Gypsy Moth Management in the United States: *a cooperative approach*

Draft
Supplemental Environmental Impact Statement

Volume II of IV

Chapters 1-8 and Appendixes A-E

United States Department of Agriculture

Forest Service

Animal and Plant Health Inspection Service

Newtown Square, PA

NA-MR-01-08

June 2008

Contents

Volume II

Chapter 1. Purpose of and Need for Action
Chapter 2. Alternatives Including the Preferred Alternative
Chapter 3. Affected Environment
Chapter 4. Environmental Consequences
Chapter 5. Preparers and Contributors
Chapter 6. Mailing List
Chapter 7. Glossary
Chapter 8. References
Appendix A. Gypsy Moth Treatments and Application Technology
Appendix B. Gypsy Moth Management Program
Appendix C. Public Involvement and Issues
Appendix D. Plant List
Appendix E. Biology, History, and Control Efforts for the Gypsy Moth

Gypsy Moth Management in the United States: a cooperative approach
Draft Supplemental Environmental Impact Statement

The complete Draft Supplemental Environmental Impact Statement, Gypsy Moth Management in the United States: a cooperative approach, consists of four volumes:

Volume I	Summary
Volume II	Chapters 1-8 and Appendixes A, B, C, D, E
Volume III	Appendixes F, G, H, I
Volume IV	Appendixes J, K, L, M

Lead Agency: Forest Service, U.S. Department of Agriculture (USDA)

Responsible Official: James R. Hubbard, Deputy Chief for State and Private Forestry
Sidney R. Yates Federal Building
201 14th Street, SW
Washington, DC 20250

For More Information**:** Bill Oldland, SEIS Team Leader
180 Canfield Street
Morgantown, WV 26505

Joint Lead Agency: Animal and Plant Health Inspection Service (APHIS), USDA

Responsible Official: Richard L. Dunkle, Deputy Administrator for Plant Protection and Quarantine
4700 River Road
Riverdale, MD 20737-1236

For More Information: Weyman P. Fussell, Ph.D., Gypsy Moth Program Coordinator
Emergency and Domestic Programs, APHIS
4700 River Road, Unit 134
Riverdale, MD 20737-1236

Abstract: The USDA Forest Service and Animal and Plant Health Inspection Service are proposing an addition to the gypsy moth management program that was described in the 1995 Environmental Impact Statement--Gypsy Moth Management in the United States: a cooperative approach--and chosen in the 1996 Record of Decision. The agencies are proposing these new treatment options: adding the insecticide tebufenozide, or adding the insecticide tebufenozide and other new treatment(s) that may become available in the future to manage gypsy moths, provided that the other treatment(s) poses no greater risk to human health and nontarget organisms than are disclosed in this Draft SEIS for the currently approved treatments and tebufenozide.

Commenting on this Draft Supplemental Environmental Impact Statement: Reviewers should provide the Forest Service with their comments during the review period of this draft supplemental environmental impact statement. Timely comments will enable the Forest Service to analyze and respond to all of the comments at one time and to use information acquired in the preparation of the final supplemental environmental impact statement, thus avoiding undue delay in the decision making process. Furthermore, the more specific and substantive the comments, the better for reviewers and the agencies alike. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553, 1978). Environmental objections that could have been raised at the draft stage may therefore be forfeited, if not raised until after completion of the final environmental impact statement (Department of Transportation v. Public Citizen, 541 U.S. 752, 764 (2004). Comments on this draft supplemental environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Web Site for Draft SEIS: The Draft SEIS is available for viewing at www.na.fs.fed.us/wv/eis

Send Comments to: Bill Oldland, SEIS Team Leader
USDA Forest Service
180 Canfield Street
Morgantown, WV 26505
304-285-1585

Date Comments Must Be Received: See cover letter for the date that comments are due in Morgantown, WV.

Photo Credits

Figure 1-1. (UGA1398104) USDA Forest Service, Northeastern Area Archives, www.forestryimages.org

Figure 1-2. (UGA1929085) USDA Forest Service Archives, www.forestryimages.org

Figure 1-3. (UGA0488025) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure 1-4. Left (UGA1241014) and Right (UGA1241013) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure 1-5 (UGA3948096) William M. Ciesla, Forest Health Management International, www.forestryimages.org

Figure 2-1. (UGA1275077) USDA Forest Service Archives, www.forestryimages.org

Figure 3-1. (UGA1275033) USDA Forest Service Archives; www.forestryimages.org

Figure 3-3. USDA Agricultural Research Service, www.ars.usda.gov/is/kids/suburb/story2/microscope.htm

Figure 4-1. (UGA1275042) USDA Forest Service Archives, www.forestryimages.org

Figure 5-1. (UGA1275050) USDA Forest Service Archives, www.forestryimages.org

Figure 6-1. (UGA1275044) USDA Forest Service Archives, www.forestryimages.org

Figure 7-1. (UGA1275010) USDA Forest Service Archives, www.forestryimages.org

Figure 8-1. (UGA1275053) USDA Forest Service Archives, www.forestryimages.org

Figure A-1. (UGA1275013) USDA Forest Service Archives, www.forestryimages.org

Figure A-2. Derek Handley

Figure A-3. (UGA1301021) Joseph O'Brien, USDA Forest Service, www.forestryimages.org

Figure A-4. (UGA2652048) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure A-5. (UGA2652042) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure A-6. (UGA1335028) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure A-7. (UGA2253091) Bill Antrobius, USDA Forest Service, www.forestryimages.org

Figure A-8. (UGA5022085) Pennsylvania Department of Conservation and Natural Resources Forestry Archives, www.insectimages.org

Figure B-1. (UGA1275058) USDA Forest Service Archives, www.forestryimages.org

Figure C-1. (UGA1275037) USDA Forest Service Archives, www.forestryimages.org

Figure D-1. (UGA1275020) USDA Forest Service Archives, www.forestryimages.org

Figure E-1. (UGA1275016) USDA Forest Service Archives, www.forestryimages.org

Figure E-3. (UGA1929072) USDA Forest Service Archives, www.insectimages.org

Figure E-4. (UGA0886002) Tim Tigner, Virginia Department of Forestry, www.insectimages.org

Figure E-5. (UGA2652066) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure E-6. (UGA2652079) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Chapter 1
Purpose of and Need for Action

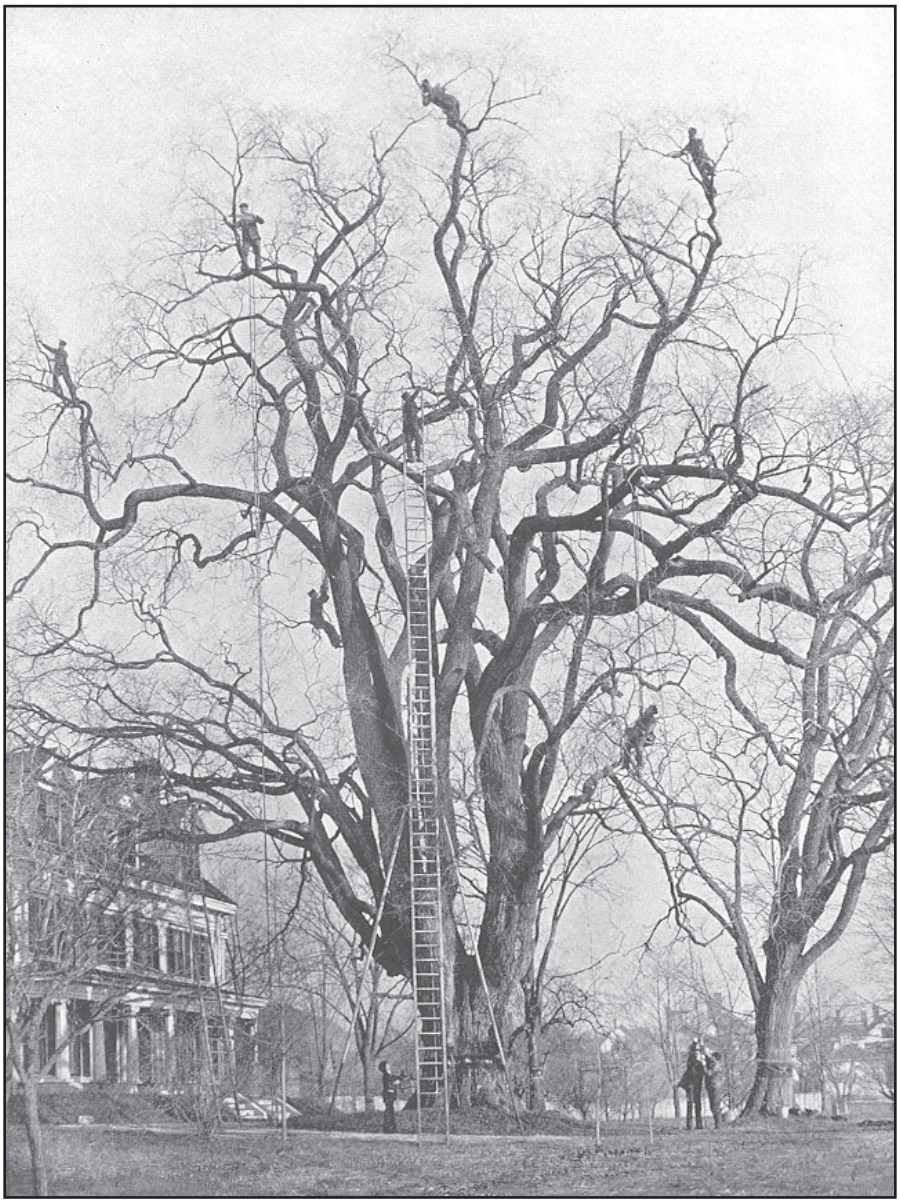

Figure 1-1. In 1892, workers attempted to control gypsy moth by hand picking egg masses.

Chapter 1 Purpose of and Need for Action

Contents

1.1 Proposed Action....1
1.2 Public Involvement and Issues....1
1.3 Background....2
1.4 Purpose of and Need for Action....3
1.5 Decision Framework....4
1.6 Scope of This Document and NEPA Requirements....5
1.7 Consultations....6

Figures and Tables

Figure 1-1. In 1892, workers attempted to control gypsy moths by hand picking egg masses....Cover

Figure 1-2. Feeding by gypsy moth caterpillars (larvae) causes defoliation....2

Figure 1-3. European gypsy moths (male on left and female on right) are found in the United States....2

Figure 1-4. This Asian gypsy moth male (left) and female (right) are from Mongolia. As of this writing, the Asian gypsy moth is not found in the United States....3

Figure 1-5. People unknowingly spread gypsy moths by moving objects on which egg masses were deposited....3

Figure 1-6. In 2006, the European gypsy moth was established in all or part of 19 states and the District of Columbia....4

Table 1-1. Acres treated in suppression projects, by treatment, 2002-2006....5

Table 1-2. Acres treated in eradication projects, by treatment, 2002-2006....5

Table 1-3. Acres treated in slow-the-spread projects by treatment, 2002-2006....5

The management of gypsy moth in the United States takes an integrated pest management approach to protecting the forests and trees of the United States from the adverse effects caused by the gypsy moth. This chapter gives brief background on the gypsy moth and the current gypsy moth management program. The chapter also states the proposed changes, rationale, and related issues. It explains the purpose of this draft supplemental environmental impact statement (SEIS) and how it is to be used.

1.1 Proposed Action.

The United States Department of Agriculture (USDA) is responsible for management activities related to the gypsy moth (*Lymantria dispar* Linnaeus [L.]), for the Federal government. Two USDA agencies, the Forest Service and the Animal and Plant Health Inspection Service (APHIS) share this responsibility. Agency authorities are found in these USDA Delegations of Authority: 7 Code of Federal Regulations (CFR) 2.60(a)(38) by the Under Secretary for Natural Resources and Environment, for the Forest Service; and 7 CFR 2.80(a)(36) by the Under Secretary for Marketing and Regulatory Programs, for APHIS.

The Forest Service and APHIS are proposing an addition to the gypsy moth management program described in the 1995 Environmental Impact Statement (EIS) and chosen in the 1996 Record of Decision (USDA 1995, 1996). The agencies are proposing to add new treatment options: the insecticide tebufenozide and the option of adding other treatments that may become available in the future to manage gypsy moths, provided such treatments pose no greater risks to human health and nontarget organisms than are disclosed in this draft SEIS for currently approved treatments and tebufenozide.

This draft SEIS discloses the method of use, effectiveness, and effects of tebufenozide, and outlines the protocol that would be followed in order to add other treatments. Appendix A provides detailed information about the use and effectiveness of tebufenozide and other treatments that are effective for eradicating, suppressing, or slowing the spread of the gypsy moth as represented in this draft SEIS. Information about treatments and natural control agents that are not used in the USDA gypsy moth management program is also presented in Appendix A for the benefit of the reader. Appendix B provides an overview of the USDA gypsy moth management program. This draft SEIS also updates effects of currently approved treatments and of the gypsy moth, with new information that has become available since the 1995 EIS, and about the slow-the-spread strategy which is now an operational component of the USDA gypsy moth management program.

1.2 Public Involvement and Issues.

On April 29, 2004, the Forest Service and APHIS published a Notice of Intent (NOI) to Prepare a Supplement to the Final EIS for Gypsy Moth Management in the United States: a Cooperative Approach (69 Federal Register (FR) 23492-93, April 29, 2004). The public was invited to comment on the proposed supplement. Fourteen comment letters were received from the public on the SEIS. Other NOIs were published on March 13, 2006 (71 FR 12674-75) and on February 7, 2007 (72 FR 5675), revising the dates for filing the draft and final SEIS.

The interdisciplinary team preparing this draft SEIS, joined by public affairs specialists and forest pest managers throughout the Forest Service and APHIS (listed in Chapter 5) actively sought public involvement. Two issues were derived from the scoping effort: Issue 1—risk to human health, and Issue 2—risk to nontarget organisms. These issues are described in Chapters 3 and 4 of this SEIS. See Appendix C for details of scoping efforts.

1.3 Background.

The gypsy moth is a significant nonnative forest pest in the United States. The gypsy moth caterpillar—one of four distinct developmental stages (*Figure 1-2*)—alters ecosystems and disrupts people's lives as it feeds on the foliage of trees, shrubs, and other plants. Excessive feeding causes defoliation, which weakens trees (increasing their vulnerability to other insects and diseases that may kill them), alters wildlife habitat, changes water quality, reduces property and aesthetic values of public and private woodlands, and reduces the recreation value of forested areas. When present in large numbers, gypsy moth caterpillars can pose a nuisance, as well as a hazard to health and safety. Effects due to the gypsy moth are described in Chapter 4.

At least 587 million acres (238 million hectares) of trees susceptible to gypsy moth feeding (Appendix D), are at risk in the United States (Powell and others 1993). Also at risk are countless urban and rural forested areas throughout the country where susceptible plants grow naturally or are planted.

Although both European and Asian strains exist, only the European strain is currently present in the United States (*Figure 1-3*). The European gypsy moth was brought to the United States and accidentally released in eastern Massachusetts around 1869. Since then, it has continued to spread into uninfested areas. The Asian strain occasionally has been found in this country, but it has been eliminated whenever it has been found (*Figure 1-4*). Unlike European female gypsy moths, which cannot fly, the Asian moth poses a greater risk of spread because females can fly and deposit egg masses miles from where they fed as caterpillars (*Figure 1-5)*.

Despite many early attempts to halt its spread, by 2006 the European gypsy moth became established in the District of Columbia and in all or parts of the following States: Connecticut, Delaware, Illinois, Indiana,

Figure 1-2. Feeding by gypsy moth caterpillars (larvae) causes defoliation.

Figure 1-3. European gypsy moths (male on left, female on right) are found in the United States.

Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, and Wisconsin (*Figure 1-6)*. Spread continues into uninfested areas because of natural and artificial movement.

The gypsy moth continues to be a problem as it spreads. Historical documentation over the last 100 years reveals gypsy moth outbreaks cause widespread defoliation, tree mortality, environmental and public health risks, and public outcry to control the outbreaks (Williams and Liebhold, 1995a). For more information about the biology, history, and control efforts for the gypsy moth, see Appendix E.

Figure 1-4. This Asian gypsy moth male (left) and female (right) are from Mongolia. As of this writing, the Asian gypsy moth is not found in the United States.

Figure 1-5. People unknowingly spread gypsy moths by moving objects on which egg masses were deposited.

1.4 Purpose of and Need for Action.

In this draft SEIS the Forest Service and APHIS propose to add additional treatments for use in the gypsy moth management program. The proposed treatments are new and were not available when the 1995 EIS was written. Additional treatments would provide gypsy moth managers with more flexibility in conducting suppression, eradication, and slow-the-spread projects. Making new treatments available is also expected to improve the gypsy moth management program, because each new treatment developed over the last 30 years has proven safer to human health and the environment, more cost efficient, easier to apply, and often more effective than older treatments.

This draft SEIS also presents new information about currently used treatments. It…

- Introduces hazard quotients for nontarget organisms
- Reinforces that the gypsy moth poses a significant risk hazard to both human health and forest condition
- Confirms that spring feeding nontarget caterpillars are more at risk from *B.t.k.* applications than are caterpillars that come out later in the year
- Determines that disparlure formulations used for mating disruption are of low toxicity to daphnids
- Makes available additional epidemiological studies for human health effects associated with *B.t.k.*
- Provides data showing that slow the spread is very effective in slowing the natural and artificial spread of the gypsy moth

Figure 1-6. In 2006, the European gypsy moth was established in all or part of 19 states and the District of Columbia (shaded in dark grey).

1.5 Decision Framework.

The 1995 EIS analyzed six alternatives for managing gypsy moth infestations (USDA 1995). With the 1996 Record of Decision (USDA 1996), the agencies selected an integrated pest management (IPM) approach comprised of suppression, eradication, and slow-the-spread strategies to manage the gypsy moth in the United States. The adopted alternative also provides delivery of technical advice and support to State, Tribal, and Federal cooperators by the Forest Service and APHIS. The USDA has carried out its gypsy moth responsibilities under that Record of Decision since 1996.

The 1996 decision provides for the use of several insecticides and other treatments in suppression (*Table 1-1*), eradication (*Table 1-2*), and slow-the-spread projects (*Table 1-3*). These include *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*), the insect growth regulator diflubenzuron, the gypsy moth nucleopolyhedrosis virus product Gypchek, a pheromone attractant disparlure used in mating disruption and mass trapping, the killing agent dichlorvos used in large-capacity pheromone traps, and the sterile insect technique. Human health and ecological risk assessments (HHERA) were prepared for each of these insecticides and for the proposed insecticide tebufenozide, and can be found in Appendixes F-K of this SEIS.

Table 1-1. Acres treated in suppression projects, by treatment, 2002-2006.

Year	*B.t.k.*	Diflubenzuron	Gypchek	Total
2002	149,772	131,601	4,794	286,167
2003	67,895	25,124	10,015	103,034
2004	73,493	0	6,078	79,571
2005	7,292	0	0	7,292
2006	145,053	18,000	602	163,655
Total	443,505	174,725	21,489	639,719

Table 1-2. Acres treated in eradication projects, by treatment, 2002-2006.

Year	*B.t.k.*	Gypchek	Mating Disruption	Total
2002	9,961	0	650	10,611
2003	16,540	0	0	16,540
2004	10,855	0	250	11,105
2005	36,778	0	0	36,778
2006	19,960	0	0	19,960
Total	94,094	0	900	94,994

Table 1-3. Acres treated in slow-the-spread projects, by treatment, 2002-2006.

Year	*B.t.k.*	Gyp-chek	Difluben-zuron	Mating Disruption	Total
2002	28,705	0	3,938	542,600	575,243
2003	70,470	6,819	0	647,618	720,907
2004	131,282	8,230	0	588,256	727,728
2005	108,611	17,075	790	287,890	414,366
2006	95,860	7,003	12,292	426,138	541,293
Total	434,928	39,127	17,020	2,488,502	2,979,577

Like the 1996 Record of Decision, the decision to be made will be programmatic. No site-specific suppression, eradication, or slow-the-spread projects will be implemented as a direct result of the decision that will follow this SEIS. The decision to implement any treatment project will be made after site-specific environmental analyses are conducted and documented in accordance with agency NEPA implementing procedures. Analyses will address unique local issues, beyond the scope of this document, for site-specific management projects for the gypsy moth. Site-specific environmental analyses are more detailed and precise as to geographical locations, individual treatments to be used, and timing of treatments.

The decision on this draft SEIS will serve as the primary guide for management of the gypsy moth on Forest Service lands; treatments and strategies allowed by the 1996 decision will continue to be available for use. The USDA is not reconsidering the suppression, eradication, and slow-the-spread strategies, or the treatments made available by the 1996 Record of Decision. The decision whether to plan and implement a gypsy moth project on National Forest System lands rests with the responsible official in that particular forest.

1.6 Scope of This Document and NEPA Requirements.

This SEIS concerns only the USDA gypsy moth management program carried out by the Forest Service or APHIS, directly or in conjunction with others (States, other Federal agencies, and Tribal governments). Actions of other Federal or local agencies or private citizens to manage the gypsy moth on their own, are not affected or in any way constrained by the USDA program. Such actions are affected or constrained only by applicable Federal and State laws, local ordinances, insecticide label instructions, and any self-imposed constraints.

The information and analysis contained in this SEIS can be incorporated by reference, into environmental documents prepared for proposed gypsy moth management projects, in accordance with the National Environmental Policy Act (NEPA) (42 United States Code (U.S.C.) 4332) and agency NEPA procedures. Future environmental documentation for specific projects would tier to the final SEIS and to the 1995 EIS (40 CFR 1508.28). Proposed treatment projects will be evaluated on an individual basis to determine if they are biologically sound, environmentally acceptable, and economically efficient.

Some gypsy moth related activities, such as treatment of regulated articles infested with gypsy moths, the boarding and inspection of ships entering U.S. seaports, and research and methods-development activities, are outside the scope of this document and were not examined. More information about these activities can be found in Appendix B.

1.7 Consultations.

As they had done on the 1995 EIS, the Forest Service and APHIS will informally consult on the proposed action (Alternative 3) under the Endangered Species Act. In addition, the Forest Service and APHIS will ensure that site-specific consultations will be done as necessary at the project level under the Endangered Species Act, the National Historic Preservation Act, and any other laws, regulations, executive orders, and agency policies that apply to site-specific projects.

Abstract: The USDA Forest Service and Animal and Plant Health Inspection Service are proposing an addition to the gypsy moth management program that was described in the 1995 Environmental Impact Statement--Gypsy Moth Management in the United States: a cooperative approach--and chosen in the 1996 Record of Decision. The agencies are proposing these new treatment options: adding the insecticide tebufenozide, or adding the insecticide tebufenozide and other new treatment(s) that may become available in the future to manage gypsy moths, provided that the other treatment(s) poses no greater risk to human health and nontarget organisms than are disclosed in this Draft SEIS for the currently approved treatments and tebufenozide.

Commenting on this Draft Supplemental Environmental Impact Statement: Reviewers should provide the Forest Service with their comments during the review period of this draft supplemental environmental impact statement. Timely comments will enable the Forest Service to analyze and respond to all of the comments at one time and to use information acquired in the preparation of the final supplemental environmental impact statement, thus avoiding undue delay in the decision making process. Furthermore, the more specific and substantive the comments, the better for reviewers and the agencies alike. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553, 1978). Environmental objections that could have been raised at the draft stage may therefore be forfeited, if not raised until after completion of the final environmental impact statement (Department of Transportation v. Public Citizen, 541 U.S. 752, 764 (2004). Comments on this draft supplemental environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Web Site for Draft SEIS: The Draft SEIS is available for viewing at www.na.fs.fed.us/wv/eis

Send Comments to: Bill Oldland, SEIS Team Leader
USDA Forest Service
180 Canfield Street
Morgantown, WV 26505
304-285-1585

Date Comments Must Be Received: See cover letter for the date that comments are due in Morgantown, WV.

Photo Credits

Figure 1-1. (UGA1398104) USDA Forest Service, Northeastern Area Archives, www.forestryimages.org

Figure 1-2. (UGA1929085) USDA Forest Service Archives, www.forestryimages.org

Figure 1-3. (UGA0488025) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure 1-4. Left (UGA1241014) and Right (UGA1241013) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure 1-5 (UGA3948096) William M. Ciesla, Forest Health Management International, www.forestryimages.org

Figure 2-1. (UGA1275077) USDA Forest Service Archives, www.forestryimages.org

Figure 3-1. (UGA1275033) USDA Forest Service Archives; www.forestryimages.org

Figure 3-3. USDA Agricultural Research Service, www.ars.usda.gov/is/kids/suburb/story2/microscope.htm

Figure 4-1. (UGA1275042) USDA Forest Service Archives, www.forestryimages.org

Figure 5-1. (UGA1275050) USDA Forest Service Archives, www.forestryimages.org

Figure 6-1. (UGA1275044) USDA Forest Service Archives, www.forestryimages.org

Figure 7-1. (UGA1275010) USDA Forest Service Archives, www.forestryimages.org

Figure 8-1. (UGA1275053) USDA Forest Service Archives, www.forestryimages.org

Figure A-1. (UGA1275013) USDA Forest Service Archives, www.forestryimages.org

Figure A-2. Derek Handley

Figure A-3. (UGA1301021) Joseph O'Brien, USDA Forest Service, www.forestryimages.org

Figure A-4. (UGA2652048) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure A-5. (UGA2652042) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure A-6. (UGA1335028) John H. Ghent, USDA Forest Service, www.forestryimages.org

Figure A-7. (UGA2253091) Bill Antrobius, USDA Forest Service, www.forestryimages.org

Figure A-8. (UGA5022085) Pennsylvania Department of Conservation and Natural Resources Forestry Archives, www.insectimages.org

Figure B-1. (UGA1275058) USDA Forest Service Archives, www.forestryimages.org

Figure C-1. (UGA1275037) USDA Forest Service Archives, www.forestryimages.org

Figure D-1. (UGA1275020) USDA Forest Service Archives, www.forestryimages.org

Figure E-1. (UGA1275016) USDA Forest Service Archives, www.forestryimages.org

Figure E-3. (UGA1929072) USDA Forest Service Archives, www.insectimages.org

Figure E-4. (UGA0886002) Tim Tigner, Virginia Department of Forestry, www.insectimages.org

Figure E-5. (UGA2652066) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Figure E-6. (UGA2652079) USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine Archives, www.forestryimages.org

Chapter 2
Alternatives Including the Preferred Alternative

Figure 2-1. Early spray operations for gypsy moths used horse-drawn equipment.

Chapter 2 Alternatives Including the Preferred Alternative

Contents

2.1 Background 1
2.2 Alternative Chosen From the 1995 Gypsy Moth EIS 1
2.3 Alternatives in This SEIS 1
Alternative 1—No Action 2
Alternative 2—Add Tebufenozide 2
Alternative 3—Add Tebufenozide, and Add Other New Treatments Through the Application of the Protocol (Preferred Alternative) 2
2.4 Evaluation and Comparison of Alternatives 3
2.5 Mitigation Measures 4
Human Health 4
Nontarget Organisms 4
Mitigation Efficacy 5

Figures and Tables

Figure 2-1. Early spray operations for gypsy moths used horse-drawn equipment ..... Cover

Table 2-1. Treatments that have been approved for use in gypsy moth projects since the 1995 gypsy moth EIS 2

Table 2-2. Treatments available under each alternative in this SEIS 3

Table 2-3. Effects of treatments approved and proposed for use, by alternatives and identified issues 6

This chapter defines the three alternatives that are being considered. It compares the alternatives based on their ability to provide flexibility for managing gypsy moth populations and their relation to the identified issues. The preferred alternative is identified. This chapter also describes mitigation measures that can be used to protect human health and nontarget organisms.

2.1 Background.

The gypsy moth is destructive to vegetative resources, and the human health and environmental effects from exposure to the pest are substantial (Chapter 4 and Appendix L). The strategies of suppression, eradication, and slow the spread and the currently approved treatments (*Table 2-1*) have proven successful in reducing damage caused by gypsy moth outbreaks in the generally infested area, eliminating new isolated infestations of the gypsy moth introduced outside the generally infested area, and slowing the short-range natural and artificial spread of this insect. For a description of the strategies, see Section B-5 in Appendix B.

These strategies form the basis for the alternatives that were considered in the 1995 Environmental Impact statement (EIS) and for the alternatives in this draft supplemental EIS (SEIS).

2.2 Alternative Chosen From the 1995 Gypsy Moth EIS.

A program consisting of the strategies of suppression, eradication, and slow the spread--the preferred alternative in the 1995 EIS--was chosen in the 1996 Record of Decision. The following insecticide and noninsecticide treatments were approved for use in the strategies:

- *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) (a microbial insecticide)
- Diflubenzuron (an insect growth regulator)
- Gypchek (gypsy moth nucleopolyhedrosis virus product)
- Mass trapping (using traps baited with the gypsy moth attracting pheromone disparlure and sometimes containing the killing agent dichlorvos)
- Mating disruption (aerially dispensed medium impregnated with the gypsy moth attractant disparlure)
- Sterile insect technique (release of sterile or partly sterile gypsy moth pupae or eggs)

Table 2-1 shows which treatments may be used in each strategy.

This alternative was adopted because it fully met the USDA goal of reducing the adverse effects of the gypsy moth on the Nation's forests and trees. The alternative addresses the major issues associated with the gypsy moth and treatments while incorporating flexible options for managing ecosystems affected by the gypsy moth. The issues influencing the discussion in the 1995 Gypsy Moth EIS focused on the effects of the gypsy moth and gypsy moth treatments on human health, nontarget organisms, and forest conditions.

2.3 Alternatives in This SEIS.

Like the 1996 Record of Decision, the decision to be made as a result of this SEIS will be programmatic. No site-specific suppression, eradication, or slow-the-spread projects will be implemented as a direct result of the decision on this SEIS. The decision to implement any treatment project will be made after site-specific environmental analyses are conducted and documented in accordance with agency NEPA implementing procedures.

The following three alternatives were identified during scoping for the draft SEIS:

Alternative 1—No action

Alternative 2—Add tebufenozide

Alternative 3—Add tebufenozide, and add other new treatments through the application of the protocol **(preferred alternative).**

Table 2-1. Treatments that have been approved for use in gypsy moth projects since the 1995 gypsy moth EIS.

Strategy	B.t.k.	Diflubenzuron	Gypchek	Mass Trapping (Dichlorvos plus disparlure)	Mating Disruption (Disparlure)	Sterile Insect Technique
Suppression	●	●	●			
Eradication	●	●	●	●	●	●
Slow the Spread	●	●	●	●	●	●

Alternative 1—No Action.

Alternative 1 is the same as the alternative selected in the 1996 Record of Decision. It is the current gypsy moth management program of suppression, eradication, and slow the spread, using currently approved treatments. Alternative 1 would make no change to the 1996 Record of Decision, and it would add no treatment options to those approved by that decision.

Alternative 2—Add Tebufenozide.

Alternative 2 would add the insecticide tebufenozide to currently approved treatments. Information on the use and effectiveness of tebufenozide is provided in Appendix A. The human health and ecological risk assessments for tebufenozide are in Appendix J.

Alternative 3—Add Tebufenozide, and Add Other New Treatments Through the Application of the Protocol (Preferred Alternative).

Alternative 3 would add the insecticide tebufenozide and add other treatment(s) that may become available in the future for managing gypsy moths, to currently approved treatments. A new treatment would be available for use upon the agencies' finding that the treatment poses no greater risks to human health and nontarget organisms than are disclosed in this draft SEIS for the currently approved treatments and tebufenozide.

The protocol for making the necessary finding that a treatment is authorized by this Alternative is as follows:

1. Conduct a human health and ecological risk assessment (HHERA). In this risk assessment review all scientific studies available for toxicological and environmental fate information relevant to effects on human health and nontarget organisms. Use this information to estimate risk to human health and nontarget organisms. Include these four elements in the HHERA: (a) hazard evaluation, (b) exposure assessment, (c) dose-response assessment, and (d) risk characterization. The HHERA will do the following:

- Identify potential use patterns, including formulation, application methods, application rate, and anticipated frequency of application.
- Review chemical hazards relevant to the human health risk assessment, including systemic and reproductive effects, skin and eye irritation, dermal absorption, allergic hypersensitivity, carcinogenicity, neurotoxicity, immunotoxicity, and endocrine disruption.
- Estimate exposure of workers applying the chemical.
- Estimate exposure of members of the public.
- Characterize environmental fate and transport, including drift, leaching to groundwater, and runoff to surface streams and ponds.
- Review available ecotoxicity data including

hazards to mammals, birds, reptiles, amphibians, fish, and aquatic invertebrates.

- Estimate exposure of terrestrial and aquatic wildlife species.
- Characterize risk to human health and wildlife.

2. Conduct a risk comparison of the human health and ecological risks of a new treatment with the risks identified for the currently authorized treatments and tebufenozide. This risk comparison will evaluate quantitative expressions of risk (such as hazard quotients) and qualitative expressions of risk that put the overall risk characterizations into perspective. Qualitative factors include scope, severity, and intensity of potential effects, as well as temporal relationships such as reversibility and recovery.

3. If the risks posed by a new treatment fall within or below the range of risks posed by the currently approved treatments and tebufenozide, publish a notice in the Federal Register of the agencies' preliminary findings that the treatment meets the requirements of Alternative 3. The notice must provide a 30-day review and comment period and must advise the public that the HHERA and the risk comparison are available upon request.

4. If consideration of public comment leads to the conclusion that the preliminary finding is correct, publish a notice in the Federal Register that the treatment meets the requirements of Alternative 3 and, therefore, is authorized by that Alternative for use in the USDA gypsy moth management program. The Forest Service and APHIS will make available to anyone, upon request, a copy of the comments received and the agencies' responses.

Like the 1996 Record of Decision, the decision to be made as a result of this draft SEIS will be programmatic. Decisions to use specific treatments in projects, including new treatments authorized under the protocol in Alternative 3, will be made after site-specific environmental analyses are conducted and documented in accordance with agency NEPA implementing procedures.

2.4 Evaluation and Comparison of Alternatives.

Different treatments could be used under the different alternatives, as shown in *Table 2-2*. The more treatments that are available, the more flexibility the program manager has in choosing the right treatment for a given set of specific conditions and the greater likelihood of meeting the project objectives. The Alternatives provide increasing flexibility from Alternative 1 to Alternative 3. With the addition of tebufenozide and other treatments that may become available, Alternative 3—the preferred alternative—would provide the program manager the greatest flexibility. This flexibility for Alternative 3 includes reducing the cost, streamlining the process, and greater efficiency in adding new treatments for gypsy moth management. Cost, availability, efficacy, and site-specific environmental effects are examples of considerations regarding which treatment to use for a specific project.

The effects of the different treatments are summarized by the issues in *Table 2-3*.

Table 2-2. Treatments available under each alternative in this SEIS

Alternative	Currently approved treatments*	Tebufenozide	Other treatments that may become available
1	●		
2	●	●	
3	●	●	●

*Currently approved treatments:
Bacillus thuringiensis var. *kurstaki*
Diflubenzuron
Mass trapping (dichlorvos and disparlure)
Mating disruption (disparlure)
Gypchek
Sterile insect technique

2.5 Mitigation Measures.

Given the variety of places and circumstances where gypsy moth projects could be implemented, it will be necessary to develop and implement specific mitigation measures for each project. Mitigation measures will be developed and implemented on a site-specific basis for each project based on local conditions and concerns.

The site-specific mitigation measures developed and employed in gypsy moth projects since the 1996 Record of Decision have shown to be effective in addressing human health and safety concerns, adverse effects on nontarget organisms and potential impacts on economic resources such as organic farms. At the same time the objectives of gypsy moth projects have been met. Site-specific mitigation measures will continue to be developed and implemented. The following are examples of project level mitigation measures that have been employed in the past and could be implemented for future projects.

Human Health.

- Ensure workers handling insecticides wear appropriate personal protective gear and protective clothing.
- Prepare a project safety plan, disseminate it to project workers, and conduct safety briefings.
- Ensure workers handling dichlorvos insecticide strips wear gloves and assemble the gypsy moth traps outdoors, preferably at the trap site, and transport traps and trapping supplies in an air-tight plastic bag.
- Use gypsy moth traps that do not contain dichlorvos, when possible, in residential areas.
- Encourage public involvement to identify human health issues, including concerns of people sensitive to insecticides. Public notification is an important part of the program, enabling those living in treatment areas to plan their activities and avoid exposure.
- Consider social and cultural factors. Take steps to ensure all groups of the affected population understand the project and are invited to provide input during project development, such as the distribution of information pamphlets in languages relevant to the affected population.
- Give notice to hospitals, schools, public health facilities and local law-enforcement agencies of treatments, the types of insecticides used and risks to humans.
- Give notice of pesticide treatment projects to organizations, groups and agencies that consist of, or work with, people who are chemically sensitive.
- Give notice to the public when treatments are scheduled, including the insecticides planned for use, potential health effects and other characteristics of the project, such as the use of low-flying aircraft.
- Give notice of treatments to people living in the project area sufficiently in advance to allow them to plan their activities and avoid exposure.
- Establish safety and protection measures for workers known to be sensitive to insecticides.
- Establish buffer zones as needed (for example, tebufenozide would not be sprayed over water or areas where surface water is present, and buffers will be maintained around these areas). Certain actions like using the latest advances in application technology as outlined in section A.5 of Appendix A would minimize the risk of insecticides drifting into bodies of water or sites such as organic farms.
- Mix, load, and unload insecticides in areas where an accidental spill will not enter and contaminate bodies of water.

Nontarget Organisms.

- Use public involvement to identify any site-specific issues with potential for effects on nontarget organisms (including threatened and endangered species), and to design appropriate means to mitigate these effects.
- Select treatments taking into consideration maximum project efficiency, potential effects on nontarget organisms (including threatened and endangered species), and the potential for these organisms to recolonize areas if they are displaced or die after treatment.

- Establish buffer zones where necessary to minimize or eliminate insecticide drift to areas of special concern, such as wilderness areas or sensitive species habitats (for example, tebufenozide would not be sprayed over water or areas where surface water is present, and buffers will be maintained around these areas).
- Review maps and conduct ground inspections or other actions as part of the site-specific analysis to identify small brooks, wetlands, estuarine waters, areas where threatened and endangered species are found, bat caves and other roosts or other sensitive areas, and to determine actions needed to minimize adverse outcomes.
- Mix, load, and unload insecticides in areas where an accidental spill will not enter and contaminate bodies of water.

Mitigation Efficacy.

The mitigation measures developed and employed in site-specific gypsy moth projects have proven to be effective in protecting human health and non-target organisms. At the same time, the objectives of gypsy moth suppression, eradication, and slow-the-spread projects have been successfully met since 1996.

Table 2-3. Effects of treatments approved and proposed for use, by alternatives and identified issues. (Unless otherwise noted, the effects are based on the maximum registered usage rate allowed by the insecticide label.)

Treatments and alternatives	**Issue 1.** **Risk to Human Health**	**Issue 2.** **Risk to Nontarget Organisms**
B.t.k. **Alternatives 1, 2, 3** **See Appendix F for Human Health and Ecological Risk Assessment (HHERA)**	May irritate the eyes, skin, and respiratory tract. Reduces human health effects caused by gypsy moth hairs.	May reduce populations of some spring feeding caterpillars. Reduces effects of gypsy moths on nontarget organisms.
Diflubenzuron **Alternatives 1, 2, 3** **See Appendix I for HHERA**	May slightly increase methemoglobin in sensitive individuals. Reduces human health effects caused by gypsy moth hairs.	Potentially affects arthropod species that produce chitin (hard exoskeleton) and are immature at time of treatment. Can temporarily increase algae due to reduction of algae-feeding aquatic invertebrates. (This has not been observed in the field.) Reduces effects of gypsy moths on nontarget organisms.
Gypchek **Alternatives 1, 2, 3** **See Appendix G for HHERA**	Not likely to affect human health. Reduces human health effects caused by gypsy moth hairs.	Has no effect on nontarget organisms. Reduces effects of gypsy moths on nontarget organisms.
Dichlorvos plus disparlure (Mass Trapping) **Alternatives 1, 2, 3** **See Appendixes H and K for HHERA**	Used in intact traps, not likely to affect human health. Could impair the nervous system if someone disassembles a milk carton trap and tampers with the dichlorvos-impregnated strip, resulting in skin contact or ingestion.	Not likely to affect nontarget organisms.

(continued)

Table 2-3 (continued).

Treatments and alternatives	**Issue 1.** **Risk to Human Health**	**Issue 2.** **Risk to Nontarget Organisms**
Disparlure (Mating Disruption) **Alternatives 1, 2, 3** **See Appendix H for HHERA**	Not likely to affect human health.	Has no effect on nontarget organisms.
Sterile Insect Technique **Alternatives 1, 2, 3**	Has no effect on human health	Has no effect on nontarget organisms.
Tebufenozide **Alternatives 2, 3** **See Appendix J for HHERA**	May slightly increase methemoglobin in sensitive individuals. Reduces human health effects caused by gypsy moth hairs.	May affect some Lepidoptera species. Reduces effects of gypsy moths on nontarget organisms.
Other treatment **Alternative 3**	Has effects no more severe than those described in this SEIS for currently approved treatments and tebufenozide. Reduces human health effects caused by gypsy moth hairs.	Has effects no more severe than those described in this SEIS for currently approved treatments and tebufenozide Reduces effects of gypsy moths on nontarget organisms.

Chapter 3
Affected Environment

Figure 3-1. Undated historical image of workers involved in a gypsy moth management program.

Chapter 3 Affected Environment

Contents

3.1 General Affected Environment....1
3.2 Affected Forest....1
Affected Plants....1
Affected Areas....2
Uninhabited Forest....2
Forest Recreation Areas....3
Forest Residential Areas....3
Developed Areas....3
Forest Condition....3
Water Quality....3
Microclimate....3
Soil....3
3.3 Affected Human Populations....4
3.4 Affected Nontarget Organisms....4
General....4
Threatened and Endangered Species....5

Figures and Tables

Figure 3-1. Undated historical image of workers involved in a gypsy moth management program....Cover

Figure 3-2. Forest stands with 20 percent basal area or more of gypsy moth host trees are at the greatest risk of defoliation....1

Figure 3-3. Gypsy moth hairs can cause irritation....4

Table 3-1. Top 20 tree species in the United States preferred by gypsy moths, ranked by total basal area (BA)....2

This chapter describes the environment that is or could be affected by the gypsy moth and the USDA gypsy moth management program.

3.1 General Affected Environment.

Because this is a programmatic document, the description of the affected environment contained in this chapter is, by necessity, general. The potentially affected environment in the United States is anywhere vegetation susceptible to gypsy moth feeding is found. Given the known worldwide distribution of the gypsy moth, it is probably capable of surviving anywhere in the United States where suitable host plants are available (McFadden and McManus 1991).

3.2 Affected Forest.

Affected Plants.

Field and laboratory studies of numerous tree species enabled determination of the gypsy moth's feeding preferences (Liebhold and others 1995; and see Appendix D for a list of susceptible plants). Forest trees grow either in pure stands comprised of a single species or in mixed stands as an aggregation of different species. Plant species composition is an important factor in determining the degree of susceptibility of a forest to the gypsy moth (McFadden and McManus 1991). Other factors include total density (basal area per acre) of preferred tree species and proportion of area covered by susceptible stands (*Figure 3-2*). Stands with basal area of preferred species greater than 20 percent are particularly at risk (Liebhold and others 1997).

Table 3-1 lists the total basal area of the 20 most common and important gypsy moth hosts in the United States. The more hardwoods, particularly oaks, in a forest, the more vulnerable it is to the gypsy moth. Higher numbers of susceptible species result in increased intensity, duration, and frequency of defoliation episodes (Davidson and others 1999).

The Forest Service classifies forested areas by combining forest cover types into "forest type groups" for inventory, mapping, and other purposes. Although forest cover types are based on and named after the

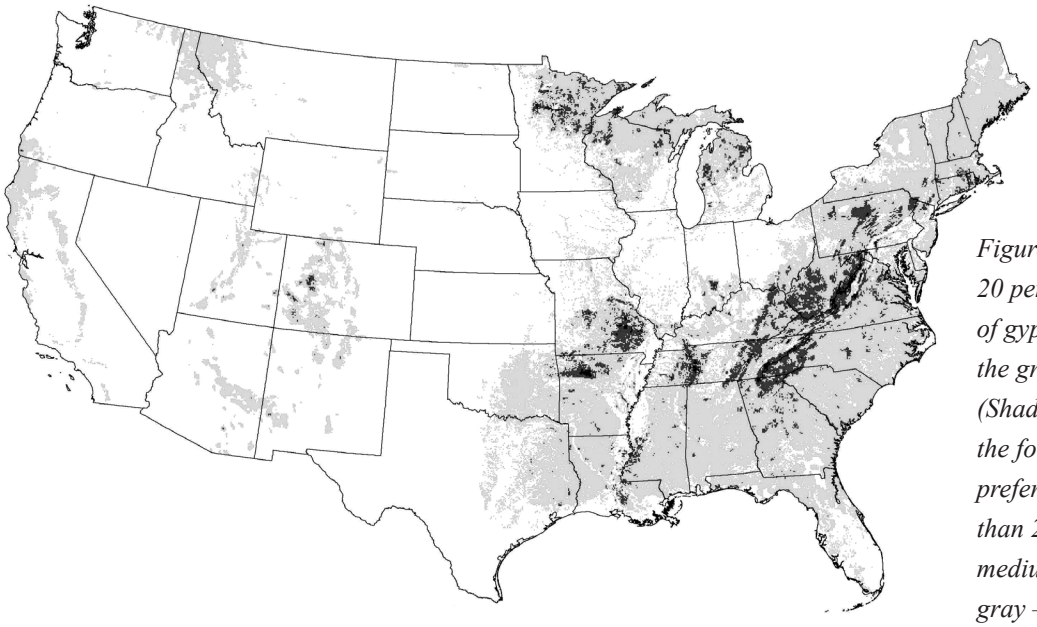

Figure 3-2. Forest stands with 20 percent basal area or more of gypsy moth host trees are at the greatest risk of defoliation. (Shading on the map represents the following basal areas of preferred hosts: white – less than 2%; light gray – 2-20%; medium gray – 21-39%; dark gray – 40-79%)

tree species dominating the stand, other tree species may be present. These associated tree species may be susceptible to the gypsy moth as well.

Oak-hickory is the largest and most diverse susceptible forest type group, extending from the Great Plains to the eastern seaboard. Oak-pine types are found in the South. Oak-gum-cypress types are bottomland forests, typically found in the South and Southeast, especially within the Mississippi Delta and Piedmont. Aspen-birch forests are located in the North Central States. All of these forest types are susceptible to the gypsy moth.

Much of south-central and southeastern Alaska has climate and trees (paper birch, willow and alders) suitable for the gypsy moth. Aspen types are the most abundant hardwood in the intermountain area, while oak types predominate in California and red alder in the Pacific Northwest.

Compared with the European strain, the Asian strain of the gypsy moth feeds on more plants (USDA 1992). In addition to feeding on the same plant species as the European strain, the Asian strain of the gypsy moth will feed on larch and tamarack (*Larix* spp.) in Siberia, eastern Asia, and Japan (USDA 1992), and on both eastern (*L. laricina*) and western larch (*L. occidentalis*) in the United States.

Affected Areas.

Uninhabited Forest.

Land use in uninhabited forest areas is dependent on the individual landowner's management objectives (e.g., timber, wildlife, esthetics, recreation). This classification of forest has no or few residences and few if any paved roads. Uninhabited forest areas exhibit nearly complete forest canopy coverage, typically with three layers composed of subcanopy vegetation, ground layer vegetation, and a layer of organic debris at the

Table 3-1. Top 20 tree species in the United States preferred by gypsy moths, ranked by total basal area (BA).

Common Name	Species	Total BA (100,000,000 ft^2)
White oak	*Quercus alba*	14.30
Sweetgum	*Liquidambar styraciflua*	11.60
Quaking aspen	*Populus tremuloides*	10.10
Northern red oak	*Quercus rubra*	9.62
Black oak	*Quercus velutina*	7.31
Chestnut oak	*Quercus prinus*	6.84
Post oak	*Quercus stellata*	5.47
Water oak	*Quercus nigra*	4.34
Paper birch	*Betula papyrifera*	3.81
Southern red oak	*Quercus falcata*	3.75
Scarlet oak	*Quercus coccinea*	3.31
American basswood	*Tilia americana*	2.41
Western larch	*Larix occidentalis*	2.40
Laurel oak	*Quercus laurifolia*	1.94
Bigtooth aspen	*Populus grandidentata*	1.90
Tan oak	*Lithocarpus densiflorus*	1.64
Willow oak	*Quercus phellos*	1.49
California red oak	*Quercus kelloggii*	1.45
Eastern hophornbeam	*Ostrya virginiana*	1.26
Canyon live oak	*Quercus chrysolepis*	1.14

soil level. The layers of vegetation serve to reduce the impact of raindrops and the subsequent chance of erosion due to overland runoff.

Forest Recreation Areas.

Recreation sites typical of rural settings include municipal, county, and state parks, national parks, monuments, forests and grasslands, public and private campgrounds, hiking trails, winter sports complexes, vacation cabins, forest lands for backpacking, and lakes and rivers used for hunting, fishing, and boating. Rural roads and scenic vistas provide attractive and tranquil settings, drawing many visiting tourists from populous, developed areas. All of these areas may be subject to gypsy moth outbreaks.

Forest Residential Areas.

Suppression projects are often conducted in areas where forests and people meet. Examples are forested residential areas that contain single- and multiple-family housing, parks, cemeteries, schools, churches, and small businesses; and woodlots in farm areas that offer the potential for gypsy moth movement. These areas are typically occupied year-round, with landowners directly experiencing the impact of gypsy moth defoliation. Homeowners generally place a high value on their trees for shade, esthetics, privacy, investment, and wildlife habitat, and are consequently concerned when this resource is threatened. Several studies reveal that trees increase property values 5 to 15 percent (Dwyer and others 1992). The presence of defoliated, dying or dead trees can decrease property value and marketability. The cost to remove a dead tree and stump is potentially hundreds of dollars.

Developed Areas.

Natural plant communities in developed areas tend to be fragmented and small, as native plants are frequently replaced with nonnative species.

Forest Condition.

Indicators of forest condition include tree mortality rates, tree growth rates, degree of insect damage (defoliation by gypsy moths), and species composition in the understory and canopy. Gypsy moth defoliation can not only cause mortality of trees, but can also affect the composition of forest communities.

The gypsy moth is not the only introduced pest that can adversely affect the Nation's forest resources. Chestnut blight and Dutch elm disease in the past, and more recently beech bark disease, dogwood anthracnose, emerald ash borer, hemlock woolly adelgid, Asian longhorned beetle, Sirex woodwasp, butternut canker, and others threaten both natural and urban forests. As the gypsy moth and other introduced insects and pathogens spread, they all add stress to forest areas. This stress may be responsible, in part, for documented cases of widespread mortality where no single agent appears to be responsible (Weiss and Rizzo 1987).

Water Quality.

Lakes, streams, rivers and other surface waters in areas with plants susceptible to feeding by gypsy moth caterpillars may be part of the affected environment. Indicators of water quality include flow rate and water chemistry.

Microclimate.

Microclimates created by moisture and temperature conditions found in forests vary by the amount of annual precipitation, elevation, and forest type group. Microclimates may potentially be affected in areas with trees susceptible to gypsy moth feeding.

Soil.

Soil types capable of supporting vegetation susceptible to gypsy moth feeding are potentially part of the affected environment. Soil supports a great diversity of organisms, such as earthworms, arthropods, and microorganisms, which may live in the surface layer, beneath leaf litter, or throughout several soil layers.

Soil structural differences support a wide range of soil-dependent organisms; for example, ground-dwelling arthropods in urban settings are less diverse than those commonly found in undeveloped areas (Gilbert 1989). Impervious surfaces in developed areas prevent air and water from penetrating the soil, which is often more disturbed and compacted than in undeveloped areas. These conditions contribute to a general reduction of plant vigor, root penetration, nitrogen fixation by legumes, and invertebrates to consume and recycle organic matter.

3.3 Affected Human Populations.

Many factors influence the health of people including these: diet, climate, airborne diseases, cultural traditions, emotional well-being, income, access to medical facilities, and contaminants in soil, air, and water. People living in or near areas with trees could be exposed to the gypsy moth and treatments. Particularly susceptible people include those with allergic reactions to gypsy moth hairs (*Figure 3-3*), respiratory ailments, chemical sensitivities, pregnant women, children, and the elderly. Those who work in the woods or with trees, mix or apply insecticides, or work in laboratories with gypsy moths could frequently be exposed to gypsy moths and treatments.

Perceptions and behaviors of individuals vary, depending upon their familiarity with the presence of gypsy moth caterpillars and the use of treatments. Reactions to the gypsy moth are usually strongest where outbreaks occur for the first time; people become alarmed when huge numbers of gypsy moth caterpillars suddenly appear. Perceptions and behaviors in response to the presence of gypsy moth caterpillars and gypsy moth treatment projects may also vary by location. Because urban dwellers are less likely to be exposed to the caterpillars and may never encounter the gypsy moth, they generally do not perceive the moths as being a problem unless the trees in their own yard are directly affected.

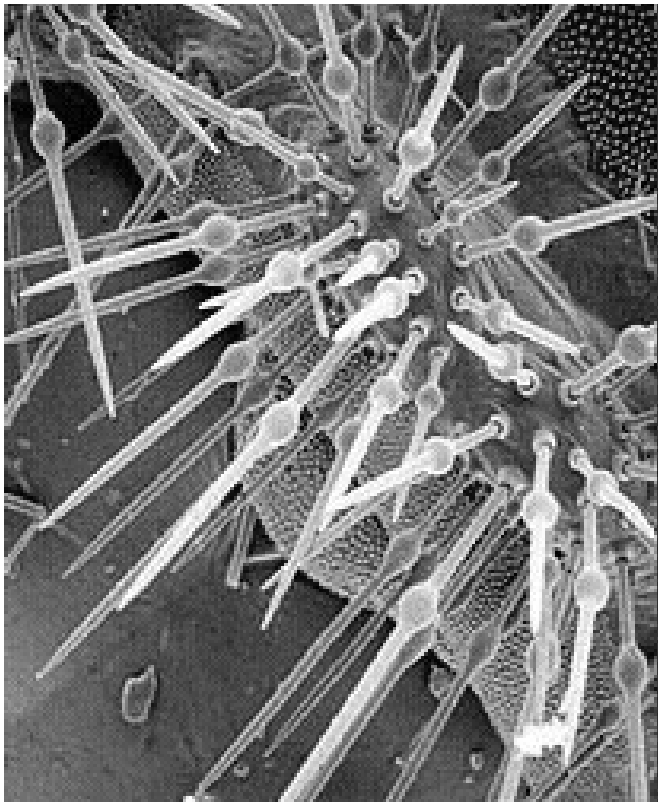

Figure 3-3. Gypsy moth hairs can cause irritation.

Suburban and rural area residents are more likely to be alarmed by large populations of gypsy moth caterpillars and treatment efforts. Inhabitants of rural agricultural areas tend to be less concerned about spraying to control gypsy moth populations due to their familiarity with spraying of agricultural crops.

3.4 Affected Nontarget Organisms.

General.

Virtually all wildlife in the United States that require trees as a part of their environment are within range of the gypsy moth. Mammals, birds, fish, and butterflies, for example, live in environments potentially affected by the gypsy moth or gypsy moth treatments. Detrimental effects of gypsy moths on native Lepidoptera were noted in a West Virginia study (Sample and others 1996).

Animal diversity is generally lower in developed areas, where native animal communities tend to be fragmented and small. Animals that do well in urban or fringe areas usually reproduce rapidly, and exhibit flexible behavior patterns, enabling them to exploit diverse food sources (Gill and Bonnet 1973). Species in urban areas (squirrels and birds like starlings, robins, and crows), which adapt to high human population density, are often found in greater numbers. Domestic animals and pets also comprise a sector of the animal life in areas with high concentrations of people. In contrast, forested areas sustain various populations, including birds (such as warblers, vireos, thrushes, flycatchers, and raptors), as well as large and small mammals such as bobcats and other predators.

Opossum, skunk, raccoon, and squirrel do well in both developed and undeveloped areas, and may be found in areas providing sufficient green space for cover. Larger mammals, such as bear, moose, and wolf, that are sensitive to human disturbances, require larger home ranges and tend to inhabit undeveloped regions.

The diversity of birds is lower in urban settings than in undeveloped areas (Gill and Bonnett 1973). Most bird species in urban areas are year-round residents or short-distance migrants rather than neotropical migrants, which are more common to undeveloped areas.

Reptiles and amphibians do not fare well in developed areas where native vegetation, breeding sites and cover have been disturbed. Loss of habitat, travel barriers and pollution are reasons for fewer numbers of reptiles and amphibians in developed areas than in more natural areas (Campbell 1974a).

Threatened and Endangered Species.

Any species that is listed or proposed for listing as a threatened or endangered species and found in or near forested habitats could potentially be affected by the gypsy moth or gypsy moth treatments. Federally listed species of moths, butterflies, and insect-eating birds are of particular concern.

Chapter 4
Environmental Consequences

Figure 4-1. This experiment station and insectary in Malden, Massachusetts, was used for some of the earliest research on the gypsy moth.

Chapter 4 Environmental Consequences

Contents

4.1 Alternatives and Treatments 1
4.2 Risk Assessments and Risk Characterization 1
Overview 1
Hazard Quotients 2
4.3 Consequences of the Gypsy Moth 4
General Effects of the Gypsy Moth 4
Forest Condition–Effects of Defoliation on Vegetation 4
Forest Condition—Tree Mortality 5
Forest Condition—Seed and Mast Production 6
Water Quality 6
Soil Condition 7
Microclimate 7
Risk to Human Health (Issue 1) 7
General 7
Groups at Special Risk 7
Risk to Nontarget Organisms (Issue 2) 7
Mammals 7
Birds 8
Terrestrial Invertebrates 9
Fish 9
Aquatic Invertebrates 9
Cumulative Effects of the Gypsy Moth 9
Risk to Human Health (Issue 1) 9
Risk to Nontarget Organisms (Issue 2) 9

4.4 Consequences of *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) (Alternatives 1, 2, 3)....10
General Effects of *B.t.k*....10
Risk to Human Health (Issue 1)....10
General....10
Groups at Special Risk....10
Risk to Nontarget Organisms (Issue 2)....11
Mammals....11
Birds....11
Terrestrial Invertebrates....11
Fish....12
Aquatic Invertebrates....12
Cumulative Effects of *B.t.k.*....13
Risk to Human Health (Issue 1)....13
Risk to Nontarget Organisms (Issue 2)....13
4.5 Consequences of Diflubenzuron (Alternatives 1, 2, 3)....13
General Effects of Diflubenzuron....13
Risk to Human Health (Issue 1)....13
General....13
Groups at Special Risk....14
Risk to Nontarget Organisms (Issue 2)....14
Mammals....14
Birds....14
Terrestrial Invertebrates....15
Fish....15
Aquatic Invertebrates....16
Cumulative Effects of Diflubenzuron....16
Risk to Human Health (Issue 1)....16
Risk to Nontarget Organisms (Issue 2)....17
4.6 Consequences of Disparlure (as Used in Mating Disruption and Mass Trapping) (Alternatives 1, 2, 3)....17
General Effects of Disparlure....17
Risk to Human Health (Issue 1)....17
General....17
Groups at Special Risk....18
Risk to Nontarget Organisms (Issue 2)....18
Mammals....18
Birds....18
Terrestrial Invertebrates....18
Fish....18
Aquatic Invertebrates....18
Cumulative Effects of Disparlure....18
Risk to Human Health (Issue 1)....18
Risk to Nontarget Organisms (Issue 2)....19

4.7 Consequences of Dichlorvos (as Used in Mass Trapping) (Alternatives 1, 2, 3)....19
General Effects of Dichlorvos....19
Risk to Human Health (Issue 1)....19
General....19
Groups at Special Risk....20
Risk to Nontarget Organisms (Issue 2)....20
Mammals....20
Birds....20
Terrestrial Invertebrates....20
Fish....20
Aquatic Invertebrates....20
Cumulative Effects of Dichlorvos....20
Risk to Human Health (Issue 1)....20
Risk to Nontarget Organisms (Issue 2)....21
4.8 Consequences of Gypchek (Alternatives 1, 2, 3)....21
General Effects of Gypchek....21
Risk to Human Health (Issue 1)....21
General....21
Groups at Special Risk....21
Risk to Nontarget Organisms (Issue 2)....21
Mammals....21
Birds....21
Terrestrial Invertebrates....21
Fish....22
Aquatic Invertebrates....22
Cumulative Effects of Gypchek....22
Risk to Human Health (Issue 1)....22
Risk to Nontarget Organisms (Issue 2)....22
4.9 Consequences of Tebufenozide (Alternatives 2 and 3)....22
General Effects of Tebufenozide....22
Risk to Human Health (Issue 1)....22
General....22
Groups at Special Risk....23
Risk to Nontarget Organisms (Issue 2)....23
Mammals....23
Birds....23
Terrestrial Invertebrates....24
Fish....25
Aquatic Invertebrates....25
Cumulative Effects of Tebufenozide....26
Risk to Human Health (Issue 1)....26
Risk to Nontarget Organisms (Issue 2)....26

4.10 Consequences of Adding a New Treatment Under Alternative 3....26
4.11 Summary of Effects Including Cumulative Effects....26
Risk to Human Health (Issue 1)....26
General....26
Cumulative Effects....27
Risk to Nontarget Organisms (Issue 2)....27
General....27
Cumulative Effects....28
4.12 Operational Flexibility of Treatments....28
4.13 Unavoidable Adverse Effects....28
4.14 Short-Term Uses and Long-Term Productivity....28
4.15 Measures to Mitigate Adverse Environmental Impacts....28
4.16 Urban Quality, Historic and Cultural Resources, and Design of the Built Environment....29
4.17 Energy Requirements and Conservation Potential of Various Alternatives....29
4.18 Natural or Depleted Resource Requirements and Conservation Potential of Various Alternatives....29
4.19 Irreversible and Irretrievable Commitments of Resources....29
4.20 Other Required Disclosures....29

Figures and Tables

Figure 4-1. This experiment station and insectary in Malden, Massachusetts, was used for some of the earliest research on the gypsy moth ....Cover

Table 4-1. Treatments available for use, by alternative....1

Table 4-2. Comparative Hazard Quotients (HQs) for the effects of gypsy moths and treatments on human health and nontarget organisms 3

This chapter examines, on a national scale, the environmental consequences of the alternatives as they relate to the issues of human health and nontarget organisms associated with the treatments that could be used. It updates the general background information presented in the 1995 EIS, and the human health and ecological risk information for the gypsy moth and for currently approved treatments. This chapter also presents human health and ecological risk information for tebufenozide (Alternatives 2 and 3) and other new treatments that may be available in the future (Alternative 3). Any information with a reference date between 1995 and 2006 is new since the 1995 environmental impact statement. All of the information on tebufenozide is new.

4.1 Alternatives and Treatments.

Chapter 2 states the three alternatives. *Table 4-1* lists the treatments that would be available under each alternative.

4.2 Risk Assessments and Risk Characterization.

Overview.

The consequences of the treatments in each alternative were determined by risk assessment for each treatment as well as for gypsy moth (no treatment) and a risk comparison among the treatments and gypsy moth (see Appendixes F-L for the risk assessments, and Appendix M for the risk comparison).

A risk assessment provides a logical process for evaluating data and analyzing potential effects of the gypsy moth and treatments. Risk assessments take into account the manner in which treatments are used in gypsy moth projects, including how treatment agents are applied, the amount applied, and the types of areas that receive treatment.

Standard steps in the risk assessment process were followed:

- Hazard identification—gathers known information from laboratory and field studies on toxicity of the gypsy moth and treatment agents.

Table 4-1. Treatments available for use, by alternative

Treatment	Alternative 1 No action	Alternative 2 Add tebufenozide	Alternative 3 Add tebufenozide and other treatments
*B.t.k.**	●	●	●
Diflubenzuron*	●	●	●
Gypchek*	●	●	●
Mass Trapping (Disparlure, or disparlure and dichlorvos)*	●	●	●
Mating disruption (Disparlure)*	●	●	●
Sterile insect technique*	●	●	●
Tebufenozide		●	●
Other treatments			●

* Currently approved treatments

- Exposure assessment—describes the nature and magnitude of contact with the gypsy moth and with treatment agents as they are used in gypsy moth treatment projects.

- Dose-response assessment—determines how much exposure to the gypsy moth and to treatment agents is needed to produce the response (effect) described in the hazard identification.

- Risk characterization—combines information from previous steps to describe the plausibility of observing certain effects of the gypsy moth and of treatments.

Each step in a risk assessment is accompanied by uncertainties, caused by limitations either in the available data or in the ability to relate the data to scenarios of concern. To compensate for uncertainties, risk assessment results tend to be conservative, meaning they are more likely to overestimate risks than to underestimate them.

Human Health and Ecological Risk Assessments (HHERA) were prepared by risk assessment experts (Syracuse Environmental Research Associates, Inc. [SERA]), using the best available data. The HHERAs also underwent independent technical review by other recognized experts in risk assessment methods, toxicology, and other applicable fields (consultants retained by SERA, and toxicologists and program specialists from APHIS and the Forest Service). The HHERAs and this chapter cover the issues raised in scoping for this SEIS for both human health (human health assessment portion of HHERA) and nontarget organisms (ecological risk assessment portion of HHERA).

Many uncertainties are inherent in conducting and interpreting risk assessments; however, the data available on the agents covered by the risk assessments, modeling, equations and statistics all taken together with the understanding of uncertainties provide adequate information to characterize the relative hazards associated with the agents evaluated. To compensate for missing data and any uncertainties in the data, numerical uncertainty factors are used in the dose-response assessments for potential human health effects, and conservative assumptions are used in both human health and ecological risk assessments. In addition, it is virtually impossible to precisely calculate an exposure value for every situation that may arise. Therefore, models, equations, and statistical techniques were used to quantify both plausible and extreme exposures and to use ranges of toxicity values to reflect ranges of sensitivity. These ranges for exposure and toxicity are then used to numerically characterize risk with hazard quotients that are typically expressed as central estimates with upper and lower bounds.

HHERAs were prepared for each of the treatments in the alternatives (Appendixes F through K) and for the gypsy moth itself (Appendix L). Results of the HHERAs are summarized later in this chapter. The relative risks of the insecticides and treatments are illustrated in a risk comparison evaluation in Appendix M.

Hazard Quotients.

Risks to human health and to nontarget organisms can be estimated numerically using hazard quotients (HQs). HQs can be calculated only for effects on populations of biotic (living) organisms. The HQ is a screening tool commonly used in risk assessments. The HQ is a ratio of the exposure estimate for a particular and defined situation (labeled or prescribed conditions) for a representative population (human or nontarget species), divided by an effect level (dose or concentration level). The HQ takes into account the inherent toxicity of a substance, as well as its ability to produce specific effects on an organism (or population of organisms), and the degree of exposure. The HQs for currently approved treatments and tebufenozide are described in Appendix M. *Table 4-2* provides the HQs for all of the treatments and for the gypsy moth.

As an example, refer to the upper bound of the HQ for *B.t.k.* for nontarget aquatic species--0.5, in *Table 4-2*. This HQ was derived from an exposure estimate of 0.24 mg/L, which is calculated as the peak concentration of the *B.t.k.* formulation in water after a direct spray. This exposure estimate serves as the numerator for the HQ. The toxicity value of 0.45 mg/L is the NOEC (no observed effect concentration)

Table 4-2. Comparative Hazard Quotients (HQs) for the effects of gypsy moths and treatments on human health and nontarget organisms. (Wherever a 0 appears, the hazard quotient value is less than 0.01.)

Population	Gypsy Moth HQ	*B.t.k.* HQ	Dichlorvos HQ	Diflubenzuron HQ	Disparlure HQ	Gypchek HQ	Tebufenozide HQ
Human health	1.6 to 625	0 to 0.04	0 to 380	0.05 to 0.5–workers 0.09 to 0.1–public	0	0 to 0.02	0.03 to 1.5
(See Table 3-4 of Appendix M for in-depth comments)	Upper range is based on major outbreaks	Unlikely effects	Upper range based on child tampering with strip.	Upper range for workers based on ground spray operations.	No potential risk can be identified	No risks are plausible	Highest HQ based on long-term consumption of contaminated fruit following two applications at the highest application rate.
Nontarget terrestrial species	0.25 to 400	0.36 to 9.4	0	0.18 to 32	0	0	0 to 4
(See Table 4-4 of Appendix M for in-depth comments)	Upper range based on gypsy moth outbreak in sensitive stands	Upper range based on sensitive caterpillars of moths and butterflies	Effects not likely	Upper range based on sensitive species of invertebrates	No potential hazard identified	Effects not likely	Upper range based on the consumption of contaminated vegetation by a large mammal
Nontarget aquatic species	0	0 to 0.5	0	0 to 5	0 to 0.4	0	0 to 0.4
(See Table 4-5 of Appendix M for in-depth comments)	No adverse effects	Upper level based on sensitive species	No risks plausible in normal use. HQ for aquatic invertebrates could reach up to 8 in accidental exposures	Upper range based on acute exposure to aquatic invertebrates (Daphnia)	Upper range based on acute exposures to sensitive aquatic invertebrates (Daphnia)	No adverse effects	Upper range based on longer term toxicity in sensitive aquatic invertebrates

from a reproduction study in *Daphnia magna,* an aquatic invertebrate. This toxicity value serves as the denominator for the HQ. Thus, the HQ is calculated as follows:

HQ = exposure estimate/toxicity value
= 0.24 mg/L / 0.45 mg/L
= 0.533… ≈ 0.5

Note that the HQ in the above example is rounded to one significant place. This is a common practice in presenting HQ values except for those in which the level of concern is marginally exceeded, i.e., an HQ of 1.45 would be rounded to 1.4 but not to 1.0.

In risk management, the HQ must be used in conjunction with other factors and characteristics of a substance, such as the quality and quantity of substantiating evidence (published scientific literature, data, models, and risk assessments done by others such as industry and universities), the severity of potential adverse effects, and the nature of the affected species and populations.

