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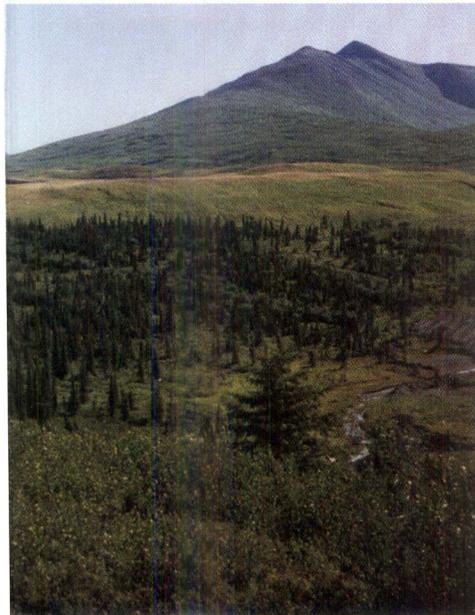
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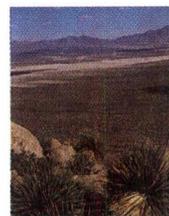
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Jornada basin, South-Central New Mexico. Current vegetation patterns reflect historic grass-shrubland mosaic, recent accelerated shrub invasion of grasslands, and human attempts to restore the pre-existing grassland. Photo by Jeff Herrick.

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## P E N P O I N T S

### To the editor:

From what he saw on his 1995 visit to the Ansai research station located in the deep loess hills of central China, Ordie Jones, a soil scientist with the USDA-ARS' Bushland Conservation and Production Research Laboratory thoughtfully reflected that *JSWC* 50(4):

"The Chinese do move mountains with only a shovel and a hand cart...Although our agriculture differs vastly from that of the Chinese, there is much we can learn from each other. Their agriculture is over 5,000 years old and is more productive than ever. Will U.S. agriculture still be productive in 5,000 years?"

This observation, while right and pertinent to the Loess Plateau reality, nevertheless calls for some further elaboration if the Chinese experience is ever to be of any reference value to the U.S. agriculture in particular and to the world soil and water conservation cause in general. As such, the Ansai message which Jones brought back from China must be interpreted in its wider context.

First, what has been central to the soil conservation work at and around Ansai and in fact, for much of the Loess Plateau itself is a rather special term called conservation eco-agriculture, a term coined by Chinese soil conservationists in recent years. The term, which has become increasingly popular among the country's conservation community, denotes an agricultural production system in which conservation measures are fully

integrated with the production process to make the whole system both ecologically sustainable and highly efficient in terms of land productivity. As would be expected, conservation eco-agriculture has many forms depending on the actual physiographical conditions involved and the appropriate crowning practices adopted. What Jones has seen and found quite amazing is just one of the many conservation eco-agriculture systems in the Loess Plateau. Among those which have also greatly impressed various soil conservation visitors from outside China include the dam-land agriculture, the bench-terrace agriculture and the sandy field agriculture systems, all fairly unique to the Chinese loess regions.

The conservation eco-agriculture idea accords perfectly well with the land husbandry thinking now extremely fashionable within the world soil and water conservation community. Viewed from whichever perspective, the two terms would mean essentially the same thing and both Oriental and Occidental wisdoms have obviously converged on the problem. Like their Western counterparts, Chinese soil and water conservationists have come a long way to reach their present understanding and the land husbandry thinking must be seen as a new imperative for future soil and water conservation the world over.

Should Jones' question, "will U.S. agriculture still be productive in 5,000 years?" ever have a positive answer,

then American soil and water conservationists and agriculturalists alike may have to go the conservational eco-agriculture or to better put it, the land husbandry way.

Second, as a largely rural nation by tradition, China carries a huge countryside population. Much of the country's soil and water conservation work needs to be done by the farmers themselves. While simply using a shovel and a hand cart may look rather primitive in the eyes of outsiders, the broad masses, if properly mobilized and well organized, could still move high mountains, just as Jones has witnessed. For the Ansai research station itself, the nearby Zhifang Gully Watershed has been used as a demonstration watershed to help the 500 villagers living there to experiment with recommended land management practices. Such extension work remains essential for the success of the conservation eco-agriculture mission, as the best way to influence farmers is always by models and examples.

