This document was received from Syngenta electronically on March 12, 2007 via email.

This document in its original form included an “Appendix 2 Containing Figures 4 through 9” for which Syngenta has made confidentiality claims.

Therefore, Appendix 2 has been excluded from this Web site posting.

March 14, 2007

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"

USE OF BEST AVAILABLE DATA AND APPROPRIATE PROCEDURES FOR ANALYSIS AND THEIR IMPACT ON EPA'S CONCLUSIONS

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Executive Summary

This document examines the data, scientific methodology and risk assessment procedures used by EPA to assess eight species of threatened or endangered mussels and their critical habitat with respect to the use of atrazine. EPA's effects determination must adhere to the Endangered Species Act (ESA) requirement to use "best scientific and commercial data available". In many instances, EPA has utilized the wealth of information (e.g., data and models) available for atrazine in making its effects conclusion. However, EPA's "effects determinations" do not consistently utilize best available data and knowledge resulting in "may affect and likely to adversely affect" (LAA) and "may affect, but not likely to adversely affect" (NLAA) conclusions that are not supported by existing information.

EPA found a "no effect" (NE) for the stirrup shell mussel because it is presumed to be extinct. On the other seven species of mussels EPA correctly finds a NE for direct acute effects and a NLAA for direct chronic effects. For indirect effects on mussels from effects on phytoplankton food items and community–level effects, EPA inappropriately found a LAA for pink pearly mucket, rough pigtoe and fine-rayed pigtoe mussels and a NLAA for shiny pigtoe, heavy pigtoe, ovate clubshell and southern clubshell mussels. However, existing information supports a NLAA for all seven species for indirect effects from effects on phytoplankton and community–level effects and a NE, rather than a NLAA for effects on zooplankton food. EPA correctly found a NE from indirect effects on all mussels from acute effects on host fish and a NLAA for chronic effects on host fish. However, available data support a NE for acute and chronic effects on host fish for all species of mussel. (Table 1)

EPA has not met the ESA standard of using best available data to support their LAA determination for indirect effects on the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species from indirect effects on aquatic communities. Appropriate use of ecological monitoring data and species location information supports, at most, a NLAA and should be NE determination for these species:

- EPA's analyses did not correctly consider the relevance of sites and information from the Atrazine Ecological Monitoring program to the locations where the listed mussels occur, and consequently EPA has overstated the potential for exposure and effects:
    - EPA did not consider that monitoring sites are subwatersheds within each of the selected 40 HUC10/11 watersheds and that atrazine data is therefore representative of much smaller drainage areas than the habitats of mussels. The assessment therefore includes an overestimation of exposure and effects, resulting in incorrect effect determinations.
    - EPA incorrectly interpreted the Ecological Monitoring results and did account for implications of procedures used to estimate daily values – especially at sites that were repeatedly dry. The assessment therefore inappropriately extrapolated monitoring data to habitats where the listed mussels occur, resulting in incorrect effect determinations.
    - Residues were overestimated because EPA did not account for flow rates being up to 2.5 orders of magnitude less in monitoring sites than the flow rates in streams occupied by then listed mussels. The assessment therefore includes an overestimation of exposure and effects, resulting in incorrect effect determinations.
    - Differences in stream sizes at monitoring sites relative to streams where the listed mussels occur where not accounted for, nor was the fact that many of the streams monitored were prone to drying down and not representative of listed mussel habitats. The assessment therefore includes an overestimation of exposure and effects, resulting in incorrect effect determinations.
- EPA did not use available spatial data on mussel locations relative to atrazine use within the watersheds to refine its assessments and consequently the LAA conclusion for fine-rayed pigtoe, pink pearly mucket and rough pigtoe mussels is not supported by best available data.
    - Fine-rayed pigtoe habitats were located completely outside the boundaries of the total population of vulnerable watersheds in the action area. The Ecological Monitoring data should therefore not be applied to the assessment of this listed mussel.
    - Spatial analysis demonstrates that the monitoring sites (two streams in MO and one stream in IN) whose residues EPA cited as possibly exemplifying community-level effects in vulnerable watersheds do not serve as habitat for the three species of mussel. The assessment included data from the Monitoring Program inappropriately due to the differences (stream size, flow, land use patterns, etc.) to the habitat where the listed mussels reside, resulting in incorrect effect determinations.

EPA has not met the ESA standard of using best available data to support their LAA determination for indirect effects on the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species from effects on aquatic food items and host fish. Appropriate use of best available data and models support, at most, a NLAA determination and should be NE for these species:

- Indirect effects on listed mussels due to potential direct acute or chronic effects on zooplankton food items or potential direct chronic effects on host fish are not

expected since the exposure concentrations used by EPA and derived from monitoring data within vulnerable watersheds are below Levels of Concern (LOC). Therefore, EPA's effects determination should reflect a NE for endpoints related to indirect effects on mussels due to effects on zooplankton or host fish.

- EPA failed to consider the microcosm and mesocosm studies available from the literature. These studies show that the primary producer-based thresholds required for indirect effects to occur on consumers at various trophic levels are not approached by atrazine residues.
- EPA only utilized the part of the available output from the CASM_Atrazine model to assess the potential effects on *primary producers*, and did not use the model to assess potential effects *consumers* such as the listed mussels. As a result, the effects on the listed mussels due to indirect effects on the aquatic food items and habitat are overestimated based upon the CASM_Atrazine model output.

EPA has not met the ESA standard of using best available data to support their LAA determination for indirect effects on seven species of mussel from potential effects on riparian vegetation. The consideration of a diversity of factors clearly supports either a NLAA or NE determination for these species:

- EPA failed to conduct a Problem Formulation focused on riparian grassy buffer characteristics and therefore used a screening-level exposure model for non-target plants that had limited relevance to the movement of runoff across buffers. Effect endpoints and plant species used in the model were not representative of real world grassy riparian buffer species. Consequently, this model output is overestimated compared to published literature and field observations which clearly support a NLAA for herbaceous riparian areas.
- EPA determined a NLAA for effects of atrazine on forested vegetation in riparian area that due to the lack of effects of atrazine on woody species should be a NE for forested riparian areas.

EPA's conclusion of a LAA for effects of atrazine on the critical habitat of the ovate and southern clubshell mussels cannot be substantiated based on the points made above for indirect effects and the use of atrazine NLAA critical habitat for these mussels.

In conclusion, if best available data and appropriate scientific methods are used, the LAA determinations made by EPA are not supported by existing information. Rather, use of best available commercial and scientific information readily available to EPA demonstrates that atrazine use is either NLAA or will have NE on the eight listed mussels due to indirect effects on aquatic communities, aquatic food items, host fish and riparian vegetation. This is detailed in Table 1, below.

Table 1 – Syngenta's Assessment (in Red) of EPA's Effects Determination Summary for Each of the Eight Assessed Listed Mussels.[a]

Assessed Mussel Species	Direct Effects		Indirect Effects						
	Acute	Chronic	Food Items		Host Fish		Aquatic Habitat: community-level effects	Riparian Vegetation	
			Phytoplankton	Zooplankton	Acute	Chronic		Herbaceous/Grassy Vegetation	Forested Vegetation
Pink pearly mucket	NE	NLAA	**LAA[b]** NLAA	NLAA NE	NE	NLAA NE	**LAA[b]** NLAA	**LAA** NLAA	NLAA NE
Rough pigtoe	NE	NLAA	**LAA[b]** NLAA	NLAA NE	NE	NLAA NE	**LAA[b]** NLAA	**LAA** NLAA	NLAA NE
Shiny pigtoe	NE	NLAA	**NLAA**	NLAA NE	NE	NLAA NE	NLAA	**LAA** NLAA	NLAA NE
Fine-rayed pigtoe	NE	NLAA	**LAA[b]** NLAA	NLAA NE	NE	NLAA NE	**LAA[b]** NLAA	**LAA** NLAA	NLAA NE
Heavy pigtoe	NE	NLAA	NLAA	NLAA NE	NE	NLAA NE	NLAA	**LAA** NLAA	NLAA NE
Ovate clubshell	NE	NLAA	NLAA	NLAA NE	NE	NLAA NE	NLAA	**LAA** NLAA	NLAA NE
Southern clubshell	NE	NLAA	NLAA	NLAA NE	NE	NLAA NE	NLAA	**LAA** NLAA	NLAA NE
Stirrup shell	NE	NE	NE	NE	NE	NE	NE	NE	NE

[a] NE = "no effect"; NLAA ' "may affect, but not likely to adversely affect"; and LAA = "may affect and likely to adversely affect". See Table 1.1 of EPA's "effects determination" for the basis of for each of the assessed mussel species. [b] EPA states that: "Further analysis of the ecological monitoring data is required to determine the representativeness of the data to other watersheds within vulnerable areas where the listed mussel species occur. If the analysis suggests that the monitoring data are representative of atrazine concentrations in vulnerable watersheds where the listed mussels occur, the effects determination will remain as "LAA." However, if further analysis reveals that the monitoring data are not representative of atrazine concentrations in vulnerable watersheds where the listed mussels occur, the effects determination will be revised to "NLAA".

