

Winter/Spring 2002 (v14n1)

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## **From the Director**

### **Governor's "Buy California" campaign recognizes SAREP efforts**

On February 12, 2002, **Governor Gray Davis** announced his unprecedented "Buy California" program, the largest single comprehensive plan to date to distribute \$79 million in state and federal grants to boost the state's agricultural economy. Governor Davis was the first governor to visit the Tulare World Ag Expo in 21 years, where he made clear his commitment to a viable future for California agriculture.

Stating that "...every Californian has a stake in the success of rural California..." Davis detailed his initiative, which includes:

- \$60 million for promotion and development of California agricultural products, including promotion and school nutrition programs,
- \$12 million for agricultural research on pest management, environmentally responsible farming, and new crops development and support including \$2 million for sustainable agriculture; and
- \$7 million for a competitive grants program to promote specialty crop growers.

The Governor's program was developed following a series of listening sessions throughout the state in October 2001. At these sessions, advice and comments as to the best uses for the funds were received from over 300 growers, industry representatives, state and local officials, educators, researchers and consumers.

In announcing \$2 million of funding for sustainable agriculture efforts, Davis said, "The fertility of California's valleys and the productivity of its growers provide an unsurpassed 'field laboratory' for researchers at the University of California's Sustainable Agriculture Research and Education Program (SAREP). With the support of California's agricultural community, this program seeks cost-effective ways for farmers to develop new market opportunities by using organic or other reduced input methods. Specialty crop growers reap the benefits of improved environmental stewardship while they identify new niche markets for these crops."

The Governor and the California Department of Food and Agriculture can be assured that SAREP will pursue all possible ways to continue our support of the development of organic and reduced-input methods and markets for these California products. Clear environmental, economic, and social benefits accrue to rural California and urban consumers in the pursuit of sustainable agriculture goals. However, no new state funds are available to SAREP to support biologically integrated farming systems or organic farming research education grants.

Following a series of discussions between California Secretary for Food and Agriculture **Bill Lyons** and UC Vice President for Agriculture and Natural Resources **W.R. "Reg" Gomes**, UC ANR assumed the responsibility for managing a new competitive grants program through which the \$2 million to support research on sustainable practices for specialty crops will be distributed. The competitive grants program will provide funding for projects of up to two years duration in the following areas:

- Management systems for ecologically based agriculture, including organic production;
- Agricultural enhancement of environmental quality;
- Biological control of pests on specialty crops; and
- New crops and products.

Investigators in all of California's public institutions of higher education are eligible to compete for these funds. SAREP will likewise be eligible, and according to Associate Vice-President **Henry Vaux** this means that there is an opportunity to augment SAREP funding. A preliminary timeline for establishment and implementation of this new program is mid-summer 2002. Stay tuned.—*Sean L. Swezey, director, University of California Sustainable Agriculture Research and Education Program.*

## Program Notes

### SAREP associate director serves as interim director of Small Farm Center

In addition to her duties as SAREP Associate Director, **Janet C. “Jenny” Broome** is serving as interim director for the UC Small Farm Center in Davis through June 30, 2002 during the sabbatical of **Desmond Jolly**, Small Farm Center director. Broome joined SAREP in 1997 as the Biologically Integrated Farming Systems (BIFS) coordinator and continues to provide leadership to this program and SAREP’s methyl bromide alternatives grants program. She has worked extensively as a technical advisor to regional projects in California to develop biologically integrated viticulture systems including the Central Coast Vineyard Team, and helped develop the Lodi Winegrowers Workbook, a self-assessment tool of the Lodi-Woodbridge Winegrape Commission’s Integrated Farming Program.

As a plant pathologist, Broome does research and extension in ecologically based pest management, including the area of weather-driven plant disease decision models. She cooperates with the University of California Statewide Integrated Pest Management Project’s PestCast program, a statewide weather monitoring network for use in plant disease model validation and implementation. Broome also serves on a National Academy of Sciences National Research Council committee that is reviewing the quality, impact and productivity of the United States Department of Agriculture’s research in the area of environment and natural resource protection and agriculture.

#### Staff presentations

SAREP Director **Sean Swezey** and entomologist **Robert Bugg** made presentations in January at the 22nd annual Ecological Farming Conference in Asilomar, Calif. sponsored by the Ecological Farming Association. In a workshop on *Land Grant Organic Research*, Swezey talked about SAREP’s coordination of the new UC Organic Farming Research Workgroup, which will identify California research for organic production, and reviewed organically relevant projects SAREP has funded in its 15-year history.

Bugg gave a presentation on *Biodiversity and Agriculture: Why We Need Wild Farms*, in which he addressed the interdependency of natural communities. In February he discussed cover crops and beneficial insects at the New Mexico Organic Farming Conference.

Also in February, SAREP and the California Agriculture Working Group (CAWG) co-sponsored the California Association of Winegrape Growers’ *Vineyard and Wildlife Workshop* at UC Davis. SAREP Associate Director **Jenny Broome** and Bugg served on the planning committee for the workshop, at which Bugg made a presentation on wildlife-friendly viticulture for the valley floor.

**Gail Feenstra**, SAREP food systems analyst, talked about how local food systems can help protect communities from the threat of terrorism at the *New Partners for Smart Growth: Building Safe, Healthy & Livable Communities* conference in San Diego in January. The conference was sponsored by the Local Government Commission and Penn State University. Feenstra, an expert on community food systems, discussed how communities identify strategies that help them “shorten the supply lines” between farm and table, how local food sources reduce the need to rely on transportation, and how local, seasonal food systems contribute to food security.

Feenstra has completed her term as president of the national Agriculture, Food and Human Values Society. At the organization’s annual meeting in Minnesota, Feenstra’s keynote address focused on what researchers are learning about the development of successful community food systems projects. The organization is made up of professionals in food and nutrition studies, agricultural disciplines, social sciences, and humanities interested in the sustainability of the modern food system, risk/benefit analysis of agricultural technologies, food access for the poor, and alternative visions of the food and agricultural system.

## **Directors attend DANR leadership conference**

**Sean Swezey**, SAREP director, and **Jenny Broome**, SAREP associate director, attended the UC Division of Agriculture and Natural Resources 2002 Leadership Conference in San Diego in February. Broome was also attending in her capacity as interim director of the UC Small Farm Center in Davis. Swezey and Broome participated in leadership skills-building and Statewide Special Programs workshops, and heard about DANR's budget. They also were informed that UC will need to hire 7,000 new faculty in the next 10 years, and that Strategic Planning Focus groups will begin in late spring.

