Effect Determination for Atrazine

Appendix I. Evaluation of Potential for Atrazine to Affect Dwarf Wedgemussels via Potential Effects to Riparian Vegetation

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Analyses of the potential of atrazine to affect known dwarf wedgemussel populations via alteration of riparian habitat are presented in this appendix. A tiered approach was used for the analysis. First, land cover in the local watersheds of known dwarf wedgemussel populations was evaluated. If local land use data suggested negligible potential for atrazine exposure to riparian areas, then no additional analysis was conducted. Otherwise, further evaluation of the potential sensitivity of the type of riparian areas present was conducted. If analysis of land cover data suggests that exposure and effects to riparian areas to an extent that may result in effects to dwarf wedgemussels may occur, and riparian areas surrounding the known locations of the dwarf wedgemussel are expected to be sensitive to atrazine, then a "likely to adversely effect" determination could be made. Conversely, if land cover data suggest that the extent of potential atrazine exposure to riparian areas is negligible or if riparian areas are not expected to be sensitive to atrazine, then a "not likely to adversely affect, determination could be made. These analyses are presented in Sections 1 through 10 below.

The analysis of riparian areas utilized aerial photography. Due to concerns with collection of endangered species, photographs presented in this Appendix are examples of riparian areas surrounding waters inhabited by the dwarf wedgemussel and are not necessarily images of actual specific mussel locations.

1.0. Po River Watershed, Spotsylvania County

The Chesapeake Bay Program (http://www.chesapeakebay.net/wspv31/) indicates that land use in the Po River watershed is as follows:

Total Area: 145 Square miles
Forest: 105 square miles (72%)
Agriculture: 30 Square miles (21%)
Open water, wetland, barren: 7 square miles (4.8%)
Developed: 2 square miles (1.4%)

Approximately 2% of the land cover in Spotsylvania county (4,300 of the 257,000 acres) was harvested for commodities labeled for atrazine uses (corn or sorghum; 2002 data, Attachment 1), and minimal cropland surrounds the Po River in Spotsylvania County (Figure I-1). Atrazine use on forestry, the predominant land cover in the Po River watershed, in Virginia is rare (VA DOF, 2004), and atrazine is not labeled for use on pastures (U.S. EPA, 2006a). This analysis suggests that the extent of riparian areas of the Po River that may be subject to atrazine exposure is minimal. Consequently, the significance of any potential effects to the dwarf wedgemussel resulting in effects to riparian areas is expected to be low such that a take is not anticipated. For these reasons, atrazine is not likely to adversely affect dwarf wedgemussels in the Po River via effects to riparian areas.

