

ENVIRONMENTAL RESEARCH AND EDUCATION FOUNDATION

Developing environmental solutions for the future.

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Research and Education Grants To-Date

- \$162,000 To the U.S. Environmental Protection Agency to investigate the management options for the safe disposal of secondary aluminum processing waste (2008).
- \$488,788 To SCS Engineers to investigate the available fugitive biogas emission measurement methods at municipal solid waste landfills and provide an intercomparison of methods (2008).
- \$100,000 To Geosyntec Consultants to determine the critical data requirements for the implementation of the EREF methodology for evaluating post-closure care needs at municipal solid waste landfills and performing case studies at existing landfills (2007).
- \$102,363 To North Carolina State University and University of Central Florida to develop a roadmap for understanding and quantifying the aspects of landfill gas generation, collection, attenuation, and emissions (2007).
- \$121,515 To the University of New Hampshire to examine landfill leachate as a substrate for microbial fuel cells (MFC) and expand the applications of MFC to other areas of landfills (2007).
- \$32,000 To Eckerd College to develop and evaluate the use of reusable food container for the college's food served thereby replacing disposal containers (2007).
- \$145,000 To Michigan State University to perform a field-scale assessment of evapotranspirative methane oxidation (ETMO) caps for sustainable management of municipal solid waste landfills in sub-humid climates (2007).
- \$147,558 To the University of New Hampshire and SCS Engineers to model hydrogen sulfide generation from processed construction and demolition materials in landfills (2007).
- \$135,000 To Safety and Ecology and Pennsylvania Department of Environmental Protection to collect and test leachate for the presence of tritium, determine the possible sources of tritium when found, and perform a dose/risk assessment of tritium found (2007).
- \$45,000 To the U.S. Environmental Protection Agency to update the existing landfill gas emission factors used by the Agency for regulatory purposes (2007).
- \$40,000 To the U.S. Environmental Protection Agency to examine the performance of bioreactor landfills and develop a state-of-art report for bioreactor landfills (2006).
- \$92,500 To Joyce Engineering, Inc. to determine the composition, size fraction, and concentration of airborne particulates generated from construction and demolition waste processing facilities (2006). The investigation will be conducted at operating facilities in the Mid-Atlantic Region and methods for minimizing particulate emissions will be developed.
- \$65,000 To Virginia Polytechnic Institute and State University (Virginia Tech) for the examination of liquid additions on cellulose and lignin degradation in bioreactor landfills (2006).
- \$25,400 To the University of Central Florida for a study on controlling hydrogen sulfide emissions at landfills using autotrophic denitrification landfill biocovers (2006).
- \$40,000 To the University of Wisconsin – Madison for a study on the performance of alternative final covers through the exhumation of test sections at various landfills in the United States (U.S.) (2006).
- \$26,875 To the University of Illinois at Chicago for performing geophysical monitoring of leachate recirculation and its effects on waste degradation at the Orchard Hills Landfill (2006).

