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October 12, 2007

Arthur-Jean B. Williams
Document Processing Desk (7504P)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Room S-4900, One Potomac Yard
2777 South Crystal Drive
Arlington, VA 22202

SUBJECT: COMMENTS ON EPA'S EFFECT DETERMINATIONS FOR ATRAZINE RELATIVE TO THREE FEDERALLY LISTED ENDANGERED FRESHWATER MUSSELS [CATSPAW (*EPIOBLASMA OBLIQUATA OBLIQUATA*), FAT POCKETBOOK (*POTAMILUS CAPAX*), NORTHERN RIFFLESHELL (*EPIOBLASMA TORULOSA RANGIANA*)] AND TWO FEDERALLY LISTED ENDANGERED FRESHWATER FISH [PALLID STURGEON (*SCAPHIRHYNCHUS ALBUS*), TOPEKA SHINER (*NOTROPIS TOPEKA*)]

Dear Ms. Williams,

With this letter and enclosed submission volume, Syngenta is providing comments on the following endangered species assessments conducted by the Environmental Protection Agency (EPA)[1]:

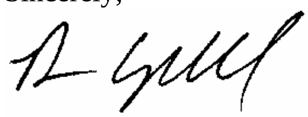
- Potential Risks of Labeled Atrazine Uses to the Topeka Shiner (Notropis topeka), August 31, 2007
- Risks of Atrazine Use to Three Federally Listed Endangered Freshwater Mussels, August 31, 2007
- Risks of Atrazine Use to Federally Listed Endangered Pallid Sturgeon (Scaphirhynchus albus), August 31, 2007

Syngenta would like to commend EPA for the obvious hard work and large amount of effort put in to these assessments. However, after our thorough technical review, we believe that EPA has not in all cases met the standard of using "best available data" to support the "likely to adversely affect" determination for (1) indirect effects on the Fat pocketbook mussel, Northern riffleshell mussel, and Topeka shiner (including critical habitat) from direct effects on aquatic communities, (2) indirect effects on the Northern riffleshell mussel, Topeka shiner (including critical habitat), and Pallid sturgeon from direct effects on riparian vegetation, and (3) direct chronic effects on the Topeka shiner.

[1] These assessments are all available at: http://www.epa.gov/oppfead1/endanger/litstatus/effects/

Thank you for consideration of our review in the enclosed document. We look forward to discussing the details of this submission in the near future. Please call me at (336) 632-7627 if you have any questions concerning this material.

Sincerely,



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VOLUME _____ OF _____ OF SUBMISSION

Atrazine

Syngenta Response to EPA's Effect Determinations for Atrazine Relative to Three Federally Listed Endangered Freshwater Mussels [Catspaw (*Epioblasma obliquata obliquata*), Fat pocketbook (*Potamilus capax*), Northern riffleshell (*Epioblasma torulosa rangiana*)] and Two Federally Listed Endangered Freshwater Fish [Pallid sturgeon (*Scaphirhynchus albus*), Topeka shiner (*Notropis topeka*)]

Response

DATA REQUIREMENT:	October 31, 2003 Amended Interim Registration Eligibility Decision for Atrazine Generic and Product-Specific Data Call-In for Atrazine, Addendum of March 18, 2005
AUTHOR(S):	David C. Volz, Ph.D. JiSu Bang, Ph.D. Steven B. Wall, Ph.D.
STUDY COMPLETION DATE:	October 12, 2007
PERFORMING LABORATORY:	Syngenta Crop Protection, Inc. 410 Swing Road Greensboro, NC 27409 USA
LABORATORY PROJECT ID:	Report Number: T008135-07 Task Number: T008135-07
SUBMITTER/SPONSOR:	Syngenta Crop Protection, Inc. 410 Swing Road Post Office Box 18300 Greensboro, NC 27419 USA

VOLUME 1 OF 1 OF STUDY

PAGE 1 OF 19

This report contains color pages.

STATEMENTS OF DATA CONFIDENTALITY CLAIM

1) *The following statement applies to submissions to regulatory agencies in the United States of America.*

STATEMENT OF NO DATA CONFIDENTIALITY CLAIM

No claim of confidentiality is made for any information contained in this study on the basis of its falling within the scope of FIFRA Section 10 (d) (1) (A), (B), or (C).

Company: Syngenta Crop Protection, Inc.

Company Representative: Dan Campbell

Title: Senior Regulatory Product Manager

Signature: ____________________ Date: 10/12/07

These data are the property of Syngenta Crop Protection, Inc. and, as such, are considered to be confidential for all purposes other than compliance with the regulations implementing FIFRA Section 10.

Submission of these data in compliance with FIFRA does not constitute a waiver of any right to confidentiality which may exist under any other provision of common law or statute or in any other country.

2) *The following statement applies to submissions to regulatory agencies other than in the United States of America.*

THIS DOCUMENT CONTAINS INFORMATION CONFIDENTIAL AND TRADE SECRET TO SYNGENTA LIMITED.

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GOOD LABORATORY PRACTICE COMPLIANCE STATEMENT

Since this volume contains previously published information and results from non-laboratory-based studies, a Good Laboratory Practice Compliance Statement as defined by 40 CFR Part 160 is not appropriate.

Study Director: There is no GLP Study Director for this volume.

