Appendix B
NPDES Applicator and Application Estimates

The following table provides EPA's current estimates of the number of applicators and applications of pesticides that fall within pesticide use patterns that result in the application of pesticides to and over, including near, waters of the United States. The information has not undergone peer review, and EPA intends to update these estimates as additional data become available.

There are two main limitations to the data provided. First, there is not a direct source of information on the number of applicators and applications made for these pesticide use patterns. As a result, the estimates were derived from secondary sources of information, and generalizing assumptions were sometimes made. The second limitation is that the definition of an application and an applicator is derived from the best available data by use pattern. Therefore the definition may be different by use pattern. More detail, by pesticide use pattern, is provided in the calculation notes.

Following the table is a listing of information sources used in EPA's estimation of the number of pesticide applicators and applications. Information sources are listed by pesticide use pattern.

NPDES Applicator & Application Estimates

Use Patterns	Number of Applicators	Number of Applications	Calculation Notes
Mosquito Adulticides	1,200	461,450	There are 400 mosquito abatement districts and approximately 800 other public agencies that apply mosquito control pesticides--it is assumed that each represents an applicator. There were 103 million acre-treatments with insecticides in 2005 (99 million for adulticides and 4 million for larvicides). Assuming that 77% of adulticide applications are made by ground and 23% are made by air and that an average adulticide application by ground covers 180 acres and that an adulticide application by air covers 600 acres, there are an estimated 461,450 annual adulticide applications.
Mosquito Larvicides	1,200	18,800	There are 400 mosquito abatement districts and approximately 800 other public agencies that apply mosquito control pesticides--it is assumed that each represents an applicator. There were 103 million acre-treatments with insecticides in 2005 (99 million for adulticides and 4 million for larvicides). Assuming that 77% of larvicide applications are made by ground and 23% are made by air and that an average larvicide application by ground covers 180 acres and that a larvicide application by air covers 600 acres, there are an estimated 18,800 annual larvicide applications.
Aquatic Weed Control - Lakes and Ponds	23,200	4,524,000	OPP data show approximately 23,200 applicators holding certification in the aquatic category. The estimate of applications to lakes, ponds, irrigation systems and waterways is the result of 23,200 multiplied by 1 application per day over 195 work days (5 work days per week multiplied by 39 weeks [9 months of the year]), which equals 4,524,000 applications per year. EPA cannot determine what applications are made to each site, so one overall number has been calculated for all aquatic weed control in lakes, ponds, irrigation systems, and waterways.

Use Patterns	Number of Applicators	Number of Applications	Calculation Notes
Aquatic Weed Control - Irrigation Systems and Waterways	See Aquatic Weed Control - Lakes and Ponds	See Aquatic Weed Control - Lakes and Ponds	See Aquatic Weed Control - Lakes and Ponds
Aquatic Weed Control – Ditchbanks	330,000	660,000	About 15%, or 330,000, of 2.2 million U.S. farms are irrigated. EPA assumes that each farm is treated twice per year. This does not account for types of irrigation.
Aquatic Nuisance Animal Control	Not Available	Not Available	Includes use of pesticides for the control of fish, lampreys, and mollusks. EPA currently does not have an estimate of the number of applicators and applications within this use pattern.
Wide Area Pest Control - Insects	170	5,000	Based on grasshopper & Mormon cricket control. Estimate of 5 million acres treated with a minimum of 1,000 acres per application. This is a low estimate because it does not include east of the Mississippi, and parts of west. Number of applicators is based on NAAA survey estimate of available aircraft.
Wide Area Pest Control - Invasive Weeds	5,000	10,000	Herbicides are usually not feasible for control of large wide area infestations. They are most likely used to control and/or eradicate smaller newer infestations. Applicators may be individual landowners or government agencies. No data is available for number of applicators and applications, but EPA estimates that there are at least 5,000 applicators and 10,000 applications, and that these estimates may be low.
Forestry	4,500	4,500	There are 5,175 tracts of forest in the U.S. and 2.7 million acres of forest are treated per year. Assuming that an average pesticide application to forests is 600 acres (based on NAAA survey), the number of applications is calculated as the number of acres treated per year divided by the number of acres treated per application. It is assumed that the 4,500 applications are evenly distributed across the 5,175 forest tracts, thus it is assumed that there is one applicator per treated tract. The estimate of the number of applications and applicators may be low because data are not available on pesticides applied by ground.
Total	365,270	5,683,750	

NPDES Applicator &Application Information Sources

Mosquito Control

CDC, 2009. Infectious disease information: Mosquito-borne diseases. U.S. Centers for Disease Control and Prevention. Available online at: http://www.cdc.gov/ncidod/diseases/list_mosquitoborne.htm

EPA Proprietar Marketing Research Data.

