



United States
Department of
Agriculture

Marketing and
Regulatory
Programs

Animal and
Plant Health
Inspection
Service



Port of Tacoma
Cernuella virgata
(*C. virgata*)
Eradication Program in
Pierce County,
Washington

Environmental Assessment
June 2008

Port of Tacoma *Cernuella virgata* (*C. virgata*) Eradication Program in Pierce County, Washington

Environmental Assessment June 2008

Agency Contact:

Barbara Chambers
Washington State Plant Health Director
U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
22000 Marine View Drive S., Suite 201
Des Moines, WA 98198

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (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 USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Mention of companies or commercial products in this report does not imply recommendation or endorsement by the U.S. Department of Agriculture over others not mentioned. USDA neither guarantees nor warrants the standard of any product mentioned. Product names are mentioned solely to report factually on available data and to provide specific information.

This publication reports research involving pesticides. 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.

Table of Contents

I. Introduction	1
A. Background	1
B. <i>C. virgata</i> Biology	2
C. Purpose and Need	3
D. Affected Environment	3
II. Alternatives	4
A. No Action	4
B. Treatment Alternative	5
III. Environmental Impacts	7
A. No Action	7
B. Treatment Alternative	8
C. Threatened and Endangered Species.....	10
IV. Listing of Agencies and Persons Consulted	11
V. References	12

I. Introduction

A. Background

In November of 2005, survey staff for the Washington State Department of Agriculture (WSDA) detected the snail, *Ceratomyxa virgata* (*C. virgata*), while conducting the Exotic Wood Boring Insect survey at the Port of Tacoma in Pierce County, Washington. *C. virgata* is a foreign invasive snail considered a major pest of cereal crops, legumes, and pasture lands found mainly in Mediterranean Europe. *C. virgata* is also known as the vineyard snail, Mediterranean white snail, and the common white snail.

The United States Department of Agriculture (USDA) confirmed the identity of the snail on November 14, 2005. Shortly after that, USDA notified the USDA New Pest Advisory Group (NPAG) of the introduction of the snail.

In January 2006, NPAG recommended that a delimiting survey be conducted to determine the extent of the infestation, and develop an eradication plan based on the outcome of the delimiting surveys. Delimiting surveys were conducted between May and December 2006, by WSDA. Areas surveyed included seaports, railways, rail yards, and import facilities, as well as agricultural production centers in the eastern half of the State. Based on these surveys, WSDA determined the infestation area to be approximately 300 acres within the Port of Tacoma. Statewide surveys for *C. virgata* have been conducted to detect incipient satellite populations or any new introductions. To date, *C. virgata* has not been detected outside the Port of Tacoma.

The Port of Tacoma began vegetation removal, debris burning, and herbicide applications, in August 2007, at their own expense. USDA and WSDA worked with the Mollusk Working Group of USDA and the Washington State New Pest Advisory Group to develop an eradication plan that draws from successful eradication of *C. virgata* from two other U.S. locations (Michigan and North Carolina). The original proposed eradication plan consisted of four key primary elements: 1) habitat alteration; 2) vegetation removal; 3) debris disposal; and 4) molluscicide applications to prevent the snail from further expanding its range in the State.

USDA and WSDA treated portions of a 594-acre area, in fall 2007, utilizing vegetation removal, chemical treatment, and debris removal.

B. *C. virgata* Biology

C. virgata is a native of Mediterranean Europe, and has become well established in Southern Australia where it was accidentally introduced in the early 1900's. The life cycle can either be annual or biennial (occurring every 2 years), depending on the crop and location. Observations made at the Port of Tacoma suggest the population located there is on a biennial life cycle (Schall, 2006).

C. virgata have both male and female reproductive organs (Schall, 2006); however, they must mate with another *C. virgata* because they cannot self-reproduce (Schall, 2006). *C. virgata* adults mate and generally lay eggs in autumn and winter (Schall, 2006). Each snail can lay 100 to 200 eggs (Schall, 2006). Observations of the population in the Port of Tacoma suggest that most *C. virgata* enter spring in the juvenile stage. The adult stage reaches its peak density and reproductive activity in fall, between October and November.