1.0 Introduction

EPA prepared "effects determinations" by evaluating the potential direct and indirect effects of the herbicide atrazine on the survival, growth and reproduction of eight Federally listed species of freshwater mussels and the potential for effects on designated critical habitat. The information contained herein is an evaluation of the adequacy of EPA's "effects determinations" in meeting the standards of the Endangered Species Act (ESA) that require use of "best scientific and commercial data available". This includes an assessment of the thoroughness of EPA's documentation of best available information and the scientific methods used in analyses of these data. EPA's assessment must contain the components necessary for meeting the standards to fulfill the requirements for a consultation package for initiating formal consultation with the Fish and Wildlife Service (FWS). EPA states that their assessment was completed in accordance with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Endangered Species Consultation Handbook (USFWS/NMFS, 1998) and procedures outlined in the Agency's Overview Document (U.S. EPA, 2004) and consequently these documents are the term of reference for the evaluations presented herein.

A large data record exists for atrazine in the form of published literature, registrant-submitted data and information, regulatory reviews and other sources. There is an unusually extensive wealth of scientific data available on atrazine combined with practical experience from approximately 50 years of registered use as an herbicide. The availability of comprehensive data, information and knowledge means that EPA is required to conduct very detailed "effects determinations" for the potential effects of atrazine on freshwater mussels in order to comply with ESA statutory requirements. Meeting standards of best available science for more typical less data-rich compounds have not required the same amount of effort since the data on typical compounds is much more limited. In many portions of this atrazine assessment, EPA has utilized this wealth of information (e.g., data and models) and the standard of best available data in drawing its effects conclusions. This submission details where the necessary standard of "best available" commercial and scientific data has not been met and cites additional data and information that must be used by EPA to meet the required standard. As a result of not meeting the "best available" standard, EPA has reached invalid effects determination conclusions.

The first part of this document (Section 2.0) discusses generally how EPA has not accurately interpreted labels and has not been consistent in its level of data and analyses refinements compared to previous assessments. Section 3 focuses on the data used by EPA in assessing indirect effects on aquatic communities including EPA's use of monitoring data and species location analysis and addresses where EPA's assessment falls short of using best available data. The document then goes on to focus on EPA's analysis of indirect effects from effects on food items (Section 4) and demonstrates how the use of appropriate data and model outputs will change the conclusion of the effects determination. Finally, the document examines appropriate analysis procedures for best available data to assess effects on riparian vegetation (Section 5) and critical habitat (Section 6) including the context and relevance of, and extrapolations leading to, the effects determination conclusions.

2.0 Interpretation of Labels, Transparency and Consistency

2.1 Current labeling and use pattern

Accurate interpretation of atrazine use labels is fundamental to developing a quality assessment. There are numerous statements made in the risk assessment document regarding label interpretations and usage information that are in error and therefore do not represent best available data. For example, Tables 3.1 and 3.4 of EPA's effects determination document reference the use of atrazine on turf. Atrazine is only labeled for use on the following "southern" turf species: bermudagrass, centipedegrass, St. Augustinegrass and Zoysiagrass. These "southern" turf species have geographical limits of growth due to winter temperatures, and to include them in areas where they cannot be successfully grown (for example in Table 3.4 of the "effects determination where a Northern turf use was assessed) is scientifically inappropriate. Other examples are in Table 3.1 of EPA's effects determination document regarding fallow and rights of way uses. Table 3.1 shows the maximum rate of 2.25 lbs/A as a single application for "Fallow/Idle Land", but this does not properly assess the two labeled use patterns allowed on Fallow/Idle Land. The allowable use patterns are Wheat in the first year, Sorghum or Corn in the second year, and Fallow in the third year ("Wheat – Sorghum – Fallow" or "Wheat-Corn-Fallow"). These fallow programs are used in the non-irrigated lands where rainfall is limited and the fallow interval is used to "store" rainfall / moisture for the next wheat crop. Atrazine is applied only once in the 3 year rotation. This practice occurs only in dryland Northwest Kansas, Nebraska and Eastern Colorado in order to allow the fallow land to build-up moisture, none of which are part of the action area in EPA's effects determination. The effects determination also assumes that Rights of Way uses are allowed throughout the action area. However, this type of application is only labeled for use in CO, KS, MT, NE, ND, SD, and WY. Only a small portion of Eastern Kansas is located within the action area.

Additionally, Table 3.1 indicates that two applications can be made to corn at a rate of 2.5 lbs./acre but in footnote (b) to Table 3.1, the Agency states: *"2.5 lbs/A is a seasonal maximum limit for corn. The single application maximum is 2.0 lbs/A. Modeling conducted using a single application at 2.0 lbs/A but adjusted to account for percent increase due to second application."* The atrazine label directions clearly state that a single application of atrazine cannot exceed 2.0 lbs/acre, and the total atrazine applied cannot exceed 2.5 lbs./acre in a calendar year. Therefore this table appears to misrepresent the label information.

EPA has not met the ESA standard of using best available data in defining the use patterns for atrazine for the "effects determination". As part of meeting the requirements of best available data, EPA should have consulted with agronomic experts to ensure that all uses are being assessed correctly. For example EPA could have organized use patterns via label data inputs to the Federal Endangered Species Task Force Information Management System (FESTF IMS).

2.2 Comparison to Previous EPA-OPP Pesticide Effects Determinations

A large data record exists for atrazine in the form of published literature, registrant-submitted data and information, regulatory reviews and other sources. In many portions of the mussel "effects determination", the EPA meets the ESA standards of best available data and provides a great level of detail and has utilized the wealth of atrazine information available. However, in other portions of the assessment EPA did not utilize best available data. Not including all best available data is inconsistent with other EPA endangered species assessments ("Effect Determination for Atrazine – Potential for Atrazine Use in the Chesapeake Bay Watershed to Affect Six Federally Listed Endangered Species,"[1] and Effect Determination for Atrazine – Risks of Atrazine Use to Federally Listed Endangered Alabama Sturgeon (*Scaphyrinchus suttkusi*)[2].

Noteworthy is that in previous atrazine effect determinations where EPA utilized best available information (e.g, refinements to the assessment) for direct and indirect effects for the assessed species, EPA reached NE or NLAA determinations. In contrast, in the current assessment where EPA did not consistently use best available information and make appropriate refinements, LAA determinations were made for indirect effects. Comparison of the previous assessments to the current mussel assessment indicates points to key differences in techniques that were previously used by EPA but not considered in the mussel "effects determination":

- The previous ESA assessments followed a tiered progression from screening-level to more refined analyses as per the EPA's Overview Document.
- EPA previously consulted with experts in the field (i.e. consultation regarding forestry practices and atrazine forestry use within the action area).
- EPA previously considered agricultural practices (buffers) or land features (riparian habitat) that already exist to mitigate or prevent exposure to the actual populations.
- Application rates and use patterns were previously modified to reflect local practices within the action area.
- EPA utilized available spatial data in the previous indirect effects determination.
- Exposure modeling was refined to better reflect the environment surrounding known locations or habitats of the listed species in the previous assessments.

3.0 Aquatic Habitat Community-Level Effects

EPA has not met the ESA standard of using best available data and the conclusion of a LAA determination for the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species is unsubstantiated. EPA does state that "*Further analysis of the ecological*

[1] Environmental Fate and Effects Division, EPA Office of Pesticide Programs. Potential for Atrazine Use in the Chesapeake Bay Watershed to Affect Six Federally Listed Endangered Species: Shortnose Sturgeon (*Acipenser brevirostrum*); Dwarf Wedgemussel (*Alasmidonta heterodon*); Loggerhead Turtle (*Caretta caretta*); Kemp's Ridley Turtle (*Lepidochelys kempii*); Leatherback Turtle (*Dermochelys coriacea*); and Green Turtle (*Chelonia mydas*) - Pesticide Effects Determination (August 31, 2006)

[2] Environmental Fate and Effects Division, EPA Office of Pesticide Programs. Risks of Atrazine Use to Federally Listed Endangered Alabama Sturgeon (*Scaphyrinchus suttkusi*) - Pesticide Effects Determination (August 31, 2006).

monitoring data is required to determine the representativeness of the data to other watersheds within vulnerable areas where the listed mussel species occur. If the analysis suggests that the monitoring data are representative of atrazine concentrations in vulnerable watersheds where the listed mussels occur, the effects determination will remain as "LAA." However, if further analysis reveals that the monitoring data are not representative of atrazine concentrations in vulnerable watersheds where the listed mussels occur, the effects determination will be revised to "NLAA". EPA's analysis to date has errors that need to be corrected and EPA has not used best available species locality data. As a result, the LAA determination for these 3 species is incorrect.