Again, the paramount need here is to increase land productivity, thus closely relating soil and water conservation to farmers' incomes. This is obviously an old problem, but the 1995 Chiangmai International Workshop on Soil Conservation Extension may have spelled out some new solutions to it.

Third, environmental restoration on a scale as large as the Chinese Loess Plateau would demand an overall implementation strategy that truly reflect the region's long

term economic development needs. Jones has clearly seen changes in the present land use patterns at Ansai with sizable portions of the land allocated for pasture or forest, but more fundamental restructuring and upgrading of the underlying conservation eco-agriculture systems there will not be far down the line. As a matter of fact, this process is already underway in some places across the Loess Plateau.

This raises a further challenge for soil and water conservation planning at the regional scale. As future agriculture will surely be more industrialized, regional soil and water conservation work may have different roles to play in the affected macroeconomy. Or, put differently, a strengthened and restructured regional economy is likely to define a large-scale environmental protection program, of which soil and water conservation is only one part.

As always, words from mountains afar speak louder for soil and water conservation

*Pen Points is a forum for readers to comment on material that has been published in the JSWC or on land and water management issues in general. Readers are invited to express their views in a letter to the editor. Letters are judged on their clarity and pertinence to natural resource issues. Letters may be edited. Send letters to Editor, JSWC, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021-9764; fax (515) 289-1227; email swcs@swcs.org or check our web site at <http://www.swcs.org/>*  
—Editor

than any armchair talks. And the Ansai message from China needs to be carefully deciphered.

—A.P. Liu and T.Q. Li,  
Lanzhou 730000, Gansu  
Province, China

### To the editor:

The *Journal of Soil and Water Conservation* (JSWC) should be highly commended for providing its readers with a timely Special Issue (Volume 59, Number 5, September-October 1995) devoted to water research and management issues in semiarid environments. During the past decade or so, dire water shortage, worsening land deterioration, and the resulting famine in semiarid areas across the world have made frequent news headlines in the international press and the proper conservation, wise use, and scientific management of the two most valuable resources of soil and water now look more crucial than ever to the well-being of the global semiarid community. As greater climatic uncertainty and unprecedented human activity are bound to wrought even more profound impact on the semiarid regions in the years to come, the need is always urgent for better research on water and related management issues there.

As semiarid research specialists who are fortunate to have acquired two personal copies of this valuable JSWC Special Issue, we have greatly enjoyed reading it. On various field trips to the semiarid Chinese Loess Plateau, we have brought it with us as an inseparable travel companion and whenever possible, we also made various discussions with our Chinese colleagues over issues raised in the Special Issue. This has given us a much clearer understanding of some of the immense challenges still facing semiarid water research today and we believe that a

number of general issues would deserve particular attention in the immediate future.

### The case for basic semiarid water research

As models of various creeds are multiplying by the day and some of them are obviously overworked, it is truly heartening for anyone engaged in semiarid water research to read Dr. Kenneth Renard's recalling that in their discussions with him a long way back, Fred Blaisdell and Bill Reed actually stated something to the effect that "the most valuable thing we leave our successors is good data and not the computer models that we have all become so overwhelmed with." The very fact that such a good piece of advice has been emphatically relayed to the present successors led by Dr. Leonard Lane at the USDA-ARS' Southwest Watershed Research Center (SWRC) stands in its own right as an exceptional tribute to the fine efforts so superbly made by Dr. Renard and his team over the years. With such a sound research philosophy deeply rooted at Tucson, it will not be too difficult for the great expectations expressed in Dr. Renard's valedictory remarks to come true that SWRC be the SOUTH(BEST) Watershed Research Center.