C. virgata was observed during the winter months. Observations made, in February 2008 at the Port of Tacoma, indicated that the snail was laying eggs at that time. This suggests that the adults are active, feeding, and reproducing during the moderate winter climate of western Washington.

Western Washington is characterized by warm, dry summers. *C. virgata* has adapted to dry environments by entering into a period of inactivity (called aestivation) during the hot, dry summer season. Aestivation is a state of dormancy, similar to hibernation, but occurs during the summer months. The animal remains inactive and insulated against the heat to avoid potentially harmful effects of the season. Because of *C. virgata*'s ability to endure long periods of warmth, dryness, fasting, and light, the snail has the potential to be widely distributed (Schall, 2006).

C. virgata is a pest of cereal crops, legumes, and pasture lands. In early summer, *C. virgata* climbs on to the heads, pods, and stalks of cereals and legumes to aestivate. Aestivation of *C. virgata* at the top of the crops has lead to machinery becoming clogged during harvest; this can contaminate the harvested grain, thus, resulting in unacceptable grain upon delivery to the silo or downgrading the grain in quality, causing significant economic damage (Schall, 2006).

C. virgata is a pest to crops, primarily because it can contaminate pasture and fodder resulting in stock rejection of pasture and hay that is heavily infested (Schall, 2006). Although *C. virgata* primarily feeds on decayed organic matter, it also eats seedlings of cereal, canola and pulse crops, and clover in pasture (Schall, 2006). *C. virgata* has also been shown to

substantially reduce the number of wheat seedlings (Schall, 2006). Native plants can also be harmed by *C. virgata* (Schall, 2006).

C. Purpose and Need

APHIS is responsible for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act (7 United States Code (U.S.C.) 7701 et seq.). As such, it is important that APHIS take the steps necessary to eradicate *C. virgata* from areas in the Port of Tacoma to prevent its spread throughout Washington State and the rest of the United States.

This EA will analyze the environmental impacts anticipated from the programmatic treatment of *C. virgata* in the Port of Tacoma using debris disposal; vegetation removal (including the use of glyphosate) and disposal; habitat alteration; and, the use of molluscicide.

This EA has been prepared consistent with the National Environmental Policy Act of 1969 (NEPA) and APHIS' NEPA implementing procedures (7 Code of Federal Regulations (CFR) part 372) for the purpose of evaluating how the proposed action, if implemented, may affect the quality of the human environment. APHIS is providing a 30-day public comment period for response to this EA.

D. Affected Environment

Tacoma is located at the foot of Mount Rainier, along the shores of Commencement Bay, in the southern portion of Puget Sound in Washington State. The Port of Tacoma is an independent, municipal corporation that operates under State-enabling legislation. The port has 2,400 acres that are used for shipping, terminal activity, and warehouse distribution and manufacturing.

Puget Sound is the nation's second largest estuary. It is a fjord-like estuary and covers an area of approximately 900-square miles, including 2,300 miles of coastline. The Puget Sound Basin is bounded on the east by the Cascade Range, and on the west by the Olympic Mountains; it extends north to British Columbia, and south to the low hills of the Coast Range near Olympia, Washington. There are 19 major watersheds in the Puget Sound Basin. The basin lies within the rain shadow of the Olympic Mountains, and receives approximately 28 to 55 inches of precipitation annually.

Commencement Bay is a natural, deep water embayment that historically consisted of extensive intertidal mudflats and emergent marsh habitats. However, today less than 10 and 2 percent, respectively, of those habitats remain. Dredging and filling of mudflats have converted much of the shallow, nearshore habitats into open water habitats with an extensive armoring of the shoreline, including bulkheads, rip rap, and rubble. In addition, an extensive system of piers and docks has been constructed to support the Port of Tacoma. As a result of past and present industrial uses, Commencement Bay has a long history of chemical and metal contamination, and was named a Superfund site by the U.S. Environmental Protection Agency (EPA) in 1981.