EPA and CDC, 2007. Joint statement on mosquito control in the United States. U.S. Environmental Protection Agency and the U.S. Centers for Disease Control and Prevention. Available online at: http://www.epa.gov/opp00001/health/mosquitoes/mosquitojoint.htm

Florida Coordinating Council on Mosquito Control, 1998. Florida mosquito control: The state of the mission as defined by mosquito controllers, regulators, and environmental managers, University of Florida, Vero Beach, FL.

NAAA, 2004. Pesticide use survey report for agricultural aviation. National Agricultural Aviation Association, Washington, DC.

University of Florida, IFAS Extension,(undated). Integrated mosquito management (IMM). Florida Medical Entomology Laboratory. Available online at: http://mosquito.ifas.ufl.edu/Integrated_Mosquito_Management.htm

Aquatic Weed Control

Baker Hughes Incorporated, 2004. MAGNACIDE® H herbicide: Most cost effective aquatic weed control. Available online at: http://www.bakerhughesdirect.com/cgi/hello.cgi/BPC/public/agriculture/pdf/BakerPetrolie_costeffective.pdf

Bronzini, Michael S., 1997. Inland waterways: Still or turbulent waters ahead? *Annals of the American Academy of Political and Social Science*, Vol. 553, Transport at the Millennium (Sep., 1997), 66-74.

California Department of Pesticide Regulation. Pesticide Information Portal, 2009. Pesticide Use Reporting. Available online at: http://www.cdpr.ca.gov/docs/pur/purmain.htm

EPA Proprietar Marketing Research Data.

EPA. 2007. Survey of the Nation's lakes: A fact sheet for communities. U.S. EPA, Office of Water, National Lakes Assessment. Available online at: http://epa.gov/owow/lakes/lakessurvey/

Smith, S.V., W.H. Renwick, J.D. Bartley, and R.W. Buddenmier, 2002. Distribution and significance of small, artificial water bodies across the United States landscape. *The Science of The Total Environment* ,Volume 299, Issues 1-3, 1 November 2002, 21-36.

University of Kentuchy, 2009. Aquatic weed control. Univ. of Kentucky Pesticide Education Program. Available online at: http://www.uky.edu/Ag/PAT/cat5/cat5.htm

U.S. Census Bureau, 2003. 2002 Census of Governments, Volume 1, Number 1, Government Organization, GC02(1)-1, U.S. Government Printing Office, Washington, DC. Available online at: http://www.census.gov/prod/2003pubs/gc021x1.pdf

USDA NASS, 2005 Census of Aquaculture, Volume 3, Special Studies, Part 2, AC-02-SP-2, 2006. Available online at: http://www.agcensus.usda.gov/Publications/2002/Aquaculture/index.asp

USDA NASS. 2009. 2007 Census of Agriculture. U.S. Department of Agriculture, National Agricultural Statistics Service. Available online at: http://www.agcensus.usda.gov/

Wide Area Pest Control

Evans, E.W. and E.W. Hodgdon, 2008. Grasshoppers, Utah Pests Fact Sheet ENT-125-08. Utah State U. Extension and Utah Plant Pest Diagnostic Laboratory, June 2008.

NAAA, 2004. Pesticide use survey report for agricultural aviation. National Agricultural Aviation Association, Washington, DC.

Plant Protection Act, Public Law 106-224 of June 20, 2000, Title IV, as amended by Public Law 108-412, Section 1, Noxious Weed Control and Eradication, October 30, 2004.

Roe, Alan, 2000. Grasshoppers and their control, Fact Sheet No.48. Utah State U. Dept of Biology.