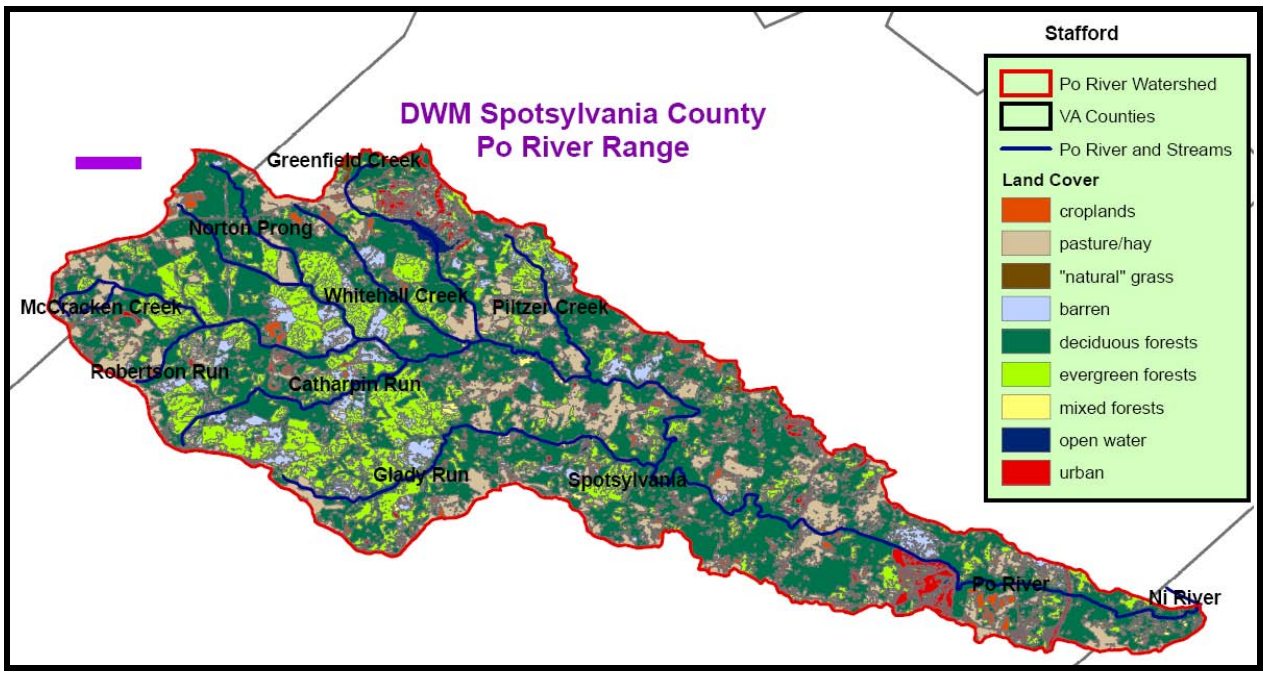

Figure I-1. Land Cover Surrounding the Po River Watershed.

2. Rappahannock River, Spotsylvania and Stafford County, Virginia

The Chesapeake Bay Program (http://www.chesapeakebay.net/wspv31/) indicates that land use in the Rappahannock River watershed is as follows:

Total Area: 339 Square miles
Forest: 201 square miles (59%)
Agriculture: 86 Square miles (25%)
Open water, wetland, barren: 36 square miles (11%)
Developed: 16 square miles (4.7%)

Figure I-2 below indicates that land cover near the Rappahannock River in Spotsylvania and Stafford Counties is predominantly forested with minimal cropland. Approximately 2% of the land cover in Spotsylvania County and approximately 1% of the land cover in Stafford County were harvested for commodities labeled for atrazine use (corn or sorghum, 2002 data; Attachment 1). Atrazine use in forestry operations is minimal in Virginia (VA DOF, 2004), and atrazine is not labeled for use on pastures (U.S. EPA, 2006a). This analysis suggests that the extent of riparian areas of the Rappahannock River watershed that may be subject to atrazine exposure is minimal, and the significance of any potential effects to the dwarf wedgemussel resulting in effects to riparian areas from atrazine is expected to be low such that a take is not anticipated. For these reasons, atrazine is not likely to adversely affect dwarf wedgemussels in the Rappahannock River via effects to riparian areas.