3.1 Monitoring Data and Relevancy of Monitoring Sites

EPA has used data from the Ecological Monitoring program as part of the "effects determination", citing that data from certain sites (MO-01, MO-02, IN-11, NE-04, and NE-07) provide evidence that threshold concentrations could be exceeded throughout the upper most vulnerable watersheds in the Midwest corn growing regions. EPA has not met the ESA standard of using best available data in the characterization of the atrazine ecological monitoring program watershed sites, as listed below.

3.1.1 New WARP Analysis Conducted in the "Effects Determination" As part of the EPA design of the Atrazine Ecological Monitoring Program, ecological monitoring sites were identified using the USGS model Watershed Regression for Pesticides Model (WARP) as the best available tool for predicting vulnerability at the Hydrological Unit Code (HUC)10/11 and larger watershed scale. The upper 20th percentile most vulnerable watersheds were identified. Forty subwatershed were then selected by EPA as a spatially representative subset of the most vulnerable 1172 watersheds for monitoring in the Atrazine Ecological Monitoring Program.

In the "effects determination" for the listed mussels, EPA has generated a new and different WARP analysis which led to identification of somewhat different 1172 most vulnerable watersheds that are not completely consistent with the original 1172 watersheds. However, the 40 watersheds monitored in the Ecological Monitoring Program are uniquely linked to the original 1172 (HUC10/11) watersheds. The new and different WARP analysis in the "effects determination" conducted by EPA for this ESA does not relate directly back to the spatially representative 40 watersheds in the ecological monitoring program, and the original set of 1172 watersheds must be used for a valid scientific analysis of the Ecological Monitoring program.

3.1.2 Atrazine Ecological Monitoring Subwatersheds are Smaller Than HUC 10/11 Scale. After the 40 representative HUC10/11 watersheds were selected by EPA for the Ecological Monitoring Program, sub-watersheds were selected within these HUC10/11 watersheds so that the sampling points used in the study would reflect even smaller headwater watersheds that are less prone to effects such as dilution. The selected monitoring locations sampled the more vulnerable areas of the HUC10/11 watersheds but were all smaller than the HUC 10/11 watersheds by at least a factor of two and had crop intensity greater than the average for the watershed. The fact that the monitoring data came from smaller scale headwater watersheds has not been appropriately considered by

EPA in their effects determination for mussels. Instead EPA incorrectly implies that this monitoring data directly applies to HUC 10/11 watersheds. Because EPA has not applied a factor to adjust for the flow rate and stream size, they have overstated the residues that could be experienced by the listed mussels and therefore have overstated the potential for adverse effects.

3.1.3 Inappropriate Extrapolation of Data from Sites with Maximum Values. In Table 5.14 of the "effects determinations", EPA cites rolling average data from some of the Ecological Monitoring sites (MO-01, MO-02, IN-11, NE-04 and NE-07) as evidence that threshold concentrations could be exceeded. Instead of using best available science, this approach is a misrepresentation of the results of the Ecological Monitoring Program. Below are examples of how the "effects determination" failed to use best available data in selecting data sets for the effects determination and failed to appropriately describe the entire 1172 watershed area. The current EPA mussel assessment:

a) Used rolling average values rather than the more specific analyses provided by the CASM_Atrazine model, as discussed further Section 4 below.
b) Did not use the range of results obtained from all watersheds in the Ecological Monitoring Program.
c) Used extrapolated data for the effects determinations for streams which were dry for substantial periods of the year (NE-04 and NE-07), resulting in sampling that was not frequent enough to conduct a valid CASM_Atrazine analysis. Additionally, streams that are dry for significant portions of the year are clearly not representative of the habitats where the listed mussels occur. It is noted that even MO-01 went dry during one year, raising further question as to its representativeness of habitats where the listed mussels occur.
d) Failed to consider that the IN-11 exceedance was driven by a single grab sample value across the two year period and that the CASM_Atrazine threshold exceedance was due to the interpolation routine applied to that single value. EPA also failed to consider that the single grab sample value appears to have resulted from inadvertent direct measurement of unmixed edge-of-field runoff coming from a ditch immediately adjacent to the sampler.
e) EPA did not characterize the two Missouri sites based upon best available science in the open literature. The Ecological Monitoring sites MO-01 and MO-02 are representative of a unique combination of soils, landform, agronomy and climate known as Major Land Resource Area 113 (MLRA113). Cohesive explanations prepared by academic and governmental scientists for the characterization of MO-01 and MO-02 are based on the presence of a uniquely shallow clay pan soil layer that makes the watersheds prone to surface runoff. The specific hydrologic behavior of streams in the MLRA113 region in Missouri is well documented in commonly available peer reviewed sources (e.g. Lerch R.N. and Blanchard P.E., Env Sci. Technol. 2000, 34, 3315-3322 and 2003, 37, 5518 – 5527 and Hjelmfelt P., Blanchard P.E., Donald W.W. and Alberts E.E. – "Assessment of Hydrology and Water Quality of Goodwater Creek" available at: https://fsb.missouri.edu/home/hjelmfelta/Publications_files/PDF/GWCreek.pdf) and leads to the interpretation that the MO-01 and MO-02 sites are only representative of

the MLRA113 in this region of Missouri rather than all 1172 watersheds identified as vulnerable by EPA in the original WARP analysis. It should be noted that no locations (Element Occurrences) for the pink pearly mucket, rough pigtoe or fine rayed pigtoe mussels are found in MLRA113.

3.1.4 Inappropriate Extrapolation of Directly Measured Residue Values from the Ecological Monitoring Program to Sites Where the Listed Mussels Occur Based Upon Differences in Size and Flow. EPA failed to meet the best available science standards because they did not apply a flow dilution factor to the Ecological Monitoring Program data for the assessment of community level risks. As a result of the small "headwater" subwatersheds used in the Ecological Monitoring Program, the values presented in Table 3.12 of the "effects determination" indicates that the overwhelming majority (85 – 90%) of the Ecological Monitoring sites have flows 90% lower than the streams where the listed mussels occur. Sites in the Ecological Monitoring Program are up to 2.5 orders of magnitude lower than the flow rates in streams occupied by the threatened and endangered mussels[3]. This should have been included since residue concentrations tend to be reduced and concentration peaks broadened when moving to larger watersheds with faster flowing streams. It is noted that EPA recognized and applied a flow dilution factor for the PRZM modeled values, but failed to do so for the Ecological Monitoring data. Inclusion of this factor not only changes the LAA determinations for aquatic habitat community-level effects for the 3 species to NLAA but also potentially impacts other "may affects" conclusions.

In summary, if EPA had conducted a detailed analysis of the monitoring study using best available data, the "effects determination" would have put the ecological monitoring data into context (including the use of a flow dilution factor), anomalous rolling average data (e.g. in dried streams) would not have been relied on, and data would not have been used from watersheds that are not representative of the locations where the endangered mussels occur. As best available data were not used in the characterization of the Ecological Monitoring Program, all determinations of LAA that resulted from this improper characterization of the data are not valid. Specifically, the conclusion of a LAA determination for the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species is unsupported.

3.2 Species Locations

This section examines species location data with respect to the 1172 watersheds identified as most vulnerable to atrazine runoff using WARP. In short, EPA did not use best available species locality data which provides yet another line of evidence that a LAA determination for the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species is unsupported.

[3] Examination of the flow data for MO-01 shows it is in the lower 5th percent of flows among the monitoring sites while flows for the MO-02 site were around the 50th centile. In other words, the only two subwatersheds which reached the CASM_Atrazine threshold multiple times were small or very small ones indicating an even bigger scale gap between flows at these sites and the occurrence sites.

3.2.1 Available Species Location Data and Geospatial Analysis

Rather than using available specific location data, EPA based their analyses of listed mussel locations on very general information of the species locations which consequently included vast areas of water reaches. Specifically, EPA states that "In many instances, the location information for the listed mussels is nonspecific (e.g. Lower Ohio River for the pink mucket pearly mussel), and in these instances, the entire stream or river reach has been included" (see p. 46 of the "effects determination"). This assessment does not meet the ESA standard for best available data because available specific location data for each listed mussel species is available and were inappropriately omitted from EPA's analyses. Use of best available data for a more in-depth analysis shows an absence of these listed species in many of these locations. Syngenta used the geo-referenced species location data available to EPA from NatureServe to reevaluate the proximity of listed species habitat to vulnerable watersheds. Note that these location data were provided by registrants (PRN 2000-1) to satisfy FIFRA requirements for providing information on the proximity of pesticide use to listed species such as the listed mussels of this analysis. In this geospatial analysis, the spatial distribution of listed mussel habitats was mapped using specific location information from The Federal Endangered Species Task Force (FESTF) multi-jurisdictional database (MJD), which is licensed from NatureServe's MJD. The FESTF MJD is a database developed and maintained by NatureServe, and is comprised of species location data and information/records ancillary to such location data. The listed mussel location maps were created using ArcGIS 9.2 (ESRI, 2006).