\$100,000	To the University of Manitoba, Canada, for an investigation on the clogging of landfill leachate collection pipes and cleaning strategies at the field- and full-scale (2005). The investigation will attempt to quantify the rate of clogging with design and operation features and assess the efficiency of various pipe cleaning equipment in restoring clogged pipes.
\$81,200	To the University of Central Florida for characterizing spontaneous fires at municipal solid waste landfills (2005). The project will investigate the thermal behavior of solid waste components under controlled temperature and oxidative conditions, create a model describing the conditions that favor spontaneous fires, and develop a training manual on preventing spontaneous fires.
\$53,863	To Michigan State University to develop an estimation of field-scale properties of bioreactor landfills for optimum performance (2005).
\$40,000	To the U.S. Environmental Protection Agency (EPA) to investigate the performance of full-scale bioreactor municipal solid waste landfills (2005). The goal of the project is to characterize how design and operational variables affect a bioreactor's performance, identify concepts and principles that reduce risks and improve performance of bioreactor landfills, and identify aspects in monitoring that improve the predictability of bioreactor performance.
\$27,000	To the Solid Waste Association of North America (SWANA) to develop a body of knowledge, a training course, and a certification examination for managers of bioreactor landfills (2004). This program was added to SWANA's existing educational programs for managers of municipal solid waste landfill operations. The project was completed and the course is offered at various times and locations. For the latest information on course offerings, visit the SWANA website at www.swana.org
\$65,000	To EPA for the development of an internet-based municipal solid waste decision support tool (DST) for North America (2004). The DST was completed a number of years ago to examine the environmental affects of municipal solid waste management decisions. However, the tool has not been made available to the public because of budget shortfalls.
\$66,351	To Michigan State University for field-scale testing of granular blankets for leachate recirculation and monitoring hydraulic performance and temperature at bioreactor landfills (2003).
\$395,640	To the Environmental Industry Associations (EIA), in conjunction with a Susan B. Harwood Training Grant from the Occupational Safety and Health Administration, to: <ul style="list-style-type: none"> • Develop a training video for solid waste supervisors on how to reduce employee injuries (2006); • Develop a training video for solid waste employers and employees on how to reduce injuries and fatalities at transfer stations (2005). The training video is available by contacting EIA's publication department at 202-244-4700 or ordering online at www.envasns.org. • Develop and hold training sessions on reducing ergonomic risks to waste service employees (2000). The training video is available by contacting EIA's publication department at 202-244-4700 or ordering online at www.envasns.org. • Extend development and training sessions on reducing ergonomic risks to waste service employees (2001). EIA developed an internet-based, distance-learning ergonomics training module for waste industry personnel; continued its development of Best Management Practices (BMPs) for preventing ergonomics injuries to waste service employees; created and maintained a comprehensive database on ergonomic issues; and offered an ergonomics training session at Waste Expo in May 2002 in Las Vegas, Nev. The internet-based training module is available and accessible on EREF's website and the development of BMPs and the ergonomics database is ongoing. • Extend development of ergonomic training materials for waste service employees (2002). EREF translated its handouts from its 2001-2002 ergonomics training sessions into Spanish; developed checklists of ergonomics issues for use as part of an overall safety and training program; continued supervision of the development of the waste industry's Best Management Practices (BMPs) for preventing ergonomic injuries to waste service employees; and maintained and updated an interactive web page concerning ergonomics and the waste service industry, applicable regulatory guidance, and the ability to ask questions that receive prompt and

informative responses. The project was completed in 2003. The checklist, handouts, and BMP is available on EIA's website at www.envasns.org or by contacting EIA's publication department at 202-244-4700.

- Develop a training video for solid waste employers and employees on how to reduce transportation-related fatalities in the solid waste industry (in both English and Spanish), as well as conducted an education session at WasteExpo in May 2004 on the principles of safe driving and the prevention of transportation-related fatalities (2003). Completion of this project occurred in September 2004. The training videos are available from EIA's publication department at 202-244-4700.
- Develop a training video for solid waste employers and employees on how to reduce injuries and fatalities at solid waste facilities, as well as conducting an education session at Waste Expo in May 2005 on the principles of safety and the prevention of fatalities (2004). The training video was completed in June 2005.