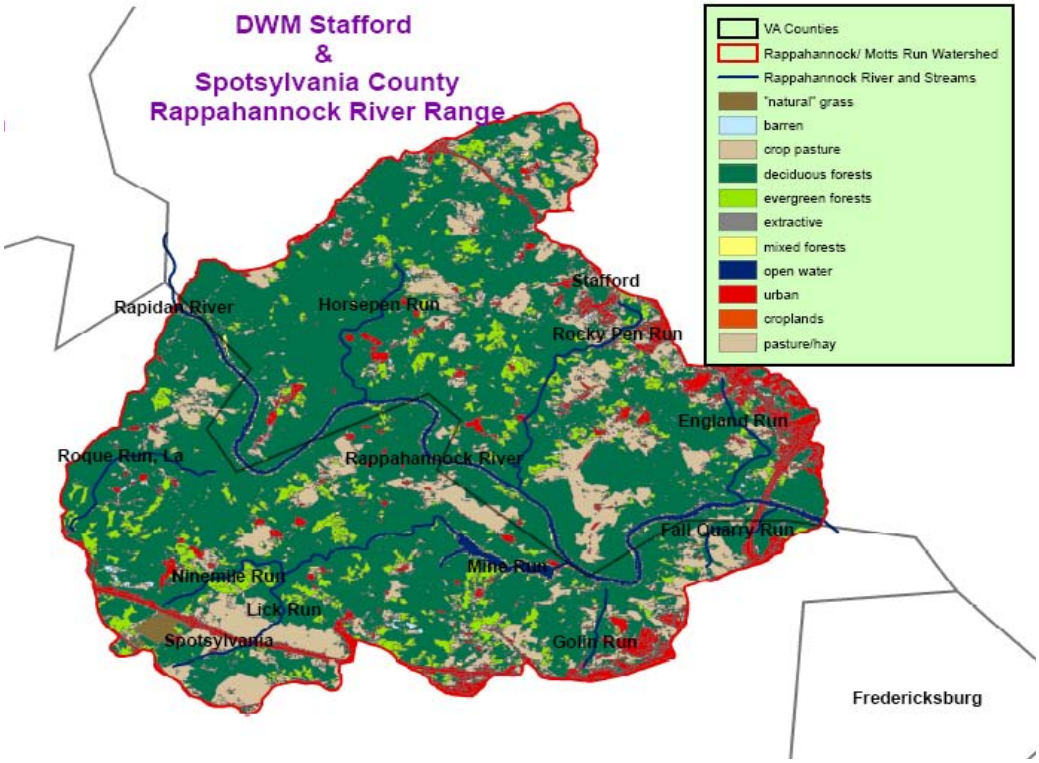

Figure I-2. Land Cover Surrounding the Rappahannock River Watershed.

3. South Anna River, Louisa and Hanover Counties, Virginia

The Chesapeake Bay Program (http://www.chesapeakebay.net/wspv31/) indicates that land use in the upper and lower South Anna River watershed is as follows:

Total Area: 466 Square miles
Forest: 310 square miles (67%)
Agriculture: 118 Square miles (25%)
Open water, wetland, barren: 33 square miles (7%)
Developed: 5 square miles (4.7%)

An analysis of the land use surrounding the South Anna River watershed (Figure I-3) indicates that land use is predominantly forest and pastureland, with minimal cropland or residential land cover. Data from USDA indicate that 1% and 4% of the land cover in Louisa and Hanover counties, respectively, was harvested for corn or sorghum (Attachment 1). Atrazine use in forestry operations is minimal in Virginia (VA DOF, 2004), and pastureland is not a currently labeled use. This analysis suggests that the extent of riparian areas of the South Anna River that may be subject to atrazine exposure is minimal. Therefore, potential effects to riparian areas and resulting potential effects to dwarf wedgemussels are expected to constitute an insignificant effect in the South Anna River.

