Introducing to readers of *Arid Lands Newsletter* the new President of the University of Arizona:

![Dr. Henry Koffler](image)

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**COVER:** Landsat false-color composite image (June 30, 1977) of the Altar Valley, Arizona, bounded on the west by the Baboquivari Mountains and on the east by the Sierrita Mountains. An oblique color infrared photograph (lower left) shows mesquite (*Prosopis velutina*) in washes flanking the Sierritas. A mesquite individual (left inset) approaching 1.2 m in diameter is an extremely large indication of the fuelwood potential for the species.

—Photo by Arizona Remote Sensing Center Staff, layout by P. Mirocha, OALS
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Fig. 1. Altar Valley, Arizona
FUELWOOD INVENTORY WITH LANDSAT ORBITAL IMAGERY

Michael C. Parton*

Fuelwood Resources

To many visitors to our state, the name 'Arizona' conjures visions of desert basins and low ranges, dry washes, and endless miles of scrub-covered plateau, interrupted only infrequently with patches of tall coniferous forest at high elevations. This is hardly surprising since more than 80 percent of our population lives within the boundaries of the Sonoran desert (Hecht and Reeves, 1981). Even a long-time resident is surprised to learn that more than 50 percent of the state's surface area is covered with forest or woodland. While relatively little of this vegetation, 15 percent, is commercially-exploitable timber, the remaining open woodlands of pinyon pine and juniper or riparian thickets of mesquite are being viewed today as a renewable resource that may feasibly be harvested for fuelwood.

As with most earth materials that are suddenly given a new status as valued resources, the extent and nature of these low-yield woodlands is not well-known. Economically viable harvesting of fuelwood relies on two types of information: density of trees within a given stand, and estimated volume (commonly expressed as stacked cords per unit area) of the prospective fuelwood. Extensive fieldwork needed for the collection of such information has precluded a large-scale statewide mapping effort to date.

Faced with the need for information on yields of mesquite on public lands slated for fuelwood sales, the Arizona State Land Department in 1980 approached the Arizona Remote Sensing Center (ARSC, formerly the Applied Remote Sensing Program) of the University of Arizona's Office of Arid Lands Studies to evaluate the potential for employing airborne or orbital remote sensing data to map fuelwood resources. ARSC has recently completed this study, a successful demonstration of Landsat orbital imagery as a tool for assessing fuelwood yield of mesquite in Southern Arizona (Hutchinson et al, 1982).

The Landsat Satellite Program

Landsat, formerly Earth Resources Technology Satellite (ERTS), is both a program for resource observation and the name for satellites launched in support of this program. Four satellites have been orbited since the inception of the program, the first in June 1972 and the most recent on July 16, 1982. The primary component of these satellites is the Multispectral Scanner (MSS). Unlike the cameras carried on earlier manned missions, the MSS provides continuous automated scanning coverage of the earth's surface from an altitude of 705 nautical miles (920 km) with repetitive coverage every 18 days. Both photographic image products and digital data can be obtained from selected overpasses of these satellites, providing a synoptic view and readily-accessible information on land cover. This information can be translated by selective manipulation to fuelwood yield.

Successful mapping of mesquite cordage relies on four factors:

1. During the driest season of the year (May-June), mesquite is the only highly-vigorous species in the low basins of Southern Arizona
2. This vigorous status can be detected and measured using digital data from the Landsat MSS (see inset)
3. The intensity of this vigor is directly proportional to the cover density of the species
4. This density, in turn, is proportional to the volume, which may be converted to estimated cordage yield

Yield Mapping the the Altar Valley

The Altar Valley, situated approximately 50 miles (80 km) southwest of Tucson, Arizona, is bounded on the west by the Baboquivari, Quinlan, and Coyote Mountains; on the east by the Sierrita, Las Guijas, San Luis, and Cerro Colorado Mountains; and on the north by its junction with the Avra Valley (Fig. 1). The total area of the valley, excluding Papago Indian Reservation land on

* Research Assistant, Arizona Remote Sensing Center, Office of Arid Lands Studies, University of Arizona.
Vegetative vigor, a qualitative measure of plant health and growth, can be assessed with Landsat MSS data through an image manipulation technique called spectral band ratioing. This technique uses the reflectance characteristics of vegetation and soil (Fig. 2) to enhance plant materials that are not stressed by lack of water or high temperatures.