In some cases numerical expressions of risk (HQs) do not adequately convey the potential for hazard. For example, a high HQ for a mild effect, such as skin rash, is probably more acceptable than a much lower HQ for a more serious effect like neurotoxicity. Therefore, the use of HQ as an expression of risk and "acceptability" requires that a qualitative perspective also be injected into the analysis. Ecological risk assessments often involve considerations of many different species of plants and animals, and abiotic factors, and their interrelationships and interactions. Invariably, few data sets are available, and field studies provide only an overview of the complex interrelationships and secondary effects among species. Human health risk assessments and ecological risk assessments cannot offer a guarantee of safety. Both risk assessments offer a way to estimate the adverse effects and their severity.

4.3 Consequences of the Gypsy Moth.

This section provides exsisting and updated information on the gypsy moth. It is intended for use with site-specific project analysis and for general information for the reader. See Appendix E for information on the history and biology of the gypsy moth. See Appendixes L and M for detailed analysis of risks associated with gypsy moths.

General Effects of the Gypsy Moth.

Forest Condition–Effects of Defoliation on Vegetation.

When gypsy moth populations are low, nearly all feeding and defoliation occurs on favored hosts, such as oaks (Campbell and Sloan 1977a). During population outbreaks gypsy moth caterpillars feed on more than 300 species of broad-leaved and coniferous trees and shrubs (Leonard 1981) (see Appendix D, Plant List). Trees stripped of 50 percent or more of their leaves are likely to refoliate the same season, although new leaves are fewer and smaller than the originals (Wargo 1981a). The impact of defoliation depends on five key factors:

(1) How much foliage is removed;
(2) The number of successive years of defoliation;
(3) When defoliation occurs in the growing season;
(4) The presence and number of secondary organisms; and
(5) The physiological condition of the tree (Parker 1981).

Defoliated trees already under stress from drought or other factors often succumb more quickly than healthier trees.

After gypsy moth outbreaks red maple (*Acer rubrum*) numbers may increase and oak numbers decrease in Appalachian forests (Allen and Bowersox 1989, Gansner and others 1994, Hix and others 1991), because red maple is not a preferred host and oaks are preferred. Trends in New England and Pennsylvania reveal a shift in composition towards less oak, with

some stands having major losses and others having only minor changes (USDA Forest Service 1994f). Moderate-to-heavy defoliation accelerates forest succession towards more shade-tolerant (and less defoliation-prone) species (Campbell and Sloan 1977a, Clement and Nisbet 1972, Feicht and others 1993, Houston 1981b, Stephens and Hill 1971).

An area that is defoliated for only 1 year will have minimal long-term effects. However, defoliation by even non-epidemic levels of gypsy moth larvae could have a significant, negative effect on the radial growth of preferred trees, except possibly aspen (Muzika and Liebhold 1999, Naidoo and Lechowicz 2001). Small feeder roots die, reducing water and mineral uptake and slowing tree recovery (Wargo 1978b). The effects of a single heavy defoliation in a mixed stand of oaks in eastern New England were visible for 10 years (Campbell and Sloan 1977a). Decreases in stem volume growth in southern New England averaged approximately 20 percent in any year a tree was defoliated compared with no defoliation the previous year, and growth loss was evident up to 3 years after defoliation (Twery 1987, Wargo 1981a). Overall stand volume may decrease initially (Gansner and Herrick 1982, Herrick and Gansner 1988) and then may increase over time (Gansner and others 1993b).

Defoliation reduces carbohydrate (starch) production (Heichel and Turner 1976, Kozlowski 1969) forcing trees to use root starch reserves. Most trees can tolerate 2 years of defoliation before root starch reserves are depleted (Wargo 1981a). Depletion of reserves weakens trees, making them vulnerable to secondary organisms that cause further decline and death. In the eastern United States the principal secondary organisms are the shoestring fungus (*Armillaria mellea*) and the two-lined chestnut borer (*Agrilus bilineatus)* (Houston 1981a, Wargo 1981b).

Increased light due to defoliation causes herbaceous plants to rapidly expand their density and coverage (Gottschalk 1988). In some areas that are subject to intense deer browsing, defoliated trees may fail to regenerate, and shrubs or herbaceous plants can dominate (Gottschalk 1988).

Heavy defoliation by the gypsy moth increases fire danger (Gottschalk 1990a). An abundance of heavy fuel, standing dead snags, dense understory vegetation, and numerous fallen trees act in combination to promote spot fires, impede fire line construction, and extend the time needed for post-fire mop-up operations (Tigner 1992).

Forest Condition—Tree Mortality.

Several factors interact to produce tree and stand mortality: severity, frequency, and distribution of defoliation, site and stand factors, environmental conditions, tree vigor, crown condition, and presence and abundance of secondary organisms (Campbell and Valentine 1971, Kulman 1971, Staley 1965, Campbell and Sloan 1977a, Gansner and others 1978, Wargo 1978a, b, Campbell 1979, Herrick and Gansner 1987, Fosbroke and Hicks 1989, Herrick 1982, Tigner 1992, Feicht and others 1993, Gottschalk and MacFarlane 1993). Oak mortality in initial outbreaks is greater than in later outbreaks (Davidson and others 1999). Oaks and other susceptible species experience more severe and frequent defoliation and have higher mortality than do non-susceptible species (Campbell and Sloan 1977a; Herrick and Gansner 1987; Quimby 1985, 1987).

Mortality can vary from stand-to-stand, even when stands have similar characteristics with mortality 80 to 100 percent in some stands (Campbell and Sloan 1977a, Gansner and Herrick 1984). Most mortality occurs during and after the initial outbreak (Twery 1991) with severe mortality along and behind an advancing outbreak front as the gypsy moth invades new areas (Gansner and Herrick 1984, Herrick and Gansner 1986, Twery and Gottschalk 1988). Subdominant trees typically have much higher mortality rates than dominant trees after heavy defoliation (Campbell 1979, Gansner and others 1993c. Quimby 1993). The most common response to canopy

gaps created by tree mortality is increased growth and density of existing understory woody plants (Collins 1961, Ehrenfeld 1980, Feicht and others 1993, Hix and others 1991, USDA Forest Service 1994f).

Drought may increase the severity of gypsy moth effects on trees (Bess and others 1947, Campbell and Sloan 1977a, Stephens and Hill 1971). Should severe drought occur with repeated years of defoliation, the cumulative impacts may increase mortality. Stress from disturbances, such as timber cutting or fire, and naturally occurring oak decline can also increase mortality.

Forest Condition—Seed and Mast Production. Nuts, seeds, and fruits that serve as food for animals in the forest are called mast. Seed production by defoliated oak trees is reduced directly through consumption of oak flowers and young acorns by gypsy moth caterpillars, and indirectly by abortion of acorns and—in the years after defoliation–reduced initiation of flower buds. Significant mortality of oaks (more than 60 percent of basal area in a stand) must occur before acorn production is reduced significantly (Gottschalk 1990b). Over the long term, an increase in soft mast, particularly berries, replaces the loss of hard mast such as acorns (Gottschalk 1990a), and mammals that usually eat acorns may start eating this soft mast.

Water Quality. Defoliation by the gypsy moth may affect a number of characteristics of nearby water bodies, including temperature, flow rate and yield, sediment load, acidity levels, oxygen availability, nutrient concentration, and structural habitat for aquatic organisms. Defoliated riparian areas receive increased exposure to the sun. Increases in the amount of light penetrating stream surfaces and changes in water temperature can affect both plants and animals in the stream. Various factors influence stream temperature at a given point, including flow volume, hydraulic gradient, ground water discharge, degree of shading, and upstream conditions. Actual changes to water temperature vary from site to site and depend in part upon the degree and duration of defoliation (USDA Forest Service 1994f). On a headwater stream under a dense tree canopy, light penetration increased from 5 to 18 percent to 73 percent after a “massive” gypsy moth outbreak in Rhode Island (Sheath and others 1986). Water temperature increased by 3.7 °C (6.7 °F) in early July, and algal growth in the streambed increased dramatically.

Defoliation by the gypsy moth has been shown to increase water yield (Corbett and Lynch 1987), in part due to fewer available leaves to transpire moisture from the soil (Twery 1991). Increased water yields from forested watersheds may produce beneficial results, such as creating more wet areas during summer, which might enhance habitat for amphibians. Conversely, increased stream discharge may have a destabilizing effect on herbivorous insects (Eagle 1993).

Sediment loads from forested land are usually low; however, increases in stream velocities due to increased water yield can lead to increased erosion, sedimentation, and turbidity. Timber cutting, exclusive of disturbances caused by road construction and log removal, usually has little if any effect on stream turbidity and sedimentation (Corbett and Lynch 1987). Therefore, gypsy moth defoliation would be unlikely to cause an increase in watershed erosion.

Whenever defoliation by the gypsy moth causes tree mortality in riparian areas, the structural habitat of streams may be altered by deposition of woody debris in affected streams. Debris dams may trap more organic material, lengthening the time it is available for ingestion by benthic invertebrates and leaf shredders, and allowing for more complete energy utilization. Large, woody materials also provide improved fisheries habitat (USDA Forest Service 1994f).

Defoliation by the gypsy moth may contribute to alterations in water chemistry and a reduction in the capacity to neutralize acids in some streams associated

with upland watersheds in the southern Appalachian region (USDA Forest Service 1994f). Defoliation temporarily produces conditions typical of winter, such as reduced acid-neutralizing capacity and increased acidity (Downey 1991). Acid-neutralizing capacity determines the concentrations of hydrogen and aluminum in solution, which at elevated levels are toxic to fish and other aquatic organisms. Acid-neutralizing capacity of streams increases seasonally, when deciduous leaves are present in the tree canopy.

Increased organic matter in streams from gypsy moth frass and leaf fragments, in combination with increased light penetrating the surface of the water, may lead to over-enrichment and result in excessive growth of algae and other microorganisms. This bloom could cause a reduction in oxygen available to other organisms in the stream. Large increases in fecal coliform and streptococci densities have been observed in streams where heavy gypsy moth defoliation has occurred (Corbett and Lynch 1987).

Defoliation is also suspected of causing increased nitrate mobility, which would allow nitrate to be lost from a site. Elevated concentrations of nitrate in streams have been associated with forest harvest (Vitousek and Melillo 1979) and defoliation by insects (Swank and others 1981, USDA Forest Service 1994f). Defoliation by the gypsy moth can accelerate the transfer of nutrients from vegetation to the soil surface; however, there is little evidence that these nutrients are lost from the site and enter adjacent water bodies to a significant degree (Eagle 1993, Grace 1986).

Soil Condition.

Gypsy moth defoliation probably increases the rate of decomposition of organic matter and decreases soil moisture content because of the greater penetration of sunlight increasing biological activity (Grace 1986, Tomblin 1994). These changes should result in short-term increases in biological productivity.

Microclimate.

The microclimate of defoliated areas is affected by rises in soil, leaf litter, and ambient air temperatures due to increased exposure to sunlight (Vaughan and Kasbohm 1993).

Risk to Human Health (Issue 1).

General.

People coming in contact with gypsy moth larvae may have skin irritation, resembling mosquito bites, with raised patches of skin approximately 0.25 to 0.5 inches in diameter. Some people may have itching persisting several days to 2 weeks and sufficiently severe to cause them to seek medical treatment. Heavy infestations or extreme outbreaks potentially cause eye and respiratory effects in some individuals. Heavy infestations are often considered a public nuisance, causing esthetic damage to the environment through tree defoliation which may induce stress or anxiety in some individuals.

Groups at Special Risk.

Young children are potentially at greater risk of effects from gypsy moth exposure perhaps because they spend more time outdoors than adults (Tuthill and others 1984, Aber and others 1982, Anderson and Furniss 1983).

Risk to Nontarget Organisms (Issue 2).

Mammals.

Fur reduces the risk of direct contact with gypsy moth hairs making skin irritation unlikely. Evidence of irritation to the eyes and or respiratory tract in mammalian wildlife species after direct contact with the gypsy moth is not found in the literature.

To determine the effects of a gypsy moth outbreak on a population of black bears (*Ursus americanus*), Vaughan and Kasbohm (1993) monitored the behavior of 54 radio-collared black bears in the Shenandoah National Park after a gypsy moth outbreak that caused widespread defoliation, hard mast failures, and tree mortality. The outbreak had no apparent effects on cub production or mortality rates of cubs or adults. In the fall, before the gypsy moth infestation, the bears ate mostly acorns. When acorns were no longer available due to defoliation, the bears switched to eating fruit, which had no apparent impact on the nutritional quality of their diets. Seventy-one percent of bear dens were in tree cavities, primarily in living oaks. Gypsy moth-induced mortality of den trees was high and, by the end of the study, 54 percent of the living oaks used as dens were dead. While no short-term effects were noted, Vaughan and Kasbohm (1993) speculated that the long-term adverse impact of defoliation on black bears may be a reduction in den sites, with natural replacement possibly requiring 50 years. Conversely, black bears will use upturned stumps of large dead trees as dens. These would be expected to increase as tree mortality increases.

Variations in acorn and other mast production are directly related to variations in populations of squirrels, mice, and other small mammals (Brooks and others 1998). Acorn crop size in the fall directly affects the population density of mice living in oak-dominated forests the following spring (McShea and Rappole 1992, McShea and Schwede 1993). A decrease in acorn production has been shown to decrease the population of white-footed mice, *Peromyscus leucopus* (Elkinton and others 1996, 2002).

White-tailed deer will migrate to areas that have not been defoliated. Nesting failures of grouse and turkey may increase. Bear, turkey, and bats may migrate to nondefoliated areas or less defoliated areas (USDA 1995).

Sample and others (1996) found no significant effects on the consumption of insects by Virginia big-eared bats in areas of high gypsy moth infestation and defoliation.

Birds.

Some species of birds appear to avoid the gypsy moth as a prey species (Smith 1985), perhaps because of larval hairs. Reported increases in nesting failures of various species of birds appear to be due to increased predation, increased weather stress, or both, which are associated with defoliation (Thurber and others 1994).

Gypsy moth infestations and subsequent defoliation may be beneficial to some species of birds, especially species that favor dead wood (snags) as a habitat (Bell and Whitmore 1997a, b; DeGraaf 1987; DeGraaf and Holland 1978; Showalter and Whitmore 2002). Available nesting and foraging resources increased for several bird species as a result of more snags, windfall, and shrub cover after defoliation, while there was no substantial impact from upper canopy defoliation on birds residing primarily in the forest canopy (Bell and Whitmore 1997a, b).

Cavity-nesting birds benefit indirectly from a gypsy moth outbreak (Showalter and Whitmore 2002). Bird density increased in plots with low to moderate defoliation (Thurber 1993). Species richness increased from 19 to 23 species per plot, with declines noted only for tree nesters and flycatchers on high-impact plots (Thurber 1993). Increases in low shrub and ground nesters, cavity nesters, low shrub and ground foragers, bark foragers, forest edge species, short-distance migrants, year-round residents, and woodpeckers were widespread, but most pronounced on moderate-impact plots. DeGraaf and Holland (1978) reported similar results, finding significantly fewer numbers of only 4 out of 36 bird species examined in heavily defoliated areas. No substantial effects on abundance of various species of birds in defoliated and nondefoliated stands were noted in central Pennsylvania over a 2-year period (DeGraaf 1987).

Terrestrial Invertebrates.

Some lepidopteran species may be adversely affected by gypsy moth outbreaks. Redman and Scriber (2000) examined the adverse effects of the gypsy moth on the northern tiger swallowtail butterfly, *Papilio canadensi*. Direct effects included 100 percent mortality in *Papilio* larvae exposed to leaves painted with gypsy moth body fluids, and 84 percent mortality in *Papilio* larvae fed leaves from aspen stands infested with gypsy moth larvae.

The potential adverse effects of gypsy moth outbreaks to Lepidoptera was also investigated in a study designed to compare lepidopteran populations in 50 acre plots in mixed oak, hickory, and pine forests in West Virginia (Sample and others 1996). Decreases in abundance and richness of larvae and adults from the family Arctiidae (tiger moths) were apparent in plots infested with gypsy moth larvae, compared with uncontaminated plots.

The impact of the gypsy moth is negative to only a small proportion of the lepidopteran community, primarily species that feed on oak and for which the larval development of the affected species and gypsy moth presumably coincide (Work and McCullough 2000). Although the study does not address the mechanism(s) by which the gypsy moths adversely affect the lepidopteran community, the investigators suggest they might include altered host plant quality, increases in natural enemies, or microclimate changes.

Some reports suggest that certain lepidopteran species respond positively to gypsy moth infestations. In 1981, the number of butterfly species was at a record high for the New Haven, Connecticut, area, despite the record number of acres defoliated by the gypsy moth that same year (Schweitzer 1988).

Fish.

Little information is available regarding the effects of gypsy moth infestations on fish populations. Defoliation by the gypsy moth can result in an increase in the pH and temperature of ambient water (Downey and others 1994, Webb and others 1995a). Trout, which are very sensitive to changes in pH and temperature, could be adversely affected by such changes (Downey and others 1994). No direct data are available on the biological effects of such changes due to gypsy moth defoliation (Webb and others 1995a).

Aquatic Invertebrates.

The rate of leaf breakdown in streams apparently increased due to gypsy moth defoliation, which might result in food deficits during spring for shredders, such as caddisflies, stoneflies, and some dipterans (Hutchens and Benfield 2000). The number of shredders collected, however, was greater in disturbed streams (i.e., streams in areas of gypsy moth defoliation) than in control streams.

Cumulative Effects of the Gypsy Moth.

Risk to Human Health (Issue 1).

The available data do not permit a definitive assessment of the effects of exposure to the gypsy moth over several seasons. Some individuals may become sensitized to the gypsy moth after repeated exposures over one or more seasons. Young children may be a group at special risk from effects of gypsy moth exposure but it is not clear whether children are more sensitive than adults to the effects of gypsy moth exposure or whether responses in children appear greater because children spend more time outdoors than with adults do.

Risk to Nontarget Organisms (Issue 2).

Effects due to the gypsy moth would be cumulative in situations of repeated outbreaks and defoliation in the same area. Repeated defoliation would lead to changes in forest condition that are characterized by increased tree mortality, stand structure and composition changes, a shift from production of hard to soft mast, and increased fire danger.

Habitats of wildlife species are altered more with each successive outbreak of the gypsy moth. Recolonization of species lost or displaced due to changes in habitat is possible; however, large areas of defoliation and frequent repeated defoliation do not favor recolonization by species with low dispersal capabilities.

Economic and recreational consequences that accumulate with repeated multiyear outbreaks include these: costs associated with annual cleanup; maintenance and replacement of trees that die; and loss of value from reduced growth and mortality of trees.

4.4 Consequences of *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) (Alternatives 1, 2, 3)

See Appendixes F and M for detailed analysis of risks associated with *B.t.k.*

General Effects of *B.t.k.*

B.t.k. may indirectly help to maintain existing forest conditions, water quality, microclimate, and soil condition by delaying increases in gypsy moth populations, thereby protecting tree foliage.

Risk to Human Health (Issue 1).

General.

B.t.k. and its formulations may cause irritation to the skin, eyes, and respiratory tract; however, serious adverse health effects are improbable. Overt signs of systemic toxicity are not likely to be observed in any group–ground workers, aerial workers, or members of the general public–that is exposed to *B.t.k.* as the result of gypsy moth management programs conducted by the USDA (Appendix M). Throat irritation is the most frequently documented effect of *B.t.k.* in the scientific literature on human health (Appendixes F and M). Dermal and ocular irritations are observed at the extreme upper levels of exposure.

There is little indication that *B.t.k.* is associated with pathogenicity in humans and no indication of endocrine disruption or reproductive effects. Carcinogenic and mutagenic effects are not likely. Neither *B.t.k.* nor its commercial formulations are highly toxic or infectious (Appendixes F and M). Formulations of *B.t.k.* are likely to cause irritant effects to the skin, eyes, and respiratory tract; however, concerns about serious adverse health effects are not plausible. This risk characterization is consistent with the risk characterization in the previous USDA risk assessment (USDA 1995), as well as with more recent risk assessments conducted by the U.S. Environmental Protection Agency (EPA) and the World Health Organization, and the comprehensive review of *B.t.* published by Glare and O'Callaghan (2000).

Pretreatment with an influenza virus substantially increased mortality in mice exposed to various doses of *B.t.k* (Hernandez and others 2000). These results raise questions about the susceptibility of individuals who contact influenza or other viral respiratory infections prior to *B.t.k.* applications and have viral infections at the time of application. The enhancement of bacterial infections by a virus is not uncommon, and the enhancement of *B.t.k.* toxicity by a viral infection is, in some respects, not surprising. The relevance of this observation to public health cannot be completely assessed at this time. Several epidemiological studies have been conducted on the effects of *B.t.k.* on human populations, and none have reported viral enhancement. It is uncertain whether epidemiology studies would detect such an effect or whether such an effect is plausible under the anticipated exposure levels used in programs to control the gypsy moth. The viral enhancement of *B.t.k.* toxicity is likely to be an area of further study in the coming years.

Groups at Special Risk.

The available toxicity data give no indication that subgroups of the general population are likely to be remarkably sensitive to *B.t.k.* Nonetheless, *B.t.k.* formulations are complex mixtures and there is a

possibility that certain individuals may be allergic to one or more of the components in the formulations. The study by Hernandez and others (2000) also raises concern regarding the susceptibility of individuals with influenza or other viral respiratory infections to *B.t.k.* toxicity (Appendix F). See Appendixes F and M for detailed information.

Risk to Nontarget Organisms (Issue 2).

Mammals.

Adverse effects due to *B.t.k.* are unlikely in mammals (Appendixes F and M). Most inhalation studies do not suggest the potential for adverse effects, even at *B.t.k.* concentrations much greater than those likely to be encountered in the environment (Appendix F). Bats that feed almost exclusively on lepidopterans might be indirectly affected through a reduction in prey, as suggested by a study in West Virginia (Sample and others 1993a, b; Sample and Whitmore 1993). A 3-year study (1990-1992) conducted in West Virginia on food of the endangered big-eared bat revealed the greatest impact within 3 weeks of *B.t.k.* application due to reduction of prey species. Contrasting these studies, Sample and others (1996) showed that the moths on which bats feed were not affected by *B.t.k.* applications.

Birds.

Acute toxic effects are not likely in birds (Appendixes F and M). Due to the lack of toxicity of *B.t.k.* formulations, as well as of other *B.t.* strains, the U.S. EPA did not require chronic or reproductive toxicity studies in birds (Appendix F). This apparent lack of toxicity is supported by numerous field studies in birds. *B.t.k.* applied at rates sufficient to decrease the number of caterpillars had no substantial adverse effects on most bird species (Rodenhouse and Holmes 1992, Nagy and Smith 1997, Sopuck and others 2002). However, a study showed a significant decline in three species of insectivorous birds (black throated green warbler, eastern tufted titmouse, and yellow-billed cuckoo), but they fully recovered within 3 years (Strazanac and Butler 2005).

A field study that included intensive searches of plots in sprayed and unsprayed areas revealed no differences in the numbers of songbird broods between the two areas for any of the species examined (Sopuck and others 2002). A reduction of lepidopteran larvae due to *B.t.k.* application appeared to have only minimal effects on reproduction in hooded warblers (Nagy and Smith 1997). The reduction in numbers of birds in an area observed in some species was considered indirect and attributed to alterations in the availability of prey rather than to the direct toxicity of *B.t.k.* (Gaddis 1987; Gaddis and Corkran 1986; Norton and others 2001).

Terrestrial Invertebrates.

B.t.k. is toxic to several species of target and nontarget Lepidoptera. The larvae of the Karner Blue Butterfly (a Federally listed endangered species), two species of swallowtail butterflies, a promethean moth, the cinnabar moth and various species of Nymphalidae, Lasiocampidae, and Saturniidae are susceptible to *B.t.k.* (Glare and O'Callaghan 2000)

Permanent changes in nontarget caterpillar populations do not appear likely as a result of gypsy moth management projects. An exception might occur in certain habitat types that support small isolated populations of lepidopterans that are highly susceptible to *B.t.k.* If unaffected individuals of the same species are unlikely to, or physically cannot, move from the treated into the untreated area, then one application of *B.t.k.* will have an effect on the ability of those populations to recover. These effects are limited to spring caterpillars that are present during *B.t.k.* treatments (Strazanac and Butler 2005). Full recovery of nontarget spring caterpillars occurred within 1 to 2 years after the treatment (Strazanac and Butler 2005).

In Oregon, Miller (1990) observed reductions in both types and numbers of nontarget caterpillars after three applications of *B.t.k.* The reductions persisted for 1 year after treatment but not for 2 years. In another study (Carter and others 1995), a second application of *B.t.k.* did not increase mortality of five species of Lepidopterans over that caused by one application. The species tested were moderately resistant to *B.t.k.* and had mortality rates below 50 percent after the first application.

While some nontarget lepidopteran species appear to be as sensitive to *B.t.k.*, most studies indicate that effects in other terrestrial insects are likely to be of minor significance (Appendix F). There is relatively little information regarding the toxicity of *B.t.k.* or *B.t.k.* formulations to terrestrial invertebrates other than insects. For some Lepidoptera, sensitivity to *B.t.k.* is highly dependent on their developmental stage. This is particularly evident for the cinnabar moth, where late instar larvae are very sensitive to *B.t.k.* and early instar larvae are very tolerant to *B.t.k.* (James and others 1993).

The variability in the response of nontarget Lepidoptera to *B.t.k.* is also illustrated in a recent field study in which a *B.t.k.* formulation was applied to two forests (dominated by oak, hickory, and maple trees) over a 2-year period, at an application rate of 40 BIU/acre (Rastall and others 2003). Researchers monitored nontarget lepidopteran populations in the 2 years prior to application as well as over the 2-year period in which *B.t.k.* was applied. The response of nontarget Lepidoptera varied substantially among different species. Larvae of three lepidopteran species significantly decreased in treatment years: *Lambdina fervidaria* (geometrid), *Heterocampa guttivitta* (notodontid), and *Achatia distincta* (noctuid). For 19 other species, larval counts were significantly higher in treatment years as were the total number of noctuids combined and the total number of all nontarget lepidopteran species combined. The Karner Blue Butterfly is susceptible to *B.t.k.,* although the larval generation at risk may vary from year to year (Herms and others 1997).

Some predators and parasitoids may be affected indirectly by *B.t.k.* because of the loss of gypsy moth caterpillars that they parasitize or eat. The more specific the parasites and predators are for lepidopterans affected by *B.t.k.,* the greater the chance of an effect. For example, populations of parasitoid tachinid flies and Braconidae wasps and Pentatomidae stinkbugs declined after application of *B.t.k.* (then recovered by the second year), but generalist predators did not decline (Strazanac and Butler 2005).

Fish.

The U.S. EPA classifies *B.t.k.* as virtually nontoxic to fish (Appendix F). This assessment is consistent with the bulk of experimental studies reporting few adverse effects in fish exposed to *B.t.k.* concentrations that exceed environmental concentrations associated with USDA programs (Buckner and others 1975, Otvos and Vanderveen 1993).

Aquatic Invertebrates.

The effects of *B.t.k.* on aquatic invertebrates is examined in standard laboratory studies and in numerous field studies. *B.t.k.* may be lethal to certain aquatic invertebrates, like *Daphnia magna*, at concentrations high enough to cause decreases in dissolved oxygen or increased biological oxygen demand (Young 1990). Most aquatic invertebrates seem relatively tolerant to *B.t.k.* (Appendix F, Section 4.1.3.3). This assessment is supported by several field studies that failed to note effects in most species after exposures that substantially exceed expected environmental concentrations (Kreutzweiser and others 1992, 1993, 1994).

Cumulative Effects of *B.t.k.*

Risk to Human Health (Issue 1).

Given the reversible nature of the irritant effects of *B.t.k.* and the low risks for serious health effects, cumulative human health effects from spray programs conducted over several years are not expected. Mating disruption with disparlure will most likely be the only other treatment used in the same spray blocks with *B.t.k.* However, *B.t.k.* is used to treat gypsy moth larvae, and mating disruption is used against gypsy moth adults, and they are applied weeks apart. These treatments also have different modes of action, and there are no known cumulative effects between the treatments.

Workers or members of the general public who are exposed to aerial or ground sprays of *B.t.k.* are also exposed to the gypsy moth and may be exposed to other control agents for the gypsy moth. No known data indicate that risks posed by these other agents will affect the response, if any, to *B.t.k.* formulations. Similarly, exposure to other chemicals in the environment may impact the sensitivity of individuals to *B.t.k.* or other agents; however, the available data are not useful for assessing the significance of such interactions.

There is no known documented evidence of a subgroup of individuals who are more sensitive than most members of the general public to *B.t.k.* formulations (Appendix F).

Risk to Nontarget Organisms (Issue 2).

Many studies indicate that *B.t.k.* lasts about a week in the environment. Repeated treatments of areas with *B.t.k.* could potentially impact some species of spring-feeding butterfly and moth caterpillars. Since *B.t.k.* is not used in the same spray blocks with other treatments that could affect nontarget organisms, there is no cumulative effect between different treatments and *B.t.k.* on spring-feeding caterpillars.

4.5 Consequences of Diflubenzuron (Alternatives 1, 2, 3).

See Appendixes I and M for detailed analysis of risks associated with diflubenzuron.

General Effects of Diflubenzuron.

Diflubenzuron may indirectly help to maintain existing forest conditions, water quality, microclimate, and soil condition by delaying increases in gypsy moth populations, thereby protecting tree foliage.

Risk to Human Health (Issue 1).

General.

Diflubenzuron causes the formation of methemoglobin, a form of hemoglobin incapable of oxygen transport, normally present in the blood in small amounts. Methemoglobinemia, the formation of excess methemoglobin, is the primary toxic effect of diflubenzuron in every species of animal tested, regardless of the route or duration of exposure. While effects on the blood are well documented, there is little indication that diflubenzuron causes other specific forms of toxicity. Diflubenzuron does not appear to be neurotoxic nor immunotoxic, does not appear to affect endocrine function in laboratory mammals, and is not a carcinogen. Additionally, diflubenzuron does not appear to cause birth defects or to affect reproductive processes. Numerous studies regarding the subchronic and chronic toxicity of diflubenzuron in laboratory animals indicate that methemoglobinemia is the most consistent clinical symptom indicative of toxicity. Diflubenzuron can be absorbed via the skin in sufficient amounts to cause hematological effects, that is, methemoglobinemia and sulfhemoglobinemia. Nonetheless, the dermal exposure concentrations necessary to induce these hematological effects are higher than the oral exposure dosage necessary to cause the same effects.

Diflubenzuron rapidly dissipates from vegetation and is broken down by sunlight; in the environment the compound degrades to 4-chloroaniline, which the EPA considers a potential carcinogen. This is the only identified potential carcinogen associated with any of the agents to control gypsy moth. The compound is not expected to be present in significant amounts during application since 4-chloroaniline does not form during application. The scenario of greatest concern involving 4-chloroaniline is a cancer risk from drinking contaminated water. This risk would be most plausible in areas with sandy soil and annual rainfall rates ranging from about 50 to 250 inches. The estimate of the hazard quotient for the consumption of water contaminated with 4-chloroaniline and based on a cancer risk of 1 in 1 million is 0.09, which is 10 times lower than the level of concern.

None of the hazard quotients for diflubenzuron reaches a level of concern at the highest application rate used in USDA programs (Appendix I). Since many of the exposure assessments overestimate exposure, and because the dose-response assessment is based on similarly protective assumptions, there is no basis for asserting that this use of diflubenzuron poses a hazard to human health (Appendix I).

Groups at Special Risk.

Some individuals have congenital methemoglobinemia and may be at increased risk of adverse effects to compounds that induce methemoglobinemia (Barretto and others 1984). Infants less than 3 months old have lower levels of methemoglobin (cytochrome b5) reductase and higher levels of methemoglobin (1.32 percent), compared with older children or adults (Centa and others 1985, Khakoo and others 1993, Nilsson and others 1990). Some infants with an intolerance to cow's milk or soy protein exhibit methemoglobinemia (Murray and Christie 1993, Wirth and Vogel 1988). These infants would be at increased risk if exposed to any materials contaminated with diflubenzuron or any compound that induces methemoglobinemia.

Individuals with poor diets might be vulnerable to some chemicals. Based on a study in rats, iron deficiency leads to anemia but does not influence methemoglobin reductase activity (Hagler and others 1981). Thus, although individuals with poor nutritional status are generally a group for which there is particular concern, the available information does not support an increased risk for these individuals with respect to diflubenzuron exposure.

Risk to Nontarget Organisms (Issue 2).

Mammals.

The available field studies indicate no substantial impacts on mammalian wildlife from applications of diflubenzuron. Applications of 60 to 280 g a.i./ha (grams active ingredient per hectare) or 0.85 to 4 oz a.i./acre (ounces of active ingredient per acre) had no detectable adverse effects on the abundance of, or reproduction in moles, field mice, and shrews (O'Connor and Moore 1975; Henderson and others 1977). Small mammals increased in abundance on a plot receiving 280 g a.i./ha compared with a control plot (Henderson and others 1977). The adverse effects that diflubenzuron might have on bot flies, a parasite of small and large mammals alike, was suggested as a possible explanation.

A field study reported no effect on body measurements, weight, or fat content in populations of mice in areas treated with diflubenzuron (Seidel and Whitmore 1995). Mice in the treated areas did consume less lepidopteran prey, but total food consumption was not significantly different between treated and untreated plots.

Birds.

The acute toxicity of diflubenzuron to birds appears generally low. The lack of direct effects on birds is supported by several field studies summarized in Appendix I. Effects secondary to a reduction in lepidopteran prey may include increased foraging

range (Cooper and others 1990), relocation (Sample and others 1993a, b; Sample and Whitmore 1993) and lower body fat (Whitmore and others 1993).

Terrestrial Invertebrates.

Arthropods, a large group of invertebrates including insects, crustaceans, spiders, mites, and centipedes, are most sensitive to diflubenzuron. Most of these organisms use chitin as a major component of their exoskeleton (outer body shell). Diflubenzuron is an effective insecticide because it inhibits the formation of chitin, disrupting normal growth and development. Both terrestrial and aquatic arthropods are affected, though some substantial differences in sensitivity are apparent.

Invertebrates lacking exoskeletons, such as earthworms and snails, do not utilize chitin, and diflubenzuron is relatively nontoxic to these species (Appendix I). Species that are most sensitive to diflubenzuron include lepidopteran and beetle larvae, grasshoppers, and other chewing herbivorous insects (Berry and others 1993, Butler 1993, Butler and others 1997a, Elliott and Iyer 1982, Jepson and Yemane 1991, Kumar and others 1994, Sample and others 1993a, Sinha and others 1990, Redfern and others 1980). Species that are relatively tolerant to diflubenzuron include flies, parasitic wasps (on insect eggs), adult beetles, and sucking insects (Ables and others 1975, Broadbent and Pree 1984, Brown and Respicio 1981, Bull and Coleman 1985, De Clercq and others 1995, Delbeke and others 1997, Gordon and Cornect 1986, Keever and others 1977, Martinat and others 1988, Webb and others 1989, Zacarias and others 1998, Zungoli and others 1983).

The U.S. EPA uses the honey bee as the standard test species to classify the toxicity of pesticides to nontarget terrestrial invertebrates. Based on early acute oral and contact toxicity studies in honey bees (Atkins and others 1974, Stevenson 1978), the U.S. EPA (1997) classifies diflubenzuron as practically nontoxic to honey bees. Several other laboratory toxicity studies also indicate diflubenzuron is not particularly toxic to bees (Chandel and Gupta 1992, Elliott and Iyer 1982, Gijswijt 1978, Kuijpers 1989, Nation and others 1986, Yu and others 1984). This conclusion is supported by several field studies conducted at application rates comparable to, or substantially higher than, those used to control the gypsy moth (Buckner and others 1975, Emmett and Archer 1980, Matthenius 1975, Schroeder 1978, Schroeder and others 1980). Additionally, no detectable amounts of diflubenzuron were found in honey bees in areas treated with diflubenzuron (Cochran and Poling 1995).

Fish.

Based on the available information, the U.S. EPA (1997) classifies acute exposure to diflubenzuron as "practically nontoxic" to fish. The 96-hour LC_{50} values range from greater than 25 milligrams per Liter (mg/L) (the value for yellow perch reported by Johnson and Finley 1980) to greater than 500 mg/L (the value for fathead minnow reported by Reiner and Parke 1975). In addition, no effects were seen in longer-term studies at concentrations up to 100 parts per billion (ppb) (Cannon and Krize 1976) or in two-generation reproduction studies at concentrations of up to 50 ppb (Livingston and Koenig 1977).

Indirect effects on fish are plausible based on a decrease in invertebrate populations as demonstrated in studies in which concentrations as low as 2.5 ppb resulted in decreased growth of fish in littoral enclosures (populations of fish placed in enclosures along the shore of a body of water and monitored) (Moffett 1995, Tanner and Moffett 1995). The reduced growth observed in these studies is attributed to a reduction in macroinvertebrates, a fish food source.

None of the field studies summarized in Appendix I note any adverse effects on fish at application rates comparable to or greater than those used in the control of the gypsy moth. A study by Colwell and Schaefer

(1980) did note a shift in the diet of fish (secondary to changes in food availability) but no effect on growth rates or general condition of the fish.

Aquatic Invertebrates.

Because diflubenzuron inhibits the synthesis of chitin, crustaceans are the aquatic invertebrates most sensitive to diflubenzuron. Many bioassays, both acute and chronic, have been conducted on *Daphnia magna* (Hansen and Garton 1982, Kuijpers 1988, Majori and others 1984, Surprenant 1988) as well as a related species, *Ceriodaphnia dubia* (Hall 1986). As detailed further in the dose-response assessment (Appendix I), these organisms are among the most sensitive to diflubenzuron (Hall 1986, Hansen and Garton 1982). Several other crustacean species appear to be about as sensitive as or only somewhat less sensitive to diflubenzuron than daphnids are (Appendix I). Small crustaceans that consume algae and serve as a food source for fish, such as *Daphnia* species, appear to be the most sensitive to diflubenzuron, while larger insect species, such as backswimmers and scavenger beetles, are much less sensitive. Other aquatic invertebrates, crustaceans, and small- to medium-sized aquatic insect larvae appear to have intermediate sensitivities.

Snails, aquatic worms, and bivalves were not affected by exposure to diflubenzuron (Hansen and Garton 1982; Surprenant 1989).

Field studies on the effects of diflubenzuron on aquatic invertebrates reinforce the standard toxicity studies, indicating diflubenzuron will impact invertebrate populations. Several of these studies, however, were conducted at application rates substantially higher than those used to control the gypsy moth. Many of the studies in which severe adverse effects were observed in aquatic invertebrate populations involved multiple applications at rates between about 110 g/ha and 560 g/ha (Ali and Mulla 1978a, b; Ali and others 1988; McAlonan 1975). Concentrations in this range are substantially higher than the application rate of 17.5 g/ha that is likely to be encountered in USDA programs. Similarly, other field studies involve direct applications to open water, a treatment method that is not part of USDA program activities, and which resulted in concentrations of diflubenzuron in water in the range of 10 ppb (Apperson and others 1977, Boyle and others 1996, Colwell and Schaefer 1980, Lahr and others 2000, Sundaram and others 1991).

Diflubenzuron reduces numbers of stream invertebrates that process detritus; however, field studies have shown no decline in detrital decomposition rates (Swift and others 1988). The populations of some invertebrates that feed on algae are reduced by diflubenzuron. An increase in algae could occur after the loss of algal herbivores, however, this has not been observed in field studies.

Field studies using lower application rates that are more typical of USDA gypsy moth management programs noted some effects on freshwater invertebrates, particularly smaller crustaceans (Farlow 1976; Griffith and others 1996, 2000; Hurd and others 1996; Reardon 1995). The effects were much less severe than those seen at higher application rates. See Section 4.4 of Appendix I for further discussion.

Cumulative Effects of Diflubenzuron.

Risk to Human Health (Issue 1).

Diflubenzuron is not likely to be used with other treatments at the same site, so no cumulative effects with other treatments are likely. Multiple applications at lower rates per application result in lower associated risks than with a single application at the maximum approved rate.

Diflubenzuron and tebufenozide could have a cumulative effect on methemoglobinemia. USDA gypsy moth management programs do not use these two chemicals together in the same area at the same time. Exposure to other methemoglobinemia-inducing compounds in the environment may contribute to a

cumulative effect. Individuals exposed to combustion smoke or carbon monoxide (agents causing oxidative damage to blood) may be at increased risk of developing methemoglobinemia. Individuals exposed to high levels of nitrates, either in air or in water, demonstrate increased levels of methemoglobin and may be at increased risk with exposure to compounds such as diflubenzuron.

Some infants with congenital methemoglobinemia and an intolerance to cow's milk or soy protein exhibit methemoglobinemia. These infants would be at increased risk if exposed to any materials contaminated with diflubenzuron.

Risk to Nontarget Organisms (Issue 2).

Diflubenzuron is generally not used in conjunction with other treatments; however, diflubenzuron might be applied to the same area in multiple years for eradication projects. In that case, diflubenzuron might have a cumulative effect on nontarget invertebrates, such as caterpillars of moths and butterflies, grasshoppers, parasitic wasps, aquatic insects, bottom dwelling crustaceans, and immature free-floating crustaceans. Diflubenzuron applications as used in USDA treatment projects will otherwise have no cumulative effects.

4.6 Consequences of Disparlure (as Used in Mating Disruption and Mass Trapping) (Alternatives 1, 2, 3).

See Appendixes H and M for detailed analysis of risks associated with disparlure as used in mating disruption and mass trapping.

In mating disruption, a medium is impregnated with disparlure for timed release and formulated for aerial application over the project area. The objective is to flood the area with pheromone, thereby impeding the male moth's ability to find and mate with female moths. Also, in mass trapping, a solid medium is impregnated with disparlure, formulated for timed release, and deployed in small "delta" or large capacity "milk carton" traps. The traps are deployed across the treatment area to attract and capture male moths, thereby preventing them from finding and mating with female moths. The delta and milk carton traps are also used in detection surveys for gypsy moth.

General Effects of Disparlure.

Disparlure is specific to the gypsy moth and may indirectly help to maintain existing forest conditions, water quality, microclimate, and soil condition by delaying increases in gypsy moth populations, thereby protecting tree foliage.

Risk to Human Health (Issue 1).

General.

Insect sex pheromones are chemicals produced by insects for communication between the sexes of the same species. Insect pheromones are generally regarded as nontoxic to mammals and are commonly employed in very low concentrations. Consequently, the U.S. EPA requires less rigorous testing of these products than is required of chemical insecticides. Results of acute exposure studies for oral, dermal, ocular, and inhalation exposure to disparlure reveal no adverse effects. Based on the results of studies on disparlure itself (i.e., the active ingredient), acute exposure to disparlure exhibits very low toxicity to mammals.

No studies were identified investigating the effects of chronic exposure of mammals to disparlure or investigating the effects of disparlure on the nervous, immune, reproductive or endocrine systems of mammals. The carcinogenic potential of disparlure has not been assessed, though a single study focusing on mutagenicity revealed no indication that disparlure is mutagenic. No information is available regarding the kinetics and metabolism of disparlure in mammals; available literature does not document absorption

of disparlure following dermal, oral, or inhalation exposure. A case report of an occupational exposure indicates that disparlure may persist in humans for years (Cameron 1981, 1983).

Although studies on the acute toxicity of disparlure have been conducted in laboratory animals, the lack of either subchronic or chronic toxicity data precludes a quantitative characterization of risk.

Groups at Special Risk.

The toxic effects of disparlure, if any, have not been identified. Consequently, groups at special risk cannot be characterized.

Risk to Nontarget Organisms (Issue 2).

Mammals.

Results of acute toxicity studies for oral, dermal, ocular, and inhalation exposure to disparlure demonstrate very low toxicity to mammals. Information is not available regarding chronic toxicity, and no field studies exist assessing the impact of disparlure on mammals.

Birds.

There is no evidence that birds are affected by USDA treatment projects using disparlure.

Terrestrial Invertebrates.

Disparlure does not attract any other insect found in North America.

Fish.

Limited data are available regarding the toxicity of disparlure to aquatic animals. A major issue in the interpretation of the aquatic toxicity data on disparlure involves the solubility of disparlure in water. While no measured values are available, estimates based on quantitative structure-activity relationships developed by the U.S. EPA suggest that the solubility of disparlure in water is in the range of 0.0019 to 0.0028 mg/L (Appendix H). No risks to fish can be identified under foreseeable circumstances in the use of disparlure formulations.

Aquatic Invertebrates.

As with fish, disparlure does not appear to pose a risk to aquatic invertebrates due to inherent toxicity. At the limit of the solubility of disparlure in water, there is no indication that toxic effects are likely in any aquatic species (Appendix H). Based on the variability in the experimental data as well as the range of application rates used in USDA programs, HQs would vary from about 0.15 to about 0.37 below the level of concern by factors of about 3 to 10. This risk characterization applies to accidental application of disparlure to a body of water 1 meter deep. The HQ will vary with the depth of the water. Since the calculations are based on a 1-meter-deep body of standing water, the HQ would be a factor of 10 lower in a 10-meter-deep body of standing water and a factor of 10 higher in a 0.1-meter-deep body of standing water. In actual field applications using Disrupt II flakes, water bodies such as lakes and rivers are never directly treated with flakes, and levels of exposure in moving water would be magnitudes lower than the calculated static level, providing an even greater margin between exposure and potential toxicity. Further, control tests using the untreated carrier products (small plastic flakes) showed no toxicity.

In summary, the application of disparlure in mating disruption is unlikely to affect aquatic invertebrates.

Cumulative Effects of Disparlure.

Risk to Human Health (Issue 1).

Since disparlure seems to persist in humans, repeated exposures of disparlure will attract the gypsy moth. No information is available on the interaction of disparlure with other control agents or other chemicals usually found in the environment.

Risk to Nontarget Organisms (Issue 2).
Since disparlure attracts only the gypsy moth in North America, no cumulative effects are expected on nontarget organisms.

4.7 Consequences of Dichlorvos (as Used in Mass Trapping) (Alternatives 1, 2, 3).

See Appendixes K and M for detailed analysis of risks associated with the use of dichlorvos in mass trapping. Appendix A provides an in-depth discussion of how dichlorvos is used in mass trapping. Dichlorvos is *not* a distinct treatment in the USDA gypsy moth management program. It is simply an insecticide (formulated in a vinyl strip as a killing agent) used in the large-capacity milk carton trap, which can be deployed for mass trapping of male gypsy moths in a project area. This same kind of milk carton traps (with dichlorvos) are also used in gypsy moth surveys. Without this insecticide in the traps, the male gypsy moths that are attracted to traps (by disparlure) would simply fly back out.

Milk carton traps with dichlorvos have not been used for mass trapping since 1997 and only twice between 1993 and 1997, where no more then 50 acres were treated. Each year for surveys APHIS deploys approximately 19,000 milk carton traps with dichlorvos pest strips. The Forest Service's slow-the-spread strategy also uses milk carton traps for surveys.

General Effects of Dichlorvos.

Because dichlorvos is used inside traps, no effect on human health and nontarget organisms is expected. A person or animal would have to deliberately eat the resin strip. In the entire history of USDA use of traps containing dichlorvos, such an accidental or deliberate action has not been encountered.

Risk to Human Health (Issue 1).

General.
Dichlorvos is readily absorbed into the body of mammals via all routes of exposure, and is rapidly metabolized and eliminated. Generally, the systemic effects observed after oral, inhalation, or dermal exposure of humans or laboratory animals to dichlorvos result from the inhibition of acetylcholinesterase (AChE). The enclosed nature of milk carton traps containing dichlorvos minimizes the chance that people will come into contact with it. In a risk assessment of the carcinogenic and mutagenic potential of diclorvos, EPA decided "The carcinogenicity potential of Diclorovos has been classified as 'suggestive' under the 1999 Draft Agency Cancer Guidelines and no quantitative assessment of cancer risk is required." (Section 3.1.10 of Appendix K).

Exposure of both workers and members of the general public should be negligible in most cases. Workers taking prudent steps to limit both dermal and inhalation exposures can minimize the likelihood of exposure to dichlorvos. Similarly, exposure of the general public to substantial amounts of dichlorvos is unlikely. The dichlorvos is contained within a PVC strip to ensure the active ingredient is released slowly over time. The strip, in turn, is placed within a trap and the trap is placed so that it will not be accessed except in the case of intentional tampering or trap monitoring.

The greatest risks for workers are associated with inhalation exposures from assembling the traps in enclosed and poorly ventilated spaces, or while transporting the traps in the passenger compartments of vehicles. These risks are readily avoided. Dermal exposures are usually at lower levels than inhalation exposures.

All of the exposure scenarios for members of the general public described in Appendix K are accidental. Should a child come into contact with a dichlorvos strip, both dermal and oral exposures (if a child ate the

strip) could substantially exceed a level of concern. See Appendix K for additional dichlorvos information and risk assessment scenarios.

Groups at Special Risk.

Children are of primary concern as identified in the risk assessment (Appendix K). As noted above, imprudent handling of a dichlorvos-impregnated strip would most likely involve a child. Additionally, very young children (infants less than 6 months old) may be at special risk because of their incompletely developed AChE systems and immature livers (ATSDR 1993).

Several other groups may be at special risk to all cholinesterase-inhibiting compounds, including dichlorvos. A small proportion of the population has an atypical variant of plasma cholinesterase that may make them more susceptible to effects when exposed to dichlorvos and other AChE inhibitors. Other groups known to have low plasma AChE levels are long-distance runners, women in early stages of pregnancy, women using birth control pills, individuals with advanced liver disease, alcoholics, individuals with poor nutritional status, and individuals with skin diseases. Asthmatics may also be at special risk because dichlorvos may induce or exacerbate respiratory distress (ATSDR 1993).

Risk to Nontarget Organisms (Issue 2).

Exposure would be accidental since dichlorvos is used inside traps.

Mammals.

The principal adverse effects of dichlorvos exposure are directly related to inhibition of cholinesterase. In the USDA program for the control of the gypsy moth, the use of milk carton traps employing slow release of dichlorvos from PVC strips essentially precludes rapid exposures to high doses of dichlorvos.

Birds.

No published data is available concerning the acute toxicity of dichlorvos encased in PVC resin to birds.

Terrestrial Invertebrates.

The only terrestrial invertebrates likely to come into close contact with the dichlorvos strip are male gypsy moths attracted by the disparlure in the trap, or carnivorous wasps and hornets that may enter the trap to feed on dead and dying gypsy moths.

Fish.

There is no indication fish are likely to be adversely affected by dichlorvos as used in PVC strips (Section 4.4.3.1, Appendix K). However, dichlorvos itself is classified as highly toxic to both freshwater and estuarine fish (U.S. EPA 1999a). See Appendix K for comprehensive information.

Aquatic Invertebrates.

Based on the same conservative exposure assessment used for both fish and terrestrial vertebrates, some sensitive aquatic invertebrates could be adversely affected by dichlorvos contamination of water if a trap is intentionally thrown into water. As in the other exposure assessments developed in Appendix K involving contaminated water, this exposure scenario should be regarded as an extremely rare accident rather than routine. Under normal circumstances, water contamination from dichlorvos strips is negligible and consistent with the conclusions reached by U.S. EPA (1999a).

Cumulative Effects of Dichlorvos.

Risk to Human Health (Issue 1).

The only substantial exposures to the general public would occur from repeated tampering with traps containing dichlorvos. No such incidents have been reported, despite the long use of dichlorvos in traps for the gypsy moth and other species.

Workers may be exposed repeatedly to dichlorvos if they are involved in the assembly and placement of traps over a period of several weeks. No data exists regarding the effects of exposure to dichlorvos in combination with exposure to the other agents used to control the gypsy moth or to the gypsy moth itself. Inhibition of AChE is the most sensitive effect of dichlorvos; this effect is not associated with exposure to the other control agents or to the gypsy moth. Therefore, there is no plausible basis for assuming that the effects of exposure to dichlorvos and any or all of the other control agents or the gypsy moth are additive.

Risk to Nontarget Organisms (Issue 2).

Experience with traps used in mass trapping and survey programs shows that there are no cumulative effects on nontarget organisms even over years of use.

4.8 Consequences of Gypchek (Alternatives 1, 2, 3).

See Appendixes G and M for detailed analysis of risks associated with Gypchek.

General Effects of Gypchek.

Gypchek may indirectly help to maintain existing forest condition, water quality, microclimate, and soil condition by delaying increases in gypsy moth populations, thereby protecting tree foliage.

Risk to Human Health (Issue 1).

General.

According to Appendix G, there is no plausible risk to either workers or members of the general public from the use of Gypchek to control the gypsy moth.

Groups at Special Risk.

No groups at special risk are identified. Some individuals may be allergic to gypsy moth parts found in Gypchek.

Risk to Nontarget Organisms (Issue 2).

Mammals.

Except for eye irritation, there is little indication that NPV or the Gypchek formulation of NPV has any effect in mammals, even at extremely high levels of exposure. One study specifically focused on wildlife conducted by Lautenschlager and others (1977), exposed mice, short-tailed shrews, and opossums to various forms of NPV (gypsy moth larvae infected with NPV, a purified formulation of NPV, and a spray preparation of NPV). Based on gross observations, as well as necropsy and microscopic examination of several different tissues, no effects were seen in any of the species.

Birds.

Few studies are available on birds, and the results of these studies are essentially identical to those on mammals. The studies indicate exposures to NPV at levels that are substantially higher than those likely to occur in the environment are not associated with any adverse effects (Podgwaite and Galipeau 1978, Lautenschlager and others 1976).

Terrestrial Invertebrates.

Barber and others (1993) found no indication that NPV is pathogenic to any insect species except the gypsy moth. No adverse effects were observed in any species tested. Additionally, a recent field study noted no effects in nontarget insects following the application of Gypchek (Rastall and others 2003). There is no indication that adverse effects are caused in nontarget insects at any level of exposure.

Fish.

Two studies are available on the toxicity of NPV to fish (Moore 1977, Kreutzweiser and others 1997). The results of both studies show no toxicity in rainbow trout, no effects on mortality, behavior, or growth rate, and no viable NPV detected in the stomach or intestinal tract.

Aquatic Invertebrates.

No effects on mortality or reproduction were observed over exposure periods of up to 4 weeks (Streams 1976).

Cumulative Effects of Gypchek.

Risk to Human Health (Issue 1).

Exposure to both the gypsy moth caterpillars and Gypchek could be additive, although there are no data showing this occurs and Gypchek treatments would eliminate the caterpillars.

Risk to Nontarget Organisms (Issue 2).

Since Gypchek is specific to the gypsy moth, no cumulative effects are expected for nontarget organisms.

4.9 Consequences of Tebufenozide (Alternatives 2 and 3).

See Appendixes J and M for detailed analysis of risks associated with tebufenozide.

The use of tebufenozide to manage the gypsy moth may adversely affect nontarget Lepidoptera. There is little indication that humans or other wildlife species will be adversely affected under normal conditions of use, even at the highest application rate (see the full analysis of tebufenozide in Appendix J). *Table 4-2* provides hazard quotients (HQ) for tebufenozide and the other treatments and gypsy moth.

General Effects of Tebufenozide.

Tebufenozide may indirectly help to maintain existing forest conditions, microclimate, and soil condition by delaying increases in gypsy moth populations, thereby protecting tree foliage. Although tebufenozide is not highly mobile in soil, it may be transported by percolation, sedimentation, or runoff from soil to ambient water. Tebufenozide would not be sprayed over water or areas where surface water is present, and buffers will be maintained around these areas. See Appendix J for additional information on tebufenozide and water quality.

Risk to Human Health (Issue 1).

General.

A relatively detailed and consistent series of studies in mice, rats, and dogs indicates that the primary mechanism of tebufenozide toxicity in mammals involves effects on the blood, specifically the formation of methemoglobin. Tebufenozide does not appear to be carcinogenic and does not appear to cause birth defects. Nonetheless, the compound is associated with adverse reproductive effects in experimental mammals. Tebufenozide itself does not seem to be irritating to the skin or eyes. As discussed in the exposure assessment in Appendix J, dermal absorption is the primary route of exposure for workers. Data regarding the dermal absorption kinetics of tebufenozide are not available in the published or unpublished literature. Potential inhalation toxicity of the compound is not of substantial concern in the risk assessment in Appendix J.

At the maximum application rate, two applications at 0.12 lb (pounds) a.i./acre spaced 3 days apart, there is little indication that adverse effects on human health are likely. The risk assessment at Appendix J suggests, however; that two applications at 0.08 lb a.i./acre or more should be avoided in areas where members of the general public might consume contaminated fruits or other contaminated vegetation.

Groups at Special Risk.

Individuals born with a form of congenital methemoglobinemia may be at increased risk of adverse effects to compounds like tebufenozide that induce methemoglobinemia (Centa and others 1985, Das Gupta and others 1980). Some infants with an intolerance to cow's milk or soy protein exhibit methemoglobinemia. Infants less than 3 months old have lower levels of methemoglobin (cytochrome b5) reductase and higher levels of methemoglobin (1.32 percent) in comparison with older children or adults (Centa and others 1985, Smith 1996). A similar pattern is seen in many species of mammals (Lo and Agar 1986).

Risk to Nontarget Organisms (Issue 2).

Under normal conditions of use at the highest anticipated application rate, no effects are expected in any group of organisms: vertebrates, invertebrates, or plants.

Mammals.

everal standard toxicity studies in experimental mammals were conducted as part of the registration process for tebufenozide. The most sensitive effect in several species of experimental mammals involves effects on the blood, specifically the formation of methemoglobin.

The acute toxicity of tebufenozide is relatively low, with an oral LD_{50} greater than 5,000 mg/kg. The subchronic and chronic toxicity studies on tebufenozide were conducted in dogs, mice, and rats, with the most sensitive effects involving changes to the blood. There is no apparent dose-duration relationship for tebufenozide; short-term exposures are likely to lead to changes in the blood comparable to those observed following longer-term exposures (Appendix J).

Birds.

Toxicity studies have been conducted on the acute toxicity and reproductive effects of tebufenozide in birds, and a field study is available on reproductive effects. The acute toxicity of tebufenozide is low for birds (Appendix J).

Reproduction studies were conducted in mallard ducks (Beavers and others 1993a) and bobwhite quail (Beavers and others 1993b, Reinert 1995a). Dietary concentrations less than or equal to 1,000 ppm tebufenozide did not cause reproductive effects in mallard ducks. In the quail studies results are inconsistent. In a study by Beavers and others (1993b), reproductive effects included reduced number of eggs laid, viable embryos and 14-day-old survivors at dietary concentrations of 300 and 1,000 ppm, but not at 100 ppm. A similar study yielded no substantial dose-related effects in quail exposed to dietary concentrations of up to 615 ppm (Reinert 1995a).

A field study on the reproductive performance of Tennessee warblers (*Vermivora peregrina*) in forests treated with tebufenozide has been published (Holmes 1998). In this study, tebufenozide was applied twice at a rate of approximately 0.06 lb a.i./acre with a 4-day interval between applications, in a forest area in Ontario, Canada. Reproductive parameters assayed included number of eggs laid, percent hatch, and growth of the hatchlings as compared with an untreated control plot. A total of six nests were observed in the control plot, and five nests were treated with tebufenozide in the test plots, with no statistically significant adverse effects noted. However, there were decreases in both the average number of eggs per nest (6.3 in the control area and 5.8 in the treated area) as well as the percent hatch (97.4 percent in the control area and 89.7 percent in the treated area). The small sample sizes result in a low statistical power, and the results are "suggestive, although not necessarily compelling, that reproductive parameters were consistently lower in the treated blocks than in the control block" (Holmes 1998, p. 191). Some

differences in adult behavior were observed in the plot treated with tebufenozide, such as an increase in foraging time and an associated decrease in brooding time. This suggests that the primary effect on the birds may have been a decrease in food abundance.

This field study by Holmes (1998) combined with the bobwhite quail assay conducted by Beavers and others (1993b) raise concern that tebufenozide could cause adverse reproductive effects in birds. This concern is addressed quantitatively in the risk assessment in Appendix J for exposures involving the consumption of contaminated vegetation, fish, and insects.

Terrestrial Invertebrates.

While tebufenozide will be specifically used by the USDA Forest Service for the control of the gypsy moth, tebufenozide is effective in controlling other pest species, including the apple bud moth (*Platynota idaeusalis*) (Biddinger and others 1998), various species of spruce budworm (Payne and others 1997; Retnakaran and others 1997a, b), and the Indian-meal moth (*Plodia interpunctella*) (Oberlander and others 1998). A complete list of the pest species for which tebufenozide is specified is provided in U.S. EPA (1999e).

The toxicity of tebufenozide has been assayed in several species, and the mechanism of action of tebufenozide in target insects is relatively well understood. Tebufenozide mimics the action of the invertebrate hormone 20-hydroxyecdysone, which controls molting in insects and various terrestrial and aquatic invertebrates by binding to species-specific ecdysone receptors present in the cytoplasm of epidermal cells (Addison 1996, Keller 1998, Smagghe and Degheele 1994a, U.S. EPA 1999e).

While 20-hydroxyecdysone is a hormone common to many invertebrates, the effectiveness of tebufenozide in mimicking 20-hydroxyecdysone activity seems to vary among orders and species of invertebrates. Although the specificity of tebufenozide is not addressed in detail in the recent U.S. EPA (1999e) ecological risk assessment, it was reviewed in detail by Rohm and Haas (Keller 1998). That review is consistent with publications in the open literature relating to species specificity of tebufenozide (Addison 1996; Biddinger and Hull 1995; Biddinger and others 1998; Brown 1996; Butler and others 1997; Dhadialla and others 1998; Rumpf and others 1998; Smagghe and others 1996; Valentine and others 1996). In general, Lepidoptera are sensitive to tebufenozide, but other insects are much less sensitive (Smagghe and Degheele 1994a). The differing levels of sensitivity appear to be related to differences in ecdysone receptor binding (Smagghe and others 1996) rather than differences in pharmacokinetics (Smagghe and Degheele 1994b).

There are four studies regarding the effects of tebufenozide on terrestrial invertebrates under field or field-simulation conditions. Three of these studies are published (Addison 1996, Butler and others 1997b, Valentine and others 1996), and one is an unpublished study conducted by Rohm and Haas (Walgenbach 1995). The studies by Addison (1996) and Butler and others (1997b) are most directly relevant to the risk assessment in Appendix J, because they assayed the effects on nontarget invertebrates in the forest canopy (Butler and others 1997b) and forest soil (Addison 1996) after the application of tebufenozide.

In the study by Addison (1996), tebufenozide was incorporated into forest soil at a concentration of 72.1 ppm. Based on a typical application rate of 70 g/ha and the assumption that tebufenozide will remain in the top 2 cm of soil, Addison (1996) estimated that the soil concentration of 72.1 ppm is equivalent to a concentration that is 100 times greater than expected environmental concentrations. There were no adverse effects on one species of earthworm (*Dendrobaena octaedra*) or on four species of Collembola (*Folsomia candida, Folsomia nivalis, Onychiurus parvicornis, and Hypogastrura pannosa*), which are indigenous to forest soils in Canada and the northern United States.

Consistent with results of the Addison (1996) study, a standard bioassay on earthworms (*Eisenia foetida*) noted no adverse effects at soil concentrations of up to 1,000 ppm over a 14-day exposure period (Garvey 1992).

Butler and others (1997b) conducted a study on canopy arthropods in which tebufenozide was applied at rates of 0.03 and 0.06 lb a.i./acre to a mixed oak plot in Ohio. The investigators examined the efficacy of tebufenozide against gypsy moth larvae and its effects on nontarget arthropods. Population assays included measures of abundance and diversity in 10 arthropod families and 15 lepidopteran species. A decrease in abundance was noted in some lepidopteran species, while no effects on abundance or richness were noted in any organisms other than lepidopteran species.

The studies by Valentine and others (1996) and Walgenbach (1995) involve the application of tebufenozide formulations to apple orchards. Tebufenozide had no effects on species of mites, spiders, various beetles (Coleoptera), and true bugs (Hemiptera), after being applied to apple orchards at rates effective in controlling lepidopteran pest species (Valentine and others 1996). Similarly, Walgenbach (1995) noted no effects on beneficial insect populations. These two studies support the general conclusion that tebufenozide is likely to have an adverse impact on Lepidoptera, but not on nonlepidopteran species.

Fish.

Information on the toxicity of tebufenozide to fish is summarized in Appendix J. All of the available studies were conducted in support of the registration of tebufenozide and submitted to the U.S. EPA.

The acute toxicity of tebufenozide to fish is relatively low with LC_{50} values of 3.0 mg a.i./L in bluegill sunfish (Graves and Smith 1992b) and 5.7 mg a.i./L in rainbow trout (Graves and Smith 1992c). There is greater concern, however, regarding the potential chronic toxicity of tebufenozide to fish. The U.S. EPA evaluates all studies like those summarized in Appendix J to determine whether the conclusions are consistent with the data, and in many instances the U.S. EPA accepts the study conclusions. For tebufenozide, however, the U.S. EPA has disagreed with conclusions for a fathead minnow egg and fry study as well as a fathead minnow full life cycle study. This disagreement is discussed further in the dose-response assessment (section 4.3.3.1 of Appendix J).

Aquatic Invertebrates.

Unpublished studies on the toxicity of tebufenozide to aquatic invertebrates submitted to the U.S. EPA in support of the registration of tebufenozide are summarized in Appendix J. Some invertebrate assays were conducted in support of the registration of tebufenozide, and the summaries of these studies in Appendix J are based on a review of the full text copies of the studies submitted to the U.S. EPA. Additional studies published in the open literature are discussed below. Unlike some of the fish studies, the studies on aquatic invertebrates, summarized in Appendix J, were accepted without exception by the U.S. EPA (1999e).

In the studies submitted for registration, the acute toxicity of tebufenozide to *Daphnia* (Crustacea) and midges (Insecta) is on the same order as that for fish, with a 48-hour LC_{50} value of 3.8 mg/L for daphnids (Graves and Smith 1992a) and a 96-hour LC_{50} value of 0.3 mg/L for midge larvae (van der Kolk 1997). Similarly, a study published in the open literature and sponsored by the U.S. Geological Survey, reported higher LC_{50} values for Crustacea (17.37 mg/L for *Daphnia* and 5.53 mg/L for *Artemia*) than for two species of mosquitoes (0.92 mg/L for *Aedes aegypti* and 0.15 mg/L for *Aedes taeniorhynchus*) (Song and others 1997).

Kreutzweiser and Thomas (1995) assayed the effects of tebufenozide on aquatic invertebrate communities in lake enclosures. A dose-related decrease in cladoceran

abundance was noted, persisting for 1-2 months at the two lower concentrations and for 12-13 months at the two higher concentrations. The decrease in cladoceran abundance was accompanied by an increase in the abundance of rotifers, suggesting that the changes in community structure could be attributable to secondary or trophic effects rather than to toxicity.

Rohm and Haas summarized the results of several field studies or field simulation studies (Kreutzweiser and others 1994, 1995) regarding the effects of tebufenozide to aquatic invertebrates (Keller 1998).

Cumulative Effects of Tebufenozide.

Risk to Human Health (Issue 1).

Tebufenozide and diflubenzuron could have a cumulative effect on methemoglobinemia. USDA gypsy moth management programs do not use these two chemicals together in the same area at the same time; however, tebufenozide might be applied to the same area in multiple years for eradication projects. These multiple applications of tebufenozide over a period of time may increase the potential risk of methemoglobinemia. Exposure to other methemoglobinemia-inducing compounds in the environment may contribute to a cumulative effect. For example, individuals exposed to combustion smoke or carbon monoxide (agents causing oxidative damage to blood) in addition to exposure to tebufenozide may be at increased risk of developing methemoglobinemia. Individuals exposed to high levels of nitrates, either in air or in water, demonstrate increased levels of methemoglobin and may be at increased risk with exposure to compounds such as tebufenozide.

Risk to Nontarget Organisms (Issue 2).

Tebufenozide generally would not be used in conjunction with other treatments; however, it might be applied to the same area in multiple years for eradication projects. Generally these areas are small (usually no more than 5,000 acres). Tebufenozide might have a cumulative effect on nontarget caterpillars of moths and butterflies by potentially reducing their populations, but it will not affect other aquatic and terrestrial species as used in USDA gypsy moth treatment projects.

4.10 Consequences of Adding a New Treatment Under Alternative 3.

At this time a prediction can not be made as to what new treatments might become available in the future for the gypsy moth. Given the protocol built into Alternative 3 (see Chapter 2), the effects and cumulative effects associated with any treatment(s) would pose no greater risk to human health and nontarget organisms than are disclosed in this draft SEIS for the currently approved treatments and for tebufenozide.

4.11 Summary of Effects Including Cumulative Effects.

Risk to Human Health (Issue 1).

General.

During a gypsy moth outbreak, people are exposed to large numbers of gypsy moths and experience skin and eye irritation and respiratory system effects, sometimes to the extent that they may seek medical treatment. Although both *B.t.k.* and Gypchek may also cause these effects, these irritations most likely will be less intense than irritations from a gypsy moth outbreak. No other human health effects are plausible for Gypchek; for disparlure, no human health risks could be identified, the only effect being the nuisance of male moths attracted to people working with traps that contain the female gypsy moth sex pheromone, disparlure.

No human health effects are likely from exposure to diflubenzuron and tebufenozide at application rates used in USDA gypsy moth projects. With very high exposures, increases in methemoglobin, an abnormal blood pigment that reduces the oxygen-carrying capacity of the blood, might be detectable for both insecticides. Should high application rates (0.12 lbs/acre in two applications 3 days apart) of tebufenozide be used, ingestion of tebufenozide becomes a concern (for example, on contaminated fruit; the upper range for the HQ of 1.5 is for long-term consumption of fruit; see *Table 4-2*). Applications at these high levels are not likely to occur for USDA projects.

The risk posed by dichlorvos is greatest for people who might tamper with traps and receive high levels of dermal exposure, or who might ingest the insecticide strip contained in the trap (*Table 4-2).* The upper range of the HQ of 380 depicts a child ingesting a dichlorvos strip; this scenario has never been encountered in USDA projects.

Cumulative Effects.

Repeated defoliation over successive years by gypsy moth caterpillars increases the potential exposure and subsequent skin, eye, and respiratory reactions. All of the treatments would reduce this risk over time. Diflubenzuron and tebufenozide both evoke the formation of methemoglobin; however, these treatments would not be utilized at the same time in the same area. Improper handling of dichlorvos poses a cumulative risk to workers, especially if ventilation is inadequate and proper handling procedures are not followed.

Risk to Nontarget Organisms (Issue 2).

General.