On the real research front, however, much of the success will depend on our ability to view the semiarid landscape as an integrated system, wherein spatial, temporal, and causal considerations are quite essential. As a fragile system, sensitive to various external excitations large and small, the semiarid environment has its own way of internal responses, which effectively form the very foundations for sound environmental management there. It is here that semiarid scientists must learn to have real "dialogues" with the semiarid landscape per se. Perhaps this also remains the only credible

way to bridge the growing schism between data collectors and analysts bemoaned by the National Research Council's influential 1991 Report "Opportunities in the Hydrological Sciences."

Data collection at the Walnut Gulch Experimental Watershed has a long history now and this enables some meaningful conclusions to be drawn concerning semiarid landscape dynamics at the watershed scale. Any cursory glance at SWRC's long list of publications would attest to the rich conclusions that have already been drawn, but a pressing need is definitely here for us to expand the existing work to the regional scale. Research experiences gained both in the Mediterranean and in the Chinese Loess Plateau have shown that complex semiarid landscape responses must be viewed in their regional perspectives and climate gradients may just provide a convenient research site for this purpose. The dynamics of the semiarid transitional zone under various global change scenarios is one typical example showing how dear the SCALE problem holds to contemporary semiarid water research. And it is probably fair to say that this problem is one we are not familiar with at the moment.

It is therefore encouraging to see that in recent years, SWRC has initiated a series of well-planned large-scale experimental schemes in order to shed new light on such problems with more sophisticated and powerful monitoring equipment being used. As some new understandings are beginning to be gained about the semiarid landscape response at the regional scale, we need to be well aware that the research exercise should not be degenerated itself into a numbers game. After all, scaling up represents a challenging problem for contemporary semiarid water research and we should always bear in mind that a balance has to be struck

between accurate data collection and careful hypothesis formulation with due emphasis placed on looking for "water laws" in the semiarid environment.

### The need for applicable semiarid water management schemes

On the applied side, current semiarid water research tends to have an even longer way to go towards formulating those practical management schemes that can ensure effective capture and improved use of the scanty rainfall resources in semiarid regions. While many of the SWRC hydrological and erosion models have already been used, and will continue to be used, to develop natural resource models which are in turn incorporated into decision support systems to offer much-needed management practices, emphasis must be given to their applicability to the concerned environment. This is particularly true in the developing world, where economic backwardness often forces people to adopt cheap and easy-to-use techniques to harvest rainfall and enhance land productivity.

Depending on the actual situation considered, applicability may have different meanings. But in all those cases, basic semiarid water research provides the underlying framework for formulating the right management strategies. Following the worst drought for well over six decades in 1995 which had caused widespread crop failure, the three provinces of Gansu, Ningxia, and Shaanxi in the Loess Plateau all have quickly responded by implementing their respective rainfed agriculture Programmed designed at better household collection and use of the natural rainfall. The methods recommended range from the construction of well-positioned underground concrete basins to store rainwater for use in dry seasons to

the creation of small courtyard plots to grow vegetables and fruits. The governments would provide technical and material assistance to the farmers to help them with the construction work and in Gansu alone, the project successfully met the elementary needs for water by some 250,000 people in 1996.

While the Loess Plateau model is very much a household scheme seemingly more applicable to meeting people's survival needs in the harsh local environments, community-, watershed, provincial, and national-level schemes for water management are of fundamental importance to achieving greater socioeconomic growth there. Water Users' Associations have been a tried community-oriented way of practice in many parts of the world towards more cost-effective use of the water resources. In China at least, the idea dates back some 2000 years that water conservancy is an infrastructure for the national economy.

The Air-Earth Interface (AEI) model developed and refined over the years by Dr. Robert Dixon and his coworkers at the Imprinting Foundation at Tucson, Arizona, provides a good example demonstrating how a concept could be turned into a workable strategy for sound arid and semiarid land management across a wide range of spatial and temporal scales. The concept, which drastically states that the microroughness and macroporosity of the AEI regulate the exchange of surface water and displaced soil air across the ARI with the rough-open interface having very high exchange rates and with the smooth-closed interface having very low rates, has in fact led to the invention and development of a series of land imprinting devices which have restored perennial grasses to some 20,000 hectares of desertified rangeland in southern Arizona. According to Dr.