MSS band 7 (reflective infrared) image data is divided on a pixel-by-pixel basis by band 5 (red) data to obtain a 7/5 ratio image. Vigorous vegetation, with high band 7 and low band 5 reflectance, is shown with the highest ratio values. Stressed vegetation with lower band 7 values, and soil with high band 5 values, are easily differentiated by their lower ratio values. Since mesquite is the only vigorous vegetation observed in the Altar Valley during the driest months, it is readily detected using this band-ratio technique.

A digital data extract from a Landsat-2 overpass on June 30, 1977, was made for the Altar Valley and surroundings (see cover this issue). Mesquite cover data from ground sampling were compared with actual MSS sample values in the Digital Image Analysis Laboratory, University of Arizona. In this way, calibration coefficients were derived with which the spectral data could be converted to fuelwood cordage values. The resulting cordage image was used to generate mesquite yield maps depicting four ranges of stacked cords per acre throughout the valley. In addition, land ownership data supplied by the State Land Department were coded and analyzed to provide mesquite yield by federal, state, and private category.

The climate of the valley is largely defined by low annual average precipitation of 10.6-11.0 inches (27-28 cm) with a bimodal summer/winter distribution. Mean monthly temperature varies from 47° F (8° C) in January to 84° F (29° C) in July. Elevation ranges from 2700 ft (823 m) in the north central valley (Altar Wash) to 7730 ft (2356 m) on Baboquivari Peak. Much of the valley can be characterized as broad, gently-sloping alluvial plain extending from the ranges that bound it on the east and west. The watershed, which culminates in Brawley Wash, drains to the north.

![Fig. 2. Idealized reflectance from desert materials by wavelength.](image-url)
During the course of ground investigations in the Altar Valley, distinctive terrain-volume relationships were observed that led to the development of landform-weighed coefficients for conversion of density to cordage yield. The same cover of mesquite consistently produced greater yields in a riparian setting than on interfluves. This terrain correlate was introduced to the yield estimates by manipulation of U.S. Geological Survey digital terrain data (Fig. 3). The application of these data hold great promise for mapping of fuelwood potential for other types of vegetation.

**Future Applications**

Based on the success of the Altar Valley mesquite study, the Arizona State Land Department has awarded ARSC a follow-on contract to demonstrate the feasibility of Landsat MSS data for mapping of the vast pinyon pine-juniper woodlands of northern Arizona. In support of this investigation, ARSC is currently conducting field activities on four sample quadrangles in the vicinity of Flagstaff and Williams, Arizona. In addition to Landsat MSS data, ARSC will be exploring the further use of digital terrain data and the related activity of landform modelling to the derivation of accurate volume estimates for fuelwood species.

Recently, the State of New Mexico has expressed a strong interest in complete mapping of fuelwood reserves. A joint proposal by ARSC, University of New Mexico’s Technology Application Center (TAC), the U.S. Department of Agriculture/Cooperative Extension Service and Range Experimental Station, and California Institute of Technology/Jet Propulsion Laboratory (JPL) suggests the employment of Landsat data for the largest detailed land surface mapping experiment conducted to date. This program, proposed as a cooperative venture with the U.S. Department of Agriculture/Soil Conservation Service, and the Department of Interior/Bureau of Land Management, reveals the keen interest being placed today in mapping and management of the Southwest’s vast fuelwood resources.

*Fig. 3.* Shaded relief image of Altar Valley produced from digital terrain data (NCIC).

**REMOTE SENSING RESOURCES WORKSHOP**

**January 10-14, 1983**

The Arizona Remote Sensing Center (ARSC), Office of Arid Lands Studies, University of Arizona, Tucson, Arizona 85719, will conduct a workshop January 10-14, 1983 to acquaint participants with remote sensing methods and materials, their procurement and interpretation, and applications to planning and resource management.