Other than effects on trees, current data and literature on the gypsy moth reveal only minor effects on other terrestrial and aquatic organisms; studies were in many cases of short duration and evaluated only a segment of the ecosystem or only a few species. There is a general lack of long-term, multi-year studies measuring over decades the impact of the gypsy moth on ecosystems and terrestrial and aquatic species and systems.
This deficiency of extended studies may mask and underestimate the long-term impacts of gypsy moth on terrestrial and aquatic systems. Gypchek, mass trapping (dichlorvos), and disparlure have no long- or short-term effects on nontarget terrestrial species (all hazard quotients are less than 0.01, see *Table 4-2).* Gypchek and dichlorvos in USDA treatment projects do not affect aquatic nontarget organisms. The highest calculated disparlure hazard quotient in any aquatic organism is 0.37 (some small aquatic invertebrates). Under normal conditions of USDA gypsy moth management projects, disparlure is not expected to impact aquatic organisms.

B.t.k. applications impact certain spring-feeding butterflies and moths. Many lepidopteran species are not affected, especially those not present in the treated foliage and species arriving in treatment areas after the *B.t.k.* has disappeared from the foliage.

Compared with any of the other treatments, diflubenzuron affects a greater variety of terrestrial and aquatic nontarget species: moths and butterflies, grasshoppers, parasitic wasps, aquatic insects, bottom-dwelling crustaceans, and immature free-floating crustaceans (*Table 4-2*).

Tebufenozide affects only Lepidopterans, having no other expected significant effect on other terrestrial species or aquatic invertebrates (*Table 4-2*). There is no expectation that tebufenozide would be used at the highest application rates in USDA treatment projects; as a result the hazard quotient derived from a mammal eating contaminated fruit is likely to be lower than 1.5 (*Table 4-2*).

Cumulative Effects.
Repeated spraying with *B.t.k.*, diflubenzuron, or tebufenozide is likely to decrease lepidopteran species populations if the same areas are sprayed over 2 or more years. An expected result of cumulative impact on sensitive lepidopteran species from repeated annual spraying with any of these treatments is reasonable, as is the expectation that repeated annual spraying with diflubenzuron would have a cumulative impact on aquatic organisms if this insecticide reached aquatic ecosystems.

4.12 Operational Flexibility of Treatments.

For example, in order to minimize possible effects on threatened and endangered species that may be present in areas proposed for treatment, Gypchek, mass trapping, and mating disruption (where appropriate) could be selected instead of using *B.t.k.*, diflubenzuron, or tebufenozide.

Tebufenozide (Alternative 2) provides the USDA gypsy moth management program with an additional treatment option that may prove useful for reducing the threat posed by gypsy moth outbreaks. Alternative 3 affords the greatest flexibility to the USDA gypsy moth management program.

4.13 Unavoidable Adverse Effects.

Since this draft SEIS is programmatic in nature, no unavoidable adverse effects were identified for any of the alternatives. Any adverse effects that might occur would be identified and addressed in environmental analyses at the site-specific project level.

4.14 Short-Term Uses and Long-Term Productivity.

The National Environmental Policy Act (NEPA) requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" [42 U.S.C. 4322 (2)(C)]. As declared by the Congress, this relationship includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The gypsy moth threatens the forest resources in the United States both in the short and long term, as described in Section 4.3 and in Appendix L. Each alternative provides treatments to lessen and delay the impacts of the gypsy moth on these forest resources. Alternative 2 provides an additional treatment and increased operational flexibility for gypsy moth treatment projects. Alternative 3 provides the greatest operational flexibility for gypsy moth treatment projects. Although the treatments may have short-term effects as outlined in Sections 4.4 – 4.9 and Table 4-2, no long-term effect could be identified--except for B.t.k. where sensitive spring lepidopteran species may take longer to recover. Mitigation measures at the site-specific project level will reduce the short- and long-term impacts of the treatments for each of the alternatives.

4.15 Measures to Mitigate Adverse Environmental Impacts.

Given the variety of places and circumstances where gypsy moth projects could be implemented, it will be necessary to develop and implement specific mitigation measures for each project. Mitigation measures will be developed and implemented on a site-specific basis for each project based on local conditions and concerns. See Chapter 2 for mitigation measures.

4.16 Urban Quality, Historic and Cultural Resources, and Design of the Built Environment.

In-depth, site-specific project environmental analyses will be performed for individual projects, as this draft SEIS is programmatic in nature.

4.17 Energy Requirements and Conservation Potential of Various Alternatives.

All of the alternatives involve energy use, primarily aviation fuel used by aircraft and helicopters for treatment application. Designing spray blocks for efficiency reduces flight time and conserves fuel.

4.18 Natural or Depleted Resource Requirements and Conservation Potential of Various Alternatives.

All alternatives reduce the impact of the gypsy moth on forest resources in protecting forests from gypsy moth outbreaks that may cause tree mortality. Other than the use of air space over treatment areas, with the short-term impacts of aviation noise and limitation of public use during application, no inherent natural or cultural resource requirements exist for the three alternatives. Impacting factors for specific projects will be addressed with site-specific environmental analyses.

4.19 Irreversible and Irretrievable Commitments of Resources.

Irreversible and irretrievable commitments of resources due to the presence of the gypsy moth, defoliation, and specific treatments occur at the project level and are disclosed through site-specific analyses.

4.20 Other Required Disclosures.

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with … other environmental review laws and executive orders."

Because this draft SEIS is programmatic in nature, the Forest Service and APHIS will ensure that site-specific consultations will be done as necessary at the project level for the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and any other laws, regulations, executive orders, and agency policies that apply.

Chapter 5
Preparers and Contributors

Figure 5-1. Civilian Conservation Corps workers traveled by truck to perform gypsy moth field work.

Chapter 5 Preparers and Contributors

Contents

5.1 Preparers....1
Interdisciplinary Team....1
Human Health and Ecological Risk Assessment Contractor....2
5.2 Contributors....2
Management Group....2
Individuals....2
5.3 Information Management and Analysis Staff....4

Figure

Figure 5-1. Civilian Conservation Corps workers traveled by truck to perform gypsy moth field work....Cover

Individuals listed as preparers were responsible for developing the content of this document. Contributors shared information and expertise. Those named under Information Management assembled the document, posted material on the Web, and managed supporting information.

5.1 Preparers.

Interdisciplinary Team

Joseph L. Cook Supervisory Entomologist and SEIS Team Leader, USDA Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA.

Three years with the Forest Service and a total of 32 years of government service to various agencies and military branches, including the Navy, Army and Marine Corps. Positions held in the fields of natural resources, fisheries, marine biology, forestry, pest management, entomology, wildlife biology, cultural resources management, environmental management and planning. Participated in National Environmental Policy Act document preparation, implementation and administration at the local, regional and national level in a variety of assignments both in the United States and overseas. Served in the U.S. Army (active and reserve) as a Medical Entomologist. Academic degrees include a B.S. in Natural Resources from the University of Michigan in 1970, M.S. in Entomology (Forest Entomology) from the University of Minnesota in 1996 and M.B.A. from University of the Incarnate Word in 1991.

Weyman Fussell SEIS Team Co-Leader, USDA APHIS Plant Protection and Quarantine, Riverdale, MD.

Eight years with the USDA, including 3 years with APHIS Pest Detection and Management Programs as Gypsy Moth program manager working to address phytosanitation issues domestically and internationally, focusing on Latin America. Prior to joining the USDA, taught at the university level for 5 years and spent 15 years in overseas programs addressing food production planning and implementation. Academic degrees include M.S. from Purdue University in Crop Genetics with a minor in Plant Pathology, and a Ph.D. from the University of Tennessee in 1983 in Agricultural Genetics with a minor in Economics of International Development.

Derek Handley Public Affairs Specialist, USDA Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA. (No longer with Forest Service)

Two years with the Forest Service, 11 years with the U.S. Navy and U.S. Navy Reserves. Responsibilities included community relations, speech writing, and media relations. Earned B.A. in English from Hampton University in 1994.

William Oldland Entomologist, USDA Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA.

Three years as an Entomologist with the USDA Forest Service and 8 years with the Tennessee Valley Authority (TVA) as contract and Federal employee. Served as TVA's Medical Entomologist for 2 of these 8 years; responsibilities included monitoring mosquito populations for West Nile Virus, malaria, several strains of encephalitis (EEE, SLE, LAC) and writing the vector chapters for the TVA EIS/Reservoir Operations Study. While serving as an Environmental Scientist for the TVA, his duties included sample collection, evaluation and compliance report composition for TVA Power Plants. While a contract Entomologist at the TVA, he assisted in the management of a biological control program for hydrilla and purple loosestrife. Bill

also spent 2 years in private industry as a Wildlife Biologist/Forester. He earned a B.S. in Wildlife Management in 1991 and M.S. in Entomology in 1993 from West Virginia University.

Mary Ann White Writer-Editor, USDA Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA. (No longer with Forest Service)

Two years with the Forest Service, 6 years on active duty in the U.S. Navy. Received A.S. in Medical Laboratory Technology from The George Washington University in 1979 and B.A (1984) and M.A.(1986) degrees in history from the University of Texas at El Paso.

Human Health and Ecological Risk Assessment Contractor

Syracuse Environmental Research Associates, Inc., Fayetteville, NY

5.2 Contributors.

Contributors provided information and expertise.

Management Group

USDA Forest Service advisory group on national gypsy moth policy.

Robert D. Mangold USDA Forest Service, Director, Forest Health Protection, Washington, DC

Jerry Boughton USDA Forest Service, Assistant Director Forest Health and Economics Programs, Northeastern Area State and Private Forestry, Newtown Square

Individuals

USDA Forest Service, USDA Animal and Plant Health Inspection Service (APHIS) and other USDA contacts provided assistance to the interdisciplinary team with their time, materials, critical review skills and support.

Debra Allen-Reid USDA Forest Service, Southwestern Region, Albuquerque, NM

John Anhold USDA Forest Service, Southwestern Region, Flagstaff, AZ

Hank Appleton USDA Forest Service, Forest Health Protection, Washington, DC

David Bakke USDA Forest Service, Pacific Southwest Region, Vallejo, CA

David A. Bergsten USDA APHIS, Riverdale, MD

Beverly M. Bulaon USDA Forest Service, Northern Region, Missoula, MT

David R. Bridgewater USDA Forest Service, Pacific Northwest Region, Portland, OR

Robert Cain USDA Forest Service, Rocky Mountain Region, Lakewood, CO

Joseph Carbone USDA Forest Service, Ecosystem Management Coordination, Washington, DC

William A. Carothers USDA Forest Service, Southern Region, Asheville, NC

Michael D. Connor USDA Forest Service, Northeastern Area State and Private Forestry, St. Paul, MN

Jesus A. Cota USDA Forest Service, Forest Health Protection, Washington, DC (retired)

Frank J. Cross USDA Forest Service, Rocky Mountain Region, Denver, CO (retired)

Meredith Dahl USDA, Office of the General Counsel, Washington, DC

John William Dale USDA Forest Service, Pacific Southwest Region, Vallejo, CA (retired)

Jack P. Edmundson USDA APHIS, Riverdale, MD

John H. Ghent USDA Forest Service, Southern Region, Asheville, NC

Kurt W. Gottschalk USDA Forest Service, Northern Research Station, Morgantown, WV

John W. Hazel USDA Forest Service, Northeastern Area State and Private Forestry, Morgantown, WV

Donna S. Leonard USDA Forest Service, Southern Region, Asheville, NC

Andrew M. Liebhold USDA Forest Service, Northern Research Station, Morgantown, WV

Jesse Logan USDA Forest Service, Rocky Mountain Research Station, Logan, UT

Leonard L. Lucero USDA Forest Service, Southwestern Region, Albuquerque, NM

Michael L. McManus USDA Forest Service, Northern Research Station, Hamden, CT

Victor C. Mastro USDA APHIS, Otis Plant Protection Center, Otis ANGB, MA

Paul A. Mistretta USDA Forest Service, Southern Region, Atlanta, GA

Wesley A. Nettleton USDA Forest Service, Southern Region, Atlanta, GA

Amy H. Onken USDA Forest Service, Northeastern Area State and Private Forestry, Morgantown, WV

Doug Parker USDA Forest Service, Southwestern Region, Albuquerque, NM (no longer with Forest Service)

John D. Podgwaite USDA Forest Service, Northern Research Station, Hamden, CT

Bernard J. Raimo USDA Forest Service, Northeastern Area State and Private Forestry, Durham, NH

Richard C. Reardon USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV

Leslie Rubin USDA APHIS, Riverdale, MD

Dwight Scarbrough USDA Forest Service, Intermountain Region, Boise, ID

Noel F. Schneeberger USDA Forest Service, Northeastern Area State and Private Forestry, Newtown Square, PA

Dave E. Schultz USDA Forest Service, Pacific Southwest Region, Redding, CA (deceased)

Mark E. Schultz USDA Forest Service, Alaska Region, Southeast Alaska Field Office, Juneau, AK

David Sire USDA Forest Service, Ecosystem Management Coordination, Washington, DC

James M. Slavicek USDA Forest Service, Northern Research Station, Delaware, OH

Rhonda R. Solomon USDA APHIS, Riverdale, MD

Dennis J. Souto USDA Forest Service, Northeastern Area State and Private Forestry, Durham, NH

Harold Thistle USDA Forest Service, Forest Health Technology Enterprise Team, Morgantown, WV

Kevin Thorpe USDA Agricultural Research Service, Beltsville, MD

Patrick C. Tobin USDA Forest Service, Northern Research Station, Morgantown, WV

Kathryn Toffenetti USDA, Office of the General Counsel, Washington, DC

Daniel B. Twardus USDA Forest Service, Northeastern Area State and Private Forestry, Morgantown, WV

Algimantas P. Valaitis USDA Forest Service, Northern Research Station, Delaware, OH

Ralph Webb USDA, Agricultural Research Service, Beltsville, MD

5.3 Information Management and Analysis Staff.

The Information Management and Analysis Staff of the USDA Forest Service, Northeastern Area State and Private Forestry, provided valuable assistance in preparation and printing of the draft and final reports, Internet site management, and computer operations support.

Cindy Barnett Morgantown, WV

Roberta Burzynski Newtown Square, PA

Helen Butalla Morgantown, WV

Patty Dougherty Newtown Square, PA

Victoria Evans Morgantown, WV

Sandy Fosbroke Morgantown, WV

Nancy Lough Morgantown, WV

Juliette Watts Newtown Square, PA

Chapter 6
Mailing List

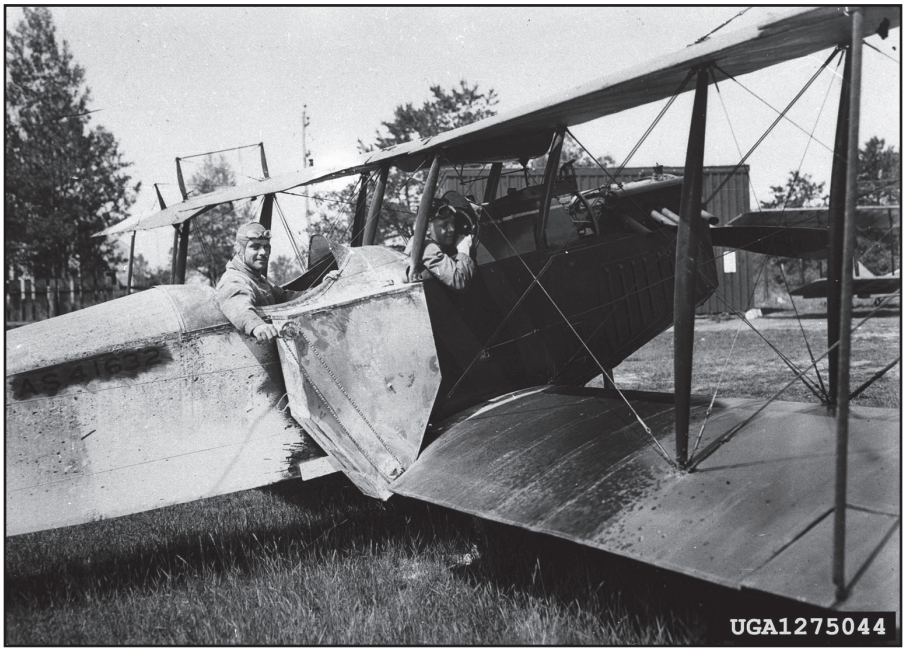

Figure 6-1. Early aerial gypsy moth treatments were manually released.

Chapter 6 Mailing List

Contents

6.1 Federal Agencies....1
6.2 State and Local Agencies....6
6.3 American Indian Nations, Tribes, and Related Agencies....24
6.4 Organizations....32
6.5 Libraries....57
6.6 Individuals....73

Figure

Figure 6-1. Early aerial gypsy moth treatments were manually released....Cover

This chapter lists agencies, organizations, libraries, and individuals who were mailed complete copies of the draft supplemental environmental impact statement or notified of its availability on the Web.

6.1 Federal Agencies

Alabama

United States Department of Agriculture (USDA), Forest Service, National Forests in Alabama (National Forests & Ranger Districts)
USDA, Animal Plant Health & Inspection Service (APHIS), Plant Protection & Quarantine (PPQ)

Alaska

United States Department of Interior (USDI), Bureau of Indian Affairs (BIA) Field Offices
National Marine Fisheries Service
USDA, APHIS, PPQ
USDA, Forest Service, Alaska Region
USDA, Forest Service, National Forests in Alaska (National Forests & Ranger Districts)

Arizona

USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Arizona (National Forests & Ranger Districts)
USDI, BIA Field Offices

Arkansas

USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Arkansas (National Forests & Ranger Districts)

California

USDI, BIA Field Offices
USDI, Bureau of Land Management (BLM)
United States Environmental Protection Agency (USEPA), Region IX
Federal Aviation Administration, Western Region
National Marine Fisheries Service
U.S. Army Corps of Engineers, South Pacific Division (CESPD)
USDA, APHIS, PPQ
USDA, Forest Service, Region
USDA, Forest Service, National Forests in California (National Forests & Ranger Districts)

Colorado

USDI, BIA, Field Offices
United States Environmental Protection Agency (USEPA), Region VIII
USDA, Forest Service, Comanche National Grassland
USDI, National Park Service (NPS), Intermountain Regional Office
USDA, Forest Service, Pawnee National Grassland
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Colorado (National Forests & Ranger Districts)
USDA, Forest Service, Rocky Mountain Region

Connecticut

USDA, Forest Service, National Forests in Connecticut (National Forests & Ranger Districts)
USDA, Forest Service, Northern Research Station

Delaware

USDI, U.S. Fish and Wildlife Service (USFWS), Bombay Hook National Wildlife Refuge (NWR)
USDA, APHIS, PPQ

District of Columbia

Advisory Council on Historic Preservation
Department of Defense (DOD), Armed Forces Pest Management Board

DOD, U.S. Navy, Office of Chief of Navy Operations
Department of Energy (DOE), Office of Environmental Compliance Rural Energy Regulatory Commission, Environmental Compliance Branch
Department of Housing & Urban Development (HUD), Office of Environment & Energy
DOI, USFWS, Division of Endangered Species
USEPA, Office of Environmental Affairs
USEPA, Office of Federal Activities
General Services Administration, Office of Planning & Analysis (OPA)
Rural Electrification Administration, Environmental Compliance
Susquehanna River Basin Commission
U.S. Army Corps of Engineers
U.S. Coast Guard, Environmental Impact Branch
U.S. Department of the Interior, Office of Environmental Affairs
U.S. Department of Transportation, Environmental Division
USDA OPA Publication Stockroom
USDA, Forest Service
USDA, Forest Service, Office of Environmental Coordination

Florida

USDI, BIA, Seminole Agency
National Marine Fisheries Service
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Florida (National Forests & Ranger Districts)

Georgia

USEPA, Region IV
U.S. Army Corps of Engineers, South Atlantic Division (CESAD)
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Georgia (National Forests & Ranger Districts)
USDA, Forest Service, Southern Region

Hawaii

U.S. Army Corps of Engineers, Pacific Ocean Division (CEPOD)
USDA, APHIS, PPQ

Idaho

USDA, APHIS, PPQ
USDI, NPS, Craters of the Moon National Monument
USDA, Forest Service, National Forests in Idaho (National Forests & Ranger Districts)

Illinois

USDI, USFWS, Crab Orchard NWR
USDI, USFWS, Cypress Creek NWR
USEPA, Region V
Federal Aviation Administration, Great Lakes Region
USDI, NPS, Lincoln Home National Historical Site
USDI, USFWS, Mark Twain NWR
U.S. Army Corps of Engineers, North Central Division (CENCD)
USDA, Forest Service, National Forests in Illinois (National Forests &Ranger Districts)
USDA, APHIS, PPQ

Indiana

USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Indiana (National Forests & Ranger Districts)

Iowa

USDA, APHIS, PPQ
USDI, NPS, Effigy Mounds National Monument
USDI, NPS, Herbert Hoover National Historic Site
USDI, USFWS, Union Slough NWR
USDA, Forest Service, National Forests in Iowa (National Forests & Ranger Districts)

Kansas

USDA, Forest Service, Cimarron National Grasslands
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Kansas (National Forests & Ranger Districts)

Kentucky

Ohio River Basins Commission
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Kentucky (National Forests & Ranger Districts)

Louisiana

USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Louisiana (National Forests & Ranger Districts)

Maine

USDI, NPS, Acadia National Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Maine (National Forests & Ranger Districts)

Maryland

USDI, NPS, Antietam National Battlefield
USDI, NPS, Blackwater National Wildlife Refuge
USDI, USFWS, Eastern Neck NWR
USDI, USFWS, Patuxent Wildlife Resource Center
USDA, Agriculture Research Service (ARS), Insect Biocontrol Laboratory
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Maryland (National Forests & Ranger Districts)
USDA, National Agricultural Library

Massachusetts

USEPA, Region I
Federal Aviation Administration, New England Region
National Marine Fisheries Service
U.S. Army Corps of Engineers, New England Division (CENED)
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Massachusetts (National Forests & Ranger Districts)

Michigan

USDI, BIA Field Offices
USDI, NPS, Isle Royal National Park
USDI, USFWS, Shiawassee NWR
USDI, NPS, Sleeping Bear Dunes National Lakeshore
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Michigan (National Forests & Ranger Districts)

Minnesota

USDI, USFWS, Agassiz NWR
USDI, BIA Field Offices
USDI, NPS, Grand Portage National Monument
USDI, USFWS, Pipestone National Monument
USDI, USFWS, Rice Lake NWR
USDI, USFWS, Tamarac NWR
USDI, USFWS, Upper Mississippi River NWR
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Minnesota (National Forests & Ranger Districts)
USDI, NPS, Voyagers National Park

Mississippi

USDI, BIA Field Offices
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Mississippi (National Forests & Ranger Districts)

Missouri

USDI, USFWS, Clarence Cannon NWR
USEPA, Region VII
Federal Aviation Administration, Central Region
USDI, NPS, Harry S. Truman National Historic Site
USDI, NPS, Ozark National Scenic Riverways
USDI, USFWS, Squaw Creek NWR
USDI, USFWS, Swan Lake NWR
USDA, APHIS, PPQ

USDA, Forest Service, National Forests in Missouri (National Forests & Ranger Districts)

Montana

USDI, BIA Field Offices
USDI, BLM
USDI, USFWS, Bowdoin NWR
USDI, NPS, Glacier National Park
USDI, NPS, National Bison Range
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Montana (National Forests & Ranger Districts)

Nebraska

USDI, BIA Field Offices
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Nebraska (National Forests & Ranger Districts)

Nevada

USDI, BIA Field Offices
USDI, BLM
USDI, NPS, Great Basin National Park
USDI, NPS, Spring Mountains National Recreational Area
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Nevada (National Forests & Ranger Districts)

New Hampshire

USDI, NPS, St. Glaudens National Historic Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in New Hampshire (National Forests & Ranger Districts)

New Jersey

Delaware River Basins Commission
USDI, NPS, Delaware Water Gap National Recreation Area
USDI, USFWS, Great Swamp NWR
USDI, NPS, Morristown National Historic Site
USDI, NPS, Shady Hook Gateway National Recreation Area
USDA, APHIS, PPQ

New Mexico

USDI, BIA Field Offices
USDI, NPS, National Park Service Intermountain Support Office
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in New Mexico (National Forests & Ranger Districts)

New York

USDI, BIA, Field Offices
USEPA, Region II
Federal Aviation Administration, Eastern Region
Federal Highway Administration, Region I
USDI, NPS, Fire Island National Seashore
USDI, USFWS, Montezuma National NWR
USDI, USFWS, Morton National Wildlife Refuge
USDI, NPS, Roosevelt-Vanderbilt National Historic Site
U.S. Army Corps of Engineers, North Atlantic
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in New York (National Forests & Ranger Districts)

North Carolina

USDA, APHIS, PPQ
USDA, Forest Service, National Forests in NC (National Forests & Ranger Districts)

North Dakota

USDI, BIA Field Offices
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in North Dakota (National Forests & Ranger Districts)

Ohio

USDI, USFWS, Cedar Point NWR
USDI, USFWS, Ottawa NWR

U.S. Army Corps of Engineers, Ohio River Division (CEORD)
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Ohio (National Forests & Ranger Districts)

Oklahoma

USDI, BIA, Field Offices
USDA, Forest Service, Black Kettle National Grasslands
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Oklahoma (National Forests & Ranger Districts)

Oregon

USDI, BIA Field Offices
USDI, BLM
USDI, NPS, Columbia Gorge National Scenic Area
USDI, NPS, Columbia River National Scenic Area
USDI, NPS, Hells Canyon National Recreation Area
Northwest Power Planning Council
USDI, NPS, Oregon Dunes National Recreation Area
U.S. Army Corps of Engineers, North Pacific Division
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Oregon (National Forests & Ranger Districts)

Pennsylvania

USDI, NPS, Delaware Gap National Recreation Area
USEPA, Region III
USDI, USFWS, Erie NWR
USDI, USFWS, Lamar NWR
USDA Forest Service Northeastern Research Station
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Pennsylvania (National Forests & Ranger Districts)
USDI, NPS, Valley Forge National Historical Site

Rhode Island

USDA, APHIS, PPQ

South Carolina

Rural Development Administration, Region III-Southeast
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in South Carolina (National Forests & Ranger Districts)

South Dakota

USDI, BIA Field Offices
USDA, Forest Service, Fall River Rd/Wall Road/ Buffalo Gap National Grasslands
USDA, Forest Service, Fort Pierre National Grassland
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in South Dakota (National Forests & Ranger Districts)

Tennessee

USDI, NPS, Great Smokey Mountains National Park
Tennessee Valley Authority (TVA), Environmental Quality
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Tennessee (National Forests & Ranger Districts)

Texas

USDA, BIA, Field Offices
USDA, Forest Service, Caddo LBJ National Grasslands
USEPA, Region VI
Federal Aviation Administration, Southwest Region
U.S. Army Corps of Engineers, Southwestern Division
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Texas (National Forests & Ranger Districts)

Utah

USDI, NPS, Arches National Park
USDI, BIA Field Offices
USDI, BLM
USDI, NPS, Bryce Canyon National Park
USDI, NPS, Canyonlands National Park
USDI, NPS, Capital Reef National Park
USDI, NPS, Cedar Breaks National Monument
USDI, NPS, Flaming Gorge National Recreation Area

USDI, NPS, Natural Bridges National Monument
USDI, NPS, Timpanogos Cave National Monument
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Utah (National Forests & Ranger Districts)
USDI, NPS, Zion National Park

Vermont

USDA, APHIS, PPQ

Virginia

USDI, NPS, George Washington Memorial Pkwy
USDI, NPS, Mount Rogers National Recreation Area
USDI, NPS, Shenandoah National Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Virginia (National Forests & Ranger Districts)

Washington

USDI, BIA Field Offices
USEPA, Region X
Federal Aviation Administration, Northwest Region
USDI, NPS, Mt. Rainier National Park
USDI, NPS, North Cascades National Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Washington (National Forests & Ranger Districts)

West Virginia

DoD-Army Blueston Lake, US Army Corps Of Engineers
USDI, NPS, Harpers Ferry National History Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in West Virginia (National Forests & Ranger Districts)

Wisconsin

USDI, NPS, Apostle Islands National Lakeshore
USDI, BIA, Field Offices
USDI, USFWS, Necedah NWR
USDI, NPS, St. Croix National Scenic Riverway
USDI, USFWS, Trempealeah NWR
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Wisconsin (National Forests & Ranger Districts)

Wyoming

USDI, BIA Field Offices
USDI, BLM
USDI, NPS, Grand Teton National Park
USDA, APHIS, PPQ
USDA, Forest Service, National Forests in Wyoming (National Forests & Ranger Districts)
USDI, NPS, Yellowstone National Park

Puerto Rico

USDA, Forest Service, National Forests in Puerto Rico (National Forests & Ranger Districts)

6.2 State and Local Agencies

Alabama

Alabama A&M University, Forestry Sciences Laboratory
Cooperative Extension Service
Department of Agriculture & Industries
Forestry Commission

Alaska

Cooperative Extension Service
Department of Environmental Conservation
Department of Fish & Game
Department of Natural Resources
Division of Forestry
Project Analyst- Forests Alaska State Agencies

Arizona

Department of Agriculture
Department of Agriculture Plant Services Division
Game & Fish Department
State Land Department
State Parks

Arkansas

Cooperative Extension Service
Forestry Commission
State Plant Board
State Plant Pest Board Division of Plant Industry

California

Department of Environmental Protection
Department of Fish & Game
Department of Food & Agriculture
Department of Forestry & Fire Protection
Department of Parks & Recreation
Department of Water Resources
Redwood Sciences Laboratory
State Lands Commission

Colorado

Department of Agriculture
Department of Natural Resources
State Conservation Board
State Forest Service

Connecticut

Bureau of Natural Resources
Department of Environmental Protection
Division of Forestry
Middlesex County Cooperative Extension Service
State Forest Tree Nursery
University of Connecticut Cooperative Extension Service
University of Connecticut Storrs Agriculture Experiment Station
West Hartford Cooperative Extension Service
Windham County Cooperative Extension Service

Delaware

Delaware Department of Agriculture
Department of Natural Resources & Environment
Division of Fish & Wildlife
Forest Service
Kent County Cooperative Extension Service
New Castle County Cooperative Extension Service
Sussex County Cooperative Extension Service
University of Delaware CES

District of Columbia

DC Government

Florida

Cooperative Extension Service (CES)
Department of Agriculture & Consumer Services Division of Plant Industry
Department of Environmental Protection
Division of Forestry
Fish & Wildlife Conservation Commission
Pike County CES

Georgia

Department of Agriculture Plant Protection Division
Department of Natural Resources
Environmental Council
Environmental Policy Institute
Forestry Commission

Hawaii

Department of Agriculture Plant Industry Division
Department of Land & Natural Resources
Division of Forestry & Wildlife

Idaho

Department of Environmental Quality
Department of Fish & Game
Department of Lands Northern Operations
Department of Lands Southern Operations
Department of Parks & Recreation
Department of Agriculture Division of Plant Industry
Department of Lands
Idaho County Weed Supervisor
Northwest Watershed Research Center
Water Resources Department

Illinois

Adams County CES
Boone County CES

Brown County CES
Bureau County CES
Caroll County CES
Champaign CES
Charleston CES
Chicago Park District
Christian County CES
Clark County CES
Clay County CES
Clinton County CES
Cook County CES
Crawford County CES
Cumberland County CES
Dekalb County CES
Department of Agriculture
Department of Conservation
Department of Natural Resources
Department of Public Health
Department of Conservation Forbes State Fish & Wildlife Area
Division of Forest Resources
Douglas County CES
Dupage County CES
Edgar County CES
Edwards County CES
Effingham County CES
Environmental Council
Fayette County CES
Ford County CES
Forest Research Center
Franklin County CES
Fulton County CES
Gallatin County CES
Greene County CES
Grundy County CES
Hamilton County CES
Hancock County CES
Hardin County CES
Henderson County CES
Henry County CES
Iroquois County CES
Jasper County CES
Jefferson County CES
Jerseyville CES
Jo Daviess County CES
Johnson/Massac Counties CES
Jones County CES
Kane County CES
Kankakee County CES
Kendall County CES
Knox County CES
Lasalle County CES
Lawrence County CES
Lee County CES
Livingston County CES
Logan County CES
Macon County CES
Macon County, Soil & Water
Macoupin County CES
Madison County CES
Marion County CES
Marion Extension Center
Marshall/Putnam Counties CES
Mason County CES
Mcdonough County CES
Mchenry County CES
Mclean County CES
Menard County CES
Mercer County CES
Monroe County CES
Montgomery County CES
Morgan County CES
Moultrie County CES
Natural History Survey
Nature Preserves Commission
Ogle County CES
Oquawka CES
Peoria County CES
Peorial County CES
Perry County CES
Pittsfield CES
Pope/Hardin Counties CES
Randolph County CES
Region 1 CES
Region 2 CES
Region 4 CES

Region 6 CES
Region 7 CES
Richland County CES
Rock Island County CES
Saline County CES
Sangamon County CES
Scott County CES
Shelby County CES
St. Clair County CES
Stephenson County CES
Tazewell County CES
Union County CES
University of Illinois CES
Urbana CES
Urbana, Department of Forestry
Vermilion County CES
Wabash County CES
Warren County CES
Washington County CES
Wayne County CES
White County CES
Whiteside County CES
Will County CES
Williamson County CES
Winnebago Count CES
Woodford County CES

Indiana

Adams County CES
Allen County CES
Bartholomew County CES
Benton County CES
Boone County CES
Brown County CES
Carroll County CES
Cass County CES
Clark County CES
Clay County CES
Crawford County CES
Davless County CES
Dearborne County CES
Decator County CES
Delaware County CES
Department of Conservation
Department of Natural Resources
Department of Health
Division of Entomology & Plant Pathology
Division of Fish & Wildlife
Division of Forestry
Division of Forestry Department of Natural Resources
Dubois County CES
Elkhart County CES
Fayette County CES
Floyd County CES
Fountain County CES
Franklin County CES
Fulton County CES
Gibson County CES
Grant County CES
Green County CES
Hamilton County CES
Hancock County CES
Harrison County CES
Hendricks County CES
Henry County CES
Howard County CES
Huntington County CES
Jackson County CES
Jasper County CES
Jay County CES
Jefferson County CES
Jennings County CES
Johnson County CES
Knox County CES
Kosciusko County CES
Lagrange County CES
Lake County CES
Laporte County CES
Lawrence County CES
Madison County CES
Marion County CES
Marshall County CES
Martin County CES
Miami County CES
Monroe County CES
Montgomery County CES

Morgan County CES
Newton County CES
Noble County CES
Owen County CES
Parke County CES
Perry County CES
Porter County CES
Posey County CES
Pulaski County CES
Purdue University, State Extension Forester
Putnam County CES
Randolph County CES
Ripley County CES
Rush County CES
Scott County CES
Shelby County CES
Starke County CES
Steuben County CES
Sullivan County CES
Switzerland County CES
Tippecano County CES
Tipton County CES
Union County CES
Vanderburgh County CES
Vermillion County CES
Vigo County CES
Wabash County CES
Warren County CES
Warrick County CES
Washington County CES
Wayne County CES
Wells County CES
White County CES
Whitley County CES

Iowa

Adair County CES
Adams County CES
Allamake County CES
Audubon County CES
Bloomfield County CES
Boone County CES
Bremer County CES
Buchanan County CES
Buena Vista County Vista CES
Butler County CES
Calhoun County CES
Carroll County CES
Cedar County CES
Cerro Gordo County CES
Cherokee County CES
Chickasa County CES
Clark County CES
Clay County CES
Clayton County CES
Clinton County CES
Council Bluffs CES
Dallas CES
Decatur CES
Delaware CES
Department of Agriculture State Horticulturist
Department of Forestry
Department of Natural Resources
Department of Natural Resources State Forest Nursery
Department of Agriculture
Des Moines County CES
Dubuque County CES
Emmet County CES
Fayette County CES
Floyd County CES
Franklin County CES
Freemont County CES
Greene County CES
Grundy County CES
Guthrie County CES
Hamilton County CES
Hamilton County Conservation Board
Hancock CES
Hardin County CES
Harrison County CES
Henry County CES
Howard County CES
Humboldt County CES
Ida Grove County CES
Iowa County CES
Iowa Department of Agriculture

Iowa Department of Public Health
Iowa State University CES
Jackson County CES
Jasper County CES
Jones County CES
Keokuk County CES
Kossuth County CES
Lee County CES
Loess Hills State Park
Louisa County CES
Lucas County CES
Lyon County CES
Madison County CES
Mahaska County CES
Marion County CES
Marshall County CES
McFarland Park
Melvern CES
Mitchell County CES
Monona County CES
Monroe County CES
Montgomery County CES
Muscatin County CES
Oakland CES
O'Brien County CES
Osceola County CES
Palo Alto County CES
Plymouth County CES
Pocahontas County CES
Polk County CES
Ringold County CES
Sac County CES
Scott CES
Shimek State Forest
Sigourney CES
Sioux CES
Spirit Lake CES
State Entomologist
State Forest Nursery
Stephens State Forest
Story County CES
Taylor County CES
Toledo CES
Union County CES
Urbana CES
Van Buren County CES
Vinton CES
Wapello County CES
Washington County CES
Wayne County CES
Webster County CES
Winnebago County CES
Winneshi CES
Worth County CES
Wright County CES
Yellow River State Forest

Kansas

Department of Agriculture Plant Prot. & Weed Control Program
Department of Wildlife & Parks
Forest Service

Kentucky

CES
Department of Fish & Wildlife Resources
Director, Kentucky Division of Forestry
Natural Resources & Environmental
Office of State Entomologist

Louisiana

Agcenter, Louisiana CES
Department of Agriculture & Forestry
Department of Natural Resources
Department of Wildlife & Fisheries

Maine

Department of Agriculture
Division of Plant Industry, Department of Agriculture
Forest Service
University of Maine CES

Maryland

Allegany County CES
Ann Arundel CES

Baltimore County CES
Calvert County CES
Caroline County CES
Carroll County CES
Charles County CES
Department of Agriculture
Department of Agriculture Forest Pest Management
Department of Agriculture, Entomology Nursery Inspection
Department of Natural Resources, Forest Service
Dorchester County CES
Garrett County CES
Gypsy Moth Program, Prince Georges County
Hartford County CES
Howard County CES
Kent County CES
Montgomery County Gypsy Moth Program
Prince Georges County CES
Somerset County CES
Talbot County CES
Wicomico County CES
Worcester County CES

Massachusetts

Association of Conservation Commissions
Barnstable County CES
Berrien CES
Central Massachusetts Extension Center
Pittsfield CES
Department of Conservation
Department of Environmental Management
Department of Environmental Management Region 5 Headquarters
Department of Food & Agriculture
Division of Fisheries & Wildlife
Division of Forests & Parks
Division of Regulatory Services, Department of Agriculture Resources
Division State Parks & Recreation
East Massachusetts Extension Center
Middlesex County CES
Pioneer Valley Extension Center
Plymouth County CES
Southeast Massachusetts Agriculture Center

Michigan

Alabastor Township
Alger & Marquette Soil Conservation District
Alger County CES
Allendale Charter Townships
Alpena County CES
Alpena Township
Antrim County CES
Antrim County Gypsy Moth Program
Arenac County CES
Arenac County Gypsy Moth Coordinator
Barry County CES
Bay County CES
Bay County Gypsy Moth Program
Bay County Gypsy Moth Suppression Program
Benzie CES
Bloomfield Township
Branch CES
Calhoun CES
Camden Township
Cass County CES
Charlevois CES
Charter Township of Highland
Charter Township of West Bloomfield
Cheboygan CES
Cherry Grove Township
Chippewa CES
Chippewa County CES
Clare County CES
Clare County Gypsy Moth Program
Crawford County CES
Crawford County Gypsy Moth Coordinator
Delta County CES
Department of Agriculture
Department of Agriculture Pesticide & Plant Pest Management Division
Department of Natural Resources
Department of Natural Resources Forestry Division
Department of Public Health
Dickson Township Manistee County

Eaton City CES
Emmet County CES
Fenton Township
Frankenmuth Township
Genesee County Gypsy Moth Coordinator
Genessee County CES
Gladwin City CES
Gladwin County Gypsy Moth Coordinator
Gogebic CES
Grand Traverse County CES
Gration County Gypsy Moth Coordinator
Harrisville CES
Hawes Township Trustee
Hillsdale CES
Home Township
Houghton CES
Huron City CES
Iosco County CES
Iosco County Gypsy Moth Coordinator
Iron County CES
Iron Mountain CES
Isabella County
Jackson CES
Kalamazo CES
Kalkaska County Gypsy Moth Coordinator
Kalkaska County Gypsy Moth Program
Kent County CES
Kent County Conservation District
Lake CES
Lake County Commissioners
Lake County Gypsy Moth Program
Lansing CES
Leelanau County CES
Lenawee County CES
Livingston County Gypsy Moth Coordinator
Livingston County Gypsy Moth Program
Luce County CES
Mackinac County CES
Macob City CES
Manistee CES
Manistee County
Manistee County Commission
Manistee County Planning Commission
Manistee Soil & Water Conservation District
Marion Township
Marquette CES
Mason County CES
Mecosta County Gypsy Moth Coordinator
Menomine CES
Michigan Department of Agriculture
Michigan Department of Transportation
Michigan State University Extension
Midland County CES
Midland County Gypsy Moth Program
Midland County Gypsy Moth Suppression Program
Millen Township Supervisor
Mio CES
Missaukee County Gypsy Moth Coordinator
Missaukee County CES
Monroe County CES
Montcalm County CES
Montgomery CES
Newaygo CES
Newaygo County Gypsy Moth Coordinator
Newaygo County Gypsy Moth Suppression Program
Oakland County CES
Oakland County Gypsy Moth Program
Oceana CES
Ogemaw County Gypsy Moth Coordinator
Ontonago CES
Osceola County Gypsy Moth Program
Oscoda County Gypsy Moth Coordinator
Otsego County CES
Ottawa County Gypsy Moth Coordinator
Ottawa County Gypsy Moth Program
Pesticide & Plant Pest Management Division,
Department of Agriculture
Presque Isle CES
Region 2, Michigan Department of Natural Resources
Rochester Parks Department
Roscommon County
Roscommon County Gypsy Moth Suppression Program
Saginaw County CES
Saginaw County Gypsy Moth Coordinator
Sanilac County CES
Shiawassee County Gypsy Moth Coordinator

St. Clair County CES
St. Jose CES
Sweetwater Township
Tuscola County CES
Van Buren CES
Village of Beverly Hills
Wexford CES
Wexford County Gypsy Moth Coordinator

Minnesota

Aitkin County CES
Becker County CES
Beltrami County CES
Benton County CES
Big Stone County CES
Blue Earth County CES
Brown County CES
Brown County Historical Society
Cass County CES
Chippewa County CES
Chisago County CES
Clay County CES
Clearwater County CES
Clearwater County Land Department
Clearwater County Land Forestry Department
Cook County CES
Cottonwood County CES
Crow Wing County CES
Dakota County CES
Department of Agriculture
Department of Agriculture Agronomy & Plant Protection
Department of Natural Resources
Department of Natural Resources
Department of Public Health
Division of Forestry
Dodge County CES
Douglas County CES
Faribault County CES
Fergus Falls CES
Goodhue City County CES
Graceville Township
Grant County CES
Hennepin County CES
Houston County CES
Hubbard County CES
Huntsville Township
Isanti County CES
Itasca County Extension
Jackson County CES
Kanabec County CES
Kandiyohi County CES
Kittson County CES
Koochiching CES
Lac Qui Parle CES
Lake County CES
Lake of the Woods CES
Le Seur County CES
Lincoln County CES
Lyon County CES
Mahnomen County CES
Marshall County CES
Martincounty CES
McLoud County CES
Mille Lacs County CES
Morrison County CES
Mower County CES
Murray County CES
Nicollet County CES
Nobles County CES
Norman County CES
Olmsted County CES
Ore County CES
Owatonna CES
Pennington County CES
Perham CES
Pine County CES
Pipestone CES
Polk West County CES
Ramsey County CES
Red Lake City CES
Redwood County CES
Renville County CES
Rice County CES
Rock County CES
Roseau County CES

St. Louis County Land Department
Sibley County CES
St. Louis CES
Stearns County CES
Stearns County Park Department
Stevens County CES
Swift County CES
Todd County CES
Traverse County CES
University of Minnesota CES
Wabasha County CES
Wadena County CES
Waseca County CES
Washington County CES
Watonwan County CES
Wilkin County CES
Winona County CES
Wright County CES
Yellow Medicine CES

Mississippi

Department of Wildlife, Fisheries
Division of Plant Industry
Forestry Commission

Missouri

Adair County CES
Andrew County CES
Atchison City CES
Audrain County CES
Audrain County CES
Barry County CES
Barton County CES
Bates County CES
Benton County CES
Boone County CES
Buchanan City CES
Butler County CES
Caldwell County CES
Callaway County CES
Camden City CES
Carroll City CES
Carter County CES
Cass County CES
Cedar County CES
Chariton County CES
Christian City CES
Clark County CES
Clinton County CES
Cole County CES
Cooper County CES
Crawford County CES
Dade County CES
Dallas County CES
Daviess County CES
Dekalb County CES
Delta Center County CES
Dent County CES
Department of Agriculture
Department of Conservation
Department of Health
Department of Natural Resources
Douglas County CES
Dunklin County CES
Gasconade County CES
Green County CES
Grundy City CES
Harrison County CES
Hickory City CES
Hickory County CES
Hold County CES
Howard County CES
Howell County CES
Jackson County CES
Jasper County CES
Knox County CES
Laclede City CES
Laclede County CES
Lafayette City CES
Lawrence County CES
Lebanon Excess Property Center
Lewis County CES
Lincoln County CES
Linn County CES
Livingston County CES

Macon County CES
Madison County CES
Maries County CES
Marion County CES
Marles County CES
Mercer County CES
Miller City CES
Mississippi County CES
Missouri CES
Moniteau City CES
Monroe County CES
Montgomery County CES
Morgan County CES
Natural History Program
Newton County CES
Nordaway City CES
Oregon City CES
Oregon County CES
Osage City CES
Ozark County CES
Pemiscot City CES
Pettis County CES
Phelps City CES
Phelps County CES
Pike County CES
Plant Industries Division
Platte County CES
Polk County CES
Pulaski CountyCES
Putnam County CES
Randolph County CES
Ralls City CES
Ray County CES
Ripley County CES
Saline County CES
Schuyler County CES
Scotland County CES
Scott County CES
Shelby City CES
St Loius CES
St. Charles County CES
St. Clair County CES
St. Louis City CES
Ste. Genevieve City CES
Stoddard County CES
Sullivan County CES
Taney County CES
Texas County CES
University of Missouri CES
Vernon County CES
Warren County CES
Washington County CES
Webster City CES
Webster County CES
Worth County CES
Wright County CES

Montana

Department of Agriculture
Department of Natural Resources & Conservation
Department of Fish & Wildlife
Forestry Division

Nebraska

Department of Agriculture Bureau of Plant Industry
Department of Environmental Quality
Game & Parks Commission
University of Nebraska CES

Nevada

Department of Agriculture
Department of Agriculture, Entomologist
Division of Forestry
Division of Plant Industry, Department of Agriculture
Division of State Lands
Division of Wildlife
University of Nevada CES

New Hampshire

Belknap County CES
Cheshire County CES
Coos County CES
Department of Agriculture
Department of Resources & Economic Development
Division of Forests & Lands

Division of Plant Industry
Grafton County CES
Merrimack County CES
Natural Heritage Inventory
New Hampshire Fish & Game Department
Rockingham County CES
Strafford County CES
Sullivan County CES
University of New Hampshire CES
University of New Hampshire CES

New Jersey

Allaire State Park Nature Center
Atlantic County CES
Bergen County CES
Bergen County Park Commission
Boonton Township
Borough of Oakland
Bureau of Forest Management
Burlington County CES
Camden County CES
Cape May County CES
Cumberland County CES
Department of Agriculture
Department of Environmental Protection
Division of Fish & Wildlife
Division of Plant Industry
Essex County CES
Federation of Shade Tree Commission
Forestry Service
Glouchester County CES
Hunterdon County CES
Jersey City CES
Mercer County CES
Monmouth County CES
Monmouth City Park System
Monmouth County Shade Tree Commission
Morris County CES
Morris County Soil Conservation District
Mount Olive Township Council
New Jersey Division of Parks & Forestry
New Jersey Forest Tree Nursery
Ocean County CES
Parvi State Park
Passaic County CES
Pinelands Commission
Salem County CES
Somerset County CES
Somerset County Park Commission
Susses County CES
Union County CES
Warren County Soil Conservation District
Warren CES

New Mexico

Clauch-Pinto Soil & Water Conservation District
Department of Agriculture
Department of Agriculture, Bureau of Entomology & Nursery Industries
Department of Game & Fish
Energy Minerals & Natural Resource
Energy, Minerals & Natural Resource Department
Southwest New Mexico Council of Governments
State Forestry
State Land Office

New York

Albany County CES
Allehgany County CES
Broome County CES
Cayuga County CES
Chautaugua County CES
Chenango County CES
Clinton County CES
Clinton County Legislature
Columbia County CES
Cornell CES
Cortland County CES
County of Nassau Department of Recreation & Parks
Delaware County CES
Department Environmental Conservation
Department of Agriculture & Markets Division of Plant Industry
Department of Environmental Conservation Forest Resources Management

Department of Environmental Protection
Department of Health
Dutchess County CES
Essex County CES
Franklin County CES
Fulton County CES
Genesse County CES
Greene County CES
Herkimer County CES
Jefferson County CES
Lewis County CES
Livingston County CES
Monroa County CES
Montgomery County CES
Nassau County CES
New York State CES
Niagra County CES
New York Department of Environmental Conservation Urban Forest Coordinator
Oneida County CES
Onondaga County CES
Ontario County CES
Orange County CES
Orange County Department of Parks, Recreation, & Conservation
Orleans County CES
Oswego County CES
Otsego County CES
Pocono Forest & Wildlife Service
Putnam County CES
Rensselaer County CES
Rockland County CES
Saratoga County CES
Schenectady CES
Schoharie County CES
Seneca County CES
St. Lawrence County CES
State Department of Environmental Conservation
State Department of Agriculture
Steuben County CES
Suffolk County CES
Sullivan County CES
Tioga County CES
Tompkins County CES
Town of Granville
Ulster County CES
Warren County CES
Washington County CES
Wayne County CES
Westchester County CES
Wyoming County CES
Yates County CES

North Carolina

Carolina Department of Environment & Natural Resources
Department of Agriculture & Consumer Services
Department of Agriculture Plant Protection Section
Division of Forest Resources
North Carolina CES
Plant Industry Division

North Dakota

Department of Agriculture
Forest Service
Game & Fish Department
State Historical Society of North Dakota

Ohio

Adams County CES
Allen County CES
Ashland County CES
Ashtabula County CES
Athen County CES
Auglaize County CES
Belmont County CES
Brown County CES
Butler County CES
Champaign County CES
Clark County CES
Clermont Couny CES
Clinton County CES
Colerain Township Parks
Columbiana County CES
Coshocton County CES

Crawford County CES
Cuyahoga County CES
Darke County CES
Defiance County CES
Deleware County CES
Division of Forestry
Erie County CES
Fairfield County CES
Fayette County CES
Franklin County CES
Fulton County CES
Gallia County CES
Geauga County CES
Geauga Park District
Guernsey County CES
Hamilton County CES
Hamilton County Park District
Hancock County CES
Hardin County CES
Harrison County CES
Henry County CES
Highland County CES
Hocking County CES
Holmes County CES
Huron County CES
Jackson Area Extension Center
Jackson County CES
Jefferson County CES
Knox County CES
Lake County CES
Lawrence County CES
Licking County CES
Logan County CES
Lorain County CES
Lucas County CES
Madison County CES
Mahoning County CES
Marion County CES
Medina County CES
Meigs County CES
Miami County CES
Monroe County CES
Montgomery County CES
Morgan County CES
Morrow County CES
Muskingum County CES
Noble County CES
Ohio Department of Agriculture
Ohio Department of Natural Resources
Ohio State University CES
Ohio State University Extension
Ottawa County CES
Paulding County CES
Perry County CES
Pickaway County CES
Pike County CES
Plant Pest Control Section, Department of Agriculture
Portage County CES
Preble County CES
Richland County CES
Ross County CES
Sandusky County CES
Scloto County CES
Seneca County CES
Shelby County CES
Stark/Summit CES
Trumball County CES
Tuscarawas County CES
Union County CES
Van Wert County CES
Vinton County CES
Warren County CES
Washington County CES
Williams County CES
Wood County CES
Wyandot County CES

Oklahoma

Department of Agriculture Plant Industries & Consumer Services Division
Department of Agriculture, Forestry Services
Department of Environmental Quality
Department of Wildlife Conservation
Department of Agriculture
Putnam County CES

Oregon

CES Umatilla County
City of Eugene Public Works Department
City of Klamath Falls
Department of Agriculture
Department of Environmental Quality
Department of Fish & Wildlife
Department of Forestry
Department of Environmental Quality
Eugene Parks & Open Space
Fern Ridge Wildlife Area
Grant County & Harney County
Grant County Education Service District
Jackson County CES
Klamath Falls Resource Area
Lane County Environmental Health
Lane County Public Works
Lincoln County Health & Human Services
OSU Agriculture Chemistry Extension
Parks & Recreation Department
Portland Parks & Recreation
Umatilla Basin Watershed Council
Umatilla County Soil & Water
Union County Extension
Wasco County Weed Control

Pennsylvania

Adams County CES
Allegheny County CES
Armstrong County CES
Asbury Woods Nature Center
Beaver County CES
Bedford County CES
Berks County CES
Blair County CES
Bradford County CES
Bucks County CES
Butler County CES
Cambria County CES
Centre County CES
Chester County CES
Clarion County CES
Clearfield County CES
Clinton County CES
Commonwealth of Pennsylvania, Department of Environment
Crawford County CES
Cumberland County CES
Dams County CES
Dauphin County CES
Delaware County CES
Department of Conservation & Natural Resources
Elk County CES
Fayette County CES
Forest Pest Management
Four Mills Nature Reserve
Franklin County CES
Fulton County CES
Game Commission
Green County CES
Hawk Mountain Sanctuary
Huntingdon County CES
Indiana County CES
Jefferson County CES
Juniata City CES
Juniata County CES
Lackawanna County CES
Lancaster County CES
Lawrence County CES
Lebanon County CES
Lehigh County CES
Luzerne County CES
Lycoming City CES
Lycoming County CES
Mckean County CES
Mckean County CES
Mifflin County CES
Monroe County CES
Montgomery County CES
Montour County CES
Northhampton County CES
Northhumberland County CES
Pennsylvania Forest Stewardship Program
Perry County CES
Philadelphia County CES

Pike County CES
Potter County CES
Potter County CES
Schuylkill Conservation District
Schuylkill County CES
Snyder County CES
Stone Valley Recreation Area
Sullivan County CES
Susquehanna County CES
Tioga County CES
Union County CES
Venango County CES
Warren County CES
Washington County CES
Wayne County CES
Wayne County Gypsy Moth Coordinator
Westmoreland County CES
Wyoming County CES
York County CES

Rhode Island

Division of Agriculture & Resource Marketing
Division of Forest Environment
Jennings Nature Reserve
Rhode Island Department of Environmental Management

South Carolina

Clemson University CES
Department of Natural Resource
Department of Plant Industry
Forestry Commission
Westvaco Forest Research Center

South Dakota

Department of Agriculture
Department of Environment & Natural Resources
Department of Game Fish & Parks

Tennessee

Department of Agriculture
Department of Agriculture - Division of Forestry
Department of Environment & Conservation
Department of Forestry, Wildlife & Fisheries
Department of Plant Industry
TN Agriculture CES
University of Tennessee Extension
Wildlife Resources Agency

Texas

Department of Agriculture
Forest Service
Parks & Wildlife Department

Utah

Department of Agriculture
Department of Natural Resources
Utah Department of Agriculture & Food Division of Plant Industry
Utah State University CES

Vermont

Department of Agriculture
Department of Agriculture Food & Markets Plant Industry Section
Department of Forest & Parks
Department of Forest & Parks Forest Resource Protection
Guildhall CES
Natural Resources Council
Newport Extension System
North Hero Extension System
Rutland Extension System
Skakel Forest Management
University of Vermont Extension
Vermont Agency of Natural Resources
Vermont Department of Fish & Wildlife
Vermont Extension System

Virginia

Alexandria Gypsy Moth Program
Bedford County CES
Botetourte County CES
CES

Clark County CES
Clark County Gypsy Moth Coordinator
Craig County CES
Culpeper County Gypsy Moth Coordinator
Department of Agriculture & Consumer Services
Department of Conservation & Recreation
Department of Forestry
Department of Game & Inland Fisheries
Dinwiddle County CES
Essex County CES
Fairfax County Gypsy Moth Program
Fairfax County Gypsy Moth Office
Flatwoods Civilian Conservation Center
Frederick County Gypsy Moth Program
Fulvanna County CES
Glocester County CES
Greensville County CES
Gypsy Moth Program Coordinator
Hanover County Gypsy Moth Program
Highland County Gypsy Moth Program
Isle of Wright County Gypsy Moth Program
King & Queen County CES
King County CES
King William County CES
Lancaster County CES
Louisa County Gypsy Moth Program
Madison County CES
Mathews County Gypsy Moth Program
Mecklenburg County CES
New Kent County CES
Northhampton County CES
Piedmont Environmental Council
Powhatan County Gypsy Moth Program
Prince Georges County CES
Prince William County Gypsy Moth Program
Prince William Forest Park
Rappahannock County CES
Richmond County CES
Roanoke County CES
Rockingham County Gypsy Moth Program
Rotetourt County CES
Shenandoah County CES
Sky Meadows State Park
Spotsylvania County CES
Surrey County CES
Virginia Polytechnic Institute (VPI) Extension Orange County
Warren County Gypsy Moth Program
Westmoreland County CES
York County Gypsy Moth Program

Washington

Alpine Lakes Protect Society
Bellevue Parks/Commission Service
Department of Ecology Office of Water Resources
Department of Fish & Wildlife
Department of Natural Resources
Department of Natural Resources, Northeast
Department of Wildlife Region 1 Habitat
Department of Agriculture Entomology
Evergreen State College
Glacier Public Service Center
Gonzaga University
King County Department of Natural Resources
King/Pierce County Farm Bureau
Natural Heritage Program
Northwest Wilderness Programs
Office of Archaeology & Historic Preservation
Okanogan Conservation District
Oregon Department of Environmental Quality
Seattle City Planning Office
State Department Agriculture
State Department of Agriculture Plant Services Division
State Department of Ecology
State of Washington, Department Natural Resources, Environmental Quality
Umatilla Forest Watch
Verlot Public Service Center
Washington Department of Natural Resources Southeast Region
Washington State Parks
Washington State University
Washington State University Department of Natural Resource Sciences

Washington State University, Extension
Washington Trout
Washington Wildlife Commission

West Virginia

Department of Agriculture
Department of Agriculture Plant Industries Division
Department of Energy
Department of Commerce, Labor & Environmental Resources
Division of Forestry
Hardy County Extension Agency
Harrison County CES
Home Health Agency of Davis Memorial Hospital
Plant Industries Program
State Lands Management
State Lands Management Division of Forestry
Upshur County
West Virginia Division of Natural Resources

Wisconsin

Adams County CES
Ashland County CES
Ashland County CES
Barron County CES
Barron County CES
Bayfield County CES
Brown County CES
Buffalo County CES
Burnett County CES
Calumet County CES
Chippewa City CES
Clark County CES
Columbia County CES
Crawford County CES
Dane County CES
Department of Agriculture
Department of Natural Resources
Department of Agriculture
Department of Agriculture & Trade
Devil's Lake State Park
Division of Forestry
Division of Health
Dodge County CES
Douglas County CES
Dunn City CES
Dunn County CES
Eau Claire County CES
Florence County CES
Fond Du Lac County CES
Forest County Board of Supervisors
Grant CES
Green County CES
Green Lake County CES
Iowa County CES
Iron County CES
Jackson County CES
Jefferson County CES
Juneau County CES
Kenosha County CES
Kewaunee County CES
Lacrosse County CES
Lafayette County CES
Langlade County Board of Supervisors
Langlade County Forestry Department
Layfayette County Board
Lincoln CES
Lincoln County Forestry Land & Park Departmen
Manitowo CES
Manitowoc County Soil & Water Conservation
Marathon County CES
Marinett County CES
Marquette County CES
Menomine County CES
Milwaukee County CES
Mondovi Township
Monroe County CES
Oconto County CES
Oneida County CES
Oneida County Board
Outagamie County CES
Ozaukee County CES
Pepin County CES
Pierce CES
Plant Industry Bureau

Polk County CES
Port Washington CES
Portage CES
Price County CES
Racine County CES
Richland CES
Rock County CES
Rock County Park & Conservation Division
Rusk County CES
Sauk CES
Shawano CES
Sheboygan CES
St. Croix CES
Taylor County CES
Town of Brooklyn
Town of Caledonia
Town of Jump River
Town of Knox
Town of Newbold
Town of Rhine
Town of Schoepre
Town of Spring Prairie
Town of Troy
Trempealeau County CES
Trenton Township
University of Wisconsin CES
Vernon County CES
Vilas County CES
Vilas County Community Resource
Walworth CES
Washburn County CES
Washington CES
Waukesha CES
Waupaca County CES
Winnebago CES
Winnebago County CES
Wisconsin Department of Agriculture
Wisconsin Department of Natural Resources
Wood CES
Wood County

Wyoming

Department of Agriculture
Department of Agriculture Technical Services Division
Department of State Parks, & Cultural Resources
Game & Fish Department
State Forestry Division
State Lands & Investments
University of Wyoming CES

Puerto Rico

University of Puerto Rico Agriculture Experiment Station

Canada

BC Ministry of Agriculture & Food
Ontario Forestry Association

6.3 American Indian Nations, Tribes, and Related Agencies

Alabama

Poarch Creek Indians

Alaska

Atmautluak Traditional Council
Andreafski Tribal Council
Agdaagux Tribe of King Cove
Akiachak Native Community
Akiak Native Community
Akutan Traditional Council
Alatna Tribal Office
Aleut Community of St. Paul Island
Algaaciq Tribal Council
Allakaket Village
Angoon Community Association
Anvik Tribal Council
Asa'carsarmiut Tribe
Beaver Tribal Council
Birch Creek Village
Central Council Tlingit & Haida Indian Tribes
Chalkyitsik Village

Chefornak Traditional Council
Chenega Council
Chevak Traditional Council
Chickaloon Village Traditional Council
Chignik Lake Traditional Village Council
Chilkat Indian Village (Klukwan)
Chilkoot Indian Association
Chinik Eskimo Community (Aka Golovin)
Chitina Traditional Village
Chuloonawick Native Village
Circle Native Community
Craig Community Association
Crooked Creek Traditional Council
Curyung Tribal Council
Dot Lake Village Council
Douglas Indian Association
Egegik Village
Ekwok Village Council
Emmonak Village
Evansville Tribal Council
Gulkana Village
Healy Lake Traditional Council
Holy Cross Tribal Council
Hoonah Indian Association
Hughes Village Council
Huslia Village Council
Hydaburg Cooperative Association
Igiugig Village
Inupiat Community of Arctic Slope
Iqurmuit Tribe (Russian Mission)
Ivanoff Bay Village Council
Kaguyak Village
Kaktovik Village
Kenaitze Indian Tribe
Ketchikan Indian Corporation
King Island Native Community
Klawock Cooperative Assn
Knik Tribe
Kobuk Traditional Council
Kokhanok Village
Kongiganak Traditional Council
Koyukuk Native Village
Kwigillingok Council
Larsen Bay Tribal Council
Lesnoi Village
Levelock Village
Lime Village
Louden Tribal Council
Manley Hot Springs Village
Manokotak Village
Mary's Igloo Traditional Council
Mcgrath Native Village Council
Mentasta Traditional Tribal Council
Metlakatla Indian Community
Naknek Native Village Council
Native Village Nuiqsut
Native Village of Afognak
Native Village of Akhiok
Native Village of Aleknagik
Native Village of Ambler
Native Village of Atqasuk
Native Village of Barrow Inupiat Traditional
Native Village of Belkofski
Native Village of Brevig Mission
Native Village of Buckland
Native Village of Cantwell
Native Village of Chignik
Native Village of Chignik Lagoon
Native Village of Chistochina
Native Village of Chuathbaluk
Native Village of Council
Native Village of Deering
Native Village of Diomede (Ira) (Aka Inalik)
Native Village of Eagle
Native Village of Eek
Native Village of Eklutna
Native Village of Ekuk
Native Village of Elim
Native Village of Eyak
Native Village of False Pass
Native Village of Fort Yukonnative
Native Village of Gakona
Native Village of Gambell
Native Village of Georgetown
Native Village of Goodnews Bay
Native Village of Hamilton

Native Village of Hooper Bay
Native Village of Kanatak
Native Village of Karluk
Native Village of Kasaan
Native Village of Kasigluk
Native Village of Kiana
Native Village of Kipnuk
Native Village of Kivalina
Native Village of Kluti-Kaah (Aka Copper Cent)
Native Village of Kotzebue
Native Village of Koyuk
Native Village of Kwinhagak
Native Village of Marshall (Aka Fortuna Ledge)
Native Village of Minto
Native Village of Nanwalek (Aka English Bay)
Native Village of Napaimute
Native Village of Napakiak
Native Village of Napaskiak
Native Village of Nikolski
Native Village of Noatak
Native Village of Nunapitchuk
Native Village of Ouzinkie
Native Village of Paimiut
Native Village of Pauloff Harbor
Native Village of Perryville
Native Village of Pitka's Point
Native Village of Point Hope
Native Village of Port Graham
Native Village of Port Heiden
Native Village of Port Lions
Native Village of Savoonga
Native Village of Scammon Bay
Native Village of Shaktoolik
Native Village of Sheldon Point
Native Village of Shishmaref
Native Village of Shungnak
Native Village of South Naknek
Native Village of St. Michael
Native Village of Stevens
Native Village of Tanacross
Native Village of Tanana
Native Village of Tatitlek
Native Village of Tetlin
Native Village of Tuntutuliak
Native Village of Tununak
Native Village of Tyonek
Native Village of Unalakleet
Native Village of Venetie Tribal Government
Native Village of Wales
Native Village of White Mountain
Nelson Lagoon Tribal Council
Nenana Native Association
New Koliganek Village Council
New Stuyahok Village
Newhalen Tribal Council
Newtok Traditional Council
Nightmute Traditional Council
Nikolai Village
Ninilchik Village Traditional Council
Nome Eskimo Community
Nondalton Village
Noorvik Native Community
Northway Village,
Nulato Village
Nunakauyak Traditional Council
Organized Village of Grayling
Organized Village of Kake, Petersburg Indian Association
Organized Village of Kwethluk
Organized Village of Saxman
Orutsararmuit Native Council
Oscarville Tribal Council
Pedro Bay Village
Pilot Point Traditional Council
Pilot Station Traditional Village
Platinum Traditional Village Council
Portage Creek Village
Qagan Tayagungin Tribe
Qawalangin Tribe of Unalaska
Rampart Village
Ruby Tribal Council
Selawik Ira Council
Seldovia Village Tribe
Shageluk Native Village
Sitka Tribe of Alaska
Skagway Village

Sleetmute Traditional Council
Solomon Traditional Council
Stebbins Community Association
Takotna Tribal Council
Tazlina Village Council
Telida Native Village Council
Teller Traditional Council
Traditional Village of Togiak
Tuluksak Native Community
Twin Hills Village Council
Ugashik Traditional Village Council
Umkumiut Native Village
Unga Tribal Council
Village of Alakanuk
Village of Anaktuvuk Pass
Village of Aniak
Village of Arctic Village
Village of Clarks Point
Village of Iliamna
Village of Kalskag
Village of Kaltag
Village of Kotlik
Village of Lower Kalskag
Village of Ohogamiut
Village of Old Harbor
Village of Point Lay
Village of Red Devil
Village of Salamatof
Village of Stony River
Village of Wainwright
Wrangell Cooperative Assn
Yakutat Tlingit Tribe

Arizona

Cocopah Tribal Council
Havasupai Tribal Council
Hopi Tribal Council
Hualapai Tribal Council
Pascua Yaqui Tribal Council
San Juan Southern Paiute Council
Tohono O'odham Nation
White Mountain Apache Tribal Council
White Mountain Apache Tribe

California

Agua Caliente Band of Cahuilla Indians
Alturas Rancheria
Augustine Band of Mission Indians
Barona Band of Mission Indians
Bear River Band of Rohnerville Rancheria
Benton Paiute Reservation
Berry Creek Rancheria
Big Lagoon Rancheria
Big Pine Reservation
Big Sandy Rancheria
Big Valley Rancheria
Bishop Reservation
Blue Lake Rancheria
Bridgeport Indian Colony
Buena Vista Rancheria
Cabazon Tribal Business Committee
Cahuilla Band of Mission Indians
Campo Band of Mission Indians
Cedarville Rancheria
Chemehuevi Tribal Council
Chicken Ranch Rancheria
Cloverdale Rancheria
Cold Springs Rancheria
Colusa Rancheria
Cortina Rancheria
Cuyapaipe Band of Mission Indians
Dry Creek Rancheria
Elem Indian Colony
Elk Valley Rancheria
Enterprise Rancheria
Fort Bidwell Reservation
Fort Independence Reservation
Fort Mojave Tribal Council
Greenville Rancheria
Grindstone Rancheria
Guidiville Rancheria
Hoopa Valley Tribal Council
Hopland Reservation
Inaja-Cosmit Reservation
Ione Band of Miwok Indians
Jackson Rancheria
Jamul Indian Village

Karuk Tribe of California
La Jolla Band of Luiseno Indians
La Posta Band of Mission Indians
Laytonville Rancheria
Lone Pine Reservation
Los Coyotes Reservation
Lytton Rancheria
Manchester - Point Arena Rancheria
Manzanita Band of Mission Indians
Mechoopda Indian Tribe of the Chico Rancheria
Mesa Grande Band of Mission Indians
Mooretown Rancheria
Morongo Band of Mission Indians
Pala Band of Mission Indians
Paskenta Band of Nomlaki Indians
Pauma/Yuima Band of Mission Indians
Pechanga Band of Mission Indians
Picayune Rancheria
Pinoleville Reservation
Pit River Tribal Council
Potter Valley Rancheria
Quartz Valley Reservation
Ramona Band of Mission Indians
Redding Rancheria
Redwood Valley Reservation
Resighini Rancheria
Rincon Band of Mission Indians
Robinson Rancheria
Round Valley Reservation
Rumsey Rancheria
San Manuel Band of Mission Indians
San Pasqual Band of Diegueno Indians
Santa Rosa Band of Mission Indians
Santa Ynez Band of Mission Indians
Santa Ysabel Band of Mission Indians
Scotts Valley Rancheria
Sheep Ranch Rancheria
Sherwood Valley Rancheria
Shingle Springs Rancheria
Smith River Rancheria
Soboba Band of Mission Indians
Stewart Point Rancheria
Susanville Indian Rancheria
Sycuan Band of Mission Indians
Table Bluff Reservation
Table Mountain Rancheria
Torres-Martinez Desert Cahuilla Indians
Trinidad Rancheria
Tule River Reservation
Twenty-Nine Palms Band of Mission Indians
United Auburn Indian Community
Upper Lake Rancheria
Viejas Band of Mission Indians
Woodfords Community Council
Yurok Tribe, Middletown Rancheria

Colorado

Southern Ute Tribe
Ute Mountain Ute Tribe

Connecticut

Mashantucket Pequot Tribe
Mohegan Indian Tribe

Florida

Miccosukee Indian Tribe
Seminole Indian Tribe

Iowa

Sac & Fox Tribe of the Mississippi in Iowa

Kansas

Iowa Tribe of Kansas & Nebraska
Kickapoo Tribe in Kansas
Prairie Band Potawatomi Indians
Sac & Fox Tribes

Louisiana

Chitimacha Indian Tribe
Coushatta Indian Tribe
Jena Band of Choctaw Indians
Tunica-Biloxi Tribe

Maine

Aroostook Band of Micmacs
Houlton Band of Maliseet Indians
Passamaquoddy Tribe
Penobscot Indian Nation
Penobscot Nation Department of Natural Resources

Massachusetts

The Trustee of Reservations
Wampanoag Tribe of Gay Head (Aquinnah)

Michigan

Bay Mills Indian Community of Michigan
Grand Traverse Band of Ottawa & Chippewa
Hannahville Indian Community of Michigan
Huron Potawatomi, Inc.
Keweenaw Bay Indian Community of Michigan
Lac Vieux Desert Band of Lake Superior Chippewas
Little River Band of Ottawa Indians
Little Traverse Bay Bands of Odawa Indians
Match-E-Be-Nash-Wish Band of Pottawatomi Indians
Pokagon Band of Potawatomi Indians of Michigan
Saginaw Chippewa Indian Tribe of Michigan
Sault Ste. Marie Tribe of Chippewa Indians

Minnesota

Bois Forte Reservation Business Committee
Fond Du Lac Reservation
Fond Du Lac Reservation Business Committee
Grand Portage Reservation Business Committee
Leech Lake Reservation
Leech Lake Reservation Business Committee
Lower Sioux Indian Community of Minnesota
Mille Lacs Band of Chippewa Indians
Mille Lacs Reservation Business Committee
Minnesota Chippewa Tribe
Prairie Island Indian Community of Minnesota
Red Lake Band of Chippewa Indians
Red Lake Band of Chippewa Indians of Minnesota
Shakopee Mdewakanton Sioux Community of Minnesota
Upper Sioux Community of Minnesota
White Earth Reservation Business Committee

Mississippi

Mississippi Band of Choctaw Indians

Montana

Blackfeet Tribal Business Council
Chippewa Cree Business Committee
Confederated Salish & Kootenai Tribes, Tribal
Crow Tribal Council
Fort Belknap Community Council
Fort Peck Tribal Executive Board
Northern Cheyenne Tribal Council

Nebraska

Omaha Tribal Council
Ponca Tribe of Nebraska
Santee Sioux Tribal Council
Winnebago Tribal Council

Nevada

Battle Mountain Band Council
Carson Community Council
Dresslerville Community Council
Duckwater Tribal Council
Elko Band Council
Ely Colony Tribal Council
Fallon Paiute Shoshone Tribal Business Council
Fort Mcdermitt Tribal Council
Las Vegas Tribal Council
Lovelock Tribal Council
Moapa Business Council
Pyramid Lake Paiute Tribal Council
Reno-Sparks Tribal Council
Shoshone-Paiute Business Council
South Fork Band Council
Stewart Community Council
Summit Lake Paiute Council
Te-Moak Tribe of Western Shoshone
Walker River Paiute Tribal Council
Washoe Tribal Council

Wells Indian Colony Band Council
Winnemucca Tribal Council
Yerington Paiute Tribe
Yomba Tribal Council

New Mexico

Jicarilla Apache Tribe
Mescalero Apache Tribe
Pueblo of Acoma
Pueblo of Cochiti
Pueblo of Isleta
Pueblo of Jemez
Pueblo of Laguna
Pueblo of Nambe
Pueblo of Picuris
Pueblo of Pojoaque
Pueblo of San Felipe
Pueblo of San Ildefonso
Pueblo of San Juan
Pueblo of Sandia
Pueblo of Santa Ana
Pueblo of Santa Clara
Pueblo of Santo Domingo
Pueblo of Taos
Pueblo of Tesuque
Pueblo of Zia
Pueblo of Zuni
Ramah Navajo Chapter

New York

Blue Mtn. Reservation
Cayuga Nation of Indians
Oneida Indian Nation
Onondaga Indian Nation
Seneca Nation of Indians
St. Regis Mohawk Tribe
Tonawanda Band of Seneca
Tuscarora Nation

North Carolina

Eastern Band of Cherokee Indians

North Dakota

Spirit Lake Tribal Council
Standing Rock Sioux Tribal Council
Three Affiliated Tribes Business Council
Turtle Mountain Band of Chippewa

Oklahoma

Absentee-Shawnee Tribe of Oklahoma
Alabama-Quassarte Tribal Town
Apache Tribe of Oklahoma
Caddo Indian Tribe of Oklahoma
Cherokee Nation of Oklahoma
Cheyenne-Arapaho Tribes of Oklahoma
Chickasaw Nation
Choctaw Nation of Oklahoma
Citizen Potawatomi Nation
Comanche Indian Tribe
Delaware Tribe of Indians
Delaware Tribe of Western Oklahoma
Fort Sill Apache Tribe of Oklahoma
Iowa Tribe of Oklahoma
Kaw Tribe of Oklahoma
Kialegee Tribal Town
Kickapoo Tribe of Oklahoma
Kiowa Tribe of Oklahoma
Miami Tribe of Oklahoma
Modoc Tribe of Oklahoma
Muscogee (Creek) Nation
Osage Tribal Council
Otoe-Missouria Tribe of Oklahoma
Ottawa Tribe of Oklahoma
Pawnee Tribal Business Council
Peoria Tribe of Oklahoma
Ponca Tribe of Oklahoma
Quapaw Tribal Business Committee
Sac & Fox Nation of Oklahoma
Seminole Nation of Oklahoma
Seneca-Cayuga Tribe of Oklahoma
Thlopthlocco Tribal Town
Tonkawa Tribe of Oklahoma
United Keetoowah Band of Cherokee Indians

Wichita & Affiliated Tribes
Wyandotte Tribe of Oklahoma

Oregon

Burns Paiute Tribe, General Council
Confederated Tribes of Coos, Lower Umpqua
Confederated Tribes of the Grand Ronde Commun
Confederated Tribes of the Umatilla Indian
Confederated Tribes of the Warm Springs Reservation
Coquille Indian Tribe
Klamath General Council
Siletz Tribal Council

Rhode Island

Narragansett Indian Tribe

South Carolina

Catawba Indian Tribe

South Dakota

Cheyenne River Sioux Tribe
Crow Creek Sioux Tribal Council
Flandreau Santee Sioux Executive Committee
Lower Brule Sioux Tribal Council
Oglala Sioux Tribal Council
Rosebud Sioux Tribal Council
Sisseton-Wahpeton Sioux Tribal Council
Yankton Sioux Tribal Business & Claims Committee

Texas

Alabama-Coushatta Tribe of Texas
Kickapoo Traditional Tribe of Texas
Ysleta Del Sur Pueblo

Utah

Goshute Business Council
Paiute Indian Tribe of Utah Tribal Council
Skull Valley Band of Goshutes
Uintah & Ouray Tribal Business Committee

Washington

Colville Business Council
Confederated Tribes of the Chehalis
Hoh Tribal Business Committee
Jamestown S'klallam Tribal Council
Kalispel Business Committee
Lower Elwha Tribal Council
Lummi Indian Business Council
Makah Indian Tribal Council
Muckleshoot Tribal Council
Nez Perce Contact
Nisqually Indian Community Council
Nooksack Indian Tribal Council
NW Indian Fisheries Commission
Port Gamble S'klallam Tribe
Puyallup Tribal Council
Quileute Tribal Council
Quinault Indian Nation - Business Committee
Samish Indian Nation
Sauk-Suiattle Tribal Council
Shoalwater Bay Tribal Council
Skokomish Tribal Council
Snoqualmie Tribal Organization
Spokane Business Council
Squaxin Island Tribal Council
Suquamish Tribal Council
Swinomish Indian Tribal Community
Umatilla Forest Resource Council
Upper Skagit Tribal Council
Yakama Indian Nation

Wisconsin

Bad River Band of Lake Superior Chippewa Indians
Forest County Potawatomi
Forest County Potawatomi Community of Wisconsin
Great Lakes Intertribal Council
Ho-Chunk Nation
Lac Courte Oreilles Band of Lake Superior Chippewas
Lac Du Flambeau Band of Lake Superior Chippewas
Lac Du Flamebeau Tribal Natural Resource Depa
Menominee Indian Tribe of Wisconsin
Menominee Tribal Enterprises

Oneida Tribe of Indians of Wisconsin
Red Cliff Band of Lake Superior Chippewa Indians
Sokaogon Chippewa (Mole Lake) Community)
Sokaogon Chippewa Community
Sokaogon Chippewa Tribe
St. Croix Chippewa Indians of Wisconsin
St. Croix Chippewa Tribe
Stockbridge Munsee Community of Wisconsin
Stockbridge-Munsee Community
Stockbridge-Munsee Tribe
Wisconsin Winnebago Business

Wyoming

Arapaho Business Committee
Shoshone Business Committee

6.4 Organizations

Alabama

Alabama Nursery Association
Auburn University CES
Auburn University, Department of Entomology & Plant Pathology
B.A.S.S., Inc.