David C. Volz, Ph.D. — Date: 12 OCT. 2007
Author

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1.0 EXECUTIVE SUMMARY

Syngenta is submitting comments regarding scientific methodology and risk assessment procedures used by EPA to assess three federally listed species of freshwater mussels and two federally listed species of freshwater fishes. Syngenta previously submitted supporting data for EPA's effects determinations (Volz *et al.*, 2007). However, even following consideration of these supporting data, Syngenta believes that EPA has not met the standard of using "best available data" in all cases to support the "likely to adversely affect" (LAA) determination for (1) indirect effects on the Fat pocketbook mussel, Northern riffleshell mussel, and Topeka shiner (including critical habitat) from direct effects on aquatic communities, (2) indirect effects on the Northern riffleshell mussel, Topeka shiner (including critical habitat), and Pallid sturgeon from direct effects on riparian vegetation, and (3) direct chronic effects on the Topeka shiner. This document contains the following additional considerations for assessment refinements:

- Targeted monitoring data used by EPA from the Atrazine Ecological Monitoring Program (AEMP) are not representative of the entire 1172 HUC10 vulnerable watersheds.
    - The two Missouri sites that slightly exceeded the aquatic community effects thresholds – known as MO-1 and MO-2 – are not representative of all watersheds within the 1172 HUC10 vulnerable watershed boundary. These sites have a unique combination of hydrogeological, pedological, and cropping factors that tend to influence atrazine runoff.
    - When best available daily autosampler residue data are considered, there is no exceedance of the aquatic community effects threshold for IN-11.
- Refinement of exposure values based on 30 years of PRZM-estimated pesticide runoff loads using multiple PRZM corn scenarios quantitatively demonstrates that atrazine is not likely to adversely affect herbaceous/grassy riparian areas. Moreover, considering the reversibility of atrazine effects on plants, grassy/herbaceous riparian vegetation transiently exposed to atrazine via runoff or drift will recover from any potential growth inhibition.
- EPA has not quantitatively determined the risk of potential atrazine impacts on riparian habitat and stream water quality, resulting in a speculative conclusion that is based on an incorrect legal standard.
- Consideration of low-flow-adjusted Estimated Environmental Concentrations (EECs) and the appropriate warmwater surrogate species for assessing direct chronic effects demonstrates that atrazine will not affect the Topeka shiner within all regions of corn production and Western fallow use regions.
- Refinement of the atrazine action areas and consideration of atrazine monitoring data from sites in close proximity to Fat pocketbook and Northern riffleshell mussel locations demonstrates that atrazine is not likely to adversely affect these species based on direct effects on aquatic producer communities.

Based on these considerations, Syngenta believes that additional refinements to EPA's assessments will indicate that the LAA effects determinations should be changed to "no effect" (NE) or "not likely to adversely affect" (NLAA) determinations for all species.

2.0 INTRODUCTION

EPA prepared "effects determinations" by evaluating potential direct and indirect effects of the herbicide atrazine on survival, growth, and reproduction of three federally listed species of freshwater mussels and two federally listed species of freshwater fishes (US EPA 2007a, 2007b, and 2007c). A large atrazine database exists in the form of published literature, registrant-submitted data and information, regulatory reviews, and other sources. Consequently, there is a wealth of scientific data available for atrazine, combined with practical experience from approximately 50 years of registered use as an herbicide. Given the availability of comprehensive data, information and knowledge, EPA is required to utilize these data and to conduct detailed and refined assessments when evaluating the potential effects of atrazine on freshwater mussels and fish. In many portions of the atrazine assessment (and earlier atrazine endangered species assessments), EPA utilized this wealth of information and the standard of best available data in drawing its effects conclusions. However, in certain areas, EPA has reached invalid or incomplete effects determinations because the best available data were not fully considered. Syngenta previously submitted supporting data for use in EPA's effects determinations (Volz *et al.*, 2007). The details and analyses submitted herein include additional refinements that should be considered for determining whether atrazine is likely to adversely affect the named federally listed species.

3.0 REPRESENTATIVENESS OF ATRAZINE MONITORING DATA

EPA concluded that atrazine is LAA the Fat pocketbook and Northern riffleshell mussel in low-flow (<200 ft^3/s) vulnerable watersheds of the action area based on direct effects on phytoplankton, aquatic plants, and primary productivity. However, EPA also stated that "if further analysis reveals that the [atrazine] monitoring data are not representative of atrazine concentrations in vulnerable watersheds where these listed mussels occur, the effects determinations will be revised to 'NLAA'." As previously described and reported to EPA (Wall *et al.*, 2007; Hampton *et al.*, 2007; Hendley *et al.*, 2007; Miller *et al.*, 2007), Syngenta believes that MO-01 and MO-02 monitoring data from the Atrazine Ecological Monitoring Program (AEMP) are not representative of all 1172 WARP-predicted upper 20^{th}-centile watersheds in the Midwest corn/sorghum growing regions. In addition, when best available daily autosampler residue data are considered, IN-11 in 2005 does not exceed the aquatic community effects thresholds. As such, maximum rolling average atrazine concentrations from these three sites should not be directly used for EPA's indirect LAA effects determinations for Fat pocketbook and Northern riffleshell mussel locations within streams with flow rates <200 ft^3/s. A brief summary of Syngenta's reasons and conclusions for these sites are provided below.

MO-01 and MO-02 are small streams with sand (MO-01) or sand/gravel (MO-02) bed material (substrate) and slightly murky to murky water. During the summer, these streams have minimal to intermittent flow and, in some cases, may dry down with only small pools of water remaining. Both sites are located in the Missouri portion of the Central Claypan Major Land Resource Area (MLRA 113) – a unique region where a combination of hydrogeological, pedological, and cropping factors can combine with higher rainfall to generate higher levels of atrazine runoff and prolonged chemograph durations. The runoffinducing factors characteristic of the Missouri portion of MLRA 113 do not generally occur in small headwater subwatersheds elsewhere in the corn and sorghum cropping regions of the United States. Therefore, streams within MLRA 113 are not immediately characteristic of streams outside of MLRA 113. Given that MO-01 and MO-02 are not representative of all 1172 vulnerable watersheds, atrazine monitoring data from these two watersheds should not be used to characterize exposure for the Fat pocketbook mussel and Northern riffleshell mussel, particularly since these species are not located within MLRA 113.