The course is designed specifically for resource scientists and managers. Regional emphasis is on arid and semiarid lands, though techniques are applicable over a

(Continued on next page)
broad regional setting. While prior experience in photo-
interpretation is useful, the course is designed for partici-
pants with no background in remote sensing.

The workshop is an intensive three-day session of
lectures, discussions, and exercises emphasizing appli-
cations of remote sensing to resource evaluation and
management. The orientation is towards practical utili-
ization rather than theoretical study. Library and data
reference facilities will be available for use by the
participants.

An Optional two-day field workshop is available to
provide directed experience to participants. Following
the conclusion of instruction on the second day of this
optional workshop, a consultation period will be pro-
vided for discussion of specific applications to manage-
ment activities of the participants.

Classes will be held at the University of Arizona.
Facilities for lodging are available next to the campus,
and participants are asked to make their own arrange-
ments for the workshop period.

Tuition for the 3-day session (January 10-12) is $175;
for the full 5-day session, $250. The cost covers all
instructional materials and transportation for the op-
tional field session. Please apply to the ARSC no later
than December 20, 1982. Class size will be limited to 30
persons. Notification of acceptance will be made by mail.

?? DID YOU KNOW ??

... that postage stamps on letters from listeners to
the BBC's African Services are sold to raise money to
help African children? Every month thousands of color-
ful African and Middle Eastern stamps pour into the
offices of the Hausa Service, Graham Mytton, himself a
collector, 'organizes the collection and takes the stamps
to the Save the Children Fund Stamp Shop in
London. . . . The latest delivery involved about 22,000
stamps which should raise about £500 for children's
projects in Africa.'

—BBC World Service Programme, Mar.-Sept. 1982

... that two polymer products, Agrosoke and
Erosel, developed in the UK for marketing in the arid
world, are being offered as the answer to desert recla-
mation and crop growth? The first provides a source of
water for plants to feed on, it is claimed, the other
prevents soil erosion. While Arid Lands Newsletter
cannot recommend any commercial product, readers
may address their own inquiries to Chemical Discoveries,
Ltd., 26 Urmston lane, Stretford, Manchester M32 9BP,
England.

Les Efforts de Reboisement à Dedougou, Haute Volta

Originally published in English in Arid Lands Newsletter No. 13, March 1981, p. 29-36, this article by Thomas Jansen has
now been translated into French by Peter Hall for greater usefulness in those areas of Africa where French is the official
language. Jansen has provided us with typescript copies available upon request to ALN's Editor by anyone who believes the
French version would serve his purpose better. While illustrations are lacking, copies of the Newsletter are still in print so
that the pictures used in the original English version can be matched. In requesting the French, please let us know if you wish
the printed copy also.

—pp
Editorially speaking:

HOW TO CHANGE THE WORLD IN ONE EASY LESSON

With our familiar penchant for having something to say about absolutely everything, we are now proposing that you consider the extension of various mobile services to those areas of the arid world that need them desperately but do not now have them. Though we have long advocated such [i.e. Arid Lands Newsletter, No. 9, p. 13, 17, December 1978], we were reminded recently by a local newspaper story about 'The Flying Samaritans,'* a group of airborne U.S. medics, including ophthalmologists and dentists, who service rural areas of Baja California without cost to patients. This group, now 21 years old, operating 15 clinics, some in shacks without electricity or running water, some almost fully outfitted thanks to the generosity and care of the flying Samaritans, might serve as a model for other areas of the world in need.

But even in the U.S., there is a 'flying doctor' serving remote rural areas of Nevada, not so much because his patients are too poor to pay for his services, as in the case in Baja, but rather because of the great distances involved to modern well-equipped hospitals with facilities for total care. This is an expensive solution to need, nevertheless, in either case, The Nevada doctor admits he is 'broke,' the Samaritans operate entirely from personal generosity. Is there another way?

Well, governments could provide medical vans, like the one operating here in rural Pima County, Southern Arizona, called 'Community Health Action on Wheels' which travels throughout rural areas, financed by a federal grant to the University of Arizona's Department of Family and Community Medicine. In this instance, the van's presence in any settlement is designed only to be a first step in a program intended to make rural communities aware of their medical needs and lack of adequate facilities, and then help them plan a permanent facility if they feel the need for one.