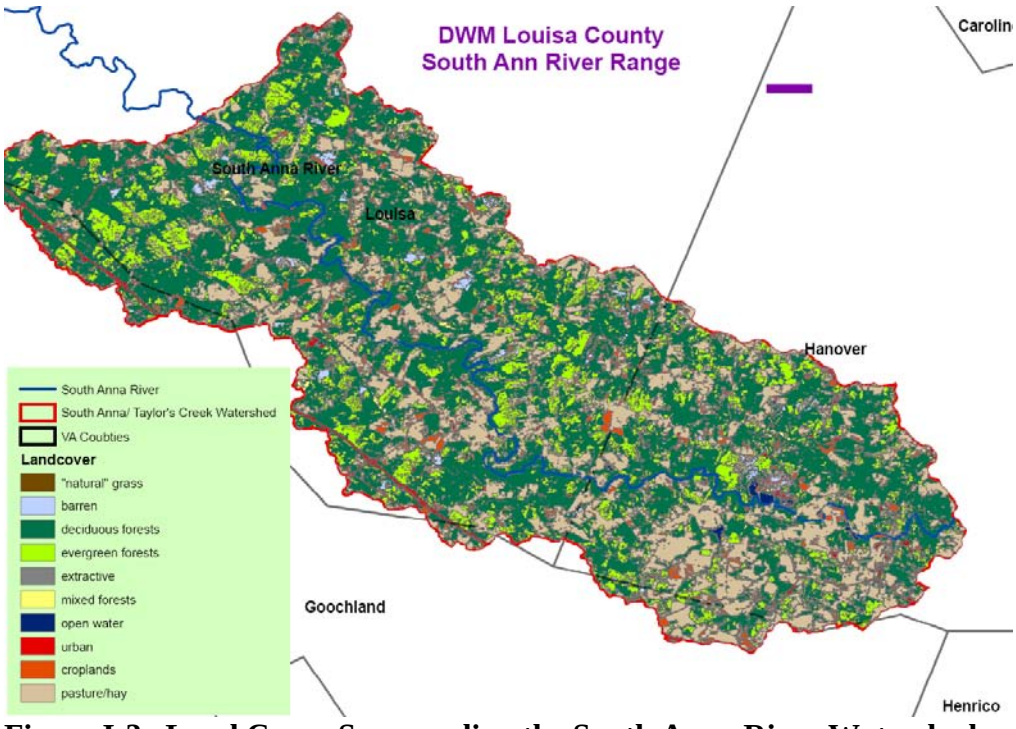

Figure I-3. Land Cover Surrounding the South Anna River Watershed.

4. Aquia Creek, Stafford County, VA

The Aquia Creek watershed is 88 square miles with 81% of land cover forest, open water, wetland, or barren land and 13% agriculture (http://www.chesapeakebay.net/wspv31/). An analysis of the land cover surrounding the Aquia Creek watershed (Figure I-4) indicates forestland is the predominant land cover with minimal cropland. Data from USDA indicate that 1% of the land cover in Stafford County (1500 of the 173,000 acres) was harvested for corn and sorghum (Attachment 1), and forestry is a rare use in Virginia (VA DOF, 2004). This analysis suggests that the acreage of riparian areas of the Aquia Creek watershed that may be subject to atrazine exposure is minimal. Therefore, potential effects to riparian areas and resulting potential effects to dwarf wedgemussels are expected to constitute an insignificant effect.