For the IN-11 site, there was a single high detection (208.76 µg/L) on one day based on grab samples monitored over three years. This high detection in 2005 was due to measurement of unmixed, edge-of-field runoff from a ditch immediately adjacent to the sampler. At this site, autosampler residues greater than 25 µg/L, and the grab sample of 208.76 µg/L, all occurred on a single day, and no other residue greater than 25 µg/L was measured over three years of monitoring. The 14- and 30-day rolling average effects threshold exceedances were driven by this single sample and use of a stair-step calculation method within CASM_Atrazine. As such, the single detection of 208.76 µg/L is a considerable overestimate since instream autosampler data from this same day (May 14, 2005) generated a daily mean of approximately 136 µg/L (equal time weighting of the 4 six-hour composite samples). When all data are considered, there was no LOC exceedance for IN-11 in 2005; 2006 CASM_Atrazine data (0% SSI deviation) and data for 2007 support this conclusion. Therefore, the IN-11 exceedance in 2005 based on a single high detection is not directly applicable for assessment of exposure and effects to the five listed species.

4.0 REFINEMENT OF ATRAZINE ACTION AREAS

EPA concluded that atrazine is not likely to adversely affect the Fat pocketbook and Northern riffleshell mussel if occupied streams/rivers are outside of the 1172 vulnerable watershed boundary and/or within the 1172 vulnerable watershed boundary but with flow rates >200 ft^3/s. Therefore, using these two criteria, refinements of these broader atrazine action area(s) are necessary in order to identify site-specific potential atrazine exposure areas to the listed species.

Syngenta's previously submitted best available species location and corresponding flow data showed that streams occupied by the Fat pocketbook and Northern riffleshell mussel have a broad range of flow rates (<100 to 600,000 ft^3/s), with only twelve current locations within the 1172 vulnerable watershed boundary and with flow rates <200 ft^3/sec (Volz *et al.*, 2007). For the Fat pocketbook mussel, only two out of 255 current locations were identified within the 1172 vulnerable watershed boundary with stream flows <200 ft^3/s or with no flow data available. Detailed satellite images showed that one Fat pocketbook mussel location (EOID: 305279) is located on an island within the main stem of the Mississippi River with an overall, surrounding flow rate of ~74,000 ft^3/s. The second Fat pocketbook mussel location (EOID: 171551) occurs within an oxbow lake in the Wabash River with a flow rate of ~30,000 ft^3/sec. Therefore, these two locations are actually located within major rivers with flow rates significantly higher than 200 ft^3/s. As such, atrazine is not likely to adversely affect the Fat pocketbook mussel based on these refined spatial data.

Only 10 out of 84 current locations for the Northern riffleshell mussel were identified within the 1172 vulnerable watershed boundary and with flow rates <200 ft^3/s (Figure 1). Based on best available aggregate NatureServe spatial location data, seven out of ten Northern riffleshell locations with flow rates <200 ft^3/s occur outside of the broader action area defined by EPA. However, evaluation of maximum rolling average atrazine concentrations from 17 AEMP sub-watersheds in close proximity to these low-flow (<200 ft^3/s) Northern riffleshell locations shows that only one site-year (IN-11 in 2005) exceeded the rolling average effects thresholds when using 4-day grab samples (Table 1). As described in Section 3, the threshold exceedance for the IN-11 site resulted from a single high detection and use of stair-step interpolation within CASM_Atrazine. Therefore, after considering best available daily autosampler data for IN-11, atrazine is not likely to adversely affect the Northern riffleshell mussels since worst-case atrazine monitoring sites (i.e., seasonal flow rates <200 ft^3/s; Table 1) in close proximity to the low-flow (<200 ft^3/s) Northern riffleshell locations have not exceeded the aquatic community effects threshold over several years of monitoring.