But in other cases throughout the developing world, the vans should be considered a permanently continuing service to those in need, beyond the services of larger urban areas. Certainly schedules could be established so that all in need in a particular area could be aware of the appearance of the van and be prepared to attend its nearest stop. The outfitting of such traveling medical services could be funded by any number of international aid programs or agencies, perhaps at the cost of flying a dozen bureaucrats to a meeting in the capital to TALK. And those native medics, who may have been sent abroad for their professional education at government expense, should be prepared to serve as local 'samaritans' for a specified length of time as reasonable repayment of educational costs.

But we do not need to confine our ideas on mobile clinics to medical clinics, for others already exist in some places to meet educational or agricultural needs. Why not more of these itinerant teachers, moving from oasis to oasis, or actually traveling with the pastoralists as they move from grazing area to grazing area? Or a traveling school van, equipped with educational tools such as videotapes as well as books, that could be programmed to stay in one locality for the length of time the population was in place and its children free to attend?

We have long talked about the necessity for more extension workers, but the mobility provided by the kind of traveling clinic we envisage would easily quadruple the usefulness of such workers, enabling them to move from settlement to settlement, to get into the actual field where the problem is. Better this than an occasional visit by the agent from his office in the district capital.

What about mobile veterinary clinics? Already there is one such functioning in the Negev under the aegis of the Ben Gurion University, where the Middle East's first camel clinic operates by visiting bedouin encampments where animals can be treated on the spot.

These mobile clinics — be they medical, educational, or agricultural — seem to our simple mind a sure-fire beginning solution, comparatively inexpensive, reversing the urbanization of blighted areas, involving locals, taking advantage of the freedom to move about as needed. What we are saying, I guess, is that in this mobile age, upward or outward, there is no excuse for denying the arid world's deprived uneducated poor of the services they require. The bill for generations of neglect already has been presented to the world in the form of desertification, disease, illiteracy, hunger, and the interest on those unpaid bills will cost us dearly. The itemized rendering will include the old familiar litany: unrest, anarchy, revolution, and worse, the exploitation of these people by the world's trigger-happy terrorists.

Compared to these costs, the cost of acquiring and equipping such vans as we have been talking about are minimal. Individual philanthropists, industries, private agencies, governments, international bodies, could manage without losing a beat — to their everlasting credit. For a trial run, can't some one such person or group just try, please? It will work, we know, and thus set the example for the many who would follow. It is possible to change the world, for the better for a change. How can you resist, those of you out there who have the means and now, because you trust us, the motivation?

— Patricia Paylore

*Steve Williams reporting for the Arizona Daily Star, August 23, 1982
1 Rainfed Farming
2 Grazing Exclosure
3,4,6 Range Revegetation
5 Water-spreading Agri-system
7 Demonstration Ranch/Farm
8 Arid Lands Forestry
9 Grazing Experiments
10 Terraces
11 Proposed Administrative Center

Low-level aerial photograph of Page Ranch with overlay detailing land use plan
The University of Arizona's 260-ha Page Ranch** at an elevation of 1,100 m, is located about 50 km from the University's Tucson campus, its climate Sb13 (Meigs), with rainfall averaging about 350 mm, and a 224-day frost-free growing season. Access to the site is by all-weather road, but internal movement is sometimes restricted during the summer or winter rainy seasons.