Alaska

Alaska Conservation Alliance
Alaska Defenders of Wildlife
Alaska Forest Association
Alaska Rainforest Campaign
Alaskan Society of Forest Dwellers
Alaskans for Responsible Resource Management
Cook Inlet Region, Inc.
Copper River Delta Institute
Friends of Berners Bay
Friends of the Earth
Greenpeace
Rural Advisor Office of the Governor
Society of American Foresters Alaska
Tongass Conservation Society

Arizona

Arizona for Wildlife Conservation
Arizona Nature Conservancy
Arizona Wilderness Coalition
Arizona Wildlife Federation
Audubon Society, Huachuca
Audubon Society, Northern Section
Audubon Society, Tucson
Center for Biological Diversity
Citizens for Protection of Prescott Arizona
Citizens of Mt. Graham Scientific Council
Cochise Conservation Council
Conservation Chair
Defenders of Wildlife
Ecological Restoration Institute
Environmental Services, Phelps Dodge Morenci, Inc.
Environmental Services
Flagstaff Activist Network
Fort Apache Timber Co.
Foundation for Biodiversity
Grand Canyon Trust
Hebbard & Webb, Inc.
Maricopa Audubon Society
Native Plant Society of Arizona
The Nature Conservancy
North Country, Inc.
Northern Arizona Loggers Association
Northwest Pine Products
Phoenix Zoo
Plateau Group
Prescott Forest Friends
Rincon Group People for the West
Rocky Mountain Elk Foundation
Roosevelt Community Association
Salt River Project
Scentry Biologicals, Inc.
Sierra Club
Sierra Club, Grand Canyon Chapter
Sky Island Alliance
Southern Arizona Environmental Council
Sonoran Biodiversity Project,
Southwest Environmental Center
Southwest Forest Alliance

Southwest Forest Watch
Trout Unlimited
Verde Watershed Association
White Mountain Conservation League
The Wilderness Society, Arizona Chapter
Wildlife Society, Arizona Chapter

Arkansas

Arkansas Forestry Association
Defenders of Quachita Forest
Ozark Organic Growers Association

California

Alternatives to Toxics
American Land Conservancy
American River Conservancy
Aspen Environmental Group
Bear Engineering
California Forestry Association
California Native Plant Society
California State Polytechnic University
California State University - Sacramento
Conservation Congress
Council for Planning & Conservation
Earthjustice, Headquarters
Entrix
Five Creek Limited Partnership
Forest Landowners of California
Golden Queen Mining Co.
Greystone
Humboldt State University, Department of Forestry
Natural Resources Defense Council
Oregon Heirs Corp.
PG&E Corporation
Preservation Officer, Oregon-California Trails Association
Robert Burt & Rebecca Burt Family Trust
Santa Cruz Rainforest Action Group
Sierra Club
Society for the Protection & Care of Wildlife
Talon Associates
Trinity River Lumber Co.
University of California, Department of Ecology & Evolution
University of San Diego, Pardee Legal Research Center
University of the Pacific

Colorado

Burns & McDonnell
Colorado Forestry Association
The Denver Gold Group
KTUN News Director
Meet the Wilderness
Native American Fish & Wildlife Society
Rocky Mountain Bird Observatory
Sierra Club, Rocky Mountain Chapter (Colorado)
Wilderness Society
Wildlife Management Institute

Connecticut

Club, Connecticut Chapter
Connwood Foresters, Inc.
Connecticut Forests & Park Association
Dubois Forestry Land Management
Forestland Associates
Hull Forestland Management
Keep America Beautiful
Sierra Conwood, Inc.
Tamarack Tree Co.
Timberline Management Co.
University of Conneticut CES
Yale School of Forestry

Delaware

Air Enterprises, Inc.
College of Agriculture & Sciences University of Delaware
Delaware Campground Owners Association
Delaware Nature Education Society
Delaware Nature Society
Delaware State University
Department of Agriculture & Natural Resources
Dover Post
Drake Farms

Hopeland Farms
Stafford Homeowners Association
T. S. Smith & Sons, Inc.
The Cedars Academy
University of Delaware Entomology

District of Columbia

American Forest Council
American Forest Resource Alliance
American Forests
American Lands Alliance
American Paper Institute
American Pulpwood Association
American Recreation Coalition
American Rivers
American Ski Federation
Americans for the Environment
Association of State & Territorial Health Officers
Coalition for Scenic Beauty
Council of Governors' Policy
Defenders of Wildlife
Ecological Society of America, The
Endangered Species Coalition
Friends of the Earth
George Washington University Library
Global Leleaf
Greenpeace USA
International Association of Fish & Wildlife
National Agricultural Chemical Association
National Association of Conservation District
National Association of Counties
National Association of State Foresters
National Audubon Society
National Coalition Against the Misuse of Pesticides
National Conference of State Legislatures
National Council for Science & the Environment
National Forest Products Association
National Governors Association
The National Grange
National Parks Conservation Association
National Tree Trust
National Urban League
Natural Resources Council of America
Natural Resources Defense Council
Public Health Foundation
Public Lands Council
Save America's Forests
Sierra Club, Washington DC Office
Sport Fishing Institute
U.S. Public Interest Research Group
United States Tourist Council
Urban Forestry Administration
Western Governors Association
Wilderness Society, The
World Resources Institute
World Wildlife Fund

Florida

Florida A&M University
Florida Forestry Association
Florida International University
Florida Native Plant Society
Florida State University
Forest Management Trust
Great Outdoors Conservancy
St. Thomas University
Tree Advisors
University of Central Florida
University of Florida, School of Forest Resources
University of South Florida, Sarasota
University of South Florida, Tampa
University of Tampa
University of West Florida

Georgia

Atlanta Audubon Society
Augusta State University
Berry College
Columbus State University
Dalton State College
Emory University
Forest Landowners Association, Inc.
Forest Watch Coordinator
Fox Forestry, Inc.
Georgia Organic Growers Association

Georgia College & State University
Georgia Department of Natural Resources
Georgia Federation of Forest Owners
Georgia Forestry Association, Inc.
Georgia Institute of Technology
Georgia Southern University
Georgia Southwestern State University
Georgia State University
Kennesaw State University
Mercer University
National Forest Products Association
North Georgia College & State University
Savannah Tree Foundation
Sierra Club, Georgia Chapter
Southeast Lumber Manufacturers Association
State University of West Georgia
Toxic Commission & Assistance Project
Trees Atlanta
Union Camp Woodlands Corp.
University of Georgia
University of Georgia, Department of Entomology
Valdosta State University
Warnell School of Forest Resources

Hawaii

Brigham Young University - Hawaii
University of Hawaii - Manoa

Idaho

Albertson College of Idaho
Association Logging Contractors, Inc.
Bioanalysts
Blue Ribbon Coalition
Boise Cascade Corporation
Boise State University
Caldwell R. & E. Center
Carney Products Co. Ltd
Ceda-Pine Beneer
CH2M Hill
Citizens for a User Friendly Forest (CUFF)
Coeur D'Alene Chamber of Commerce
Coeur D'Alene Tribal Forestry
College of Forestry University of Idaho
Croman Corp
Crown Pacific Island
Dames & Moore
Economic Modeling Specialists
Flying Resort Ranches
Friends of the Clearwater
Hells Canyon Alliance
Idaho Audubon Council
Idaho Conservation League
Idaho Forest Industries, Inc.
Idaho Nursery & Landscape
Idaho Power Co.
Idaho State University
Idaho Trails Council
Idaho Water Users Association
Idaho Watersheds Project
Idaho Wildlife Federation
Idaho Women in Timber
Intermountain Forest Industry Association
JAG, Inc.
Kootenai Environmental Alliance
Lewis-Clark State College
Ling, Nielsen & Robinson
Louisiana-Pacific Corporation
Northwest Management, Inc.
Northwest Timber Workers Resourse Council
Potlatch Corporation
President, ID Chapter, Oregon California Trails Association (OCTA)
Regulus Stud Mills, Inc.
Resource Solutions
Ricks College
Selkirk-Priest Basin Association
Sierra Club
Society of American Foresters, Intermountain
Spokesman-Review
St. Joe Economic Development Foundation
Three Rivers Timber, Inc.
University of Idaho Department of Forest Resources-Entomology
University of Idaho
University of Idaho Extension Forestry

University of Idaho Forest, Wildlife & Range Policy Analysis Group
University of Idaho, College of Forestry, Forest Entomology
University of Idaho Society of American Foresters
Western Forest Environmental Alternative
Western States Equipment
Wilderness Society

Illinois

Abbot Laboratories Capd
America Defender Network
American Nurseyman
Benedictine University
Bradley University
Capital Agriculture Property Service, Inc.
Chicago Region Biodiversity Council, Chicago
Chicago State University
Depaul University
Dominican University
Eastern Illinois University
Governors State University
Harold Flying Service
Hendrickson Flying Service
Illinois Nurserymen's Association
Illinois Forest Products Co., Inc.
Illinois Native Plant Society
Illinois State Library
Illinois State University
Illinois Valley Community College
Illinois Walnut Council
Illinois Wesleyan University
International Society of Arboriculturists
John A. Logan College
Lake Forest College
Lewis University
Loyola University, Chicago
Monmouth College
Moraine Valley Community College
National Campers & Hikers Association
North American Wildlife Foundation
Northeastern Illinois University
Northern Illinois University
Northwestern University
Northwestern University School of Law
Olivet Nazarene University
Open Lands Project
Plant Illinois
Pontiac Flying Service
Race & Heartwood
Reed's Fly-On Farming
Rocky Moutain Elk Foundation
Southeast Illinois College
Sierra Club Great Lakes Chapter
South Suburban College
Southern Illinois University Carbondale
Tri-State Forestry
University of Chicago
University of Illinois Extension, University
University of Illinois, Chicago
University of Illinois at Urbana, Champaign
Urbana Forestry Management, Inc.
Valent Biosciences Corp
Western Illinois University
Wheaton College
Wildlife Society Illinois Chapter

Indiana

Ace Pest Control
Akard Forestry Consultants
Al's Aerial Spraying
Anderson University
Ball State University
Berg-Warner Nursery, Inc.
C.S. Bond Forest Management
Chris Leibering & Sons
Depaul University
Forest & Land Managers, Inc.
Forest Management Services
Hanover College
Hensler Nursery, Inc.
Hopwood Forestry Consultants
Hudson Forestry Co.
Huntington College
Indiana Forestry & Woodland Owners Association
Indiana State University

Indiana University
Indiana University, Kokomo
Indiana University, Northwest
Indiana University, South Bend
Indiana University, Southeast
Indiana Wood Products, Inc.
Pike Lumber Co., Inc.
Purdue University Hardwood Tree Improvement & Regeneration Center
Purdue University
Purdue University Entomology Department
Saint Joseph College
Schuerman Forestry Service
Stambaugh Forestry & Nursery
University of Notre Dame
University of Southern Indiana
Valparaiso University
Wabash College
Walley Lumber Co.
Walnut Council
Weston Paper

Iowa

Control Services
Cornell College
Department of Entomology Iowa State University
Drake University
Drake University
Geode Resource Conservation and Development (RC&D)
Grinnell College
Haugen Contracting
Iowa State University
Iowa State University Department of Plant Pathology
Iowa State University Extension Forester
Iowa State University Extension Horticulture
Iowa State University of Science & Tech.
Iowa Woodland Owners Association
Izaak Walton League of America Endowment
Krambeer Forestry Services, Inc.
Lone Tree Nursery
Murphy's Walnut Hill Nursery
National Association of County Engineers
North Iowa Area Community College
Northwest Landscaping, Inc.
Northwestern College
Pathfinders RC&D
Pella Nurseries
Peters Logging & Milling
Soil & Water Conservation Society of America
State Library of Iowa
Tiedt Nursery & Forestry Service
Trees Forever
Trees-R-Us
University of Iowa
University of Northern Iowa
Upper Iowa University
West Enterprises

Kansas

Baker University
Colby Community College
Dodge City Community College
Fort Hays State University
Kansas City Community College
Kansas State University
Kansas Wesleyan University
University of Kansas
Washburn University
Wichita State University

Kentucky

Department of Entomology, University of Kentucky
Eastern Kentucky University
Kentucky State University
Kentucky Wesleyan College
Kentucky Woodland Owners Association
Kentucky Forest Industries Association
Morehead State University
Murray State University
Northern Kentucky University
Union College
University of Kentucky
University of Kentucky Department of Entomology
University of Kentucky Department of Forestry

University of Louisville
Western Kentucky University

Louisiana

Alexandria Forestry Center
Louisiana College
Louisiana Forestry Association
Louisiana State University Department of Entomology
Louisiana State University, Baton Rouge
Louisiana State University, Eunice
Louisiana State University, Shreveport
Louisiana Tech University
Loyola University, New Orleans
Norrie Colony, Inc.
Northwestern State University
Southeastern Louisiana University
Southern Forest Products Association
Southern University A&M College
Tulane University
University of Louisiana, Lafayette
University of Louisiana, Monroe
Xavier University of Louisiana

Maine

American Pulpwood Association, Inc.
Andrews Land Service, Inc.
Bates College
Bear Paw Lumber
Bowdoin College
Champion International
Colby College
Coolong Land Surveys
Eco- Analysts
Edgewood Tree Farm
Evans Notch Visitor Center
Forest Society of Maine
Forests by Design
International Paper Co.
The Ireland Group
James River Timber
James W. Sewall Co.
Landvest, Inc.
Leonardi Associates
Llavalley Lumber Co.
M.S. Lavoie Air
Mackintosh Forest Management Services
Maine Maritime Academy
Maple Hill Forest Services
Marine Helicopters
Marty's Logging
National Audubon Society, Maine Audubon
Natural Resources Council of Maine
Prentiss & Carlisle Co., Inc.
S.D. Warren Woodlands
Sierra Club, Maine Chapter
Small Woodland Owners Association of Maine
Southern Maine Forestry Services
Timberland Consultants
Two Trees Forestry
University of Maine, School of Law
University of Maine, College of Natural Sciences
University of Maine, Orono
University of Maine, Presque Isle
Whittling Ridge Farm
Wood Fiber Industries
Woodlot Alternatives, Inc.
Woodlot Management Services

Maryland

Allegany College of Maryland
Alliance for Maryland Forest
American Hiking Society
Associationiatoin of Consulting Foresters America,
Center for Watershed Diversity
Chesapeake Corporation
Chesapeake Forest-Land Services
East Coast Helicopter, Inc.
Entomological Society of America
Forestry Concepts
Frostburg State University
Glatfelter Pulp Wood Co.
Helicopters Applications, Inc.
International Society of Tropical Foresters
Izaak Walton League of America, Inc.
James Bailey Agrotors

Kennedy Consultants
The Land & Tree Co.
Maryland Campground Owners Association
Maryland Chistmas Tree Association
Maryland Forest, Park & Wildlife Service
Maryland Forests Association
Maryland Native Plant Society
Michel Forestry Co.
National Military Fish & Wildlife Association
The Orchards Association, Inc.
Parker Forestry Services
Parkton Woodland Services
Pickering Creek Audubon Center, Audubon Maryland
Pine Top Woodland Improvement Ser.
Piney Run Nature Center
Rachel Carson Council, Inc.
Renewable Natural Resources Foundation
Salisbury State University
Society of American Foresters
Spicer Lumber Co.
University of Baltimore
University of Maryland at College Park
University of Maryland, Baltimore County
Versar, Inc.
Washington College
Western Maryland College
Wildlife Habitat Council
Wood Products, Inc.

Massachusetts

Amherst College
Appalacian Mountain Club
Beaver Tree Work
Boston Athenaeum Library
Boston College
Boston University, School of Law
Brandeis University
Conservation Law Foundation of Northeast
Earthwatch
Forest Logic
Forester - W.D. Cowle, Inc.
Gordon College
Harvard College
Holdsworth Natural Resource Center
The Land Concern, Inc.
Massachusetts Audobon Society
Massachusetts Forestry Associatione
Massachusetts Institute of Technology
National Parks Conservation Association
New England Forestry Foundation
North American Family Campers Association
Northeastern University
Sierra Club, Massachusetts Chapter
Trust for Public Land
Tufts University
Tufts University Environmental Program
Turnagain Resources
University of Massachusetts, Amherst
University of Massachusetts CES
University of Massachusetts, Dartmouth
University of Massachusetts, Department of Entomology
University of Massachusetts, Department of Forestry & Wildlife Mgmt
University of Massachusetts Extension
University of Massachusetts, Lowell
University of Massachusetts, Medical Center
University of Massachusetts, Shade Tree Lab
University of Massachusetts, Western MA Agriculture Center
University of Massachusetts, Department of Zoology
Wellesley College
Western New England College
Williams College

Michigan

Abitibi-Price Corporation
Albion College
Al's Aerial Spraying
American Motorcycle Association
American Society of Agricultural Engineers
Armintrout's Nursery
Battelle Great Lakes Environmental Center
Biewer Sawmill, Inc.
Big Creek Associates
Central Michigan University

Champion Fleet Owners Association
Citizens for Alternatives to Chemical Contamination
Consumers Power Co.
Cycle Conservation Club of Michigan
Delta College
Dow Chemical Co.
Earl's Spray Service, Inc.
Eastern Michigan University
The Ecology Center
Federation Natural Resources
Federation of Fly Fishers
Ferris State College
Ferris State University, Department of Bio Science
Forest-Land Services, Inc.
Georgia Pacific Corporation
Global Relief of Michigan
Great Lakes Camp & Trail Association
Grosse Pointe Woods Tree Commission
Hatfields Spraying Service
Huron Audobon Club
Hydrolake Leasing & Sales
Keweenaw Land Association, Ltd.
Lake States Forestry Alliance
Lake States Lumber Association
Lake Superior State University
Mackinac Chapter - Sierra Club
Marble Institute of America
Maurice's Flying Service
Mead - Publishing Paper Division
Metropolitan Forestry Consultants, Inc.
Michigan Association of Private Campground Owners
Michigan Association of Timbermen
Michigan Audubon Society
Michigan Bow Hunters
Michigan Chamber of Commerce
Michigan Conservation Foudation
Michigan Environmental Council
Michigan Environmental Defense League
Michigan Forest Products Industry Dev. Council
Michigan Forests Association
Michigan Independent Wood Products Association
Michigan Nature Association
Michigan Nature Association
Michigan Recreation Canoe Association
Michigan Salmon & Steelheader Association
Michigan Snowmobile Association
Michigan State University Department of Entomology
Michigan State University Extension
Michigan State University, Pesticide Research Center
Michigan Tech University, School of Forestry & Wildlife
Michigan Technological University
Michigan Technological University School of Forest & Wood Products
Michigan Trail Riders Association
Michigan Tree
Michigan Trout Unlimited
Michigan United Conservation Clubs
Michigan Wild Turkey Federation
Michigan Wilderness Prevention
Michigans Trapper's Association
Mid-Michigan Helicopters, Inc.
Morth County Trail Association
Michigan State University, Department of Forestry
National Gypsy Moth Management Group
National Woodlands
Nature Conservancy
North Central Michigan College
North Country Trail Association
Northeast Michigan Sportsmen Club
Northern Hardwoods
Northern Michigan University
Northwestern Financial Center
Oakland University
Oscoda Sierra Club
Outdoor Access, Inc.
Packaging Corporation of America
Pere Marquette Watershed Council
Pictured Rocks National Lakeshore
Potts Tree Farm
Ruffed Grouse Society
Screamin Eagle Aviation
Sierra Club
Sierra Club, West Michigan Group
Steelhead Anglers
Steiger Lumber Co.

Timberwatch
Trout Unlimited
University of Michigan, Botanical Gardens
University of Michigan, School of Natural Resources
West Michigan Environmental Action Council
West Michigan Tourist Association
Western Michigan University
Weyerhauser
Wiggins Tree Co.
Wild Turkey Federation
The Wilderness Society

Minnesota

Airborne Custom Spraying, Inc.
Cook Co.
Forest Management Specialists, Inc.
Forestry Associates
Hamline University
Heartwood Forestry
Kunde Co. Forestry
Minnesota Forestry Association
Minnesota Ornithologists' Union
Moorhead State University
Mountland Timber, Inc.
North Hardwoods Notes
Plant Health Associates, Inc.
Potlatch Corp.
Privatelands Forestry Consulting
Rijala Timber Co.
Saint Cloud State University
Split Rock Forestry, Inc.
Sundance Silviculture
Two by Forestry
Woodland Services, Inc.

Mississippi

Alcorn State University
Delta State University
Jackson State University
Mississipe State University Department of Entomology
Mississippi College
Mississippi Department of Agriculture & Commerce
Mississippi Forestry Commission
Mississippi State University Department of Forestry
Mississippi State University, College of Forestry
Mississippi University for Women
Mississippi State University
Mississippi Forestry Commission
National Association of Professional Forestry Schools
Sidney Malone International
University of Mississippi
University of Southern Mississippi

Missouri

Audubon Society of Missouri
Central Missouri State University
Chamberlain & De James
Department of Conservation/Forestry Division
Dowler's Lower Place
Foremost Forest Managers
G-W Lumber Co.
Hammons Products Co.
Jefferson College
Lincoln University
Lindenwood University
Loners of America
Maryville University of Saint Louis
Meers & Associates
Metropolitan Forestry Services
Missouri Forest Products Association
Missouri Native Plant Society
Missouri Southern State College
Missouri Forest Management Co.
National Timber Consultants
Northwest Missouri State University
Port Hudson Timber Management
Rockhurst University
Saint Louis University
Schnurbusch Land Services
Sierra Club, Ozark Chapter (Missouri)
Skip Kincaid & Associates
Southeast Missouri State University
Southeastern Association of Fish & Wildlife Agencies
Southwest Missouri State University
Steward Agriculture Research Services

Truman State University
University Extension, University of Missouri
University of Missouri
University of Missouri, Columbia Department of Entomology
University of Missouri, Columbia Department of Entomology
University of Missouri, Columbia
University of Missouri, Kansas City
University of Missouri, Rolla
University of Missouri, Saint Louis
University of Missouri, School of Forestry, Fisheries & Wildlife
Washington University
Washington Wheatley Neighborhood Association
William Jewell College

Montana

Alliance for the Wild Rockies Ecosystem Defense
American Wildlands
Belt Creek Information Center
CS & KT Forestry
Lewis & Clark Intrepretive Center
Missoula Technology Development Center
Montana Forest Owners Association
Montana State University, Billings
Montana State University, Bozeman
Montana State University, Northern
Montana Tech/University of Montana
National Audubon Society, Montana Audubon
National Forest Foundation
Rocky Mountain Elk Foundation
Scentry Biologicals., Inc.
University of Montana
Wilderness Watch

Nebraska

Creighton University
Dana College
National Arbor Day Foundation
University of Nebraska, Kearney
University of Nebraska, Lincoln
University of Nebraska, Omaha
Wayne State College

Nevada

University of Nevada, Las Vegas
University of Nevada, Reno

New Hampshire

Blue Hills Forest Products
Dartmouth College
Foreco
Gorham Land Co.
James River Corp.
Little Pro Timber Service
New Hampshire Association of Conservation Districts
New Hampshire College
New Hampshire Landowners Alliance
New Hampshire Timberland Owners Association
NH Timberlands Owners Association
Northern Forest Lands
Preserve Appalachian Wilderness
Saint Anselm College
Sierra Club, New Hampshire Chapter
Society for the Protection of New Hampshire Forests
Trust for New Hampshire Lands
University of New Hampshire
Urban Forestry Center
Wagner Woodlands, Inc.
Waterville Valley Co.
White Mountain Attractions Association
Wonalancet Outdoor Club

New Jersey

Aeolium Nature Center
Alliance for Environmental Concerns
American Littoral Society
Arbor Management
Batsto Nature Center
Bergab County Wildlife Center
Cattus Island Nature Center
Center for Environmental Studies

College of Saint Elizabeth
Conservation & Environmental Center, Inc.
Consolidated Eastern Corp.
Cordoba Helicopter Enterprises, Inc.
Cornucopia Network of New Jersey, Inc.
County College of Morris
The Delicate Balance
Downstown Aero Crop Service, Inc.
Drew University
Fairleigh Dickinson University
Flat Rock Brook, Director
Forest Management Services
Forestry Section, Cook College
Galway Forestry Services
Grassroots Environmental Organization
H & S Forestry Co., Inc.
The Hope Commission
Interstate Pest Control Compact
Irvington Outdoor Education Center
Monmouth University
Montclair State University
New Jersey Association of Conservation Districts
New Jersey Beekeepers Association, Inc.
New Jersey City University
New Jersey Coalition for Alternatives to Pesticides
New Jersey Conservation Foundation
New Jersey Environmental Federation
New Jersey Forestry Association
Ocean County College
Palisades Nature Association
Paul Cowie Associates
PGE
Poricy Park Nature Center
Princeton Education Center at Blairstown
Princeton University
Public Service Electric & Gas Co.
Rdg Associates, Inc.
Rider University
Rowan University
Rutgers University, Camden
Rutgers University, New Brunswick
Rutgers University, Newark
Sandy Hook Environmental Education Center
Seton Hall University
Seton Hall University, School of Law
Shade Tree Commission
Sierra Club Chatam
South Branch Watershed Association
Spermaceti Cove Visitor Center
Stony Brook-Millstone Watershed
Tenafly Nature Center
Trailside Nature & Science Center, Director
Upper Raritan Watershed Association
Watergate Environmental Education Center
Weis Ecology Center
The Wetlands Institute
YMCA Camp Bernie

New Mexico

Audubon Society
Audubon Society, Central New Mexico
Audubon Society, Southwest New Mexico
Carson Forest Watch
Chippeway Lumber, Inc.
Coalition for Public Lands & Natural Resources
Coalition of AZ/NM Counties
Conklin Lumber Co
Department of Natural Science, WNMU
Earth First, New Mexico
Eastern New Mexico University
Forest Conservation Council
Forest Guild
Forest Trust
Forestry Association, Inc.
Gila Conservation Coalition
Gila Watch
Hansen Lumber Co., Inc.
Hawkwatch International
Izaak Walton League
Kuykendall Lumber Co.
La Jicarita Enterprise, Inc.
Madera Forest Products Coop
MCS Task Force of NM
Moore Cash Lumber
Native Plant Society of New Mexico
The Nature Conservancy of New Mexico

New Mexico Audubon Council
New Mexico Earth First!
New Mexico Farm & Livestock Bureau
New Mexico Highlands University
New Mexico Junior College
New Mexico Public Interest Research Group
New Mexico Public Land Council
New Mexico Rural Development Response
New Mexico State University
New Mexico Wilderness Study Committee
People for the West
Public Land Users Association
The Quivira Coalition
Sanchez Timber & Mill Co.
Santa Fe Canyon Association
Santa Fe Forestry Council
Scientech
Sierra Club
Sierra Club, Albuquerque Group
Sierra Club, Pajarito Group
Sierra Club, Rio Grande Chapter
Sierra Club, Santa Fe Chapter
Sierra Club, Tularosa Basin Group
Taos Birders
Taos Nature Society
University of New Mexico
University of New Mexico, School of Law
Western Environmental Law Center
Western Network
Western New Mexico University
Wild Turkey Federation, Las Cruces Chapter
Zuni River Watershed

New York

A to Z Forestry
Adelphi University
Adirondack Conservancy
Adirondack Council
Adirondack Eco-Center
Adirondack Forestry, Inc.
Adirondack Mountain Club
Airspray, Inc.
Alley Pond Enviroment Center, Inc.
Alpine Forestry
American Birding Association, Inc.
American Forest Council
American Nature Study Society
American Whitwater Affiliation
Appalachian Forestry Consulting Services
Arbor Care Ltd.
Arthur W. Butler Memorial Sanctuary
Ashokan Field Campus
Baltimore Woods
Bayard Cutting Arboretum
Beaver Lake Nature Center
Beaversprite Nature Center
Binghamton University
Brooklyn Botanic Garden
Brooklyn College/College University of New York (CUNY)
Brooks Resources Management Co.
Buttermilk Falls Tree & Turf, Inc.
Camp Greenkill Environmental Education Center
Camp Owahta Outdoor Education Center
Capake Falls State Park Nature Center
Cary Arboretum
Catskill Forest Association
Catskill Mountain Forestry Service
Catskill Real Estate Appraisals
Christian Gearwar
City College/CUNY
Clarkson University
Clear Creek Consulting
Colgate University
The College of Insurance
Columbia University
Conservation Advisory Committee
Cooper Union
Co-operating Consultant Foresters
Cornell Laboratory of Ornithology
Cornell University
Cornell University CES
Cornell University, Department of Entomology
The Cummings Nature Center
Delaware Valley Forestry Service
Downing Enviroment & Forest Consultant

Dyken Pond Environment Education Center
Earth First
East-West Forestry Association
Elmira College
Empire State Forestry Service
Environmental Action Coalition
Environmental Defense, Headquarters
Erie County CES
Ferncliff Forest
Five Rivers Environmental Education Center
Fordham University
Fordham University, School of Law
Forecon, Inc.
Forest-All: Tree & Forest Care
Forsite Forestry
Fountain Forestry, Inc.
Golden Valley Outdoor Recreation Center
Great Neck Outdoor Environmental Center
Green Chimneys Farm Center
Greenburg Nature Center
Greenwood Park
Gunlocke Co.
Heldeberg Workshop
Herbert H. Lehman College/CUNY
High Rock Park Conservation Center
Hillside Outdoor Education Center
Hofstra University
Intermountain Forestry
Intermountain Forestry
International Paper Co.
Inwood Hill Park Environmental Education Center
IPM Laboratories
Kenneth L. Willimas & Association
Long Island University
Mallery Lumber Co.
Manitoga Hudson River Nature Center
Mianus River Gorge Wildlife Refuge & Botanica
Micha Tree & Landscape Consultants
Miller Forest Products
Minna Anthony Com. Nat. Center
Monroe Tree & Landscape, Inc.
Muscoot Park Interp. Farm
Museum of Hudson Highlands
Nassau County Museum Preserve
National Audubon Society
National Campers & Hikers Association
National Council of Paper Industry
Natural Resources Defense Council, Inc.
North East State Foresters Association
New York Botanical Gardens Institute of Ecosystem Studies
New York Forest Owners Association
New York Law Institute
New York Law School
New York University
New York Zoological Park
Northeast Timber Services
Northern Consulting
Northern States Tree Services, Inc.
Norton Timberland Management
NY Department of Environmental Cons.
Oceanside Marine National Study Area
Pace Environmental Center
Peterson Forestry, Inc.
Pioneer Forestry Service
Planting Fields Arboretum
Plattsburgh State University
Pok-O-Moonshine Outdoor Education Center
Queens Botanical Garden
Queens College/CUNY
Quogue Wildlife Refuge
Regional Plan Association
Rockland Lake Nature Center
Rudolf Steiner Farm School
Rye Nature Center
Sackhoes Region Nature Center
Saint Bonaventure University
Saint John's University
Sapsucker Woods Bird Sanctuary
Sarah Lawrence College
Sharpe Enviroment Center
Skidmore College
South Fork, Shelter Island Chapter
St. Lawrence University
State University College of Technology
State University College of Brockport

State University College of Cortland
State University College of Geneseo
State University College of New Paltz
State University College of Oneonta
State University College of Oswego
State University College of Potsdam
State University of New York (SUNY)
SUNY, Albany
SUNY, Buffalo
SUNY, College of Environmental Sciences & Forestry
SUNY, Farmingdale
SUNY Institute
SUNY Maritime College
SUNY, Stony Brook
SUNY, Department of Natural Resources
Sylvan Forestry Services
Synecology Forest Management
Syracuse University
T. Roosevelt Memorial Bird Sanctuary
Teatown Lake Reservation
Thompson Pond Project
Thorington Forestry Service
Timberland
Town of North Salem
Town of Warrensburg
Trailside Nature Museum
Trust for Public Land
Twin Valleys Outdoor Education Center
Union College
University of Rochester
Upland Farm
Upper Delaware Council
Upper Delaware Scenic & Rec. River
Vassar College
Wave Hill Center for Environ. Study
Weinberg Nature Center
Westmoreland Sanctuary, Inc.
Winding Hills Park Nature Center

North Carolina

Abw Lumber Indiustries, Inc.
Apex Nurseries, Inc.
Appalachian State University
Associationiated Hardwoods, Inc.
Bartlett Tree Rsch Lab
Beard, E.N. Hardwood Co.
Campbell University
Catawba College
Cramer Lumber Co.
Davidson College
Duke University
Duke University School of Forestry & Environmental Studies
East Carolina University
Fayetteville State University
Forest History Society, Inc.
Gilkey Lumber Co., Inc.
Interforest, Inc.
Mount Olive College
National Foundation for the Chemically Hypersensitive
National Toxics Campaign
NC Christmas Tree Association
North Carolina A & T State University
North Carolina Central University
North Carolina Forestry Association
North Carolina State University
North Carolina State University College of Forest Resources
North Carolina State University Department of Entomology
North Carolina Wesleyan College
North Carolina Wildlife Resources Commission
Oaks Unlimited
Prime Lumber Co.
Queens College
Southern Appalachian Biodiversity Project
University of North Carolina, Chapel Hill
University of North Carolina, Charlotte
University of North Carolina, Greensboro
University of North Carolina, Pembroke
University of North Carolina, Wilmington
Voohees & Pitts Lumber Co., Inc.
Wake Forest University
Watson Lumber Co., Inc.
Western Carolina University

North Dakota

North Dakota State University
Sully's Hill-N-Game Preserve
University of North Dakota

Ohio

American Farm Tree Program
Ashland University
Bob Ruhe AG Service
Bowling Green State University
Capital University
Case Western Reserve University
Cleveland State University
College of Wooster
Custom Forestry
Denison University
Downing Woodland Services
Forest Resource Consultants
Hooking College
International Association of Natural Resource
John Carroll University
Johnson's Forest Products
The Longaberger Co.
Kent State University
Kenyon College
MacArthur Lumber & Post Co.
Marietta College
Marketing Labs Co., Inc.
Meadow Woodlands
Med Woodlands
Miami University
Miami University - Middletown
Municipal Arborists & Urban Foresters Society
Muskingum College
Native Plant Society of Northeast Ohio
Oberlin College
Ohio Christmas Tree Association, Inc.
Ohio Ecological Food & Farm Association
Ohio Forestry Association, Inc.
The Ohio Lepidopterists
Ohio Integrated Pest Management Program
Ohio Northern University
Ohio Nursery Association
Ohio State University
Ohio State University Extension Lucas Co.
Ohio Tree Consulting Services
Ohio University
Ohio Wesleyan University
Olde Forester Consultants
Otterbein College
Potts Tree Farm
Prime Air
Shawnee State University
Society of Municipal Arborists
Timberland Forestry Consutants
Tree Sentry
Treevalue Forestry Service
University of Akron
University of Cincinnati
University of Dayton
University of Findlay
University of Toledo
Wright State University
Youngstown State University

Oklahoma

East Central University
National Watershed Coalition
Native Americans for a Clean Environment
Northeastern State University
Northwestern Oklahoma State University
Oklahoma Forestry Association.
Oklahoma State University
Oklahoma State University Department of Forestry
Oklahoma Woodland Owners Association
Southeastern Oklahoma State University
Southern Nazarene University
Southwestern Oklahoma State University
University of Central Oklahoma
University of Oklahoma
University of Tulsa

Oregon

Andersen Forestry Consulting
Agri-Pacific Resources, Inc.
Alice V. Wissman Living Trust
American Fisheries Society - Oregon Chapter
American Lands Alliance
Argus Observer
Associated Oregon Loggers
Atterbury Consultants, Inc.
Audubon Society of Portland
Avion Water Co., Inc.
B & S Logging, Inc.
Bark
Big Pines RV Park
Black Butte Resort
Blue Mountain Back Country Horsemen
Blue Mountain Biodiversity Project
Blue Mountain Native Forest Alliance
Blue Mountains Biodiversity Project
Blue Mountain Lumber Products
Boise Cascade Corporation
Boise Corporation of Northeast Oregon
Brandt-Nelson, Lark & Brandt
The Bulletin
Camp Tamarack
Capital Press
Cascadia Forest Alliance
Center for Environmental Equity
Central Cascades Alliance
Central Oregon Audubon Society
Central Oregon Community College
Central Oregon Small Woodlands Associates
Central Point Lumber
Chambers Communication Corp
Churchill, Leonard, Brown, Lodine, & Hendrie
Circle De Lumber Co.
City of Eugene, Parks & Open Space
Clouston Energy Research
Cold Springs Resort
Columbia Basin Fish and Wildlife Authority
Concerned Friends ofthe Winema
Consolidated Pine
Crane Prairie Resort
Crescent Creek Cottages
Crescent Lake Lodge & Resort
Crescent Lake RV Park
Crescent Water Association
Crown Pacific Ltd.
Crown River Corp. & Crown Zellerbach
Cultus Lake Resort
D.R. Johnson Lumber (Prarie Wood Products)
David Evans & Associates
Defenders of Wildlife
Deschutes Province Advisory Committee
Double-D-Logging
Douglas Timber Operators, Inc.
Dow Agrosciences
Dr. Johnson Lumber Companies
Dunn Family Trust
Earth Share of Oregon
Eastern Oregon University
Eastern Oregon University Baker Center
Eco-Northwest
Ecola Creek Awareness Project
Ecosystem Equity Council
Emerald Chapter, Native Plant Society of Oregon
Environmental Studies Center
Eugene Burrill Lumber Co.
Eugene Parks & Open Space
Evergreen Helicopters
Forest Recovery, Inc.
Forest Resource Management, Inc.
Forest Resource Services
Forest Service Employees for Environmental Ethics
Fowler Timber Co.
Friends of the Columbia Gorge
Friends of Black Butte Ranch
Friends of Living Oregon Waters
Friends of the Greensprings
Friends of the Metolius
Friends of the Metolius-Environmental Advocates
Glide Lumber Co./Western Timber Co.
Grande Ronde Resource Council
Grande Ronde Model Watershed Program
Grant County Conservationists
Grizzly Mountain Aviation

Guistina Resources
Haglund, Kirtley, Kelly & Horngren LLP
Halfway House Gallery & Gifts
Headwaters
Hells Canyon Preservation Council
Henderson Logging
High Desert Committee, Sierra Club
Hood River County Weed & Pest Director
Independent Forest Products Association
Institute for Fisheries Resources
Izaak Walton League
J. & J. Logging
J. Herbert Stone Nursery
Joseph Timber Co.
K/P Corporation
Keerins Ranch
Kinzua Resources
Klamath Siskiyou Wildlands Center
L. & D., Inc.
Lane County Audubon Society
Lapine Forestry Services, Inc.
Larch Co.
Lewis & Clark College
Lewis & Clark Law School
Linfield College
Lowell Service Center
Lowell Work Center
M. & L. Enterprises
Malheur Lumber Co.
Malheur Timber Operators, Inc.
Mason, Bruce & Girard, Inc.
Mckenzie Guardians
Metolius Meadows Property Owners Association, Inc.
Metolius Recreation Association
Metolius River Summer Homes
Mid-Columbia Native Plant Society
Monarch Magic
Mountaineers
Mt. Bachelor, Inc.
Musselman & Association, Inc.
Myrmo & Sons, Inc.
National Audubon Society
Native Plant Society
Native Plant Society of Oregon, Blue Mountain Chapter
Native Plant Society of Oregon, Wm Cusick Chapter
The Nature Conservancy
Neighborhood Association
Net Work Association Ecological Consulting
North American Butterfly Association
North American Wild Sheep
North Santiam Watershed Council
North Santiam Watershed Forum
Northwest Coalition for Alternatives to Pesticides
Northwest Environmental Defense Council
Northwest Forestry Association
Northwest Resource Council
Northwest Special Forest Products Association
Northwestern School of Law
The Nugget Natural Areas Association
Ochoco Lumber Co.
Odell Lake Homeowners Association
Odell Lake Resort
Odell Sportsman
Old Cascades Wilderness Com
One World Trade Center
Oregon Association of Nurserymen
Oregon Cattlemen's Association
Oregon Eagle Foundation
Oregon Equestrian Trails
Oregon Farm Bureau
Oregon Forest Homeowners Association
Oregon Hunters Association
Oregon Natural Desert Association
Oregon Natural Resources Council
Oregon Poison Center
Oregon Rivers Council
Oregon Sierra Club Wildlands
Oregon Small Woodlands Association
Oregon Society of American Foresters
Oregon State Public Interest Research Group
Oregon State Snowmobile Association
Oregon State University
Oregon State University CES
Oregon State University, Department of Botany & Plant Pathology

Oregon State University, Department of Entomology
Oregon State University, Department of Forest Management
Oregon State University, Department of Rangeland Resources
Oregon State University Integrated Plant Protection Center, Cordley Hall
Oregon Tilth, Inc.
Oregon Water Resources
Ouzel Outfitters
P & M Lumber & Cedar Products
Pacific Environmental Advocacy Center (PEAC)
Pacific University
Pacificorp
The Pacific Rivers Council
Pape Brothers, Inc.
Pendleton Record
People for the West
Pine Creek Logging, Inc.
Pine Point Forest
Portland State University
Portland General Electric
Prarie Wood Products
Public Forestry Foundation
Reed College
Rei Co-Op
River Conservancy
Robert E. Morris Contracting
Rogue Valley Audubon Society of Medford
Rosboro Lumber Co.
Rosebud Contracting
Ross Trust
Salmon-Drift Creek Watersheds Group
Samuel S. Johnson Foundation
Sandy River Basin Watershed Council
Save Our Wild Salmon Coalition
Save the West
Shirbeck, Inc.
Sierra Club
Sierra Club Juniper Group
Sierra Club Oregon Chapter
Sierra Club Portland
Sierra Club, Oregon Chapter
Siskiyou Regional Educational Project
Sisters Forest Planning Committee
Smith Properties
Society Advocating Natural Ecosystems
Society for Range Management
Society of American Forersters, OR State Society
South Oregon University- Biology Department
Southeast Oregon Resource Advisory Council
Southern Oregon University
Steens Mountain Packers
Sun Mountain Water Systems, Inc.
Sunriver Nature Center
Sunriver Owners Association
Sunriver Properties Oregon Ltd.
Sunriver Resort
Thompson Timber Co.
Timber Data Co
Trout Unlimited-Oregon Council
Twin Lakes Resort
Twin Rivers Logging Co.
Umatilla Basin Watershed
University of Oregon
Upper Deschutes Watershed Council
Wagon Wheel Water Co.
Walla Walla Basin Watershed Council
Wallowa Forest Products (D.R. Johnson)
Washington Forest Law Center
Water Wonderland Improvement District
Western Ancient Forest Campaign
Western Environmental Law Center
Western Farm Service
Western Forestry & Conservation Association
Western Oregon University
Western Radio Services Co, Inc.
Wilderness Trail Riders, Inc.
Wildland Resources
Wildlife Management Institute
Wildlife Society, Oregon Chapter
Willamette Industries
Willamette Pass Inn
Willamette University
Woodsman Motel
Xerces Society

Yaquina Basin Planning Team
Zacharias Logging

Pennsylvania

A.D. Renninger Lumber Co.
Agrotors
Ahora Tree Service
Alder Valley Forestry Consulting
Allegheny Acres
Allegheny College
Allegheny Foresters & Consultants
Allegheny Forestry, Inc.
Allegheny Portage Railroad
American Forestry Consultants
Andrews Woodlot Consulting Service
Appalachian Forest Consutants
Arboreal Forestry Services
Bailey Lumber Co.
Bear Run Nature Reserve
Beechwood Farms Nature Reserve
Bloomsburg University of Pennsylvania
Bradford Area Chamber of Commerce
Bradford Naturalist Club
Briar Bush Nature Center
Brownlee Lumber, Inc.
Bucknell University
C.F.E., Inc.
Carl Hunsberger Sawmill, Inc.
Chas. M. Shaffer Memorial Natl. Center
Clifford B. Carts Co.
Coastal Lumber Co.
Collins Pine Kane Hardwood Division
Columbia County CES
Derwood Nature Center
Duquesne University
Dwight Lewis Lumber Co.
East Stroudsburg University
Felton Associates
Forest Land Services, Inc.
Forest Management Center
Forest Management Associates, Inc.
Forest/Woodlot Management, Inc.
Forestry & Wildlife Consulting
Franklin & Marshall College
Franklin Foresty Services
Freeman's Forestry & Wildlife Services
Fulton Forest Products
Glatfelter Pulpwood Co.
Haverford College
Hercon Environmental
Highlands Lumber Co., Inc.
Hyma-Devore Lumber Co.
Indiana University of Pennsylvania
International Paper Co.
J.M. Wood Products, Inc.
Jay-For Logging
John J. Tyler Arboretum
Joseph W. Arnold Association
Kane Hardwood Division, Collins Pine
Kuhns Bros. Lumber Co., Inc.
La Roche College
Lamar National Wildlife Refuge
Landon Forestry Services
Lapp Lumber Co.
Lehigh University
Longwood Gardens
Mansfield University
Meiser Lumber Co.
Miller Ag-Craft, Ltd
Miller Aircraft Limited
Millersville University of Pennsylvania
Montgomery County Community College
Mooretown Mill
Morris Arboretum
Mt. Valley Farms & Lumber Products, Inc.
Muhlenberg College
Nagy & Webb Forestry & Surveying Services
National Audobon Society, Audobon Science off
National Gypsy Moth Management
National Gypsy Moth Management Group, Inc.
Northern Timber Services
Northern Timberlands
Open Land Conservancy
Penelec Manager of Forestry
Penn Forestry Co., Inc.
Penn State New Kensington

Pennsylvania Deer Association
Pennsylvania Forestry Association
Pennsylvania State University
Pennsylvania State University Department of Entomology
Polaris Surveying & Forestry
Proctor & Gamble Paper Co.
Pennsylvania State University, School of Forest Resources
Ram Forest Products
Regional Vice President National Audubon Society
Robert Labar Forestry Consultant
Robert Morris College
Robert S. Bommer, Jr., Inc.
Rohm & Haas
Rolling Rock Farms
The Ruffed Grouse Society
Saint Joseph's University
Seneca Highlands Association
Shippensburg University of Pennsylvania
Sierra Club, Pennsylvania Chapter
Slippery Rock University
Sparty-Wood Products, Inc.
Sunderland Surveying & Forestry
Susquehanna County Historical Society & Free Library Association
Swarthmore College
Tallman Aerial Spraying
Temple University
Timber Mgmt Services
Tinicum National Environmental Center
Twin Ponds Sawmill
Twin Tier Systems
University of Pennsylvania
University of Pittsburgh
University of Pittsburgh-Bradford
Valent Biosciences
Villanova University.
Walter H. Weaver Co,
West Chester University Department of Biology
West Chester University of Pennsylvania
Wheeland Lumber Co., Inc.
Whites Wood Nature Center

Rhode Island

Brown University
Florence Gray Center
Group for Alternative to Spraying Pesticides
National Network of Forest Practitioners
Pesticide Public Policy Foundation
Providence College
Rhode Island College
Rhode Island Forest Conservator's Organization
Rhode Island Organic Farmer's Association
Southern New England Forest Consortium, Inc.
Southern Northeast Woodland Service
Turnquist Lumber Co.
University of Rhode Island
University of Rhode Island CES
University of Rhode Island, Department of Plant Sciences
University of Rhode Island, Department of Forestry

South Carolina

Center for Forested Wetlands
Charleston Southern University
Clemson University
Clemson University, Department of Forest Resources
Coastal Carolina University
College of Charleston
Francis Marion University
Furman University
Lander University
South Carolina State University
Southern Appalachian Botanical Society
University of South Carolina, Aiken
University of South Carolina, Columbia
University of South Carolina, Lancaster
Winthrop University

South Dakota

Black Hills State University
Northern State University
South Dakota State University
University of South Dakota

Tennessee

Austin Peay State University
Cleveland State Community College
Columbia State Community College
East Tennessee State University
Fisk University
Hardwood Forest Foundation
Hardwood Research Council
King College
Lambuth University
Middle Tennessee State University
Sierra Club, Tennessee Chapter
Tennessee Forestry Association
Tennessee State University
Tennessee Technological University
United States Aviation Underwriters
University of Memphis
University of Tennessee, Department of Forestry, Wildlife & Fisheries
University of Tennessee, Knoxville
University of Tennessee, Martin
University of the South
Vanderbilt University

Texas

Angelo State University
Audubon Society
Bat Conservation International
Baylor University
F. Austin State University
Geo-Marine, Inc.
Hardin-Simmons University
Howard Payne University
Lamar University
Loma Linda Homeowners Association
Midwestern State University
Mitchell Energy Corp.
Navarro College
Rice University
Saint Mary's University
Sam Houston State University
San Antonio College
Sierra Club, El Paso Regional Group
South Texas College of Law
Southern Methodist University
Southwest Texas State University
Stephen Texas Forestry Association
Tarrant County College
Texarkana College
Texas A&M International University
Texas A&M University
Texas A&M University Research & Extension Center
Texas A&M University, Commerce
Texas A&M University, Corpus Christi
Texas A&M University, Kingsville
Texas Christian University
Texas Southern University
Texas Tech University
Trinity University
University of Houston
University of Houston, Clear Lake
University of Houston, Victoria
University of North Texas
University of Texas, Arlington
University of Texas, Austin
University of Texas, Dallas
University of Texas, El Paso
University of Texas, Pan American
University of Texas, San Antonio
West Texas A&M University

Utah

Brigham Young University
Southern Utah University
University of Utah
University of Utah, Department of Biology
Utah State University
Utah Woodland Owners Council
Vermillion Services
Weber State University
Western Association of Land Users

Vermont

Harwood Forestry Services
Nature's Light
Society of American Foresters New England
Upland Resource Group, Inc.
Vermont Law School

Virginia

American Pulpwood Association
Association of Consulting Foresters of America
Chespeake Forest Products Co.
Citizens for a Better America
College of William & Mary
Conservation Foundation
Dupont Nature Club
Dynamic Aviation
Emory & Henry College
Friendly Forest Farms
Future Farmers of America
George Mason University
Hampton University
Helicopter Association International
Highland County CES
Hollins University
James Madison University
Labot-Anderson
Madison County Library, Inc.
Mary Washington College
National Campground Owners Association
National Recreation & Parks Association
National Wildlife Federation
National Wildlife Federation, Headquarters
National Woodland Owners Association
Nature Conservancy
Old Dominion University
Old Time Orchard
Potomac Appalachian Trail Club
Roanoke College
Tetrotech
Trout Unlimited
University of Richmond
University of Virginia
University of Virginia's College at Wise
Virginia Polytechnic Institute & State University, Department of Entomology
Virginia Commonwealth University
Virginia Forestry Association
Virginia Native Plant Society
Virginia Polytechnic Institute
Virginia State University
Virginia Tech University, College of Natural Resources
Virginia Tech University, Department of Entomology
Virginia Tech University, Department of Fisheries & Wildlife
Virginia Tech University, Department of Forestry
Virginia Wesleyan College
Virginians for Wilderness/Earth First
Washington & Lee University

Washington

49 Degrees North Ski Area
Alpine Lakes Protect Society
Alps Trustee
Alpine Lakes Protection Society Alta Crystal Resort, L.L.C.
American Land Rights Association
American Lands Access Association, Inc.
American Rivers
Apple Valley Broadcasting
Auble Association
Audubon Society, North Cascades
Audubon Society, Skagit Chapter
Backcountry Bicycle Trails
Backcountry Horsemen of Washington, Inc.
Backpacker Magazine
Bear Creek Tree Farms
Bellingham Mountaineers
The Bloedel Reserve
Camp Sheppard, BSA - Chief Seattle Chapter
Center for Environmental Law & Policy
Central Washington University
Central Washington University Department of Geog. & Land Studies
Chinook Byways
Citizens of Greenwater

Coalition for a Livable Washington
Columbia Basin Nursery
Columbiana
Common Sense Resource League
Concerned Friends of Ferry County
Crown Zellerbach Corp.
Crystal Mountain Resort
David Evans & Associates
Double Shake Co.
Dunau Associates
Dupont Forestry Products
Earth Justice Legal Defense Fund
East Lake WA Audubon Society
Eastern Washington University
Ebel & Associates
Elma Truck & TLR
Environmental Outlook, University of Washington
F.O.C.U.S.
Federal Lands Advisory Committee
Ferry County Action League
Forest Recovery-Granger Co.
Forest Stewards Guild, Northwest Regional Chapter
Forestry Sciences Lab
Fort James Corporation
Foster Wheeler Environmental Corp.
Friends of the Earth
Georgia Pacific Corp.
Grassland West Co.
Greater Greenwater Gateway Committee
Guy Bennett Lumber Co.
Inland Empire Paper Co.
Inland Empire Public Lands Council
James River Corp.
Kamerrer Family Farms
Kettle Range Conservation Group
The Lands Council
Lusignan Forestry, Inc.
Mentor Law Group
Methow Valley News
Methow Valley Snowmobile Association
Mountaineers
Mountains to Sound Greenway
National Audubon Society
National Audubon Society, Seattle Audubon Society
National Campers & Hikers
National Outdoor Leadership School, Pacific
National Wildlife Federation
Natural Resources Defense Council
The Nature Conservancy
North Cascade Audubon Society
North Cascades Conservation Council
North Cascades Institute
Northeast Washington Medical Group
Northwest Coalition for Alternatives to Pesticides
Northwest Ecosystem Alliance
Northwest Fly Anglers
Northwest Forestry Association
Northwest Timber Workers Resource Council
Okanogan Highlands Alliance
Okanogan Resource Council
Olympia Forest Sciences Laboratory
The Omak County Chronicle
P.L.U.S.
Pacific Biodiversity Institute
Pacific Crest Biodiversity Project
Pacific Rivers Council
Pilchuck Audubon Society
Plum Creek Timber Co.
Ponderay Newsprint Co.
Potlatch Corporation
Public Land Users Society
Raedeke Association., Inc.
Rafter Seven Ranch
Rainier Audubon Society
Resources Northwest, Inc.
Rivers Council of Washington
Rocky Mountain Elk Foundation
Rosboro Lumber Co.
RZ Resource Consultants
Seattle Audubon Society
Seattle Snohomish Mill Co.
Seattle University
Sierra Club
Sierra Club Legal Defense Fund
Sierra Club Northern Rockies Chapter
Sierra Club, Northwest Office

Signpost Magazine
Skagit Valley College
Skyline Wheat Ranch
Society of American Foresters
Spokane Research Center
Stevens Pass Ski Area
Tahoma Audubon Society
The Trust for Public Lands
Trout Unlimited, NW Steelhead & Salmon Council
Umatilla Forest Watch
University of Puget Sound
University of Washington
University of Washington, College of Forest Resources
Upper Columbia Resource Council
Vaagen Brothers Lumber Co.
Volunteers for Outdoor Washington
Washington Native Plant Society
Washington Contract Loggers Association
Washington Environmental Council
Washington Farm Forestry Association
Washington Forest Protection Association
Washington Friends of Farms & Forests
Washington Native Plant Society
Washington State Department of Ecology
Washington State Department of Fish & Wildlife
Washington State Farm Bureau
Washington State Mineral Council
Washington State Snowmobile Association
Washington State University
Washington Wilderness Coalition
Western Land Exchange Project
Western Resource Analysis
Western Washington University
Weyerhaeuser Co.
White River Recreation Association
Whitman College
Wild Washington Campaign
Wilderness Society
Wilderness Watch
Willapa Hills Audubon Society, Conservation B
Zahn Ranch

West Virginia

Allegheny Wood Products, Inc.
Alyeska, Inc.
Appalachian Investments
Appalachian Trail Conference
Bluefield State College
Central Tie & Lumber Co.
Coastal Lumber Co.
Concord College
Davis & Elkins College
Davis & Elkins College, Department of Biology
The Garden Works
Fairmont State College
Fairmont State College, Department of Biology
Hardscrabble Enterprises, Inc.
Harmony Hill
Lapaix Farm
Marshall University
Marshall University, Department of Biological Services
Millstone Farm
Monongahela Power Co.
Mountain Aquaculture & Producers Association
The Mulch Patch
New Dawn Farm
Parsons Volunteer Fire Department
Salem-Teikyo University
Shepherd College
Sierra Club, West Virginia Chapter
Sleepy Creek Seed Co.
Tilinghast & Neely
Twin Oaks Farm & Nursery
West Virginia Bass Federation
West Virgina Forestry Association
West Virgina RC&D Association
West Virgina Sierra Club
West Virginia State College
West Virginia University
West Virginia University CES
West Virginia University Division of Plant & Soil Sciences
Westvaco Corp.
Wheeling Jesuit University
Woodland Owners Association of West Viginia

Wisconsin

American Pulpwood Association
Beloit College
Blue Ox Forestry Service, Inc.
Boardman, Suhr, Curry & Field
Burns Forestry Consultants
Consolidated Papers, Inc.
Florence Mining News
Forestry Services Co
Fox Valley Technical College
Georgia Pacific
Johnson Timber Corp.
Lake States Forestry
Lake States Independent Loggers
Lake States Women in Timber
Lawrence University
Lodholz North Star Acres
Louisiana-Pacific Corporation
M&M Associates
Meier Natural Resources Conservation
Michigan-Wisconsin Timber Producers Association
National Association of Conservation District
Natural Resources Services & Consulting
Oakwood Forestry Consulting
Pierre & Sweeney Lawyers
Pine River Lumber Co.
Rhinelander Daily News
Ruffed Grouse Society
Sierra Club - Midwest Region
Steigerwaldt Land Services
Tappon-Ruetz Land Services, Inc.
Thilmany Paper Co.
Tigerton Lumber Co.
Triple "T" Enterprises, Inc.
University of Wisconsin, Green Bay College of Environmental Science
University of Wisconsin Extension
University of Wisconsin, Stevens Point School of Natural Resources
University of Wisconsin, Eau Claire
University of Wisconsin, Green Bay
University of Wisconsin, La Crosse
University of Wisconsin, Madison
Vilas County News Review
Wausau Paper Mills Co.
Whitetails Unlimited, Inc.
Wisconsin Audubon Society
Wisconsin County Forests Association
Wisconsin Forest Conservation Task
Wisconsin Forest Productivity Council
Wisconsin Paper Council
Wisconsin Woodland Owners Association

Wyoming

Central Wyoming College
Northern Rockies Conservation Cooperative
Northwest College
Sierra Club, Wyoming Chapter
University of Wyoming

Canada

Bioforest Tech., Inc.
Valent Biosciences
3M Canada Co Ltd

6.5 Libraries

Alabama

Alabama A&M University, J.F. Drake Memorial Library
Andalusia Public Library
Attalla-Etowah County Public Library
Auburn University at Montgomery Library
Baldwin County Library Cooperative
Cherokee County Public Library
Choctaw County Public Library
Clayton-Town & County Library
De Kalb County Public Library
Fayette County Memorial Library
Gadsden-Etowah County Library
Hale County Public Library
Huntsville-Madison County Public Library
Jacksonville State University, Houston Cole Library
Lawrence County Public Library

Macon County-Tuskegee Public Library
Marengo County Public Library
Marion-Perry County Library
Monroe County Public Library
North Shelby County Library
Phenix City-Russell County Library
Saint Clair County Library
Sumter County Library System
Troy State University, Library, Wallace Hall
Tuskegee University, Hollis Burke Frissell Library
University of Alabama, Amelia Gayle Gorgas Library
University of Alabama, Huntsville, Salmon Library
University of South Alabama, University Libraries
Washington County Public Library
Wilcox County Library

Alaska

Alaska Resources Library & Information Service
Anchorage Municipal Libraries
Arlis Library
University of Alaska, Anchorage Consortium Library
University of Alaska, Fairbanks, Elmer E. Rasmuson Library
University of Alaska, Southeast, Ketchikan Campus Library
University of Alaska, Southeast, William A. Egan Library
Z.J. Loussac Public Library

Arizona

Arizona State Library,
Clifton-Greenlee County Public Library
Cochise County Library District
Flagstaff City-Coconino County Public Library
Gila County Library District
Huachuca City Public Library
Maricopa County Library District
Mohave County Library District
Northern Arizona University Cline Library
Phoenix Public Library
University of Arizona Main Library
Yavapai County Library District
Yuma County Library District
Yuma County Library District Main Library