## **Project Update**

### **SAREP funds expansion of winegrape, prune BIFS projects**

by Lyra Halprin and Marco Barzman, SAREP

Two groups of farmers, researchers and ag consultants in counties stretching from Tehama in the north to Santa Barbara in the south have received grants from UC SAREP to promote biologically integrated practices in Central Coast winegrape vineyards and Central Valley prune orchards. The farming practices, fine-tuned and evaluated by a team of growers, UC scientists and consultants, are designed to reduce off-farm movement of pollutants and soil, while enhancing natural processes.

The Central Coast Vineyard Team (CCVT) will be awarded \$99,969 to fund the first year of their three-year project and the Integrated Prune Farming Practices (IPFP) team will receive \$80,000 to continue its project. Each will use the Biologically Integrated Farming Systems (BIFS) extension model whose main components include a team approach to project management, on-farm demonstrations, monitoring of key biological and economic variables, and farmer-to-farmer information flow.

Funding for this round of BIFS projects came from the U.S. Environmental Protection Agency Region 9 Agricultural Initiative, with funds made available to help California farmers with pest management challenges they face related to the implementation of the 1996 Food Quality Protection Act. SAREP administers the BIFS program.

“These two farmer-researcher partnerships have several years of experience in sustainable agriculture in California and are now ready to mainstream their efforts,” said **Janet C. “Jenny” Broome**, SAREP associate director. “These teams have a committed core of growers who can help other growers adopt biologically integrated farming practices and make a difference on a regional scale.”

Farmers involved in the BIFS projects integrate biological and cultural control of pests into their production systems; provide on-farm habitats for beneficial insects; use crops to provide all or part of the nitrogen needed by crops; and monitor pests, beneficials, and water and nitrogen needs to inform their farm management decisions. These biologically integrated farming practices, according to Broome, enable conventional farmers to maintain yields and quality while greatly reducing their reliance on agrichemicals.

BIFS teams include farmers, pest control consultants, University of California farm advisors and researchers. Both of these BIFS projects will be using successful working vineyards or orchards to demonstrate agricultural operations that have reduced pesticide use in high-value crops. Other area growers have agreed to participate by adapting the methods demonstrated to sections of their own acreage and then monitoring and comparing results with their normal practices.

“BIFS demonstration projects involve a high level of cooperation among individuals, public institutions and private companies,” said **Sean L. Swezey**, SAREP director. “Projects involving such diverse groups represent a new and innovative extension model, but we have accumulated seven years of experience in this grants program. We are moving ahead to help new teams get started with BIFS, building on the experiences of the earlier projects, while retaining flexibility to respond to local conditions.”

Through their outreach, the two projects promote practices that reduce environmental problems while simultaneously maintaining profitability.

#### **Winegrape team**



(R-L) Central Coast Vineyard Team (CCVT) members Kelly McFarland and Robert LaVine, Assemblymember Fred Keeley, CCVT executive director Kris O' Connor, CCVT member Dana Merrill, and UC Governmental and External Relations executive director Steve Nation tour a CCVT vineyard in Monterey County. (photo by Jenny Broome)

The vineyard team BIFS project addresses the main environmental challenges faced by Central Coast growers without compromising their economic viability. By promoting a system that integrates soil fertility, plant nutrition, and pest management decisions, the project will reduce sediments, pesticides and nutrients moving into bodies of water draining into the Monterey and Morro Bay estuaries.

“Growers participate in the project because they believe that it is an important process,” said **Kris O’Connor**, executive director of CCVT and coordinator of the vineyard BIFS project. “Many of our growers incorporate BIFS practices because it reduces their inputs and improves quality. It is critical to communicate their successes to other mainstream growers in the region.”

**Dana Merrill**, winegrape grower, vineyard manager and president of the Central Coast Vineyard Team said the winegrape BIFS project will allow growers to work with Cooperative Extension to spotlight the sustainable practices many of them use.

“We believe if we can get a group of growers who are perceived as respected and committed operators to share their successful practices, others will adopt and adapt the practices,” he said.

Merrill noted that the Central Coast Vineyard Team growing area encompasses a diverse region, including parts of Monterey, San Luis Obispo and Santa Barbara counties.

“We have growers in rural areas, near population centers, in cool areas and in warmer climates,” he said. “There is no one system that will work the best for everyone. In the BIFS project, we are trying to come up with tools and guidelines that can arm growers to move toward sustainable growing systems. The growers are the best ones to adapt these to individual growing situations.”

He said field days might show growers that one vineyard is able to use leaf pulling efficiently to avoid some insecticides, while other vineyards may benefit from cover crops or compost.

“The BIFS project helps us in our mission to adopt more sustainable techniques by allowing individual growers to zero in on the whole farming system. It’s a logical next step in what we’re trying to do,” he said. “It allows us to set up a biological system where we can get good data.”

Merrill manages several thousand acres of winegrapes in Monterey, San Luis Obispo and Santa Barbara counties, and is a founding member of the Central Coast Vineyard Team.

The typical farming practices and the slopes associated with Central Coast vineyards make these particularly susceptible to erosion and run-off, a major cause of watershed degradation in that region. In addition to the above practices, the CCVT gives special attention to reducing off-site movement of water and soil through the promotion of various cover-cropping strategies.

### **Prune team**



(L-R) Don Vossler, BIFS grower and chair of the research subcommittee of the California Dried Plum Board, discusses orchard management of his Tulare property with Steve Sibbett, Cooperative Extension Tulare County farm advisor emeritus, and Steve Arenas, BIFS field scout and pest control adviser. (photo by Macro Barzman)

The prune team addresses the main environmental challenges faced by California's 1,400 prune growers in the Central Valley. According to **Gary Obenauf**, project manager for the California Dried Plum (formerly "Prune") Board and coordinator of the prune BIFS project, runoff of both pesticides and fertilizers into the stream and river systems as well as leaching into ground water must be mitigated by prune farmers if they are to farm effectively. In addition, water is no longer an unlimited resource to California prune growers.

**Dan Aguir**, a BIFS prune grower, said he has learned useful information that has given him confidence to reduce inputs.

"Monitoring insects and irrigation needs has been very helpful," Aguir said. "Since the BIFS team has been helping us monitor the predatory [good] bugs and seeing when there's a good buildup, we've been able to cut back on some sprays, and we're getting close to maybe eliminating a dormant spray. There are 10 acres adjacent [to the BIFS block] that we haven't dormant-sprayed in four years. We're still in the early stages, but we're definitely getting results from the project."