Since it was announced in April 1982 that the Ranch was to be designated as an International Center for Arid Lands Agricultural Systems, a number of advances have been made in its design to support its multipurpose character:

**Purposes**

- to increase University of Arizona faculty understanding of constraints to arid lands agricultural development where natural and human resources are limited
- to test appropriate arid lands agricultural and related technologies in a realistic setting including social and economic factors; to test small-scale energy production systems and arid lands construction technology
- to provide opportunities for training international students and visiting scholars in a setting similar to their home countries; to serve as a training site for U.S. Peace Corps volunteers and similar groups
- to demonstrate applicability of technologies developed and/or adapted for small-scale arid lands agricultural systems on a carefully monitored on-site operating unit
- to establish a field laboratory with a long-term natural resources data base for research in hydrology, climatology, ecology, range management, watershed management, arid lands forestry, and related topics
- to be a showplace of appropriate arid lands agricultural and related technologies for international and other visitors

**Relation to International Programs**

Activities at Page Ranch are closely related to University of Arizona international programs for a number of reasons:

1) Technologies to be developed are immediately applicable and of high priority in many developing countries:
   - water harvesting/runoff farming
   - small-scale farming systems
   - integrated crop and livestock production
   - small-scale energy production systems
   - appropriate educational technology

2) The site's isolated location and lack of infrastructure present a situation similar to that which might be expected facing scientists and educators in developing countries

3) Many of the University of Arizona's international students would profit from relating their course work to conditions at Page Ranch, as a substitute for typical large-scale U.S. agriculture

4) Faculty working there would increase their capability for and interest in involvement with the University in U.S. development assistance programs

5) Already a high level of interest in Page Ranch has been shown by international students and visiting scholars, as well as others

6) International development agencies have expressed considerable interest in the type of activities to be carried out at the site.

**Program**

By this time a research and land use philosophy is taking shape that will add significant new characteristics:

- A systems approach to arid lands agricultural development will be emphasized, with social/economic/energy factors included in all work done there, and many activities related to the needs of developing countries
Focus will be on small-scale operators, those with limited land and capital resources. The demonstration farm/ranch will make use of appropriate technology in a self-sufficient operating unit where all inputs/outputs will be monitored closely, thus improving the linkage between research and real world farm/ranch problems.

No use will be made of expensive wells to tap the deep groundwater underlying the property, although water may be used from a shallow ‘perched’ water table.

Studies conducted at Page Ranch by individual scientists will be separate and independent, but concerted efforts will be made to integrate them where possible or pertinent.

Agricultural Activities:
1) water harvesting/runoff farming: micro catchments, floodplain water spreading, diversion and terracing
2) range management demonstrations: exclosure-inclosure, multiple species grazing, land imprinting, pitter, reseeding
3) watershed management: rainfall-runoff relationships, field water measurement
4) forest hydrology: integrated management, arid lands forestry
5) crop drying, processing, and storage

Water Resources Management Activities:
1) infiltration, soil moisture, and recharge studies
2) small-scale resources development
3) erosion and gully control
4) water storage, using compartmented reservoirs
5) reservoir seepage and evaporation control
6) wastewater use
Spaces between rows of grapevines have been treated with salt to increase their ability to shed water toward the vines.
In addition to the program in agriculture which forms the primary base of all Page Ranch activities, other related research and demonstrations will be conducted, for example: energy (solar, wind, methane, wood), appropriate building design and construction techniques (rammed earth, underground, adobe, passive solar), waste disposal, roadway and paths, and water supply.

Training activities, organized for U.S. and international students and visiting scholars, will include short courses on such topics as range and watershed management, water harvesting/runoff farming, arid lands forestry; and practical training experiences (on-the-job), along with regular academic courses and thesis and dissertation research.

Implementation of some activities is already underway, with construction of the first building scheduled for September 1982-March 1983, new water harvesting programs for July 1982-June 1983, and other undertakings such as a wind generator planned to begin shortly.

There will be many opportunities for cooperative research at Page Ranch involving people from around the world. Interested international scientists are welcomed at Page Ranch as visitors or collaborative scholars. Since no guest facilities are available, and no regular transportation from Tucson is provided, visitors contemplating visits should contact the University of Arizona for additional details:

W.G. Matlock
Office of Council for International Programs
209 Nugent Bldg.
University of Arizona
Tucson, Arizona 85721
(602) 626-1717
Runoff from water-collection surfaces flows toward storage ponds.

WHY IS IT CALLED PAGE RANCH?