Arkansas

Arkansas State Library
Arkansas State University, Jonesboro, Dean B. Ellis Library
Central Arkansas Library System Main Library
Cleburne County Library
Conway County Library Headquarters
Craighead County & Jonesboro Public Library
Crittenden County Library
Dallas County Library
Faulkner County Library
Garland County Library
Grant County Library
Hot Spring County Library
Izard County Library-Melbourne
Jackson County Library
Lawrence County Library
Lonoke Prairie County Regional Library
Lyon College Mabee-Simpson Library
Montgomery County Library
Ouachita Baptist University Riley-Hickingbotham Library
Pine Bluff & Jefferson County Library System
Poinsett County Library
Pope County Library System
Saline County Public Library
Southern Arkansas University Magale Library
University of Arkansas, Mullins Library
University of Arkansas - Little Rock, Ottenheimer Library
University of Arkansas, Monticello Library
University of Arkansas - Pine Bluff, Watson Memorial Library
University of Central Arkansas Torreyson Library
University of the Ozarks Robson Library

California

Alameda County Library
Alpine County Free Library
Anaheim Public Library
Berkeley Public Library
Butte County Library
California Institute of Technology Library
California Polytechnic State University Library
California State Library
California State University, Bakersfield Library
California State University, Chico Library
California State University, Dominguez Hills Library
California State University, Fresno Library
California State University, Fullerton Library
California State University, Hayward Library
California State University, Long Beach Library
California State University, Los Angeles Library
California State University, Northridge Library
California State University, San Bernardino Library
California State University, San Marcos Library
California State University, Stanislaus Library
Carlsbad City Library
Claremont University Center Library
Colusa County Free Library
Contra Costa County Library
College of the Sequoias Library
County of Los Angeles Public Library
Daly City Public Library
Del Norte County Library District
Fresno County Free Library
Fresno County Genealogical Society Library
Fresno County Public Library
Humboldt County Library
Humboldt State University Library
Kern County Library
Kern County Library System Library
Lake County Library
Los Angeles Public Library System
Los Gatos Public Library
Madera County Library
Marin County Free Library
Mariposa County Library
Mendocino County Library
Merced County Library
Modoc County Library
Mono County Free Library System-Northern Region
Mono County Free Library System-Southern Region
Monterey County Free Libraries
Nevada County Library
Oakland Public Library
Orange County Public Library
Pepperdine University Library
Plumas County Library
Riverside Public Library
Sacramento Public Library
San Benito County Free Library
San Bernardino County Library
San Diego County Library
San Diego Public Library Library
San Diego State University Library
San Francisco State University Library
San Jose State University Library
San Leandro Public Library
San Luis Obispo City-County Library
San Mateo County Library
Santa Clara County Free Library
Santa Clara University Library
Santa Cruz City-County Library System Headqua
Shasta County Library
Solano County Library System Library
Sonoma County Public Library
South San Francisco Public Library
Stanford University Library
Stanislaus County Free Library
Sutter County Free Library
Thousand Oaks Library
Tulare County Library System
Tuolumne County Free Library
University of California, Berkeley Library
University of California, Berkeley School of Law Library
University of California, Davis Library
University of California, Irvine Library
University of California, Los Angeles Library
University of California, Riverside Library
University of California, San Diego Library

University of California, Santa Barbara Library
University of California, Santa Cruz Library
University of Redlands Library
University of San Francisco Library
University of Southern California Library
Ventura County Library Services Agency
Whittier College Library
Yolo County Library
Yuba County Library

Colorado

Adams State College Library
Arkansas Valley Regional Library Service System
Baca County Public Library
Colorado College Library
Colorado School of Mines Library
Colorado State Library
Colorado State University Library
Conejos County Library
Delta County Public Library
Denver Public Library
Dolores County School Public Library
East Morgan County Library District
Elbert County Library
Garfield County Public Library System
Gilpin County Public Library
Grand County Library District
Gunnison County Public Library
Jackson County Public Library
Jefferson County Public Library
Kiowa County Public Library
Lake County Public Library
Las Animas-Bent County Public Library
Mesa County Public Library District
Mesa County Public Library District
Mesa State College Library
Mineral County Regional Library
Moffat County Libraries
Park County Public Library
Pitkin County Library
Pueblo Library District
Regis University Library
San Miguel County Public Library District No
Southern Peaks Public Library
University of Colorado, Boulder Library
University of Colorado, Colorado Springs Library
University of Colorado, Denver Library
University of Denver Library
University of Northern Colorado Library
University of Southern Colorado Library

Connecticut

Central Connecticut State University Library
Connecticut College Library
Connecticut State Library
Danbury Public Library
Eastern Connecticut State University Library
Hartford Public Library
Quinnipiac University Library
Southern Connecticut State University Library
Teikyo Post University Library
Trinity College Library
Union Free Public Library
University of Connecticut Library
University of New Haven Library
Wesleyan University Library
Western Connecticut State University Library
Yale University Library

Delaware

Appoquinimink Community Library
Delaware State University Library
Delaware Technical & Community College Library
New Castle County Public Library System
Sussex County Department of Libraries
University of Delaware Library

District of Columbia

American University Library
Catholic University of America Library
District of Columbia Public Library
Georgetown University Library
Library of Congress Library
U.S. Department of the Interior Departmental Library
U.S. Senate Library

Florida

Alachua County Library District Headquarters
Bradford County Public Library
Brevard County Library System
Broward County Division of Libraries
Calhoun County Public Library
Collier County Public Library
Columbia County Public Library
Flagler County Public Library
Florida Atlantic University Library
Florida Institute of Technology Library
Franklin County Public Library
Hardee County Public Library
Hendry County Library System
Hernando County Public Library System
Highlands County Library System
Holmes County Library
Indian River County Main Library
Jacksonville Public Library
Jacksonville University Library
Jefferson County Public Library
Lake County Library System
Lee County Library System
Manatee County Public Library System
Martin County Library System
Monroe County Public Library
North Indian River County Library
Osceola County Library System
Palm Beach County Genealogical Society Librar
Palm Beach County Library System
Pasco County Library System
Putnam County Library System
Saint Johns County Public Library System
Saint Lucie County Library System
Seminole County Public Library System
State Library of Florida
Stetson University Library
Tampa-Hillsborough County Public Library
Taylor County Public Library
Union County Public Library
University of Florida Library
University of Miami Library
University of North Florida Library
Volusia County Public Library
Wakulla County Public Library
Washington County Library

Georgia

Athens Clarke County Library
Atlanta-Fulton Public Library
Bartow County Library System
Brooks County Public Library
Brunswick-Glynn County Regional Library
Chattooga County Library
Clayton County Library System
Coastal Plain Regional Library
Cobb County Public Library System
Dekalb County Public Library
Dougherty County Public Library
Elbert County Library
Fitzgerald-Ben Hill County Library
Gwinnett County Public Library
Hart County Library
Houston County Public Library System
Jefferson County Library System
Newton County Library
Thomas County Public Library System
Troup-Harris-Coweta Regional Library

Hawaii

Hawaii State Library
Hawaii State Library System
Hawaii State Public Library System

Idaho

American Falls District Library
Boundary County District Library
Camas County Public Library
Cambridge Community Library
Clark County District Library
East Owyhee County Library District
Idaho Falls Public Library
Idaho State Library
Idaho State Talking Book Library
Jefferson County District Library

Latah County Free Library District
Menan County District Library
Midvale District Library
Oneida County Free Library

Illinois

Brown County Public Library District
Calumet City Public Library
Champaign Public Library
Decatur Public Library
Evansville Public Library
Henderson County District Library
La Grange Park Public Library District
Northern Illinois Library System
Putnam County Public Library District
South County Public Library District
Warren County Public Library District

Indiana

Allen County Public Library
Bartholomew County Public Library
Benton County Public Library
Crawford County Public Library
Fayette County Public Library
Fulton County Public Library
Greensburg-Decatur County Public Library
Indianapolis-Marion County Public Library
Jackson County Public Library
Jasper County Public Library
Jay County Public Library
Monroe County Public Library
Morgan County Public Library
Newton County Public Library
North Madison County Public Library System
Ohio County Public Library
Owen County Public Library
Pike County Public Library
Saint Joseph County Public Library
Scott County Public Library
Spencer County Public Library
Sullivan County Public Library
Switzerland County Public Library
Tell City-Perry County Public Library
Tippecanoe County Public Library
Tipton County Public Library
Union County Public Library

Iowa

Altoona Public Library
Ames Public Library
Cumberland Public Library
Dubuque County Library
Public Library of Des Moines
Scott County Library System
State Library of Iowa
Union Public Library
Woodbury County Rural Library

Kansas

Coffey County Library
Finney County Public Library
Graham County Public Library
Grant County Library
Hamilton County Library
Johnson County Library
Kearny County Library
Kiowa County Library
Linn County Library District Three
Linn County Library District Two
Linn County Library District One
Morton County Library
Scott County Library
Sheridan County Library
Stanton County Library
Stevens County Library
Wichita County Library

Kentucky

Allen County Public Library
Boone County Public Library
Bowling Green Public Library
Boyd County Public Library
Boyle County Public Library
Breathitt County Library

Breckinridge County Public Library
Calloway County Public Library
Campbell County Public Library
Carroll County Public Library
Casey County Public Library
Clark County Public Library
Clinton County Public Library
Crittenden County Public Library
Cumberland County Public Library
Cynthiana-Harrison County Public Library
Daviess County Public Library
Edmonson County Public Library
Estill County Public Library
Fleming County Public Library
Floyd County Public Library
Gallatin County Public Library
Garrard County Public Library
Grant County Public Library District
Graves County Library
Grayson County Public Library
Hancock County Library
Hardin County Public Library
Harlan County Public Library
Hart County Public Library
Henderson County Public Library
Henry County Library
Hopkins County-Madisonville Public Library
Jackson County Public Library
Johnson County Public Library
Kenton County Public Library
Kentucky Department for Libraries
Knott County Public Library
Knox County Public Library
Laurel County Public Library District
Lawrence County Public Library
Lee County Public Library
Leslie County Library
Lewis County Public Library
Logan County Public Library
Louisville Free Public Library
Lyon County Public Library
Madison County Public Library
Magoffin County Library
Marion County Public Library
Marshall County Public Library
Mason County Public Library
McCreary County Public Library District
Meade County Public Library
Menifee County Public Library
Mercer County Public Library
Metcalfe County Public Library
Middlesboro-Bell County Public Library
Monroe County Public Library
Nicholas County Public Library
Ohio County Public Library
Oldham County Public Library
Owen County Public Library
Pendleton County Public Library
Pike County Public Library District
Powell County Public Library
Pulaski County Public Library
Robertson County Public Library
Rockcastle County Library
Rowan County Public Library
Russell County Public Library
Scott County Public Library
Spencer County Public Library
Taylor County Public Library
Todd County Public Library
Trimble County Public Library
Union County District Library
Washington County Public Library
Wayne County Public Library
Whitley County Library
Wolfe County Library

Louisiana

Beauregard Parish Public Library
Bossier Central Library
Caldwell Parish Library
Catahoula Parish Library
Claiborne Parish Library
Concordia Parish Library
Jefferson Parish Library Department
Lafourche Parish Public Library
Saint Martin Parish Library

Saint Mary Parish Library
Southern University, New Orleans
State Library of Louisiana
Tangipahoa Parish Library
Union Parish Library
Washington Parish Library System
West Carroll Parish Library
Winn Parish Library

Maine

Maine State Library
Portland Public Library

Maryland

Baltimore County Public Library
Calvert County Public Library
Caroline County Public Library
Carroll County Public Library
Dorchester County Public Library
Frederick County Public Libraries
Harford County Public Library
Kent County Public Library
Montgomery County Department of Public Library
Prince George's County Memorial Library System
Queen Anne's County Free Library
Saint Mary's County Memorial Library
Somerset County Library System
Talbot County Free Library
Washington County Free Library
Worcester County Library

Massachusetts

Boston Public Library
Cambridge Public Library
State Library of Massachusetts
Worcester Public Library

Michigan

Alcona County Library System
Alpena County Library
Ann Arbor District Library
Bay County Library System
Benton Harbor Public Library
Charlevoix Public Library
Crawford County Library
Detroit Public Library
Dickinson County Library
East Lansing Public Library
Flint Public Library
Gladwin County Library
Jackson District Library
Kalkaska County Library
Lapeer County Library
Macomb County Library
Manistee County Library
Mason County District Library
Menominee County Library
Mideastern Michigan Library Cooperative
Missaukee District Library
Monroe County Library System
Muskegon County Library
Oakland County Library
Otsego County Library
Petoskey Public Library
Shiawassee County Library
St. Clair County Library
Washtenaw County Library

Minnesota

Anoka County Library
Anoka County Library System
Carver County Library
Douglas County Library
Fergus Falls Public Library
Great River Regional Library
Hennepin County Library
Hennepin County Library System
Jackson County Library System
Marshall-Lyon County Library
Martin County Library
Milaca Community Library
Montevideo-Chippewa County Public Library
Nobles County Library & Information Center
Ramsey County Public Library
Rock County Community Library

Saint Paul Public Library
Scott County Library System
Washington County Library
Watonwan County Library

Mississippi

Biloxi Public Library
Hancock County Library System
Harrison County Library System
Humphreys County Library System
Laurel-Jones County Library
Madison County-Canton Public Library
Marks-Quitman County Library
Marshall County Library System
Mississippi Library Commission
Neshoba County Public Library
Noxubee County Library System
Raleigh Public Library'
Sunflower County Library System
Tallahatchie County Library
Union County Library
Warren County-Vicksburg Public Library
Washington County Library System

Missouri

Bollinger County Library
Camden County Library District
Cass County Public Library
Christian County Library
Dallas County Library
Daviess County Library
Douglas County Public Library
Gentry County Library
Grundy County-Jewett Norris Library
Henry County Library
Jefferson County Library
Kansas City Public Library
Livingston County Library
Mcdonald County Library
Mercer County Library
Miller County Library Service Center
Mississippi County Library
Missouri State Library
Neosho Newton County Library
New Madrid County Library
Ozark County Library
Putnam County Public Library
Ralls County Library
Ray County Library
Saint Charles City County Library District
Saint Clair County Library
Saint Louis County Library
Scotland County Memorial Library
Springfield-Greene County Library
Stone County Library
Sullivan County Public Library
Washington County Library
Wright County Library

Montana

Blaine County Library
Chouteau County Library
Daniels County Free Library
Flathead County Library
Garfield County Library
Glacier County Library
Glasgow City County Library
Liberty County Library
Lincoln County Public Libraries
Livingston-Park County Library
Meagher County City Library
Mineral County Public Library
Missoula Public Library
Montana State Library
Petroleum County Community Library
Prairie County Library
Roosevelt County Library
Rosebud County Library
Sheridan County Library
Stillwater County Library
Thompson-Hickman Free County Library

Nebraska

Garfield County Library
Grant County Library
Hooker County Library
Lincoln City Libraries
Logan County Library
Omaha Public Library
Rock County Public Library
South Sioux City Public Library
Thomas County Library

Nevada

Carson City Library
Douglas County Public Library
Elko-Lander-Eureka County Library System
Humboldt County Library
Las Vegas-Clark County Library District
Lincoln County Library
Lyon County Library System
Mineral County Public Library
Pershing County Library
Storey County Public Library
Washoe County Library
White Pine County Library

New Hampshire

East Rochester Public Library
Nashua Public Library
Unity Free Public Library

New Jersey

Atlantic City Free Public Library
Atlantic County Library
Burlington County Library
Camden County Library System
Cape May County Library
Cumberland County Library
Gloucester County Library System
Hunterdon County Library
Mercer County Library
Monmouth County Library
Morris County Library
Somerset County Library
Sussex County Library System
Trenton Public Library
Warren County Library

New York

Albany Public Library
Brooklyn Public Library
Broome County Public Library
East Rochester Public Library
La Grange Association Library
Monroe County Library System
Mount Vernon Public Library
New York Public Library
Onondaga County Public Library
Queens Borough Public Library
Schenectady County Public Library
South Country Library
South New Berlin Free Library
Tompkins County Public Library

North Carolina

Alexander County Library
Asheville-Buncombe Library System
Avery County Morrison Public Library
Bladen County Public Library
Brunswick County Library
Burke County Public Library
Caldwell County Public Library
Carteret County Public Library
Catawba County Library
Columbus County Public Library
Cumberland County Public Library & Informatio
Currituck County Public Library
Dare County Library
Davidson County Public Library System
Davie County Public Library
Duplin County Library
Durham County Library
Edgecombe County Memorial Library
Forsyth County Public Library
Franklin County Library

Gates County Library
Graham County Public Library
Granville County Library System
Greene County Public Library
Harnett County Public Library
Havelock-Craven County Library
Haywood County Public Library
Henderson County Public Library
Hertford County Library
Hoke County Public Library
Iredell County Public Library
Jackson County Public Library
Kinston-Lenoir County Public Library
Lee County Library
Lincoln County Public Library
Macon County Public Library
Madison County Public Library
Mcdowell County Public Library
Mitchell County Public Library
Montgomery County Public Library
New Hanover County Public Library
Onslow County Public Library
Pamlico County Library
Pender County Library
Perquimans County Library
Person County Public Library
Robeson County Public Library
Rockingham County Public Library
Scotland County Memorial Library
Stanly County Public Library
State Library of North Carolina
Transylvania County Library
Tyrrell County Public Library
Union County Public Library
Warren County Memorial Library
Washington County Library
Watauga County Public Library
Wayne County Public Library, Inc.
Wilson County Public Library
Yancey County Public Library

North Dakota

Bottineau County Public Library
Cavalier County Library
Kidder County Library
Mckenzie County Public Library
Morton County Library
Stutsman County Library
Valley City-Barnes County Public Library
Ward County Public Library

Ohio

Adams County Public Libraries
Akron-Summit County Public Library
Brown County Public Library
Carroll County District Library
Champaign County Library
Clark County Public Library
Clermont County Public Library
County District Library
Cuyahoga County Public Library
Delaware County District Library
Findlay-Hancock County Public Library
Geauga County Library System
Geauga County Public Library
Greene County Public Library
Guernsey County District Public Library
Highland County District Library
Logan County District Library
Medina County District Library
Meigs County District Public Library
Mercer County District Library
Monroe County District Library
Paulding County Carnegie Library
Perry County District Library
Pickaway County District Public Library
Pickerington Public Library
Portage County District Library
Preble County District Library
Public Library of Cincinnati
Stark County District Library
State Library of Ohio
Troy-Miami County Public Library

Tuscarawas County Public Library
Warren-Trumbull County Public Library
Washington County Public Library
Wayne County Public Library
Williams County Public Library

Oklahoma

Beaver County Pioneer Library
Cherokee-City-County Public Library
Choctaw County Library
Delaware County Library
Latimer County Public Library
Metropolitan Library System
Nowata City-County Library
Tulsa City-County Library
Woodward Public Library

Oregon

Baker County Public Library
Clackamas County Library
Corvallis-Benton County Public Library
Crook County Library
Deschutes County Library System
Douglas County Library System
Gilliam County Library
Grant County Library
Harney County Library
Hood River County Library
Jackson County Library Services
Jefferson County Library
Josephine County Library System
Klamath County Library
La Grande Public Library
Malheur County Library
Multnomah County Library
The Dalles-Wasco County Library
Tillamook County Library
University of Oregon Library
Washington County Cooperative Library Service

Pennsylvania

Adams County Library System
Allegheny County Library
Altoona Area Public Library
Bedford County Library
Blair County Library System
Bradford County Library System Headquarters
Bucks County Free Library
California University of Pennsylvania Louis L. Manderino Library
Cambria County Library System & District Cent
Cameron County Public Library
Carnegie Library of Pittsburgh
Centre County Library & Historical Museum
Chester County Library
Clearfield County Public Library Federation
Columbia County Traveling Library
Crawford County Federated Library System
Dauphin County Library System
Delaware County Library System
Dickinson College Waidner-Spahr Library
Dormont Public Library
Erie County Public Library
Fayette County Library System
Forest County Library
Franklin County Library System
Free Library of Philadelphia
Fulton County Library
Greene County Library System
Huntingdon County Library
Juniata County Library, Inc.
Lackawanna County Library System
Lancaster County Library
Lawrence County Law Library
Lebanon County Library System
Mifflin County Library
Montgomery County-Norristown Public Library
Perry County Law Library
Pike County Public Library
Snyder County Library
Somerset County Library
State Library of Pennsylvania
Sullivan County Library

Wayne County Public Library
West Chester Public Library
York County Library System

Rhode Island

Rhode Island State Library

South Carolina

Beaufort County Library
Berkeley County Library
Calhoun County Library
Cherokee County Public Library
Chester County Library
Chesterfield County Library
Colleton County Memorial Library
Darlington County Library
Dillon County Library
Dorchester County Library
Fairfield County Library
Florence County Library
Georgetown County Library System
Greenville County Library
Harvin Clarendon County Library
Horry County Memorial Library
Kershaw County Library
Lancaster County Library
Laurens County Library
Lee County Public Library
Marion County Library
Oconee County Library
Orangeburg County Library
Pickens County Library System
Richland County Public Library
Saluda County Library
Spartanburg County Public Libraries
Spartanburg County Public Library
Sumter County Library
Union County Carnegie Library
Williamsburg County Library
York County Library

South Dakota

Bennett County Public Library
Custer County Library
Grant County Public Library
Hand County Library
Hyde County Library
Jackson County Library
Potter County Free Public Library
Sully County Library
Tripp County Library-Grossenburg Memorial

Tennessee

Benton County Library
Bledsoe County Public Library
Blount County Public Library
Bolivar-Hardeman County Public Library
Carroll County Library
Chattanooga-Hamilton County Bicentennial Library
Cheatham County Public Library
Chester County Public Library
Claiborne County Public Library
Coffee County Lannom Memorial Public Library
Coffee County-Manchester Library
Decatur County Library
Decatur-Meigs County Library
Dickson County Public Library
Fayetteville-Lincoln County Public Library
Fentress County Public Library
Franklin County Library
Gibson County Memorial Library
Giles County Public Library
Hancock County Public Library
Hardin County Library
Houston County Public Library
Humphreys County Public Library
Johnson County Public Library
Knox County Public Library System
Lawrence County Public Library
Lebanon-Wilson County Library
Lewis County Public Library
Macon County Public Library
Marshall County Memorial Library

Maury County Public Library
Memphis-Shelby County Public Library
Moore County Public Library
Mount Juliet-Wilson County Public
Overton County Public Library
Perry County Public Library
Pickett County Library
Public Library of Nashville & Davidson
Putnam County Library System
Rutherford County Library System
Scott County Public Library
Sequatchie County Public Library
Sevier County Public Library
Smith County Public Library
Stewart County Public Library
Sullivan County Public Library
Tipton County Public Library
Unicoi County Public Library
Washington County - Jonesborough Library
Wayne County Public Library
Williamson County Public Library

Texas

Alamo Area Library System
Amarillo Public Library
Arlington Public Library
Bandera County Library
Bee County Public Library
Brazoria County Library System
Brooks County Library
Calhoun County Library
Callahan County Library
Carson County Public Library
Central Texas Library System
Chambers County Library System
Coke County Library
Cooke County Library
Corsicana Public Library
Crane County Library
Crockett County Public Library
Crosby County Library
Dallas Public Library
Dawson County Library
Delta County Public Library
Dickens County-Spur Public Library
Dimmit County Public Library
East Parker County Library
Ector County Library
Floyd County Library
Ford County Library
Fort Bend County Libraries
Gaines County Library
Goliad County Library
Hansford County Library
Harris County Public Library
Haskell County Library
Hemphill County Library
Hidalgo County Library System
Hockley County Memorial Library
Hood County Public Library
Houston Public Library
Huntsville Public Library
Irion County Library
Jackson County Library
Jefferson County Library
Karnes County Library System
Kaufman County Library
Kent County Library
Kimble County Library
Kinney County Public Library
Lamb County Library
Leon Valley Public Library
Live Oak County Library
Llano County Library System
Madison County Library
Martin County Library
Memphis Public Library
Mitchell County Public Library
Montgomery County Memorial Library System
Newton County Public Library
North Texas Regional Library System
Oldham County Library
Rains County Public Library
Reagan County Library
Real County Public Library
Red River County Public Library

Reeves County Library
Roberts County Library
Rockwall County Library
San Patricio County Library System
San Saba County Library
Schleicher County Public Library
Scurry County Library
Shackelford County Library
Sherman County Public Library
Somervell County Library
Starr County Public Library
Stonewall County Library
Sutton County Library
Sweetwater County-City Library
Swisher County Library
Terrell County Public Library
Texas State Law Library
Upshur County Library
Upton County Public Library
Val Verde County Library
Waco-Mclennan County Library
Waller County Library
Wilson County Library
Winkler County Library
Yoakum County Library
Yoakum County Library
Zapata County Public Library

Utah

Davis County Library
Grand County Public Library
Morgan County Library
Salt Lake County Library System
San Juan County Library
Uintah County Library
Utah State University Natural Resources Research Library
Wasatch County Library
Washington County Library
Weber County Library

Vermont

Aldrich Public Library
Bennington Free Library
Landgrove Public Library
Orwell Free Library
State of Vermont Department of Libraries
Thetford Town Library

Virginia

Appomattox Regional Library
Arlington County Department of Libraries
Botetourt County Library
Campbell County Public Library
Charlotte County Library
Chesterfield County Public Library
Colonial Heights Public Library
County of Henrico Public Library
Culpeper County Library
Cumberland County Public Library
Fauquier County Public Library
Fluvanna County Library
Franklin County Library
Jefferson-Madison Regional Library
Loudoun County Public Library
Norfolk Public Library System
Nottoway County Library
Orange County Library
Pittsylvania County Public Library
Powhatan County Public Library
Pulaski County Library
Rappahannock County Library
Roanoke County Public Library
Russell County Public Library
Shenandoah County Library
Tazewell County Public Library
Washington County Public Library
York County Public Library

Washington

Asotin County Library
Forest Resource Library
King County Library System

Pacific Marine Technology Library
Pierce County Library System
Spokane County Library District
Spokane Public Library
Stevens County Rural Library District
Tacoma Public Library
Walla Walla County Library
Washington State Law Library
Washington State Library
Whitman County Rural Library

West Virginia

Alpha Regional Library
Brooke County Public Library
Cabell County Public Library
Calhoun County Public Library
Clarksburg-Harrison Public Library
Doddridge County Public Library
Elkins-Randolph County Public Library
Fayette County Public Libraries
Five Rivers Public Library
Grant County Library
Greenbrier County Library
Hamlin-Lincoln County Public Library
Hampshire County Public Library
Hardy County Public Library
Jackson County Library
Kanawha County Public Library
Keyser-Mineral County Public Library
Marion County Public Library
Mason County Library System
Mingo County Library
Monroe County Public Library
Morgan County Public Library
Ohio County Public Library
Pendleton County Public Library
Pleasants County Public Library
Pocahontas County Free Library
Putnam County Library
Raleigh County Public Library
Ritchie County Public Library
Roane County Public Library
Summers County Public Library
Taylor County Public Library
Tyler County Public Library
Upshur County Public Library
West Virginia University Evansdale Library
Wyoming County Library System

Wisconsin

Cumberland Public Library
Dodge County Library Service
Door County Libraries
Florence County Library
Marathon County Public Library
Marinette County Consolidated Public Library
Menominee Tribal County Library
Milwaukee County Federated Library System
Oneida County Mailbox Library
Portage County Public Library
Western Taylor County Public Library
Wisconsin State Law Library

Wyoming

Campbell County Public Library
Carbon County Library System
Converse County Library
Crook County Library
Goshen County Library
Hot Springs County Library
Johnson County Library
Laramie County Library System
Lincoln County Library
Natrona County Public Library
Niobrara County Library
Park County Library System
Platte County Public Library
Sheridan County Fulmer Public Library
Sublette County Library
Sweetwater County Library System
Teton County Library
Uinta County Library
Western Wyoming Community College Library

6.6 Individuals

Alabama

Timothy Boyce
J. Wayne Brewer
Jim Hyland
Adam Jackson
Tomm Johnson
Bill Moore
M. N. "Corky" Pugh
Bruce Shupp
Debi Summersell

Alaska

Randy Bates
Candace Beery
Charles Bell
Joel Bennett
Tim Blust
Corrie Bosman
Roger Burnside
Andre Camara
Niles Cesar
Melanie Duchin
Hugh Durham IV
Ken Fisher
John Fox
Sylvia Geraghty
Bob Gorman
Owen Graham
Mike Holloway
Eric Hummel
Jeff Jahnke
Edgar Jenks
Christina Jewett
Jason Loos
Gary Morrison
Don Muller
Mary Pete
Frank Rue
Joseph Sebastian
Marlo Shedlock
Fred Sorenson
Dave Sturdevant
Tara Sweeney
Doug Warner
Ronald Wolfe

Arizona

Thomas Abrams
Gale & Vesta Aldrich
Peggy Alexander
Theresa L. Allison
Andrea Anderson
Fred Anderson
Kathryn Anderson
John Anhold
Scott and Toni Arena
Donald Arganbright
Don Arkin
Rachel Aschmann
Janina Austin
Jean & Trevor Avenett
Charles Babbitt
Pat Baca, Jr.
Paula Bachman-Williams
John Baker
Theodore Barbone
Ariel Barfield
Annie Barva
Beverly Bass
Charles & Mar Bast
Kay Bawden
Don Beck
Paul Beier
Cher Beilfuss
William Beloret
Fray H. Belshe
Robert Bennet
Patsy Bennett
Linda Bentley
Don & Linda Bentley
David Bertelsen
Rebecca Berton
Andy Bessler

Carl Beyerhelm
Jessie Bhangoo
Bettina Bickel
Dennis J. Bigelow
Robert Bigelow
Rulon & Lucie Bigelow
Evelyn Billo
Toni Bish
Michael Bissontz
Joe Blaszczak
Edward Blumer
W. Brent & Joann Bogdanski
Larry Borden
Roy Boss
Melville S. Bowers
Virginia Gail Bowers
Curtis Bradley
Richard Bradshaw
Christine & M. Brady
Susan Brandes
Clait Braun
Ruth Brawdy
Robert Breen
Sheri Brennan
Ronald Brill
Scott Brill
ArthurandAnne Britt
Bob Broscheid
Grant & Innis Brown
Jarrod Brown
Kelli Brown
Rayanne & Jam Brown
Tonda Brown
James Brown
James A. Bruder
Adam Burdick
Jeff Burgess
Brian & Sarah M. Burnett
Carolyn Burns
M. & Jackie Butler
Paul Byers
John Caid
William Calder
Jean Calhoun
A. P. Camps
Stephen Canning
Lawrence Carlson
Larry Carlson
Royce Carlson
Ron Carswell
L. M. Case
Eligio & Anna Castillo
Mr. Bob Celaya
Don Chaney
Frank Chapman
Holden Chase
Alan Chatfield
Helen & Placi Chavez
Donna Chesner
Gary Christensen
Earl Christian
Paula Chronister
Ray & Sabine Cichlar
Becki Cimadevilla
Lamar & Pat Clark
Letha Cline
Christopher Cloud
Vonna Cluff
Joanne Cockerill
Mark Colby
Rose Coleman
A. Consolo
Mel Copeland
Brenda Corkin
Tania Corliss
Walter & R. Craig
Cullen Cramer
Cole Crocker-Bedford
Lauerl Crosby
Martha Crosby
Laura Cummings
Diane Cusack
Rudy Dankwort
Diana Davis
Vada L. Davis
Loren Dawn
Porter Dean
Roy & Joanne Dechant
Vic DeFrancesco
Tom DeGomez
Marc Delany
Eileen DeLauer
Shanna & Rod Denault
Charlie Denton
Sonya Diehn
Carl Dietrich
Linda Dills
Robert Dink, Jr.
John & Annie Dunn
Michael Durgain
Dane & Marlen Dyrland
Auroroa B. Eagar
Dustan & Cynthia Eagar
Roland & Ruth Eagar
Karen Earley
Barbara Edwards
David E. Eisley
Dan Ellerbroek
Dillie A. Ellis
Dock Ellis
Glen L. Ellison
Terrance Ely
Larry & Suzan Ely
Lloyd Engel
Rick Erman
Corwin Estes
Paula Fan
Christine Farney
Albert Farr
Dewey H. Farr
W. John Faust
James & Glend Finch
R. J. Finch
Brent Finley
Holly Finstrom
Heather Fitar
Bobby & Linda Fite
Chase & Lance Fite
M. Fitzgerald

Jenny Flynn
Chris Ford
Tyler Forman
B. & Kendie Foster
Cheryl Foster
Zee Fowler
Linda Franks
Steve Franks
Dirk Frauenfelder
Rae Frederickson
Jim Frich
Bruce Friedemann
Kevin J. Fritz
Eric Gabel
Sharon Galbreath
Charles Gallagher
Victor Gallegos
Joe Ganey
Karen R. Garley
Ted Gartner
Connie Gartner
Robert Gay
Roxanne George
Roxane George
Don Gerrard
Mary Ann Gibbons
Lee Roy Gibson
M. Gice
Curtis & Jean Gillespie
Brandon Gilliam
D. Gilliam
Joyce & Stone Gilliam
Robert & Elvia Gillies
Pamela Goldman
Kenn Goldman
Robert Gomez
Jerry Gonzales
Jose Gonzalez
Joni Goode
Donald & Evel Goodman
John & Karen Goodwin
Kenneth Gouker
Penny Govedich
Scott Graff
L. Graham
Richard Grapp
Jesse Greenberg
Michael Gregory
D. Grhoton
Tim Griffith
Anastacia Gutierrez
Brent Hall
Douglas & Michelle Hamblin
Lana Hamblin
Marion Hamblin
Cheles Hancock
Holly Hancock
Tina Hancock
Robbie Hannawacker
Byron & Roz Harding
Mr. & Mrs. Jeff Harper
N. Harper
Ryan Harper
Shae Lynn Harris
Leo Hartke
Syble & LaMar Hartley
Meredith Hartwell
Cynthia Hartzell
Ron Harvey
Michael Haseltine
C. A. & Wilma Haught
Jim & Sherri Haught
Kay Hauser
Mike & Joelle Hauser
Steven & Christine Heap
Craig Hegel
Merrill Hentz
Robert Herdliska
Terry Heslin
Tom Hicks
Cody Hill
Ron Hill
Sky Hilts
Dawn Hines
Sidney Hirsh
Orne H. Hiscox
David Hodges
Bobbie Holaday
William Holden
Jim & Karen Horton
Caroline Hotaling
Michael Houghtaling
Sally L. Hulsey
Michael Humphrey
Michael & Pat Humphrey
Kip & Alicia Hunsaker
Sean Hunsaker
T. & A. Hunsaker
Joseph & Mari Hunter
Peter Ianchiou
Mike Ingram
Wayne D. Iverson
Glen Jacobs
David Jason Jaramillo
Manuel Jaramillo
Jeff Jenness
Shane & Paula Johnson
Bonnie Johnson
Richard & Fran Jones
Mitzi Jones
T. J. Jordan
Oweta Josleyn
Cecelia Juszczak
Michelle Kaczynski
Charlie Kane
Joseph Kantauskis
Jennifer Katcher
John Keane
Dennis Kee
Bart Keehn
Charlotte Keller
Patricia Kelly
M. Keoppen
June A. & Don W. Kimble
Barbara & W. Kinman
Edward Kirsten
Larry Kivela
Henry J. Klassen
Keith Kleber

Barbara & Fred Klug
Edwin Knochel
Julie Kornmeyer
Kimberly Kuehnert
Paul Kuenstler
Gene & Barbar Laird
Jason Laird
Pierre Landau
Bob Landis
Linda Laney
G. James Langello
Kimberly Larsen
Alicia Larson
Susan Lascelles
Calvin Lash, Jr.
Arthur N. Lee
Danny Lee
Katherine Lee
Dan Leeds
Kent LeSueur
N. LeSueur
Vera LeSueur
Robin Levenworth
Lainie Levick
Jerry Levitt
Glen Lewis
H. Lewis
Timothy Lewis
Tracy Liston
Roy Little
Jose Logan
Manuel Logan
Duane Lowell
Karen Lowery
Sam A. Luce
Dave Lugers
Bradley Lundahl
Ann Lynch
Dan Lytle
Dave Madison
Joe Madrid
Robert Majors
Katie Malone
Pat & Sandra Malone
Lynn Marcus
Rich Marimow
Georgia E. Marks
Ginger Marks
Randy Marlatt
Rob Marshall
Fred Martin
Nita Martin
Stephanie Martin
Gerald & Sandy Martinez
Robert Mathieu
Perri Matthews
Donald & Susan Maxwell
Marlin Maxwell
Edward McCain
Bette McCall
Martha McClain
Max McClain
Lou McDonald
Kevbin McHugh
Jane McIntyre
Robert McIntyre
Richard McKee
Dorthy McKenna
Taylor McKinnon
Tamara McWhinney
Gary Mead
Kim Medina
Chris Mehling
Harry Melts
Bob & Bunny Meredith
Phillip Merkle
Karen Merrill
Lula Merrell
L. Vista Michael
Karen Midkiff
Len Milich
Dave Miller
Norma Miller
Lydia Millet
John Miranda
Leo Mobley
Ron Mohney
Rick Mohr
Jay Moore
William Morris
Robert Mossman
Fidencio Moya
Naomi Mudge
Lynn Mullenaux
Virginia Mundy
Carroll Munz
Dewey W. Murray
Michael Mutschler
Tina Myers
Dennis Nakashian
Anupam Narayan
Laurie Neidich
Joy & Carla Nelson
Toni & James Nelson
Tracy Nelson
Frank Newman
Will Newman
Mark Noethen
Albert Norcross
Jim & Sheila Norine
James Notestine
Winnie Noth
Robert Ohmart
Victor Ong
Sue Ordway
Elna Otter
Andrea Ouse
Pauline Padilla
Jeffrey Paisley
Donna Palladino
John Pamperin
Johnny Paredez
John Parsons
D. Bryce Patterson
D. R. Patterson
Roy M. Patterson
Ruth U. Patterson
George Paul
Regina Pena

William Sean Penn
Randel Penrod
Arnold Petermann
Shawn Peters
Vivian Peters
Clara Peterson
Coni Peterson
James Pilar
Theresa Pinto
Richard & Gail Potts
Jim Powers
Michael Powers
Doug Pressel
Walt Pritchard
Lowanda Pugh
David Pulsifer
John & Arlene Purbaugh
William T. Quinsler
Arlene Raban
Timothy & Sharo Raban
Arthur Reade
Holly Reck
Charles L. Redman
Neal Reidhead
Dwight & Lore Reynolds
Rose Reynolds
Linda & Raymond Rice
Daniel W. Richard
A. Richards
David "Dink" Robart
Tim Robart
Lyle Robinson
B. Elaine Rogers
Homer Rogers
Kent Rogers
Leo & Marie Rogers
Merlyn Rogers
Richard & Virginia Rogers
Wes, Pat, & Jacob Rogers
Jeff Rogers
Frank Ronco
Jeff Ronstadt
Margaret Ross
Linda Rosson
Kirk Rowdabaugh
Richard Rudolph
Mary Rose & F. Rush
Gary Russell
Sam Russell
Christine L. Saffell
David Salafsky
Richard L. Sandheger
Jim Sankey
Maria Sans
F. V. Saporito
Jen Schaffer
Mindy Schlimgen-Wilson
R. R. Schmoller
Andrew Schneller
Don Schuster
D. Sciensh
Gene C. Seeley
Mike Seidman
Angeline Serfoss
Amanda Shauger
Todd Shepard
William Sheppard
Larry & Mary Sherwood
Marjorie Sherwood
Larry & Rhond Shockley
Duane L. Shroufe
David & Rober Shuck
Ron Sieg
Victoria Sikora
M. Silva
Robin Silver
Donna Simmons
Dan & Roxanna Simpson
Florence Simpson
Jeff Simpson
W. T. & Nadine Singleton
Elaine Sisler
Rhiwena Slack
Arnold & Lore Slade
Davy Slade
Doug Slade
Ronda Slade
Wanda W. Slade
Irene Slater
Shirley Slaysman
Mary Lou Smith
Ray Smith
Susan Snetsinger
Sid Snyder
M. Solberg
Thomas Sonadres
Cynthia Soria
Lorna Soroko
Gary Spegal
Gregg & Susan Spindler
Glen & Aureli Stann
Carrie Stark
Kenny & Crystal Steed
Drew Stern
Don Steuter
Sillcie & Jeff Stevenson
Scott Stewart
Howard Stone
C. Stover
Douglas & Suz Stover
Floyd Stover
Kay Stradling
Marvin Stradling
Carol & Leon Strenkoski
Dick Stuart
Kieran Suckling
Judy Sugg
Thomas Swift
Peter Swolak
Margie Tapia
Philip F. Teisl
Rheal Tetreault
Cliff & Rachel Thomas
Paul Thomas
Craig Thompson
Milton Thompson
Paul Torrence
Ralph Trammell
Carrie Tucker

Jennifer Turner
Ann Udall
Robert G. Udall
Herb Van Slyke
Kenneth & Tam Vance
Deborah Vath
Mike Wagner
Dave Walker
Jesse & Sarah Walker
Libby Walker
Evelyn Wallace
Thomas Warfield
James M. Webb
Valora Webster
David Weigel
John Weiss
W. Welch
Manfred Wenner
Bill White
Richard White
Ken Whiting
Karen Williams
John Willis
Don Wilson
Gary Wiltbank
Jeff Wiltbank
Judy Wiltbank
Michael Wiltbank
Ricahrd Winstead
Liz Wise
Ed Wissinger
Robert Witzeman
Eleanor Wootten
Thomas Wootten
Nancy Wright
Kevin Wynn
Don & Linda Zepp
Cory Zimbleman
Carol Zimmerman

Arkansas

Sherry Balkenhol
Joel Bard
D. Blackburn
David Blackburn
Al Brooks
Alvin & Jane Brooks
Henry Dowse
Charles Gresham
Basil Kyriakikas
Jim Northum
Frank A. Roth
John T. Shannon
John Shannon
Fred Stephen
Connie Swanick
Lynne C. Thompson
T. Walker
Tamara Walkingstick
Jerry Williams

California

Seth Ackerman
Lani Adams
Evan Albright
Gary Allen
Dana Amarisa
Paul Andrade
Kelvin Askew
Mark Edward Attew
Dominique Avery
David Bakke
Jean Baldrige
Mark Balitzer
Karen Bane-Gaston
Steven W. Banning
Janet Barber
Kevin Barry
Alan Bart
Justin Bastow
Pete Batchelder
Diane Beck
Randy Benthan
Sandy Berry
Lauren Blaschke
R. J. Blinkwolt
Audrey Blumeneau
Randy Bostick
Joseph & Susan Bower
Audrey Bowers
Jo Boyard
Charles Boyce
Theresa Brady
Steve Branch
Stephen & Irene Brewer
Michael Brewster
James E. Brookshier
Robert Brothers
Michael Brown
Steve Brown
Gary Brown
Terry Bunch
Carrie Caldwell
Mary Carpelan
David Carter
Marian Carter
Steve Cassidy
Beverly Cherner
Alexander Clayton
Walter Cook
James Cooney
J. Simon Cornette
Rachel Couch
Mallory Crenin
Lyle Dahms
John Dale
D. N. Danielsen
Sandell Davidson
Galen Davis
Pat Davison
Owen Dell
Bob Denike
Lou Anna Denison
E. M. Dennis
Jerry Dewey
Sarah Diehl
Bonnie Dombrowski
Cynthia Douglas
Robert V. Dowell

Lenore Dowling
Magen Dryshale
Kathryn A. Dudley
Shawn Duke
Marty Dumpis
David Duncan
Colette Dupont
Gloria Durant
Constantina Economou
Bruce Emerson
Sarah Emmerson
Laura Engeman
Brian Espy
Adela A. Fast
Laura Ferejohn
Mildred Filiberti
Wendy Fleming
C. B. Follett
Ivan Forbes
Sara Foster
Charles Fox
Dennis Freeman
Anthony Friend
Bill Friend
Pat Frost
Aileen Furuyama
Ron Gaul
Eric Gerstung
Robin K. Gibson
Alan Goggins
Rena Gonzalez
Richard Gordon
Leslie Gordon
Raymond Grace
Steve Graves
Stuart Gray
Leda Beth Gray
Anika Green
Nate Greenberg
Dana Gurdling
RaLana Gurney
Bob Gustafson
Dave Hall
Floyd Hamilton
Danny J. Hamon
Evelyn Harrigan
Norma J. F. Harrison
Kari Hartmann
Sara Hayes
Todd Heinsma
Dennis Heinzig
M. H. Hemp
Tanya Henrich
Nancy Higbee
Robert C. High
Frances Hillyard
James Hines
John Hofmann
Ted Hogan
Alice Hone
Mello Dee Hrdlicka
Jerry Hughes
Michael Hughes
Thomas Hunt
Nancy Ingalsbee
Lottie Jenvey
Samuel B. Johnston
Stephen M. Jones
Julia Jones-Ufkes
Natalie Josef
Edna Juck
Isabelle Kay
Mha Atma S. Khalsa
Mary Ann Kiger
Diana Joni Kindwall
Elizabeth Kinney
Saran Kirschbaum
Kyra Kitts
Thyra Knutson
Jeff Koch
Mary Koopman
Vanessa Kranda
Charles L. Krusp
Peter H. Kurtz
Laura Lee
Edward Lemos
Harlo Lenning
Emily Loen
Mark Loughridge
Heather Louwsma
Sara Louwsma
Steven Luo
Joe Machado
M. Magleby
Heather Mansfield
Ara Marderosian
Tamar Margolit
Amber Martin
Charles Martin
Carolyn Martus
Kanta Masters
Joyce McCann
Michael McFarland
William McKillop
Suzanne McMillan
Camille McNeely
Don Mecchi
Trish Meyer
Joe E. Miller
Christine & Greg Miller
Jack Miller
Pat Minyard
Ahned Mohsen
Maya Moiseyev
Peter Morrisette
Charlie Moss
Dave C. Mough
Bob & Jan Mountjoy
Roger Moussa
Reuel Myers
Denver Nelson
Kenneth R. Nelson
Beryl Ness
Andrea Newman
David Owen
Felice Pace
Elizabeth Painter
Debby Parker
David Paschal

Scott Pearce
Jay & Annette Pennock
Jim Pentrack
Cheri Pillsbury
Carolyn O. Pizzo
Philip W. Poor
David Popp
Ron & Daun Powers
Ruby Price
Lynn Ragghianti
Jim Rains
Hamid Rastergar
Yvette Redler
Kristin Reed
Saelon Renkes
Don & Karin Riley-Thron
Jesse Rios
Donald Rivenes
K. Roark
Lois Robin
Mike Rogala
Pandora Rose
Stephen Rothstein
Leslie Rowe
Earl Ruffa
Kim Rusher
George Russel
Eli Sarnat
Alex Saunders
Eileen Sauppe
Rob Schaeffer
Jane Schneider
Dave Schultz
Jason Scorse
Susan Shapira
Alison Sheehey
Anne Sheldon
Brenda Sherman
Tamia Sheyner
Alison Shilling
Matthew Silver
Philip Simon
David Slater
Gregory M. Smith
Kathy Smith
Bill Snyder
Jesse Rios Snyder
Glenn Stewart
Bonnie Stoehn
Luben Stoilov
Bonnie Story
Kent Stronsmoe
Maggie Sullivan
Anna Suranyi
Mika Suzuki
Stan Swenson
Carolyn C. Taylor
Diana M. Taylor
Martin Taylor
Thomas Tereszkiewicz
Craig Thomas
Dale Thornburgh
Cheryl Tillotson
Sara Timby
Alexandra Toledo
Istvan Toth
M. Toutonghi
Kiran Turan
Cathneen Tuttle
Andrea Tuttle
Craig Usher
Judy Vance
Angelo Vassos
Phoenix Vie
Natasha Vilagi
Rosann Volmert
Ron Voss
Johanna H. Wald
Kristine Walker
David Wall
Michelle Waters
Robert D. Webb
Roland Weidenkeller
Carl & Stanley Weidert
Breana Wheeler
Wilma Wheeler
Claudia Whitnah
Scott Williams
Anthony Wilson
Lynda Winslow
James Woods
Tiffany Woznicki
Madeline Yamate
Don & Lila Young
Michael Young
Glenn A. Zane

Colorado

Charles Adams
Kelsey Alexander
Richard Alfred
Scott Balcomb
Robert Belford
Sarah Bender
Harry Benton
Carl & Nora Bernklau
William Braun
Eleanor Brickham
Tom Brinkmeyer
Merlynn Brown
Marth Brummett
Don Byers
Bob Cain
Stan Capps
Len H. Carpenter
Joy M. Caudill
George & Cathy Chandler
Alex Chappell
Kathleen Christensen
Elizabeth Considine
Frank G. Cooley
Bob Currie
Rick Cutler
David Danciger
William & Jan Daufman
Earl H. Dean
Donald Lee Delise
Mr. Stanley Dempsey
Rich C. Dever

Darlene Doyle-Stockey
Lynne Drogosz
Patrick Duffield
Marin & Leona R. Dumont
Keith F. & Eula Dunbar
Jim & Irene Dysart
Howard W. Earnest
Charles Van Epps
Harlen Feder
Kenneth Fish
William Fisher
Nancy Fishering
Michael Gates
Bill Gibson
Leslie Glustrom
William & Shirley Goosman
Mr. Larry Green
Robert P. Greybar
Sanford V. Griffin
Gus R. & Christy Halandras
Norman A. Hassig
Hugh & Jennifer Hatcher
William Heicjer
Meeker Herald
Gary & Karen Hill
Stephen Hill
Jim Himmes
Glen Horn
James Hubbard
John & Phyllis Hyrup
Thrisha Jones
Tom Kaldenbach
Kenneth Kelley
Bob Kirkegaard
John Kirkham
James & Pearl Knight
Mary & Brian Koehn
Wayne Lacovetto
Ed Lawn
Norm Lewis
Richard & Phy Lockhart
Suzanne MacDonald
Angie Many
Carl Marcus
Ron Margolis
Amy Marsh
Thomas J. McCloskey
George L. Mohar
Leno & Shirley Montover
Howard & Jeanet Moser
Robert Myers
Lori Nielsen
Dorothy O'Connell
Jim Olp
Marcia Patton-Mallory
Terry Paulson
James Peacock
Hal & Tom Pearce
Lisa Peraino
Robert & Ruth Perry
Tracy Pheneger
Patrick M. Pherren
Tom Phillips
Victor Pierson
Steve Pittel
Gloria K. Pollard
Robert Porter
William J. Post
John Randolph
Randall Rasmuffen
Robert Ray
Bob Reiling
Bob Richard
R. Richard
Robert D. Richard
Bob Richard
Tom Riesing
James L. Rose
Ted & Charles Ryden
Eloy A. Sandoval
Frank Sapio
Bill Schapley
Steven Schiff
Duane Scott
Leslie Scott
Thomas R. Sharpe
Verne & Lina Soucie
Jim Spenst
Sam Stapleton
Mr. Joseph Staufer
Don Tosha
Gene Tourville
Kyle J. Troxel
Cynthia A. Wayburn
Joseph & Ann Wells
Nancy Williams
Dean M. Winstanley
Amy Winter
Kristy Withrow
Robert Wiygul
Gary A. Wright
E. B. Zukoski

Connecticut

Ronald Bertotly
Joe Bigwood
Patricia M. Douglas
Michael Ferrucci
Richard Hodgson
Pam Huntley
Denny Immergut
Tom Jordan
Lou Magnarelli
Michael L. McManus
John Medyka
Gian Andrea Morresi
John Podgwaite
Sendhil Revuluri
Phillop Roger
Donald Smith
Victoria Smith
Peter Trenchard

Delaware

Glen Adams
Everett Baker
Marianna Baker
Denies Ball

Paula Barto
George Beckman
Lee Biddle
Roger Bowman
Stephen Brasure
Ray Brittingham
Jeff Brothers
Jody Brown
Paul Burns
Henry Byler
Gary Cannon
George Carmean
Dewey Caron
Mary Cashel
Bob Causey
Joseph Clymer
Craig Conaway
Everett Conaway
Warren Conaway
Patricia Cooper
James Corcoran
Ken Corrin
Donald Craft
Gaylan Crumley
Mike D'Amico
Frank D'Armi
Jodie Daudt
Greta Decogin
Walter Demhoff
Paul Dickerson
Harry Diehl
Frank Dill
Mario Dobrich
Charles Dukes
Norma Dukes
C. P. Elliot
Howard Ennis
Herman Entzion
Connie Erixson
Donald Ewing
James Fahs
Robert Ferber
Ray Fisher
Lorraine Fleming
Jim Flood
Gary Focht
Joseph Forrest
Warren Foster
Harry Fox
Roger W. Fuester
Loretta Galaska
Geoffrey Gard
William Garey
John & Gladys Garret
Joseph George
Bruce Getzan
Wayne Gibson
Robert Glading
Charlene Glasco
Thomas Good
Edith Gray
Garriet Grier
James Guthrie
Beth Haldenan
David Harman
James Harrison
Carol Haskins
Davison Hawthorne
Roy Hazzard
Thomas Hickman
William Higginson
John Hitch
William Hitchens
Everett Hodge
Clinton Hoffer
Dale Holloway
Lester Huey
Fleet Hughlett
David Hynson
Al Jackson
Bob Jahn
William Jerread
James Johnson
Charlotte Jones
Terry Kanask
Francis Kelly
Charles King
Martha King
Karl Klein
Leonard Klein
Faith Kuhn
Jean Lankford
Robert Lewis
Phillip Livingston
Charlie Long
Samuel Mace
Andrew Manus
Isaac Markowitz
William Marsh
Tim Martin
Jim Marvel
Howard Masten
Krickett McLlroy
Harry McPartland
Groome Mears
Claire Melvin
Crystal Messick
Richard Meyer
Dorothy Miller
Ralph Moore
C. Parker Moore
James Morgan
C. Mortenson
Roy Murray
Hearn Myer
Austin Nadeau
Gary Oakes
Maura O'Conner
James Olson
Barbara Osiolek
Bonnie Outten
James & Georgen Palmer
Ingrid Parker
Randy Peiffer
Richard Peishala
Victor Pierce
Grant Pierce-Beck
Paul Pizzuto
Lila Lee Porter

Dennard Quillen III
Peter Ratledge
Richard Rice
Thomas Rider
Thomas Rider, Jr.
Joyce Robbins
Winston Roberts
Fred Roberts
Kenneth Rogers
Thomas Rooney
Stephen Schilly
Titus Schlabach
Jack Schuh
Bill Shedaker
Donald Shelor
E. Austin Short III
Dale Shuirmann
Mark Sienkiewicz
Jim Sigmon
Vernon Smith
Donald Smith, Sr.
C. Walton Smith, Jr
Carl Solberg
Shelley Spicer, Jr.
Jennings Spiker
Chester Stachecki
Charles Stebner
Fleta Steward
Neal Swartz
Charles Taylor
Louis Thibodeau
Florence Thomas
Floyd & Madelin Toomey
James Towers
Johanna Troncone
Betty Truitt
M. H. Upton
Michael A. Valenti
Harold Valerius
Ray Valteris
Joseph Vaughan
Robert Lee Venables, Jr.
Ron Vickers
Beverly Viehman
Kim Vincent
Anton Vodvarka
John Vogl
Robert Walcome
Deanne Walker
Robert Walsh
Lynn Ware
Ronald Warren
Joan & Henry Waudby
Sue Wells
Robert West
Jim White
Marion Wiley
Jean Willis
Rocky Wingate
Christopher Yang
Herman Zeitler
Crist Zook
Dorothy Zupon

District of Columbia

Ainsley Caldwell
Jesus Cota
Muriel Crespi
John J. Fay
Forrest Fenstermaker
Joey Fink
Charlotte Fox
Steve Holmer
Mike Leahy
Robert T. Mangold
Kristen McDonald
Rena Rodriguez
David F. Thomas
Adele Wells

Florida

Joseph Bail
Thomas Baxter
A. Bowen
Marvin Cornell
Traci Darnell
Wayne Dixon
Mike Dolan
Allan Egbert
John L. Foltz
Charles Harden
Ron Harding
Mike Long
Albert E. Mayfield
Michael McGirr
Carlos Milan
L. Earl Peterson
Claire Poertner
Andrea Repp
Curtis Ricks
Esther Shomper
Kate Sullivan
Capt. Michael Tracy
Kristina Trotta
Andrea Van Loan

Georgia

D. Duerr
J. Fredrick Allen
Wayne Berisford
Chantal Blanton
Giovanni A. Caban
Mike Chedwick
Joseph Cummins
Edwin Dale
Marlin Dixon
Dan Dossin
G. Keith Douce
John Harmon
James K. Johnson
Mary Kiotz
Bob Lazenby
Lee Martin
Carlos Martinez
Chuck Niemeyer
Raymond Norvell
Terry S. Price
Tanya Sharon

Warren Winter
James Young

Hawaii

Bobbie Becker
Michael Buck
Arthur F. Buckman
Alan Lennard
Benton Pang

Idaho

David R. Adams
John W. Adams
Adrianne Allen
Dale Allen
Eldora Allen
Sam Allnan
Carl F. Austin
W. R. Bachman
George Bacon
Henry Bailey
Sara Baldwin
Stefany Bales
Duane Ball
Wally Bang
Yvonne Barkley
Susan Barnes
Chuck & Paul Barnhart
Bill Barteaux
Douglas Basford
Ann Bates
Shelton Beach
Ray C. Bedke
Susan Bell
Gary Bender
Mark Bender
Cliff Bennett
Donna Bennett
Robert Blanford
Steve Bliss
Vaiden Bloch
Sherry Blood
Scott Boag
Joann Boswell
Cory Branch
W. R. Branch
Rudy J. Brandvold
Jerry Branning
Larry Branson
K. D. Braven
Bob Breckenridge
Earl & Dawn T. Britt
Joyce Broadsword
David & Grace Brown
Jack A. Buell
Glen Burdick
Jason Busch
Susan Canniff
Guy M. Carlson
Opal G. Carlson
E. Carpenter
Gretchen Casey
Julie Chasteen
Richard S. Christensen
C. J. Coates
Bob Collett
Aelena Cook
Jeff Cook
Philip S. Cook
Stephen Cook
Michael Cooper
Kirk Corbridge
Cindy Cottrell
Clay Coudit
Ervin Cowley
Carl Crabtree
Mary A. Crofts
L. Daniels
Greg Danly
Rick Davis
Stanley B. Davis
R. D. Davis
Gene Delimata
Wayne K. Denton
Lou Dersch
Betty G. Deveny
Bill Deveny
Grant Dirks
Jane R. Ditto
Phil Doyle
Judy Drake
Larry A. Drew
Fred L. Edmiston
Edgar Edwards
Robert Elieson
Maurice C. Ellsworth
Rod Erickson
Mike Etcheverry
R. Kirk Ewart
Diane Ewell
Valerie Fast Horse
Annie M. Fisher
Bill Fortis
David Foruria
David Foster
Terry Fuchs
Ralph Fulp
James Funk
Ron Gannys
Gary C. Gapp
George Gauzza
Charles Gehring
Craig Gehrke
Jim Gerber
Linda Gillette
Dale Goble
Jane Gorsuch
Fred K. Grant
Tom Griffin
Connie Grover
Scott Grunder
Theodore E. Guindon
Tom Haislip
Jerry S. Hamilton
Stanley F. Hamilton
Douglas A. Hancey
Aaron Harp
Cheryl Hart

R. J. Harwood
Everett Headrick
Jeffrey W. Hickman
Robert P. Hirst
Zaz Hollander
Ed Holm
A. Holthuijzen
Ed Hood
Chris Hunter
Larry Isenberg
Steve Jakubowics
Roger Jannson
Janet Jenkins
Fred Johnson
Charlie Johnson
Roger L. Jones
Lei Lani Jones
Larry Kaiser
Larry Keller
James L. Kennedy, Jr.
Marcia Kent
Mark E. Kieckbusch
Mike Kirby
John Kirch
Cecelia M. Kirkland
James P. Kjelland
John H. Kramer
Christopher Lammer
Sue Lang
Alonzo B. Leavell
Gretchen Lech
Jennifer R. Leggett
Nancy Lewis
Rodney Lindsay
Roger D. Ling
James A. Little
Ladd Livingston
Vicki Long
Marvun Lowry
Johanna Luce
Michael Lucid
Howard Lunderstadt
Mark Madrid
Fred Maitland
Regena Malvich
Paul Marchant
Gerald Marchant
Jeff Mark
Don Martin
Roger Martinson
Jon Marvel
Stan Matsuura
Bob Maynard
John McCarthy
Larry McCoy
Richard A. McEwan
Sandi McFarland
Alfred M. McGlinsky
Marc McGregor
Dave McNeal
David McQueen, Jr.
Ron Meacham
Stephen P. Mealy
Beloit Mendenhall
Sarah Michael
Mike Mihelich
Melanie Miller
Robert Miller
Wayne Minshall
Dan Misciagna
Sandra Mitchell
Ruth Monahan
Rebecca Morgan
Eric Morrison
Larry Morton
Bob J. Muffley
Bill Mulligan
Gloria M. Murillo
Jim Murphy
Mike Needham
Doug Nelson
Erik Nielsen
Jay O'laughlin
John Olson
Calvin Osborn
Lori Osborne
Kerry Overton
Bernice E. Paige
Brian Painter
Deana Parrish
Afton Patrick
Steve Paulson
Arleen Pence
Terry M. Pfav
Kat Phillips
Ellie Pierce
Sharon Pratt
George L. Presley
Mary Price
Frank S. Priestley
Keith Ray
Jerry Reese
Gary Regehr
Fritz Rennebaum
Virginia Ricketts
Eileen K. Riddle
Bruce Rieman
James S. Riley
Neil Rimbey
M. G. Robert
Hank Robison
Todd Royer
Mike Sampson
Bill Schow
Gerald Schroder
Norm Semanko
Jim Shake
Scott E. Short
Don Simpkins
Roger Singer
Charles W. Slaughter
Carol Smith
Richard Smith
Eric Snyder
Ronald M. Solbrig
Stefan Sommer
Margaret Soulen
Sharon Spiker
Carol Spoor

Mark Sprengel
Carol K. Staley
M. B. Stanley
Catherine Stapp
Wendell M. Stark
Dave Stasney
Arthur A. Stone
Marjorie M. Strawn
Leslie Streeter
Norm Suenkel
Patrick A. Takasugi
Dia Terese
Tim Thomas
Allan Thomas
Lyle Thompson
Duane Thompson
Glenn Thompson
John Thornton
Dale Toweill
Paul Turcke
Rich Uberuaga
Alex Urfer
Dave Van D'Graff
Pam Walker
Gene E. Wallace
Madeline Walters
John Warofka
Lonnie Way
Jim West
Mike West
Buck Wheeler
Winston A. Wiggins
Dick Willhite
Jack T. Williams
Robert C. Williams
Shannon Williams
Robert E. Wilson
Tima Wilson
Rex, Susan M. Winegar
Harry Winkler
Nancy R. Wolff
Bill Wood
D. T. Worden
Don Wright
Doug Wulff
Skip Young
Art Zack

Illinois

James Ahrenholz
Jim Appleby
Kurt Bobsin
Eunice Brooks
William Calvert
Chris Carlson
James Cavanaugh
Jim Cavanaugh
R. Cibulsky
M. Cinnamon
Mark Cinnamon
Raymond A. Cloyd
William Coan
E. Cunningham
Bob Czernik
John Dickson
Mark Donham
Doug Dufford
Joe Fasig
Marilyn Ford
Howard Fox
M. Gaffney
Lee Geistlinger
Gerald Girardot
William B. Glass
Cynthia Greenberg
Susan Guinnip
Laurence Hall
Robert Henningson
Daniel Holland
Knute Horwitz
Robert Hughes
Rob Ittner
Michael Kirchhoff
Ken Konsis
R. Korth
Mary Krane Derr
S. Krause
Al Kulczewski
Barbara Kurtz
Max Lane
J. Larson
Donovan Larson
Thomas Long
Roland Manthe
Tony Massarello
Glenn Massie
Harold Miller
Rick Moore
Al Novara
Dan Ormer
Stewart Pequignot
S. Petersen
Michael Plumer
B. Poliska
B. Reed
R. Reed
James Reid
Kitlyn Rescinito
Virginia Schick
Debbie Scott
Cindy Sheridan
Stan Sipp
Peter Skuba
S. Smith
Peggy Snow
Leellen F. Solter
Martha Speir
Theodore Steck
Randy Stephens
Russell Sutton
Richard Thom
Dale Thurber
Eric F. Ulaszek
Amber Urban
Carissa Van Nevel
Brad Virden
Stephen Warble
Roger Weber
Nancy Wedow

Patrick Weicherding
Mark Willi
Jason J. Zylka

Indiana

Mrs. Parks Adams
Charles Anderson
Wilford Barlett
Joe Bruggenschmidt
Jim Brummett
Harold Bruner
Glenn Burham
James Burke
Richard Burt
Kevin Clark
Dan Cole
Louise Cummings
Joseph Davison
D. Eby
J. Ellis
Clay Faller
Burnell Fischer
C. Gallowitch
J. Golod
Donald Goodwin
Steven Goodwin
Frank Gottbrath
Anthony Grossman
Harry Halstead
William Kautz
Gregory Koontz
Norman Lamunion
Ronnie Linville
P. Marshall
Philip T. Marshall
Dan Meisberger
James Morris
G. Moughler
Brian Mueller
J. Ogle
Jim W. Pleasant
Tom Rathert
Phil Reid
Charles Rush
Dan Schmoker
Z. Smith
Zachery M. Smith
Jill Strawder
Jeffrey Swackhamer
Jim Sweeney
Steward Turner
Lloyd Vanderstreek
Bruce Wakeland
Robert D. Waltz
D. Yaninek

Iowa

Jim Ahrens
Allan Beck
Mike Brandrup
Mark Dungan
Wayne Fuhlbrugge
Merlin Glade
Jay Gold
Denny Haugen
Bill Haywood
Roger Jacob
Robert Kassmeyer
Steve Lekwa
Al Manning
Darwyn Peters
Robin D. Pruisner
Norman Riemersma
David Sell
Brian Wade
Mark Webb
Pat Wenke
Dan & Vicki Fogle

Kansas

Raymond Aslin
B. F. Barker
Pete Garfinkel
Russell A. McKinney

Kentucky

C. Thomas Bennett
Allen Hale
Carl Harper
Emily Loomis
Leah W. MacSwords
Mike Madryga
Jennifer Reed
Lynne Rieske-Kinney
Sara Sanders
Jeffrey W. Stringer
Barbara Werner

Louisiana

Esther Boykin
Richard Goyer
Louis Heaton
James Jenkins, Jr.
Peter Martinat
Edward Rivera
Bill Spitzer
Will Waring
Alvin Wells
David Wilbur
Robert Zinn

Maine

Ohn Ackerman
John Ackley
Richard Aishton
Jeff Albert
Kennard Allen
David Allen
Linda Alverson
Phillip Andrews
Richard Arbour
Mark Armstrong
Walt Armstrong
Dennis Arsenault
James Austin
William Barron
Mark Beauregard

Michael Benjamin
Peter Beringer
Heather Bessey
Richard Blodgett
Leon Blood
Wendall Bradford
Jack Brake
Jerri Brandt
David Brann
J. Brennan
Michael Brown
Raymor Brown
Barbara Brusila
Robert Bryan
Stephen Bumps
Harold Burnette
William Calderwood
Albert Carey
Ernest Carle
Iver Carlson
Stanley Carpenter
Katherine Carter
Robert Chadbourne
Robert Chandler
Pete Chase
John Churchhill
Michael Cline
John Colannino
Phillip Conkling
Terri Coolong
Roger Coolong
Andrea Corbett
John Cote
Robb Cotiaux
Hewlette Crawford
Stephen Croman
Chester Curtis
Fernald Curtis
Mike Cyr
Brian Dangler
Debra Davidson
Theresa Davis
Christopher Deane
Mark Deschene
Herbert Dickey
Jack Dirkman
John Dirkman
Kevin Doran
David Dow
Harold Dow
Phillip Dow
Amanda Dow-Smith
William Drisko
Michael Duddy
Martin Duffany
Eugene Dumont
Geneva Duncan
Ralph Dunn
Emile Dupuis
Harold Dwyer
James Ecker
Stephen Elliot
Kirby Ellis
Leon Emery
Grant Estelle
Peter Farnsworth
Floyd Farrington
Robert Fenderson
Richard Finlay
Robert Finlay
Emma Finn
Gary Fish
Stephen Follette
Norman Forbes
Clifton Foster
Chester Gage
Tim Gammell
Robert Gammons
Arthur Garland
Stephen Gettle
Ann Gibbs
Robert Giffin
Dale Gilman
Daniel Gilmore
Walter Gooley
Douglas Gray
Glenn Gurney
Dana Hall
Frederick Hallenberg
Michael Hammond
Geoffrey Hancock
James Harris
M. E. Hartley
Martin Hartley
Patsy Hartley
Michael Hartung
David Harvey
Hugh Hastings
Bob Haynes
Thomas Henderson
Kerry Herbert
Frederick Herrick
Mindie Hesketh
Eric Holden
Dave Hopkins
Patricia Hopkins
Fred Huntress
Gary Inman
Wayne Jackson
Lonnie Jandreau
William Jarvis
Roger Johndro
Linda Johns
Marc Johnson
Albert Johnston
Alfred Johnson
Anita Johnson
Bela Johnson
Peter Johnson
Rick Jones
Mike Kankainen
Alan Kimball
Charles Kinney
Richard Kircher
Peter Klachany
David Knupp
John Kochi
Joseph Koller
Gloria Krellman

John Laban
Ken Lamond
Mitch Lansky
Kenneth Laustsen
Mike Lavoie
John Leslie
Robert Leso
Phillip Levasseur
David Libby
Robert Liske
Robert Locke
Ronald Locke
John Long
Robert Lumppio
Michael MacDonald
Sandra MacGown
David Maddocks
Alan Magrath
Douglas Mahan
Tristan Manchester
David Manski
Douglas Marston
Mark Martin
Todd Massey
Sue May
Earl McCheeney
M. McClean
Malcolm McConnell
Izzy McKay
Jack McMullen
James McMullen
Paul Memmer
Mark Michaud
Paul Miller
Brian Milligan
Roger Milligan
Brooks Mills
John Mills
Robert Moore
Gary Morse
Keith Morse
Christopher Murdock
Kenneth Nawfel
Scott Nelson
Thomas Nelson
William Newcomb
A. Newell
Merle Parise
Scott Pease
Stephen Pelletier
D. Perkins
Christopher Polson
Neil Postlewaite
Andrew Pottle
Gerald Poulin
Eugene Putnam
Don Quellette
Kevin Raye
Steve Reynolds
Linwood Rideout
Merle Ring
Bruce Ripley
George Ritz
Hugh Roak
Jonathan Robbins
Wallace Robbins
Michael Rochester
Robert Rochester
David Rock
David Rocque
Fred Rooney
Megan Ropiak
Edwin Rosso
Paul Rudd
Daniel Russell
Michael Sackett
J. Sass
Wendall Saucier
Dave Schaible
Wilhelm Schloth
Timothy Scott
David Shaible
Randy Shaw
Charles Simpson
Carl Sjogren
Dan Smith
Robert Smith
Donald Soctomah
Brian Somers
Michael Spellman
Robert Spivey
Frank Spizuoco
Ellis Sprague
George Stadler
Susan Stetson
Timothy Stevens
Andrew Strachon
Kenneth Strickland
David Struble
Joel Swanton
Christopher Taylor
Theresa Tenney
Alan Thiebeault
Terry Thomas
Barry Tibbetts
Sam Timberlake
Irvin Tower
Everett Towle
Peter Tracy
James Trask
Joel Tripp
Theodore Tryon
Gail Tunstead
Daren Turner
Bob Umberger
Mark Vannah
Vite Vitale
Peter Volz
Carol Voss
Dave Walker
James Ward
David Warren
Dean Webster
Andrew Weegar
David Wellman
John Wenteel
Forest Weston
James Wheeler
Thomas Whitworth

Carroll Willette
Maynard Wilson
Kenny Wing
Donald Winslow
Mark Woodbury
David Woodhead
Robert Wright
R. Alec Giffen
D. Eric Johns
James St. Pierre
Russell F. Roy
Ronald St. Saviour
Scott & Doree Olson

Maryland

Robert Albert
Lynn Alexander
Leslie Amtower
Ronald Antill
Jim Bailey
Glen Besa
Fred Bolton
Rusty Booker
Susan A. Bright
Scott Burroughs
Steward Callis
Ryan Carter
Joseph Clisham
John Cullom
John Davis
Henry Debruin
Chuck Divan
Richard J. Dolesh
Wade Dorsey
Alice Eastman
Nathan Erwin
Drew Foerster
Jeanne Frantz
Weyman P. Fussell
Jim Getter
Anne Harmeyer
Rex Harper
Harry Hartment
Joe Hautzenroder
Zoh Hieronimus
Martha Holdridge
John Houser
Rolf Hubbe
Kristin Iden
Andrea Illig
Clint Irwin
John & Linda Jacobs
John Jordan
Charles Keeley
John Kennedy
Jerry Kimmel
Steve Koehn
Steven Koehn
John Kowalski
Craig Kuhn
Margret Leary
Rodney Lipscomb
Robert Loomis
Chris Lynch
Melissa McDaniel
Todd McDonald
David Miller
Robert More
Phil Nester
Sonny Newhall
Dawn Parker
Bob Prettyman
Heidi Pringle
Bob Rabaglia
Melvin Reuber
Chuck Schneider
Larry Sharpe
Earl Sheble
Paul Shogren
Don Sisler
Richard Smucker
Mark Souterland
Warren Spencer
Marshall Stacy
Frank Stark
Henry Stasick
Jerry Stokes
Raymond Stralka
Kathleen Talman
Mark C. Taylor
Matt Taylor
Kevin W. Thorpe
Robert Tichenor
John Van Horn
Adrienne Venables
Carole Vila
Marie Walz
Kenneth Willets
Shawn Winterberg
Peter Wood
Len Wrabel
Amelia Wright

Massachusetts

Warren Archey
Suzanne Artemieff
Abigail Avery
Glenn Ayers
Kerri Belval
Norman Berberi
Charles Burnham
Susan Campbell
Paul Cole
John Deans
James Dennesen
Charles Diehl
James Dimaio
Alexandra Durbin
Tom Emerson
Burt Germond
Kenneth Gooch
Jeff Grove
Kerowyn Guillotte
Donna Hampson
Robert Hannon
Donald Harris
Jeff Hourdain
Mike Kiernan
Lisa Kroeber

Louis Laz
Michael Leonard
Aaron Maia
Victor C. Mastro
Lawrence May
Phyllis Michalewich
Richard Mytkowicz
Robert Perschel
John E. Rice
David Richard
David Sanderson
Jack Savastano
Michael Sikora
Grechen Smith
Edward Syrjala
Charles Thompson
Rick Tormala
Lucille Traina
Peter Tucker
Kimberly Walsh
Robert Watjen
Mary Wigmore

Michigan

Steve Alguire
John Arend
C. Arsnoe
B. Austin
Ralph Babcock
Dan Bailey
Samuel Bailor
J. Barense
Jim Barry
Andrew Barton
William Beach
Martin Blackedge
Gary Boushelle
Maurice Bracken
M. Brackenbury
Darryl Braun
Dan Braun
Peter Buehler
Christopher Burnett
Robert Caouette
Gordon Cole
Richard Cooper
James Crowfoot
Tracy Curlee
D. Dantuma
B. Dayton
Leanne Dijok
Homer Earl
Lee Eavy
M. Eddy
J. Edgerly
L. Eisbrenner
Lee Ekstrom
Leon Erbe
George Ferrar
Walter Fifelski
Marlene Fluharty
Ken Ford
Suzanne Gartz
Dennis Good
C. Gorsuch
Earl Gorsuch
Kathryn Griffith
Gerald Grossman
Shawn Hagan
Ron Hansen
John Hanson
Kevin Harsch
W. Hatfield
William Hatfield
P. Henry
Bob Heyd
J. Hill
John P. Hill
Max Holden
Bernard Hubbard
Don Ingle
Larry Jobson
Stanley Johns
Jim & Patricia Johnson
Carl Johnson
Martha Jones
Norbert Karmann
C. Keefe
Gerald Keiser
Duane Kenaga
Phil Kline
B. Kroll
Dane Lamb
R. Larowe
C. Lenchek
Frank Lendzion
Larry Lindenberg
R. Lintemuth
Jack Lockwood
J. Loncar
Rory Mattson
James Mccumber
D. Mckay
M. Meriwether
Cynthia Merrow
Kip Miller
A. Mrozinski
G. Patchen
M. Philip
Mike Philip
T. Plachta
Richard Potts
M. Quesnel
Don Quick
K. Rauscher
K. Reis
Robert Rohn
David Roose
Forrest Ruppert
J. Ryan
Eino Sainio
Ken Salo
John Santeiu
Frank Sapio
A. Schiffer
Albert Schiffer
Kathy Schiffer
M. Schiffer
Lisa Schoppmann

Josheph Schott
Walter Selski
Ronald Sievertson
Shaun Smakal
John Sosnowski
L. Sperry
Thomas Stadt
Edward Stulberg
Russell J. Sutton
Mike Tansy
Howard Taylor
M. Ticehurst
Jack Titus
Donald Tracey
Jack Tucker
G. Voyle
A. Wallace
Alicia H. Wallace
Richard Wallace
G. Wheeler
John Wiggins
Richard Wilcox
Gary Willis
J. Winkler
John Witter
Sylvester Wood
Dennis Worst
Christopher Wright
Ralph Zandt

Minnesota

Kenneth Anderson
Lillian Baker
David Banta
S. Burks
John Calgaro
Jennifer Callahan
Michael Carroll
Valerie J. Cervenka
Marty Christensen
M. Connor
Michael D. Connor
Mike Connor
Ronald Daigle
P. Deerwood
Robert Despot
Gene Dressely
Carlos Eberhardt
Jeff Fellows
Donald Ferguson
Geir Y. Friisoe
Thomas Gearhart
Richard Gitar
Cathryn Greene
Ralph Greilig
Keith Hanson
Dennis A. Haugen
T. Heyer
Roger Holmes
Ralph Hovind
Mark Johnson
Alan Jones
R. A. Knoll
Mert Lammi
Raymond Lopresto
Brian Lutenegger
Greg Magnuson
Susan McGuire
Wade Mier
Jim Mohler
Steve Nelson
Kevin O'Brien
Glen Olson
Ralph Olson
Arlet Phillips
Kevin Proescholdt
Arthur Reese
Kathryn Robbins
M. Roberts
Geart Searfoss
Michael Shepard
Don Small
E. Karsten Smelser
D. Solum
Lance Sorenson
George Stever
John Swanson
Michael Swift
Kimberly Thielen Cremers
Maynard Underbakke
Carl Vogt

Mississippi

John Corban
Jeffery Head
Sidney Malone
Thomas A. Monaghan
Tamara Muller
Evan Nebeker
Sam Polles
Robert Simonds
James Sledge, Jr.

