

Impact of Land Disturbance on the Fate of Arsenical Pesticides

Carl E. Renshaw,* Benjamin C. Bostick, Xiahong Feng, Christine K. Wong,
Elizabeth S. Winston, Roxanne Karimi, Carol L. Folt, and Celia Y. Chen

ABSTRACT

Increasing development of historic farmlands raises questions regarding the fate of pesticides applied when these lands were in cultivation. We quantified As and Pb budgets in field soils in two orchards where arsenical pesticides were applied in the early 20th century and a third uncontaminated control field. Sequential extractions and X-ray analyses also were used to determine mineral phases. In addition, we measured metal loads in drainages adjacent to the fields and in two common macroinvertebrate taxa within the wetland at the outlet of the drainages. We find that the applied As and Pb have undergone little vertical redistribution; concentrations of As and Pb in the top 25 cm of contaminated orchard soils are higher than in the uncontaminated control field. However, none of the applied lead arsenate (PbH_2AsO_4) remains in its original mineral phase. Instead, the metals are more primarily adsorbed onto fine silt and clay-sized amorphous oxides and organic matter. Further, physical erosion associated with tilling and replanting appears to have mobilized the fine-particulate-bound As and Pb in one orchard. The remobilized metals are found in sediments in the stream channel draining the tilled orchard. It is unclear if the As and Pb transported sediments are biologically active; average macroinvertebrate metal burdens in the wetland are not elevated above those observed elsewhere in the region. However, little of the mobilized metals may have reached the wetland. These results demonstrate that land use change can significantly impact the retention of arsenical pesticides.

DURING THE 1930S AND 1940S an average of more than 40 Mg of arsenical pesticides were applied annually to U.S. farmland (Murphy and Auncott, 1998). Growing recognition of the health risks (U.S. Public Health Service, 2000; Karagas et al., 2002; Smith et al., 1992) associated with long-term exposure to the low levels ($1\text{--}50\text{ }\mu\text{g L}^{-1}$) of As in drinking water has focused attention on the fate of these pesticides.

The use of arsenical pesticides was particularly prevalent in apple (*Malus sylvestris* Mill.) orchards before the invention of 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (DDT) in 1947 (Welch et al., 2000). Many studies have concluded that the redistribution of surface-applied Pb and As within orchard soils is limited; decades after the application of arsenical pesticides, the highest concentrations of Pb and As generally remain in the top 25 cm of contaminated soils (Aron et al., 1980; Benson, 1976; Jones and Hatch, 1937; Peryea and Creger, 1994; Veneman et al., 1983). Arsenic is somewhat more mobile

than Pb (Elfvig et al., 1994; Merry et al., 1983; Peryea and Creger, 1994), particularly in sandy soils (Veneman et al., 1983). In some cases the mobility of As may be significantly increased by the application of phosphate-rich fertilizers (Johnson and Barnard, 1979; Murphy and Auncott, 1998). Phosphate and As exhibit similar physicochemical behavior in soils and compete directly for specific adsorption sites on soil particles (Woolson et al., 1973).

The limited redistribution of As and Pb implies that these metals are strongly retained in the soil. However, if the metals are retained on fine particles, then the retention of the As and Pb may be impacted by physical erosion (Cooper and Gillespie, 2001), particularly if the upper soil is physically disturbed such as during tilling or land development (Wu et al., 2004). More than 2500 km² of U.S. farmland are developed each year (USDA, 2003b), suggesting the possibility that land development might mobilize significant amounts of Pb and As in lands where arsenical pesticides were used.

To assess the potential for land disturbance to mobilize arsenical pesticides, we compared the Pb and As budgets of two orchards in southern New Hampshire having similar historical applications of arsenical pesticides during the early 1900s. Trees more than 80 yr old continue to grow in the first orchard, while the original trees planted in the second orchard were removed when the field was tilled and replanted in 1992. A third orchard where lead arsenate was never applied provided a control for our study. We also determined the masses of As and Pb in sediments within streams that drain each field; much of any soil that eroded from these fields would likely be deposited in these channels. Finally, to assess the bioavailability of any Pb and As mobilized by the tilling, we measured metal body burdens in macroinvertebrates inhabiting the wetland ecosystem at the outlet of the stream draining the tilled field.