3.2.2 Results of Analysis of Habitat Locations

As mentioned previously in Section 3.1 (Relevancy of Monitoring Sites), EPA has used data from the Ecological Monitoring Program as part of the "effects determination", citing that rolling average data from MO-01, MO-02, IN-11, NE-04 and NE-07 provides evidence that threshold concentrations could be exceeded. Nebraska does not serve as habitat for listed mussels and is outside of EPA's action area. Spatial analysis demonstrates that the remaining streams (two in MO and one in IN) do not serve as habitat for the Fine-rayed pigtoe mussel (Figure 1), the pink pearly mucket mussel (Figure 2), or the rough picktoe mussel (Figure 3).

In addition, direct application of data from the Monitoring Program is not appropriate due to the differences (stream size, flow, land use patterns, etc.) to the habitat where the listed mussels reside.

Spatial analysis and available records shows that:

- No Fine-rayed pigtoe mussel habitat locations are located within the boundary of any of the 1172 vulnerable watersheds (Figure 1).
- Eight habitat locations for pink pearly mucket mussel were identified in the 1172 vulnerable watersheds (Figure 2). In an attempt to validate these 8 occurrences, a detail analysis of available records indicate that:
    - Five of the locations are considered historical habitats (last observation during or before 1980). An additional location had no data regarding viability or ecological integrity (Element Occurrence Identification (EO

ID): 170628 in IN). Two locations (EO ID: 440019 and 442302) were potentially considered as current habitats for pink pearly mucket.

- Thirteen habitat locations for the Rough pigtoe mussel were identified in the 1172 vulnerable watersheds (Figure 2). In an attempt to validate these occurrences, a detail analysis of available records indicate that:
    - Ten locations in IN (EO ID: 177086, 180162, 178061, 169886, 171270, 174427, 167981, 173267, 166636, and 176046) had no data attached in terms of viability (species) or ecological integrity (communities). One location in IN (EO ID: 165793) was ranked as "extirpated" and one location in KY (EO ID: 446659) as "Failed to find". Another location in IN (EO ID: 739312) was ranked as "fair estimated viability".

Therefore, use of best available location data in a geospatial analysis shows the Fine-rayed pigtoe mussel does not occur within the 1172 vulnerable watersheds associated with the Ecological Monitoring Program. The pink pearly mucket mussel, and the rough pigtoe mussel are not located within the Ecological Monitoring sites that EPA relied on (i.e. MO-01, MO-02, IN-11, NE-04 and NE-07) to make their effects determination. As previously mentioned, these sites are not representative of the watersheds where the pink pearly mucket and the rough pigtoe mussels occur. Consequently, the use of best available data does not support EPA's conclusion of LAA determination for the pink pearly mucket, rough pigtoe and fine-rayed pigtoe mussels.

Use of detailed location data, combined with appropriate use of monitoring data in the analyses supports NE for the fine-rayed pigtoe mussel and at most a NLAA and should be NE for the pink pearly mucket and the rough pigtoe mussel. This is further substantiated in Section 4 (below) where appropriate use of best information shows that indirect effects on listed mussels are not likely to occur due to lack of direct effects of atrazine on food items or habitat.

4.0 Indirect Effects from Effects on Food Items, Host Fish, and Aquatic Plants

EPA has not met the ESA standard of using best available data to support their conclusion of a LAA determination for the pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussel species based on indirect effects from effects on primary producers (phytoplankton and aquatic plants). Further, a NE determination for host fish and zooplankton-related indirect effects and not a NLAA determination is appropriate.

4.1 Zooplankton

For pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussels located within vulnerable watersheds of the action area, the EPA concluded NLAA determinations for indirect effects to zooplankton as prey items. As discussed within EPA's assessment, indirect effects on mussels due to potential direct acute or chronic effects on zooplankton are not expected since peak and 21-day EECs derived from targeted monitoring data from subwatersheds within potentially vulnerable HUC10/11 watersheds are below screening-level acute and chronic LOCs respectively (p. 152-155). Therefore, "no effect" (rather than NLAA) determinations are appropriate for assessment endpoints related to indirect effects on listed mussels due to direct acute or chronic effects on zooplankton food items.

As discussed in detail below (Section 3.2.2), "no effect" determinations for zooplankton-related indirect effects (even when inappropriately based on worst-case monitoring data) are also supported by stream ecosystem modeling predictions and published experimental data.

4.2 Phytoplankton and Aquatic Plants

For pink pearly mucket, rough pigtoe, and fine-rayed pigtoe mussels, the EPA concluded LAA determinations for indirect effects on primary producer productivity through effects on phytoplankton (as food) and aquatic plants (as habitat). As discussed below, EPA's assumptions of indirect effects on mussels due to direct effects on producers are not supported by additional ecosystem model output and available experimental data.

As specified within EPA's problem formulation, the model CASM_Atrazine "was used to integrate direct and indirect effects of atrazine to indicate changes to aquatic community structure and function (p. 51)." EPA's LAA determinations were based on the comparison of the Ecological Monitoring program data to thresholds concentration derived using the ecosystem model known as "CASM_Atrazine". However, EPA only utilized the model to assess the potential effects on *primary producers,* and did not use the model to assess potential effects *consumers* such as the listed mussels. Thus, inconsistent with EPA's problem formulation, the risk characterization did not meet best available data standards since CASM_Atrazine-predicted indirect effects to consumer communities were not considered when evaluating atrazine effects on aquatic community structure and function.

While not reported within EPA's assessment, CASM_Atrazine model output predictions for *consumer* communities are provided in Table 2, below. The CASM_Atrazine results presented in Table 2 are consistent with EPA's conclusions for producer community structures for IN-11 (2005), MO-01 (2004, 2005, and 2006), and MO-02 (2004 and 2006). Using a very conservative assumption of a Level of Concern (LOC) of >5% average percent change in *consumer* community structure (identical to the CASM_Atrazine LOC currently used for producer communities), no indirect effects on consumer communities were predicted for these worst-case Ecological Monitoring study sites (Table 2). Therefore, based on worst-case atrazine monitoring data, these results show that modeled direct impacts on producers are not sufficient to indirectly affect modeled community structure at the consumer level. Moreover, these data are especially applicable to mussels since no known obligate relationship exists between these listed mussels and any particular food item or aquatic plant species. Therefore, EPA's assumption of indirect effects on listed mussel populations due to potential direct effects on producer communities is not scientifically supported when considering the complete CASM_Atrazine modeling dataset. EPA should consider CASM_Atrazine model output to consumers in their "effects determination".

In addition to CASM_Atrazine modeling, a low probability of indirect effects on mussels (via reduction in food items and/or aquatic plants) is scientifically supported by available field experimental studies. EPA did not consider the microcosm and mesocosm studies available to EPA from the literature. Approximately ten of these studies are relevant and

provide detailed data showing that rolling average atrazine concentrations 3-5 times higher than primary producer-based thresholds are required for indirect effects to occur on consumers at various trophic levels[4]. When these data are plotted by exposure duration and atrazine concentration, there is a clear delineation of concentration-duration profiles generating indirect effects versus no indirect effects. For exposure durations between 21 and 63 days, an approximate threshold concentration for indirect food web-related effects on consumers is 90 µg/L. Therefore, rolling average atrazine concentrations must be 3-fold and 5-fold higher than primary producer-based LOCs used by EPA [30-day (27 µg/L) and 60-day (18 µg/L) rolling average EPA LOCs, respectively] for indirect effects to occur on consumers (i.e. listed mussels). Since all 14-day, 30-day, 60-day and 90-day rolling average concentrations for worst-case targeted monitoring data are below the 90-µg/L threshold concentration for indirect effects on consumers (Table 2), indirect effects are not expected via direct effects on food items (phytoplankton) and habitat (aquatic plants).

In conclusion, within potentially more vulnerable watersheds, EPA failed to consider best available data that indicate a low probability of indirect effects on listed mussels due to potential atrazine effects on food items or habitat. As discussed above, no habitat locations (0/71) for Fine-rayed pigtoe mussels exist within this vulnerable watershed area, and only 2% (8/336) and 12% (13/107) of total habitat locations (element occurrences) for pink pearly mucket and rough pigtoe mussels, respectively, are within 1172 vulnerable watersheds. Under worst-case exposure within the 1172 watershed area, pink pearly mucket and rough pigtoe mussels are not likely to be affected by direct effects on food items, primary productivity, and/or habitat due to atrazine exposure. Consequently, EPA's LAA for indirect effects determinations for pink pearly mucket, rough pigtoe and fine-rayed pigtoe mussels based on direct effects to phytoplankton and aquatic habitat should be revised to NLAA based on best available data.