USDA/APHIS. 2002. Rangeland Grasshopper and Mormon Cricket Suppression Program, Final Environmental Impact Statement--2002. Available online at: http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/eis.pdf

Forestry

Baker, J. and S. Bambara, 2001. White pine weevil. North Carolina Cooperative Extension, NC State University, retrieved 3/12/09. Available online at: http://www.ces.ncsu.edu/depts/ent/notes/O&T/trees/note33/note33.html

Christopherson J., (no date). Mountain pine beetle. Nevada Division of Forestry, Forest Health Program, retrieved 3/12/09 at http://www.forestry.nv.gov/main/health_pine.htm

Day, E. and S. Salom, 2003. White pine weevil. Virginia State University, Cooperative Extension. Publication Number 444-270, retrieved 3/12/09. Available online at: http://www.ext.vt.edu/pubs/entomology/444-270/444-270.html

Duddles, R.E. and M. Cloughesy, 2002. Introduction to conifer release. *The Woodland Workbook: Reforestation*, retrieved 3/12/09. Available online at: http://extension.oregonstate.edu/catalog/pdf/ec/ec1388.pdf

Dun and Bradstreet, 2009. Query, retrieved 2/14/09. Available online at: https://pdp.dnb.com/pdpepa/PDPLogin.asp

Fitzgerald. S.A.,1998. Site preparation: an Introduction for the woodland owner. *The Woodland Workbook: Reforestation*, retrieved 3/12/09. Available online at: http://extension.oregonstate.edu/catalog/pdf/ec/ec1188.pdf

Jackson, D., 2007. Herbicides and forest vegetation management: Controlling unwanted trees, brush, and other competing forest vegetation, Penn State College of Agricultural Sciences, Agricultural Research Cooperative Extension, retrieved 3/12/09. Available online at: http://pubs.cas.psu.edu/freepubs/pdfs/UH174.pdf

Kelley, T., 2007. Gypsy moth infestation may kill 17,000 acres of trees in New Jersey. New York Times, July 20, 2007, retrieved 3/12/09. Available online at: http://www.nytimes.com/2007/07/20/nyregion/20gypsy.html?fta=y

Kucera, D. and P. Orr, (no date). Spruce budworm in the Eastern United States, Forest Insect and Disease Leaflet 160. U.S Department of Agriculture, Forest Service. retrieved 3/12/09. Available online at: http://www.na.fs.fed.us/spfo/pubs/fidls/sbw/budworm.htm

Leatherman, D.A., J.W. Brewer, and R.E. Stevens, 2009. Western spruce budworms. Colorado State University, retrieved 3/12/09. Available online at: http://www.ext.colostate.edu/pubs/insect/05543.html

McManus, M, N. Schneeberger, R. Reardon, and G. Mason, (no date). Gypsy moth, Forest Insect and Disease Leaflet 162, U.S. Department of Agriculture, Forest Service, retrieved 3/12/09. Available online at: http://www.na.fs.fed.us/SPFO/pubs/fidls/gypsymoth/gypsy.htm

Michael, J., 2004. Best management practices for silvicultural chemicals and the science behind them. Water, Air, and Pollution: Focus. 4(1), 95-117.

NAAA, 2004. Pesticide use survey report for agricultural aviation. National Agricultural Aviation Association, Washington, DC.

Robbins, J., 2008. Bark beetles kill millions of acres of trees in West. New York Times, November 17, 2008, retrieved 3/12/09. Available online at: http://www.nytimes.com/2008/11/18/science/18trees.html

USDA APHIS, 2008. Gypsy moth program manual. United States Department of Agriculture, Animal and Plant Health Inspection Service, retrieved 3/16/09. Available online at: http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/gypsy_moth.pdf

USDA FS, 2008. The cooperative state-county-landowner gypsy moth suppression program in West Virginia. West Virginia Cooperative Extension Service/United States Department of Agriculture, Forest Service, retrieved 3/12/09. Available online at: http://home.comcast.net/~wvdanewcreek/2008_2009_CSCL_Program_Brochure.pdf

Wickman, B.E., R.R. Mason, and G.C. Trostle. Douglas-fir Tussock moth, Forest Insect and Disease Leaflet 86. U.S. Department of Agriculture, Forest Service, retrieved 3/12/09. Available online at: http://www.na.fs.fed.us/spfo/pubs/fidls/tussock/fidl-tuss.htm