Because it was originally owned by a man named Joseph T. Page, a 63-year-old retired Kansas City streetcar conductor who had come to Arizona in 1923 with the dream of establishing a family farm. He acquired a half section of overgrazed rangeland and, in an area of less than adequate rainfall for rainfed crop production, initiated many water conservation practices to which we are now, ironically, returning, including a water harvesting system for fruit trees. He labored personally and prodigiously for over a decade, during which grass production and carrying capacity were increased greatly.

A few years before his death in the early 1940s, his half section was combined with the adjoining half section to the south and the square mile was given to the University of Arizona for experimental use.

For the next three decades, research at the Page Ranch was primarily on range management, with studies of plant succession and the effect of fire on grasses and mesquite. A water harvesting system to collect rainfall for stock watering was reinstated [if the old man is monitoring the ranch, from somewhere ‘out there’, he’d be pleased, I imagine! -pp], and some range reseeding was done. In 1971 work was initiated on the present water-harvesting/runoff farming systems. Land was cleared and treated with salt to disperse clays to increase runoff, and wine grapes were planted, already being harvested and pressed into wine that is being carefully evaluated.

So, you asked, and now you know.
THE HAND IMPRINTER*

The hand imprinter is designed to establish grass and trees on steep erosive slopes, interseed needed species into existing stands of vegetation, seed through and anchor a heavy mulch, facilitate planting in rocky or gravelly soils, and insure seed germination and seedling survival where the land resources of rainwater, soil, and biomass are sparsely distributed. They are especially appropriate for small-scale farming, gardening, landscaping, and soil conservation/improvement efforts in arid and semiarid regions of the world. Labor-intensive societies will find imprinters useful in the revegetation of land denuded through desertification practices and processes.

The hand imprinting tool consists of one or more imprinting teeth attached in sequence to a backing plate, foot stirrup, and T-handle. Teeth are wedge-, cone-, or pyramid-shaped, with terminal angles ranging from 30-150 degrees. Pyramids are 3-6 sided, the tooth base may be circular, square, or rectangular in shape, and its dimensions range from 5-30 cm in diameter, length, or width. The teeth may be cast from iron, aluminum, or plastic, or fabricated from sheet metal, then internally reinforced by filling with plastic. The T-handle, stirrup, and backing plate are fabricated from metal tubing, strap, and plate respectively. The metal may be either steel or aluminum alloy.

Soil imprint funnels rainwater to seed and seedlings and shelters young seedlings from wind and sun.

The hand imprinter creates seedbeds and seedling cradles formed by the rainwater infiltration funnels, thus protecting the seedling from the sun and wind and providing a more humid environment than a smooth surface where a seedling is fully exposed. When the imprint dries after a rain, shrinkage cracks form to allow unimpeded exchange of rainwater and soil air across the imprinted soil surface, thus permitting rainwater to penetrate the soil deeply at the vertex of the funnel.

Detailed information about the construction and operation of the hand imprinter, together with advice on the best uses of various designs for the imprinting teeth, may be obtained from Robert M. Dixon, Soil Scientist, USDA/ARS, Aridland Ecosystems Research, 2000 E. Allen Rd., Tucson, Arizona 85719, USA.

Hand imprinter with exchangeable teeth. Examples of seedling cradles formed by either wedge (left) or pyramid (right) teeth.
INTERNATIONAL VISITORS TO UA/OALS

INDIA:

ISRAEL:


Stanley Kaplan, Executive Director, International Technical Cooperation Centre, Tel-Aviv, August 6, 1982. Interests: University of Arizona participation in the 6th World Congress of Engineers & Architects [see this issue of ALN under Meetings, p. 18].

ITALY:

KENYA:
Dr. Michael Norton-Griffiths, Managing Director, EcoSystems, Ltd., Nairobi, August 31-September 3, 1982. Dr. Norton-Griffiths gave two lectures under the auspices of the Arizona Remote Sensing Center and the School of Renewable Natural Resources: ‘Low-Level Aerial Survey for Natural Resource and Agricultural Planning in East Africa,’ and ‘Dynamics of Pastoralists, Livestock, and Big Game on the Rangelands of East Africa,’ as well as a slide show, ‘East Africa Through the Eyes of a Roaming Consultant.’