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Table 2 CASM_Atrazine Modeling Data for Indirect Effects Determinations

		Maximum Rolling Averages (µg/L)				CASM Community	
		14-day (38 µg/L)	30-day (27 µg/L)	60-day (18 µg/L)	90-day (12 µg/L)	Producers (% change)	Consumers (% change)
IN-11	2005	**65.1**	**31.5**	16.2	11.0	**6.7**	4.2
MO-01	2004	**39.6**	**28.6**	**19.4**	**13.9**	**6.7**	2.8
	2005	**78.1**	**42.5**	**25.7**	**17.8**	**9.7**	4.9
	2006	**48.2**	**31.6**	17.5	12.0	**8.1**	3.4
MO-02	2004	33.0	25.9	16.8	**12.3**	**5.1**	1.2
	2006	34.7	**27.4**	15.4	11.5	**5.6**	1.2
NE-04	2005	ND	ND	ND	ND	ND	ND
NE-07	2005	ND	ND	ND	ND	ND	ND

Bold values denote exceedances of threshold concentrations and/or average percent change in community structure.

ND = Due to the particular watershed characteristics, the monitoring sites on these streams experienced ultra-low to completely dry conditions and prevented sampling during portions of the season. As a result of the interpolation routine in CASM_Atrazine, the lack of subsequent samples makes the chemograph artificial and unsuitable for use in CASM_Atrazine.

4.3 Host Fish

EPA found that atrazine was a NLAA determination for listed mussels via indirect effects based on chronic effects to host fish (p. 161). However, as discussed within EPA's assessment (p.160), indirect effects on mussels due to direct chronic effects on host fish are not expected since 60-day EECs derived from targeted monitoring data within vulnerable watersheds are below screening-level chronic LOCs. Therefore, similar to direct acute effects, NE (rather than NLAA) determinations are appropriate for assessment endpoints related to indirect effects on mussel glochidia due to direct chronic effects on host fish.

5.0 Riparian Vegetation

EPA's determination of a LAA for all seven species based on effects on riparian vegetation cannot be substantiated and cannot be validated by the current situation in the field.

5.1 Herbaceous/Grassy Vegetation

Rather than conducting a scientifically appropriate problem formulation, EPA has relied on a screening-level risk assessment for non-target plants to make a LAA determination for the listed mussels based on potential impacts on herbaceous/grassy riparian areas. The EPA states that due to the Risk Quotients (RQs) being greater than the LOCs based on the screening-level model that "…an analysis of the potential for habitat degradation to affect the listed mussels is necessary." This conclusion is inappropriately drawn from EPA's use of a generic, qualitative description of riparian habitat and RQs from non-target plant screening-level analysis to determine potential impact.

Potential indirect effects to listed mussels from potential impacts on riparian vegetation are inappropriately assessed using terrestrial plant seedling emergence and vegetative vigor plant species. It is widely known that the species used in this test (corn, oats, onion, ryegrass, carrot, soybean, lettuce, cabbage, tomato and cucumber), with the exception of corn, are among the most sensitive to atrazine and are not representative of grass species that would normally be found in a riparian habitat. With the possible exception of ryegrass, not a single one of these species would be used in a grassy riparian habitat because they are a) are not grasses, and b) do not have the growth characteristics required for a buffer.

This scientifically inappropriate analysis does not qualify as using best available information and it is therefore inappropriate to conclude an LAA. Other information that qualifies as best available should be used to refine the assessment: consideration of data to refine the screening-level model; consideration of recovery; use of available literature which indicates minimal impact in riparian areas (as discussed below in sections 5.2, 5.3 and Appendix 1); use of technical experts who have studied riparian buffer zones for over 30 years; and use of available spatial data. This additional information indicates that atrazine is NLAA herbaceous riparian areas.

5.2 Lack of Refinement to the Screening-level Model

The EPA Terrplant model used in this analysis is a screening-level calculation used to quantify screening-level risk quotients. The RQs from this model were used as the basis for a LAA determination without refining the model, considering available data or conducting verification based on field observations and published literature. This lack of refinement is contrary to previous analyses conducted by the EPA for endangered species (Alabama sturgeon, Barton Springs salamander, and six species in the Chesapeake Bay watershed including the dwarf wedge mussel) and is also inconsistent with the indirect effects determination for aquatic habitat within this assessment (i.e. utilizing flow-based EEC refinements).

EPA's assessment uses laboratory derived EC_{25} toxicity values from standard toxicity studies to assess impacts on a population. The EC_{25} represents a sublethal endpoint from which plants can recover: it does not indicate the lethality necessary to deliver the adverse effects EPA predicts (for example, efficacious control of target weeds requires lethality approaching 90% or greater in a cropping situation). It well documented that atrazine has a reversible mode of action and this needs to be considered with respect to riparian plants that are transiently exposed to atrazine in potential runoff. Furthermore, it should have been recognized in the Problem Formulation step that the laboratory species used in the assessment are more sensitive annuals and not representative of the perennial plants that are most commonly used in herbaceous grassy riparian buffers that are not affected by atrazine (see memo from Dr R.S. Fawcett attached as Appendix 1). EPA also failed to consider or cite the numerous field studies which have been conducted that demonstrate the safety of atrazine to a variety of plants in vegetative filter strips, these

species commonly occur in riparian areas (Popov and Cornish 2006[5], Popov et al. 2005[6], Hall et al. 1983[7], Lin et al. 2004[8], Fawcett et al. 1994[9], Arora et al. 1996[10]).

The supposition that atrazine will inhibit seed germination is flawed since the guideline seedling emergence study that EPA relied on for this analysis (MRID 42041403) clearly indicates that atrazine has no effect on seed germination (EC_{25} greater than the highest dose tested (0.4 - 4 lb ai/A) which is well above any Terrplant predicted EECs.

5.3 Available Buffer System Research was not used by EPA

EPA did not use best available data in finding that a "likely to adversely affect (LAA) determination was concluded for seven of the eight assessed species based on indirect effects to habitat and water quality via sedimentation resulting from the direct effects to herbaceous/grassy riparian vegetation…." The EPA "effects determination" analysis did not evaluate the 30 years of grass buffer research, including riparian buffers, conducted by several agencies within USDA, several university studies, and private corporations. Additionally, the USDA-NRCS has, over the same time period, empirical on-farm experience in design, construction and maintenance of grass waterways, buffer strips and riparian buffers throughout the major corn and sorghum production states. Since atrazine has been a major component of weed control programs in corn and sorghum, most buffer effectiveness studies over the past 30 years have included atrazine. The major findings of these research studies show herbicide runoff and drift, including atrazine, has essentially no adverse effect on the growth and maintenance of the buffer systems. In fact, the empirical observations show the buffer systems that are in place on farms are populated with species that are tolerant to atrazine. Also, the recommended species in the USDA-NRCS guidelines for use in buffer systems are tolerant to atrazine.

The existing riparian buffers, both natural and constructed (1980 - present), throughout the agricultural watersheds in atrazine use states are not eliminated by atrazine in field surface runoff. To meet the ESA standards of use of best available data, EPA should consult with USDA to better understand the effectiveness of buffer systems in soil, nutrient and pesticide management from agricultural fields.

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[5] 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.

[6] 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.

[7] Hall, JK, NL Hartwig, and LD Hoffman. 1983. Application mode and alternate cropping effects on atrazine losses from a hillside. J. Environ. Qual. 12(3):336-340.

[8] Lin, CH, RN Lerch, HE Garrett, and MF George. 2004. Incorporating forage grasses in riparian buffers for bioremediation of atrazine, isoxaflutole and nitrate in Missouri. Agroforestry systems. 63:91-99.

[9] Fawcett, R.S., B.R. Christensen, and D.P. Tierney. 1994. The impact of conservation tillage pesticide runoff into surface water: a review and analysis. J. Soil and Water Cons. 49:126-135.

[10] Arora, K, SK Mickelson, JL Baker, DP Tierney, and CJ Peter. 1996. Herbicide retention by vegetative buffer strips from runoff under natural rainfall. Trans of the ASAE 30(6):2155-2162.

To provide an overview of buffer research and field observations on the tolerance of existing grass waterways and riparian buffer strips to atrazine in agricultural field runoff, observations from Dr. Richard Fawcett are provided in Appendix 1. Dr. Fawcett is presently an agricultural consultant in Iowa and was a professor at Iowa State University. Based upon the body of available research and data on riparian zones and buffers over the past 30 years and the empirical observations of the success of agricultural buffer systems in reducing soil erosion, atrazine does not have the potential to adversely impact riparian buffers and should be assessed, at most, as NLAA and should be NE for the listed mussels due to potential impacts on riparian habitats.