Figure 1 Spatial Distribution of Current Northern Riffleshell Mussel Locations

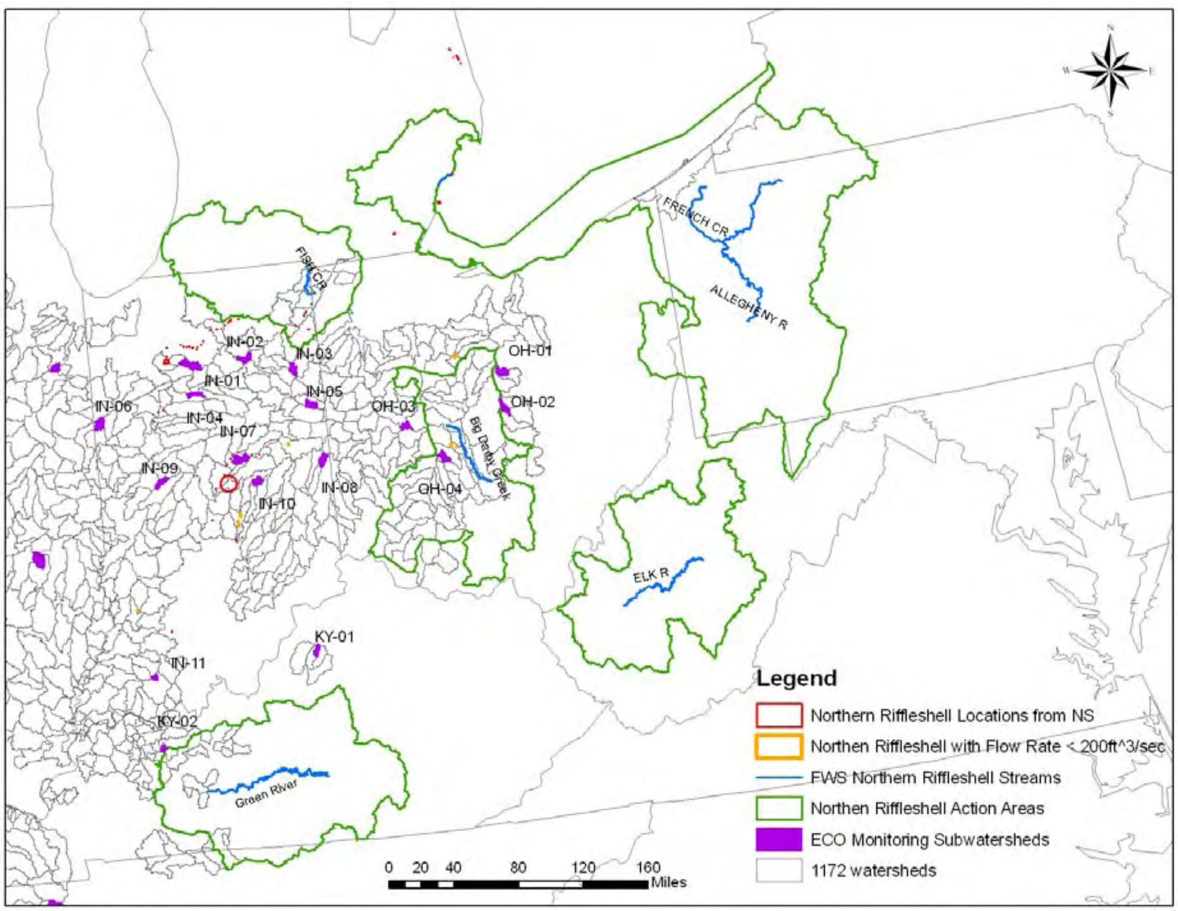


Table 1 Maximum Rolling Average Atrazine Concentrations (µg/L) for Atrazine Ecological Monitoring Program Sites in Close Proximity to Northern Riffleshell Mussels Occupying Low-Flow (<200 ft^3/s) Streams

Watershed ID	Mean Daily Flow (ft^3/sec)	2004				2005				2006			
		14-day (38 ppb)	30-day (27 ppb)	60-day (18 ppb)	90-day (12 ppb)	14-day (38 ppb)	30-day (27 ppb)	60-day (18 ppb)	90-day (12 ppb)	14-day (38 ppb)	30-day (27 ppb)	60-day (18 ppb)	90-day (12 ppb)
IN-01	105.6	4.0	3.5	2.4	1.7	1.4	1.0	0.7	0.5	N/A	N/A	N/A	N/A
IN-02	22.3	6.3	4.5	2.8	2.1	6.3	4.3	3.0	2.1	N/A	N/A	N/A	N/A
IN-03	27.7	N/A	N/A	N/A	N/A	4.3	3.3	2.3	1.7	10.6	6.2	3.9	2.9
IN-04	22.4	23.8	12.0	6.3	4.4	3.6	2.1	1.4	1.0	5.6	3.7	2.2	1.6
IN-05	8.2	14.9	11.9	7.0	4.9	7.8	4.5	4.1	3.5	17.9	13.1	7.5	5.6
IN-06	173.9	N/A	N/A	N/A	N/A	2.9	1.8	1.0	0.7	4.1	2.7	1.9	1.5
IN-07	200.5	N/A	N/A	N/A	N/A	9.6	6.4	3.9	2.7	5.3	3.6	2.0	1.4
IN-08	34.7	N/A	N/A	N/A	N/A	6.9	4.9	2.8	2.1	8.9	7.7	4.4	3.1
IN-09	59.1	N/A	N/A	N/A	N/A	3.7	2.4	1.7	1.3	3.0	1.8	1.2	0.9
IN-10	22.1	N/A	N/A	N/A	N/A	6.1	4.0	2.8	2.2	7.5	6.3	3.6	2.6
IN-11[1]	24.5	N/A	N/A	N/A	N/A	**65.1**	**31.5**	16.2	11.0	5.9	3.3	1.9	1.4
KY-01	11.1	N/A	N/A	N/A	N/A	1.5	1.2	0.9	0.7	6.9	3.6	1.9	1.3
KY-02	55.3	N/A	N/A	N/A	N/A	8.7	7.1	4.5	3.6	4.7	3.9	2.2	1.6
OH-01	30.9	8.8	5.7	3.2	2.2	1.0	0.9	0.5	0.5	N/A	N/A	N/A	N/A
OH-02	31.9	N/A	N/A	N/A	N/A	7.1	4.0	2.7	2.0	5.9	5.2	2.9	2.1
OH-03	19.6	9.1	7.0	4.5	3.1	3.0	1.6	0.9	0.6	N/A	N/A	N/A	N/A
OH-04	200.8	N/A	N/A	N/A	N/A	8.0	4.7	2.7	1.9	2.6	1.7	1.0	0.7

[1] Based on inclusion of best available daily autosampler data, maximum rolling average concentrations for were 36.9, 18.2, 9.5, and 6.6 µg/L for 14-, 30-, 60- and 90-days respectively. These refined rolling average concentrations do not exceed the aquatic community effects thresholds.

5.0 HERBACEOUS/GRASSY RIPARIAN VEGETATION

Syngenta has previously indicated that additional data need to be considered for indirect effect determinations based on potential impacts on herbaceous/grassy riparian areas (Wall *et al.*, 2007; Volz *et al.*, 2007). EPA's LAA effects determinations based on direct effects on herbaceous/grassy riparian areas for the Fat pocketbook mussel, Topeka shiner (including critical habitat), and Pallid sturgeon were dependent on screening-level assumptions inherent to EPA's TerrPlant model. However, as presented below, refinements to TerrPlant based on 30 years of PRZM-estimated atrazine runoff loads using multiple PRZM corn scenarios quantitatively demonstrates – particularly given the reversibility of direct atrazine effects on plants – that atrazine is not likely to adversely affect herbaceous/grassy riparian areas.