SYRIA:

PAKISTAN:
Syed Hassan Raza, Deputy Director, Land and Water Use Division, Arid Zone Research Institute, Quetta, Baluchistan, May 24, 1982
USSR:
Visiting Soviet Scientific Delegation, Project 02.05-51, Protection of Arid Ecosystems US/USSR Environmental Agreement, May 17-31, 1982:

Dr. A.G. Babayev, Director, Institute of Deserts and President, Academy of Sciences Turkmen SSR, Ashkhabad
Dr. N.S. Orlovskiy, Laboratory Chief, Institute of Deserts, Ashkhabad
Dr. Petr D. Gunin, Senior Researcher, Institute of Evolutionary Animal Morphology and Ecology, USSR Academy of Sciences, Moscow
Dr. Y.A. Starikov, Staff Specialist, USSR State Committee for Hydrometeorology and Control of the Natural Environment

During the course of their stay in the U.S., the Soviet specialists had an opportunity to observe arid land sites with ongoing ecological research, resource management, and economic activity including various projects in Utah, Wyoming, and Arizona. Discussions of future joint activities under the Project brought agreement on cooperation in arid ecosystem monitoring, developing desertification control methods, improvement, protection, and rational use of rangelands. It is expected that an American delegation will visit the USSR in the spring of 1983 for familiarization with its desert regions, management programs, and ongoing arid ecosystem research.

1 to r: Babayev, Orlovskiy, Gunin, Starikov, examining some remote sensing data as presented by Michael Parton, Research Assistant, Arizona Remote Sensing Center.
Development of the Desert and Sparsely Populated Areas: Policies, Planning, Architecture and Industry, 6th World Congress of Engineers and Architects, December 11-16, 1983, Tel-Aviv, Israel. Nine panels are being designed to carry out the theme of the congress: Problems and Directions for Solutions.

- Environment and Conditions
- People and Communities
- Water, Energy and Agriculture
- Responsive Architecture
- Building, Infrastructure and Transportation
- Industry — Lifeline for Development
- Advanced Technology and Energy
- Telecommunications and Information
- Policies, Financing and Planning for Development

There will be parallel project evaluation sessions during post-congress field trips to a kibbutz, Arad, and the Galilee, as well as tours to Haifa, Eilat, and the Dead Sea. Offers of papers and project case studies should be submitted in outline not exceeding 300 words by December 31, 1982, and complete papers or case studies by July 31, 1983. Poster presentations must be received by September 30, 1983. Contact: International Technical Cooperation Centre, P.O. Box 3082, Tel Aviv, Israel.

Association for Arid Lands Studies (AALS), annual meeting to be held in conjunction with the Western Social Science Association, April 27-30, 1983, in Albuquerque, New Mexico. Papers dealing with social, economic, and environmental aspects of energy development in arid zones are especially solicited. Contact: John G. Hehr, AALS Program Chairman, c/o Department of Geography, University of Arkansas, Fayetteville, AR 72701. Deadline for submitting abstracts: November 15, 1982.

International Safe Water Conference, March 6-9, 1983, Washington, D.C. This first annual conference promoted by Global Water, a recently established organization serving as an umbrella organization for a wide range of groups involved wholly or partly in the water field, has the strong backing of the United Nations and the U.S. State Department in support of the U.N. International Drinking Water Supply and Sanitation Decade. Its theme: Global Water: Giving Life. Papers are invited on water conservation strategies, finding water, strengthening government institutions for water programs, water and energy, and other water topics. Contact: Stephanie Loiacono, Global Water, Suite 300, 2033 M St., N.W., Washington, D.C. 20036. Tel: (202) 466-3518.

Environmental Sciences in Developing Countries, 3rd Symposium, Cairo, Egypt, April 16-21, 1983. In the context of UNEP's global assessment of the state of the world environment during the decade after Stockholm, this symposium will focus on environmental considerations in rural development as its main theme, with accompanying attention to research on environmentally oriented rural development in fragile and marginal ecosystems in developing countries designed to establish a rational and environmentally sound land use policy which will minimize environmental damage and promote maximum sustainable yields. Contact: Samir I. Ghabbour, c/o Department of Natural Resources, Institute of African Research and Studies, Cairo University, Giza (Cairo), Egypt.