Aguir, who manages Simonich Farms, Inc., a family operation in Tulare, has enrolled 40 of his 320 acres of prunes in the BIFS project.

"We're also now doing pressure bomb readings, which tests the stress on trees," he said. Pressure bomb readings show when the trees need water and allow him to irrigate at optimum times only, rather than on a set irrigation schedule. BIFS growers often save on the amounts of water used in irrigation, which in turn, decreases the likelihood of nutrient leaching.

"Water analysis has also helped," he said. "By knowing how much nitrogen is in our well water we've been able to cut back on fertilizer inputs. Tulare County farm advisor [emeritus] Steve Sibbett has been great to work with on the project."

“Monitoring requires us to manage more intensively, be a lot more ‘hands-on,’ and know what insects are out there, but it is definitely a cost-saving tool,” he said. “Monitoring the insects is the biggest change we’ve made, and it has given us more confidence.”

Aguair said he is looking forward to finding out what the long-term effects of the BIFS-recommended practices will be.

Past prune profitability has resulted in substantial new plantings that are now beginning to bear fruit. The resulting crop has presented the industry with an oversupply and low grower prices.

“California prune growers must cut costs and improve fruit quality to be profitable,” said Obenauf. “Costly inputs such as insecticide and fertilizer materials that may only be marginally effective must be reduced.”

Both projects are extending a pest management decision-making system based on monitoring of pests, beneficials and weather data that results in fewer pesticide applications with less-toxic materials. With this system, for example, wintertime sprays of diazinon—an organophosphate insecticide that has contaminated California rivers—was eliminated on 877 acres farmed by 33 prune growers statewide.

A “nitrogen budgeting tool” has been successfully used in the prune farming systems that permits the most efficient synthetic nitrogen applications. By taking into account nitrogen inputs from all possible sources, including irrigation water and ground cover, and by analyzing leaf nitrogen content, this approach usually results in significant reductions in applications of purchased nitrogen. A similar approach also makes more efficient use of irrigation water possible.

With intensive outreach programs that include newsletters, field days, tailgate meetings, grower breakfasts, a sustainability rating system, and Web sites, these two projects can influence practices in 14 counties. At stake is the long-term interest of growers farming 100,000 acres of winegrape and 81,000 acres of prune, and the health of major watersheds in California.

## **Dairy farmers experiment with manure as commercial fertilizer alternative**

by Marco Barzman

The dairy BIFS project “Integrating forage production with dairy manure management in the San Joaquin Valley” reports in its January 2002 newsletter that dairy manure water can effectively replace synthetic fertilizer. Data reported in the article show that before the project, participating farmers used commercial fertilizer at an average per acre rate of 150 pounds of nitrogen, 70 pounds of phosphorus, and 45 pounds of potassium on their silage corn fields. As a result of the project, farmers in eight dairies nearly eliminated these synthetic fertilizer applications without reducing yields.

The savings generated from this approach are estimated at more than \$57 per acre. Project coordinators also estimate that these practices will significantly reduce groundwater contamination from both chemical fertilizer and manure water. It is anticipated that dairy operators throughout the state will adopt these techniques when the economic and environmental benefits are widely reported.

More information is available at: <http://alfalfa.ucdavis.edu/subpages/2001symposium/proceedings/cas01happycowspettygrove-5.pdf>

## **Project Update**

### **Artichokes**

## **An affordable, biorational pest management program for artichokes on the Northern Central California coast**

by Bev Ransom, SAREP, and Mohammad Bari, Artichoke Research Association



A plume moth larva tunnels through a wormy artichoke leafstalk. The moth is the most serious insect pest for artichokes. (photo by Bob Viales)

Artichoke growers on the Northern Central Coast of California in Santa Cruz and San Mateo counties and growers in San Benito County face many challenges: poor soil fertility, irrigation water salinity and shortages, infestations of vertebrate pests such as rodents, rabbits, and deer, and the very big problem of the artichoke plume moth, the crop's primary insect pest. The average yields of artichokes from these farms is typically less than a quarter of the yields expected from farms in the Central Coast region, which includes the Castroville area.

With these issues in mind, **Sean Swezey**, then associate director of the Center for Agroecology and Sustainable Food Systems at UC Santa Cruz, **Mohammad Bari**, entomologist at the Artichoke Research Association, **Reggie Knox**, outreach coordinator for the Community Alliance with Family Farmers, and Northern Central Coast artichoke growers received funds from SAREP in 1998 to design and demonstrate a biorational management program for artichokes that they hoped would be economically feasible for the area.

Artichoke plume moth (APM) is a major limiting factor for perennial artichoke production. In the mild weather of the Northern Central Coast, APM never becomes dormant; instead it reproduces throughout the year. Conventional growers have relied heavily on chemical insecticides to control APM; without control measures the infestation rate can reach as high as 70 percent.

Other control methods such as biological control, use of sex pheromone in mating disruption, and mass trapping of APM have been studied during the last 20 years. Though many of these studies demonstrated success, the techniques did not gain acceptance among Central Coast artichoke growers because of the higher material and/or labor costs compared to conventional chemical control.

Northern Central Coast artichoke growers with smaller farms expect yields of 100 cartons/acre compared to an average of 450 cartons/acre on Central Coast farms. With the low cash flow resulting from these yields, these farmers have little incentive to use any APM management program requiring a major capital investment. It is estimated that for these growers, the contracted cost of one insecticidal spray aimed at APM is approximately \$40/acre. Several applications would be needed to achieve optimum control of this persistent pest. It is also likely that use of chemical

control against APM would disrupt the delicate balance of naturally occurring predators and parasitoids and secondary pests such as aphids, leaf miners, lygus bug, and proba bug, possibly resulting in increased loss.

## Project phases

The first phase of this project focused on two components of a potential biorational management program: release of an egg parasitoid (*Trichogramma thalense*) and the use of mating disruption (APM Rope). During this time a group of ten growers met with project researchers to share research information and farming experiences.

“These meetings were a great opportunity for growers to hear about the latest research and for researchers to hear what was actually happening on the farm,” said Knox.

Bari stepped in as principal investigator in 1999 for the second phase of this project after Swezey was appointed director of SAREP; Swezey became the project adviser.

By the beginning of Phase Two in early 2000, it had become apparent that the egg parasitoid and the APM Rope dispensers that were studied in Phase One were prohibitively expensive and no longer available to Northern Central Coast growers. The focus of the project shifted to evaluate the effectiveness and economic feasibility of a mass trapping technique to control APM.