Site Description

The field site for this study is a commercial orchard located in southern New Hampshire. The orchard is still in production and has been owned and managed by the same family for >80 yr. Active orcharding at the site is indicated on the 1953 U.S. Geological Survey topographic map and the New Hampshire State Blister Rust survey maps from 1936, 1938, and 1960.

Average monthly precipitation at the site is 8.4 cm mo^{-1} and is approximately uniformly distributed throughout the year. The site receives ~25% of its precipitation in the form of snow. About half the total annual precipitation in this region is lost to evapotranspiration (Randall, 1996). Orchard soils are well drained, shallow to medium depth, gravelly to fine, sandy

C.E. Renshaw, B.C. Bostick, X. Feng, C.K. Wong, and E.S. Winston, Dep. of Earth Sciences, Dartmouth College, Hanover, NH 03755; and R. Karimi, C.L. Folt, and C.Y. Chen, Dep. of Biology, Dartmouth College, Hanover, NH 03755. Received 15 Mar. 2005. *Corresponding author (Carl.Renshaw@Dartmouth.edu).

Published in J. Environ. Qual. 35:61–67 (2006).
Technical Reports: Heavy Metals in the Environment.
doi:10.2134/jeq2005.0096
© ASA, CSSA, SSSA.
677 S. Segoe Rd., Madison, WI 53711 USA.

Abbreviations: ICP-MS, inductively coupled plasma mass spectrometer; RUSLE, Revised Universal Soil Loss Equation; SEM, scanning electron microscopy; XRD, X-ray diffraction.

Arsenical Pesticides A Symposium Sponsored

Brendan G. Carr



Arsenical Pesticides A Symposium Sponsored:

Arsenical Pesticides ,1975 **Arsenical Pesticides** E. A. Woolson,1975 **National Library of Medicine Current Catalog** National Library of Medicine (U.S.),1971 Current Catalog National Library of Medicine (U.S.),1979 First multi year cumulation covers six years 1965 70 **Impacts of Coal-fired Power Plants on Fish, Wildlife, and Their Habitats** ,1978 **FWS/OBS.** ,1978 **Mercury, Lead, Arsenic, and Cadmium in Biological Tissue** Werner F. Beckert,1978
An Approach to Water Resources Evaluation of Non-point Silvicultural Sources ,1980 EPA-600/8 ,1980-08
Bibliographic Guide to Conference Publications New York Public Library. Research Libraries,1989 Vols for 1975 include publications cataloged by the Research Libraries of the New York Public Library with additional entries from the Library of Congress MARC tapes

The Enigmatic Realm of **Arsenical Pesticides A Symposium Sponsored**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Arsenical Pesticides A Symposium Sponsored** a literary masterpiece penned with a renowned author, readers set about a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting effect on the hearts and minds of those who partake in its reading experience.

<https://dashboard.colourpop.com/results/publication/fetch.php/Top%20Ethical%20Shopping.pdf>

Table of Contents **Arsenical Pesticides A Symposium Sponsored**

1. Understanding the eBook **Arsenical Pesticides A Symposium Sponsored**
 - The Rise of Digital Reading **Arsenical Pesticides A Symposium Sponsored**
 - Advantages of eBooks Over Traditional Books
2. Identifying **Arsenical Pesticides A Symposium Sponsored**
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an **Arsenical Pesticides A Symposium Sponsored**
 - User-Friendly Interface
4. Exploring eBook Recommendations from **Arsenical Pesticides A Symposium Sponsored**
 - Personalized Recommendations
 - **Arsenical Pesticides A Symposium Sponsored** User Reviews and Ratings
 - **Arsenical Pesticides A Symposium Sponsored** and Bestseller Lists