Dixon's estimates, measurable progress in reversing global desertification with the method would require increased annual funding from developed countries by at least three orders of magnitude—from the present millions to billions of dollars. With this prediction, the socioeconomic dimension of water management is crystal clear.

Perhaps, the most significant implication of the applicability argument rest with the fact that modern soil and conservation can only be better accomplished through sound land management. This is the very idea that a new thinking known as land husbandry has been preaching for in recent years. Water management in semiarid environments is just one of the many examples to which this new movement is particularly relevant.

### **The prospect for international research cooperation**

With only a few exceptions, the papers collected in the JSWC Special Issue are mainly the work done by our American colleagues and we wholeheartedly congratulate them on the leading role that they have been playing in semiarid water research over the years. We sincerely hope that they will continue to provide the lead in the long years still to come. Having said all this, it would be a good idea to have research experiences from more semiarid areas across the world fully represented if only just to show the diversity of the problems at hand, the scope of the challenges facing management and the lovely spirit that various local people possess in coping with such challenges.

It raises the whole question of future international collaborations in semiarid water research, which for one thing or another have been far from adequate in the past. Given that arid and semiarid areas now

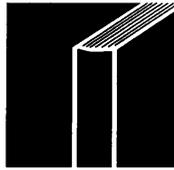
cover well over one-third of the world's total land surface and are still expanding, the prospect for international collaboration in the water research field looks just as good as anyone could hope and combating the semiarid problem could only succeed in the long term if concerted international efforts are made. Needless to say, the advanced instrumentation systems at the US Walnut Gulch Experimental Watershed could readily be put into better use to upgrade the rather aged monitoring facilities still run in the Chinese Loess Plateau, while indigenous rainfall harvesting practices developed by Chinese farmers may find good use in dryland environments in Africa. Perhaps our Israeli colleagues, with all their resourcefulness, may have more creative answers to a great number of water management questions that still baffle many semiarid regions in the world.

As a first step towards fruitful international semiarid water research collaborations, some outstanding institutions will have to take the lead and in our instance, SWRC appears to be the ideal organization to perform such an important role. There is certainly a lot of enthusiasm for this at Tucson and without any doubt, Dr. Lane and his team also have every expertise to make the initiative a lasting success. For their part, semiarid water research institutions and individuals in other parts of the world should see the collaboration as a valuable chance to share one another's research experiences and as such, need to devote as much if not more energy as their American colleagues to keep the exchange going the smoothest way possible. A regular international forum may need to be established for semiarid water scientists from all over the world to meet and a special publication be circulated to put the latest theoretical as well as practical water re-

search advances across to a wider audience concerned with semiarid problems. In addition, firm links should be established with international and governmental organizations to rut the research findings to various policymakers so that the scientific recommendations could be fully considered in making socioeconomic development plant about the semiarid environment.

As our frequent travels deep into the Chinese Loess Plateau would tell us, the opportunities for semiarid water research are numerous and bright. However, to take the opportunities and turn them into a research success is no easy task. Nevertheless, the JSWC Special Issue has provided a much needed momentum to that end and we semiarid research specialists will not be forgiven if we do not have a hard try, now.

—Y.Q. Li and A.P. Liu are two independent researchers in Lanzhou 730000, Gansu Province, China



## BOOKS, ETC.

### Agriculture

*Identifying characteristics of crop varieties* (ISBN 1-886106-90-8). By R.L. Agrawal. 125 pp., 1997. Science Publishers, Inc., P.O. Box 699, May Street, Enfield, NH 03758. Phone: (603) 632-7377; fax: (603) 632-5611. \$29.50 hardcover.