Mass trapping uses a pheromone lure to attract APM to a water-oil trap. The trap, developed by the Artichoke Research Association, is easy to assemble from locally available materials and has proved to be both durable and inexpensive.

Various types of pheromone lures were first tested in field trails to determine their effectiveness and longevity. The Trece lure, a red rubber septum containing APM pheromone Z-11 Hexadecenal, was determined to be most effective in attracting APM to the trap and highly stable in maintaining its attractiveness for more than two months.

To test the use of a mass trapping system in the Northern Central Coast, four experiment fields were selected on grower **Tim Hudson**'s Coastways Ranch in Pescadero. In October 2000, mass trapping was established in two fields. Traps were stationed in a grid pattern with 100 X 100 foot spacing to achieve a density of 4.3 traps per acre. At six to eight week intervals the lures were renewed and the traps were replenished with fresh water and oil. In the two control fields, no attempts were made to control APM.

Throughout the growing season, researchers monitored the level of APM larval infestation of vegetative shoots in all four fields. By the end of August 2001, the two fields using mass trapping had significantly lower rates of APM infestation (approximately 2% and 4%) than the two control fields (approximately 7% and 20%). Hudson was satisfied with the APM control maintained in the fields using mass trapping.

The total cost of parts and labor for assembling the traps is estimated to be \$100 for a five-acre field; depreciated over five years, the total hardware cost can be estimated at \$20 per year. Including the recurring costs (lures, miscellaneous supplies, and trap maintenance), the total annual cost for a five-acre field is estimated to be \$358 (\$72 per acre).

These study results show that mass trapping is an economically feasible method of APM control for Northern Central California artichoke growers. Although this method is not currently compatible with organic culture because of the petroleum-based oil used in the traps, future studies could be done to determine if sticky traps may be a viable alternative for organic systems. Hudson has expanded the use of mass trapping to control APM on all 28 acres of his artichoke crop.

“The material and labor costs of mass trapping probably don't quite equal the cost of one pesticide spraying,” Hudson said. He continues to find it economically beneficial to avoid spraying by keeping his APM populations under control with mass trapping.

For more information, contact Mohammad A. Bari, Artichoke Research Association, (831)-755-2871; [mohdabari@aol.com](mailto:mohdabari@aol.com). The full report of this project is available on SAREP's Web site at: [www.sarep.ucdavis.edu/Grants/Reports/Bari/bari.htm](http://www.sarep.ucdavis.edu/Grants/Reports/Bari/bari.htm)



## **BIFS Advisory Review Board Committee members**

by Jeri Ohmart, SAREP

An increasing number of California farmers and livestock producers representing many agricultural commodities are maintaining yields and quality while reducing their reliance on agricultural chemicals through Biologically Integrated Farming Systems (BIFS). BIFS, established in 1995 by the UC Regents at the request of the California state legislature, uses a “whole system” approach to demonstrate innovative farming practices that enhance biological processes while reducing degradation of natural resources.

In partnership with farm advisors and researchers, participating farmers implement alternative growing practices that include pest management, soil building, irrigation, waste management and other biological and cultural practices. These practices are designed to reduce negative environmental impacts such as pollution from agricultural chemicals, animal waste, and soil erosion.

A 13-member Program Advisory Review Board reviews BIFS project proposals and provides program guidance. In addition to two UC members, the board is composed of representatives from relevant state and federal agencies, non-profit organizations, as well as growers and a pest control adviser. The following individuals make up the BIFS board. (For more detailed information on the history, approach and accomplishments of the BIFS program, see [www.sarep.ucdavis.edu/BIFS/overview.htm](http://www.sarep.ucdavis.edu/BIFS/overview.htm).)

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### **Grower representatives**

**SHERMAN A. BOONE** is a fourth generation Stanislaus County farmer who grows almonds in the Denair area, where he and his wife have raised four daughters. Boone has been a member at both the local and state level of the Farm Bureau, a school board member and a local fireman. In order to make the family farm management and custom nut harvesting operations more profitable, he became an accredited agricultural consultant and a real estate salesman. He was among the first participants in the Community Alliance with Family Farmers’ Biologically Integrated Orchard Systems (BIOS) program in Merced County; he also enrolled his Stanislaus County acreage in a similar management program. Currently he is serving on the Yosemite Farm Credit ACA and the East Stanislaus Country Resource District.

**STEPHEN GRIFFIN** is president of Misionero Vegetables in Salinas. He started working in his family’s farming business after graduating from UC San Diego, and has extensive experience in year-round production and shipping of high quality fresh vegetables in California and Arizona. He has been responsible for managing his family business through a period of changing agricultural laws and regulations, and has transformed it into a value-added farming, processing, and shipping specialty salad business. He has also guided his company in the development of its in-house state-accredited laboratory. Griffin has served as a board member of Western Growers Association, chairman and board member of United Fresh Fruit and Vegetable Association, board member of the Arizona Citrus, Fruit, Vegetable Advisory Council and of the Iceberg Lettuce Research Council.

**GREGORY T. NELSON** is the president and ranch manager of Nelson & Sons, Inc., a farming operation on the North Coast of California that grows winegrapes, pears and Christmas trees. Nelson received a bachelor of science degree from Cal Poly San Luis Obispo and has served as the director of the county and state Farm Bureau, a Ukiah Unified School Board trustee, and as a director of the North Coast Regional Water Quality Control Board. He is currently a California North Coast Grape Grower director, a commissioner for the Mendocino County Planning Commission and a member of the McNabb Creek Restoration Committee. Nelson is interested in sustainable agriculture and has implemented a variety of biological and cultural practices on his ranch as alternatives to pesticide, herbicide and fertilizer use. The

ranch offers educational farm visits for local school children that provide information on the ranch history, reforestation practices and fish restoration in the property's three streams.

### **Federal agency representatives**

**TISH ESPINOSA** is an agronomist/plant resource specialist with the USDA Natural Resources Conservation Service. She received a bachelor of science degree in animal production and a master of science degree in agricultural science/agronomy at Cal Poly Pomona. She works at the Plant Material Center in Lockeford, where she provides technical assistance in areas such as cover crops, soil quality, erosion control, range and pasture, wildlife habitat, culturally significant plants, field borders and hedgerows. Espinosa also raises goats for show and meat.