EPA's standard TerrPlant model is a screening-level terrestrial plant exposure model that evaluates pesticide exposure via runoff and spray drift. This model predicts EECs within adjacent dry and semi-aquatic areas as a function of drift (5 and 1% for aerial and ground applications respectively) and pesticide runoff (2% of total application for atrazine). Runoff load estimations are based on the application rate, chemical solubility, and assumptions about drainage and receiving areas. For assessments of non-endangered terrestrial plants, exposure estimates are then compared to EC_{25} values derived from guideline non-target plant toxicity data. For EPA's effects determinations, exposure values for "dry adjacent areas" were used to approximate exposure for adjacent herbaceous/grassy riparian vegetation.

As indicated within EPA's assessments, TerrPlant was used to estimate screening-level exposure values for terrestrial plants in riparian areas. As such, terrestrial plant risk quotients (RQs) calculated by EPA are also considered screening-level risk assessments and, if the level-of-concern (LOC) is exceeded, should be refined via additional exposure analyses. As TerrPlant does not consider environmental fate characteristics, but rather presumes a fixed, persistent concentration of runoff based on chemical solubility, refined pesticide edge-of-field runoff load estimates must account for, at minimum, environmental behavior and fate of atrazine following application and temporal variability of exposure associated with runoff events. Therefore, rather than assuming a edge-of-field atrazine concentration that is 2% of the application rate (TerrPlant default for chemical solubility of 10-100 mg/L), pesticide runoff flux data based on five different PRZM corn scenarios were used to refine pesticide runoff to adjacent dry areas. A similar approach has been previously used by EPA for propiconazole (USEPA 2006).

PRZM inputs for atrazine were identical to those within EPA's assessments (Table 2). Additionally, the corn scenarios were identical to those within EPA's assessments, and represented the Northern, Southern, Western, and Upper Great Plains regions of the United States. PRZM crop scenarios and corresponding weather data files are indicated in Table 4. A single worst-case aerial application rate of 2.0 lb ai/A (2.24 kg ai/ha) (average rates on corn are ~1.2 lb ai/A) was simulated within each PRZM corn scenario. Although single application rates are higher on fallow (2.25 lb ai/A) and forestry (4.0 lb ai/A) uses, corn scenarios were simulated since these scenarios generally resulted in the highest aquatic EECs within EPA's assessments (US EPA 2007a, 2007b, and 2007c). All PRZM-based pesticide runoff loads were estimated using EPA's standard graphical use interface, PE4v01.pl.

Maximum daily PRZM pesticide runoff flux (g/cm^2) data within each year (1961-1990) were first identified from daily cumulative pesticide runoff flux data (g/cm^2 X 10^{-5}) and converted to lb ai/A in order to compare exposure estimates directly with seedling emergence toxicity data. As direct effects on grassy/herbaceous riparian buffers (and not federally listed plants) were being considered, non-endangered RQs were calculated using the most sensitive monocot (oats and onions) and dicot (carrots and cucumbers) species from each seedling emergence guideline study (Table 3) and compared to the corresponding LOC (=1). Daily runoff-based RQs were calculated over 30 years, generating a total of 10,957 daily RQs for each modeled PRZM corn scenario.

For drift-only RQs, potential exposure of riparian vegetation via drift (5% of application rate) would only occur once per year since a single seasonal aerial application on corn was simulated; importantly, this is a conservative assumption given that <5% of atrazine is applied on corn via aerial application. Given these assumptions, potential drift exposure would only occur for 30 total days over 30 years. As drift assumptions are not regionally dependent, identical RQs for each of the 30 days were assumed for all areas of corn production. Drift-specific RQs were calculated using the most sensitive monocot and dicot species from each vegetative vigor guideline study (Table 3) and compared to the corresponding LOC (=1). Total daily runoff and drift LOC exceedances (RQ > 1) and percentile ranks (10th-to-99.9th-centile) were determined based on 30 years of RQ data.

Table 2 Summary of PRZM Input Parameters Used for Estimating Edge-of-Field Pesticide Runoff Loads

Input Parameter	Value
Molecular Weight	215.7 g/mol
Henry's law constant	2.58×10^{-9} atm m^3/mol
Vapor pressure @ 25ºC	3×10^{-7} torr
Water solubility	33 mg/L
Aqueous photolysis	335 days
Hydrolysis	stable at pH 5, 7, and 9
Water half-life	304 days
Benthic half-life	608 days
Soil half-life	152 days
K_{oc}	88.78 ml/g
Application efficiency	95% (aerial)
Spray drift fraction	6.5% (aerial)
Application rate	2.24 kg ai/ha
Number of applications	1
Chemical Application Model (CAM)	1
Incorporation Depth	0 cm

As expected, total daily exceedances were dependent on the species, toxicity endpoint, and PRZM corn scenario (Table 4). The maximum number of daily exceedances (60 days) for runoff alone was predicted for emerging dicots adjacent to IL corn, with a maximum overall LOC exceedance rate of 0.55% (Table 4). When these 30-year RQ data were ranked as percentiles, the worst-case scenario (dicots adjacent to IL corn) showed that no exceedances occur up to the 99th-centile of the RQ distribution, and a marginal LOC exceedance occurs at the 99.5th-centile of the RQ distribution. Based on this refined analysis that considers 30 years of site-specific weather data, atrazine runoff concentrations at worst-case sites are only expected to exceed monocot or dicot LOCs approximately two days over the entire year. Similarly, assuming a single seasonal application on corn, atrazine drift concentrations are only expected to exceed the dicot LOC for one day (same day as application) over the entire year.