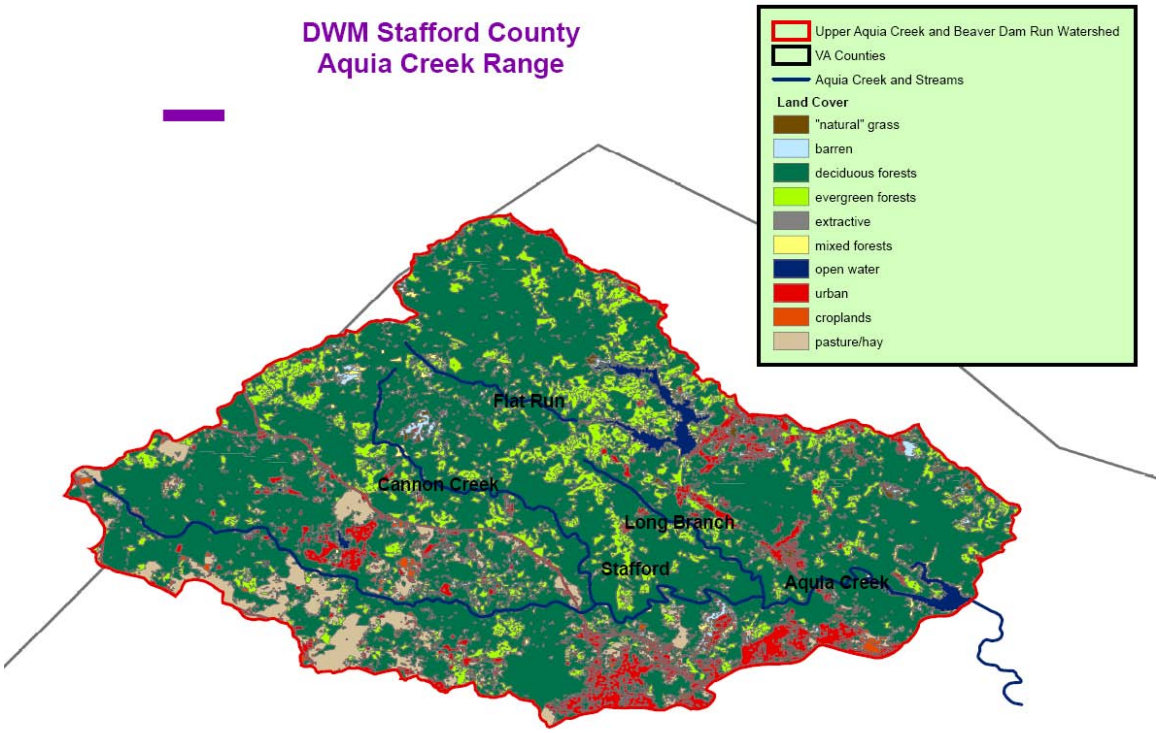

Figure I-4. Land Cover Surrounding the Aquia Creek Watershed.

5. **Carter Run, Fauquier County, Virginia**

The Carter Run watershed is approximately 56 square miles (36,000 acres). The predominant land cover in the watershed is forest (63%) and pasture land (34%). Cropland constitutes 1.5% of the land cover in the Carter Run watershed. Figure I-4 illustrates land cover data in the watershed. These data were presented in the Bacteria TMDL for Carter Run, Fauquier County, Virginia (January, 2005). Atrazine use in forestry operations is minimal, and pasture land is not a labeled use for atrazine. Therefore, this analysis suggests that the extent of riparian areas of Carter Run that may be subject to atrazine exposure is minimal. Therefore, potential effects to riparian areas and resulting potential effects to dwarf wedgemussels are expected to constitute an insignificant effect.