Missouri

Burl Ashley
Randall Bolyard
M. Brown
Scott Brundage
Michael Collins
K. Combs
Jerry Conley
John Dwyer
Troy Gordon
Amy Grubert
Kerwin Hafner
Randall Herberg
John Keesey
Robert Krepps
Jay Law
Rob Lawrence
Gregory Linn
Ronald Lumb
James McClure
Sarah Messbarger
Robert Miley
Charles Phillips
M. Roling

Cheryl Rosenfeld
Don Schultz
Robert Simonds
Clell Soloman
Delores Ward
Rebecca Weisser

Montana

Gary Adams
Vick Applegate
Tom Corse
Bruce Erickson
Roger Gowan
Patrick J. Graham
Cathey Hardin
Bob Harrington
Lee Harry
Bruce Higgins
Jack Holmes
Sharon Klinkhammer
Steve Kohler
Sue MacMeekan
Bill Michels
George Nickas
Jane Olson
Wes Paulson
Christopher Reichert
Jerry Sass
Steve Slaughter
Kathy Tribby
Lynn Vrlanic
Val Walker
John Weinert
M. Whalen
Michael Wood

Nebraska

Gary Hergenrader
Susan Schimmer
Ruth Wusk

Nevada

R. C. Bechtel
Valerie Buchanan
Frank R. Cervantes
Gail Durham
Gail Ferrell
Trevor & Tracy Ganske
Shelly Germann
Steven Glimp
Doug Hunt
Anna Keyzers
Robert King
P. C. Martinelli
Marian Mckenzie
Leanne Miller
Steve Robinson
Patrick Rucker
Marilyn Tomkins
Robert Vaught
Roy & Ruby Venghams
Sean & Erin Wallace

New Hampshire

Charles Baylies
George Bell
Putnam Blodgett
Jennifer Bofinger
Charles Bond
Philip Bryce
Michael Burke
Norman Charest
Richard Chase
Raymond Conley
Gibb Dodge
Tom Durkis
Kevin Evans
Rick Evena
Peter Farrell
Donna Gamache
Buhrman Garland
Walter Graff
Frank Hammond
Bruce Jacobs
Jonathan Janis
Kenneth Jordan
Keith Kidder
Charles Koch
Fred Kocher
Ted Lacey
Kyle Lombard
Quentin Mack
John Martinson
Bruce McAllister
Brooks McCandlish
Joseph McKeever
Dennis McKenney
Charles Moreno
David Noyes
David Olson
Daniel Reed
Pete Renzelman
Peter Rhoades
Jay Seavey
Bruce Sloat
Norma Sorgum
David Thompson
Robert Todd
Wayne E. Vetter
John Twichell
John Violette
Steve Walasewicz
Wayne Young

New Jersey

Diane Allen
James Barresi
Paul Barrett
Joseph Bateman
Diane Beatty
Judson Bennett
Paul Berezny
Deborah Boerner
Melani Bolyai
Ian Borden
Paul Borokhov

William Brash
Tom Brodde
Thomas Bullock
Gene Burks
Hugh Carola
Dennis Chandler
Nancy Coleman
Paul Cowie
Joseph Dunn
David Edelman
G. Ettenger
Galen E. Ettinger
Lorens Fasano
Robert Fimber
R. Fine
David Finley
Richard Goodenough
Ted Gordon
Heather Gracie
William Grundmann
Christina Harrigan
Cora Hartshorn
Kris Hasbrouck
Curtis Helm
Neil Hendrickson
Frank Hennion
Madelyn Hoffman
Lewis Howell
Christina Hurd
Mark Hynson
Matthew Immergut
Craig Kane
Constance Katzenbach
George Paul Koeck
Mary Lamielle
John Linson
Lucine L. Lorrimer
Gary Lovalo
Linda Mack
Wendy Malmid
Timothy Matthews
Steve Maurer
John Mayyyott
Bob McDowel
William Metterhouse
Nenneth Meyers
David Moore
Robin Murphy
Steven Panter
Linda Price
Stuart Rich
Paul Rodriguez
Nicole Roskos
Barbara Sachau
Dale Schweitzer
Jack Shuart
Robert Sidor
Timothy Slavin
Sunil Somalwar
Hank Suydam
Kenneth Taaffe
Linda Tatem
Douglas Tavella
Dena Temple
Luke Templin
Bob Williams
J. Worrell
George Zimmerman
Joe Zoltowski

New Mexico

Doug Abbott
Ann Alexander
Craig Allen
Debra Allen-Reid
Josefina Alvarez
Jim Bailey
James Bailey
Randy Balice
Mary Ann Baruch
Hugh E. Bearup
Joanie Berde
Jacque E. Blackman
Butch Blazer
Doug & Penny Bogart
Jess Bowman
Billy O. Branman
Jerry Brock
Kelly L. Bryan
Ysabel Campbell Luecke
Henry Carey
Elizabeth G. Chapman
Betty Jane Curry
Leslie Davis
Nelson Denman
Rich Detry
Ellen Dietrich
George Duda
Robert & Lill Dunn
Ron Ensminger
Karen Epperson
Judith Espinosa
John Fowler
Ric Frost
Delbert L. Fulfer
Charles Fuller
Sid Goodloe
Frank E. Gorskey
Randall Gray
Carrie Green
William Gross
Wayne Gyulai
Darrol L. Harrison
Bruce Hayward
Martin T. Heinrich
David Henderson
Sam Hitt
Mark Hoak
Larry Hughes
Timothy Humphrey
Abe Jacobson
Thomas Jervis
Sarah Johnson
Jennifer Johnson
Jack T. Jordan
David Keller
Ed Kelly
Suedeen Kelly
Richard Khanlain

Lane Krahl
Anthony Ladino
Gabe Lopez
Willie Lucero
Leonard Lucero
Richard V. Ludwig
Paul Luehrmann
Greg Magee
Anne Malone
Jerry Maracchini
Freddie Martin
Aron Martinez
Michael Massey
Pat Mathis
Fred C. & Wil May
Ann McCampbell
Mr. Jerry McCrea
Tracy McFarland
Julie McIntyre
Stephen Mergault
Mark Miller
Verna Miller
Tim Mitchusson
William H. Moore
Patrick Morandi
Alex Mueller
Nance Neskaukas
Rick Norris
James Norwick
Douglas B. Osborn
Manuel Pacheco
Doug Parker
Jeff Pierce
Gregory Pollak
Joanna Prukop
Don Rauch
Harold Reynolds
Eric Roybal
Deleen Ruebush
Richard Ryan
Calvin J. & B. Salars
Ben Sanchez
Pat D. Sanchez
Stephani Sandoval
Mike Sauber
Joe Savage
Melissa Savage
Hazel M. Shuck
Jack Stauder
Mary Steele
Carol Sutherland
Fred Swetnam
John Talberth
Dierde Tarr
Chancel Teague
Alex Thal
David Ther
Jerry Sue Thompson
Bruce Thompson
Lauro Vanegas
Arlene Walsh
Rhonda Ward
Jan Ward
Dave Wilgues
Marjorie Williams
Rex Wilson
Wade Worrell
Raleigh Zellers

New York

Scott Aldridge
Clifford Asdal
Richard Audette
Jordan Bain
Todd Baldwin
Wilford Bartlett
Richard Bell
Nadya Carolyn Bennett
Glen Berger
Bobbie Blowers
Herb Boyce
Bernard Braun
John Burton
Steve Callahan
Jerry A. Carlson
Marcia Carlson
Steve Collins
William Connally
James Danoff-Burg
Robert Davies
Richard DeBadts
Brian Dermody
Jane Difley
Dana Drake
John Earl
James Farrar
Richard Fox
I. M. Frellsen
Ronald Frisbee
Bill Galdstone
Edward Gammon
Cindy Garfield
David Gee
John Gibbs
Jody Gray
Ann E. Hajek
Glen Hampton
David Hawke
John Herrington
Ken Hotopp
Robert Howard
Sabrina Islam
Calvin John
Jack Karnig
Susan Keister
John Koshorek
David Kotzle
Ted Kozlowski
Peter Levatich
Lowell Lingo
Wendy Lochner
Lisa Maybee
Warren McKeon
John Miller
Richard Monti
Robert Moore
Bob Mungari
Aprille Nace
Gary Nelson

Evan Nichols
Rodney Nielsen
Robert Peterson
Richard Pettus
Barlow Rhodes
Jim Roberts
Monique Roberts
William Roe
Ed Schaffer
James Schuler
David Seymour
Phillip Siarkowski
David Sinclair
Vernon St. Louis
John Stratton
Robert Synowiez
Patricia Testa
Christopher Thompson
Louis Tirtito
Wayne Tripp
Sarah Waite
Fred Wilhelm
Rodman Williams
Alex Wipf
Allyn Wright
Michael Wright
Jennifer Zeh
David Zlomek

North Carolina

Stanford Adams
Weedie Barnard
Phil Bell
Erica Blackwell
Nancy Brown
Richard Brown
Leo Bunce
Kevin Carpenter
Gene Cross
Tracy Davids
Brian Fireman
Joann Fireman
Paul Gallimore
S. Andrew Gerry
John Ghent
Lessie Mae Graves
Robert Giles
Harris Gruber
Fred P. Hain
Rick Hamilton
Edward Harrison
Brian Heath
Phillip Heatherly
James B. Jones
John Kent
Donna Leonard
M. Leonard
Olivia Lim
D. Martin
Mike Massey
A. Mustian
James Padgett
Brett Pendergrass
Ethel Pittman
Derek L. Puckett
Robert Reiman
Donald F. Rogers
Stephen P. Schmidt
Aron Sebastian
Terry Seyden
Jill Sidebottom
Walton Smith
Deborah Steward
Robert Thatcher
Ron Thigpen
Michael Thompson
Robert Trickel
Diana Underhill
Ralph Willard
James Yount

North Dakota

John Brauner
Dean Hildebrand
Dave Hirsch
Larry Kotchman
Joe Maxwell

Ohio

Dave Adkins
Daniel Balser
Joel Berry
Pamela S. Blackburn
Robert Boley
Michael J. Budzik
B. Burke
Brian Burke
Richard Cappell
Greg Crandall
John Dorka
Robert Endebrock
Judy Fink
David Fleischer
Jeff Frontz
Tammy Frye
Margaret Garwook
D. Geglein
Stephanie Glazer
Robert Hampel
Margaret Harwreak
Betty Jean Herner
Tim Humprey
A. Lacy Johnson
Lacy Johnson
Robert Lamoreaux
William Lebold
Michael Littlejohn
Frank Luppino
Steve McKee
Thomas Morban
K. Niese
Galen Oakes
Peter Oros
Gilbert Papsy
B. Ramsey
Richard Ramsey
Deb Reed
C. Richards

Chris Richards
Delores Rogers
Amanda Schackow
James Scheetz
Siobhan Wolf Shaffer
J. Slavicek
James M. Slavicek
Mary Smallsfeed
Kathleen Smith
Jim Stafford
Thomas Stanley
A. Stone
James Suhanic
Stanley Swierz
Robert Tapeman
Algimantas P. Valaitis
Becky Violey
Joseph Vitti

Oklahoma

John Burwell
Sancho M. Dickinson
Jacob Frank
Jack Gobin
Pat Mcdowell
Bill Ross

Oregon

Hilary Abraham
Sherry L. Adams
Dennis Ades
Thomas P. Ady
John Aguirre
Steven Akehurst
Nate Alexander
Tena Alvarez
Ed Alverson
Bob Amundson
Arvid Andersen
Debbie Anderson
Don E. & Pat Anderson
Donald J. Anderson
Jim Anderson
Zach Anderson
Martin Andre
Bret & Doris Armacost
Jerome & Jane Arnold
Larry Aschenbrenner
Kathy Askren
Mary M. Atkinson
Alan Ayres
Dale Badrick
Barry B. Bai
Ric Bailey
James Bailey
Tim Bailey
Ric Bailey
James Baker
Jerry Baker
Bruce Ball
Cindy Banzer
Jamie Barbour
Stanley Barg
Lyle Barkman
John R. Barnes
Rick Barnes
Dan Barnett
Richard Barnette
Donald & June Barnum
John Barry
Edward & Bob Bartell
Conrad Bateman
John & Patricia Bates
Robert A. Batty
Byron Beach
Joy Belsky
LeRoy Bennett
Leslie Benscoter
Ken Benson
Ted Berg
Lars Bergstrom
A. Berier
Thomas Berkemeier
Daniel Berman
Donald Bettis
Ann Bettman
Gary Betts
John & Linda Biehl
Ken Bierly
Mack Birkmaier
Tom Birkmaier
Cal & Lorna Birrer
Dan Bishop
David Bishop
Neil Bjorklund
Erin Black
Scott Black
Christopher & J. Blake
Larry Bliesner
Richard Bloom
Dick Blum
Mike Blumm
Mark & Vicki Bolton
Donald & Donna Bond
Dale Bonnell
Tracy Bosen
Cassandra Botts
Gerald Bowerly
Grant Bowerman
Sue Bowers
Sandy Boyce
Jack Boyd
Jim Boyle
David Boyles
Durward L. Boyles
Albert Bradford
James & Doris Brady
Mike & Kathy Brandis
Bruce Brandt
William D. Brand
La Dora Brasel
David M. Braun
John & Lynne Breese
Lynne Breese
Eugene Brick
Dave Bridgwater
Chris Broadfoot
D. Brodie

Bob Brown
Gary Brown
Jason Brown
Mark Brown
Marvin Brown
Rick Brown
Ronald Brown
Brett Brownscombe
Charlie Bruce
Virginia Buck
Amy Buffum
Charles H. Burley
Chuck Burley
Tom & Inger Burns
Steven C. Buttrick
Bruce Byerly
David Byrnes
Jean Cameron
Vera Campbell
Robert Carl
Don Carlton
Vanelle Carrithers
Robert G. Carson
John Carter
Steve Carter
Richard D. Cartwright
John A. Cason
Bill Castillo
Juine Chada
David Chamberlain
Rodney & Kimber Chambers
Sheila Chambers
Richard L. Chapman
Frances Chapple
Frank N. Chase
Harold Chase
Arthur & Annett Cheatham
William J. Cherry
Rod Childers
David Childs
Phil Chlopek
Christopher Christie
Victoria Churchill
David Clairborne
Keith Clark
Laura Cleland
Sidney N. Clouston, Jr.
James Coburn
Noelle Colby-Rotell
Larry D. Cole
Paul, Vicki Conable
James Conlay
Robert A. Cook
Todd & Barbara Cooley
Eric M. Coombs
Katheryn Cooper
Steve Corfield
Grant L. Cornelius
Bette Coste
Doug Cottam
Karen Coulter
Caroline Cox
Michael Cramblit
Tim & Cynthia Cramblit
John Cramer
Gary Cremer
Dave Crider
Ernest Cristler
Steve Cross
Joseph Crowell
Nancy Crumpacker
Gordon Culbertson
Charles & Mary Culver
Ron Cunningham
Tim Cuthbertson
Keith Cyrus
Paul Czemerys
Chris Daggett
Bob Dale
Kim Davenport
Duane Davey
Jeff Davies
Shannon W. Davis
Bert Davis
Tim Davis
Robert P. Davison
Michael Dean
Major Defoe
Garth & Cathy De'garlais
Susan Delles
Marci Denison
Ray Denny
Mark Desmarets
Lisa Devaney
Paul D. Dewey
Alan Dickman
Penney Diebel
Jeff Dillon
Tom Dimitre
Robin Dobson
Wanda Dobson
Paul Doescher
Mark Dohrmann
Jacquin Dole
Eric Dolson
Deanna Donaca
Jim Dovenberg
Linda Driskill
Robert Drummond
Barbara Dudman
Marianne Dugan
Julia Dugan
Bruce Dunn
Jack & Imogene Dunn
Jim Durbin
Robert Dusenbery
Laurence Dyer
Gregory J. Dyson
James Eblin
Kelly R. Edwards
Ron Eggleston
Paul F. Ehinger
Richard Eiguren
Paul Eisenberg
Don Eixenberger
Lyle Ellickson
Cal Elshoff
Clint Emerson
Nadine Emery

Paul Engelmeyer
James C. Engelstad
C. Enyart
Kimbell Erdman
Arthur Erickson
Robert Ervin
Wayne Estabrook
Gary Estes
Dan Evans
Louisa Evers
E. Lucille Farr
Susan Fay
Helen Felbick
Don Feldmann
Brent Fenty
Carol Ferguson
Dan Ferguson
Denzel Ferguson
Charles J. Ferranti
Senator Ted Ferrioli
Shelby Filley
Stephen D. Finlayson
Melissa Finn
Edwin & Laurene Fitzjarrell
Donald Fontenot
Bruce Forbes
Sandy Force
Dick Ford
Scott Forrester
Walt Forsea
Daniel Forsea
Toni Foster
Rachel Foster
Brad Fowler
Gary Fowles
Ken French
Don & Emilie Frisbee
Cheryl Fuller
Georgia Gallagher
Richard L. Gambrall
David & Judith Gardine
John H. Garren
Thomas & Lana Garrett
Kalvin B. Garton
Sharon Gatlin
Frank Gearhart
Larry Geiber
James C. Geisinger
Jim Geisinger
M. J. Gemmet
Walt Gentis
Rick George
Randy Ghormley
Richard Gibson
Jerzy Giedwoyn
Kent Gill
Don & Joann Gilliam
Robert J. Girdner
Susan Glarum
Cheyenne Glasgow
Alicia Glassford
Jared Goddard
Jerome & Waltro Goertzen
Don & Ellen Goheen
Peter Goldman
Daniel L. Goldy
Dan Goltz
Pete Gonzalves
Tom Goodall
Dan & Marilyn Graham
Richard Granger
Bill Granning
Clark Gray
Barbara Green
Jim Greer
Norma Grier
Mary Griffin
J. Groom
Mike Gross
Dean Guess
Tom & Maggie Gunn
Carol & Herma Gunnels
Kenneth & Mary Gustafson
Jim Gustafson
Lester R. Haglund
Carl L. Hagstrom
Eldon Haines
Howard A. Hall
Lexie Hallahan
Karl C. Hallstrom
Jessica Hamilton
Larry Hamilton
Ray Hamilton
Paul Hammond
Michael F. Hanley
Nancy Hanna
Dorothy Hannigan
Susan Hanscom
B. Hanson
Mary Hanson
Richard Hanson
William Hanzen
Robert & Shalen Hargreaves
Norman R. Harris
Robert Harrison
James W. Hart
Walter T. Haswell III
Judy Hatton
Eugene R. Hawes
Clayton Hawkes
Gary & Collee Haynes
Michael Hayward
James Hedgecock
Doug Heiken
Anita K. Helser
Kathleen A. Helser
Richard & Anita Helser
Elwayne Henderson
Lebron Hendon
Sarah Hendrickson
Mark Henjum
P. Sydney Herbert
John Herbst
David & Sandra Herman
Helen Herman
David Herr
Pam Hewitt
L. R. Hiatt, Jr.
Claire Hibler

Jerolee N. Hickey
Dennis V. Higgins
Sue Hinton
Mark E. Hitchcox
Kelly Hockema
Gary & Maggie Hoeppner
Mary Holbert
E. E. Holder
Carmelita Holland
Todd Hollis
Arthur Holmes
Steve Holmes
Irwin Holzman
Chad I. Honl
John O. Hooson
Scott W. Horngren
Zane Horowitz
Kay Houck
Harold Houghtelling
Reis Hoyt
Laura Hudson
Wendy Hudson
Warren Hudspeth
Patrick & Donna Hughey
Amie Huish
Jewel Hult
George Hutchinson
John & Tammy Hyland
George Ice
Jerry Igo
Emery John Ingham
Frank Isaacs
Gary Ivey
Joan Jacobsen
Carol Jacquet
Irene James
Lisanne Pearcy
Ginny Jayne
Aaron Jennings
Paul Jepson
Becky Johnson
Diane E. Johnson
Elizabeth K. Johnson
Jesse F. Johnson
John Johnson
John & Brenda Johnson
Kathleen J. Johnson
Jeffrey Johnston
Parker Johnstone
Russ Jolley
Herbert & Virgi Jones
Denise Jones
Ed Jones
Ted Jones
Callie Jordan
Dorothy Josellis
Susan Joshua
Steve Kadas
Garth Kahl
Richard & Trudy Kalac
Peter & Lorrain Karassik
Oscar & Sharon Kay
Gery Kazda
Donald & Trudy Kearney
Floyd Kednay
Lloyd T. Keeland
Roy Keene
Robert L. Keeney
Mike & Joanne Keerins
Kent Kelly
Bill Kelso
W. Dean Kendall
Lloyd Kendrick
Tim Kerns
Andy Kerr
Merle Keys
Kevin Kilduff
Ed Kimball
Robert P. Kingzett
Ann Kinnaman
Maureen Kirk
Anita Kirkaldy
Mellissa Kirkland
Gary Kish
Dennis & Joan Kizziar
Walt & Patty Knapp
James & Judith Knapp
Devon Knutson
John Koenig
J. Pierre Kolish
John Kowalczyk
Paula Kreger
Bob Krein
Ralph Krellwitz
Mary Krenowicz
David Kucera
Leigh Kuhn
Paul Kunkel, Jr
Ronald Kunzman
E. A. Kupillas
Philip Lanfear
Alfred & Doris Lang
Jeff Lang
Doug & Pat Larsen
Larry Larson
Patricia A. Larson
Bruce & Frances Lattin
Rhett Lawrence
Sam Layman
Barbara Lee
Duane & Marian Lee
Georgia M. Lee
Patrick Lee
Jack Leishman
Spencer Lennard
Steve Lewis
Jay Lininger
Connie Linsdale
Mona Linstromberg
Clyde Alan Locklear
Bev Loennig
Carol Logan
Patricia Loveland
Thomas Lovlien
John Lowe
Marilyn Lowe
Robert A. Luna
Ted Lyster
Nancy Machugh

Duncan S. Mackenzie
Joseph & Connie Madar
Ron Maertz
Clifford Mann
Mari Margil
William & Carol Mark
John Maroney
Norm Marsh
Dave Marshall
Stan Martindale
Marvin Maxwell
Thomas May
Edward & Marily Mayers
Larry Mayes
Rynn Mazur
Michael McAllister
Ian McAndie
Mike McCann
Scott McCaran
Dave McClain
Gerry McClain
Greg McClarren
Albert McCollam
Evelyn McConnaughey
Bruce McCullough
Glenn McDonald
Peter McEvoy
Tim McFetridge
Michael McIlrath
Mike McInnis
John & Lelia McIntire
Albert D. McKenzie
Katheryne McKenzie
Roger L. McKinley
Rebecca McLain
Dimetra & J. McLain
Jim McLean
R. C. McNeil
Brian McNerney
Michelle McSwain
Sarah Medary
Beth Medler
Johnny Medlin
Bob Meinke
Charles Meslow
Robert C. Messinger
Brian Richard Metke
Mark & Marie Metzdorff
Christopher C. Meyers
Holly Michael
Charles Middleton
Virgil Miller
Robert Miller
Mike Miller
Jeff Miller
Terry Miller
Glenn Miller
Randy Mills
Roy Milner
Elizabeth Mitchell
M. J. Mitchell
Larry R. Mittnacht
Ray L. Moles
David Monk
James Monteith
Marty Moody
Chris Moore
Marilyn J. Moore
Robert L. Moore
Tam Moore
Wayne Moro
Bob & Terry Morse
Guy Mount III
Alan Mudge
Dan Mulligan
Mrs. Steve Mullin
Bob Mullong
Andy Munsey
Ronald Murphy
Victor P. Musselman
Dennis Myhrum
Cheryl Neal
Edward Needles
Grace E. Neff
Richard Nelsen
Dick Nelson
Jay Nelson
M. Nelson
Mitch Nelson
Mitchell G. Nelson
Mark Newbill
Bruce Newhouse
Carl Newport
Frazier Nichol
Marvin Nichols
Craig Nielsen
Fred Nilsen
Ranei Nomura
James D. Noteboom
Karl E. Nulton
Carol Nygaard
Mark Nystrom
Richard Oberdorfer
Robert Oborne
Mary O'Brien
Mary H. O'Brien
Mike Obymako
Mike & Nancy Obymako
Steve Odell
Paul Oester
Sara Olsher
Charlie O'Neal
Elizabeth O'Neill
Charlie & Jan O'Rorke
Douglas & Roxan Osborne
George & Rhonda Ostertag
Robert Otteni
Stephan Otto
Dave Overhulser
Jeff Oveson
John Owen
Stan Owen
Dwight Owens
John & Madeline Pagano
George Page
Edward Page
Jeff & Susan Pape
Stephanie M. Parent
Rick Parker

Neal C. Parsons
Tom Partin
Kerry Paulson
John Peaks
Ed Pearson
Jack Peasley
Eric Perkins
Mike Perkins
Peyton & Ruth Perkins
Wayne B. Persons
Larry Petersen
Marilyn Peterson
Joe A. Petrovich
Donald H. Phillips
Therese Picado
Phil Pinney
Russ Plager
Harold & James Pliska
Don Podrabsky
Catherine Poncil
Delores Porch
David Post
David Potter
Michael Powelson
Laurie Power
Daniel Powers
Tony Pranger
George & Alicia Prigmore
Karl Puls
David A. Pyke
David & Beth Quick
Bob Quitmeier
Hans Radike
Iral Ragenovich
Ruth Raizin
Teri Raml
Sheri Rand
Alan A. Rappleyea
Mark Rasmussen
Don Rayborn
Kevin & Patrici Rea
Elizabeth Redon
Phillip Reed
W. R. & Janet Reed
Erika Reesor
Diane Reimers
Richard & Chery Reinertson
Troy Reinhart
Byron Rendar
Gary Rhinhart
Chuck Rhodes
David & Coralie Rhoten
Russell S. Ricco
Bob Rietman
Doris J. Riggs
Robert S. Riley
Robert & Ann Rissberger
Asante Riverwind
Clarence & Dolores Robart
Dvora Robinson
Thomas & Donna Robinson
Jean Rodgers
Maggie Rogers
Dan Rohlf
Noelle Colby Rotell
Dave & Janett Roth
Lilijoy Rothstein
Renee Roufs
Mary Rounds
Jim Roy
Skip Royes
Roy M. Runco
Paul Runquist
Jerry Russell
Ken Rutherford
Fred Ryan
Irene Saikevych
Bill Sanowski
David A. Sauer
Anne Saxby
William & Judy Scally
Benjamin Schafer
Jack Schaffer
Patrick Schatz
Jennifer Schemm
Owen Schmidt
Guenter & Erika Schoener
Edward Schoor
David & Francoi Schreiner
Reid Schuller
Larry Scofield
Donald W. Scott
Norm & Cheryl Scott
Steven Scott
Wayne & Marlene Scott
Mary Scurlock
Darwin Secord
Jim Sedell
Lloyd Seely
Joe Serres
M. Ray & Bonnie Sessler
George Sexton
R. D. & Karen Shadley
Patrick & Tamar Shannon
Kathy Sheehan
Craig Shinn
Dan B. Shoop
Terence Shumaker
Ralph Siegfried
Greg Sieglitz
Alex Sifford
Ronald E. Siler
Gene Silovsky
Annette Simonson
Bill Sisson
Carol D. Skerjanec
R. William Skinner
Robert M. Skinner
Trygve B. Sletteland
Gerald & Connie Sloper
Rosalyn Smarr
David Smerski
Chris Smith
Florence E. Smith
Gary Smith
Matt Smith
Michael & Glenda Smith
Pat Smith
Roger Smith

Ryan Smith
William Smith
Paul Smoland
Donald Smpson
Sally Snyder
Mark Snyder
Dee Southard
Maeve Sowles
Glen H. Spain
Ida Spaulding
H. Grant & Debra Spies
Linda J. Spillum
Beverly Springer
Keith Squire
Janice Staats
Naomi Stacy
Julie Stangell
Shannon Starratt
Gail Stater
Tom Stave
Chris Stecher
Trygve P. Steen
William Steers
Beth Steinberg
David Stengar
Dale Stennett
Linda & Carl Steppan
Dalton Stewart
Don Stewart
Loran R. Stewart
Lorna Stickel
Karen Stingle
David Stitt
Dan Stokes
Joseph L. Stone
Trevor M. Stone
Rex Storm
Daniel Stotter
Benjamin B. Stout
Sally Streeter
Don Stroeber
Leonard & Linda Sundval
Jerry J. Sutherland
John & Judy Svoboda
Marvin Swaggart
Susan Swatek
R. Taber
S. Tamiesie
John Tanaka
Ed Tarnasky
Trevor Taylor
Dennis Taylor
Wayne Teschner
Doug Thackery
Toby Thaler
Greg & Arlene Thomas
James Thompson
Paul Thompson
Everett & Eva Thornburg
John Thornton
Dennis Thorsen
Avery Gary Tittle
Trudy Toliver
Nora Tomlinson
Pepper W. Trail
Bruce Troyer
Gerald Trussell
Phil Turrell
Laurence Tuttle
Dee & David Tvedt
Ed Uebler
Barb Ullian
Joseph Vaile
Carlos & Sylvia Valdez
Maritza Valle
Ben Van Camper
Walt Van Dyke
Carol Van Strum
Phil Vanbuskirk
Robert Vancreveld
Roberta Vandehey
Dick Vander Schaaf
Opal L. Vankommer
Kathryn Venator
Gregory Vik
Lucy & Lawren Vinis
Patrick Voigt
Derek Volkart
Liz & Brian Vollmer-Buhl
Sue Vrilakas
Bill Waddel
John & Claudia Wadsworth
William Wadsworth
D. Kent & Gail Waggoner
Lisa Wale
Dick Walker
Larry Walker
Jack Walsh
Jack Walstad
Elden Ward
John Ward
Fred Way
Walter G. Weagel
D. R. Webb
Ginger Webster
Jim Webber
Laura Weeks
Bill Weide
Sharon Weinberger
Ted & Tami Weitman
Ray & Bobbie Wells
Vonda Welty
Mindy Whaley
Robert Whittier
Thomas Wiemann
Kathleen Wilber
John Williams
John D. Williams
Joyce Williams
King Williams
Tucker Williamson
Dan Wilson
John & Hannah Wilson
Robert Wilson
Shannon Wilson
Mr. Rian Windsheimer
Jerry Winegar
Bob Wineman
Eric Wold

Tom Wolf
Darlene Woods
Beth Woodward
Chuck Woosley
Jan Wroncy
George Wuerthner
Henry & Virginia Wydra
Chris Wyne
Wes Yamamoto
Scott Yates
Brad Yazzolino
Ron Yockim
Dan Young
Bob Zacharias
Frank Zilla
Donald B. Zobel

Pennsylvania

Bob Adams
Dave Aeerich
T. Anderson
James Angelo
David Anundson
Brent Backenstoes
Neil Bajwa
Daniel Baker
Gary Baker
Greg Baker
Darla Barnshaw
Michael Barton
A. Bauman
Robert Bingman
Louie Birtch
Robert Bishop
Mike Blumenthal
Chris Bobick
David Boden
Terry Boos
Victor Briggs
Margaret Buckwalter
Earl Burnside
Charles Campbell
Kevin D. Carlin
Sara Carryer
Richard Cary
Matthew Castano
George Cline
William Compston
Robert Connor
Scott Conner
William Cook
James Crockett
Bary Cunningham
E. Cunningham
D. Dagnan
Beth Davis
Tony Delost
Andy Demko
Marion Deppen
Ben Dickey
James Diehl
Joseph Domitrovich
Donald Dorn
David Driesbach
Bernard Dumm
Phillip Eckert
Donald A. Eggen
Cornella Ellis
Julia Engle
David Ester
E. Farrand
Paula Ford
Kent Fox
Owen Fox
Thomas Frair
James Francis
M. Frank
George L. Fusco
Robert A. Fusco
Ronald Garis
James Garland
Donald Gibbon
I. Glendenning
James Grace
William Graham
Duane Green
Thomas Greenlee
Donald Grubbs
Beverly Gruber
Steven Haller
Tim Hammand
Jeff Hannahee
Estle Harp
Clyde Harris
Frederick Harris
Bill Herbolsheimer
Gerard Hertel
Steven Hess
Larry Hickman
Dale Hildenbrand
Pat Hill
Herman Hoffman
Mark Holman
John Hopkins
Keith Horn
Tina Horowitz
Sean Howard
Stephen Jaquith
Stephen Jennings
Michael Kacala
Mark Kane
John Karakash
Matthias Kayhoe
Jennifer L. Keesler
Elmer King
Jeff Knell
Paul Knipp
Allan Knox
Ed Kocjancic
Karl Kort
Bill Krieger
Rick Lamping
Robert Lanbenberg
Ivan Leidy
Mike Lester
Fred Levan
John Long
Don Loutzenhiser
Ed Lytwak

Priscilla Maclean
Tim Marasco
Timothy R. Marasco
Jonathan Markowitz
Donald McCandless
Daniel McCarty
Pete McClelland
Michael McKain
Christine McNeal
Dennis Meiser
Arthur Meyers
Wayne Millington
Dayton Milstifer
Norman Montoy
Bud & Phyl Morello
F. Morgis
G. Morris
Tim Murphy
Fred Myers
J. Paul Neal
Raymond W. Nelling
Donald Nibert
Richard Nichols
George Niskala
Craig Olver
Thomas O'Neil
Pete Orr
Gary Pierotti
Annette Ponnock
Donald Pontsch
Patricia Porter
Russ Quava
Dave Radzavich
Donald Raub
Warren Ravenscroft
Sam Rebach
Steven Rensma
Fred Rimmel
Gorman Ritchie
Lamont & Kelly Rogers
William Rogers
Philip Rose
Barry Rose
Walter Rossman
Jim Ruppli
Tom Schenarts
Howard Schmouder
N. Schneeberger
Albert Schultz
Keith Shader
Bob Shipman
Rob Shipman
Leonard Skultety
Stanley Soberi
Jeff Spako
G. Stamm
John Stankiewicz
David Steckel
Pauline Steinmeyer
Delton Stiles
Elvie Stiles
William Stiteler
Robert Swindell
Charles Taylor
Barry Towers
David Trost
Harry Tucci
James Uhl
Bob Wawrousek
Robert Weaver
Adriann White
Robert White
Glenn Whitmire
Jonathan Wirth
Grover Wolf
Dennis Yoder
J. Yoder
Joseph Young
William Zahuranac

Rhode Island

James Brown
Thomas Dupree
Walter Gould
Dennis Martin
Cathy Sparks
John Stolgitis
Norma Willis

South Carolina

Catherine Bennett
Andy Boone
Vince Cannarella
Richard & Linda Clapp
Marvin Felder
Patricia Friedman
Sam Gingrich
W. Glenn
C. Harden
Roy Hedden
H. B. Jackson
Jason Jeffcoat
Deborah Nicol
Bob Schowalter
Robert C. Schowalter

South Dakota

D. Anderson
David Bieber
John Cooper
A. Mesman
Amy Mesman
Dennis Sandbak
Ray Sowers

Tennessee

Jane Adler
Barry Anderson
Charles Aulds
Jay A. Chapman
Wayne Clatterbuck
Ralph Cooley
Jim Dattilo
Seth Ellis
Beth Graham
Gary Haun
Patricia Lawson
Scott Meneely

Judy Moore
Gary Myers
Steven Scott
Tommy Scott
Steven Scott
D. Witzman
Carl Wright
J. Mark Young
Gabrielle Zeiger

Texas

Keith Baker
Awinash P. Bhatkar
Ron Billings
David A. Brown
Joyce Carter
Jonathan Coker
Joseph Davidson
Connie Ericson
Jim Field
Dodie Finstead
Jeff Foreman
James Heater
Jack Henry
Monty Holmes
James Hull
James B. Hull
Bruce Hunter
Laura Jobe
Tracy Jones
Glenn Justice
Joseph Kaskey
Anne Kristek
Josie Lopez
Thomas Matthews
Phil McDaniel
Sarah McGiffert
George McMahan
Theodore Mertig
Tammy Monroe
George Nash
Shashank Nilakhe
Joe Pase
Glen Pearce
Gene & Doris Peters
Ofelia Pina
Candel J. Quintana
I. M. Rice
Kevin Rolfes
Sims Sandra
Jim Settle
Margaret Rose Simons
Barte Smith
John Sproul
Rex E. Stahlman
Bobby Stark
Eric Taylor
Jennifer Walker
Richard Wehrman

Utah

Greg Abbot
Edward Bianco
James Biser
Bob Brister
Alice Carlton
Noni Davies
Steve Deacons
Steve C. Deakins
Patrick Diehl
Art DuFault
Mary Erikson
A. Joel Frandsen
Craig Hawke
Dawn Holzer
Peter Karp
Colleen Keyes
John Kimball
Robert King
Henry Maddux
Jim Matson
Steve Munson
Wes Odell
Gary Orr
Lee Peterson
John Peterson
S. J. & Jessie E. Quinnoy
Paul Ries
Christy Rose
Robert Russell
David Schen
Jeff Schramm
Tom Tidwell
Jack Troyer
George Weldon
Dick Wilson

Vermont

Robert Ammel
Tom Anderson
David Bailey
Todd Barker
Patrick Bartlett
Daniel Batchelder
Dale Bergdahl
Richard Bizzozero
Nelson Blackburn
Albert Bupp
Barbara Burns
Bob Burt
Harry Chandler
Gregg Christie
Paul Council
Clarence Croft
Willis Curtis
Dottie Dubey
Chuck Eaton
Bernard Folta
Noel Fritzinger
Tom Gray
Clay Grove
Trish Hanson
Harry Hayden
John Hemenway
Ray Henderson
Robert Hill
Bob Hoffman
Galen Hutchison
Angelo Incerpi

William Jones
Ronald Kelley
William Kinsley
Jay Lackey
David Leavitt
Delwin Lewis
David Mance
Linda Matteson
John Meyer
Dolly Miller
Ryle Miller
Sam Miller
Robert Mills
Leanne Moorman
Ross Morgan
Larry Myott
Robert Noble
Jan Otto
Bruce Parker
Anne Peterman
Scott Pfister
David Potter
Thomas Ragle
Gloria Rapalee
Bruce Richardson
Charles Richardson
Scott Rowden
Sandy Savage
Robert Seniff
George Sexton
Steven Sinclair
Paul Smith
William Snow
Jeff Soshnick
Stephen Springer
Willis Tarnowski
H. Brenton Teillon
Bryce Thomas
Catherine Van De Berkt
Richard Warren
Steve Weber
Brendan Whittaker
Klinton Wigren
Richard Wilbur
Randy Wilcox
Jim Wilson
Brendan Wittaker
Buck Young

Virginia

Bernetta Barco
Carol Bass
Britt Baucher
Diane Beyer
Corinne Blank
Chris Bolgiano
Christine Borjoivin
Britt Boucher
Jennifer Boyer
Larry Bradfield
Craig Bradley
Eric Bush
John Cannon
Thomas Cary
Diane Clark
Bob County
Eric Cox
Glenn Curtis
Rupert Cutler
Donald Davis
Robert DeLost
Jim Derzon
Henry P. Espenhorst
Thomas Ewert
Frank Filipy
Stuart Finley
Francis Formichella
Frank Fulgham
James W. Garner
James Garner
Cherie Gilchrist
David Gilliam
J. Warren Good
Jason Green
Otto Gutenson
Frances Hallahan
Andienne Hall-Bodie
Dennis L. Heltzel
Zena Hemp
Scott Hicks
William Hrezo
Rebecca Hudson
Genevieve Jacobs
John Kilkenny
Ken Klein
Kevin Klein
Jean Kolb
Bobbe Krueger
Steve Law
William Leichter
Debra Leighton
W. Lewis
Tina MacIntyre
Beth McClelland
Keir Mussen
John Nash
Jennifer Nelson
Larry M. Nichols
Lara Rene Noel
Jerry Overstreet
Charles Pierce
Dana & Doris Pond
Andrew Powell
Laura Ramirez
Gary & Carolyn Redman
Sheila Reilly
Andy Robats
R. Scott Robertson
Jim Ruckman
Scott Salom
Wanda San Jule
Rosemarie Sawdon
Joe Scardo
Everett See
Dee Dee Sellers
Lee Sonne
Karl Stoltzfos
Dr. Tcheslavskaia
Pat Therrien

Darrell Thorpe
Tim Tigner
I. Fred Traw
John Troo
Tom Trykowski
Charlotte Umhaltz
Robin Van Tine
Virginia Walden
Tesia Williams
Shannon Wilson
Allen Yankey

Washington

Harriet Allen
Jane Allen
Susan Altengarten
Mike Anderson
Steve Appel
Karin Argo
Richard Arnold
Dave Atcheson
Keith Aubry
Barry Bacon
Susan Bacon
Mitch Baird
Marc Bardsley
Christa Barke
Jeff Barrett
Mark A. Batchelor
Kevin Baversfeld
Harry Bell
Gina Bentley
Jim Berry
Bill Bidstrup
Joe Bigas
Carl Bjelland
Janine Blaeloch
Keith Blatner
Rance Block
Robert & Kristin Blow
Richard Bohart
Ray A. Borden
Carolyn Bowman
Kristen Boyles
Bill Boyum
Gene Brain
Hal Branscom
Bill Brazelton
Shari Brewer
Allyson Brooks
Vonda Broom-Parris
Craig Brougher
William Brown
Richard Brown
Peggy Bruton
Martha Bupp
Stephen Bupp
Kevin Burgess
Ryan Burkett
Dennis Burmeister
Mrs. Norene Burton
Steve & Vivian Cadematori
Clinton Campbell
Clinton L. Campbell
Pamela Campbell
Glen E. Candler
Bart Cannon
Shawn Cantrell
Charles M. Chambers
David Chapin
James L. Chapman
Les Chapman
Phil Christy
Michael J. Clark
Harold Clinesmith
Don Cocheba
Mike Coe
Timothy Coleman
Tim Coleman
Mike Collins
Joseph Collins
Carolee Colter
Dorothy Compinsky
Cindi Confer
Al Cook
Grant Coomer
Richard Cooper
William Corbin
Arvilla Corey
Kaleen Cottingham
Randall Courtney
Ted Cowan
Rex C. Crawford
Kathy Creahan
Fred Cunk
Chuck Cushman
Norman Danielson
Richard Dart
Jerry Davidson
Bruce Davies
Robert & Evelyn Davis
Chase S. Davis
Marjorie Day
Ruth Deery
Neal Degerstron
Tony & Marilyn Delgado
Ed Depurt
Gene Derig
Dan Dewald
Bob Dick
Jim Dipeso
Charles Downen
Scott Dungan
Jim Durkos
Stephanie Durman-Matheny
Polly Dyer
Michelle Eames
Lanette M. Earnhart
Fred Ebel
Millard D. Eckert
Vicki Edwards
Mark Egger
Daniel D. Eggers
Hans Ehlert
Ezra Eickmeyer
Carol L. Ellis
Gordon Ellis
James Ellis
John Eminger

Richard Everett
Bob Everitt
John H. Fagan
Dan Fagerlie
Mike Fenimore
Ed Fields
C. M. & J. A. Fisher
Richard Fleming
Mary Jane Floyd
David Foecke
Peter R. Forbes
Fran Forgette
Dale K. Fortune
Jeannine Frazier
Bob Freimark
Lawrence Fricke
Bob Friemark
Tom Frost
Ken Fukes
Bill Gaffney
Mike Gagner
Howard Gains
Dean Gaiser
John E. Galley
Len Gardner
Gary Garrison
Walter Gary
Edward E. Gates
Nick Gayeski
Chris Gebhandt
John Geyer
John Gifford
Joe Ginsburg
Fred Girtman
Linda Givler
Tim Godfrey
Michelle Goling
James P. Golingo
Ross Graham
Shaune Gramlow
Carl Grando
Mark Grandstaff
G. N. Grant
Richard Grauer
Carol Green
Jack & Jacpue Green
Matt Green
William Green
Ron Gregory
Bob Groncznack
Vivian Gross
Anthony Grover
Bob Grubb
Darlene Hajny
Peter Haller
Patricia C. Hand
John Hanron
Heather Hansen
Echo Harbison
Trip Hart
Neal T. Hart
Scott Hebner
Jeff Hedge
Tim Hein
John Hendrix
Sally Hewitt
Lorin Hicks
Marion E. Hill
Bert Hilo
John Hite
Dave Holland
John A. Holmberg
Larry Holquist
Alan Holt
Marvin Hoover
Mike Hopkins
Tim Hopkinson
Sid Houpt
James & Gertrud Howarth
Andrew Hudak
Stanley D. Humann
Bob Hutchens
Leonard Rex Hutchins
Pat Irle
Ruth Ittner
Bob Jackson
Laurie Jackson
William Jacobs
Neal M. Jacques
Eric James
David C. James
Ray James
Jon Jarvis
Jean B. Jarvis
Aileen Jeffries
C. J. Jelmberg
Bob Jewett
James G. Johannes
Bill Johns
Judith Johnson
Keith Johnson
Robert W. Johnson
Sharon Johnston
Jim Jordan
Ken Kadlec
Karl Kaiser
John Kamerrer
Pat Kane
Amy Kanerva
Alex Kaplan
Gary L. Kaski
David M. Keeley
Charles Kehl
Nancy Keith
Mike Kenner
Steven Ketz
Lorraine Kile
Dan Kinney
Bill & Amy Kinsel
Gary Kinseruk
George C. Kirkmire
Glen Klock
George Koehler
Dale Kolbe
Ken Konigsmark
Mary Kovatch
Butch Koykka
Fayette F. Krause
A. R. Kruckeberg

Jordan Krug
Deanna R. Kuhn
Henry Lagergren
Peter Lagerwey
Tonya Lander
Mark Langston
Russ Larsen
Ray Lasmanis
Justin Lavadour
Mark Lawler
Bonnie Lawrence
Nathaniel Lawrence
Sam Layman
Hoa Le
John Leary
Renee Leask
M. Delphine Ledoux
Mike Lee
Rose A. Lee
Mark Lehinger
John Lehmkuhl
Ryan Leland
Tom Leonard
Mirian Lewis
Yale Lewis
Joseph Leysath
Phil Loe
Peter Loft
Robert Lopresti
Bryon L. Lorenz
Rob Lovitt
Louise Luce
Karen Lucei
Thom Lufkin
Guy Lusignan
Larry Luton
Dean Lydig
Doug Mace
Frith Maier
Mike & Chris Mallon
Vernon Marll
David Martell
Anne Martin
Carol Martinez
Earle & Shirlee Marvin
Jennifer Mast
Mark Matthies
Linda Maxwell
Elizabeth Mc Dowell
Mike Mc Glenn
Loren S. Mc Govern
Dick McCann
Mark McCann
Bryan McConaughy
Scott McCorkell
Linda McDaniel
Pat McElroy
Albert McFarland
Rick McGuire
Ed McHugh
Jim McLean
Cindy McMeans
W. B. McPherson
Bob Meeks
Robyn Meenach
Hal Meenach
Joe Mentor
Richard Mewes
Tina M. Miller
Gerard R. Millman
Ben R. Milne
Mike Miraglio
Wayne Mohler
Bill E. Moore
Erin Moore
Jeffery Moore
Doreen Moran
Ron & Elrae Morgenthaler
Peter Morrison
Charlie Moses
Daniel R. Muhm
Shirley Muse
James R. Musgrove
Dave Myers
Cara Nelson
Craig Nelson
Dan Nelson
Don Nelson
Gale Nelson
Diane Neuman
Judy Nicastro
Dale Nichols
Patsy Nortz
Catherine Oconnell
Patrick R. Ohagan
Doug Oien
Danny O'keefe
John Osborn
Darton Overby
Bill Paleck
Kelly & Steve Palumbo
Dennis R. Parent
Alice Parker
Donald Parks
Jeff Parsons
James B. Patterson
Kimberly Paul
Jerry Pavletich
Randall D. Payne
Geraldine Payton
Jeff Pebworth
Cole Perkins
Susan Perkins
Gie Perleberg
Rianne Perry
Thom Peters
Kelly B. Peterson
Mike Peterson
Mike Petersen
William Peterson
Thomas W. Petrie, Sr.
Chad Phillips
Chap H. Phillips
Mike Phillips
Phil Piazza
Timm E. Picknell
Sheldon Pifer
Clinton Piper
Kent Pittard

Jeff Pitts
Charles F. Pitz
Bob Playfair
Robert L. Plute
Genna S. Porter
Antonia Potter
Julian Powers
Ray W. Powers
Robin Purcell
Charlie Raines
Michael C. Ralston
Mary Ramaley
Trese Rand-Schaller
Martin G. Raphael
Pat Rasmussen
Sally Rasmusson
Kenneth C. Ratliff
Leigh A. Ready
Lorna Ream
Woody Rehanek
Milt Reimers
Marvin Reiner
John M. Reinke
Marlene Renwyck
Chuck Ricevuto
John M. Richards
Wesley Rickard
Jerry & Lilli Riley
Victor & Martha Robert
Melissa Roberts
Dave Robinson
Esther Rolllis
P. Roni
Rodney & Ging Ropp
Bonnie Ross
Eldon Roush
Hal Rowe
Ben & Roberta Rust
Bruce Rutherford
Randy & Suzie Sage
Peter Sanburn
Rob Sandine
David R. Sando
Jack Sauers
Steven Saunders
Roger Savage
W. L. Schlagel
Stan Schneider
Peter Scholes
R. Schroeder
Cynthia Schroeder
Greg Schroer
Robe Schulstad
Ed Schultz
James Schumacher
Max Scoggin
Paul Scott
Mary Seaman
Brenda Senturia
Sharon Shadbolt
Susan Sharp
Leo Shaw
Terry Shawver
Jackie Shiner
Charles Shonkwiler
Diane Smith
B. Smith
Stuart Smythe
Irvin Sobek
Ed Soper
Don Sorensen
Ernie Soya
Jeffrey S. Spencer
Rocky Spencer
William Sprowl
Jon Spunaugle
Jon M. Spunaugle
Tim Stearns
Bill Steel
Leonard Steiner
Terry Stergion
Dennis Stergion
L. Stetson
Neil Strege
Daniel R. Strube
Beth Stucker
Curtis & Elizabeth Stucki
David J. Stueckle
Roger Styner
Mr. Arland E. Swanson
John Swartz
Paula Swedeen
David Taylor
Tom Tebb
Penny Tee
Karen Terrazas
Charles Thomas
Celeste Thorne
Dick Tiggers
John W. Townsend
Ron Tressler
Barry Truman
Bob Tuck
Bill Tweit
Richard & Kau Udaloy
Morris Uebelacker
Albert Ulrich
Dick Van De Mark
Don F. Vanetten
Mark Vetter
Kristina Vogt
Jane Waite
Wayne Walden
Bill Wallace
Sunny Walter
Kay Walton
Clint Watkins
Bill Waymire
Bill Weatherly
David Weed
Saul Weisberg
Gael Wenzler
Dave Werntz
Gary Westerlund
Brad White
John Whitecar
Kenneth Wilcox
Ken & Carol Wilcox
Martha Wiley

Marika Wilkerson
Eric Williams
Joe Williams
Morris Williams
Jerry Williamson
Howard Wilson
Mark E. Wilson
Norman Winn
Margo Wolf
Allan Wolfson
Charlie Woodruff
G. R. Woods
George Wooten, Jr.
Tom Wynne
Bill Yake
Susan York
Pat Young
Jim Youngw
Doug Zahn
John P. Zuvela

West Virginia

Robert Acciavatti
Frank Ames
Jerry Atkins
Gene Bailey
Cindy Barnett
Alfred Barr
Lewis Bartlett
Tom Berlin
Mike Bitely
Dr. Matthew J. Blackwood
Kerry Bledsoe
Myra Bonhage-Hale
Richard Bosley
Jim Bowen
Bill Bowling
Bruce Brenneman
Barbara Breshock
Michael Burns
Helen Butalla
Linda Butler
James Circle
William Coffindaffer
Dr. Charles Coffman
Charles Coffman
Phyllis Cole
Samuel Conley
George Constantz
Julia Cook
Jack Cromer
James Crum
Sam Cuppett
Robert Daoust
Edward Dauchess
Eileen Day
Norman Dean
Michael Demchik
Keith Dix
Gus Douglas
Dennis Dunham
Chad H. Dye
C. Randall Dye
Donald Eskridge
Matt Evans
James Evans
Virgil Falloon
Pete Filler
Don Flegel
Paul Flippin
Gary Foster
Nancy Friend
Allan Glasscock
Charles Glick
Barry Glick
Paul Goland
Kate Goodrich
Roger Green
Jan Hacker
John Hall
Howard Hardy
Marion Harless
Jamesq Hayes
James Hayes
Clark Haynes
Clark Haynes
Austin Hinkle
Sherri F. Hutchinson
David Ingram
Margaret Jenness
William Judy
Willliam Judy
Bill King
Beth Kniceley
Ray Knotts
Emil Knutti
James Kotcon
Edward Kraynok
John Landolt
Delmar Lough
William Macdonald
Harry Mahoney
David Marsh
Larry May
Tom Merril
Donna Mitchell
H Moore
Ward Moyers
Dwight Moyers
Hubert Moyers
Coy Mullins
Roy Nutter
Hazel Oldland
Jennifer Ours
Dan Parker
T Patrick
Tom Pauley
Harry Pawelczyk
K Plitt
Doug Ramsey
Rus Richardson
Natalie Rutledge
S. Arthur Rybeck
John Sanders
Butch Sayers
Sara Schell
George Schell
Bruce Schick
Roger Sheppard

Mark E. Sims
Clay Smith
Allen Staggers
Pete Stemple
Steven Stephenson
Gary Strawn
John Strazanac
Jack Summers
Karen Sykes
Shalom Tazwell
Eugene Thorn
Patrick Tobin
Douglas Toothman
William Tusing
Jim Vangundy
Charles Vetter
Donald Wagner
George Walburn
Dick Waybright
Lester Whitecotton
Paul Wieber
Scottie Wiest
Johnny Wilkins
Ronald Wilson
David Workman
Arthuer Yagel
Arthur Yagel
Cathy Zivkovich

Wisconsin

Mike Ablutz
Tim Bacon
George Banzhaf
Don Bartels
Leo Baur
Jim Berlin
Frank Bremser
David Brost
Richard Camp
Jane Cummings Carlson
Cathrine Cerness
Jay Cravens
J. Cruse
Paul Delong
Andrea Diss
James Drescher
Dennis Fincher
Mark Giese
Jeff Groeschl
Tony Hallman
Lee Hanks
Pete Hilgers
Paula Kamps
Robert Kasten
C. Kelly
Phil Knudson
Dan Kretz
Walter Kuhlmann
J. Kyhl
Bill Landwehr
J. Larson
Jane H. Larson
C. Lettau
Chris Lettau
Peter Luxenhofer
M. Marie
Jim McDonald
B. McNee
Carolyn Mella
James Meunier
Terry Moore
Rudy Nigl
Louise Plaskey
Willa Pledger
Thomas Rausch
Joe Schmidt
William Seybold
Mark Simon
Michael Smith
Billy Stern
Edson Stevens
Craig Ver Kuilen
Allan Waelchli
Steve Weekly
Daniel Weiss
Chris O. Whitney
Wayne Wood
Carroll Zietlow

Wyoming

Robert Anderson
Bill Crapser
Justin Gentle
Kniffy Hamilton
Brian Kelly
James Marra King
Les Koch
Bryce E. Lundell
Paul Miller
Roy Reichenbach
Bruce Shambaugh
Dana Stone
Grant Stumbough

Guam

J. Champagne
Juliet Klemm

Puerto Rico

Sandra Lopez

Canada

Jon Bell
R. A. Costello
Tim Ebata
Peter M. Hall
Kristaps Kuplais
J. Meating
S. Mikalachki
Stephen Nicholson
K. Nielsen
G. Oliver
Shane Sela
Peter M. Hall

Italy

Alberto Cozzi

Chapter 7
Glossary

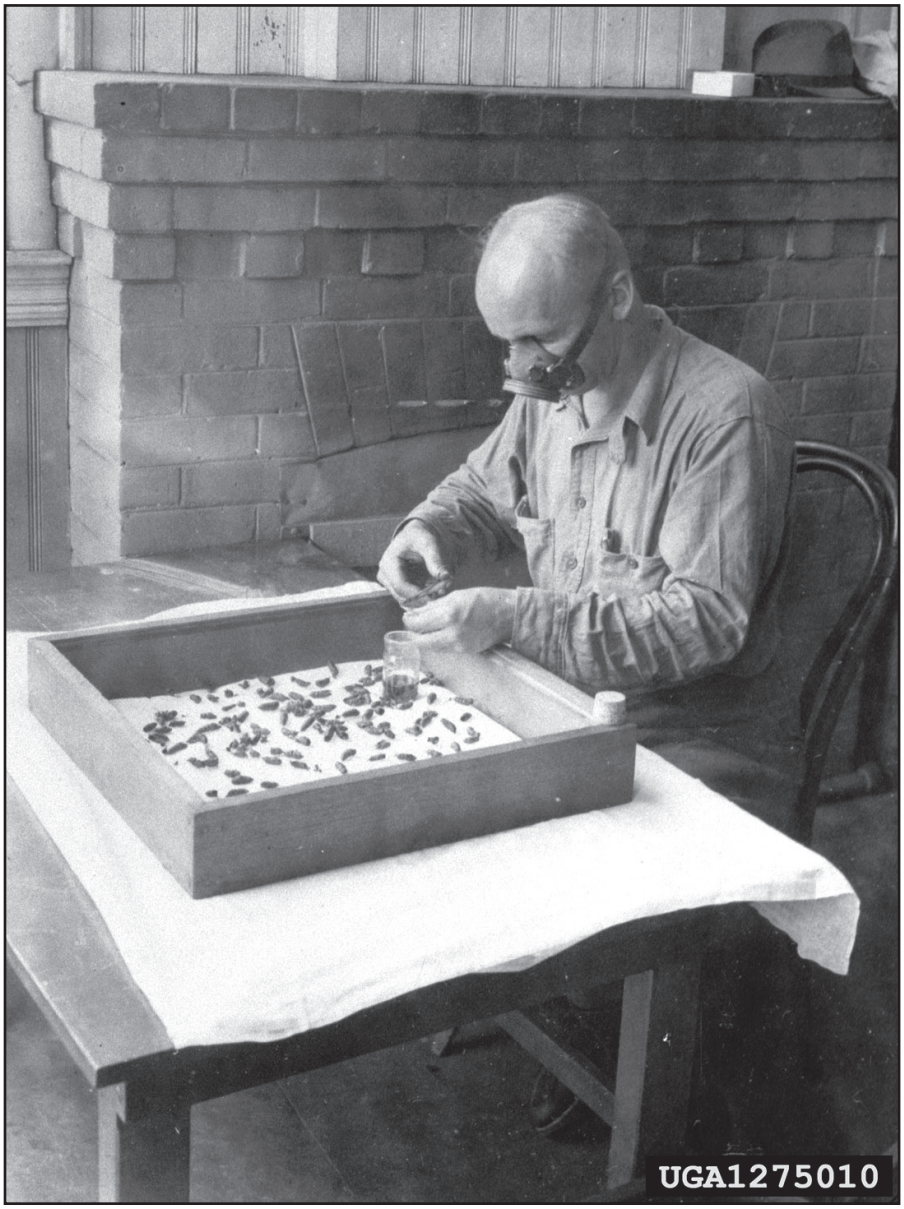

Figure 7-1. A respirator prevented inhalation of wing scales and fine hairy particles from gypsy moth life stages.

Chapter 7 Glossary

Figure

Figure 7-1. A respirator prevented inhalation of wing scales and fine hairy particles from gypsy moth life stages .....Cover

Terms are defined as they pertain to this Supplemental Environmental Impact Statement (SEIS).