Table 3 Worst-Case Terrestrial Plant Toxicity Data Used for RQ Calculations

Most Sensitive Surrogate Species		EC_{25} (lbs ai/A) Seedling Emergence	EC_{25} (lbs ai/A) Vegetative Vigor
Monocot	Oat (*Avena sativa*)	0.004	-
Dicot	Carrot (*Daucus carota*)	0.003	-
Monocot	Onion (*Allium cepa*)	-	0.61
Dicot	Cucumber (*Cucumis sativus*)	-	0.008

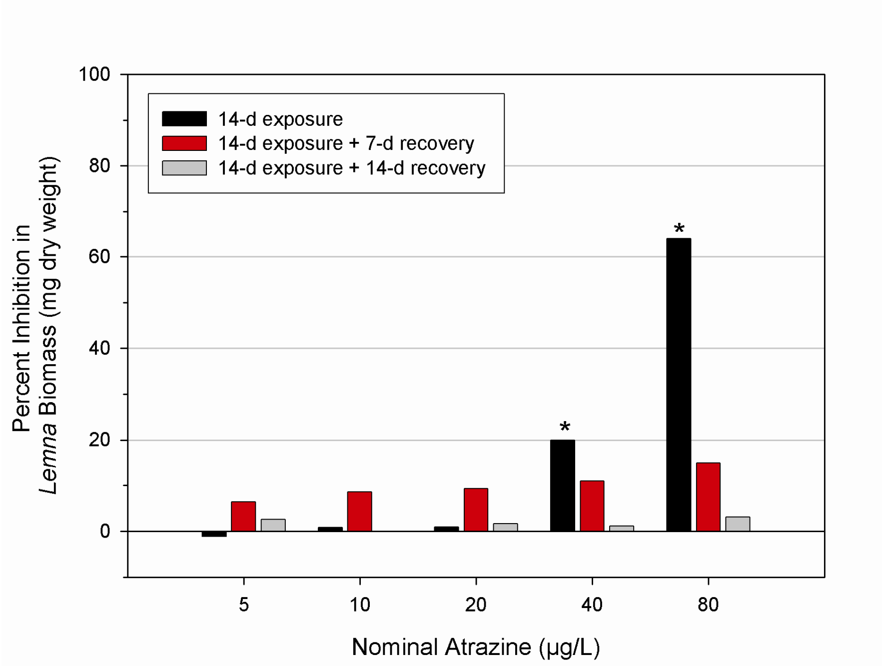
Atrazine's unique mode-of-action is an important consideration relative to the ecological risk assessment of atrazine in riparian areas. Atrazine is not a burn-down herbicide, but rather specifically inhibits growth of target weeds via competitive binding with plastoquinone and inhibition of electron transport during active photosynthesis. In plants, atrazine-induced growth inhibition is reversible, with atrazine removal resulting in recovery of plant growth. Recovery has been documented in aquatic plants (Desjardins *et al.*, 2007), terrestrial plants (Popov and Cornish, 2006), and newly emerged seedlings (Popov *et al.*, 2005). For example, following a 14-day exposure of duckweed (*Lemna gibba*) to atrazine, full recovery occurred in all treatment groups after 7 days (Figure 2) (Desjardins *et al.*, 2007). Thus, grassy/herbaceous riparian vegetation transiently exposed to atrazine via runoff or drift will recover from any potential growth inhibition.

EPA's conclusions that impacts on herbaceous/grassy riparian areas will result in decreased stream water quality (due to increased sedimentation) are not supported by published data and quantitative risk assessment methods. Rather, EPA's conclusions that direct effects on herbaceous/grassy riparian areas will result in a "take" of the Fat pocketbook mussel, Topeka shiner (including critical habitat), or Pallid sturgeon are solely based on the *hypothesis* that potential atrazine impacts on riparian areas indeed leads to increased sedimentation within streams. EPA cited no atrazine-specific studies that (a) demonstrate impacts on riparian vegetation and/or (b) demonstrate that alleged impacts on riparian vegetation lead to increased sedimentation.

Table 4 Summary of Terrestrial Plant RQs based on PRZM-estimated Atrazine Runoff and Drift

							Non-endangered Risk Quotient (RQ = EEC/EC_{25}) (LOC = 1)						
Exposure	Region	PRZM Crop Scenario (Weather Station/File)	Appl. Date	Toxicity Endpoint	Species	Total Daily Exceedances over 30 yrs (10,957 days)	10th-centile	50th-centile	90th-centile	95th-centile	99th-centile	99.5th-centile	99.9th-centile
Runoff	North	IL Corn (Moline, IL / 14923)	April 15	Seedling Emergence	Monocot	50 days	0	0	0	0	0.20	0.89	**4.60**
					Dicot	60 days	0	0	0	0	0.27	**1.19**	**6.14**
		OH Corn (Dayton, OH / 93815)	April 15	Seedling Emergence	Monocot	31 days	0	0	0	0	0.02	0.29	**2.92**
					Dicot	36 days	0	0	0	0	0.03	0.39	**3.90**
	South	MS Corn (Mobile, AL / 13894)	April 1	Seedling Emergence	Monocot	52 days	0	0	0	0	0.07	0.77	**9.40**
					Dicot	56 days	0	0	0	0	0.09	**1.03**	**12.54**
	West	IL Corn (Springfield, MO / 13995)	April 15	Seedling Emergence	Monocot	45 days	0	0	0	0	0.11	0.67	**5.90**
					Dicot	53 days	0	0	0	0	0.15	0.89	**7.86**
	Upper Great Plains	ND corn (Fargo, ND / 14914)	April 1	Seedling Emergence	Monocot	40 days	0	0	0	0	0.16	0.57	**2.68**
					Dicot	48 days	0	0	0	0	0.21	0.76	**3.58**
Drift	N/A	N/A	N/A	Vegetative Vigor	Monocot	30 days	0	0	0	0	0	0	0.16
					Dicot	30 days	0	0	0	0	0	0	**12.50**

Figure 2 ***Lemna gibba* Growth Following a 14-Day Atrazine Exposure and a 0-, 7- or 14-Day Recovery Period**



* Significant difference (P<0.05) from within-group control.