The Port of Tacoma has encompassed a number of activities to protect the environment, including construction and monitoring of habitat improvement and restoration projects, cleanup of historical contamination and pollution, and ensuring that Port operations comply with applicable environmental laws and regulations.

The treatment area consists of a 594-acre industrial area. Land ownership within the area includes approximately 284 acres owned by the Port of Tacoma, 25 acres owned by the City of Tacoma, 256 acres owned by private companies, and 19 acres owned by the Puyallup Tribe. Most of the treatment area is developed with strips and patches of vegetation scattered throughout. Only vegetated areas of the site will be treated.

II. Alternatives

This EA will analyze the environmental impacts anticipated from the programmatic treatment of *C. virgata* at the Port of Tacoma in Washington State. Two alternatives are being considered: (1) no action by APHIS to eradicate *C. virgata*; and (2) the proposed action to treat with chemical treatments, habitat alteration, and vegetation removal.

A. No Action

Under the no action alternative, APHIS would not provide financial or other assistance in the eradication of *C. virgata* from the Port of Tacoma, Washington. WSDA and/or the private owners of the Port of Tacoma may implement their own eradication program utilizing chemical and mechanical means to eradicate *C. virgata*; however, the State of Washington and private owners of the Port of Tacoma may decide not to eradicate and, thus, *C. virgata* would be allowed to become established and spread into surrounding areas.

B. Treatment Alternative

Under the preferred treatment alternative, APHIS, in cooperation with WSDA, would utilize 1) outreach, 2) debris disposal, 3) vegetation removal and disposal, 4) habitat alteration, and 5) molluscicide applications over a 5-year period to eradicate *C. virgata* from the Port of Washington, as described below:

1. Outreach

APHIS and WSDA will continue to encourage landowners to actively participate in eradication efforts. WSDA will work with landowners who are unwilling or unable to conduct eradication activities and, at the very least, ensure access to those properties allowing WSDA or their contractors to engage in eradication efforts.

APHIS and WSDA will conduct site visits to discuss planned agency operations with property owners/managers. During these visits, site conditions will be evaluated, letters delivered, and brochures and pamphlets handed out. WSDA will also hold an open house prior to conducting a treatment. During an open house, WSDA staff will answer questions and provide more detailed information about *C. virgata*, how others States treat snail infestations, and plans for eradication. The open house will be open to the general public, as well as property owners.

WSDA has sent information on *C. virgata* to Washington State University county extension agents statewide. WSDA has requested that extension agents submit snails of concern to WSDA for identification.

2. Debris Disposal

Snails are frequently detected under debris where they often find refuge. Scrap wood and metal, abandoned vehicles, machinery parts, plastic tarps, and other various types of debris are scattered throughout the port industrial area. APHIS and WSDA will work with property owners to relocate debris to a central site for treatment within the infested area. Larger debris will be pressure washed using a hydraulic sprayer and sent to a disposal site to prevent any snails that may be on the large debris from being transported to another location. Debris will be cleaned and removed throughout the Port of Tacoma prior to molluscicide treatment.

3. Vegetation Removal and Disposal

Vegetation provides food and habitat for the snail. Low-lying vegetation and trees blocking access to vegetation will be removed. Larger trees (greater than 4-inch diameter at breast height) and smaller trees and shrubs in open landscaped areas will remain. Vegetation removal and disposal will occur throughout the program prior to molluscicide treatment.

Cut vegetation will need to be thermally treated (possibly incinerated) on site prior to disposal outside the treatment zone. APHIS and WSDA will investigate the possibility of using a mobile rotary kiln or mobile

incinerator for vegetation treatment prior to transport off site. Other options being considered are transporting chipped vegetation in large sealed envelopes or containers for deep burial (greater than 36 inches of cover material) at a yet to be determined site outside the treatment area. USDA and WSDA will work with individual landowners to have debris and vegetation removal and disposal completed prior to molluscicide application. All equipment used will be pressure washed before leaving the infested area.

In areas that remain unpaved, the application of herbicides will also be used. Glyphosate (Rodeo[®]) will be applied to suppress vegetation in unpaved areas. Application periods will coincide with molluscicide application and will be applied during the periods of March to June and September to November.