A

absorption — process by which the agent is able to pass through the body membranes and enter the bloodstream. The main routes by which toxic agents are absorbed are the gastrointestinal tract, lungs, and skin

acetylcholine — compound released at nerve endings, active in the transmission of the nerve impulse

acetylcholinesterase — enzyme that occurs in nerve endings and prevents accumulation of acetylcholine; acetylcholinesterase inhibition results in acetylcholine accumulation, which impairs the nervous system

acinar-cell adenomas — type of benign tumor

actinomycete — any bacterium in the order Actinomycetales, which contains filamentous branching bacteria of the genera Actinomyces and Streptomyces

active ingredient — (a.i.) toxic part of an insecticide formulation

acute exposure — single exposure or multiple exposures occurring within a short time frame (24 hours or less)

acute toxicity — potential of a substance to cause injury or illness in a single dose or in multiple doses over a period of 24 hours or less

adenoma — benign epithelial tumor; glandular

additive effect — combined effect of two chemicals is equal to the sum of the effect of each chemical alone. The effect most commonly observed when two chemicals are administered together is an additive effect

adjuvant(s) — formulation factors used to enhance the pharmacological or toxic effect of the active ingredient

absorption — tendency of one chemical to adhere to another material

adverse-effect level — (AEL) signs of toxicity that must be detected by invasive methods, external monitoring devices, or prolonged systematic observations. Symptoms that are not accompanied by grossly observable signs of toxicity

AEL — acronym for adverse-effect level.

aerobes — organisms that require oxygen.

aesthetic damage — undesirable change in appearance

Agricultural Research Service (ARS) — USDA agency that develops the means to protect trees in forests, parks, yards, and other nonforest environments; conducts research to support activities against the gypsy moth

a.i. — abbreviation for active ingredient

alkaline — having a high pH; a basic solution, compared with an acidic solution

allergic reaction — situation where a pre-exposure of the chemical is required to produce the toxic effect via an antibody

alopecia — hair loss

alternative — one possible way to accomplish a proposed action; a way to manage the gypsy moth in the United States

amino acids — relatively simple carbon-nitrogen molecules that are the subunits of proteins

amphiphod — any of the various small crustaceans in the order Amphipoda, with laterally compressed bodies found primarily in aquatic habits; examples are sandhoppers, beach fleas and skeleton shrimp

anaerobes — organisms that do not require oxygen

analogy to other compounds — using data on one set of compounds to predict the activity of another set of compounds

anemia — decrease in the concentration of red blood cells in whole blood

Animal and Plant Health Inspection Service — (APHIS) joint-lead agency for this environmental impact statement on the gypsy moth; the USDA Agency that enforces national quarantine, coordinates with States on the National Gypsy Moth Survey, provides assistance to States to eradicate isolated infestations of the gypsy moth on 640 acres or less, develops new methods to improve gypsy moth quarantine and eradication practices, and conducts technology transfer activities

anthelmintic — compound used to rid an organism of parasitic worms

antibodies — large protein molecules that interact with antigens and deactivate antigens

antigen — substance capable of inducing an immune response

APHIS — acronym for Animal and Plant Health Inspection Service

aplastic — pertaining to or characterized by aplasia– the lack of development of an organ or tissue, or of the cellular products from an organ or tissue

aplastic anemia — form of anemia that is difficult to treat

ARS — acronym for Agricultural Research Service

arthropods — large group of invertebrate animals that includes insects, spiders and crustaceans

artificial spread — spread of the gypsy moth by other than natural means, for example, by insect life stages attaching to and being moved on recreational vehicles, automobiles, nursery stock, outdoor household articles, and cargo

Asian strain — refers to strains of the gypsy moth originating in the Far East, which have some females that can fly, and may have the capacity to establish in a broader host range, be larger, and hatch earlier than the European strain

assay — a test (noun); to test (verb)

atrophy — decrease in the size of a cell, tissue, or organ, often associated with exposure to a toxic agent

B

***Bacillus thuringiensis* (*B.t.*)** — bacterium; found in most of the world useful in regulation and/or control of insect populations. This microorganism produces several agents (toxins) active against insects

Bacillus thuringiensis* var. *kurstaki (*B.t.k.*) — scientific name of a bacterium that is specifically pathogenic to caterpillars of many moths and butterflies; the active ingredient in biological insecticides sold under the trade names Dipel, Foray, and Thuricide

basal area — cross-sectional area of a tree determined from the diameter of the trunk at breast height; the total area of ground covered by trees measured at breast height

benchmarks — results of toxicological tests, such as LCD or EC_{50} values.

beneficial organism — any organism that eats, parasitizes, or regulates in some way populations of other organisms that are pests

benign — not malignant, not recurrent, favorable for recovery

benthic — pertaining to the sea bed, river bed, or lake floor

beta-exotoxin — proteinaceous toxin in some forms of *B.t.* that is mutagenic in mammals; this toxin is not present in *B.t.k.*

biliary — referring to bile, a substance in which many chemicals are eliminated from the body

bioassay — determination of the relative strength of a substance (e.g., drug, insecticide) by comparing its effect on a test organism with that of a standard preparation

biodiversity — variety of life and its processes; includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur

biologically sensitive — term used to identify a group of individuals who, because of their developmental stage or some other biological condition, are more susceptible than the general population to a chemical or biological agent in the environment

biomass — total weight, volume, or energy equivalent of organisms in a given area

biota — plants and animals

BIU — acronym for billion international units

B.t.k. — abbreviation for *Bacillus thuringiensis* var. *kurstaki*

C

cancer potency parameter — model-dependent measure of cancer potency (mg/kg/day) over lifetime exposure; often expressed as a q, which is the upper 95 percent confidence limit of the first dose coefficient (q,) from the multistage model

canopy — uppermost layer of foliage in forest vegetation, formed by the crowns of trees

carcinogen — chemical capable of inducing cancer

carcinoma — malignant tumor

carrier — in commercial formulations of insecticides or control agents, a substance added to the formulation to make it easier to handle or apply

caterpillar — soft-bodied larva of the gypsy moth or other moth, butterfly, or sawfly

cell-mediated response — response originating from materials within the cell, in contrast to a humoral response

cfu — acronym for colony forming units

chironomid — ecologically important group of aquatic insects belonging to the family Chironomidae (order Diptera), often occurring in high densities and diversity, and feeding on a great variety of organic substrates; important prey of most aquatic predators

chitin — hard substance made of a complex carbohydrate (acetyl glucosamine) similar to cellulose; main component in the skin (cuticle) of insects, spiders, and crustaceans

cholinergic — refers to nerve cells that release acetylcholine

cholinesterase — group of enzymes that degrade acetylcholine and similar compounds. Cholinesterases that occur in nerve tissues have a clear function. Other cholinesterases, such as those occurring in red blood cells or plasma, do not have a clear function but are used as indicators of insecticide exposure

chromatography — method of separating chemicals prior to quantitative analysis

chronic exposure — long-term exposure studies often used to determine the carcinogenic potential of chemicals; these studies are usually performed on rats, mice, or dogs and extend over the average lifetime of the species; for example, chronic exposure for a rat is 2 years

chronic toxicity — adverse biologic response, such as mortality or an effect on growth or reproductive success, resulting from repeated or long-term (equal to or greater than 3 months) doses (exposures) of a compound, usually at low concentrations

circadian rhythm — influence of the time of day on the rate of metabolism of foreign compounds, often observed in a given animal species; a variation in the metabolic rate often correlated with variations in endocrine functions, as influenced by the light-dark cycle to which the animal is exposed

cladoceran — small aquatic crustaceans in the order Cladocera; water fleas

coliforms — bacteria that indicate recent fecal contamination of water

colony forming unit (cfu) — index of bacterial levels in a medium such as air or water; a cfu represents a collection of a droplet or particulate from air that contains one or more viable spores or vegetative cells of *B.t.k.*

common logarithm — common logarithm of a number, X, is defined as the number, Y, which when used as the exponent of 10 results in X. Thus, if $X = 10^1$, then the log of X is Y, which is often written using the notation, $\log(X) = Y$

community — association of potentially interacting plants and/or animals, more or less distinguishable from other such associations, usually defined by the nature of their interaction or the place in which they live

compliance agreement — written agreement between APHIS Plant Protection and Quarantine and a person who grows, handles, or moves regulated articles to comply with APHIS regulations

confounders — term used in discussions of studies regarding human populations (epidemiology studies) to refer to additional risk factors which, if unaccounted for in a study, may lead to erroneous conclusions

congenital — refers to conditions present at birth, regardless of their cause

conidium — asexual spore produced by fungi (pl. conidia)

conjugation — in metabolism, a linkage of one molecule with another; common step in the elimination of many chemicals from the body

conjunctiva — thin mucous membrane that lines the eyelids

conjunctivitis — inflammation of the membrane that lines the eyelids

connected actions — exposure to other chemical and biological agents in addition to exposure to a treatment agent used to control gypsy moth

connective tissue — tissue that binds together and supports the various structures of the body

contaminants — for chemicals, impurities present in a chemical-grade chemical; for biological agents, other agents that may be present in a commercial product

control — maintain or try to maintain a population density of insects or other undesirable animals below the point where injury to man's interests occurs

conspecific — belonging to the same species

cooperative project — management project conducted by a State or Federal agency, under agreement and with financial and technical assistance of the U.S. Department of Agriculture, to control forest diseases and insects such as the gypsy moth

Cooperative State Research, Education, and Extension Service — (CSREES) USDA agency that administers a research grants program, including gypsy moth research; plans cooperative research projects through the State Agriculture Experiment Station System and coordinates information and education activities

cooperator — State or Federal agency that enters into an agreement with the U.S. Department of Agriculture

to conduct a cooperative project

copepod — small marine or freshwater crustaceans in the class Copepoda, exhibiting great diversity in form and life history

corixid — insects in the family Corixidae (order Hemiptera); referred to as true water bugs

corneal opacity — cloudy area on the cornea

corneal ulcer — small area of damaged tissue on the surface of the eye

corticosteroid — anti-inflammatory agent

corrosive effect — effect that causes visible destruction and alteration in tissue at the site of contact

cover type — vegetation, described in terms of its general form or dominant species, comprising the plant community in a given area

critical habitat — area determined by the U.S. Fish and Wildlife Service to be essential to the conservation of threatened or endangered species and that may require special management considerations or protection

crown condition — combination of tree crown density, coloration, leaf-rolling, mortality, or other factors that provide an indication of tree health

crustaceans — organisms such as crabs, lobsters, shrimp, crayfish, wood lice, pill bugs, and water fleas that have hard exoskeletons made of chitin, as do other arthropods

CSREES — acronym for Cooperative State Research, Education, and Extension Service

cumulative effects — effects attributable to exposure(s) that may last for several days to several months, or effects resulting from gypsy moth program activities that are repeated more than once during a year or for several consecutive years

cumulative exposure — exposure that may last for several days to several months or exposures resulting from program activities that are repeated more than once during a year or for several consecutive years

cytosolic — found in the cytoplasm of a cell

D

dam(s) — female parent(s)

DDVP — abbreviation of the chemical name for dichlorvos—2,2 dichloroethenyl dimethyl ester phosphoric acid—an insecticide contained in some gypsy moth traps

defoliation — noticeable loss of foliage due to feeding by insects, such as gypsy moth caterpillars; light defoliation is normal background defoliation of less than 30 percent, moderate defoliation is 30 to 60 percent, heavy defoliation is greater than 60 percent

defoliation survey — visually examining trees from the ground or the air, to detect defoliation

degradation — breakdown of a compound by physical and chemical or biochemical processes, into basic components with properties different from those of the original compound

degraded — broken-down or destroyed

degrees of freedom — number of data points minus the number of parameters in a model. For example, two points are required to define a straight line. In statistical jargon, using two points to define a straight line is fitting a two-parameter model with zero degrees of freedom

delimiting survey — using pheromone-baited traps to determine the approximate size of an infested area

delineation — a process used in slow the spread to estimate numbers and presence of gypsy moths in an area

delta-endotoxin — proteinaceous toxin in *B.t.k.* that is toxic to gypsy moth larvae

dermal — pertaining to the skin

dermatitis — inflammation of the skin; characterized by redness, swelling, pain, and warmth

detection survey — using pheromone-baited traps to determine whether the gypsy moth is present and where delimiting may be necessary

detritus — fragmented, particulate-organic matter resulting from the decomposition of plant and animal remains

developed forest — privately owned forested residential areas

dichlorvos — another name for DDVP

diflubenzuron — active ingredient of chemical insecticide formulations sold under the trade name Dimilin®; acts as a growth regulator by interfering with chitin synthesis, preventing molting in gypsy moth caterpillars, some other immature insets, and crustaceans

Dimilin® — trade name of diflubenzuron formulations registered for use against the gypsy moth

DiPel — one of the commercial formulations of *B.t.k.*

dipteran — insect belonging to the order Diptera (meaning two wings), which includes flies and mosquitoes

direct effect — reaction of an organism after exposure to a chemical or non-chemical agent that is not medicated through another organism. For example, caterpillars that eat leaves with diflubenzuron on them fail to molt, and die as a result of their direct exposure to this insecticide; the direct effect of an unchecked gypsy moth infestation could be a change in species composition of trees

dislodgeable residues — residue of a chemical or biological agent on foliage as a result of aerial or ground spray applications, which can be removed readily from the foliage by washing, rubbing, or having some other form of direct contact with the treated vegetation

disparlure — synthetic version of the pheromone produced by female gypsy moths to attract males for mating

diuresis — increased urinary excretion

diurnal rhythm — normal changes in the body that occur during the day; most diurnal variations have been shown to be related to eating and sleeping habits

dominant trees — trees with crowns extending above the general level of the canopy and receiving full light from above and from the side

dose — quantity of material that is taken into the body; dosage is usually expressed in amount of substance per unit of animal body weight, often in milligrams of substance per kilogram (mg/kg) of animal body weight, or other appropriate units; in radiology, the quantity of energy, or radiation absorbed

dose-response assessment — description of the relationship between the dose of a chemical and the occurrence or intensity of an effect

draft environmental impact statement — detailed, written statement of effects expected as a result of a major Federal action that is released to the public and other agencies for review and comment, as required under Section 102 (2)(c) of the National Environmental Policy Act

E

EC_{50} — acronym for median effective concentrate

ecology — study of the interrelationships between living organisms and their environment

ecosystem — living organisms interacting with each other and with their physical environment, usually described as an area for which it is meaningful to address these interrelationships

ecosystem management — holistic approach to achieving productive healthy ecosystems by blending social, physical, economic, and biological needs and values

eczema — form of dermatitis associated with swelling and redness of the skin

effect level — dose or concentration of a substance reported to have no harmful (adverse) effects on people or animals.

effector cell — cell stimulated by a nerve cell to effect a certain function. Examples include muscle and sensory cells

egg mass survey — visually examining an area in a systemic manner, either (1) outside the generally infested area, to obtain evidence that gypsy moths are present and reproducing, or (2) in an infested area, to assess the population density

EIS — acronym for environmental impact statement

empirical — refers to an observed, but not necessarily fully understood relationship; in contrast to a hypothesized or theoretical relationship

enantiomer — reference to molecules that are structurally identical except for differences in the three-dimensional configuration

endangered species — Federal designation for any species that is in danger of extinction throughout all or a significant part of its range. The Federal list of endangered species is maintained by the Secretary of the Interior

endemic — something that is always present in a population but not always prevalent or present in high numbers; often applied to diseases or infestations

endospore — thick-walled body containing genetic material that forms inside the vegetative cell of some types of bacteria, including bacillus, under adverse conditions. When conditions improve, the endospore can develop into a vegetative cell

endpoints — components of an ecosystem that indicate its sensitivity to the type of disturbance expected from the gypsy moth or treatments; five endpoints were selected for the ecological risk assessment: nontarget organisms, forest condition, water quality, microclimate, and soil fertility and productivity

Entomophaga maimaiga — scientific name for a fungus that causes disease in gypsy moth caterpillars

environmental analysis — investigation of alternative actions and their predictable environmental effects through a systemic interdisciplinary approach, which ensures the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making that may have an impact on the human environment

Environmental Assessment — (EA) a concise public document that a Federal agency prepares under the National Environmental Protection Act (NEPA) to provide sufficient analysis and evidence for either a finding of no significant impact or preparation of an environmental impact statement

Environmental Impact Statement — (EIS) a detailed public document written by a Federal agency to disclose significant environmental impacts that would result from a planned action and used to make decisions about the action

enzyme — biological catalyst; a protein produced by an organism itself, which enables the splitting (as in digestion) or fusion of other chemicals

Ephemeroptera — order of aquatic insects including mayflies

epidemiology — branch of science that deals with the incidence, distribution, and control of disease in a population

epidermis — outermost layer of the skin

epizootic — occurrence of a disease in animals that is widely prevalent and spreads rapidly

eradication — strategy of eliminating an isolated infestation of the gypsy moth

erythema — name applied to redness of the skin produced by congestion of the capillaries, which may result from a variety of causes

erythrocyte — red blood cell

European strain — strain of the gypsy moth historically found in Western Europe and the original source of the North American population, which has females that do not fly

evaluation — gypsy moth survey to determine the need for treatment or to determine the effectiveness of treatment

exclusion — policy pursued by APHIS to prevent animal and plant pests and diseases, including the gypsy moth, from being introduced into the United States

exotic — refers to all species of plants and animals not naturally occurring, either now or in the past, in an ecosystem of the United States

exposure — skin contact, inhalation, or ingestion of a substance that may have a harmful effect

exposure assessment — process of estimating the extent to which a population will come into contact with a chemical or biological agent

extra risk — risk in the population that can be attributed to exposure to the agent

extrapolation — use of a model to make estimates outside of the observable range

exuviae — cast-off skins or outer coverings of insects and animals that shed skin

F

fecal — relating to feces (solid waste)

fibroma — benign tumor composed mainly of fibrous or fully developed connective tissue

fibrosarcoma — malignant tumor derived from fibroblasts that produce collagen

FIFRA — Federal Insecticide, Fungicide, and Rodenticide Act; establishes procedures for the registration, classification, and regulation of pesticides

final environmental impact statement — detailed, written statement of the analysis of a major Federal action, released to the public as required under sec. 102 (2)(c) of the National Environmental Policy Act

financial assistance — money provided by the Forest Service and APHIS to Federal and State agencies through several pest control or management programs to suppress, eradicate, or slow the spread of the gypsy moth. On Federal lands the cost of gypsy moth projects are paid in full; on State and private lands cost may be shared with State cooperators. See technical assistance for other assistance provided

food chain — feeding sequence used to describe the flow of energy and materials through the system

food web — interconnected food chains in the ecosystem, representing the various paths of energy flow through populations in the community

Foray — one of the commercial formulations of *B.t.k.*

forest — land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential or administrative areas, improved roads of any width, and adjoining road-clearing and power line clearing of any width

forest condition — species composition, tree growth rates and mortality rates, productivity, and degree of insect damage

forest cover type — description based on and named after the tree species that forms a plurality of the basal area in a stand; other tree species may also be part of the stand

Forest Service — lead agency for this environmental impact statement; the largest USDA agency, which conducts research and develops the means to control the gypsy moth in forests; conducts surveys and evaluations on lands managed by other Federal

agencies; helps State and other Federal agencies to conduct detection surveys, evaluation and suppression; to test and transfer technology designed to improve gypsy moth control and reduce damage; and to conduct eradication on Federal or adjacent land, and on non-Federal land for infestations of more than 640 acres

forest type group — grouping of forest cover types for inventory, mapping, or other purposes

forestomach — front or foremost portion of the stomach in animals

formulation — commercial preparation of a chemical including any inert ingredients or contaminants

frank effects — obvious signs of toxicity

Frank Effect Level (FEL) — dose or concentration of a chemical or biological agent that causes gross and immediately observable signs of toxicity

frass — fecal excrement of gypsy moth caterpillars

fumigant — pesticide applied as a liquid or powder which volatilizes to gas; usually applied beneath a tarp, sheet, or other enclosure

fumigation — process of using a fumigant to destroy pests, usually applied under a cover or shelter

FWS — Fish and Wildlife Service, an agency of the U.S. Department of the Interior

G

gavage — placement of a toxic agent directly into the stomach of an animal, using a gastric tube

gene — basic unit of inheritance, by which hereditary characteristics are transmitted from parent to offspring. Genes consist of short lengths of DNA (or RNA in some viruses) that direct the synthesis of protein. These in turn influence the form and function of the organism

generally infested area — (regulated or quarantined area) the area in the eastern United States where the European strain of the gypsy moth is considered to be permanently established; also the area quarantined by APHIS and the States. All life stages are present, and populations are continuous. Population outbreaks occur, and defoliation is common. In 1994, the area extended from Maine to northern North Carolina and west to West Virginia, Ohio, and Michigan

genotoxic — causing direct damage to genetic material, associated with carcinogenicity

genotoxicity — specific adverse effect on the genome (the complement of genes contained in the haploid set of chromosomes) of living cells, which upon the duplication of the effected cells can be expressed as a mutagenic or carcinogenic event because of specific alteration of the molecular structure of the genome

geocorid — big-eyed bug

geometric mean — measure of an average value often applied to numbers for which a log-normal distribution is assumed

gestation — period between conception and birth; in humans, the period known as pregnancy

gram (g) — metric unit of measure for weight or mass

growth regulator — chemical that controls the rate of growth, or interferes with successful growth in an animal; diflubenzuron is a growth regulator for insects and other chitinous animals

guild — group of species with similar modes of existence

Gypchek — trade name for a biological insecticide containing gypsy moth nucleopolyhedrosis virus, which is registered and produced by the Forest Service and APHIS

gypsy moth — all life stages of the Asian and European strains of the insect with the scientific name *Lymantria dispar* (L.), previously *Porthetria dispar* (L.)

H

Haber's Law — in toxicology, the assumption that the concentration or dose, multiplied by the duration of exposure (time) will always have the same effect. This relationship is true for some chemicals and some endpoints but not true for others. Even when true for a particular chemical and effect, it may be true only over certain ranges of exposure

habitat — place or type of site where a plant or animal naturally or normally lives and grows

half-life — time required for the concentration of a chemical to decrease by half of the original concentration (the longer the half-life, the more persistent a chemical is considered to be)

hazard — adverse effects to humans or the environment as a result of exposure to the gypsy moth or treatments; compare risk

hazard assessment — component of a risk assessment that consists of the review and evaluation of toxicological data to identify the nature of the hazards associated with a chemical, and to quantify the relationship between dose and response

hazard identification — process of identifying the array of potential effects that an agent may induce in an exposed population

hazard quotient — ratio of the estimated level of exposure to the risk-reference value or some other index of acceptable exposure; a hazard quotient greater than 1 raises concern

Heinz bodies — dark-staining granules found in red blood cells, which are signs of oxidative damage; formation of Heinz bodies can lead to red cell dysfunction and breakdown of the cell membrane

hemangiosarcoma — malignant tumor formed by proliferation of endothelial and fibroblastic tissue

hematological — pertaining to the blood

hemipteran — insect belonging to the order Hemiptera, including the true bugs

hemoglobin — iron-containing respiratory pigment in red blood cells of vertebrates

herbaceous — relating to plants that have nonwoody stems and die down annually

herbivorous insect — insect that eats plants and plant material; the gypsy moth is an herbivorous insect because it eats leaves

HHERA — acronym for Human Health and Ecological Risk Assessment

histamine — naturally occurring chemical; causes dilation of the capillaries and muscle contraction

histopathology — signs of tissue damage that can be observed only by microscopic examination

homopteran — insect in the order Homoptera, which includes aphids, scale insects, and cicadas

host — living organism that provides subsistence or lodging for another organism

humoral — associated with agents dissolved in the blood or body fluids, in contrast to materials contained in cells (cell-mediated)

hydroxylation — addition of a hydrogen-oxygen or hydroxy (−OH) group to one of the electron rings of a compound. Hydroxylation increases the water solubility of aromatic compounds, particularly when followed by conjugation with other water-soluble compounds in the body, such as sugars or amino acids, hydroxylation greatly facilitates the elimination of the compound in the urine or bile

hymenopteran — any of highly specialized insects in the order Hymenoptera, usually with four membranous wings, the abdomen borne on a slender pedicel and associated with large colonies and complex social organization; includes bees, wasps, ants, ichneumonid flies, sawflies, and gall wasps

hypoactivity — less active than normal

I

immunocompetent — having normal immune function

immunocompromised — having an impaired immune system, such as people with HIV or AIDS

immunodeficient — organism with impaired immune function

in vitro — in glass; a test-tube culture; any laboratory test using living cells taken from an organism

in vivo — in the living organism; in vivo tests are those laboratory experiments carried out on whole animals or human volunteers

indirect effect — reaction of an organism to a change in the environment that is a direct result of exposure to a chemical or non-chemical agent. For example, wasps that prey on caterpillars that eat leaves with diflubenzuron on them could obtain diflubenzuron that the caterpillars ate, thus exposed indirectly to the chemical; the indirect effect of an unchecked gypsy moth infestation could be the change in woodland structure, a direct effect of the gypsy moth

inerts — adjuvants or additives in commercial formulations of gypsy moth control agents that do not cause mortality in the gypsy moth

inert ingredients — additives in insecticide formulations that do not effect the organism targeted but are added for a variety of reasons, such as to stabilize the formulation, to improve its weatherability, or to prevent growth of contaminating microorganisms

infestation — presence of the gypsy moth and an indication of a reproducing population, based on the results of surveys

infested area — isolated infestation or generally infested area

inhalation — act of breathing

innocuous — something that produces no injury; harmless; inoffensive

insecticide — pesticide that kills, debilitates, or controls the growth of insects

instar — stage between molts in the development of the gypsy moth caterpillar and other arthropods

Integrated Pest Management (IPM) — selecting strategies to mange pest-host systems for specific objectives; includes planning, detection, evaluation, monitoring, establishing acceptable damage thresholds, and use of appropriate management practices to prevent or control pest-caused damage and losses

intercept — in a simple linear equation, the value of the dependent variable when the independent variable is zero

interdisciplinary team — team of varied resource specialists with different professional backgrounds who conduct an environmental analysis; members of the interdisciplinary team who prepared this environmental impact statement are listed in chapter 5, Preparers and Contributors

interpolation — use of mathematical models within the range of observations

intraperitoneal — injection into the abdominal cavity

invertebrates — animals without a spinal column, such as insects, spiders, and crustaceans

IPM — acronym for Integrated Pest Management

iritis — inflammation of the iris

irritant effect — reversible effect, compared with a corrosive effect

isolated infestation — defined area infested with the gypsy moth outside the generally infested area; or, a defined area infested with the Asian strain of the gypsy moth within the generally infested area

issue — public concern or significant problem that might occur when the gypsy moth is present or treatments are applied

IU — International Unit

L

land use — type of activity occurring on the land surface, e.g. forestland, farmland, pastureland, etc

landscape — physical features of an area (e.g. slope, aspect, drainage) that affects the characteristics of the plant and animal communities in the ecosystem

Latin Hypercube — stratified sampling technique designed to sample from all portions of a distribution

larva — stage in development between hatching and attaining adult form

larval survey — placing tar paper, burlap, or similar material around the trunks of susceptible trees, to create hiding places for gypsy moth caterpillars so they can be captured and counted

LC_{50} — acronym for lethal concentration$_{50}$

LD_1 — acronym for lethal dose$_1$

LD_{50} — acronym for lethal dose$_{50}$

leaf expansion — percentage of leaf growth from 0 to 100

lentic — water bodies that do not flow (e.g., lakes, ponds)

lepidopteran — insects in the order Lepidopteran, characterized by adults with two pairs of scale-covered wings and coiled sucking-mouthparts, including moth and butterflies

lethal concentration$_{50}$ (LC_{50}) — calculated concentration of a toxicant in air (or water) to which exposure for a specific length of time is expected to cause death in 50 percent of a defined test animal population

lethal dose$_1$ (LD_1) — dose of a chemical or biological agent calculated to cause death in 1 percent of a defined test animal population

lethal dose$_{50}$ (LD_{50}) — dose of a chemical or biological agent calculated to cause death in 50 percent of a defined test animal population

lethargy — decrease in the normal amount of activity

life stage — distinctive period in an insect's life (Nichols 1989); life stages of the gypsy moth are: egg (in an egg mass), larva or caterpillar, pupa, and adult moth

lipophilic — having a tendency to dissolve or partition to fatty substances

LOAEL — acronym for lowest-observed-adverse-effect level

log-normally — a logarithmic function with a normal distribution

lotic — water bodies that flow and have running waters (e.g. streams, rivers)

lowest-observed-adverse-effect level (LOAEL) — lowest measured amount of a chemical that produces significant increases in frequency or severity of adverse effects in an exposed human population

M

macroinvertebrates — invertebrates large enough to be seen with the unaided eye

malignant — cancerous

mammary gland — breast

management practice — specific act, measure, cause of action, or treatment

mass trapping — using pheromone-baited traps to catch all or nearly all the male gypsy moths in an area having low gypsy moth populations

mast — fruit and seeds of trees and other forest vegetation eaten by wildlife; hard-mast includes nuts and seeds (such as acorns, walnuts, hickory nuts, maple

seeds); soft-mast is fruit (such as apples, blackberries, wild grapes)

mating disruption — saturating an area with gypsy moth pheromone to confuse male gypsy moths, thereby preventing them from locating and mating with females

median effective concentration (EC_{50}) — concentration of a substance that results in some effect being exhibited by 50 percent of the test organisms

median lethal concentration — concentration of a toxicant necessary to kill 50 percent of the organisms in a population being tested; usually expressed in parts per million (ppm), milligrams per liter (mg/L), or milligrams per cubic meter (mg/m^3)

median lethal dose — dose necessary to kill 50 percent of the test organisms; usually expressed in milligrams of chemical per kilogram of body weight (mg/kg)

metabolite — compound formed as a result of the metabolism or biochemical change of another compound

metastatic — pertaining to or of the nature of metastasis; the transfer of disease from one organ or part to another not directly connected with it; may be due either to the transfer of pathogenic microorganisms (e.g., bacilli) or to the transfer of cells, as in malignant tumors

methemoglobinemia — rare blood disorder in which there is a deficiency of the enzyme that turns methemoglobin into hemoglobin (methemoglobin differs from hemoglobin in being unable to combine reversibly with oxygen)

mg/cm^2 — milligrams per square centimeter

mg/kg — milligrams per kilogram

mg/m^3 — milligrams per cubic meter

microclimate — climate of the immediate surroundings or habitat, differing from the macroclimate, as a result of the influences of local topography, vegetation and soil

microinvertebrates — invertebrates too small to be seen without magnification

microlepidopterans — general term for the most primitive families of moths whose members usually have the smallest body size among lepidopterans

microorganism — organism so small that a microscope is necessary to see it

microsomal — pertaining to portions of cell preparations commonly associated with the oxidative metabolism of chemicals

mineralization — conversion of an organic substance into an inorganic substance as a result of microbial decomposition

minimal risk level (MRL) — route-specific (oral or inhalation) and duration-specific estimate of an exposure level that is not likely to be associated with adverse effects in the general population, including sensitive subgroups

mixture of concern — mixture on which a risk assessment is being conducted. See sufficient similarity.

molting — process of shedding an old skin and creating a new one, as an insect grows or changes in form

monitor — to observe or check that treatments are carried out as planned, or to determine whether effects of treatments are those that were predicted

Monte Carlo simulation — technique used to simulate systems with probabilistic elements; one or more variable in a Monte Carlo simulation is determined by drawing a random number from a probability distribution (such as the normal or uniform distribution), which describes the natural variation in that variable

most-sensitive effect — adverse effect observed at the lowest dose of a substance—an important concept in risk assessments; if the most-sensitive effect is prevented, no other effects will develop

multiple-chemical sensitivity — syndrome that affects individuals who are extremely sensitive to chemicals at extremely low levels of exposure

mutagenicity — ability of a substance (mutagen) to cause genetic damage, that is, damage to DNA or RNA (mutation); mutations can lead to birth defects, miscarriages, or cancer

N

nabid — damselbug belonging to Order Hemiptera of Class Insecta

NADH — acronym for nicotinamide adenine dinucleotide phosphate; a molecule that is common in all living systems and is necessary for the proper function of many enzymes

nanogram (ng) — one billionth of a gram

National Environmental Policy Act (NEPA) Act of 1969 (42 U.S.C. 4321) — established a national policy that encourages harmony between man and the environment; requires that Federal agencies proposing legislation or a major action use a systemic, interdisciplinary approach to planning and decisionmaking, and prepare a detailed statement that includes the following: the environmental impact of the proposed action, any adverse environmental effects that cannot be avoided, alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources

National Gypsy Moth Survey — minimal detection survey administered by APHIS in cooperation with the States to detect isolated infestations of the gypsy moth outside the generally infested area

natural landmark — site on the National Registry of Natural Landmarks, administered by the National Park Service, U.S. Department of the Interior, preserved as an outstanding example of plant or animal communities, geological features, scenic grandeur, or other attribute

natural spread — movement of gypsy moths from an infested area: (1) of first instar larvae by wind, (2) of larger larvae by crawling, (3) of adult females of the European strain by crawling, (4) of some adult females of the Asian strain by flying

necropsy — examination of a body after death, usually refers to a gross examination of the major organs

nematodes — elongated cylindrical worms that are parasitic in animals or plants or free-living in soil or water

neotropical migrant — bird that nests in North America but migrates to the Neotropics (region of the New World south of the Tropic of Cancer, includes South America, Central America, southern Mexico, the West Indies, and Caribbean) during winter

NEPA — acronym for National Environmental Policy Act

neuropathy — damage to the peripheral nervous system

ng — nanogram, one billionth of a gram

NIOSH — acronym for the National Institute for Occupational Safety and Health

nm — nanometer, one billionth of a meter

NOAEL — acronym for non-observed-adverse-effect level

NOEL — acronym for no-observed-effect level

no-observed-adverse-effect level (NOAEL) — highest measured amount of a chemical at which no increase in frequency or severity of adverse effects is observed in an exposed human population when compared with a control; effects may be produced, but they are not considered to be adverse

no-observed-effect level (NOEL) — dose of a chemical or biological agent at which there are no biologically or statistically significant effects attributable to treatment

non-insecticidal treatments — gypsy moth treatments that do not involve spraying of insecticides; in this environmental impact statement, they include mass trapping, mating disruption, and the sterile insect technique

non-target organism — any living organism that is not the target of a management practice

normal distribution — theoretical frequency-distribution of variable data generally shaped in a bell-shaped curve

Notice of Intent — announcement that preparation of a new national gypsy moth supplemental environmental impact statement was beginning, which appeared in the April 29, 2004, Federal Register (vol. 69, no. 83, p. 23,492 – 23,493)

NPV — acronym for nucleopolyhedrosis virus

nucleopolyhedrosis virus (NPV) — category of naturally occurring viruses that cause a usually fatal disease, mainly in larvae of moths, butterflies, sawflies, wasps, ants, bees, and others. The nucleopolyhedrosis virus specific to the gypsy moth is the active ingredient in the insecticide Gypchek

nymph — larvae of an insect with incomplete metamorphosis that differs chiefly in size and degree of differentiation from the final adult stage

O

OB — acronym for occlusion bodies

occlusion bodies (OB) — virus particles containing variable numbers of genetic material within one protein envelope

octanol-water partition coefficient (K_{ow}) — equilibrium ratio of the concentrations of a chemical in n-octanol and water, in dilute solution

ocular — pertaining to the eye

odonates — insects in the order Odonata; dragonflies and damselflies

1-day health advisory — drinking water concentration (mg/L) not likely to cause adverse effects in the general population, including sensitive subgroups, after 1 day of exposure

one-storied stand — stand of trees that is characterized by the predominance of trees the same size

ophthalmic — pertaining to the eye, as an ophthalmic solution–a solution of medication intended to be applied to the eye

oral — pertaining to the mouth

oral toxicity — toxicity of a compound when given or taken by mouth, usually expressed as milligrams of chemical per kilogram of body weight of animal (mg/kg)

organoleptic — relating to an objectionable taste or smell

organophosphate — class of insecticides that are toxic to the nervous system

orthopteran — insects in the order Orthoptera, which includes grasshoppers, crickets, locusts, and cockroaches

osteosarcoma — malignant tumor derived from bone tissue

outbreak — cyclic rise in gypsy moth populations when feeding by caterpillars causes widespread moderate-to-heavy defoliation

ovicide — chemical toxic to the eggs of the target animal

P

parasite — organism that lives in, on, or at the expense of another, from which it obtains food, shelter, or other requirements; a parasite is usually smaller than the host and weakens it

parasitoid — parasite that eventually kills its host, for

example, insects that kill life-stages of the gypsy moth

parenteral — any form of injection

partition — in chemistry, the process by which a compound or mixture moves between two or more media

pathogen — an agent, such as a virus or bacterium, that causes disease

pathogenic — causing or capable of causing disease

pathway — in metabolism, a sequence of metabolic reactions

peroxide — molecule that contains two or more oxygen atoms in series, such as —O—O—; these molecules are often involved in the degradation of polymers, including proteins

persistence — characteristic of an insecticide or a compound to remain in the environment as an effective residue; persistence is related to volatility, chemical stability, and degradation

pesticide — substance or mixture of substances that kill insects, rodents, fungi, weeds, or other forms of plant or animal life that are considered to be pests

pH — measure of acidity and alkalinity on a scale from 0 to 14, of which 7 is neutral; lower numbers are acidic, higher numbers are alkaline; numbers vary by a factor of 10, i.e., pH 3 is 10 times more acidic than pH 4

pharmacokinetics — quantitative study of the metabolic processes of absorption, distribution, biotransformation, and elimination of drugs

pheromone — chemical produced and emitted by an animal as a form of communication with other individuals of the same species, for example, the sex attractant given off by the female gypsy moth to attract males for mating

phytoplankton — small algal cells suspended in the water column of water bodies

phytotoxic — toxic or harmful to plants

piloerection — condition in which the hair stands on end

pituitary-adrenal axis — hormonal interaction between the pituitary and the adrenal glands

planktonic — suspended in the water of seas, lakes, rivers, or other water bodies

plasma cholinesterase — another term for pseudo-cholinesterase; the normal physiological role of this cholinesterase is not known, inhibition of this enzyme is considered an index of exposure to many oganophosphate insecticides

plasma — fluid portion of the blood in which particulates are suspended

plasmid — sub-cellular elements in bacteria that contain genetic material for relatively narrow and specific traits; plasmids can be transferred from one microorganism to another of the same species; transfer may also occur between two microorganisms of different species

Plecoptera — order of insects; includes stoneflies

polymer — generic term for a molecule composed of repeating units of less complex molecules; for example, proteins are polymers of amino acids

polyvinyl chloride — nontoxic polymer of vinyl chloride

population — group of gypsy moths that occupy a defined area, separated to some degree from other groups, and are reproducing

population survey — counting egg masses in the generally infested area to determine if suppression treatments are warranted, or using pheromone traps in the transition area to determine if slow-the-spread treatments are warranted

post-treatment evaluation or survey — defoliation, egg mass, or larval survey conducted in a treatment area to evaluate treatment effectiveness

potentiation — action of two or more substances from which one or more (the potentiator) enhances the toxicity of another

ppb — parts per billion; the number of parts of chemical substance per billion parts of the substrate in question

ppm — parts per million; the number of parts of chemical substance per million parts of the substrate in question

predator — animal that obtains the energy it needs to live and grow by eating animals of other species, for example, some mice are predators of the gypsy moth

probit analysis — analysis technique that relates doses to measures of standard deviation away from the 50 percent response level, using the cumulative normal distribution

programmatic — broad or general rather than site specific

proposed species — any species of fish, wildlife, or plant that is proposed in the Federal Register for listing as a threatened or endangered species under the Endangered Species Act

proteinaceous — consisting or composed of proteins

proteolytic enzymes — enzymes that breakdown proteins

prototoxins — proteins that can be converted to toxins

pruritis — itching; an unpleasant skin sensation that provokes the desire to rub or scratch

pseudocholinesterase — term for cholinesterase found in the plasma; the normal physiological role of this cholinesterase is not known; inhibition of this enzyme is considered an index of exposure to many organophosphate insecticides

public involvement — actions taken by the Forest Service and APHIS to involve the various individuals, groups, and organizations who are interested in or may be affected by this environmental impact statement and the decision that may result

pupa — developmental stage of gypsy moth or any lepidoptera, between the caterpillar and adult moth stages, during which the insect undergoes major structural changes

Q

quarantine — designating an area as generally infested, so as to regulate the movement of articles (such as outdoor household articles, logs, and nursery stock) and prevent artificial spread of gypsy moth life-stages to uninfested areas of the United States

R

racemic mixture — 50:50 blend of a (+) enantiomer and (−) enantiomer

recreational forest — publicly owned forest used predominantly for hiking, hunting, camping, day-use, and sightseeing

reference concentration — concentration in air (mg/m^3) not likely to be associated with adverse effects over lifetime-exposure, in the general population, including sensitive subgroups

reference dose (RfD) — oral dose (mg/kg/day) not likely to be associated with adverse effects over lifetime exposure in the general population, including sensitive subgroups

regeneration — renewal of a tree or stand of trees; restocking of an area

regulatory activities — activities conducted by APHIS and the States to prevent the artificial spread of the gypsy moth from the regulated area to the uninfested area; activities include inspection and treatment of regulated articles on which the gypsy moth commonly deposits egg masses. See quarantine

renal — pertaining to the kidneys

reproductive effects — adverse effects on the reproductive system that may result from exposure to a chemical or biological agent. The toxicity of the agent may be directed to the reproductive organs or the related endocrine system. The manifestations of these effects may be noted as alternatives in sexual behavior, fertility, pregnancy outcomes, or modification in other functions dependent on the integrity of the reproductive system

residue — quantity of insecticide and its metabolites remaining on and in vegetation, soil, or water

resistance — ability of a population or ecosystem to absorb an impact without significant change from normal fluctuations; for plants and animals, the ability to withstand adverse environmental conditions and/or exposure to toxic chemicals or disease

RfD — acronym for reference dose

rhinitis — inflammation of the mucous membranes of the nose

riparian — pertaining to, living in, or situation on, the banks of rivers and streams (Lincoln and Boxshall 1987)

risk — likelihood that adverse effects will occur; compare hazard

risk assessment — evaluation of the likelihood that adverse effects may occur in humans or the environment as a result of exposure to one or more stressors, such as the gypsy moth and treatments

risk characterization — process of estimating the incidence of a healthy effect in a human population under the different conditions of exposure described in the exposure assessment

risk comparison — the practice of comparing one risk to another in order to promote a better understanding of the consequences of different treatment options as well as the consequences of no treatment

risk reference-value (RRV) — generic term used as an estimate of dose that is not likely to induce adverse health effects in humans under specific conditions of exposure such as duration and route

route-of-exposure — way in which a chemical or biological agent enters the body. Most typical routes include oral (eating or drinking), dermal (contact of the agent with the skin), and inhalation

RRV — acronym for risk reference value

S

safety factor — factor used to give a margin-of-error to the screening index in the Ecological Risk Assessment; safety factors are selected based on the amount of error likely in estimating toxicological benchmark values or concentrations of a toxicant in the environment

salvage — cutting and removing dead, dying, or deteriorating trees before they lose their value as timber

sarcoma — tumor made up of a substance like embryonic connective tissue; often highly malignant

scientific notation — the method of expressing quantities as the product of a number between 1 and 10, multiplied by 10 raised to some power. For example, in scientific notation,
1 kg = 1,000 g [is expressed as] 1 kg = 1×10^3 g; 1 mg = 0.001 [is expressed as] 1 mg = 1×10^{-3} g

scission — in metabolism, breaking or cleavage of part of a molecule

scoping — open process, including public notification and participation, by which an agency identifies significant environmental issues and determines the extent of analysis needed to make an informed decision on a proposed action

screening index — index used to determine whether a species exposed to a toxic agent is at risk. The screening index is a conservative estimate of species at risk. It is more likely to indicate that a species is at risk when it actually may not be than to miss species that are at risk

secondary organism — pathogens or insects that attack trees already weakened by defoliation and that sometimes cause death of the trees

SEIS — acronym for Supplemental Environmental Impact Statement

sensitive subgroup — subpopulation that is much more sensitive than the general public to certain agents in the environment

septicemia — occurrence of pathogens or pathogenic toxins in the blood or other body fluids

serotype — classification of a microorganism based on occurrence of antigens in the cell

silviculture — practice of applying treatments to forest stands, to maintain and enhance them for any purpose (Smith 1986); silvicultural treatments may also be applied to forested areas in urban and suburban areas

slow the spread — strategy being pilot-tested on a large-scale to determine its biological effectiveness and economic efficiency in slowing the gypsy moth's natural spread from areas where it is already established or is a permanent resident by keeping low-level populations from increasing

species composition — assemblage of species inhabiting a defined area

species diversity — ecological concept that incorporates both the number of species in a given area and the number of individuals per species

species richness — number of species in a local area, region, or community

species-to-species extrapolation — method involving the use of exposure data on one species (usually an experimental mammal) to estimate the effects of exposure in another species (usually humans)

squamous-cell papillomas — type of benign tumor

stand — contiguous group of trees sufficiently uniform in species composition, age, and condition to be distinguishable as a unit

stand composition — variety of vegetation species in a stand

stand growth — increases in wood, dry matter, or biomass with a stand

stand structure — combination of species, ages, sizes, and numbers of trees that describe a stand

standard deviation — expression of the variability in a sample or population

standard-normal distribution — normal distribution with a mean of zero and a standard deviation of one

sterile insect technique — gypsy moth treatment that reduces the chance of fertile female gypsy moths mating with fertile males and producing fertile eggs, by the release of large numbers of (1) male pupae sterilized by radiation, (2) male pupae irradiated but not sterilized, or (3) eggs from mating of irradiated males with non-irradiated females

stewardship and stewardship incentives programs — cooperative programs between the Forest Service and States, to provide financial and technical assistance for silvicultural planning on non-Federal forested areas for private landowners

strain — group within a species that differs physiologically rather than in form or structure

strategy — planned actions with specific objectives; the strategies of eradication, suppression, and slow the spread make-up the alternatives examined in this environmental impact statement

***Streptococcus* (pl. *Streptococci*)** — genus of bacteria, which—depending on its classification—may be associated with infections in humans

stressor — an agent, such as an insecticide or the gypsy moth, that causes stress to an ecosystem

subcanopy — cover of branches and foliage formed collectively by trees and other woody growth that is below the principal canopy

subchronic exposure — exposure studies that can last for different periods of time, but 90 days is the most common duration; the subchronic exposure study is usually performed in two species (rat and dog) by the route of intended use or exposure

subchronic reference dose — oral dose (mg/kg/day) not likely to be associated with adverse effects over a less-than-lifetime exposure, in the general population, including sensitive subgroups

subchronic toxicity — adverse biologic response of an organism, such as mortality or an effect on growth or reproductive success, resulting from repeated or short-term (3 month) doses (exposures) of a compound, usually at low concentrations

subconjunctival — refers to the area beneath the membrane that lines the eyelids and eyeball

subcutaneous — just below the skin

subdominant trees — trees with crowns below the general level of the canopy and that receive little or no direct light from above; trees whose crowns make up the subcanopy (Smith 1986)

substrate — with reference to enzymes, the chemical that the enzyme acts upon

succession — natural and gradual replacement of one community of plants by another

succinylcholine — neuromuscular blocking agent

sufficient similarity — as applied to chemical mixtures, whether or not the data on one or more samples of a complex and variable mixture can or should be used for dose-response assessments for all such mixtures

sulfhemoglobinemia — presence of abnormal pigments, other than methemoglobin, in red blood cells

Supplemental Environmental Impact Statement — a document that is written to provide a supplement to the original Environmental Impact Statement

suppression — strategy of reducing outbreak populations of the gypsy moth in areas where it is already established, or is a permanent resident, to prevent or minimize damage to resources

survey — see defoliation survey, delimiting survey, detection survey, egg mass survey, larval survey, National Gypsy Moth Survey, population survey, post-treatment survey, and transition area survey

susceptible plants — plants with leaves the gypsy moth will eat

synapse — space between two nerve cells or a nerve cell and an effector cell such as muscle

synergism — action of two or more substances to achieve an effect of which each is individually incapable; synergistic effects may be greater or less than the sum of effects of the substances in question

synergistic effect — situation in which the combined effects of two chemicals are much greater than the sum of the effect of each given agent alone

systemic — entering and then distributing throughout the body of an organism

systemic effects — effects that require absorption of a toxic agent at an entry point and distribution to a distant site at which effects are produced

systemic toxicity — effects that require absorption and distribution of a toxic agent to a site distant from its entry point at which point effects are produced; systemic effects are the obverse of local effects

T

technical assistance — any of a whole range of direct and indirect help that USDA provides to Federal and State cooperators, short of providing monetary funds; this assistance includes but is not limited to providing training, providing assistance in preparing environmental documents, work and safety plans, contracts, and monitoring plans, and providing assistance on site during the conduct and evaluation of gypsy moth projects

technology transfer — disseminating research results and adapting innovations so government and private parties can use them

1-day health advisory — drinking water concentration (mg/L) not likely to cause adverse effects in the general population, including sensitive subgroups, after 1 day of exposure

teratogenic — relating to or causing developmental malformations

teratology — study of malformations induced during development from conception to birth

thinning from below — silvicultural technique of removing the subdominant trees in a forest stand, leaving the dominant trees more or less evenly distributed over the stand

threatened species — Federal designation for any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (the Federal list of threatened species is maintained by the Secretary of the Interior)

threshold — maximum dose or concentration level of a chemical or biological agent that will not cause an effect in the organism

threshold-limit value — air concentration, in milligrams per cubic meter (mg/m^3), not likely to cause adverse effects in exposed workers, over a normal period of work

Thuricide — one of the commercial formulations of *B.t.k.*

toxic — poisonous to organisms

toxicant — poisonous substance such as the active ingredient in pesticide formulations that can injure or kill plants, animals, or microorganisms

toxicity — capacity of a poison to cause adverse effects

toxicological benchmark value (or benchmark value) — values determined for any of a number of toxicological tests, such as lethal dose $_{50}$, lethal concentration $_{50}$, no-observed-adverse-effect level, lowest-observed-adverse-effect level

toxicology — science that deals with poisons and their effects and problems involved (such as clinical, industrial, or legal)

toxins — chemicals that may cause toxic effects, often used when referring to naturally occurring toxic agents, especially proteins

transition area — area between the uninfested area and generally infested area; populations are discontinuous, consist mostly of adult male moths, and occasionally other life stages; population outbreaks do not occur, and defoliation is uncommon

transition area survey — monitoring gypsy moths in the transition area to provide date that support the decision to quarantine an area or to take other management action

treatment threshold — population level reached by an insect pest that indicates treatment is necessary to prevent unacceptable damage to other resources

triangular distribution — theoretical frequency-distribution shaped like a triangle and described by a minimum, maximum, and likeliest values

trichopteran — insects in the order Trichoptera, in which the adults are terrestrial and immature life stages are almost exclusively aquatic in freshwater; caddisflies

trophic levels — feeding levels—for example, primary producer, herbivore, and first-level carnivore

U

uncertainty factor — factor used in deriving the risk-reference values and similar values from experimental data; uncertainty factors are intended to account for variation in sensitivity among people, the uncertainty in extrapolating animal data to humans, and other sources of uncertainty; common uncertainty factors are 10, 100, and 1,000

understory — vegetation layer below the canopy of other plants, formed by shade-tolerant trees and low shrubs, grasses, and other herbaceous plants

uninfested area — area outside the generally infested area and ahead of the transition area; adult male moths are occasionally found, other life stages are rarely found; no populations are found, and no outbreaks occur

uniform distribution — theoretical frequency-distribution described by a minimum and a maximum value; all values in the uniform distribution have an equal probability of occurrence

Urban and Community Forestry Program — cooperative program between the USDA Forest Service and States to provide financial and technical assistance to municipalities, school districts, communities, and nonprofit organizations for managing trees on non-Federal lands in urban environments

urban forest — forested areas in cities, towns, and communities

urinalysis — testing of urine samples to determine whether toxic or other physical effects have occurred in an organism

urticaria — skin condition marked by the development of wheals

USDA — acronym for U.S. Department of Agriculture

U.S. EPA — acronym for U.S. Environmental Protection Agency

V

vehicle — substance (usually a liquid) used as a medium for suspending or dissolving the active ingredient; commonly used vehicles include water, acetone, and corn oil

vertebrates — animals with a spinal column, such as mammals, fish, birds, amphibians, and reptiles

volatile — referring to compounds or substances that have a tendency to vaporize; material that will evaporate quickly

volatility — tendency of a substance to evaporate at normal temperatures and pressures

vulnerability — likelihood that a tree or plant will die if defoliated

W

watershed — area of land with a characteristic drainage network that contributes to the same surface flow

wheal — smooth, slightly elevated area on the body surface, which is more red or more pale than the surrounding skin; often accompanied by severe itching and usually changing size or shape or disappearing within a few hours; the typical lesion of urticaria, the dermal evidence of an allergic reaction (allergy), and in sensitive persons may be provoked by mechanical irritation of the skin; also called a hive

X

xenobiotic — chemical that does not naturally occur in an organism; term is often applied generically to all synthetic or man-made chemicals

Z

zooplankton — animals that are dependent on movement of water or air for their position or distribution

Chapter 8
References

Figure 8-1. Civilian Conservation Corps workers scouted for gypsy moths.

Chapter 8 References

Figure

Figure 8-1. Civilian Conservation Corps workers scouted for gypsy moths ..... Cover

References listed are cited in Chapters 1-4 and Appendixes A-E.

A

Aber, R.; DeMelfi, T.; Gill, T.; Healey, B.; McCarthy, M.A. 1982. Rash illnesses associated with gypsy moth caterpillars, Pennsylvania. Morbidity Mortality Weekly Report 31(13): 169-170.

Ables, J.R.; West, R.P.; Shepard, M. 1975. Response of the house fly and its parasitoids to Dimilin© (TH-6040). Journal of Economic Entomology 68(5): 622-624.

Addison, J.A. 1993. Persistence and non-target effects of *Bacillus thuringiensis* in soil: a review. Canadian Journal of Forest Research 23: 2329-2342.

Addison, J.A. 1996. Safety testing of tebufenozide, a new molt-inducing insecticide, for effects on non-target soil invertebrates. Ecotoxicological and Environmental Safety 33(1): 55-61.

Ali, A.; Mulla, M.S. 1978a. Effects of chironomid larvicides and diflubenzuron on non-target invertebrates in residential-recreational lakes. Environmental Entomology 7(2): 21-27.

Ali, A.; Mulla, M.S. 1978b. Impact of the insect growth regulator diflubenzuron on invertebrates in a residential-recreational lake. Archives of Environmental Contamination and Toxicology 7: 483-491.

Ali, A.; Nigg, H.N.; Stamper, J.H.; Kok-Yokomi, M.L.; Weaver, M. 1988. Diflubenzuron application to citrus and its impact on invertebrates in an adjacent pond. Bulletin of Environmental Contamination and Toxicology 41(5): 781-790.

Allen, D.; Bowersox, T. 1989. Regeneration in oak stands following gypsy moth defoliations. In: Rink, George; Budelsky, Carl A., editors. Proceedings: Seventh Central Hardwood Forest Conference; 1989 March 5-8; Carbondale, IL. Gen. Tech. Rep. NC-132. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 67-73.

Anderson, J.F.; Furniss, W. E. 1983. Epidemic of urticaria associated with first-instar larvae of the gypsy moth (Lepidoptera: Lymantriidae). Journal of Medical Entomology 20(2): 146-150.

Andreadis, T.G.; Weseloh, R.M. 1990. Discovery of *Entomophaga maimaiga* in North American gypsy moth, *Lymantria dispar*. Proceedings of the National Academy of Science 87: 2461-2465.

Apperson, C.; Schaefer, C.; Colwell, A. 1977. Effects of diflubenzuron on *Chaoborus astictopus* Dyar and Shannon (Diptera: Chaoboridae) and non-target organisms, and persistence of diflubenzuron in lentic habitats. (Unpublished study received Jul 31, 1978; prepared by North Carolina (California), Mosquito Abatement District; submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL: 234511-AC). MRID No.00099897.

Atkins, E.L.; Greywood-Hale, E.A.; and Macdonald, R.L. 1974. Effect of pesticides on agriculture; 1974 Annual Report: Project No. 1499. (Unpublished study received October 21, 1976 under 6F1696; prepared by The University of California at Riverside Agricultural Experimental Station, Department of Entomology, Citrus Research Center. Submitted by E.I. duPont de Nemours & Company, Inc., Wilmington, Delaware, CDL: 095326-K). MRID No.00040601. Summarized in U.S. EPA 1997a.

ATSDR (Agency for Toxic Substances and Disease Registry) 1993. Cholinesterase-inhibiting pesticide toxicity. Case studies in environmental medicine 22. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

B

Barber, K.N.; Kaupp, W.J.; Holmes, S.B. 1993. Specificity testing of the nuclear polyhedrosis virus of the gypsy moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae). The Canadian Entomologist. 125: 1055-1066.

Bardwell, C.J.; Averill, A.L. 1996. Effectiveness of larval defenses against spider predation in cranberry ecosystems. Environmental Entomology 25(5): 1083-1091.

Beavers, J.; Ross, T.; Jaber, M. 1993a. RH-5992 Technical: A one generation reproduction study with the Mallard (*Anas platyrhynchos*): Lab Project Number 129-148: 90RC-0222: 91P-222. Unpublished study prepared by Wildlife International, Ltd. MRID No. 42991503.

Beavers, J.; Ross, T.; Jaber, M. 1993b. RH-5992 Technical: A one-generation reproduction study with the Bobwhite (*Colinus virginianus*): Lab Project Number: 129-147: 90RC-0267: HWA 417-481. Unpublished study prepared by Wildlife International, Ltd. MRID No.42991501.

Bell, J.L.; Whitmore, R.C. 1997a. Eastern towhee numbers increase following defoliation by gypsy moths.Auk. 114(4): 708-716.

Bell, J.L.; Whitmore, R.C. 1997b. Bird populations and habitat in *Bacillus thuringiensis* and Dimilin® treated and untreated areas of hardwood forest. American Midland Naturalist. 137(2): 239-250.

Bellinger, R.G.; Ravlin, F.W.; McManus, M.L. 1988. Host plant species and parasitism of gypsy moth (Lepidoptera: Lymantriidae) egg masses by *Ooencyrtus kuvanae* (Hymenoptera: Encyrtidae). Environmental Entomology 17(6): 936-940.

Berry, R.E.; Noldenke, A.F.; Miller, J.C.; Wernz, J.G. 1993. Toxicity of diflubenzuron in larvae of gypsy moth (Lepidoptera: Lymantriidae); effects of host plant. Journal of Economic Entomology 86: 809-814.

Bess, H.A.; Spurr, S.H.; Littlefield, E.W. 1947. Forest site conditions and the gypsy moth. Harvard Forest Bulletin 22, Petersham, MA.

Bettancourt, M. 1992. RH-5992 Technical: Toxicity to Fathead Minnow (*Pimephales promelas*) embryos and larvae: Final Report; Lab Project Number 91-9-3923: 86.0291.6133.120: 90RC-0212. Unpublished study prepared by Springbo. MRID No. 42436242.

Biddinger, D.J.; Hull, L.A. 1995. Effects of several types of insecticides on the mite predator *Stethorus punctum* (Coleptera: Coccinellidae), including insect growth regulators and abamectin. Journal of Economic Entomology. 88(2): 358-366.

Biddinger, D.J.; Hull, L.A.; Rajotte, E.G. 1998. Stage specificity of various insecticides to tufted apple bud moth larvae (Lepidoptera: Cidae). Journal of Economic Entomology 91(1): 200-208.

Blumenthal, E.M.; Fusco, R.A.; Readon, R.C. 1981. Parasite augmentation. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC, U.S. Department of Agriculture: 402-408.

Bogenschutz, H.; Maier, K.; Trzebitzky, C. 1989. Gypsy moth outbreak and control in southwest Germany, 1984-86. In: Wallner, William E.; McManus, Katherine A., technical coordinators. Proceedings, Lymantriidae: a comparison of features of new and old world tussock moths; 1988 June 26-July 1; New Haven, CT. Gen. Tech. Rep. NE-123. Broomall, PA (now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 89-99.

Boyle, T.P.; Farichild, J.F.; Robinson-Wilson, E.F. 1996. Ecological restructuring in experimental aquatic mesocosms due to the application of diflubenzuron. Environmental Toxicology and Chemistry 15: 1806-1814.

Broadbent, A.B.; Pree, D.J. 1984. Effects of diflubenzuron and BAY SIR 8514 on beneficial insects associated with peach. Environmental Entomology 13(1):133-136.

Brooks, R.T.; Smith, H.R.; Healy, W.M. 1998. Small-mammal abundance at three elevations on a mountain in central Vermont, USA: a sixteen-year record. Forest Ecology and Management 110(1-3): 181-193.

Brown, J.J. 1996. The compatibility of tebufenozide with a laboratory lepidopteran host-hymenopteran parasitoid population. Biol. Control 6(1): 96-104.

Brown, M.W. 1984. Literature review of *Ooencyrtus kuvanae* (Hymenoptera: Encyrtidae), an egg parasite of *Lymantria dispar* (Lepidoptera: Lymantriidae). Entomophaga 29 (3): 249-265.

Brown, M.W.; Cameron, E. A. 1979. Effects of disparlure and egg mass size on parasitism by the gypsy moth egg parasite. *Ooencyrtus kuwanai*. Environmental Entomology 8(2): 77-80.

Brown, M.W.; Respicio, N.C. 1981. Effect of diflubenzuron on the gypsy moth egg parasite *Ooencyrtus kuwanai* (Hymenoptera: Encyrtidae). Melsheimer Entomology Series 31: 1-7.

Buckner, C.H.; McLeod, B.B.; Kingsbury, P.D. 1975. The effect of an experimental application of Dimilin® (4) upon selected forest fauna. Rep. CC-X-97. Ottawa, ON: Environment Canada, Forestry Service, Chemical Control Research Institute.

Bull, D.L.; Coleman, R.J. 1985. Effects of Pesticides on *Trichogramma* spp. Southwestern Entomologist Supplement 0(8): 156-168.

Burrill, E.A.; Worrall, J.J.; Wargo, P.M.; Stehman, S.V. 1999. Effects of defoliation and cutting in eastern oak forests on *Armillaria* spp. and a competitor, *Megacollybia platyphylla*. Canadian Journal of Forest Research 29(3): 347-355.

Butler, L. 1993. Dimilin® impact on Lepidoptera and other canopy arthropods: preliminary results. In: Fosbroke, Sandra L.C.; Gottschalk, Kurt W., eds. Proceedings, U.S. Department of Agriculture Interagency Gypsy Moth Research Form; 1993 January 19-22; Annapolis, MD. Gen. Tech. Rep. NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 28.

Butler, L.; Strazanac, J. 2000. Occurrence of Lepidoptera on selected host trees in two central Appalachian National Forests. Annals of the Entomological Society of America 93(3): 500-511.

Butler, L.; Chrislip, G.A.; Kondo, V.A.; Townsend, E.C. 1997a. Effect of diflubenzuron on non-target canopy arthropods in closed, deciduous watersheds in a central Appalachian forest. Journal of Economic Entomology 90(3): 784-794.

Butler, L.; Kondo, V.; Blue, D. 1997b. Effects of tebufenozide (RH-5992) for gypsy moth (Lepidoptera: Lymantriidae) suppression on non-target canopy arthropods. Environmental Entomology 26 (5): 1009-1015.

C

Cameron, E. A. 1981. On the persistence of disparlure in the human body. Journal of Chemical Ecology 7(2): 313-317.

Cameron, E. A. 1983. Apparent long-term bodily contamination by disparlure, the gypsy moth (*Lymantria dispar*) attractant. Journal of Chemical Ecology 9(1): 33-37.

Campbell, C.A. 1974a. Survival of reptiles and amphibians in urban environments. In: Proceedings of symposium: Wildlife in an urban environment. Planning and Resource Development Series No. 28, Holdsworth National Resources Center: 61-66.

Campbell, R.W. 1974b. The gypsy moth and its natural enemies. Agricultural Information Bulletin. 381. Washington, DC: U.S. Department of Agriculture, Forest Service.

Campbell, R.W. 1979. Gypsy moth: forest influence. Agriculture Information Bulletin 423. Washington, DC: U.S. Department of Agriculture, Forest Service.

Campbell, R.W.; Sloan, R.J. 1976. Influence of behavioral evolution of gypsy moth pupal survival in sparse populations. Environmental Entomology 5(6): 1211-1217.

Campbell, R.W.; Sloan, R.J. 1977a. Forest stand response to defoliation by the gypsy moth. Society of American Foresters, Forest Science Monograph 19.

Campbell, R.W.; Sloan, R. J. 1977b. Natural regulation of innocuous gypsy moth populations. Environmental Entomology 6(2): 315-322.

Campbell, R.W.; Sloan, R.J. 1977c. Release of gypsy moth populations from innocuous levels. Environmental Entomology 6(2): 323-330.

Campbell, R.W.; Valentine, H.T. 1971. Tree condition and morality following defoliation by the gypsy moth. Research Paper NE-236. Broomall, PA (Now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Campbell, R.W.; Hubbard, D.L.; Sloan, R.J. 1975. Location of gypsy moth pupae and subsequent pupal survival in sparse, stable populations. Environmental Entomology 4(4): 596-600.

Campbell, R.W.; Sloan, R.J.; Biazak, C.E. 1977. Sources of morality among late instar gypsy moth larvae in sparse populations. Environmental Entomology 6(6): 865-871.

Cannon, G.; Krize, J. 1976. TH-6040 Egg-to-egg reproduction study in Fathead Minnows: Laboratory No. 5E-6094. (Unpublished study received July 19, 1976 under 148-1262; prepared by Cannon Laboratories, Inc., submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL:096209-I; 225306). MRID No. 00099755.

Carter, J.L.; Schweitzer, D.F.; Reardon, R. 1995. The effects of two applications of *Bacillus thuringiensis* on non-target Lepidoptera. Final report. Hamden, CT: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Centa, A.; Camera, G.; Zucchinetti, P.; DiPetro, P. 1985. Methemoglobinemia in the newborn and nursing infant: genetic and acquired forms (Italian). Pathologica 77(1052): 659-655.

Chandel, R.S.; Gupta, P.R. 1992. Toxicity of diflubenzuron and penfluron to immature stages of *Apis cerana indica* and *Apis mellifera.* Apidologie. 23(5): 465-473.

Clement, R.C.; Nisbet, I.C. 1972. The suburban woodland: trees and insects in the human environment. Audubon Conservation. Rep. 2. New York, NY: National Audubon Society.

Cochran, M.; Poling, P. 1995. Chapter 9. Pollinating insects – Honey bees: 77-80. In: Reardon, R.C., ed. Effects of Diflubenzuron on Non-target Organisms in Broadleaf Forested Watersheds in the Northeast. USDA National Center of Forest Health Management. FHM-CN-05-95. November 1995.

Collins, S. 1961. Benefits in understory from canopy defoliation by gypsy moth larvae. Ecology 42(4): 836-838.

Colwell, A.E.; Schaefer, C.H. 1980. Diets of *Ictalurus nebulosus* and *Poxomis nigromaculatus* altered by diflubenzuron. Canadian Journal of Fisheries and Aquatic Science 37: 632-639.

Cook, S.P.; Smith, H.R.; Hain, F.P.; Hastings, F.L. 1995. Predation of gypsy moth (Lepidoptera: Lymantriidae) pupae by invertebrates at low small mammal population densities. Environmental Entomology 24(5): 1234-1238.

Cooper, R.J. 1988. Dietary relationships among insectivorous birds of an eastern deciduous forest. Morgantown: Ph.D. thesis, West Virginia University.

Cooper, R.J.; Dodge, K.M.; Martinat, P.J.; Donahoe, S.B.; Whitmore, R.C. 1990. Effect of diflubenzuron application on eastern deciduous forest birds. Journal of Wildlife Management 54(3): 486-493.

Corbett, E.S.; Lynch, J.A. 1987. The gypsy moth—does it affect soil and water resources? In: Fosbroke, Sandra; Hicks, Ray R., Jr., eds. Proceedings of the workshop: Coping with the gypsy moth in the new frontier; 1987 August 4-6; Morgantown, WV. West Virginia University Books: 39-46.

Council on Environmental Quality. 1992. Regulations for implementing the procedural provisions of the National Environmental Policy Act. 40 CFR Parts 1500-1508. Washington, DC.

D

Das Gupta, A.; Vaidya, M.S.; Bapat, J.P.; Pavri, R.S.; Baxi, A.J.; Advani, S.H. 1980. Associated red cell enzyme deficiencies and their significance in a case of congenital enzyomopenic methemoglobinemia. Acta Haematol. (Basel) 64(5): 285-288.

Davidson, C.B.; Gottschalk, K.W.; Johnson, J.E. 1999. Tree mortality following defoliation by the European gypsy moth (*Lymantria dispar* L.) in the United States: a review. Forest-Science 45(1): 74-84.

De Clercq, P.; De Cock, A.; Tirry, L.; Vinuela, E.; Degheele, D. 1995. Toxicity of diflubenzuron and pyriproxyfen to the predatory bug *Podisus maculiventris*. Entomologia Experimentalis et Applicata 74(1): 17-22.

DeGraaf, R.M. 1987. Breeding birds and gypsy moth defoliation: Short-term responses of species and guilds. Wildlife Society Bulletin 15: 217-221.

DeGraaf, R.M.; Holland, D.G. 1978. Response of breeding birds to gypsy moth defoliation of an upland oak forest. Trans Northeast Section Wildlife Society 35: 105-119.

Delbeke, F.; Vercruysse, P.; Tirry, L.; De Clercq, P.; Degheele, D. 1997. Toxicity of diflubenzuron, pyriproxyfen, imidacloprid and diafenthiuron to the predatory bug *Orius laevigatus* (Het.: Anthocoridae). Entomophaga 42: 349-358.

Dhadialla, T.S.; Carlson, G.R.; Le, D.P. 1998. New Insecticides with ecdysteroidal and juvenile hormone activity. Annual Review of Entomology 43: 545-569.

Dirr, M.A. 1990. Manual of woody landscape plants: their identification, ornamental characteristics, culture, propagation and uses. 4th ed. Champaign, IL: Stipes Publishing Co.

Doane, C.C. 1970. Primary pathogens and their role in the development of an epizootic in the gypsy moth. Journal of Invertebrate Pathology 15: 31-33.

Doane, C.C. 1971. A high rate of parasitization of *Brachymeria intermedia* (Hymenoptera: Chalcididae) on the gypsy moth. Annals of the Entomological Society of America 64(3): 753-754.

Doane, C.C.; McManus, M.L., eds. 1981. The gypsy moth: research toward intergrated pest management. Tech. Bull. 1584. Washington, DC: U.S. Department of Agriculture.

Downey, D.M. 1991. Do gypsy moths impact stream water chemistry? Appalachian Gypsy Moth Integrated Pest Management Demonstrations Project News 4(9): 1-3.

Downey, D.M.; Armstrong, James D.; Bennett, Kevin H.; French, Christopher R.; Graul, Timothy W. 1994. Impact of watershed defoliation by gypsy moths: water chemistry changes in low ANC head streams. Harrisonburg, VA: James Madison University, Department of Chemistry.

Dubois, N.R. 1991. Insect and foliage development. In: Reardon, Richard, Aerial spraying for gypsy moth control: a handbook of technology. NA-TP-20 [Radnor, PA]: U.S. Department of Agriculture, Forest Service, Northeastern Area and Northeastern Forest Experiment Station: 108-111.

Dubois, N.R.; Reardon, R.C.; Kolodny-Hirsh, D.M. 1988. Field efficacy of the ND-12 strain of *Bacillus thuringiensis* against gypsy moth (Lepidoptera: Lymantriidae). Journal of Economic Entomology 81(6): 1672-1677.

Dunlap, T.R. 1980. The gypsy moth: a study in science and public policy. Journal of Forest History 24(3): 116-126.

Dwyer, J. F.; McPherson, E. G.; Schroeder H. W.; Rowntree, R. A. 1992. Assessing the benefits and costs of the urban forests. Journal of Arboriculture 18: 227-234.

E

Eagle, T.R., Jr. 1993. The effects of gypsy moth defoliation on soil water nutrient concentration in two forest cover types in West Virginia. Morgantown: West Virginia University; Masters thesis: 10-16, 72-81, 147-148.

Ehrenfeld, J.G. 1980. Understory response to canopy gaps of varying size in a mature oak forest. Bulletin of the Torrey Botanical Club 107(2): 29-41.

Elkinton, J.S.; Liebhold, A.M. 1990. Population dyanmics of gypsy moth in North America. Annual Review of Entomology 35: 571-596.