Healthy riparian vegetation is important for mussels and fish. However, EPA has not quantitatively determined the risk of impacts on riparian habitat and stream water quality. Indeed, EPA conceded that "[i]t is difficult to estimate the magnitude of potential impacts of atrazine use on riparian habitat and the magnitude of potential effects on stream water quality from such impacts as they relate to survival, growth, and reproduction," further stating that "[q]uantification of risk to the listed mussels [and fish] from potential effects to riparian areas is precluded" due to several factors related to soil vulnerability and sensitivity of riparian vegetation. For an effects determination concluding that a pesticide is "likely" to adversely affect a species, or that it is "likely" to cause jeopardy, the weight of evidence must support the proposition that there is a high probability of an effect. Limited (or no) evidence raising the possibility that an effect might occur does not satisfy the ESA standard for showing that the effect is "likely" to occur.

The meaning of "likely" is further clarified within the Services' regulations. The Services are charged with evaluating the "effects of the action" during a consultation (50 C.F.R. § 402.14(g)(3)), and then formulating a biological opinion as to whether the action is "likely to jeopardize," (§ 402.14(g)(4)). The regulations incorporate the concept that "effects of the action," whether direct or indirect, are those that "are caused by" the proposed action and "are reasonably certain to occur" (50 C.F.R. § 402.02). In the preamble to the 1986 regulations, the Service stated that it rejects the suggestion that "future, speculative effects" might be said to jeopardize a species: "Congress did not intend that Federal actions be precluded by such speculative actions" (51 Fed. Reg. 19926, 19933 (June 3, 1986). Such an interpretation "would open the door for speculative actions to be factored into the" analysis. *Id*. Thus, "there must exist more than a mere possibility" that an action will cause adverse effects in order to find that such effects are likely. *Id*. Given that EPA conceded that "[q]uantification of risk to the listed mussels [and fish] from potential effects to riparian areas is precluded," proposed or hypothesized effects on mussels or fish based on direct effects on riparian vegetation do not satisfy the ESA standard for establishing that adverse effects are "likely." Therefore, EPA's analysis is largely based on an incorrect legal standard.

In conclusion, atrazine is not likely to adversely affect the Fat pocketbook mussel, Topeka shiner (including critical habitat), and Pallid sturgeon based on direct effects on grassy/herbaceous riparian areas for the following reasons:

- As atrazine is not a burn-down herbicide, atrazine exposure at environmentally realistic levels in riparian areas will not result in direct plant mortality.
- Based on refined modeling, atrazine runoff concentrations in grassy/herbaceous riparian area only exceeds the LOC for *growth inhibition* (not mortality) for approximately two days over the entire year.
- Terrestrial plants within riparian areas will fully recover from any potential growth inhibition following transient atrazine exposure.
- Syngenta has previously submitted information from experts demonstrating that atrazine does not adversely affect riparian vegetation (Wall *et al.*, 2007; Volz *et al.*, 2007).
- EPA has not quantitatively determined the risk of potential atrazine impacts on riparian habitat and stream water quality, resulting in a speculative conclusion that is based on an incorrect legal standard.

6.0 DIRECT CHRONIC EFFECTS ON TOPEKA SHINER

Syngenta previously submitted supporting data demonstrating that atrazine is not likely to adversely affect the Topeka shiner via direct chronic effects (Volz *et al.*, 2007). However, EPA concluded that atrazine is likely to adversely affect the Topeka shiner via direct chronic effects within all regions of corn production and Western fallow use regions. These effects determinations were based on static 60-day EECs predicted by PRZM/EXAMS and the brook trout NOEC (65 µg/L) derived from a 44-week full life-cycle study. As described below, Syngenta is providing additional information suggesting that the (a) appropriate warmwater surrogate species should be used for Topeka shiner assessments and (b) flow adjustments should be considered for Topeka shiner habitat since this species inhabits intermittent streams and not static pools throughout the year.

EPA relied on brook trout chronic toxicity data (NOEC = 65 µg/L) for assessing potential direct chronic effects of atrazine on the Topeka shiner. However, effects data from a 30-45-cm, coldwater salmonid (trout) should not be applied to a <7-cm, warmwater cyprinid (shiner), particularly since chronic toxicity data from a 43-week full life-cycle study for a taxonomically and ecologically related species – the fathead minnow (warmwater cyprinid) – are available for assessing potential direct chronic effects. Indeed, a 1995 EPA study comparing chemical sensitivity of coldwater and warmwater standard test species and federally listed fish demonstrated that rainbow trout are a better surrogate for coldwater species and fathead minnows are a better surrogate for warmwater species (USEPA, 1995). For assessment of direct chronic effects on the Topeka shiner, chronic atrazine toxicity data derived from the fathead minnow are considered more appropriate since the fathead minnow is more taxonomically related to the Topeka shiner than the brook trout. Using fathead minnow data (NOEC = 210 µg/L) and assuming worst-case non-flow-adjusted 60-day EECs (103.9 µg/L), the chronic RQ (=0.49) for the Topeka shiner is well below the LOC (=1).