*Crop improvement: Stress tolerance* (ISBN 1-57808-005-3). By U.S. Gupta. 310 pp., 1997. Science Publishers, Inc., P.O. Box 699, May Street, Enfield, NH 03758. Phone: (603) 632-7377; fax: (603) 632-5611. \$79.50 hardcover.

*World fiber crops* (ISBN 1-886106-91). By R.K. Maiti. 220 pp., 1997. Science Publishers, Inc., P.O. Box 699, May Street, Enfield, NH 03758. Phone: (603) 632-7377; fax: (603) 632-5611. \$59.50 hardcover.

*Fundamentals of modern agriculture* (ISBN 1-886106-89-4). By P. Prevost and P. Le Glor. 250 pp., 1997. Science Publishers, Inc., P.O. Box 699, May Street, Enfield, NH 03758. Phone: (603) 632-7377; fax: (603) 632-5611. \$37.50 hardcover.

*Strategies for improvement of salt tolerance in higher plants* (ISBN 1-886106-97-5). By P.K. Jaiwal. 450 pp., 1997. Science Publishers, Inc., P.O. Box 699, May Street, Enfield, NH 03758. Phone: (603) 632-7377; fax: (603) 632-5611. \$95.00 hardcover.

### Environmental restoration

*The once and future forest: A guide to forest restoration strategies* (ISBN 1-55963-552-5). By Leslie Jones Sauer. 350 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$50.00 cloth; \$30.00 paper

*Restoring streams in cities: A guide*

*for planners, policymakers, and citizens* (ISBN 1-55963-043-4). By Ann Riley. 450 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$55.00 cloth; \$35.00 paper.

*The tallgrass restoration handbook: For prairies, savannas, and woodlands* (ISBN 1-55963-319-0). By S. Packard and C. Mutel, eds. 432 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$50.00 cloth, \$25.00 paper.

### Environmental science

*Integrated weed and soil management* (ISBN 1-57504-069-7). By J.L. Hatfield, D.D. Buhler, and B.A. Stewart, eds. 400 pp., 1997. Ann Arbor Press, Inc., 121 South Main Street, P.O. Box 310, Chelsea, MI 48118. Phone: 1-800-858-5299 or (313) 475-8787; fax: (313) 475-8852. \$59.95 hardcover.

*Animal waste utilization: Effective use of manure as a soil resource* (ISBN 1-57504-068-9). By J.L. Hatfield and B.A. Stewart, eds. 340 pp., 1997. Ann Arbor Press, Inc., 121 South Main Street, P.O. Box 310, Chelsea, MI 48118. Phone: 1-800-858-5299 or (313) 475-8787; fax: (313) 475-8852. \$59.95 hardcover.

*Environmental engineering and science: An introduction* (ISBN 0-86587-548-0). By Ram Gupta. 600 pp., 1997. Government Institutes, 4 Research Place, Rockville, MD 20850. Phone: (301) 921-2355; fax: (301) 921-0373; email: [giinfo@govinst.com](mailto:giinfo@govinst.com); internet: <http://www.govinst.com>. \$70.00 hardcover.

*Continuous emission monitoring* (ISBN 0-442-02503-3). By James Jahnke. 400 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-

7778. \$69.95 hardcover.

*Institutions and technologies for rural development in West Africa* (ISBN 3-8236-1268-9). T. Bierschenk, P. Le Meur, and M. Von Oppen, eds. 550pp., 1997. Margraf Verlag, P.O. Box 105, 97985 Weikersheim, Germany. Phone: (+49) (0)7934-3071; fax: (+49) (0)7934-8156. \$80.00 hardcover.

### General

*Vital signs 1997: Environmental trends that are shaping our future* (ISBN 0-393-31637-8). By L. Brown, M. Renner, and C. Flavin. 165 pp., 1997. W.W. Norton & Company Inc., 500 Fifth Avenue, New York, NY 10110. Phone: (212) 354-5500; fax: (212) 869-0856. \$12.00 paper.

*Laurance S. Rockefeller: Catalyst for conservation* (ISBN 1-55963-547-9). By Robin Winks. 240 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$25.00 cloth.