Elkinton, J.S.; Gould, J.R.; Liebhold, A.M.; Smith, H.R.; Wallner, W.E. 1989. Are gypsy moth populations in North America regulated at low density? In: Wallner, William E.; McManus, Katherine A., technical coordinators. Proceeding, Lymantriidae: a comparison of features of new and old world tussock moths; 1988 June 26-July 1; New Haven, Ct. Gen. Tech. Rep. NE-123. Broomall, PA (now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 233-249.

Elkinton, J.S.; Hajek, A.E.; Boettner, G.H.; Simons, E.E. 1991. Distribution and apparent spread of Entomophaga maimaiga (Zygomycetes: Entomophthorales) in gypsy moth (Lepidoptera: Lymantriidae) populations in North America. Environmental Entomology 20(6): 1601-1605.

Elkinton, J.S.; Healy, W.M.; Buonaccorsi, J.P.; Boettner, G.H.; Hazzard, A.M.; Smith, H.R.; Liebhold, A.M. 1996. Interactions among gypsy moths, white-footed mice, and acorns. Ecology 77(8): 2332-2342.

Elkinton, J.S.; Healy, W.M.; Liebhold, A.M.; Buonaccorsi, J.P.; McShea, W.J. (ed.); Healy, W.M. 2002. Gypsy moths and forest dynamics. Johns Hopkins University Press; Baltimore Oak Forest Ecosystems: Ecology and Management for Wildlife: 100-112.

Elliot, R.H.; Iyer, R. 1982. Toxicity of diflubenzuron to nymphs of the migratory grasshopper Melanoplus sanguinipes (Orthoptera: Acrididae). Canadian Entomologist 114(6): 479-484.

Emmett, B.J.; Archer, B.M. 1980. The toxicity of diflubenzuron to honey bee (Apis mellifera L.) colonies in apple orchards. Plant Pathology 29(4): 177-183.

F

Farlow, J. 1976. Ecological impact of Dimilin® on the aquatic fauna of a Louisiana coastal marsh. Doctoral dissertation, Louisiana State University, Agricultural and Mechanical College, Dept. of Entomology. (Unpublished study received Dec 23, 1976; submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL:095650-K). MRID No. 00099678.

Farrar, R.R., Jr.; Martin, P.A.W.; Ridgway, R.L. 1996. Host plant effects on activity of Bacillus thuringiensis against gypsy moth (Lepidoptera: Lymantriidae) larvae. Environmental Entomology 25(5): 1215-1223.

Federal Register (FR), 69 FR 23492-93, April 29, 2004, Notice of Intent to Prepare a Supplement to the Final Environmental Impact Statement for Gypsy Moth Management in the United States: a Cooperative Agreement.

Federal Register (FR), 71 FR 12674-75, March 13, 2006, Revised Notice of Intent to Prepare a Supplement to the Final Environmental Impact Statement for Gypsy Moth Management in the United States: a Cooperative Agreement.

Feicht, D. L.; Fosbroke, S.L.C.; Twery, M.J. 1993. Forest stand conditions after 13 years of gypsy moth infestation. In: Gillespie, A. R.; Parker, G.R.; Pope, Phillips E.; Rink, G., editors. Proceedings, Ninth Central Hardwood Forest Conference; 1993 March 8-10, West Lafayette, IN. General Technical Report NC-161. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 130-144.

Fletcher, D. 1990. 8-Day Dietary LC_{50} with RH-5992 technical in mallard ducklings, Lab Project Number 87RC-0055: 87P-210: BLAL 87 DC 93. Unpublished study prepared by Bio-Life Associates MRID No. 42436237.

Ford-Robertson, F.C., ed. 1971. Terminology of forest science, technology practice and products. Society of American Foresters, Washington, DC.

Fosbroke, D.E.; Hicks, R.R., Jr. 1989. Tree mortality following gypsy moth defoliation in southwestern Pennsylvania. In: Rink, George; Budelsky, Carl A., editors. Proceedings, Seventh Central Hardwood Forest Conference; 1989 March 5-8; Carbondale, IL. General Technical Report. NC-13. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station: 74-80.

Fuester, R.W.; Taylor, P.B. 1996. Differential mortality in male and female gypsy moth (Lepidoptera: Lymantriidae) pupae by invertebrate natural enemies and other factors. Environmental Entomology 25(2): 536-547.

G

Gaddis, P.K. 1987. Secondary effects of B.t. spray on avian predators: the reproductive success of chickadees. Oregon Department of Agriculture, Plant Division Report, Salem.

Gaddis, P.K.; Corkran, C.C. 1986. Secondary effects of B.t. spray on avian predators: the reproductive success of chestnut-backed chickadees. Oregon Department of Agriculture, Plant Division Report 86-03, Salem.

Gansner, D.A.; Arner, S.L.; Widmann, R.H.; Alerich, C.L. 1993a. After two decades of gypsy moth, is there any oak left? Northern Journal of Applied Forestry 10(4): 184-186.

Gansner, D.A.; Arner, S.L.; Widmann, R.H.; Alerich, C.L. 1993b. What's happening to Pennsylvania's oaks? In: Finley, James C.; Jones, Stephen B., eds. Penn's Woods – Change and Challenge. Proceedings of the Penn State Forest Resources Issues Conference; 1993 April 1-2; State College, PA: 15-22.

Gansner, D.A.; Arner, S.L.; Widmann, R.H.; Alerich, C.L. 1993c. What's up with Billy Penn's oak? In: Twardus, Daniel B., editor. Gypsy Moth News 33: 4-7.

Gansner, D.A.; Herrick, O.W.; White, W.B. 1978. Economic analysis of the gypsy moth problem in the Northeast: IV. Forest stand hazard ratings for gypsy moth. Res. Pap. NE-410. Broomall, PA (Now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Garvey, N. 1992. RH-5992 Technical-subacute (14-day) toxicity to earthworms (Eisenia foetida): Final report: Lab Project Number 91-11: 4003: 90RC-0211. Unpublished study prepared by Springborn Labs, Inc. MRID No. 42991511.

Gaugler, R. 1981. Biological control potential of neoaplectanid nematodes. Journal of Nematology 13(3): 241-249.

Giese, R.L.; Casagrande, R.A. 1981. Egg development and diapause. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1548. Washington, D.C.: U.S. Department of Agriculture: 145-146.

Gijswijt, M.J. 1978. Investigations with Dimilin® on bees. Crop Protection Division, Phillips-Duphar B.V., Graveland, the Netherlands.

Gilbert, O. L. 1989. The ecology of urban habitats. New York; Chapman and Hall: 369.

Gill, D.; Bonnett, P. 1973. Nature in the urban landscape. Baltimore, MD: York Press: 36-56.

Glare, T.R.; O'Callaghan, M. 2000. Bacillus thuringiensis: Biology, ecology and safety. John Wiley & Sons, Ltd., New York.

Gordon, R.; Cornect, M. 1986. Toxicity of the insect growth regulator diflubenzuron to the rove beetle Aleochara bilineata, a parasitoid and predator of the cabbage maggot Delia radicum. Entomologia Experimentalis et Applicata 42(2): 179-186.

Gottschalk, K.W. 1988. Gypsy moth and regenerating Appalachian hardwood stands. In: Proceedings. Guidelines for regenerating Appalachian hardwood stands. May 24-26, 1988; Morgantown, WV, West Virginia University: 241-254.

Gottschalk, K.W. 1990a. Economic evaluation of gypsy moth damage in the United States of America. In: proceedings, XIX World Congress; 1990 August 5-11; Montreal, PQ. Canadian IUFRO World Congress Organizing Committee: 235-246.

Gottschalk, K.W. 1990b. Gypsy moth effects on mast production. In: McGee, Charles E., editor. Proceedings of the workshop: Southern Appalachian mast management; 1989 August 14-16; Knoxville, TN. University of Tennessee: 42-50.

Gottschalk, K.W.; MacFarlane, W. R. 1993. Photographic guide to crown condition of oaks: use of gypsy moth silvicultural treatments. General Technical Report NE-168. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Grace, J.R. 1986. The influence of gypsy moth on the composition and nutrient content of litter fall in a Pennsylvania oak forest. Forest Science 32(4): 855-870.

Graves, W.; Smith, G. 1992a. RH-5992 Technical: A 48-hour static acute toxicity test with the Cladoceran (Daphnia magna): Final Report: Lab Project Number 129A-109: 90RC- 0065. Unpublished study prepared by Wildlife International, Ltd. MRID No. 42436241.

Graves, W.; Smith, G. 1992b. RH-5992 Technical: A 96-hour static acute toxicity test with the Bluegill (Lepomis macrochirus): Final Report: Lab Project Number 129A-108: 90RC- 0063. Unpublished study prepared by Wildlife International, Ltd. MRID No. 42436239.

Graves, W.; Smith, G. 1992c. RH-5992 Technical: A 96-hour static acute toxicity test with the Rainbow Trout (Oncorrhynchus mykiss): Lab Project Number 129A-110: 90RC-0064. Unpublished study prepared by Wildlife International, Ltd. MRID No. 42436240.

Griffith, M.B.; Barrows, E.M.; Perry, S.A. 1996. Effects of aerial application of diflubenzuron on emergence and flight of adult aquatic insects. Journal of Economic Entomology 89: 442-446.

Griffith, M.B.; Barrows, E.M.; and Perry, S.A. 2000. Effect of diflubenzuron on flight of adult aquatic insects (Plecoptera, Trichoptera) following emergence during the second year after aerial application. Journal of Economic Entomology 93(6): 1695-1700.

Grushecky, S.T.; Liebhold, A.M.; Greer, R.; Smith, R.L. 1998. Does forest thinning affect predation on gypsy moth (Lepidoptera: Lymantriidae) larvae and pupae? Environmental Entomology 27(2): 268-276.

H

Hagler, L.; Askew, E.W.; Neville, J.R.; Mellick, R.W.; Coppes, R.I.; Lowder, J.F. 1981. Influence of dietary iron-deficiency on hemoglobin, myoglobin, their respective reductases, and skeletal muscle mitochondrial respiration. American Journal of Clinical Nutrition 34(10): 2169-2177.

Hajek, A.E.; Humber, R.A. 1997. Formation and germination of Entomophaga maimaiga azygospores. Canadian Journal of Botany 75(10): 1739-1747.

Hajek, A.E.; Roberts, D.W. 1992. Field diagnosis of gypsy moth (Lepidoptera: Lymantriidae) larval mortality caused by Entomophaga maimaiga and the gypsy moth nuclear polyhedrosis virus. Environmental Entomology 21(4): 706-713.

Hajek, A.E.; Shimazu, M. 1996. Types of spores produced by Entomophaga maimaiga infecting the gypsy moth Lymantria dispar. Canadian Journal of Botany 74(5): 708-715.

Hajek, A.E.; Humber, R.A.; Elkinton, J.S.; May, B.; Walsh, S.R.A.; Silver, J.C. 1990. Allozyme and restriction fragment length polymorphism analyses confirm Entomophaga maimaiga responsible for 1989 epizootics in North American gypsy moth populations. Proceedings of the National Academy of Sciences of the United States of America 87(18): 6979-6982.

Hajek, A.E.; Butler, L.; Wheeler, M.M. 1995a. Laboratory bioassays testing the host range of the gypsy moth fungal pathogen *Entomophaga maimaiga*. Biological Control 5(4): 530-544.

Hajek, A.E.; Renwick, J.A.A.; Roberts, D.W. 1995b. Effects of larval host plant on the gypsy moth (Lepidoptera: Lymantriidae) fungal pathogen, *Entomophaga maimaiga* (Zygomycetes: Entomophthorales). Environmental Entomology 24(5): 1307-1314.

Hajek, A.E.; Bauer, L.; McManus, M.L.; Wheeler, M.M. 1998a. Distribution of resting spores of the *Lymantria dispar* pathogen *Entomophaga maimaiga* in soil and on bark. BioControl 43(2): 189-200.

Hajek, A.E.; Butler, L.; Walsh, S.R.A.; Silver, J.C.; Hain, F.P.; Hastings, F.L.; Odell, T.M.; Smitley, D.R. 1998b. Host range of the gypsy moth (Lepidoptera: Lymantriidae) pathogen *Entomophaga maimaiga* (Zygomycetes: Entomophthorales) in the field versus laboratory. Environmental Entomology 25(4): 709-721.

Hajek, A.E.; Olsen, C.H.; Elkinton, J.S. 1999. Dynamics of airborne conidia of the gypsy moth (Lepidoptera: Lymantriidae) fungal pathogen *Entomophaga maimaiga* (Zygomycetes: Entomophthorales). Biological Control 16(1): 111-117.

Hajek, A.E.; Wheeler, M.M.; Eastburn, C.C.; Bauer, L.S. 2001. Storage of resting spores of the gypsy moth fungal pathogen *Entomophaga maimaiga*. Biocontrol Science Technology; October 11.

Hall, D. 1986. Toxicity of Two Insect Growth Regulators on *Ceriodaphnia dubia*. Unpublished study prepared by Colorado State University, Department of Fishery & Wildlife. MRID No. 40130601.

Hansen, S.R.; Garton, R.R. 1982. Ability of standard toxicity tests to predict the effects of the insecticide diflubenzuron on laboratory stream communities. Canadian Journal of Fisheries and Aquatic Sciences 39: 1273-1288.

Hastings, F.L.; Hain, F.P; Smith, H.R.; Cook, S.P.; Monahan J.F. 2002. Predation of gypsy moth (Lepidoptera: Lymantriidae) pupae in three ecosystems along the southern edge of infestation. Environmental Entomology 31(4): 668-675.

Heichel, G. H.; Turner, Neil C. 1976. Phenology and leaf growth of defoliated hardwood trees. In: Anderson, John F.; Kaya, Harry K., editors. Perspectives in forest entomology. New York; Academic Press: 31-40.

Hendersen, C.; Smith, H.D.; Jorgensen, C.D. 1977. Small mammal responses to experimental pesticide applications in coniferous forests. Final report Douglas-fir tussock moth R&D Program RA-8, Pacific Southwest Forest and Range Experiment Station, Berkeley.

Herms, C.P.; McCullough, D.G.; Bauer, L.S.; Haack, R.A.; Miller, D.L.; Dubois, N.R. 1997. Susceptibility of the endangered Karner blue butterfly (Lepidoptera: Lycaenidae) to *Bacillus thuringiensis* var.*kurstaki* used for gypsy moth suppression in Michigan. Great Lakes Entomologist 30(4): 125-141.

Herms, D.A. 2003. Assessing management options for gypsy moth. Pesticide Outlook, February: 14-18.

Hernandez, E.; Ramisse, F.; Gros, P.; Cavallo, J.D. 2000. Super-infection by *Bacillus thuringiensis* H34 or 3a3b can lead to death in mice infected with influenza A virus. FEMS Immunology Med Microbioloby 29: 177-161.

Herrick, O.W. 1982. Hazard rating forest trees threatened with gypsy moth invasion. In: Coping with the gypsy moth. Proceedings of the Penn State Forest Resources Issues Conference; 1982 February 17-18; University Park, PA: 38-42.

Herrick, O.W.; Ganser, D.A. 1986. Gypsy moth on a new frontier: forest tree defoliation and mortality, Northern Journal of Applied Forestry 4: 128-133.

Herrick, O.W.; Gansner, D.A. 1987. Morality risks for forest trees threatened with gypsy moth infection. Research Note NE-388. Broomall, PA (now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Herrick, O.W.; Gansner, D.A. 1988. Changes in forest condition associated with gypsy moth on new frontiers of infestation. Northern Journal of Applied Forestry 5(1): 59-61.

Hix, D.M.; Fosbroke, D.E.; Hicks, R.R., Jr.; Gottschalk, K.W. 1991. Development of regeneration following gypsy moth defoliation on Appalachian Plateau and ridge valley hardwood stands. In: McCormick, Larry H.; Gottschalk, Kurt W., editors. Proceedings, 8th Central Hardwood Forest Conference; 1991 March 3-6; University Park, PA. General Technical Report. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service. Northeastern Forest Experiment Station: 347-359.

Hofacker, T.H. 1994. Entomologist, U.S. Department of Agriculture, Forest Service, Forest Pest Management Staff, Washington, DC. [Statement made at meeting with EIS Team]. 14 June.

Holmes, S.B. 1998. Reproduction and nest behavior of Tennessee warblers *Vermivora peregrina* in forests treated with Lepidoptera-specific insecticides. J. Applied Ecology 35: 185-194.

Houston, D.R. 1981a. Oak decline and mortality. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Tech. Bul. 1584. Washington, DC: U.S. Department of Agriculture: 217-219.

Houston, D.R. 1981b. Forest stand relationships. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth; research toward integrated pest management. Tech. Bul. 1584. Washington, DC: U.S. Department of Agriculture: 267-293.

Hurd, M.K.; Perry, S.A.; Perry, W.B. 1996. Non-target effects of a test application of diflubenzuron to the forest canopy on stream macroinvertebrates. Environonmental Toxicology and Chemistry 15(8): 1344-1351.

Hutchens, J.J., Jr.; Benfield, E.F. 2000. Effects of forest defoliation by the gypsy moth on detritus processing in southern Appalachian streams. American Midland Naturalist 143(2): 397-404.

I

Ivie, G. Wayne: Bull, Done L.; Veech, Joseph A. 1980. Fate of diflubenzuron in water. Journal of Agricultural and Food Chemistry 28 (2): 330-337.

J

James, R.R.; Miller, J.C.; Lighthart, B. 1993. *Bacillus thuringiensis* var. *kurstaki* affects a beneficial insect, the cinnabar moth (Lepidoptera: Arctiidae). Journal of Economic Entomology 86(2): 334-339.

Jepson, P.C.; Yemane, A. 1991. Toxicity of diflubenzuron to nymphs of the desert locust *Schistocerca gregaria* Forsk (Orthoptera: Acrididae). Pesticide Science 34(1):92-93.

Johnson, W.; Finley, M.R. 1980. Handbook of acute toxicity of chemicals to fish and aquatic invertebrates. USDI Publication 137, Washington DC. Cited in U.S. EPA 1997.

K

Kaya, H.K.; Readon, R.C. 1982. Evaluaton of *Neoaplectana carpocapsae* for biological control of the western spruce budworm, (*Choristoneura occidentalis*): ineffectiveness and persistence of tank mixes. Journal of Nematology 14(4): 95-597.

Kay, H.K.; Hara, A.H.; Readon, R.C. 1981. Laboratory and field evaluations on *Neoaplectana carpocapsae* (Rhabditda: Steinernematidae) against the elm leaf beetle (Coleoptera: Chrysomelidae) and the western spruce budworm (Lepidoptera: Tortricidae). The Canadian Entomologist 113(3): 787-793.

Keever, D.W.; Bradley, J., Jr.; Ganyard, M.C. 1977. Effects of diflubenzuron (Dimilin®) on selected beneficial arthropods in cotton fields. Environmental Entomology 6(5): 732-736.

Keller, L. 1998. Literature Summary for Tebufenozide (RH-5992). Rohm and Haas Report No. 98R-1055. Report submitted by John W. Long, Product Development Manager, Rohm and Hass: to David F. Thomas, USDA Forest Service, Dec. 1, 1999.

Khakoo, G.A.; Maconochie, I.K.: Jaffer, P. 1993. An unusual blue baby. Journal of Royal Society of Medicine (London) 86(12): 730-731.

Knipling, E. F. 1979. The basic principles of insect population suppression and management. Agricultural Handbook 512. Washington, DC: U.S. Department of Agriculture.

Kolodny-Hirsch, D.M.; Webb, R.E.; Olsen, R.; Venables, L. 1990. Mating disruption of gypsy moth (Lepidoptera: Lymantriidae) following repeated ground application of racemic disparlure. Journal of Economic Entomology 83(5): 1972-1976.

Kozlowski, T.T. 1969. Tree physiology and forest pests. Journal of Forestry 67(2): 118-123.

Kreutzweiser, D.P.; Thomas, D.R. 1995. Effects of a new molt-inducing insecticide, tebufenozide, on zooplankton communities in lake enclosures. Ecotoxicology 4: 307-328.

Kreutzweiser, D.P.; Holmes, S.B.; Capell, S.S.; Eichenberg, D.C. 1992. Lethal and sublethal effects of *Bacillus thuringiensis* var. *kurstaki* on aquatic insects in laboratory bioassays and outdoor stream channels. Bulletin of Environmental Contamination and Toxicology 49: 252-258.

Kreutzweiser, D.P.; Capell, S.S.; Thomas, D.R.; Wainio-Keizer, K.L. 1993. Effects of *B.t.k..* on aquatic microbial activity, detrital decomposition, and invertebrate communities. NAPIAP Proj. NA-25. Sault Ste., Marie, Ontario: Forestry Canada, Forest Pest Management Institute.

Kreutzweiser, D.P.; Capell, S.S.; Wainio-Keizer, K.L.; Eichenberg, D.C. 1994. Toxicity of a new molt-inducing insecticide (RH-5992) to aquatic macroinvertebrates. Ecotoxicology and Environmental Safety 28: 14-24.

Kreutzweiser, D.P.; Ebling, P.M.; Holmes, S.B. 1997. Infectivity and Effects of Gypsy Moth and Spruce Budworm Nuclear Polyhedrosis Viruses Ingested By Rainbow Trout. Ecotoxicology. 38 (1): 63-70.

Kuijpers, L. 1988. The acute toxicity of diflubenzuron to Daphnia magna: Laboratory Project ID: C.303.51.008. Unpublished study prepared by Duphar B.V. MRID No. 40840502.

Kuijpers, L. 1989. The side-effects of diflubenzuron (Dimilin®) on bees: A review. Philips-Duphar B.V., The Netherlands, Crop Protection Division, Report No. 56635/07/89.

Kulman, H.M. 1971. Effects of insect defoliaton on growth and mortality of trees. Annual Review of Entomology 16: 289-324.

Kumar, S.; Dahiya, B.; Chauhan, R.; Jaglan, M.S. 1994. Ovicidal action of diflubenzuron against *Helicoverpa armigera* (Lepidoptera: Noctuidae). Agriculural Science Digest.

L

LaChance, L.E. 1985. Genetic methods for control of Lepidopteran species: status and potential. ARS-28. U.S. Department of Agriculture, Agricultural Research Service. Available from: NTIS, Springfield, VA.

Lahr, J.; Diallo, A.O.; Gadji, B.; Diouf, P.S.; Bedaux, J.J.M.; Badji, A.; Ndour, K.B.; Andreasen, J.E.; Straalen, Nmvan. 2000. Ecological effects of experimental insecticide applications on invertebrates in Sahelian temporary ponds. Environmental Toxicology and Chemistry. 19: 1278-1289.

Lautenschlager, R.A.; Rothenbacher, H.; Podgwaite, J.D. 1976. The response of birds to aerially applied nuclear polyhedrosis virus of the Gypsy Moth, *Lymantria dispar* L. (U.S. Forest Service, Northeastern Forest Experiment Station, Forest Insect and Disease Laboratory and Pennsylvania State Univ., Dept. of Veterinary Pathology for USFS. Unpublished study; CDL:227336-AN). MRID No. 00066108.

Lautenschlager, R.A.; Kircher, C.H.; Podgwaite, J.D. 1977. Effect of nucleopolyhedrosis virus on selected mammalian predators of the gypsy moth. Res. Pap. NE-377. Upper Darby, PA (now Radnor, PA): U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Leonard, D.E. 1981. Bio-ecology of the gypsy moth. In: Doane, Charles C.; McManus, Michael L., eds. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture: 9-29.

Liebhold, A.M.; Gottschalk, K.W.; Mason, D.A.; Bush, R.R. 1997. Forest susceptibility to the gypsy moth. Journal of Forestry 95(5): 20-24.

Liebhold, A.M.; Gottschalk, K.W.; Muzika, R.; Montgomery, M.E.; Young, R.; O'Day, K.; Kelley, B. 1995. Suitability of North American tree species to the gypsy moth: a summary of field and laboratory tests. Gen. Tech. Rep. NE-211. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Lincoln, R. J.; Boxshall, G.A. 1987. The Cambridge illustrated dictionary of natural history. Cambridge University Press.

Little, E.L., Jr. 1979. Checklist of United Sates trees (native and naturalized). Agricultural Handbook 541. Washington, DC: U.S. Department of Agriculture.

Livingston, R.; Koenig, C. 1977. Life cycle toxicity tests concerning the acute and chronic effects of a pesticide (TH-6040) on the mummichug (*Fundulus heteroclitus* Walbaum), and egg-laying topminnow. (Unpublished study received Feb 6, 1978 under 1481259; prepared by Environmental Planning & Analysis, submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL:096787-M). MRID No. 00099722.

Lo, S.C.; Agar, N.C. 1986. NADH-methemoglobin reductase activity in the erythrocytes of newborn and adult mammals. Experientia 42(11-12): 1264-1265.

Lovett, G.M.; Christiansen, L.M.; Groffman, P.M.; Jones, G.G.; Hart, J. E.; Mitchell, M.J. 2002. Insect defoliation and nitrogen recycling in Forests. Bioscience 52: 335-341.

M

Maddox, J.V.; Baker, M.D.; Jeffords, M.R.; Kuras, M.; Linde, A.; Solter, L.F.; McManus, M.L.; Vavra, J.; Vossbrinck, C.R. 1999. Nosema portugal, NSP, isolated from gypsy moths (*Lymantria dispar* L.) collected in Portugal. Journal of Invertebrate Pathology. 73.

Majori, G.; Romi, R.; Ali, A. 1984. Toxicity of the IGR diflubenzuron to neonate, adult, and gravid female Daphnia magna Straus (Cladocera: Daphniidae) in the laboratory. Proceedings and Papers on the 52nd Annual Conference of the California Mosquito and Vector Control Association: 68-70.

Martinat, P.J.; Coffman, C.C.; Dodge, K.; Cooper, R.J.; Whitmore, R.C. 1988. Effect of diflubenzuron on the canopy arthropod community in a central Appalachian forest. Journal of Economic Entomology 81(2); 261-267.

Mastro, V.C., Schwalbe, C.P.; ODell, T.M. 1981. Sterile-male technique. In: Doane, Charles C.; McManus, Michael L., eds. The gypsy moth: research toward integrated pest management. Tech. Bull. 1584. Washington, DC: U.S. Department of Agriculture; 669-679.

Matthenius, J.C., Jr. 1975. Effects of Dimilin® on honey bees. (New Jersey, Dept. of Agriculture, unpublished study; CDL: 094969-K). MRID No. 00038216.

Mazzone, H.M.; Tignor, G.H.; Shope, R.E.; Ran, I.C.; Hess, W.R. 1976. A serological comparison of the nuclear polyhedrosis viruses of the gypsy moth and the European pine sawfly with arthropod-borne and other viruses. Environmental Entomology 5(2): 281-282.

McAlonan, W. 1975. Effects of two insect growth regulators on some selected saltmarsh non-target organisms. (Unpublished study received Jul 31, 1978 under 148-1259; submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL:234511-AA). MRID No. 00099895.

McFadden, M.W.; McManus, M.E. 1991. An insect out of control? The potential for spread and establishment of the gypsy moth in new forest areas in the United States. In: Baranchikov, Yuri N.; Mattson, William J.; Hain, Fred P.; Payne, Thomas L., editors. Forest insect guilds: patterns of interaction with host trees. General Technical Report NE-153. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 172-186.

McManus, M.L.; Leellen, S. 2003. Microsporidian pathogens in European gypsy moth populations. In: Proceedings, Ecology, Survey and Management of Forest Insects (Michael L. McManus and Andrew Liebhold, editors). U.S. Department of Agriculture GTR NE-311.

McManus, M.L.; McIntyre, T. 1981. Introduction. In: Doane, Charles C.; McManus, Michael L., eds. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture; 1-7.

McManus, M.; Schneeberger, N.; Reardon, R.; Mason, G. 1989. Gypsy moth. Forest Insect Disease Leaflet 162. Washington, DC: U.S. Department of Agriculture, Forest Service.

McShae, W.J. 2000. The influence of acorn production on annual variation in rodent and bird populations. Ecology 81: 228-238.

McShea, W.; Rappole, John H. 1992. White-tailed deer as keystone species within forest habitats of Virginia. Virginia Journal of Science 43(1B): 177-186.

McShea, W.J.; Schwede, G. 1993. Variable acorn corps: responses of white-tailed deer and other mast consumers. Journal of Mammalogy 74(4): 999-1006.

Miller, J.C. 1990. Field assessment of the effects of a microbial pest control agent on non-target Lepidoptera. American Entomologist 36 (summer): 135-139.

Moffett, M. 1995. Effects, persistence and distribution of diflubenzuron in littoral enclosures: Final Report. Unpublished study prepared by U.S. EPA and University of Wisconsin-Superior. MRID No. 44386201.

Moore, R.B. 1977. Determination of the effects of nuclear polyhedrosis virus in Trout and Bluegill Sunfish under laboratory conditions. Cooperative Agreement No. 42-213.(Unpublished study received Aug 18, 1977 under 27582-2; prepared by Essex Marine Laboratory, Inc. and U.S. Forest Service, Northeastern Area, State and Private Forestry; submitted by Parker Livestock Supply, Inc. MRID No. 00054565.

Montgomery, M.E. 1991. Variations in the suitability of tree species for the gypsy moth. In: Gottschalk, Kurt W., Twery, Mark J.; Smith, Shirley I., editors. Proceedings, U.S. Department of Agriculture Interagency Gypsy Moth Research Review; 1990 January 22-25; East Windsor, CT. Gen. Tech. Rep. NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Murray, K.F.; Christie, D.L. 1993. Dietary protein intolerance in infants with transient methemoglobinemia and diarrhea. Journal of Pediatrics 122(1): 90-92.

Muzika, R.M.; Liebhold, A.M.1999. Changes in radial increment of host and nonhost tree species with gypsy moth defoliation. Canadian Journal of Forest Research 29(9): 1365-1373.

N

Nagy, L.R.; Smith, K.G. 1997. Effects of insecticide-induction reduction in Lepidopteran larvae on reproductive success of hooded warblers. Auk.114(4): 619-627.

Naidoo, R.; Lechowicz, M.J. 2001. Effects of gypsy moth on radial growth of deciduous trees. Forest Science Aug 47(3): 338-348.

Nation, J.L.; Robinson, F.A.; Yu, S.J.; Bolten, A.B. 1986. Influence upon honeybees of chronic exposure to very low levels of selected insecticides in their diet. Journal of Apiculture Research. 25(3): 170-177.

Nichols, J.O. 1961. The gypsy moth in Pennsylvania: its history and eradication. Misc. Bull. 4404. Harrisburg, PA: Pennsylvania Department of Agriculture.

Nichols, J.O. 1980. The gypsy moth. Harrisburg, PA: Commonwealth of Pennsylvania, Department of Environmental Resources, Bureau of Forestry.

Nichols, S.W., compiler. 1989. The Torre-Bueno Glossary of Entomology, including Supplement A by George S. Tulloch. New York Entomological Society, with the American Museum of Natural History.

Nilsson, A.; Engberg, G.; Henneberg, S.; Danielson, K.; De Ferdier, C. H. 1990. Inverse relationship between age-dependent erythrocyte activity of methaemoglobin reductase and prilocaine-induced methemoglobinaemia during infancy. British Journal of Anaesthesia (London) 64(1): 72-76.

North, D.T. 1975. Inherited sterility in Lepidoptera. Annual Review of Entomology 20: 167-182.

Norton, M.L.; Bendell, J.F.; Bendell-Young, L.I.; Leblanc, C.W. 2001. Secondary effects of the pesticide *Bacillus thuringiensis* kurstaki on chicks of spruce grouse (*Dendragapus canadensis*). Archives of Environmental Contamination and Toxicology 41(3): 369-373.

O

Oberlander, H.; Silhacek, D.L.; Leach, C.E. 1998. Interactions of ecdysteroid and juvenoid agonists in *Plodia interpunctella* (Hubner). Archives of Insect Biochemistry and Physiology. 38(2): 91-99.

O'Connor, T.F.; Moore, R.B. 1975. The effects of Dimilin® on small mammals. In: The environmental impact of Dimilin® (TH 6040) on a forest and aquatic ecosystem. Lake Ontario Environmental Laboratory. LOTEL Report Number. 210: 120-139.

Ostfeld, R.S.; Jones, C.G.; Wolff, J.O. 1996. Of mice and mast: ecological connections in eastern deciduous forests. BioScience 46(5): 323-330.

Otvos, I.S.; Vanderveen, S. 1993. Environmental report and current status of *Bacillus thuringiensis* var. *kurstaki* use in control of forest and agricultural insect pests. Victoria, BC: Forestry Canada and Province of British Columbia, Ministry of Forests.

P

Paananen, D.M.; Fowler, R.F., Wilson, L.F. 1987. The aerial war against eastern region forest insects, 1921-1986. Journal of Forest History 31(4): 173-186.

Parker, J. 1981. Effects of defoliation on oak chemistry. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC. U.S. Department of Agriculture: 219-225.

Payne, N.; Retnakaran, A.; Cadogan, B. 1997. Development and evaluation of a method for the design of spray applications: aerial tebufenozide applications to control the Eastern Spruce Budworm, *Choristoneura fumiferana* (Clem.). Crop Protection 16 (3): 285-290.

Podgwaite, J., Microbiologist, USDA Forest Service, [Conversation with Joseph L. Cook]. 28 July 2004.

Podgwaite, J.D.; Campbell, R.W. 1972. The disease complex of the gypsy moth: II. Aerobic bacterial pathogens. Journal of Invertebrate Pathology 20: 303-308.

Podgwaite, J.; Galipeau, P. 1978. Effect of nucleopolyhedrosis virus on two avian predators of the gypsy moth (Forest Service Research Note NE-251; also in unpublished submission received Sep 11, 1979 under 27586-2; submitted by U.S. Forest Service, Washington, DC; CDL:240994-I). MRID No. 00134318.

Powell, D.S.; Faulkner, J.L.; Darr, D.R.; Zhu, Z.; MacCleery, D.W. 1993. Forest resources of the United States, 1992. Gen. Tech. Rep. RM-234. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Q

Quimby, J.W. 1985. Tree mortality in Pennsylvania forests defoliated by gypsy moth—a 1984 update. In: Forest management decisions based on future forest product requirements. Proceedings of the Penn Sate Forest Resources Issues Conference; 1985 March 19-20; State College, PA: 95-105.

Quimby, J.W. 1987. Impact of gypsy moth defoliation on forest stands. In: Fosbroke, Sandra; Hicks, Ray , Jr., eds. Proceedings on the workshop: Coping with the gypsy moth in the new frontier; 1987 August 4-6; Morgantown, WV. West Virginia University Books: 21-29.

Quimby, J.W. 1993. Tree morality following gypsy moth epidemic. In: Twardus, Daniel B., ed. Gypsy Moth News 33: 8-12.

R

Rastall, K.; Kondo, V.; Strazanac, J.S.; Butler, L. 2003. Lethal effects of biological insecticide applications on non-target lepidopterans in two Appalachian forests. Environmental Entomology 32(6): 1364-1369.

Reardon, R.C. 1981. 6.1 Parasites: introduction. In: Doane, Charles C.; McManus, Michael L., eds. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture: 300-301.

Reardon, R.C. 1991. Appalachian gypsy-moth integrated pest-management project. Forest Ecology and Management 39: 107-112.

Reardon, R.C., ed. 1995. Effects of diflubenzuron on non-target organisms in broadleaf forested watersheds in the Northeast. USDA National Center of Forest Health Management; November 1995. FHM-CN-05-95.

Reardon, R.C. 1998. Using mating disruption to manage gypsy moth : a review. FHTET (Series); 98-01. Morgantown, WV: Forest Health Technology Enterprise Team, USDA, Forest Service.

Reardon, R.; Hajek, A. 1993. *Entomophaga maimaiga* in North America: a review. NA-TP-15-93. Radnor, Pa: U.S. Department of Agriculture, Forest Service, Northeastern Area.

Reardon, R.; Hajek, A.E. 1995. *Entomophaga maimaiga* in North America: a review. In: Twardus, Daniel B., editor Gypsy Moth News 39: 3-4.

Reardon, R. C.; Mastro, V.C. 1993. Development and status of the sterile insect technique for managing gypsy moth. NA-TP-13-93 [Radnor, PA]: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry.

Reardon, R.; Podgwaite, J. 1992. The gypsy moth nucleopolyhedrosis virus product. NA-TP-02-92. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area.

Reardon, R.C.; Kaya, H.K.; Fusco, R.A.; Lewis, F.B. 1986. Evaluation of *Steinernema feltiae* and *S. bibious* (Rhabditida: Steinernematidae) for suppression of *Lymantria dispar* (Lepidoptera: Lymantriidae) in Pennsylvania, U.S.A. Agriculture, Ecosystems and Environment 15: 1-9.

Reardon, R; Venables, L.; Roberts, A. 1993. The Maryland Integrated Pest Management Gypsy Moth Project: 1983-1987. NA-TP-07-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry.

Reardon, R.; Dubois, N.; McLane, W. 1994. *Bacillus thuringiensis* for managing gypsy moth: a review. FHM-NC-01-94. Morgantown, WV: U.S. Department of Agriculture, Forest Service, National Center of Forest Health Management.

Reardon, R.C.; Podgwaite, J.; Zerillo R. 1996. Gypchek – the gypsy moth polyhedrosis virus product. FHTET-96-16.

Reardon, R.; Cowan, D.; McLane, W.; Talley, S. 2000. Efficacy and deposit assessment of tebufenozide against gypsy goth (Lepidoptera: Lymantriidae). FHTET-97-06.

Redfern, R.E.; Demilo, A.B.; Borkovec, A.B. 1980. Large milkweed bug: effects of diflubenzuron and its analogues on reproduction. Journal of Economic Entomology 73: 682-683.

Redman, A.M.; Scriber, J.M. 2000. Competition between the gypsy moth, *Lymantria dispar*, and the northern tiger swallowtail, Papilio canadensis: interactions mediated by host plant chemistry, pathogens, and parasitoids. Oecologia 125(2): 218-228.

Rehder, A. 1951. Manual of cultivated trees and shrubs hardy in North America. 2nd edition. New York: Macmillan Co.

Reiner, H.K.; Parke, G.S.E. 1975. Report: Static 96-hour toxicity study of Thompson- Hayward Chemical Company. sample TH 6040 in Fathead Minnows: Laboratory No. 5E-6095. (Unpublished study received Jul 31, 1978 under 148-1259; prepared by Cannon Laboratories, Inc., submitted by Thompson-Hayward Chemical Co., Kansas City, KS; CDL:234513-S); MRID No. 00060376. Cited in U.S. EPA 1997a.

Reinert, K. 1995a. (RH-5992 Technical) Reproduction study in bobwhite quail: Lab Project Number 94RC-0023: RH59BWR-394: HWA 417-492. Unpublished study prepared by Ecological Planning and Toxicology, Inc.; MRID No. 43781701.

Reinert, K. 1995b. (RH-5992 Technical) Avian reproduction toxicity: Supplement to Rohm and Haas Report No. 94RC-0023: Lab Project Number 94RC-0023B. Unpublished study prepared by Rohm and Haas Co.; MRID No. 43781702.

Retnakaran, A.; Macdonald, A.; Tomkins, W.L.; Davis, C.N.; Brownwright, A.J.; Palli, S.R. 1997a. Ultrastructural effects of a non-steroidal ecdysone agonist, RH-5992, on the sixth instar of the Spruce budworm, *Choristoneura fumiferana*. Journal of Insect Physiology 43(1): 55-68.

Retnakaran, A.; Smith, L.F.R.; Tomkins, W.L.; Primavera, M.J.; Palli, S.R.; Payne, N.; Jobin, L. 1997b. Effect of RH-5992, a nonsteroidal ecdysone agonist, on the Spruce budworm, *Toneura fumiferana* (Lepidoptera: Tortricidae): Laboratory, greenhouse and ground spray. Canadian Entomologist. 129(5): 871-885.

Rodenhouse, N.L.; Holmes, R.T. 1992. Results of experimental and natural food reductions for breeding black-throated blue warblers. Ecology 73(2): 357-372.

Rumpf, S.; Frampton, C.; Dietrich, D.R. 1998. Effects of conventional insecticides and insect growth regulators on fecundity and other life-table parameters of *Micromus tasmaniae* (Neuroptera: Hemerobiidae). Journal of Economic Entomology 91: 34-40.

S

Sample, B.E.; Butler, L.; Whitmore, R.C. 1993a. Effects of an operational application of Dimilin® on non-target insects. The Canadian Entomologist 125(2): 173-179.

Sample, B.E.; Butler, L.; Zivkovich, C.; Whitmore, R.C. 1993b. Evaluation of *Bacillus thuringiensis* and defoliation effects on native Lepidoptera. NA-TP-10-93. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry.

Sample, B.E.; Whitmore, R.C. 1993. Food habits of the endangered Virginia big-eared bat in West Virginia, Journal of Mammalogy 74(2): 428-435.

Sample, B.E.; Butler, L.; Zivkovich, C.; Whitmore, R.C.; Reardon, R. 1996. Effects of *Bacillus thuringiensis* (Beliner) var. *kurstaki* and defoliation by the gypsy moth (*Lymantria dispar* (L.), Lepidoptera: Lymantridae) on native arthropods in West Virginia. The Canadian Entomologist 128: 573-592.

Schroeder, W. 1978. Letter sent to J. Taylor dated Feb 13, 1978: Dimilin® sprays applied to citrus, effect on bees. (U.S. Agricultural Research Service, Southern Region, Horticultural Research Laboratory; unpublished study; CDL:096960-A). MRID No. 00099731.

Schroeder, W.J.; Sutton, R.A.; Beavers, J.B. 1980. *Diaprepes abbreviatus*: fate of diflubenzuron and effect on nontarget pests and beneficial species after application to citrus for weevil control. Journal of Economic Entomology 73(5): 637-638.

Schweitzer, D.F. 1988. Element stewardship abstract for *Lymantria dispar* gypsy moth. Arlington, VA: The Nature Conservancy.

Seidel, G.E.; Whitmore, R.C. 1995. Effects of Dimilin® application on white-footed mouse populations in a central Appalachian forest. Environmental Toxicology and Chemistry 14(5): 793-799.

Sharov, A.A.; Liebhold, A.M. 1998. Model of slowing the spread of gypsy moth (Lepidoptera: Lymantriidae) with a barrier zone. Ecological Applications 8(4): 1170-1179.

Sharov, A.A.; Leonard, D.; Liebhold, A.M.; Clemens, N.S. 2002a. Evaluation of preventive treatments in low-density gypsy moth populations using pheromone traps. Journal of Economic Entomology 95(6): 1205-1215.

Sharov, A.A.; Leonard, D.; Liebhold, A.M.; Roberts, E.A.; Dickerson, W. 2002b. “Slow the Spread:” a national program to contain the gypsy moth. Journal of Forestry 2002, 100(5): 30-35.

Sharov, A.A.; Thorpe, K.W.; Tcheslavskaia, K. 2002c. Effect of synthetic pheromone on gypsy moth (Lepidoptera: Lymantriidae) trap catch and mating success beyond treated areas. Environmental Entomology 31(6): 1119-1127.

Sharpe, W.E. 1982. Effects of gypsy moth defoliation in Pennsylvania on water quality and quantity, In Proceedings of Coping With Gypsy Moth in the New Frontier; 1982 Feb 17-18; The Pennsylvania State University; 95-102.

Sheath, R.G.; Burkholder, J.A.M.: Morison, M.O.; Steinman, A.D.; VanAlstyne, K.L. 1986. Effect of tree canopy removed by gypsy moth larvae on the macroalgae of a Rhode Island headwater stream, Journal of Phycology 22: 567-570.

Shimazu, M.; Soper, R.S. 1986. Pathogenicity and sporulation of *Entomophaga maimaiga* Humber, Shimazu, Soper and Hajek (Entomophthorales: Entomophthoraceae) on larvae of the gypsy moth, *Lymantria dispar* L. (Lepidoptera: Lymantriidae). Applied Entomology and Zoology 21(4): 589-596.

Showalter, C.R.; Whitmore, R.C. 2002. The effect of gypsy moth defoliation on cavity-nesting bird communities. Forest Science 48(2): 273-281.

Sinha, S.N.; Lakhani, K.H.; Davis, N.K. 1990. Studies on the toxicity of insecticidal drift to the first instar larvae of the Large White butterfly *Pieris brassicae* (Lepidoptera: Pieridae). Annals of Applied Biology 116:27-41.

Smagghe, G.; Degheele, D. 1994a. Action of a novel non-steroidal ecdysteroid mimic, tebufenozide (RH-5992), on insects of different orders. Pesticide Science 42(2): 85-92.

Smagghe, G.; Degheele, D. 1994b. The significance of pharmacokinetics and metabolism to the biological activity of RH-5992 (tebufenozide) in *Spodoptera exempta, Spodoptera exigua* and *Leptinotarsa ineata.* Pesticide Biochemistry and Physiology 49(3): 224-234.

Smagghe, G.; Eelen, H.; Verschelde, E.; Richter, K.; Degheele, D. 1996. Differential effects of nonsteroidal ecdysteroid agonists in Coleoptera and Lepidoptera: Analysis of evagination and receptor binding in imaginal discs. Insecticide Biochemistry and Molecular Biology 26(7): 687-695.

Smagghe, G.; Vinuela, E.; Budia, F.; Degheele, D. 1997. Effects of the non-steroidal ecdysteroid mimic tebufenozide on the Tomato looper *Deixis chalcites* (Lepidoptera: Noctuidae): An ultrastructural analysis. Archives of Insect Biochemistry and Physiology. 35: 179-190.

Smith, D.M. 1986. The practice of silviculture. 8th edition. New York: John Wiley and Sons: 1, 47-49, 87-88.

Smith, H.R. 1985. Wildlife and the gypsy moth. Wildlife Society Bulletin 13(3): 166-174.

Smith, R.P. 1996. Toxic responses of the blood. In: Casarett and Doull's Toxicology: The Basic Science of Poisons. 5th Edition. McGraw-Hill, Health Professions Division, New York: 335-353.

Smith, H.R.; Lautenschlager, R.A. 1978. Predators of the gypsy moth. Agric. Handbook 534. Washington, DC: U.S. Department of Agriculture.

Smith, H.R.; Lautenschlager, R.A. 1981. Gypsy moth predators. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture: 96-124.

Smitley, D.R.; Bauer, L.S.; Hajek, A.E.; Sapio, F.J.; Humber, R.A. 1995. Introduction and establishment of *Entomophaga maimaiga*, a fungal pathogen of gypsy moth (Lepidoptera: Lymantriidae) in Michigan Environmental Entomology 24(6): 1685-1695.

Snow, J.W.; Jones, R.L.; North, D.T.; Holt, G.G. 1971. Effects of irradiation on ability of adult male corn earworms to transfer sperm and field attractiveness of females mated to irradiated males. Journal of Economic Entomology 65(3): 906-908.

Song, M.Y.; Star, J.D.; Brown, J.J. 1997. Comparative toxicity of four insecticides, including imidacloprid and tebufenozide, to aquatic arthropods. Environmental Toxicology and Chemistry. 16(12): 2494-2500.

Soper, R.S.; Shimazu, M.; Humber, R.A.; Ramos, Mark E.; Hajek, A.E. 1988. Isolation and characterization of *Entomophaga maimaiga* sp. Nov., a fungal pathogen of gypsy moth, *Lymantria dispar*, from Japan. Journal of Invertebrate Pathology 51(3): 229-241.

Sopuck, L.; Ovaska, K.; Whittington, B. 2002. Responses of songbirds to aerial spraying of the microbial insecticide *Bacillus thuringiensis* var. *kurstaki* (foray 48B(R)) on Vancouver Island, British Columbia, Canada. Environmental Toxicology and Chemistry 21(8): 1664-1672.

Staley, J.M. 1965. Decline and mortality of red and scarlet oaks. Forest Service 11(2): 2-17.

Stephens, G.R.; Hill, D.E. 1971. Drainage, drought, defoliation, and death in unmanaged Connecticut forests. Bulletin 718. New Haven: Connecticut Agricultural Experiment Station.

Stevenson, J.H. 1978. The acute toxicity of formulated pesticides to worker honey bees. (*Apis mellifera)*. Plant Pathology, 27: 38-40. Summarized in WHO 1997.

Strazanac, John S.; Butler, Linda. 2005. Long-term evaluation of the effects of *Bacillus thuringiensis kurstaki*, gypsy moth nucleopolyhedrosis virus product Gypchek, and *Entomophaga maimaiga* on nontarget organisms in mixed broadleaf-pine forests in the central Appalachians. FHTET-2004-14. [Morgantown, WV]: USDA Forest Service, Forest Health Technology Enterprise Team; 81 p.

Streams, F.A. 1976. Susceptibility of aquatic invertebrates to gypsy oth NPV. Grant No. 23-Final report. (Univ. of Connecticut, Biological Sciences Group, Ecology Section, U-42 for U.S. Forest Service; unpublished study; CDL:231360-M). MRID No. 00068408.

Sundaram, K.M.S. 1996. Leaching, mobility and persistence of tebufenozide in columns packed with forest litter II. J. Environmental Science and Health. B31(6): 1215-1239.

Surprenant, D. 1988. The chronic toxicity of carbon^{14}-diflubenzuron to *Daphnia magna* under flow-through conditions: Laboratory Project ID: 11493.0188.6109.130. Unpublished study prepared by Springborn Life Sciences, Inc. MRID No. 40840501.

Surprenant, D. 1989. Acute toxicity of diflubenzuron to Quahogs (*Mercenaria mercenaria*) embryo-larvae Under Static Conditions. Lab Project Number: 89-3-2945: C 303.51.009. Unpublished study prepared by Springborn Laboratories, Inc. MRID No. 41392001.

Swank, W.T.; Waide, J.B.; Crossley, D.A., Jr.; Todd, R.L. 1981. Insect defoliation enhances nitrate export from forest ecosystems. Oecologia (Berlin) 51: 297-299.

Swift, M.C.; Smucker, R.A.; Cummins, K.W. 1988. Effects of Dimilin® on freshwater litter decomposition. Environmental Toxicology and Chemistry 7: 161-166.

T

Tanner, D.K.; Moffett, M.F. 1995. Effects of diflubenzuron on the reproductive success of the bluegill sunfish, *Lepomis macrochirus*. Environmental Toxicology and Chemistry 14(8): 1345-55.

Taylor, N., ed. 1961. Taylor's encyclopedia of gardening (horticulture and landscape design). 4th edition. Cambridge, MA: Houghton Mifflin Co.

Thorpe, K.W. 1996. Effects of ground-based applications of soap, *Bacillus thuringiensis*, cyfluthrin, and trunk barriers on gypsy moth density and defoliation. Journal of Arboriculture 22(2): 87-91.

Thorpe, K.W.; Webb, R.E.; Ridgway, R.L.; Venables, L.; Tatman, K.M. 1993. Sticky barrier bands affect density of gypsy moth (Lepidoptera: Lymantriidae) and damage in oak canopies. Journal of Economic Entomology 86(5): 1497-1501.

Thorpe, K.W.; Ridgway, Richard L. 1994. Effects of trunk barriers on larval gypsy moth (Lepidoptera: Lymantriidae) density in isolated- and contiguous-canopy oak trees. Environmental Entomology 23(4): 832-836.

Thorpe, K.W.; Podgwaite, J.D.; Slavicek, J.M.; Webb, R.E. 1998. Gypsy moth (Lepidoptera: Lymantriidae) control with ground-based hydraulic applications of Gypchek, *in vitro*-produced virus, and *Bacillus thuringiensis*. Journal of Economic Entomology 91(4): 875-880.

Thurber, D.K. 1993. Effects of gypsy moth-caused tree mortality on bird habitat. In: Fosbroke, S.L.C.; Gottschalk, K.W., editors. Proc., USDA Interagency gypsy Moth Research. Forum General Technical Report Cited in USDA 1995b.

Thurber, D.K.; McClain, W.R.; Whitmore, R.C. 1994. Indirect effects of gypsy moth defoliation on nest predation. Journal of Wildlife Management 58(3): 493-500.

Ticehurst, M.; Fursco, R.A.; Kling, R.P.; Unger, J. 1978. Observations on parasites of gypsy moth in first cycle infestations in Pennsylvania from 1974-1977. Environmental Entomology 7(3): 355-358.

Tigner, T. 1992. Gypsy moth impact of Virginia's hardwood forests and forest industry. Charlottesville, VA: Virginia Department of Forestry.

Tomblin, D.C. 1994. [Untitled]. Unpublished manuscript on file at Forestry Sciences Laboratory, West Virginia University, Morgantown, WV.

Tuthill, R.W.; Canada, A.T.; Wilcock, K.; Etkin, P.H.; O'Dell, T.M.; Shama, S.K. 1984. An epidemiologic study of gypsy moth rash. American Journal of Public Health 74(8): 799-803.

Twery, M.J. 1987. Changes in vertical distribution of xylem production in hardwoods defoliated by gypsy moth. New Haven, CT: Yale University, Ph.D. dissertation.

Twery, M.J. 1991. Effects of defoliation by gypsy moth. In: Gottschalk, Kurt W.; Twery, Mark J.; Smith, Shirley I., editors. Proceedings, U.S. Department of Agriculture Interagency Gypsy Moth Research Review; 1990 January 22-25; East Windsor, CT. General Technical Report NE-146. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 27-39.

Twery, M.J.; Gottschalk, K.W. 1988. Silviculture vs. the gypsy moth: can it help? In: Healthy forests, healthy world. Proceedings, Society of American Foresters National Convention; 1988 October 16-19; Rochester, NY. SAF Publication. 88-01. Bethesda, MD: Society of American Foresters: 169-172.

U

USDA (U.S. Department of Agriculture). 1985. Gypsy moth suppression and eradication projects: final environmental impact statement as supplemented—1985. Washington, DC: Forest Service, and Animal and Plant Health Inspection Service.

U.S. Department of Agriculture. 1989. Memorandum of understanding between the U.S. Department of Agriculture, Forest Service and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service for management of the gypsy moth, October 1. Washington, DC.

U.S. Department of Agriculture.1990. Departmental gypsy moth policy. Department Regulation 5600-1. Washington, DC.

U.S. Department of Agriculture. 1992. Potential impacts of Asian gypsy moth in the western United States. Washington, DC and Hyattsville, MD: Forest Service in consultation with the Animal and Plant Health Inspection Service.

U.S. Department of Agriculture. 1993. USDA programs related to integrated pest management. Program Aid 1506. Washington, DC.

U.S. Department of Agriculture. 1995. Gypsy moth management in the United States: a cooperative approach: final environmental impact statement as supplemented. Washington, DC: Forest Service and Animal and Plant Health Inspection Service.

U.S. Department of Agriculture. 1996. Gypsy moth management in the United States: a cooperative approach. Record of Decision. Washington DC. USDA Forest Service and Animal and Plant Health Inspection Service.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service.1990. Gypsy moth program manual. Frederick, MD: Plant Protection and quarantine [pagination not continuous].

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 1992. Asian gypsy moth emergency program manual: Washington, D.C.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2007. European gypsy moth, *Lymantria dispar*, quarantine. www.aphis.usda.gov/ppq/maps/gypmoth.pdf. (April 11, 2007)

U.S. Department of Agriculture, Forest Service. 1989. Final environmental impact statement for the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project Management Bulletin R8-MB 33. Atlanta, GA: Southern Region, and Northeastern Area State and Private Forestry [pagination not continuous].

U.S. Department of Agriculture, Forest Service. 1990a. Forest Service Manual 2300-Recreation, wilderness, and related resource management, Amendment Number 2300-90-1, 1 June. Washington, DC.

U.S. Department of Agriculture, Forest Service. 1990b. Forest Service Manual 3400, Forest pest management. Amend. Number 3400-90-1, 1 June. Washington, DC.

U.S. Department of Agriculture, Forest Service. 1993. Urban forestry, fiscal year 1993: a status report. Radnor, PA; Northeastern Area State and Private Forestry.

U.S. Department of Agriculture, Forest Service. 1994a. Cooperative suppression and eradication projects: guidelines for participating state agencies. Radnor, PA; Northeastern Area State and Private Forestry [pagination not continuous].

U.S. Department of Agriculture, Forest Service. 1994b. Forest Service Manual 2300, Recreation, wilderness, and related resource management. Amendment Number 2300-94-1, 17 June. Washington, DC.

U.S. Department of Agriculture, Forest Service. 1994c. Forest Service Manual 4000, Research Amendment Number 4000-94-2, 4 May. Washington, DC.

U.S. Department of Agriculture, Forest Service. 1994d. Gypsy moth digest. Database maintained at Northeastern Area State and Private Forestry, Morgantown, WV.

U.S. Department of Agriculture, Forest Service. 1994e. The Appalachian Integrated Pest Management Gypsy Moth Project: final status report. Radnor, PA; Northeastern Area State and Private Forestry.

U.S. Department of Agriculture, Forest Service. 1994f. The gypsy moth in southern and eastern national forests: to treat or not to treat? A reference guide for forest managers. Atlanta, GA: Southern Region. Unpublished draft.

U.S. Department of Agriculture, Forest Service. 2003. Gypsy Moth Digest. http://na.fs.fed.us/fhp/gm/. [Date accessed unknown].

U.S. Environmental Protection Agency. 1975. DDT—a review of scientific and economic aspects of the decision to ban its use as a pesticide. EPA 540/1-785/022. Available from NTIS, Springfield, VA: PB-245029.

U.S. Environmental Protection Agency. 1987a. Recommendations for and documentation of biological values for use in risk assessment. ECAO-CIN-554. Cincinnati, OH: Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office [pagination not continuous].

U.S. Environmental Protection Agency. 1987b. The risk assessment guidelines of 1986. EPA 600/8-87/045. Washington, DC: Office of Health and Environmental Assessment, Research and Development [pagination not continuous]. Available from NTIS, Springfield, VA: PB-88-123997/AS.

U.S. Environmental Protection Agency. 1997. Re-registration Eligibility Decision (RED): Diflubenzuron. EPA 738-R-97-008. Office of Pesticide Programs.

U.S. Environmental Protection Agency. 1999a. Tebufenozide pesticide tolerances for emergency exemptions. Federal Register. 64(51): 13088-13094.

U.S. Environmental Protection Agency. 1999b. Tebufenozide Pesticide Tolerance Final Rule. Federal Register 64(183): 51251-51258.

U.S. Environmental Protection Agency. 1999c. Tebufenozide: Tier I Drinking Water EECs for use in the Human Health Risk Assessment. Memo from Dana Spatz and Jim Cowles dated January 19, 1999. (Copy courtesy of Janet Bressant, Public Information and Records Integrity Branch, U.S. EPA/OPP).

U.S. Environmental Protection Agency. 1999d. EFED risk assessment for Section 3 registration of tebufenozide (Confirm 2F and 70WSP) for use on tree nuts and almond hull; DP Barcode: D255779. Memo from N.E. Federoff, M. Rexrode, and J. Cowles dated July 13, 1999. (Copy courtesy of Janet Bressant, Public Information and Records Integrity Branch, U.S. EPA/OPP).

U.S. Environmental Protection Agency. 1999e. EFED risk assessment for Section 3 registration of tebufenozide (Confirm 2F and 70WSP). Memo from M. Rexrode, and J. Cowles dated March 1, 1999. (Copy courtesy of Janet Bressant, Public Information and Records Integrity Branch, U.S. EPA/OPP).

V

Valenti, M.A. 1998. *Entomophaga maimaiga*: salvation from the gypsy moth or fly in the ointment? American-Entomologist 1998, 44: 1, 20-22.

Valentine, B.J.; Gurr, G.M.; Thwaite, W.G. 1996. Efficacy of the insect growth regulators tebufenozide and fenoxycarb for Lepidopteran pest control in apples and Their Compatibility with Biological Control for Integrated Pest Management. Australian Journal of Experimental Agriculture 36 (4): 501-506.

Van der Kolk, J. 1997. RH-5992: Chronic Effects on Midge Larvae (*Chironomus riparius*) in a Water/Sediment System: Final Report: Lab Project Number: 95RC-0196: 96-047-1007: 1007.011.173. Unpublished study prepared by Spring. MRID No. 44198301.

Van Dersal, W.R. 1938. Native woody plants of the United States, their erosion-control and wildlife values. USDA Miscellaneous Publication 303. Washington, DC: U.S. Department of Agriculture.

Vaughan, M.R.: Kasbohm, J.W. 1993. Response of black bears to gypsy moth infestations in Shenandoah National Park, Virginia. In: Fosbroke, Sandra L.C.; Gottschalk, Kurt W., editors. Proceedings, U.S. Department of Agriculture Interagency Gypsy Moth Research Forum; 1993 January 19-22; Annapolis, MD. General Technical Report NE-179. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Viertel, A.T. 1970. Trees, shrubs and vines (a pictorial guide to the ornamental woody plants of the northern United States, exclusive of conifers). Syracuse, NY: Syracuse University Press [no page numbers].

Vitousek, P.M.; Melillo, J.M. 1979. Nitrate losses from disturbed forests: patterns and mechanisms. Forest Science 25(4): 605-619.

W

Walgenbach, J.F. 1995. Effect of various insecticide programs on pest and beneficial arthropods in apples. Rohm and Hass Cooperator Report No. 2599521. Unpublished report; summarized in Keller 1998.

Wallner, W. 1992. A US/Canada chronicle. Gypsy Moth Exotica. Hamden, CT: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 4 p.

Wallner, W. 1994. Research planning and accomplishments. Gypsy Moth Exotica. Hamden, CT: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1-2.

Wargo, P.M. 1978a. Defoliation by the gypsy moth: how it hurts your tree. Home and Garden Bulletin 223. Washington, DC: U.S. Department of Agriculture.

Wargo, P.M. 1978b. Insects have defoliated my tree—now what's going to happen? Journal of Arboriculture 4(8): 169-175.

Wargo, P.M. 1981a. Defoliation and tree growth. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture: 225-240.

Wargo, P.M. 1981b. Defoliation, dieback, and mortality. In: Doane, Charles C.; McManus, Michael L., editors. The gypsy moth: research toward integrated pest management. Technical Bulletin 1584. Washington, DC: U.S. Department of Agriculture: 240-248.

Webb, R.E.; Boyd, V.K. 1983. Evaluation of barrier bands and insecticidal strips for impeding intraplant movement of gypsy moth caterpillars. Melscheimer Entomological Series 33: 15-20.

Webb, R.E.; Shapiro, M.; Podgwaite, J.D.; Reardon, R.C.; Tatman, K.M.; Venables, L.; Kolodny-Hirsch, D.M. 1989. Effect of aerial spraying with Dimilin®, Dipel, or Gypchek on two natural enemies of the gypsy moth (Lepidoptera: Lymantriidae). Journal of Economic Entomology 82(6): 1695-1701.

Webb, J.R.; Cosby, B.J.; Deviney, F.A., Jr.; Eshleman, K.N.; Galloway, J.N. 1995a. Change in the acid-base status of an Appalachian mountain catchment following forest defoliation by the gypsy moth. Proceedings from the 5th International Conference on Acidic Deposition: Science and Policy, Goteborg, Sweden, 26-30 June, 1995. Water Air and Soil Pollution 85(2): 535-540.

Webb, R.E.; White, G.B.; Thorpe, K.W. 1995b. Response of gypsy moth (Lepidoptera: Lymantriidae) larvae to sticky barrier bands on simulated trees. Proceedings of the Entomological Society of Washington 97(3): 695-700.

Webb, R.E.; White, G.B.; Thorpe, K.W. 2003a. Augmenting nucleopolyhedrovirus load in gypsy moth (Lepidoptera: Lymantriidae) populations with egg mass treatments. Journal of Entomological Science 38(2): 300-313.

Webb, R.E.; White, G.B.; Thorpe, K.W. 2003b. Low incidence of viral and fungal entomopathogens in gypsy moth (Lepidoptera: Lymantriidae) populations in Northern Virginia. Journal of Entomological Science 38(2): 314-316.

Weiss, M.J.; Rizzo, D.M. 1987. Forest declines in major forest types of the eastern United States. In: Kairiukstis, L; Nilsson, S.; Straszak, A., editors. Proceeding of the workshop, Forest decline and reproduction: regional and global consequences; 1987 March 23-27; Krakow, Poland. WP-87-75. Laxenburg, Austria: International Institute for Applied Systems Analysis: 297-305.

Weseloh, R.M. 1976. Reduced effectiveness of gypsy moth parasite, *Apanteles melanoscelus*, in Connecticut due to poor seasonal synchronization with its host. Environmental Entomology 55 (4): 743-746.

Weseloh, R.M. 1983. Population sampling method of cocoons of the gypsy moth (Lepidoptera: Lymantriidae) parasite, *Apanteles melanoscelus* (Hymenoptera: Braconidae), and relationship of its population levels to predator-and hyperparasitic-induced morality. Environmental Entomology 12(4): 1228-1231.

Weseloh, R.M. 1985a. Changes in population size, dispersal behavior, and reproduction of *Calosoma sycophanta* (Coleoptera: Carabidae), associated with changes in gypsy moth, Lymantria (Lepidoptera: Lymantriidae) abundance. Environmental Entomology 14(3): 370-377.

Weseloh, R.M. 1985b. Predation by *Calosoma sycophanta* L. (Coleoptera: Carabidae): evidence for a large impact of gypsy moth, *Lymantria dispar* L. (Lepidoptera: Lymantriidae), pupae. The Canadian Entomologist 117(9): 1117-1126.

Weseloh, R.M. 1988. Effects of microhabitat, time of day, and weather on predation of gypsy moth larvae. Oecologia 77(2): 250-254.

Weseloh, R.M. 1998a. Modeling the influence of forest characteristics and ant (Formicidae: Hymenoptera) predation on dispersal and survival of neonate gypsy moths (Lymantriidae: Lepidoptera). Environmental Entomology 27(2): 288-296.

Weseloh, R.M. 1998b. Possibility for recent origin of the gypsy moth (Lepidoptera: Lymantriidae) fungal pathogen *Entomophaga maimaiga* (Zygomycetes: Entomophthorales) in North America. Environmental Entomology 27(2): 171-177.

Weseloh, R.M. 2003a. Short and long range dispersal in the gypsy moth (Lepidoptera: Lymantriidae) fungal pathogen, *Entomophaga maimaiga* (Zygomycetes: Entomophthorales). Environmental Entomology 32(1): 111-122.

Weseloh, R.M. 2003b. A computer model of the gypsy moth and its fungal pathogen. Bulletin Connecticut Agricultural-Experiment-Station No. 987.

Weseloh, Ronald M. 2003c. People and the gypsy moth: a story of human interactions with an invasive species. American Entomologist 49 (3): 180-190.

Weseloh, R.M.; Andreadis, T.G. 1982. Possible mechanism for synergism between *Bacillus thuringiensis* and the gypsy moth (Lepidoptera: Lymantriidae) parasitoid. *Apanteles melanoscelus* (Hymenoptera: Braconidae). Annals of the Entomological Society of America 7(4): 435-438.

Weseloh, R.M.; Andreadis, T.G. 1997. Persistence of resting spores of *Entomophaga maimaiga*, a fungal pathogen of the gypsy moth, *Lymantria dispar*. Journal of Invertebrate Pathology 69(2): 195-196.

Weseloh, R.M.; Andreadis, T.G. 2002. Detecting the titer in forest soils of spores of the gypsy moth (Lepidoptera: Lymantriidae) fungal pathogen, *Entomophaga maimaiga* (Zygomycetes: Entomophthorales). Canadian Entomologist 134(2): 269-279.

Whelan, C.J.; Holmes, R.T.; Smith, H.R. 1989. Bird predation on gypsy moth (Lepidoptera: Lymantriidae) larvae: an aviary study. Environmental Entomology 18(1): 43-45.

White, G. B.; Webb, R. E; Thorpe, K. W.; Douglass, L.W. 1997. Evaluation of an insecticidal latex coating for control of late-stage gypsy moth larvae. Arthropod Management Tests 24:385.

Whitmore, R.C.; Cooper, R.J.; Sample, B.E. 1993. Bird fat-reductions in forests treated with Dimilin®. Environmental Toxicology and Chemistry 12: 2059-2064.

Williams, D.W.; Liebhold, A.M. 1995a. Influence of weather on the synchrony of gypsy moth (Lepidoptera: Lymantriidae) outbreaks in New England. Environmental Entomology 24(5): 987-995.

Williams, D.W.; Liebhold, A.M. 1995b. Forest defoliators and climatic change: potential changes in spatial distribution of outbreaks of western spruce budworm (Lepidoptera: Tortricidae) and gypsy moth (Lepidoptera: Lymantriidae). Environmental Entomology 24(1): 1-9.

Williams, D.W.; Liebhold, A.M. 1995c. Forest defoliators and climate change: potential changes in spatial distribution of outbreaks of western spruce budworm (Lepidoptera: Torticidae) and gypsy moth (Lepidoptera: Lymantriidae). Environmental Entomology 24(1): 1-9.

Wirth, S.; Vogel, K. 1988. Cow milk protein intolerance in infants with methemoglobinemia and diarrhea. European Journal of Pediatrics (Berlin) 148(2):172.

Woods, S.A.; Elkinton, J.S.; Shapiro, M. 1990. Factors affecting the distribution of nuclear polyhedrosis virus among gypsy moth (Lepidoptera: Lymantriidae) egg masses and larvae. Environmental Entomology 19(5): 1330-1337.

Work, T.T.; McCullough, D.G. 2000. Lepidopteran communities in two forest ecosystems during the first gypsy moth outbreaks in Northern Michigan. Environmental Entomology 29(5): 884-900.

Y

Yu, S.J.; Robinson, F.A.; Nation, J.L.1984. Detoxication capacity in the honey bee, *Apis mellifera*. Pesticide Biochemistry and Physiology. 22: 360-368. Summarized in WHO 1996.

Z

Zacarias, M.S.; de Moraes, J.C.; de Castro Diniz, L.; Ciociola, A.I.; Damasceno, A.G. 1998. Selectivity of insect growth regulators to eggs and nymphs of *Podisus nigrispinus* (Dallas) (Homoptera: Pentatomidae). Ciênc. E. Agrotec. Lavras 22(2): 194-198.

Zungoli, P.A.; Steinhauer, A.L.; Linduska, J.J. 1983. Evaluation of diflubenzuron for Mexican bean beetle (Coleoptera: Coccinellidae) control and impact on *Pediobius foveolatus* (Hymenoptera: Eulophidae). Journal of Economic Entomology 76: 188-191.

Pesticide Precautionary Statement

This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Printed on recycled paper with soy-based ink.