5. Accessing Arsenical Pesticides A Symposium Sponsored Free and Paid eBooks
 - Arsenical Pesticides A Symposium Sponsored Public Domain eBooks
 - Arsenical Pesticides A Symposium Sponsored eBook Subscription Services
 - Arsenical Pesticides A Symposium Sponsored Budget-Friendly Options
6. Navigating Arsenical Pesticides A Symposium Sponsored eBook Formats
 - ePub, PDF, MOBI, and More
 - Arsenical Pesticides A Symposium Sponsored Compatibility with Devices
 - Arsenical Pesticides A Symposium Sponsored Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Arsenical Pesticides A Symposium Sponsored
 - Highlighting and Note-Taking Arsenical Pesticides A Symposium Sponsored
 - Interactive Elements Arsenical Pesticides A Symposium Sponsored
8. Staying Engaged with Arsenical Pesticides A Symposium Sponsored
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Arsenical Pesticides A Symposium Sponsored
9. Balancing eBooks and Physical Books Arsenical Pesticides A Symposium Sponsored
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Arsenical Pesticides A Symposium Sponsored
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Arsenical Pesticides A Symposium Sponsored
 - Setting Reading Goals Arsenical Pesticides A Symposium Sponsored
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Arsenical Pesticides A Symposium Sponsored
 - Fact-Checking eBook Content of Arsenical Pesticides A Symposium Sponsored
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

Arsenical Pesticides A Symposium Sponsored Introduction

Arsenical Pesticides A Symposium Sponsored Offers over 60,000 free eBooks, including many classics that are in the public domain. Open Library: Provides access to over 1 million free eBooks, including classic literature and contemporary works. Arsenical Pesticides A Symposium Sponsored Offers a vast collection of books, some of which are available for free as PDF downloads, particularly older books in the public domain. Arsenical Pesticides A Symposium Sponsored : This website hosts a vast collection of scientific articles, books, and textbooks. While it operates in a legal gray area due to copyright issues, its a popular resource for finding various publications. Internet Archive for Arsenical Pesticides A Symposium Sponsored : Has an extensive collection of digital content, including books, articles, videos, and more. It has a massive library of free downloadable books. Free-eBooks Arsenical Pesticides A Symposium Sponsored Offers a diverse range of free eBooks across various genres. Arsenical Pesticides A Symposium Sponsored Focuses mainly on educational books, textbooks, and business books. It offers free PDF downloads for educational purposes. Arsenical Pesticides A Symposium Sponsored Provides a large selection of free eBooks in different genres, which are available for download in various formats, including PDF. Finding specific Arsenical Pesticides A Symposium Sponsored, especially related to Arsenical Pesticides A Symposium Sponsored, might be challenging as theyre often artistic creations rather than practical blueprints. However, you can explore the following steps to search for or create your own Online Searches: Look for websites, forums, or blogs dedicated to Arsenical Pesticides A Symposium Sponsored, Sometimes enthusiasts share their designs or concepts in PDF format. Books and Magazines Some Arsenical Pesticides A Symposium Sponsored books or magazines might include. Look for these in online stores or libraries. Remember that while Arsenical Pesticides A Symposium Sponsored, sharing copyrighted material without permission is not legal. Always ensure youre either creating your own or obtaining them from legitimate sources that allow sharing and downloading. Library Check if your local library offers eBook lending services. Many libraries have digital catalogs where you can borrow Arsenical Pesticides A Symposium Sponsored eBooks for free, including popular titles. Online Retailers: Websites like Amazon, Google Books, or Apple Books often sell eBooks. Sometimes, authors or publishers offer promotions or free periods for certain books. Authors Website Occasionally, authors provide excerpts or short stories for free on their websites. While this might not be the Arsenical Pesticides A Symposium Sponsored full book , it can give you a taste

of the authors writing style. Subscription Services Platforms like Kindle Unlimited or Scribd offer subscription-based access to a wide range of Arsenical Pesticides A Symposium Sponsored eBooks, including some popular titles.