*Strategies of industrial and hazardous waste management* (ISBN 0-442-02445-2). By N. Nemerow and F. Agardy. 752 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$99.95 hardcover.

*Market-based approaches to environmental policy* (ISBN 0-442-02483-5). By R. Kosobud and J. Zimmerman. 353 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$69.95 hardcover.

*Getting the signals right: Tax reform to protect the environment and the economy* (ISBN 1-878071-36-X). By David Roodman. 68 pp., 1997. Worldwatch Institute, 1776 Massachusetts Avenue, NW,

Washington, DC 20036-1904. Phone: (202) 452-1999; fax: (202) 296-7365; email: [wwpub@worldwatch.org](mailto:wwpub@worldwatch.org); internet: <http://www.worldwatch.org>. \$5.00 paper

*Engineering and environmental ethics: A case study approach* (ISBN 0-442-02518-1). By J. Wilcox and L. Theodore. 275 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$39.95 hardcover.

*Paying the piper: Subsidies, politics, and the environment* (ISBN 1-878071-35-1). By David Roodman. 83 pp., 1996. Worldwatch Institute, 1776 Massachusetts Avenue, NW, Washington, DC 20036-1904. Phone: (202) 452-1999; fax: (202) 296-7365; email: [wwpub@worldwatch.org](mailto:wwpub@worldwatch.org); internet: <http://www.worldwatch.org>. \$5.00 paper.

*Remediation engineering* (ISBN 1-56670-137-6). By Suthan Suthersan. 384 pp., 1997. CRC Press/Lewis Publishers, 2000 Corporate Blvd., NW, Boca Raton, FL 33431. Phone 1-800-272-7737 or (407) 994-0555; fax: 1-800-374-3401 or (407) 998-9784; email: [orders@crcpress.com](mailto:orders@crcpress.com); internet <http://www.crcpress.com>. \$79.95 hardcover.

*Soil conservation extension: From concepts to adoption* (ISBN 974-7721-70-8). S. Sombatpanit, et al (eds). 488 pp., 1996. Science Publishers, P.O. Box 699, Enfield, NH 03748. Phone: (603) 632-7377; fax: (603) 632-5611. \$n/a, paper.

### Natural resources management/planning

*Beyond the new urbanism: Planning for environment, economy, and community* (ISBN 1-55963-478-2). By T. Beatly and K. Manning. 225 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-

828-1302; fax: (707) 983-6414. \$25.00 paper.

*Balancing nature and commerce in gateway communities* (ISBN 1-55963-545-2). By J. Howe, E. McMahon, and L. Propst. 165 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$21.95 paper.

*The science of conservation planning: Habitat conservation under the Endangered Species Act* (ISBN 1-55963-566-5). By R. Noss, M. O'Connell, and D. Murphy. 272 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$40.00 cloth; \$25.00 paper.

*Holding our ground: Protecting America's farms and farmland* (ISBN 1-55963-482-0). By T. Daniels and D. Bowers. 420 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$34.95 paper.

*Coastal waters of the world: Trends, threats, and strategies* (ISBN 1-55963-382-4). By Don Hinrichsen. 420 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$60.00 cloth.

*Strangers in paradise: Impact and management of nonindigenous species in Florida* (ISBN 1-55963-429-4). By D. Simberloff, D. Schmitz, and T. Brown. 480 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$50.00 cloth, \$29.95 paper.

*Frontiers of sustainability: Environmentally sound agriculture, forestry, transportation, and power production* (ISBN 1-55963-546-0). By R. Dower et al. 415 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$34.00 paper.

*Placing nature: Culture and landscape ecology* (ISBN 1-55963-559-2). By J.I. Nassauer, ed. 215 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$30.00 paper.

*Landscape ecology principles in landscape architecture and land-use planning* (ISBN 1-55963-514-2). By W. Dramstad, J. Olson, and R. Forman. 80 pp., 1996. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-

828-1302; fax: (707) 983-6414. \$17.95 paper.