\$60,000	To the University of Central Florida (UCF) to continue the investigation of the fate and transformation of nitrogen in bioreactor landfills by conducting laboratory and field studies aimed at determining nitrification and denitrification rates as a function of ammonia and nitrate mass loadings, respectively, under different environmental conditions to more accurately characterize nitrification and denitrification in landfills and to provide the data necessary to enable field-scale implementation (2003-2004). UCF staff and other researchers are working at the New River Regional Landfill in Union County, Fla. An annual report for the project is available by contacting EREF's publications department at 703-299-5139 ext.10 and requesting <i>Full-Scale Management of Nitrogen at a Bioreactor Landfill – Year 1</i> .
\$60,000	To the Interstate Technologies and Regulatory Council's (ITRC) Alternative Landfill Technologies Team for case studies, technology overview, and technical and regulatory guidance for use of alternative landfill technologies including alternative cap (infiltration) designs and bioreactors (2003). Copies of the guidance documents titled <i>Technical and Regulatory Guidance for Design, Installation, and Monitoring of Alternative Final Landfill Covers</i> and <i>Characterization, Design, Construction, and Monitoring of Bioreactor Landfill</i> are available on the ITRC's website at http://www.itrcweb.org/ .
\$531,945	To GeoSyntec Consultants for defining the end of post-closure care at municipal solid waste landfills (2002). The study developed a universal approach for defining the end of the post-closure care (PCC) period and identified management controls for PCC at municipal solid waste landfills in the U.S. A copy of the report titled <i>Performance-Based System for Post-Closure Care at MSW Landfills: A Procedure for Providing Long-Term Stewardship under RCRA Subtitle D</i> is available on CD by contacting EREF's publications department at 703-299-5139 ext.10. The Interstate Technology & Regulatory Council (ITRC), a state-led national coalition of personnel from the environmental regulatory agencies, has adopted the approach in EREF's final report and developed Technical/Regulatory Guideline for states titled: <i>Evaluating, Optimizing, or Ending Post-Closure Care at Municipal Solid Waste Landfills Based on Site-Specific Data Evaluations</i> . ITRC's guidance is available on the Internet at http://www.itrcweb.org .
\$297,970	To R.D. Gibbons, LTD, Terra-Dynamics, Inc., and Severn Trent Laboratories, Inc. for a landfill leachate sampling and characterization study (2002). The purpose of this project is to collect and compile leachate analytical data over time and evaluate leachate quality in terms of landfill operational and physical attributes. The results will enable landfill owner/operators and regulators the ability to confidently evaluate and predict changes in leachate quality and quantity.
\$20,000	To North Carolina State University (NCSU) in support of the Second Intercontinental Landfill Research Symposium (ICLRS) held October 13-16, 2002 in Asheville, N.C. (2002). The ICLRS serves as the primary international meeting for idea exchange among landfill researchers throughout the world. One hundred and thirty one researchers attended this second symposium. Details about the Intercontinental Landfill Research Symposia are available at http://lst.sb.luth.se/iclrs/web/symposia.html .
\$38,211	To Case Western Reserve University for development of an electronic nose technology for application to landfill odors (2001). The electronic nose project provided both a "fingerprint" and concentration of various landfill odors. Copies of the final report titled <i>Electronic Nose Technology</i>

Applied to Landfill Odors, as well as a CD with conference presentations, are available by contacting the EREF's publications department at 703-299-5139 ext. 10.