FAQs About Arsenical Pesticides A Symposium Sponsored Books

What is a Arsenical Pesticides A Symposium Sponsored PDF? A PDF (Portable Document Format) is a file format developed by Adobe that preserves the layout and formatting of a document, regardless of the software, hardware, or operating system used to view or print it. **How do I create a Arsenical Pesticides A Symposium Sponsored PDF?** There are several ways to create a PDF: Use software like Adobe Acrobat, Microsoft Word, or Google Docs, which often have built-in PDF creation tools. Print to PDF: Many applications and operating systems have a "Print to PDF" option that allows you to save a document as a PDF file instead of printing it on paper. Online converters: There are various online tools that can convert different file types to PDF. **How do I edit a Arsenical Pesticides A Symposium Sponsored PDF?** Editing a PDF can be done with software like Adobe Acrobat, which allows direct editing of text, images, and other elements within the PDF. Some free tools, like PDFescape or Smallpdf, also offer basic editing capabilities. **How do I convert a Arsenical Pesticides A Symposium Sponsored PDF to another file format?** There are multiple ways to convert a PDF to another format: Use online converters like Smallpdf, Zamzar, or Adobe Acrobats export feature to convert PDFs to formats like Word, Excel, JPEG, etc. Software like Adobe Acrobat, Microsoft Word, or other PDF editors may have options to export or save PDFs in different formats. **How do I password-protect a Arsenical Pesticides A Symposium Sponsored PDF?** Most PDF editing software allows you to add password protection. In Adobe Acrobat, for instance, you can go to "File" -> "Properties" -> "Security" to set a password to restrict access or editing capabilities. Are there any free alternatives to Adobe Acrobat for working with PDFs? Yes, there are many free alternatives for working with PDFs, such as: LibreOffice: Offers PDF editing features. PDFsam: Allows splitting, merging, and editing PDFs. Foxit Reader: Provides basic PDF viewing and editing capabilities. **How do I compress a PDF file?** You can use online tools like Smallpdf, ILovePDF, or desktop software like Adobe Acrobat to compress PDF files without significant quality loss. Compression reduces the file size, making it easier to share and download. **Can I fill out forms in a PDF file?** Yes, most PDF viewers/editors like Adobe Acrobat, Preview (on Mac), or various online tools allow you to fill out forms in PDF files by selecting text fields and entering information. Are there any restrictions when working with PDFs? Some PDFs might have restrictions set by their creator, such as password protection, editing restrictions, or print restrictions. Breaking these restrictions might require specific software or tools, which may or may not be legal depending on the circumstances and local laws.

Find Arsenical Pesticides A Symposium Sponsored :

[top ethical shopping](#)

sustainable travel latest

latest minimalist living

[upcycling ideas framework](#)

[zero waste lifestyle tutorial](#)

guide conscious consumerism

[upcycling ideas advanced](#)

[ideas green building](#)

[sustainable travel ebook](#)

[conscious consumerism ebook](#)

sustainable fashion pro

[top sustainable travel](#)

zero waste lifestyle tutorial

[advanced carbon footprint](#)

[for beginners sustainable travel](#)

Arsenical Pesticides A Symposium Sponsored :

The Woman Who Stole My Life: A Novel: Keyes, Marian The Woman Who Stole My Life: A Novel [Keyes, Marian] on Amazon.com. *FREE ... The Woman Who Stole My Life: A Novel · Marian Keyes · 3.8 out of 5 stars 20,633. The Woman Who Stole My Life by Marian Keyes Nov 6, 2014 — The Woman Who Stole My Life just made me realize how much I missed chick lits. This book is a whooping 550 pages but I breezed through them all. The Woman Who Stole My Life The Woman Who Stole My Life. The Woman Who Stolen My Life by Marian Keyes. Buy from... Waterstones · Amazon · Audible. Read extract. 'Name: Stella Sweeney. The Woman Who Stole My Life by Keyes, Marian The Woman Who Stole My Life · Marian Keyes · 3.8 out of 5 stars 20,634. Paperback. \$16.11\$16.11 · The Break · Marian Keyes · 4.1 ... Book Review 07 - The Woman Who Stole My Life by ... Feb 13, 2019 — The Woman Who Stole My Life is a novel written by the famous Irish author Marian Keyes. The title of the book is very engaging, ... The Woman Who Stole My Life by Marian Keyes Jul 7, 2015 — About The Woman Who Stole My Life ... A funny new novel from international bestselling author Marian Keyes about Irish beautician Stella Sweeney ... THE WOMAN WHO STOLE MY LIFE THE WOMAN WHO STOLE MY LIFE. by Marian Keyes □ RELEASE DATE: July 7, 2015. A