**KATHERINE TAYLOR** is the associate director for agriculture, U.S. Environmental Protection Agency (EPA) Region 9, San Francisco. She has served with the EPA since 1985. Currently she provides leadership and direction on regional cross-media agricultural issues emphasizing and promoting multi-program and place-based approaches. Working with others on the Region 9 Senior Management Team, she coordinates and promotes strategic management of the broad range of agricultural activities within the region. Previously, she managed the Pesticides and Toxics programs and created the Ag Initiative and Merit Partnership teams in order to address broad environmental issues using a wide variety of regulatory and incentives-based tools. She has bachelor of science and bachelor of arts degrees from the University of Maryland and has a master of science degree in public administration.

**PAUL (“AUGIE”) FEDER** (US-EPA, Region 9, San Francisco, alternate representative) has worked on agricultural and environmental issues for 15 years. Since 1992, he has been an agricultural policy specialist for the San Francisco office of the US-EPA's Agriculture Initiative. The Initiative has promoted voluntary programs in biological farming for nine years. He was instrumental in building agency recognition and support for the BIOS and BIFS program. He has a bachelor of arts in geology and a master of science in environmental policy and management.

**LORI ANN THRUPP** (US-EPA, Region 9, San Francisco alternate representative) is an EPA life scientist. Her work involves education, outreach, and partnerships with agricultural stakeholders (growers, scientists, commodity organizations, agencies, non-profit organizations, community groups) to support the development and adoption of sustainable agriculture practices, pollution prevention, and environmental stewardship. Thrupp received her doctorate and master of science degrees from Sussex University in development studies, and a bachelor of science degree from Stanford University. Before joining EPA, she was the World Resources Institute director of sustainable agriculture for nine years.

### **Nonprofit organizations representatives**

**JOHN CARLON** is the president of Sacramento River Partners and the owner/operator of Sierra Cascade Blueberry Farm. Carlon received his master of science degree in agriculture from Cal Poly San Luis Obispo and worked as a farm manager for five years in Saudi Arabia and Sudan. When he returned to the United States, he purchased his farm, planted blueberries and certified the land as organic in 1988. As president of Sacramento River Partners, Carlon is involved in large-scale riparian restoration projects and works to integrate natural resource conservation with production agriculture.

**DAWIT ZELEKE** is the agricultural and restoration programs manager for the Sacramento River Project of The Nature Conservancy. He has worked for The Nature Conservancy for over ten years. His specialty is restoring natural ecosystems and creating riparian transition zones along the Sacramento and Cosumnes rivers.

### **California EPA Department of Pesticide Regulation (DPR) representatives**

**PAUL GOSSELIN** is the chief deputy director of the Department of Pesticide Regulation (DPR), which is part of the California Environmental Protection Agency. DPR is responsible for regulating, monitoring,

and controlling the use of pesticides in California, including evaluating the public health and environmental effects of pesticides. DPR also develops and promotes pest management practices that reduce the problems associated with pesticide use. Previously at DPR he was the assistant director of the Division of Registration and Health Evaluation, and assistant director of the Division of Enforcement, Environmental Monitoring, and Data Management. He has a bachelor of science degree in chemistry and a master of science degree in biochemistry, both from the University of Massachusetts.

**BOB ELLIOTT** (DPR alternate representative) is responsible for administration of DPR's Pest Management Grant programs. He works with commodity groups, growers, university researchers, non-profit groups, government agencies and others to promote adoption of alternative, reduced-risk pest management practices. He was the interim coordinator of DPR's food safety program, prepared its annual pesticide residue report, and assessed statewide compliance by pesticide users. Elliott has a bachelor of science degree in horticulture from California State University, Fresno, and previously worked as a research technician for the Fresno County UC Cooperative Extension, as a pest control adviser for Wilbur Ellis Company, and as an agricultural biologist for the Yolo County Agriculture Department.

**BELINDA MESSENGER** (DPR alternate representative) is an associate environmental research scientist for DPR. Her specialty areas are plant pathology, Integrated Pest Management (IPM), and biopesticides. Messenger has a doctorate in plant pathology from UC Riverside. She is particularly interested in sustainable agriculture, IPM and agroecology.

#### **Pest Management Advisory Committee member representative**

**MATT BILLINGS** is a fourth generation farmer from California's Central Valley. He received a bachelor of science degree from UC Davis and returned home to work, where he is marketing director for all domestic and international sales for his family's almond operation. He also started a new company, Sterling Nursery & Insectary, which focuses on raising and selling beneficial insects and wholesale grapevines and orchids.

#### **California Department of Food and Agriculture representative**

**JOHN STEGGALL** works for the California Department of Food and Agriculture (CDFA) where he analyzes the economic impacts of pesticide regulatory decisions. This work is done in conjunction with agricultural economists at UC Berkeley and CDFA, as well as UC Cooperative Extension faculty. Steggall has also worked at DPR, where he analyzed pesticide alternatives and trends in pest management. Steggall has degrees from Colorado College, University of Michigan, and a doctorate in entomology from UC Berkeley.

#### **Licensed Pest Control Adviser**

The representative from the pest control adviser (PCA) community has recently stepped down; a new PCA representative is being sought.

#### **University of California representatives**

Representatives from the University of California have recently stepped down; new representatives are being sought.

#### **Retiring BIFS Board members**

SAREP would like to thank the following founding BIFS board members, who are now retiring, for their generous participation. Their wise counsel and advice has been an invaluable asset to the BIFS program.

**LONNIE HENDRICKS** retired in the fall of 2001 from his position as Merced County UC Cooperative Extension Farm Advisor and from the BIFS Advisory Board after devoting 41 years to improving almond, walnut, pistachio, and apricot production in the San Joaquin Valley. Hendricks's work in integrated pest

management propelled significant changes in nut crop pest control. Over the years, he has worked on a wide variety of research projects in the area of pest control and other cultural practices important to farmers. Hendricks has traveled the world to share his expertise in nut crop production, speaking or working with farmers in Italy, Turkey, Hungary, France, Budapest, Spain, and Australia. He authored or co-authored 29 peer-reviewed publications.

**JUDY STEWART-LESLIE** is a pest control adviser with Pest Management Associates, an Exeter firm started in 1968 by her father, Jim Stewart, and Jim Gorden. Pest Management Associates' specialty is integrated pest management and biocontrol; the firm received a California Environmental Protection Agency Department of Pest Management IPM Innovator award in October 2001. Stewart-Leslie is a graduate of Cal Poly San Luis Obispo.

**STEVEN WEINBAUM** is a professor in the pomology department at UC Davis. His areas of specialization include fertilization practices, nitrogen use and best management practices in tree fruit culture and management. Weinbaum is particularly interested in fertilization practices as they impact nitrate pollution of groundwater. He received his bachelor of science and master of science degrees from Penn State University and his doctorate from the University of Illinois.