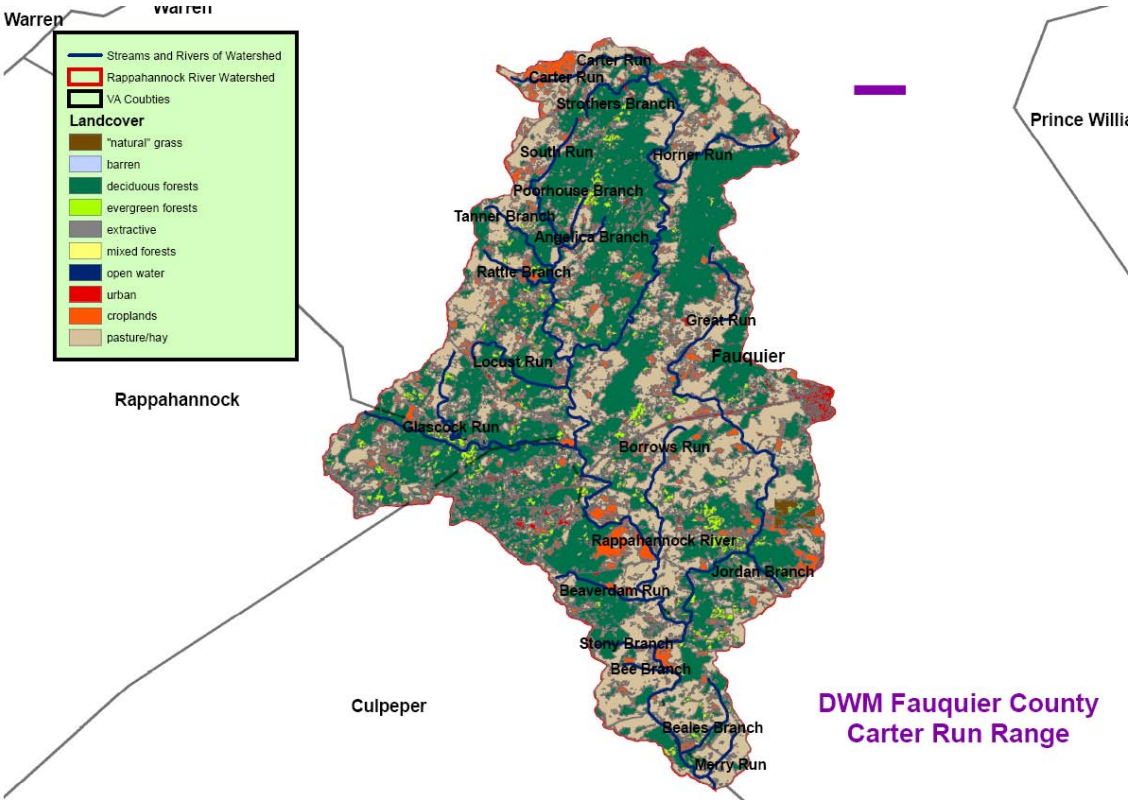

Figure I-5. Land Use for the Carter Run Watershed in Fauquier County, Virginia

6. **Nanjemoy Creek, Charles County, MD.**

Land cover data for the Nanjemoy Creek watershed was evaluated and presented in U.S. FWS (1997). The Nanjemoy Creek watershed is a predominantly forested watershed with 90% forested area within 100 meters of streams in the watershed. In addition, approximately 10% of land use in Charles County is cropland with approximately 2% harvested for corn or sorghum (Attachment 1). Together, these data suggest that the extent of potential atrazine exposure to riparian areas of Nanjemoy Creek is minimal and that the types of riparian areas in the Nanjemoy Creek watershed (forestland, typically 100 meters or more) are not expected to be sensitive to atrazine exposure based on the low sensitivity of woody plants to atrazine (Wall *et al.*, 2006; MRID 4687040001). Therefore, potential effects to riparian areas and resulting potential effects to dwarf wedgemussels are expected to constitute an insignificant effect.

7. **McIntosh Run, St. Mary's County, MD.**

Land cover data for the McIntosh Run watershed was evaluated and presented in U.S. FWS (1997). The McIntosh Run watershed is largely forested; 85% of the area within 100 meters of streams in the watershed is forested and 9% is cropland. In addition, 4% of land cover was harvested for corn or sorghum (Attachment 1). Together, these data suggest that the extent of potential exposure to riparian areas of McIntosh Run is minimal and that the types of riparian areas surrounding Nanjemoy Creek (forestland, typically 100 meters or more) are not expected to be sensitive to atrazine based on the low sensitivity of woody plants (Wall *et al.*, 2006; MRID 4687040001). Therefore, potential effects to riparian areas and resulting potential effects to dwarf wedgemussels are expected to constitute an insignificant effect.

In contrast to the above habitats (Po River, Rappahannock River, South Anna River, Aquia Creek, Carter Run), land cover within the watershed of the dwarf wedgemussel populations on the Eastern Shore of Maryland (Queen Anne's, Caroline, and Talbot counties) is predominantly cropland. For example, land use within 100 meters of either stream bank of Long Marsh Ditch was estimated at approximately 69% cropland (U.S. FWS, 1997). Therefore, there is a higher likelihood that sedimentation from cropland may impact dwarf wedgemussels at these locations on Maryland's Eastern shore. The predominance of cropland does not necessarily imply that atrazine use is expected to result in increased sedimentation from agricultural fields at these locations. For atrazine to affect sedimentation via impacts on riparian vegetation, riparian areas would need to be present and to be comprised predominantly of grassy or herbaceous vegetation. In addition, herbicide use in no-till farming may not be associated with increased sedimentation. Therefore, a qualitative analysis of the riparian areas along the dwarf wedgemussel habitats in Maryland's Eastern shore (Norwich Creek, Long Marsh Ditch, and tributaries of Southeast creek and Corsica River) was performed. Results of these analyses are discussed below.