4. Habitat Alteration

USDA and WSDA will encourage landowners to pave over vegetated areas wherever possible. Some of the larger port-owned properties that are heavily vegetated are currently being planned for development. Eventually these properties will be plowed, graded, and paved. Development on these properties, however, may be years away.

5. Molluscicide

Timing of molluscicide applications will be tied to snail life history. Survey staff will monitor snail populations during the year to determine optimal days to apply treatments. Applications of molluscicide will occur during spring (mid-March to mid-June) and fall (mid-September to mid-November) when the snails are most active. Applications will occur during a rain-free period following an initial rainfall when snails are active.

Both the solid (Metarex[®]) and liquid formulations (Slug-Fest[®]) of the active ingredient metaldehyde are being proposed. Molluscicides will be applied in accordance with label instructions by licensed applicators at maximum rate. Maximum rate for Metarex[®] (4% active ingredient) is 40 lbs/acre; maximum rate for Slug-Fest[®] (25% active ingredient) is 1 gallon/acre. A maximum of three applications will be used in spring and three in fall, and will occur no less than 2 weeks apart, depending on weather.

Straw wattles or silt fences (physical barriers) will be installed adjacent to all water bodies and waterways to prevent the intrusion of molluscicide in water. To prevent movement into the surrounding water bodies or waterways, Slug-Fest[®] will not be applied within a 60-foot buffer of any water body or waterway. All molluscicide amounts, rates, and timing of applications will be documented for each application. Molluscicide will be applied only to nonpaved areas.

The *C. virgata* infestation in the Port of Tacoma is larger than either the Michigan or North Carolina infestation. Previous snail infestations indicate that years of treatment will likely be required for successful eradication to be completed.

III. Environmental Impacts

A. No Action

Under the no action alternative, APHIS would not cooperate with WSDA to implement an integrated eradication plan for *C. virgata*. WSDA and the Port of Tacoma private owners may implement their own eradication program without APHIS aid, utilizing the same techniques. However, if WSDA and the Port of Tacoma private owners decide not to treat *C. virgata*, the population may spread into other areas of Washington and potentially into other States. *C. virgata* is a pest of cereal crops (i.e., barley and wheat), legumes, and pasture lands.

Barley is grown in every county in Washington, but concentrated production is located in eastern Washington in Adams, Garfield, Lincoln, Spokane, and Whitman Counties. Washington was the fourth major barley-producing State behind North Dakota, Idaho, and Montana. Washington is also the fourth major producer of wheat in the United States behind North Dakota, Kansas, Montana, and Washington. The majority of the wheat production is also in the southeastern portion of Washington State in Adams, Douglas, Lincoln, Walla Walla, and Whitman Counties.

Damage caused by snails occurs primarily at the time of crop establishment and at harvest. The snail will also climb and feed on new growth, causing considerable damage to vines, shrubs, and trees. *C. virgata* feeds on young crops and can cause substantial damage to some areas, thus, requiring resowing. In late spring, snails climb plants and contaminate the grain during harvest. The contaminated grain may be downgraded or rejected, and live snails in grain pose a threat to exports. Crushed snails clog up machinery causing delays during harvest.

In 1984, barley shipped from South Australia was rejected by quarantine authorities in Chile because it was contaminated with living *C. virgata*. It is reported that this rejection cost the Australian Barley Board \$1.3 million in compensation payments. The barley grown for malt was downgraded to feed, dropping its value from \$130 per ton to \$30 per ton.

C. virgata have invaded native ecosystems, as well as agricultural fields in southern Australia. Although information is scarce, it seems highly probable that these introduced gastropods are having a significant impact on the native flora and fauna in Australian ecosystems.

C. virgata is common in the British Isles and France, and very common in northwest Spain; however, there are few references that mention damage in Europe. This may have to do with the presence of biological control agents which do not occur or have been ineffective in Australia, such as invertebrate and vertebrate predators (i.e., mollusks, beetles, lizards, birds, small mammals), and insect parasitoids (i.e., sacrophagid, sciomyzid, phorid, and calliphorid flies). It is not known whether biological control agents would be effective in the Washington area and the surrounding States that may be affected if *C. virgata* were to establish and spread.