EPA concluded that "static water body [PRZM/EXAMS] EECs are considered representative of high-end estimates of potential exposure for the Topeka shiner…because the Topeka shiner resides in headwater streams with low flow and in side pools of streams." As the Topeka shiner does not inhabit static pools during periods of significant atrazine runoff, static water body 60-d EECs significantly overestimate exposure since these EECs are predicted assuming no-flow for the entire simulated year. Peak atrazine runoff within the Midwest corn-belt generally occurs during periods of flow within April and May. Thus, small static pools during summer dry-down periods will occur after peak atrazine concentrations have declined in these intermittent streams. Assumptions of long-term, peak-like exposure is incorrect given the difference of timing for atrazine runoff relative to the formation of static pools during summer dry-down periods. Although EPA concluded that "no refinement to account for flowing water" was warranted for the Topeka shiner, flow adjustments reflective of flow periods during atrazine runoff are necessary for predicting 60-d EECs.

Based on use of the appropriate surrogate species and flow-adjusted EECs, atrazine will not affect the Topeka shiner via direct chronic effects within all regions of corn production and Western fallow use regions.

7.0 CONCLUSIONS

Syngenta has provided additional information important to the assessment of listed mussel and fish species. In actual endangered species' locations, EPA should use the following best available data for their assessments:

- Appropriate monitoring data
- Exposure refinements for estimating effects on grassy/herbaceous riparian areas
- Location specific information (e.g., flow and habitat)
- Appropriate surrogate species and toxicity data
- Additional refinements of the atrazine action area based upon location data

Additionally, EPA has not quantitatively determined the risk of potential atrazine impacts on riparian habitat and stream water quality, resulting in a speculative conclusion that is based on an incorrect legal standard. These refinements will lead to "no effects" or "not likely to adversely affect" determinations for potential direct and indirect effects to all named species.

8.0 REFERENCES

Desjardins *et al.* 2003. Atrazine Technical – A 14-Day Static-Renewal Toxicity Test with Duckweed (*Lemna gibba* G3) Including a Recovery Phase. MRID No.: 46150901

Hampton *et al.* 2007. Atrazine – Atrazine Ecological Exposure Flowing Water Chemical Monitoring Study in Vulnerable Watersheds: Investigation of MO-01 and MO-02 Watersheds and Their Water Quality Characteristics. MRID No.: 47174104.

Hendley *et al.* 2007. Atrazine – Atrazine Ecological Exposure Flowing Water Chemical Monitoring Study in Vulnerable Watersheds: Data Assessment and Interpretation. MRID No.: 47174107.

Miller *et al.* 2007. Atrazine – Atrazine Ecological Exposure Flowing Water Chemical Monitoring Study in Vulnerable Watersheds: MLRA 113 – Central Claypan Area – Soils and Water Quality. MRID No.: 47174106.

Popov VH and PS Cornish. 2006. Atrazine tolerance of grass species with potential for use in vegetated filters in Australia. *Plant and Soil* 280:115-126.

Popov VH, PS Cornish, K Sultana, EC Morris. 2005. Atrazine degradation in soils: the role of microbial communities, atrazine application history, and soil carbon. Australian *Journal of Soil Research* 43:861-871.

US EPA. 1995. Use of surrogate species in assessing contaminant risk to endangered and threatened species. Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL, USA. EPA/600/R-96/029. 78 pp.

US EPA. 2006. Terrestrial Plant Runoff Risk Assessment for Propiconazole on Turf Using PRZM. Memorandum dated July 14, 2006. 3 pp.

US EPA. 2007a. Risks of Atrazine Use to Three Federally Listed Endangered Freshwater Mussels: Fat Pocketbook Pearly Mussel (*Potamilus capax*), Purple Cat's Paw Pearlymussel (*Epioblasma obliquata obliquata*), and Northern Riffleshell (*Epioblasma torulosa rangiana*) – Pesticide Effects Determination. Office of Pesticide Programs, Environmental Fate and Effects Division, Washington, D.C. 172 pp.

US EPA. 2007b. Potential Risks of Labeled Atrazine Use to the Topeka Shiner (*Notropis topeka*) – Pesticide Effects Determination. Office of Pesticide Programs, Environmental Fate and Effects Division, Washington, D.C. 108 pp.

US EPA. 2007c. Risks of Atrazine Use to Federally Listed Endangered Pallid Sturgeon (*Scaphirhynchus albus*) – Pesticide Effects Determination. Office of Pesticide Programs, Environmental Fate and Effects Division, Washington, D.C. 135 pp.

Volz *et al.* 2007. Atrazine - Supporting Data for EPA's Effect Determinations for Atrazine Relative to Three Federally Listed Endangered Freshwater Mussels [Catspaw (*Epioblasma obliquata obliquata*), Fat pocketbook (*Potamilus capax*), Northern riffleshell (*Epioblasma torulosa rangiana*)] and Two Federally Listed Endangered Freshwater Fish [Pallid sturgeon (*Scaphirhynchus albus*), Topeka shiner (*Notropis topeka*)]. Syngenta Report No.: T005015-07. 46 pp.

Wall *et al.* 2007. Atrazine - Update to Syngenta response to EPA's "Risks of Atrazine Use to Eight Federally Listed Endangered Freshwater Mussels: Pink Mucket Pearly (*Lampsilis abrupta*), Rough Pigtoe (*Pleurobema plenum*), Shiny Pigtoe Pearly (*Fusconaia edgariana*), Fine-rayed Pigtoe (*Fusconaia cuneolus*), Heavy Pigtoe (*Pleurobema taitianum*), Ovate Clubshell (*Pleurobema perovatum*), Southern Clubshell (*Pleurobema decisum*), and Stirrup Shell (*Quadrula stapes*) Pesticide Effects Determination." Syngenta Report No.: T001709-07. 252 pp.