## **SAREP gets Heller funding for organic grants/projects**

by Lyra Halprin, SAREP

Organic agriculture is the main beneficiary of the largest private grant ever awarded to the University of California's sustainable agriculture program. The Clarence E. Heller Charitable Foundation has awarded the statewide Sustainable Agriculture Research and Education Program (SAREP) program \$450,000 to support four county-level programs for California organic farming and soil health research and extension.

"We are gratified to be able to use these funds to work with local Cooperative Extension offices on organic farming in Marin, Humboldt, Stanislaus and Ventura counties," said **Sean L. Swezey**, SAREP director. "This is the largest grant SAREP has received from a private foundation in its 15 years of existence."

Swezey said a grant will be made to Marin Cooperative Extension Director **Ellie Rilla** to fund an organic and sustainable agriculture coordinator who will work with an advisory committee. Rilla will also be able to fund a local farm advisor, the Marin Organic Board and other community members to assist farmers and ranchers with business plans focusing on the transition to organic practices and marketing.

In Humboldt County, a grant to County Director **Deborah Giraud** will fund a new organic farming researcher who will work with county farm advisors on research and education projects. A grant to **Phil Osterli**, Stanislaus County Cooperative Extension director emeritus, will fund a researcher to develop information on soil health and compost science for transitional and organic farmers. Additionally, a matching grant to Ventura County Director **Larry Yee** will be used to organize a research and extension program to support local organic farming production and marketing.

"The intent of the Clarence E. Heller Charitable Foundation grant is to increase knowledge and information about organic farming systems. It also includes support for commodity-specific organic production extension manuals and a University of California scientific conference on organic farming research in the near future," said Swezey. "The Heller Foundation has shown great leadership in funding this, which will allow us to more fully integrate SAREP with statewide county programs."

Organic farming is growing in importance internationally, nationally and in California, Swezey said. European Union members spend an estimated \$4.5 billion on organic products and Japanese consumption approaches \$2 billion per year, according to reports. In 2000 the U.S. market for organic products was over \$6 billion, up from \$78 million in 1980, Swezey said.

Swezey noted that preliminary data from the California Department of Food and Agriculture's California Organic Program show registered organic acreage in the state has more than doubled since 1998 to over 170,000 acres. Records also show that declared sales value of organic agricultural products was more than \$250 million in 2000, and that over 2,200 organic growers were registered with their county agricultural commissioners in 2001. Organic agriculture has shown an estimated 20 percent per year increase over the last five years, Swezey said.

"If organic acreage growth rates of 10 to 20 percent per year continue, as much as 10 percent of California's cropland acreage could be organic by 2025," Swezey said. "We believe the Heller Foundation grant will assist us in our efforts to help growers with knowledge to improve organic yields, pest control, soil health and to stabilize income."

"We're pleased to see the Heller Foundation step forward and underwrite organic research," said **Bob Scowcroft**, executive director of the Organic Farming Research Foundation, a national organization based in Santa Cruz, Calif. that represents organic farmers. "This research will have environmental, agricultural and consumer benefits for all of California."

## **Technical Reviews**

### **Restoration ecology and conservation biology in agriculture (PART II)**

Robert L. Bugg

[Note: Part I, focusing on general theory, appeared in **Sustainable Agriculture**, Vol. 13, No. 3, Fall 2001.]

#### **Farming Affects Birds**

Fluetsch and Sparling (1994) conducted a replicated study of insecticide use, songbird diversity, and nesting success of Mourning dove (*Zenaida macroura*) and American robin (*Turdus migratorius*) in organic vs. conventional apple orchards of Pennsylvania. Their data reflect heavy use of organophosphorus insecticides and document insecticide deposition in bird nests. Further, daily survival rate of immature birds and bird diversity were significantly greater in organic orchards. Intermediate forms of orchard management that are not organic have also eliminated organophosphorus insecticides (Santer 1995), and might be expected to support bird life better than conventional orchard management.

In the Prairie Pothole region of southeastern North Dakota, Lokemoen and Beiser (1997) evaluated bird densities, bird nest densities, and daily survival rates on conventional, minimum-tillage, and organic farms (sunflower and wheat production; organic farms used yellow sweetclover as a green manure or fallow). Mean number of nesting species and mean nest densities were higher on minimum-tillage and organic than on conventional farms. Significantly greater densities of birds were observed on reduced-tillage than on conventional farms. Daily survival rate for shore birds was greater in minimum-tillage than in organic fields. No other differences among farm type were observed. For organic fields, there was a negative correlation between tillage treatments (numbers of diskings) and bird nest densities. In light of the low nesting success rate, the authors suggested use of late-maturing legumes to allow delayed plowing down of organic fallow fields until late June, which would in turn enable bird nesting. The authors also recommended further reduction of tillage.

In England and Wales, Chamberlain et al. (1999) compared replicated pairs of organic and nearby conventional farms. The same observer assessed each pair of farms, to avoid systematic bias. Farms were not matched by crop rotation, because rotation is an intrinsic difference between the organic and conventional approaches, as are pesticide and fertilizer regimes and management of non-crop areas (e.g., hedgerows). In the spring and summer (the breeding season), the number of territorially active birds were estimated. During fall and winter, numbers of birds in boundaries (edges) of fields were assessed. On-farm habitat was characterized, including area, crop types, and boundary conditions. The study included fall and winter data for 1992/93-1993/94 (two years) as well as breeding-season data for 1992-1994 (three years). There was no overall pattern in the Shannon-Weiner species diversity index. Pair densities for 17 species over three breeding seasons showed 43 of 51 differences in favor of the organic farms, and data from 1992 (15 of 17 comparisons) and 1994 (16 of 17) were significant individually, whereas data from 1993 (12 of 17) were not, by themselves, significant. During fall and winter, bird density was greater on organic than conventional in 56 of 64 cases. Nine of these individual cases showed statistical significance, and sign tests showed significantly greater overall densities for organic in three of the four years of sampling. Outside the breeding season, bird densities in fields were greater for organic in 50 of 68 cases, but only in the winter of 1992 was a difference detected for a given time period. The researchers infer that territorial exclusion may lead to smaller differences between organic and conventional during the breeding season, but that in fall and winter territorial behavior is relaxed for most species, so densities will better reflect resource availability.