C. virgata has thrived in areas which have a Mediterranean climate, such as Australia and Europe, along with portions of California and Oregon. These areas are considered the areas to be the greatest threat from *C. virgata*. In addition, *C. virgata* has the ability to persist in very dry areas; therefore, fields in the Southwest United States, particularly those under irrigation, may also suffer damage from *C. virgata*.

B. Treatment Alternative

Under the treatment alternative, the program will utilize public outreach, debris removal, vegetation removal, habitat alteration, and metaldehyde application. The portion of the Port of Tacoma that is being proposed for treatment consists of high traffic areas where minimal wildlife is present. The use of public outreach, debris removal, habitat alteration, and some of the vegetation removal will have little or no effects to the environment due to the treatment, and this is further supported by the fact that there are minimal wildlife species present in the area. Therefore, these treatments are not discussed further in this document. However, the use of chemical treatments, such as glyphosate, and the use of liquid and pellet forms of metaldehyde could affect wildlife that is present. The effects of these are discussed in more detail below.

1. Glyphosate

Glyphosate is a nonselective herbicide that is registered for many food and nonfood uses. The intent of its use in this program is to remove areas of suitable habitat for invasive snails. Within the Port of Tacoma, the treatment area consists of areas of high traffic where minimal wildlife is present. There may be some amphibians and small mammals that live in the grassy areas, as well as invertebrates. Birds may also frequent these areas.

Glyphosate will be applied with hand-held equipment from the ground targeting the suitable habitat for the invasive snails. The toxicity of glyphosate is considered to be low. Field studies to assess impacts under representative natural conditions, and monitoring studies conducted under conditions relevant to product use indicate that glyphosate herbicides registered for terrestrial application are not likely to result in adverse

effects to amphibians when used according to label directions (Langeland, 2006). EPA determined effects of glyphosate on birds, mammals, and invertebrates to be minimal (EPA, 1993).

Glyphosate binds strongly to soil and, therefore, is not likely to contaminate ground water. There is potential for glyphosate to enter surrounding water through surface water runoff; however, because of the limited use of glyphosate in this program and its high binding affinity, runoff is not expected to occur at levels that would impact aquatic biota.

The toxicity of different formulations can increase the toxicity depending on the surfactant used. However, Kubena (1998) concluded that most concentrations of glyphosate and surfactants tested did not have a detectable effect on growth, survival, or vitellogenin production in fish. The formulation to be used in this program is Rodeo[®], a formulation designed to be used in aquatic settings.

Past studies support the conclusion that, if applied in accordance with label requirements, Rodeo[®] is not likely to result in measurable effects to fish, amphibians, mammals, birds, invertebrates, or their habitat. This is due primarily to the low toxicity levels of the products used in Rodeo[®], the strong soil binding characteristics of glyphosate which renders it inactive soon after an application, and its tendency not to bioconcentrate in aquatic organisms due to its water solubility. Based on the available information of the toxicity of glyphosate, (as the formulated product, Rodeo[®]), and the surfactants Agri-Dex and LI 700, the use of these combined products will have minimal effects on fish, amphibians, birds, mammals, or invertebrates.

2. Metaldehyde

Metaldehyde is a molluscicide used to control snails and slugs on a wide variety of sites. EPA concluded that it is moderately toxic to mammals, and slightly to moderately toxic to birds. There is limited aquatic effects data for metaldehyde; however, based on the available toxicity data, effects are expected to be moderate to low for fish and aquatic invertebrates (Calumpang et al., 1995; EPA, 2006). Metaldehyde will be used in two different formulations (Metarex[®] and Slug-Fest[®]) as a means to eradicate invasive snails.

Metarex[®] is a colored-pellet form of metaldehyde which also includes acetaldehyde (11%) and denatonium benzoate (.02%). Denatonium benzoate is a bittering agent which prevents significant ingestion of the Metarex[®] bait. Straw wattles or silt fences (physical barriers) will be installed adjacent to all water bodies and waterways to prevent the intrusion of molluscicide in water. Metarex[®] will only be applied in nonpaved areas.