*Managing growth in America communities* (ISBN 1-55963-442-1). By Douglas Porter. 215 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$29.95, paper.

## Reference

*National organic directory*. 400 pp., 1997. Community Alliance with Family Farmers, P.O. Box 363, Davis, CA 95617. Phone: 1-800-852-3832 or (916) 756-8518; fax: (916) 756-7857; email: nod@caff.org; internet: <http://www.caff.org>. \$44.95 paper.

*Pesticide profiles: Toxicity, environmental impact, and fate* (ISBN 1-56670-190-2). By Michael Kamrin, ed. 704 pp., 1997. CRC Press/Lewis Publishers, 2000 Corporate Blvd., NW, Boca Raton, FL 33431. Phone 1-800-272-7737 or (407) 994-0555; fax: 1-800-374-3401 or (407) 998-9784; email: [orders@crcpress.com](mailto:orders@crcpress.com); internet <http://www.crcpress.com>. \$99.95 hardcover.

*Rapid guide to chemical incompatibilities* (ISBN 0-442-02394-4). By R. Pohanish and S. Greene. 878 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$29.95 paper.

*Agrochemicals desk reference* (ISBN 1-56670-167-8). John Montgomery, ed. 700 pp., 1997. CRC Press/Lewis Publishers, 2000 Corporate Blvd., NW, Boca Raton, FL 33431. Phone 1-800-272-7737 or (407) 994-0555; fax: 1-800-374-3401 or (407) 998-9784; email: [orders@crcpress.com](mailto:orders@crcpress.com); internet <http://www.crcpress.com>. \$94.95.

## Water resources/quality

*Last oasis: Facing water scarcity* (ISBN 0-353-31744-7). By Sandra Pastel. 272 pp., 1997. W.W. Norton & Company Inc., 500 Fifth Avenue, New York, NY 10110. Phone: (212) 354-5500; fax: (212) 869-0856. \$10.95 paper

*Handbook of public water systems* (ISBN 0-442-02406-1). By HDR Engineering, Inc. 752 pp., 1997. Thompson Publications, 7625 Empire Dr., Flo-

rence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$129.95 hardcover

*Handbook of drinking water quality* (ISBN 0-442-02344-8). By John De Zuane. 592 pp., 1997. Thompson Publications, 7625 Empire Dr., Florence, KY 41402-2978. Phone: (606) 525-6600; fax: (606) 525-7778. \$74.95 hardcover.

*Pesticides in ground water: Distribution, trends, and governing factors*. By J.E. Barbash and E.A. Resek. 1997. Ann Arbor Press, Inc., 121 South Main Street, P.O. Box 310, Chelsea, MI 48118. Phone: 1-800-858-5299 or (313) 475-8787; fax: (313) 475-8852.

*Water, culture, and power: Local struggles in a global context* (ISBN 1-55963-521-5). By John Donahue and Barbara Rose Johnston. 430 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$50.00 cloth, \$30.00 paper.

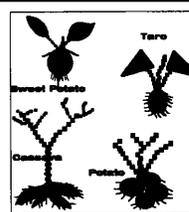
*Hydrology and the management of watersheds* (ISBN 0-8138-2287-4). By K. Brooks, P. Ffolliott, H. Gregersen, and L. DeBano. 516 pp., 1997. Iowa State University Press, 2121 S. State Avenue, Ames, IA 50014-8300. Phone: 1-800-862-6657 or (515) 292-0155; fax: (515) 292-3348. \$62.95 hardcover.

*Instream flow protection: Seeking a balance in western water use* (ISBN 1-55963-523-1). By D.

Gillilan and T. Brown. 432 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$50.00 cloth, \$30.00 paper.

## Wetlands

*Discovering the unknown landscape: A history of America's wetlands* (ISBN 1-55963-314-X). By Ann Vilesis. 440 pp., 1997. Island Press, Box 7, Covelo, CA 95428. Phone: 1-800-828-1302; fax: (707) 983-6414. \$27.50 cloth.



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