Shutler et al. (2000) evaluated bird diversity and density over an approximately one-year period on Saskatchewan, Canada wild sites and on organic, reduced-tillage, and conventional fields. Geographic area was used as a blocking variable to provide local clusters of fields representing all four treatments. A fixed-radius, point-count method was used, and several ecological covariates were measured within the quartersections containing the fields where bird density was assessed. Values for these variables were based on whether wetlands or woodlands were located within a

200-meter radius of the center of each sampling area, and on the area of wetlands and woodlands and an estimate of habitat complexity within the quartersection containing each sampling site. Several species of birds showed significantly higher densities on organic farms or the adjoining wetlands. For example, black-billed magpie, American robin, Le Conte's sparrow, and Vesper sparrow, all had significantly greater densities on organic than on one or more of the other three treatments. Relative abundance of birds on organic farms was significantly greater than on conventional or reduced tillage farms, and was not significantly less than for wild sites. Wetlands and their margins adjoining organic fields had significantly greater relative abundance of birds than did those adjoining reduced tillage or conventional fields.

In Ontario, Canada, Freemark and Kirk (2001) studied bird diversity on 10 pairs of organic and conventional farms. Mean bird diversity and species richness were significantly higher and eight species were more abundant on organic farms. Two species were significantly more abundant on conventional farms. Statistical trends ( $0.05 < P < 0.10$ ) suggested four additional species were more abundant on organic and three on conventional farms. Further statistical analyses revealed the importance of non-crop habitats, permanent crop cover, and the negative effect of intensive, conventional management practices on bird species diversity.

In a review article, Vickery et al. (2001) highlighted probable reasons for decline of bird diversity and density on lowland neutral grasslands in England, apparently correlated with intensification of forage-production practices. The following points were emphasized:

1. Transition from cattle to sheep has led to simplification of the sward floristic composition.
2. Transition from grazing to silage production has led to monocultures of high-statured plants subject to frequent close mowing for harvest.
3. Addition of fertilizer nitrogen leads to simplified stand composition, uniform, high stature, and reduced densities of several key arthropod prey of birds.
4. Use of the anti-helminthic (de-worming) medicine Avermectin makes animal dung less hospitable to various arthropods that are a food base to birds.

The authors note that low-input grazing operations have long been recognized as a major reservoir for native biodiversity, but that most on-farm studies of bird ecology have focused on arable (tillage-based) agriculture rather than extensive grasslands. The authors advocate the conservation and restoration of extensive, low-input grazing operations, the protection of field edges from grazing, and the exploration of alternative anti-helminthic medicines to the Avermectin now used to treat stock animals.

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Usher, M.B. and S.W.J. Keiller. 1998. The Macrolepidoptera of farm woodlands: determinants of diversity and community structure *Biodiversity and Conservation* 7(6): 725-748.

Vickery, J.A., J.R. Tallwin, R.E. Feber, E.J. Asteraki, P.W. Atkinson, R.J. Fuller and V.K. Brown. 2001. The management of lowland neutral grasslands in Britain: effects of agricultural practices on birds and their food resources. *Journal of Applied Ecology* 38:647-664.

**Other suggested reading:**

Elphick, C.S. 2000. Functional equivalency between rice fields and seminatural wetland habitats. *Conservation Biology* 14:181-191.

Reddersen, J. 1997. The arthropod fauna of organic versus conventional cereal fields in Denmark. *Biological Agriculture and Horticulture* 15: 61-71.

Rodenhouse, N.L., L.B. Best, R.J. O'Connor, and E.K. Bollinger. 1995. Effects of agricultural practices and farmland structures. Pp. 269-293 in: T.E. Martin and D. M. Finch (eds.). *Ecology and management of neotropical birds*. Oxford University Press, New York.

Sotherton, N.W. 1998. Land use changes and the decline of farmland wildlife: An appraisal of the set-aside approach. *Biological Conservation* 83:259-268.

Van Elsen, T. 2000. Species diversity as a task for organic agriculture in Europe. *Agriculture Ecosystems and Environment*. 77:101-109.

## **Resources**

### **Videos**

#### **Food politics**

*The Global Banquet: Politics of Food*, Maryknoll World Productions, 50 minutes. This video examines the impact of free trade on agriculture, farmers, and the poor, particularly women in the Third World. To order the \$19.95 video, call (800) 227-8523.

### **Audio cassettes**

#### **Pesticide safety**

*Pesticide Safety for Small Farms*, University of California ANR catalog, narration only from the videotapes of the same name. Produced for workers on small family farms, this program illustrates the importance of following safe practices for storing, mixing, applying, and disposing of pesticides. \$7 each. To order, contact UC ANR Web links below, or call (800) 994-8849.

English, 19 minutes, V96-A-A

<http://anrcatalog.ucdavis.edu/merchant.ihtml?pid=5438&step=4>

Hmong, 28 minutes, V96-B-A

<http://anrcatalog.ucdavis.edu/merchant.ihtml?pid=5439&step=4>

Lao, 28 minutes, V00-A-A

<http://anrcatalog.ucdavis.edu/merchant.ihtml?pid=5440&step=4>

### **Print Publications**

#### **Agritourism manual**

*Agritourism and Nature Tourism in California: A How-To Manual for Farmers and Ranchers*, **Ellen Rilla** and **Holly George**, UC Cooperative Extension, and **Diana Keith**, Community Works, 310 pages, 2002, University of California Small Farm Center. Agritourism and nature tourism are steadily growing tourism industries, due in part to an increasingly urban population. This manual helps California farmers and ranchers explore the feasibility of operating an agritourism or nature tourism enterprise. Designed as a workbook, it includes county and region specific data, and a resources chapter. The UC Small Farm Center, the Renewable Resources Extension Act, and the UC Eco- and Agritourism Workgroup provided funding for the manual. The cost is \$25 plus shipping and handling. To order, contact the Small Farm Center, University of California, One Shields Ave., Davis, CA 95616-8699; tel: (530) 752-8136, [sfcenter@ucdavis.edu](mailto:sfcenter@ucdavis.edu).

#### **Guide to California pesticide program**

*Regulating Pesticides: The California Story*, 125 pages, California Department of Pesticide Regulation. A guide/history to the most comprehensive, rigorous state pesticide regulatory program in the U.S. includes information on pesticide law, an explanation of regulatory and registration processes, a description of local and state enforcement activities, initiatives to reduce pesticide risks, and an extensive index. The guide is available for downloading free of charge from DPR's Web site [www.cdpr.ca.gov](http://www.cdpr.ca.gov). A limited number of paper copies are also available; send an \$8 check and a request for DPR Publication No. 203 to Cashier, California Department of Pesticide Regulation, PO Box 4015, Sacramento 95812-4015. DPR is one of six departments and boards within the California Environmental Protection Agency.