Metarex[®] can be hazardous to wild birds and animals if consumed; however, there should be limited exposure to Metarex[®] because the Port of Tacoma is a high-traffic area, thus, limiting wildlife presence.

Slug-Fest[®] is being implemented as a more effective means of treating areas of high juvenile activity, and will be applied using a backpack sprayer which will reduce drift during application. Slug-Fest[®] will only be used as a spot treatment in nonpaved areas. There will be a 60-foot application buffer from aquatic waterbodies to eliminate potential drift and runoff during application. Risks to mammals and birds are expected to be reduced, when compared to the Metarex[®] formulation, because it is not being applied as a bait.

C. Threatened and Endangered Species

Section 7 of the Endangered Species Act and its implementing regulations require Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat. APHIS has prepared a biological assessment that considers the effects of the eradication program for *C. virgata* on all federally listed species and designated critical habitat in the Port of Tacoma.

Through informal consultation with Fish and Wildlife Services and National Marine Fisheries Service (NMFS), APHIS has determined that, with the implementation of certain protection measures, the proposed action may affect, but is not likely to adversely affect the Puget Sound Chinook, Puget Sound Steelhead Trout, Bull Trout, or their critical habitat. The use of silt fences and/or textile fabrics around storm water drains and drainage ditches adjacent to treatment areas are mitigations to prevent Metarex[®] from entering the surrounding water and, thus, affecting the listed species. Buffers have been created to ensure that no pesticides used in this eradication program will enter surrounding waters.

In accordance with the Section 7 consultation process, APHIS has provided the biological assessment to NMFS for its review, and has requested concurrence with its effect determinations.

IV. Listing of Agencies and Persons Consulted

U.S. Department of Agriculture
Animal Plant Health Inspection Service
Plant Protection and Quarantine
Office of the WA State Plant Health Director
22000 Marine View Drive S., Suite 201
Des Moines, WA 98198

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Environmental Compliance Team
4700 River Road, Unit 150
Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Western Regional Office
2150 Centre Avenue, Building B
Fort Collins, CO 80526

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Policy and Program Development
Environmental Services
4700 River Road, Unit 149
Riverdale, MD 20737

Washington State Department of Agriculture
Plant Protection Division / Pest Programs
3939 Cleveland Ave., SE
Olympia, WA 98501

V. References

EPA—See U.S. Environmental Protection Agency, Office of Pesticide Programs

Atterholt, C.A., Delwiche, M.J., Rice, R.E., and Krochta, J.M., 1998. Study of biopolymers and paraffin as potential controlled-release carriers for insect pheromones. *J. Agric. Food Chem.* 46:4429–4434.

Calumpang, S.M.F., Medina, M.J.B., Tejada, A.W., and Medina, J.R., 1995. Environmental impact of two molluscicides: niclosamide and metaldehyde in a rice paddy ecosystem. *Bull. Environ. Contam. Toxicol.* 55:494–501.

Kubena, K., 1998. Rounding up the facts about Rodeo: an evaluation of non-target effects on estuarine invertebrates and juvenile salmonids. [Thesis] Masters of Science. University of Washington, Seattle, WA.

Langeland, K., 2006. Safe use of glyphosate-containing products in aquatic and upland natural areas. <http://edis.ifas.ufl.edu/AG248>

Schall, R.A., 2006. NPAG (New Pest Advisory Group) Data: *Cerutuella virgata* a terrestrial snail. United States Department of Agriculture, Animal and Plant Health Inspection Service. (Draft) January 11, 2006.

U.S. Environmental Protection Agency, Office of Pesticide Programs, 1993. Registration eligibility decision for glyphosate. Publication EPA 738–R93–014, EPA Office of Pesticide Programs, Washington, D.C. 162 pp.

U.S. Environmental Protection Agency, Office of Pesticide Programs, 2006. Level one screening ecological risk assessment for the reregistration of metaldehyde. 209 pp.