salon owner-turned-invalid-turned author struggles to ... The Woman Who Stole My Life The Woman Who Stole My Life · Marian Keyes. Viking, \$27.95 (464p) ISBN 978-0-525-42925-8 · More By and About this Author [chevron_right](#) · Featured Fiction Reviews. Review: The Woman Who Stole My Life Jul 28, 2015 — Review: The Woman Who Stole My Life ... Summary: In her own words, Stella Sweeney is just “an ordinary woman living an ordinary life with her ... 'The Woman Who Stole My Life' by Marian Keyes Feb 27, 2016 — 'The Woman Who Stole My Life' was the 2014 contemporary novel from bestselling Irish author, Marian Keyes. Keyes has been a prolific, ... The American Tradition in Literature: Concise The American Tradition in Literature:... by Perkins, George B. The American Tradition in Literature, 12th Edition ... Widely known as the anthology that best unites tradition with innovation, The American Tradition in Literature is proud to enter its fifth decade of ... The American Tradition in Literature: Perkins, George Nov 11, 2008 — Widely known as the anthology that best unites tradition with innovation, The American Tradition in Literature is proud to enter its fifth ... The American Tradition in Literature (... Chosen based on extensive research, The American Tradition in Literature blends classic and newly discovered voices, while maintaining a keen eye for the ... The American Tradition in Literature (concise) book alone Widely known as the anthology that best unites tradition with innovation, The American Tradition in Literature is proud to enter its fifth decade of ... The American Tradition in Literature (concise) book alone The American Tradition in Literature (concise) book alone · ISBN: 9780073384894 | 0073384895 · Cover: Paperback · Copyright: 11/11/2008 ... The American Tradition in Literature (concise) book alone ... The American Tradition in Literature (concise) book alone Paperback - 2008 ; Language ENG ; Publisher McGraw-Hill Education, U.S.A. ; Date 2008-11 ; ISBN ... AMERICAN TRADITION IN LITERATURE (CONCISE)(W ... Nov 11, 2008 — AMERICAN TRADITION IN LITERATURE (CONCISE)(W/OUT CD) (P) ... Widely known as the anthology that best unites tradition with innovation, The ... American Tradition in Literature, Concise (Paperback ... Widely known as the anthology that best meshes tradition with innovation, The American Tradition in Literature enters its fifth decade of leadership among ... American Tradition in Literature (concise) Book Alone American Tradition in Literature (concise) Book Alone · ISBN-10: 0073384895 · ISBN-13: 9780073384894 · Edition: 12th 2009. Walls: Travels Along the Barricades by Marcello Di Cintio In this ambitious first person narrative, Marcello Di Cintio shares tea with Saharan refugees on the wrong side of Morocco's desert wall. He meets with illegal ... Walls: Travels Along the Barricades - Marcello Di Cintio A perfect mix of fact and vivid first-person narrative leaves you feeling that you've witnessed death-defying acts of bravery, and fallen ill with Wall Disease... Walls: Travels Along the Barricades by Di Cintio, Marcello In this ambitious blend of travel and reportage, Marcello Di Cintio travels to the world's most disputed edges to meet the people who live alongside the ... Walls: Travels Along the Barricades by Marcello Di Cintio, ... In this ambitious first person narrative, Marcello Di Cintio shares tea with Saharan refugees on the wrong side of Morocco's desert wall. He meets with illegal ... Walls: Travels Along the Barricades by Marcello Di Cintio Aug 10, 2013 — A tour of the world's most disputed border areas becomes a forceful

study in human suffering, writes Anthony Sattin. Walls: Travels Along the Barricades - Marcello Di Cintio In this ambitious blend of travel and reportage, Marcello Di Cintio travels to the world's most disputed edges to meet the people who live alongside the ... Walls Aug 20, 2013 — Marcello Di Cintio is the author of four books including Walls: Travels Along the Barricades which won the Shaughnessy Cohen Prize for Political ... Walls ... Travel Book Award. Reviews. "Walls: Travels Along the Barricades offers unique perspectives on some of the most divided regions of the planet while forcing ... Walls: Travels Along the Barricades Aug 20, 2013 — What does it mean to live against a wall? In this ambitious first person narrative, Marcello Di Cintio travels to the world's most disputed ... Walls : travels along the barricades : Di Cintio, Marcello, 1973 May 6, 2021 — A line drawing of the Internet Archive headquarters building façade.