5.4 Available biological and spatial data were not utilized by EPA

EPA notes that "Riparian vegetation typically consists of a groundcover of grasses and forbs, under story of shrubs and young trees, and over story of mature trees." This description of riparian areas is also supported by the literature (e.g. USDA 2000[11], Lin et al. 2004). Therefore it is unlikely that riparian areas consisting solely of herbaceous/grassy areas that are sensitive enough to be affected by atrazine actually exist within the action area. The EPA did not consider this common mixed vegetation system and focused on assessing theoretical areas throughout the action area consisting solely of herbaceous/grassy areas potentially adjacent to atrazine treated fields. The effects of atrazine on herbaceous/grassy areas in the field are not likely to occur and woody species are tolerant to atrazine. Further, EPA did not fully describe the available woody plant toxicity data. Woody plant tests were conducted at full application rates (i.e. 1.5 to 4 lb ai/A) and only one species out of 35 exhibited any effect at the labeled rate indicative of no or negligible effects predicted at concentrations in field runoff. Therefore it can be concluded that atrazine will have NE instead of NLAA on the listed mussels due to impacts on riparian areas containing woody species.

5.5 Riparian Spatial Data

The EPA indicates that they could not spatially quantify potential effects on riparian areas due to variability in habitat type and the geographic scope of the action area. Therefore EPA's conclusion of a LAA to mussel habitat due to effects on herbaceous/grassy riparian areas does not rely on the best available spatial data. In previous atrazine endangered species assessments, EPA has conducted a more refined spatial analysis based on land cover and known species locations to better characterize and refine the assessment. Syngenta's preliminary analysis demonstrates that using best available spatial data will refine the "effects determination" and shows that EPA's LAA determination is unfounded.

Syngenta conducted a refined spatial analysis for two example locations within the action area that contained habitat for the fine-rayed and shiny pigtoe mussels near the border of Tennessee and Virginia (Figures 4 and 5) and for the rough pigtoe in Indiana (Figure 6): the rough pigtoe location is EO 178061 as identified in Section 3. A land cover analysis at the HUC-8 watershed scale for the Fine-rayed and Shiny pigtoe locations (Figure 4) indicates that the area is dominated by forest (60%), with 17% grassland/herbaceous,

[11] USDA 2000. Conservation buffers to reduce runoff losses. Publication of the United States Department of Agriculture Natural Resources Conservation Service.

12% pasture/hay, and only <0.1% cultivated crop. An even more detailed land cover analysis indicates that the area surrounding the "zoomed in" view of the mussel locations are comprised of forest, pasture, and grassland/herbaceous – there is no cultivated crop acreage proximate or upstream from these locations. Syngenta does not support atrazine use on pasture and the spatial analysis does not indicate the riparian areas are comprised solely of herbaceous/grassy areas. A land cover analysis was not conducted for the rough pigtoe location in Indiana since it was assumed that the area was dominated by cultivated crops. However, satellite imagery for this location indicates the riparian area is forested within this watershed (Figure 6). Again, the spatial analysis does not indicate the riparian areas are comprised solely of herbaceous/grassy areas. Examples of results of spatial analysis of the designated critical habitat for the southern clubshell and ovate clubshell mussels are also provided in Figures 7 through 9. (Note that Figures 4 – 9 have been moved to a confidential appendix). It is expected that similar analyses for other mussel locations will have the same result, leading to the conclusion that land cover spatial analysis adds further evidence that atrazine has not had an impact on the health of riparian zones even in high use areas. This provides more evidence that a determination of NLAA, at most, and should be NE on the listed mussels is appropriate due to impacts on riparian zones.

6.0 Critical Habitat

The EPA has characterized the potential for atrazine to adversely modify designated critical habitat for the ovate and southern clubshell mussels. The EPA states that "Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide essential life cycle needs of the species." However, the EPA did not rely on the best scientific and commercial data available to make their LAA effects determinations on critical habitat, for the reasons detailed below.

- Atrazine is NLAA host fish spawning areas; water quality necessary for normal behavior, growth and mussel viability of all mussel life stages by increasing turbidity; or increase sedimentation through effects on riparian areas.
- Riparian areas will consist of mixed vegetation and therefore separating riparian into forested and herbaceous/grassy areas is flawed (see previous discussion in Section 5).
- Atrazine will have NE on woody plant species (see previous discussion in Section 5).
- Atrazine is NLAA herbaceous/grassy plants in the field (see previous discussion in Section 5).
- Utilizing best available spatial information for critical habitat it is apparent that riparian areas will not be affected in the areas where the listed mussels occur. Figures 4 through 9 show examples of the health of the riparian zone in areas where the listed mussels are known to occur. Land cover analysis at the HUC-8 watershed level for critical habitat along the AL/MS border indicates the area is dominated by forest (62%) and cultivated crop area is minor (3%). Detailed imagery of the riparian area indicates the riparian area is forested; it is not

comprised solely of herbaceous/grassy vegetation. Imagery of similar to the examples provided in the figures is available for all such locations.

In summary, EPA's conclusion of a LAA for critical habitat of the ovate and southern clubshell mussels cannot be substantiated and the use of atrazine is not likely to adversely modify critical habitat for these mussels.

7.0 Conclusions

EPA's "effects determination" does not consistently utilize best available data resulting in "may affect" conclusions that cannot be corroborated. Syngenta has found many lines of evidence showing that if best available data including risk refinements and appropriate scientific methods had been used, the LAA determinations are indeed at worst NLAA determinations and many of the NLAA are in fact NE determinations. Of particular significance, EPA did not conduct a spatial analysis of species locations but instead generally assumed the whereabouts of mussel species. Incorrect methods were used to represent Ecological Monitoring data sites, including inclusion of sites that go dry, that could not serve as habitat. Furthermore, the influence of flow rate and stream size adjustments was not considered. Selective use of the aquatic ecosystem model CASM_Atrazine to look at primary productivity only and to omit use of the output for consumer effects inappropriately characterizes the modeled indirect effects of atrazine on the listed mussels. Of paramount importance, EPA's evaluation of the impact of atrazine on grassy/herbaceous and woody riparian areas is contradictory to EPA's guidance on problem formulation, published literature, field observations, geospatial analysis and years of experience and effort by USDA.

It is clear that EPA did not consistently meet the requirement to base its effects determinations for freshwater mussels on the best scientific and commercial data available and that other information including species location data, methods to refine assessments and field knowledge exists that is the best scientific and commercial data available. EPA, as the Federal action agency, chose to exclude applicants from the informal consultation process for these eight species of mussels. Syngenta can provide critical scientific information that is not only relevant to EPA's effects determination but is pertinent to development of the biological opinion in the process for formal consultation. Syngenta requests that EPA recognize Syngenta as an applicant under ESA and provide Syngenta with appropriate input to the consultation process going forward. In addition, training of registrants like FESTF (including Syngenta) by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, could further enhance the potential contribution that could be made by registrants to the quality of consultation processes.

Over many years, Syngenta has worked diligently and exhaustively as a registrant of atrazine to provide EPA with high quality and extensive scientific information to support EPA in its scientific assessments and regulatory decisions. Furthermore, Syngenta has worked in good faith with the FESTF for over a decade to respond to data requirements for information on the proximity of endangered species to pesticide use, that were imposed by EPA under FIFRA. FESTF has provided EPA with an Information Management System (IMS) and access to species location information. Unfortunately,

neither was utilized by EPA in their effects determinations of freshwater mussels to date but may provide valuable information in developing the biological opinion for formal consultation.

In conclusion, Syngenta believes that it can make a significant scientific contribution consistent with the ongoing requirement that the best available scientific and commercial data be used in analyzing the effects of atrazine. Syngenta seeks active involvement in the formal consultation process moving forward. This will provide an opportunity for Syngenta to bring scientific information into the consultation process and exercise the intent which is both implicit and explicit throughout the ESA and its implementing regulations[12] to have an open collaboration between the Federal action agency, the Services and, where applicable, the "applicant".

[12] 16 U.S.C. § 1531, *et seq.*; 50 C.F.R. § 402, *et seq.*

Figure 1 Spatial Distribution of Fine-Rayed Pigtoe Habitats.