8. Norwich Creek, Talbot County, MD.

Norwich Creek is part of the Tuckahoe drainage system. Land use in the watershed is predominantly (72%) agriculture (U.S. FWS, 1997). The area of Norwich creek with dwarf wedgemussel habitat is surrounded by a 50 meter forested riparian zone (U.S. FWS, 1997; Figure I-6a). In addition, upstream locations are surrounded by predominantly forested riparian areas on both sides of the stream bank (Figure I-6b). Atrazine is not expected to detrimentally impact primarily forested riparian areas based on the low sensitivity of atrazine on woody plants (Wall *et al.*, 2006; MRID 4687040001). Therefore, riparian areas of Norwich Creek are not expected to be affected by atrazine use to an extent that would be anticipated to have significant impacts on the dwarf wedgemussel.

Figure I-6a. Aerial Photograph of Example Area of Norwich Creek Dwarf Wedgemussel Habitat. Image obtained from Google Earth, Version 4.

Figure I-6b. **Example of riparian area upstream of the Norwich Creek site presented in Figure I-6a above.** Image obtained from Google Earth, Version 4.

9. Mason's Branch, Granny Finley Branch, and unnamed tributaries of the Corsica River and Southeast Creek

Land use surrounding these dwarf wedgemussel habitats is dominated by cropland; therefore, there is potential for atrazine exposure to riparian areas surrounding these waters. However, aerial photographs indicate that the riparian areas surrounding these waters are predominantly forested on both sides of the stream banks (Figures I-7 through I-10). Based on the low sensitivity of woody plants, atrazine is not likely to affect riparian areas of these waters to an extent that would be expected to constitute a significant effect to the dwarf wedgemussel.

Figure I-7. Example Reach of Brown's Branch, Image obtained from Google Earth, Version 4.

Figure I-8. Example Tributary of Southeast Creek, Image Obtained from Google Earth Version 4.

Figure I-9. Example Reach of Mason's Branch, Caroline County, Image obtained from Google Earth, Version 4.

Figure I-10. Example Reach of Granny Finley Branch, Image obtained from Google Earth, Version 4.

10. Long Marsh Ditch, Queen Anne's and Caroline Counties

Long Marsh Ditch is a small, channelized stream with cropland that borders the stream banks on both sides (U.S. FWS, 1997). There is no buffered riparian zone on either side of the stream (Figure I-11); farming extends up to within a few feet of the stream bank (U.S. FWS, 1997). Although sedimentation from agricultural land may affect the population of dwarf wedgemussels in Long Marsh Ditch, the absence of a riparian area along most of Long Marsh Ditch precludes potential effects to riparian areas induced by atrazine. However, if efforts are made to implement a riparian zone along Long Marsh ditch in the future, then the potential for atrazine to affect the developing riparian area will need to be reevaluated.

Figure I-11. Example of Long Marsh Ditch, Queen Anne's County, Image obtained from Google Earth, Version 4.

Attachment 1. Summary of Land Use Data for Counties with Known Dwarf Wedgemussel Populations from USDA

County	Square Miles[a]	Acres	Acres of Cropland[b] (% of total acreage)	Acres of corn and sorghum[b] (% of total acreage)
Louisa, VA	497	318,000	39,000 (12%)	2300 (1%)
Spotsylvania, VA	401	257,000	27,000 (11%)	4300 (2%)
Stafford, VA	270	173,000	14,000 (8%)	1500 (1%)
Caroline, MD	320	205,000	94,000 (46%)	29,000 (14%)
Charles, MD	461	295,000	30,000 (10%)	5200 (2%)
Queen Anne, MD	372	238,000	132,000 (55%)	47,000 (20%)
Saint Mary, MD	361	231,000	42,000 (18%)	9700 (4%)
Talbot, MD	269	172,000	86,000 (50%)	33,000 (19%)

a Total acreage of each county was obtained from http://www.fedstats.gov; percentage of acres cropland for each county was determined using the following equation:
Acres cropland / total acres of county
b http://www.ams.usda.gov/statesummaries/. Acreage of corn and sorghum represents acres harvested; acreage of cropland represents total cropland.