- \$500,000 To Michigan State University to design and operate an anaerobic bioreactor landfill cell and quantify its air and water emissions (2001). Filling of the bioreactor was completed February 2003 and monitoring continues.
- \$25,000 To Drexel University to study and characterize municipal solid waste landfill microbiology using landfill gas (2001). The researchers collected and analyzed microbial samples from the gas steam during the summer and fall of 2001. Highlights of the project were portrayed in EREF's Winter 2004 *Research Bulletin* and copies of the resulting dissertation *The Study of Landfill Microbial Communities Using Landfill Gas and Landfill Gas Condensate* are available from EREF's publication department at 703-299-5139 ext.10.
- \$185,000 To URS Dames & Moore (United Kingdom) to research the regulatory, economic, and technical aspects of greenhouse gas emission reductions in the waste industry (2001). Copies of the project's final report titled *Greenhouse Gases in the Waste Management Industry* are available by contacting EREF's publication department at 703-299-5139 ext.10.
- \$215,000 To SCS Engineers to investigate the use of a biologically active landfill cap to reduce air emissions from a municipal solid waste landfill (2001). Copies of the final report titled *Evaluation of a Biologically Active Landfill Covers for Mitigation of Landfill Gas Emissions* are available by contacting EREF's publications department at 703-299-5139 ext.10.
- \$200,000 To Kurtis Productions for the video program *Bury, Burn or Return: Winning the War Against Waste*, with accompanying teaching unit (2000). This documentary highlights waste disposal technologies being used in both developed and undeveloped countries. Distribution to middle school science educators occurred in July 2002. The documentary aired on over 100 U.S. Public Broadcasting Stations in April 2003 to 2004. Copies of the video and lesson plan are available from EREF's publications department at 703-299-5139 ext.10.
- \$140,625 To North Carolina State University (NCSU) to develop a global assessment of recycling policies and markets (2000). The NCS researchers collected and analyzed data from the United States, Europe, and Asia. Copies of the report titled *Global Recycling Policy* are available by contacting EREF's publications department at 703-299-5139 ext.10.
- \$300,000 To EPA to collect and test municipal solid waste landfill gas as generated and after combustion. Site visits to collect data have occurred and the draft final report has been developed. EREF's Spring 2006 *Research Bulletin* containing preliminary finding is available by contacting EREF's publication department at 703-299-5139 ext.10.
- \$30,000 To Yale University in support of the establishment of the Society for Industrial Ecology (2000). The Society was launched in 2000 and initially contained approximately 100 members. The Society's first annual conference was held in Europe in the summer of 2001. The Society for Industrial Ecology can be contacted at www.yale.edu/is4ie.
- \$30,000 To SCS Engineers for a review of landfill bioreactor studies and identification of research needs (2000). Copies of the final report titled *Literature Review and Research Needs for Landfill Bioreactors* are available by contacting EREF's publications department at 703-299-5139 ext. 10.
- \$49,580 To the University of South Florida for its *Solid Choices* education program (1999). The lesson plans were developed in 2001 for grades K-2 and 3-5. The curriculum for grades 6-8 was covered in a Florida supplement to the National Science Teacher's Association (NSTA) program titled *An Ounce of Prevention*. For copies, contact the Florida Department of Education at 850-487-7900.
- \$15,000 To Yale University in support of the publication *Journal of Industrial Ecology* (1999). The first edition of the journal was printed in 2001, with successive editions in print. For information about the journal or copies, contact the *Journal of Industrial Ecology* at www.yale.edu/is4ie.
- \$428,920 To Ecobalance, Professor Robert Ham (University of Wisconsin), and Professor Mort Barlaz (North Carolina State University [NCSU]) for a *Life Cycle Inventory of a Municipal Solid Waste Landfill* and a computer model to evaluate environmental impacts (1999). The landfill computer model was incorporated into EPA's *Municipal Solid Waste Decision Support Tool* that examines the lifecycle of

all aspects of waste management. Copies of the report and case studies are available by contacting EREF's publications department at 703-299-5139 ext.10.

- \$473,000 To R. W. Beck, Chartwell Information Publishers, and Ames Economic Associates for a nationwide study to assess the size of the waste industry (1998). Copies of the study titled *Size of the United States Solid Waste Industry* are available by contacting EREF's publications department at 703-299-5139 ext. 10.
- \$158,000 To North Carolina State University (NCSU) to develop an economic model for recyclables (1998). Copies of the study titled *An Assessment of Price Volatility in Recyclables Markets and Market Mechanisms to Stabilize Prices* are available by contacting EREF's publications department at 703-299-5139 ext. 10.
- \$50,000 To the Waste Equipment Technology Association (WASTEC) to update the waste service industry *Manual of Recommended Safety Practices* (1998). The updated manual was finished on June 7, 1999 and has gone through a second revision that was completed on March 28, 2001. Copies of the publication are available by contacting EIA's publications department at 202-244-4700.
- \$25,000 To Keep America Beautiful (KAB) for its *Prevention of Urban Litter* project (1998). This is an ongoing project for KAB to educate children on litter prevention. The Foundation's portion of the project is complete.
- \$80,000 To the Environmental Industry Associations (EIA) to develop a waste service industry ethics program (1998). Copies of *Doing Our Best -- A Matter of Integrity* are available by contacting EIA's publications department at 202-244-4700.

The above grant information, as well as project updates, are also posted on our website at www.erefdn.org.