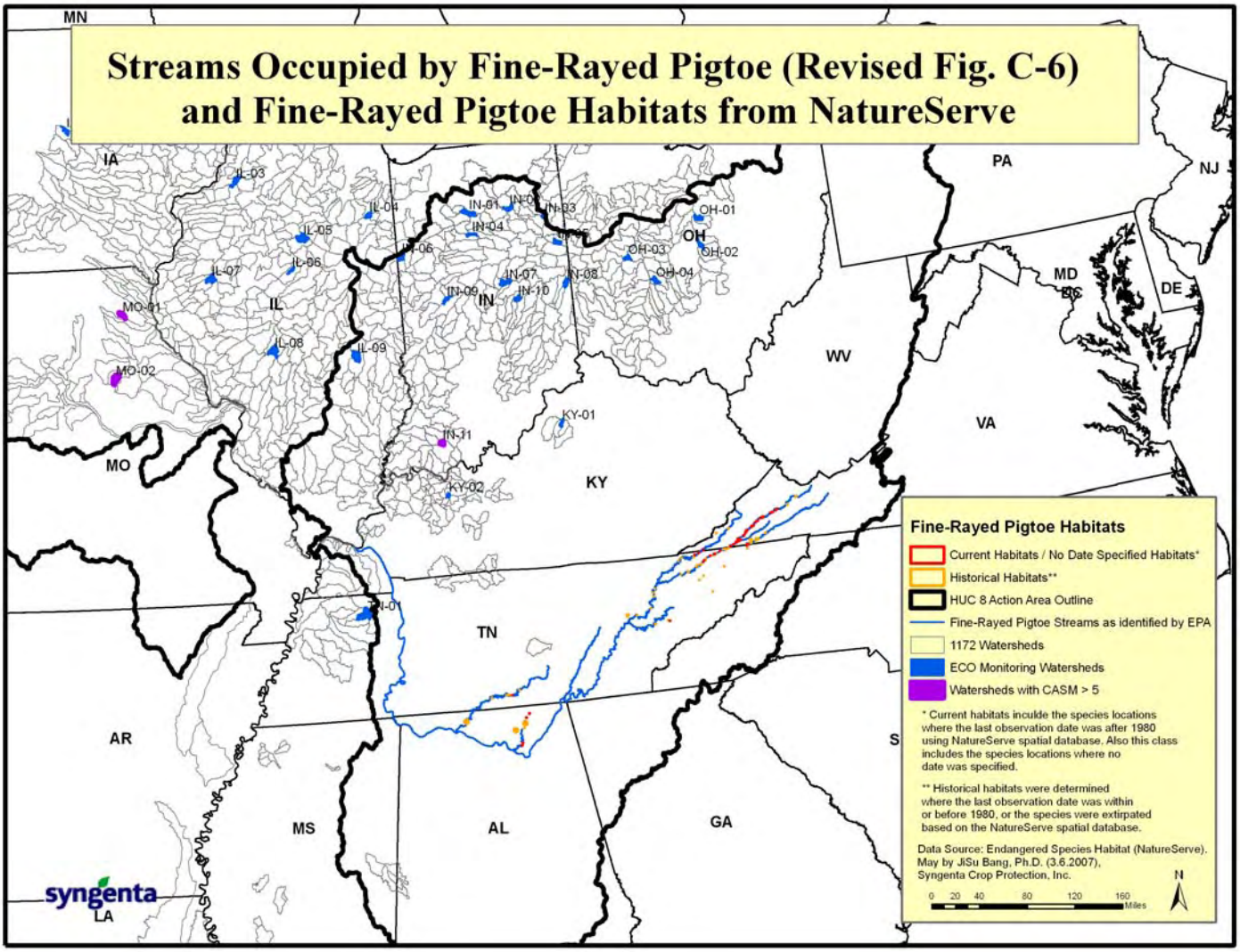


Figure 2 Spatial Distributions of Pink Pearly Mucket Habitats.

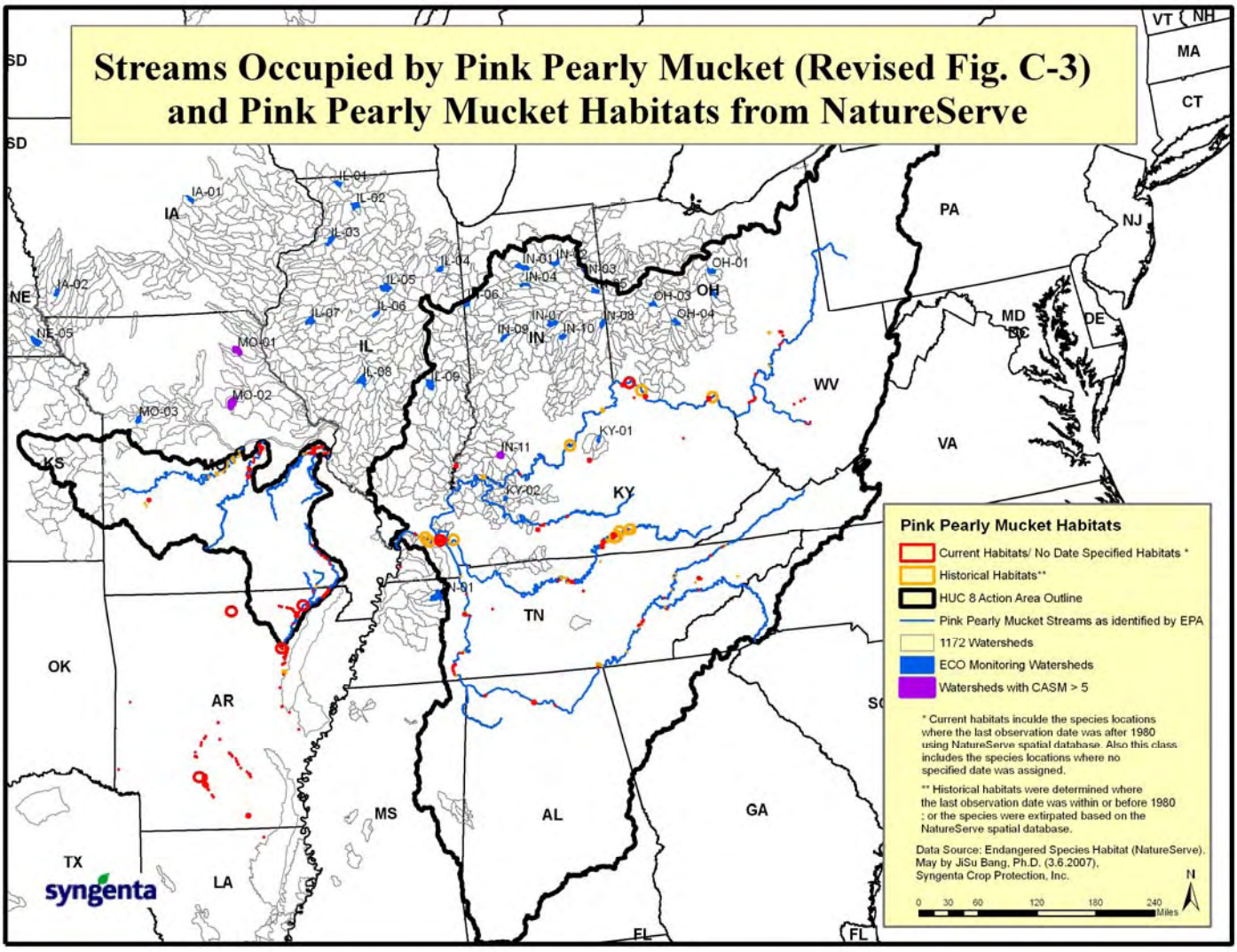
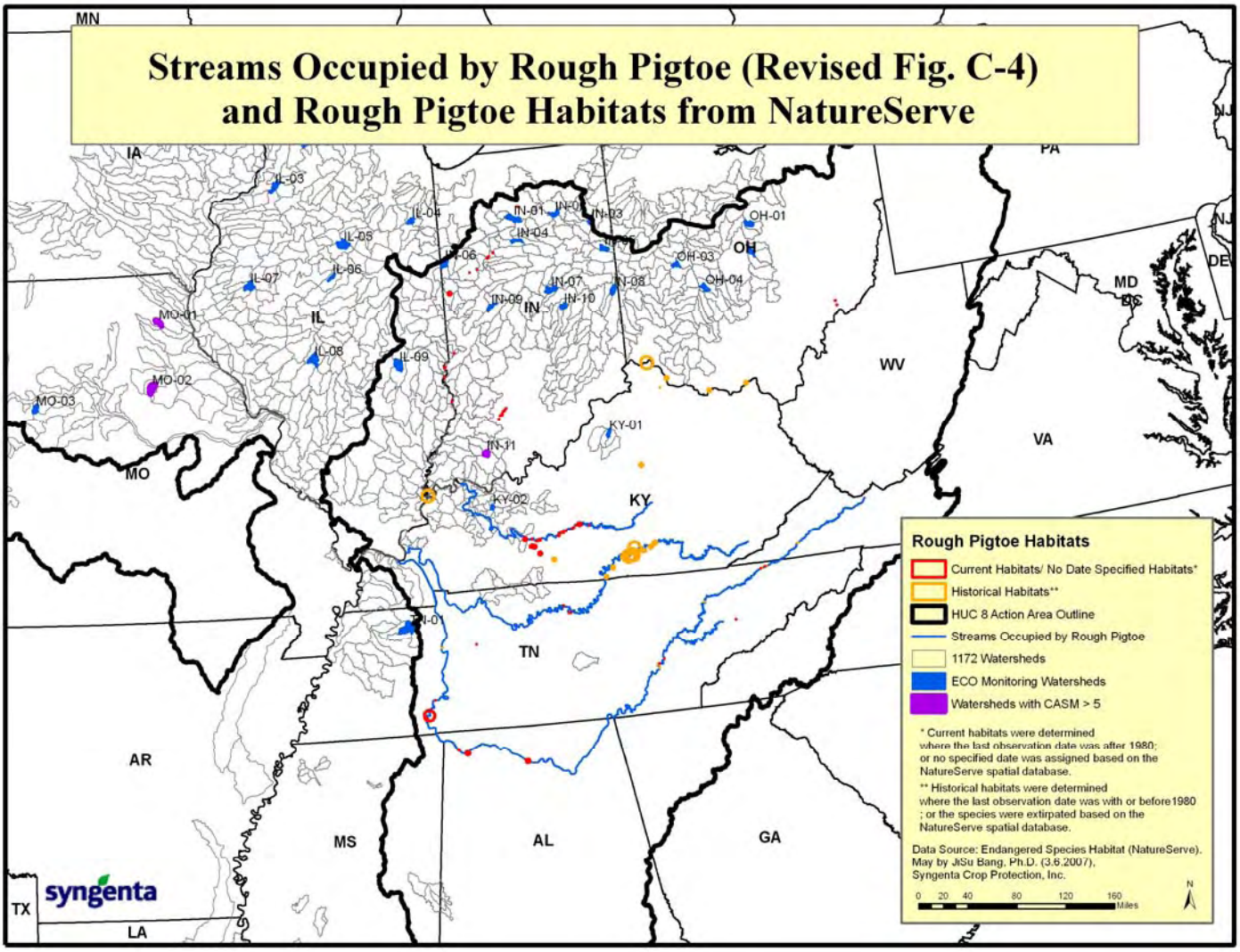


