soil-sand mix increased LOEC to > 3 ppm (highest concentration tested).
[19]Sediment exposed to aqueous diquat concentration for 9 days before rinsing and testing.
[20]nominal concentrations.
[21]all dead within a few days of initiation, none returned.
[22]not sure if this is per tested product or a.i. Diquat concentrations measured analytically.
[24]5 d treated followed by 3 d untreated.
[25]ppm diquat in feed.
[26]EPA RED (1995) reports study date as 1975.
[27]33% mortality @ 5000 ppm.
[28]Cation concentration in concentrate.
[29]now Oncorhynchus mykiss.
[30]5 ppm treatment and tissue residues only.
[31]Hydrilla treated with 2 ppm diquat 5 days before feeding experiments began.
[32]Not certain if measured or nominal concentrations were used in calculation of the LC_{50}.
[33]96-h LC50s range from 115 to 498 mg/L for pH of 6.5-9.5 at hardness of 44 mg/L.
[34]Endpoints from 24, 48, and 72 hours also available.
[35]Based on diquat cation.
[36]All results reported in ppm of commercial formulation and not of active ingredient.
[37]Inappropriate exposure route.
[38]N,N'-ethylene 2,2'-bipyridilium.
[39]Doses based on previous studies.
[40]Doses administered on days 6-15 of gestation.

MRID - Master Record Identification Number

Endpoints

EC_{25} - 25% effect concentration
EC_{50} - 50% effect concentration
IC_0 - concentration causing 0% inhibition of a process
IC_{100} - concentration causing 100% inhibition of a process
IC_{25} - concentration causing 25% inhibition of a process
IC_{50} - concentration causing 50% inhibition of a process
LC_{16} - lethal concentration, 16% mortality
LC_{50} - median lethal concentration, 50% mortality
LC_{70} - lethal concentration, 70% mortality
LC_{95} - lethal concentration, 95% mortality
LD_{50} - median lethal dose, 50% mortality
LOAEC - lowest-observable-adverse effect concentration
LOAEL - lowest-observable-adverse effect level
LOEC - lowest-observable-effect concentration
LOEL - lowest-observable-effect level
MATC - maximum acceptable toxicant concentration
NOAEC - no-observable-adverse effect concentration
NOAEL - no-observable-adverse effect level
NOEC - no-observable-effect concentration
NOEL - no-observable-effect level

Durations

hr - hours
d - days
w - weeks
m - months
y - years