#### **Transporting Food**

*Food, Fuel, and Freeways: An Iowa Perspective on How Far Food Travels, Fuel Usage, and Greenhouse Gas*

*Emissions*, Leopold Center for Sustainable Agriculture, 37 pages, 2001. 209 Curtiss Hall, Iowa State University, Ames, IA 50011-1050; (515) 294-3711; [leopold@iastate.edu](mailto:leopold@iastate.edu); [www.iastate.edu](http://www.iastate.edu)

### **Organic Certification Programs**

*Organic Certification Programs and Organizations*, Appropriate Technology Transfer for Rural Areas, 12 pages, Oct. 2000. PO Box 3657, Fayetteville, AR 72702; (800) 346-9140 or (501) 442-9842; [www.attra.org/attra\\_pub/orcert.html](http://www.attra.org/attra_pub/orcert.html) or [www.attra.org/attra-pub/PDF/organicorgs.pdf](http://www.attra.org/attra-pub/PDF/organicorgs.pdf)

### **Small Farm Resources**

List of Alternative Crops and Enterprises for Small Farm Diversification, Alternative Farming Systems Information Center, [www.nal.usda.gov/afsic/AFSIC\\_pubs/altlist.htm](http://www.nal.usda.gov/afsic/AFSIC_pubs/altlist.htm); (301) 504-6559; [mgold@nal.usda.gov](mailto:mgold@nal.usda.gov)

### **Food Politics**

*Food Politics: How the Food Industry Influences Nutrition and Health*, 469 pages, **Marion Nestle**, University of California Press, March 2002 (30 black/white photographs, four illustrations, 41 tables). Food companies in 2000 generated nearly \$900 billion in sales. Marion Nestle, editor of the *1988 Surgeon General's Report on Nutrition and Health*, details how the food industry shapes food policy and safety and influences personal nutritional choices. Nestle is professor and chair of the nutrition and food studies department at New York University. The cost is \$29.95; order through bookstores or contact the UC Press Web site at <http://www.ucpress.edu/books/pages/9518.html>.

### **Organic farm journal**

*Root: A seasonal journal from Mariquita Farm*, Mariquita Farm. A new journal is available from an organic farm in Watsonville, Calif. Published seasonally, the debut issue (Autumn 2001) is introduced by co-publisher **Andrew Griffin** as different from other food magazines, which “do a great job of creating enthusiasm about food,” but do not explore the social issues and stories behind food production. Features include a question-and-answer section on planting by the moon, articles on the strength of the Virgin Mary in the farmworker community, recipes and scientific information about pumpkins, and a profile of a farmworker. To subscribe (\$22/year), contact Mariquita Farm, PO Box 2065, Watsonville, CA 95077, (831) 761-3226, [root@mariquita.com](mailto:root@mariquita.com).

## **Sources of Funding**

### **EPA farming transition grants**

The U.S. Environmental Protection Agency (EPA) is offering grants for “Education and demonstration for Food Quality Protection Act (FQPA) transition and integrated or reduced-risk practices for pest/crop management” through the Agriculture Initiative in EPA’s Region 9 (California, Nevada, Arizona, Hawaii, and the Pacific Trust Islands). FQPA, passed by Congress in 1996, established standards for pesticide residues in raw and processed food to protect public health and create an environment favorable for the development of lower risk, effective crop protection tools for U.S. agriculture. Each grant will be up to \$30,000; a total of \$170,000 will be awarded. The grants will support projects that help growers reduce dependence on pesticides, reduce health/environmental risks from pesticides, and move toward the implementation of ecologically based or integrated pest and crop management methods. Proposals should include partnerships and grower participation. State agencies, universities, cooperative extension, tribes, and nonprofit organizations (including not-for-profit commodity groups or farmers’ groups) in EPA’s Region 9 are eligible. New and existing projects are eligible. These grants cannot be used for basic research, although the projects may include a component for applied on-farm research if they include demonstration, education and/or outreach activities. Grant proposals must be postmarked by **May 10, 2002**; decisions will be made by June 5. For more information, contact **Lori Ann Thrupp**, Agriculture Initiative, EPA Region 9, 75 Hawthorne St CMD-4-1, San Francisco, CA 94105; tel: 415-947-4242; fax: 415-947-3583; email: [thrupp.loriann@epa.gov](mailto:thrupp.loriann@epa.gov).

### **Organic Research grants up**

The Organic Farming Research Foundation (OFRF) has raised the amount of its research grants to \$15,000 (up from \$10,000); applicants are invited for consideration in its twice-yearly funding cycle. Funds are offered for organic farming research, dissemination of research results to organic farmers and growers interested in making the transition to organic production and consumer education on organic farming issues. OFRF technical program coordinator **Jane Sooby** is available to work with farmers and others interested in doing on-farm research and applying for grants. The foundation’s on-farm research guide gives an overview of the research process and is accessible through OFRF’s Web site ([www.ofrf.org](http://www.ofrf.org)) under “research program” or can be ordered free of charge by calling OFRF at (831) 426-6606. The deadlines for proposal consideration are January 15 for the spring funding cycle and **July 15** for the fall funding cycle. Contact Sooby at OFRF, PO Box 440, Santa Cruz, CA 95061 or email [research@ofrf.org](mailto:research@ofrf.org) or [jane@ofrf.org](mailto:jane@ofrf.org)

### **Grant resources**

*Environmental Grantmaking Foundations 2001* directory is a useful resource for those seeking funding. It is published by Resources for Global Sustainability, PO Box 3665, Cary, NC 27519-3665; tel: (800) 724-1857; fax: (919) 363-9841; email: [rgs@environmentalgrants.com](mailto:rgs@environmentalgrants.com); Web site: [www.environmentalgrants.com](http://www.environmentalgrants.com). The directory is a comprehensive guide to the most significant independent, community and company-sponsored foundations that fund environmental projects. These foundations give more \$600 million for environmental purposes annually. The fifth edition profiles 900 foundations that give environmental grants, including 215 members of the Environmental Grantmakers Association. Profiles of each group include useful data; multiple indexes narrow the search to the grantmakers that fund particular topics or geographic focus. The directory is available in print and CD-ROM formats; the printed edition is \$105 plus shipping and handling, the CD-ROM version (PC only) is \$115 plus handling.