Figure 3 Spatial Distributions of Rough Pigtoe Habitats.



CROSSREFERENCE 1:
FIGURES 4 THROUGH FIGURE 5 HAVE BEEN REMOVED TO CONFIDENTIAL APPENDIX 2

A SUPPLEMENTAL STATEMENT OF DATA CONFIDENTIALITY CLAIMS IS PROVIDED AT THE END OF THIS DOCUMENT.

APPENDIX 1: LETTER TO SYNGENTA FROM DR. RICHARD FAWCETT

****

Dr. Richard S. Fawcett

Fawcett Consulting

30500 Doe Circle

Huxley, IA 50124

Phone/Fax: 515-597-2206

March 6, 2007

Dennis Tierney
Syngenta Crop Protection
P.O. Box 18300
Greensboro, NC 27419-8300

Dear Dr. Tierney:

I would like to respond to the conclusions of the EPA document: Risk of Atrazine Use to Eight Federally Listed Endangered Fresh Water Mussels, Pesticide Effects Determination, Environmental Fate and Effects Division, Office of Pesticide Programs, Feb. 28, 2007.

I have over 30 years experience in studying the impacts of pesticides on off-target species and have specifically worked with riparian buffers. I strongly disagree with the conclusion that drift and runoff of atrazine have significant negative impacts on riparian buffers, thus allowing greater sedimentation of waters in mussel habitat. Indeed the opposite is true. If atrazine were not available, conservation tillage systems relying on atrazine would be harmed, causing more tillage and more erosion. Atrazine is an essential tool for conservation tillage systems, such as no-till, as evidenced by the fact that it is used preferentially by conservation tillage farmers. In 2004, atrazine was used on 84.1% of conservation tillage corn, compared to 61.7% of conventional tillage corn. Reduced or mulch-till systems have reduced erosion by an average 69% in controlled studies (Fawcett et al. 1994). No-till reduces erosion by more than 90%. I have recently reported on the potential impact of the loss of atrazine availability and concurrent increase in tillage and erosion that would occur (Fawcett, R.S., 2006). Under one potential scenario, one half of no-till corn farmers would be expected to do one additional tillage operation, burying enough surface crop residue to place land into the reduced or mulch-tillage category (being less effective in reducing erosion). One half of mulch-tillage acres would receive extra tillage, placing these acres into the conventional tillage

category. This modest increase in tillage would result in an increase in erosion of 68 million tons/year and increase fuel use by 43 million gallons per year.

As a university professor and later as an independent consultant, I have investigated hundreds of cases of herbicide drift throughout the United States. I have never investigated a case of atrazine drift. This is not to say that atrazine doesn't drift. Indeed it can when sprayed under windy conditions (it moves as spray particles only, not as a vapor). However, at rates found in drift it causes so little impact to established plants that economic or esthetic problems simply don't occur.

Table 5.9 Non-target Terrestrial Plant Vegetative Vigor Toxicity RQs, shows that using EPA's models, only soybean, cabbage, and cucumbers would be affected by predicted atrazine drift. Given my experience in observing a total lack of symptoms on millions of acres of soybeans planted immediately adjacent to atrazine-treated corn fields throughout the Corn Belt, the model must greatly exaggerate concentrations and effects.

EPA acknowledges that plants are most sensitive to atrazine in the seedling emergence stage. This begs the question: When would seedlings be emerging in a riparian area when atrazine might come in contact with them? All the species in Table 5.8 are annual species. Riparian buffers, either naturally occurring or planted by man, contain nearly exclusively perennial plants, not annuals. Perennial plants are far less sensitive to atrazine than seedlings. Most perennials would not be significantly affected by direct applications of atrazine. EPA acknowledges that woody species are not sensitive to atrazine, but fails to understand that perennial herbaceous species similarly are not affected.

Theoretically, a few seedling plants might be found in a buffer at some point in time and be sensitive to atrazine. Given the dense nature of perennial vegetation in a buffer, even if these seedlings were killed, it would have no effect on the sediment trapping ability of the buffer.

The USDA NRCS provides technical assistance to landowners planting conservation buffers. The NRCS publication, Plants for Conservation Buffers, lists 34 plant species recommended for buffers. All of these species are perennials, and would not be significantly affected by atrazine drift. Some popular species, such as switchgrass, indiangrass, and big bluestem (the top rated species in the publication) are resistant to atrazine, with direct applications having no impact. Some of the most common grasses found in riparian buffers, both natural and planted, are perennial grasses like smooth bromegrass, tall fescue, and reed canarygrass, species very tolerant to atrazine. Farmers trying to kill these grasses with direct applications of atrazine fail.

Buffers are a widely recommended practice to trap herbicides in runoff to protect surface water (Krutz, et al. 2005; NRCS 2000). The potential impact of trapped

herbicides on buffer species has been studied with no detrimental effects found. In fact, in Iowa studies with atrazine, buffer vegetation was most vigorous at the top end of buffers adjacent to atrazine-treated corn fields (Arora et al. 1996). More vigorous growth was attributed to nutrients trapped by the buffer. However, the authors concluded that atrazine trapped by the buffers had no harmful effect on the buffer. Kurtx et al. (2005) reviewed all published studies investigating buffer trapping of pesticides. No study reported problems with trapped herbicide (or drift of herbicides) causing any problem with buffer vegetation. In fact, several studies reported enhanced degradation of trapped herbicides, including atrazine (Mersie et al. 1999). I have examined hundreds of buffers across the Midwest and have never seen a buffer adversely affected by atrazine (or any other herbicide found in runoff). The NRCS publication, Conservation Buffers to Reduce Pesticide Losses (NRCS, 2000), similarly concludes that established buffers are usually not affected by herbicides in runoff. This publication points out that trapped sediment itself is the biggest problem in reducing the efficiency of buffers. Trapped sediment changes the shape of buffers and may lead to concentrated flow unless periodically removed.

Atrazine reaching buffers either as drift or in runoff simply is not a problem in the real world. Any atrazine reaching buffers is at a concentration far too low to kill perennial species found there. Effects, if any, would be slight symptoms, having no effect on buffer efficiency. Any rare annual seedling plants present would have no impact on buffer efficiency even if they were killed or injured.

The only possible real impact of atrazine off-target movement on buffers would be during the process of seeding new buffers. Even then the timing of runoff or drift would have to coincide with the exact time of seed germination and emergence to have significant impact. The NRCS Buffer publication acknowledges that "the greatest chance for harmful impact of herbicides in runoff would occur during buffer establishment." I have worked with farmers across the Midwest, helping them establish buffers and observing buffers. I can say that problems in buffer establishment due to drift or runoff are very rare. Farmers generally take extra care when seeding new buffers, as they recognize the greater sensitivity of seedlings.

APPENDIX 1: LETTER TO SYNGENTA FROM DR. RICHARD FAWCETT (continued)

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In conclusion, it is my professional opinion that atrazine in runoff or drift would have no impact on sediment trapping efficiency of buffers, with the only exception being possibility of injury for a few weeks after seeding new buffers. I base this conclusion on my own research experience with buffers, 30 years of experience observing the impacts of atrazine and other herbicides on adjacent vegetation, and on my experience in installing buffers (on my own farm) and helping other landowners install buffers.

Sincerely,

Dr. Richard S. Fawcett

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