QUOTE

O wilderness of drifting sands, O lonely caravan! 
The desert heart is set apart, unknown to any man.

— Kismet
new Directory information:

ENGLAND

ROYAL BOTANIC GARDENS (1982)

a) governmental
b) Ministry of Agriculture, Fisheries & Food

2. Headquarters: Kew, Richmond, Surrey TW9 3AB, UK, Telephone 01-940 1171.
   Telegrams KEWGAR. Telex 296694KEWGAR, Greater London
   l) substation: Wakehurst Place, Ardingly, near Haywards Heath, W. Sussex RH17 6TN, approx. 45 km south of London. Telephone 0444 892701

3. Scope of interest: plant taxonomy, cytology, anatomy, physiology, plant biochemistry, economic botany, botanic gardens

4. Research program (arid zone only):
   a) completed: Flora of West Tropical Africa, 3v.
   b) current: Survey of Economic Plants for Arid and Semi-arid Tropics (SEPASAT)
   c) planned: arboreal seed storage for conservation purposes in connection with the FAO/IBPGR project on 'Genetic Resources of Arid and Semi-arid Arboreal Species for the Improvement of Rural Living'

6. Staff:

   a) Professor E.A. Bell, Director
   b) P.S. Green, Deputy Director and Keeper of the Herbarium; Professor K. Jones, Keeper, Jodrell Laboratory; Ms. S. M. D. FitzGerald, Chief Librarian and Archivist
   c) [arid zone only] Dr. G.E. Wickens, SEPASAT; R. Smith, Seed Bank, Wakehurst
   d) ca 100 scientists
   e) ca 350 others, including technicians, garden staff and administrators (permanent staff)

7. Facilities:
   a) herbarium with worldwide representation of over 5 million sheets; Museums of Economic Botany containing ca 1 million items; Jodrell Laboratory (cytology, anatomy and biochemistry at Kew, physiology and seed bank at Wakehurst)

(continued on following page)

INDIA

GUJARAT STATE RURAL DEVELOPMENT CORPORATION, Ltd. (1982)

a) State of Gujarat
b) Board of Directors

   b) substations in Banas-Kantha, Dangs, Kutch, Panchmahal, and Surendranagar Districts

3. Scope of interest: Promotion of rural development of wastelands through energy and fodder plantation projects; and income-generating activities for the State's 19 million rural population in the 65,300 sq km of arid, semi-arid, and drought-prone areas

4. Research program:
   b) • Linking of land development projects with fodder and energy plantations
   • Particular species being cultivated include Cenchrus ciliaris, Medicago sativa, Acacia arabica, A. tortilis, Prosopis juliflora
   • Providing milk cows and buffalo to rural poor families and subsequent marketing potential through such opportunities as those provided by Rural Milk Processing Centers
   • Food-for-work projects in forestry programs
   • Biogas and wind energy projects
   c) • new crops
   • densification processes
   • technology transfer

5. Authorized capital: Rs. 200/lakhs; subscribed capital: Rs. 38/lakhs

6. a) Arvind N. Mafatlal, Chairman
   b) Anil C. Shah, Vice-Chairman and Secretary for Rural Development
   K.N. Shelat, General Manager

6. c) project sites are in the areas of both the Great and Little Ranns of Kutch, bisected by the Tropic of Cancer, swamp areas that are hard salt flats six months of the year; plus future operations in other Districts cited in 2b), above

9. Established 1977
(Royal Botanic Gardens, continued:)

b) library of over 120,000 vols., 2,000 current periodical titles, 140,000 pamphlets, 175,000 illustrations, 10,000 sheet maps, 250,000 mss and letters

c) Kew, 121 ha (300 acres); Wakehurst, 187 ha (462 acres) of botanic gardens, including glass
d) local accommodations in hotels and guest houses. Research facilities for bona fide researchers on application to the Director

8. Publications in series: Kew Bulletin (annually in 4 pts.), Kew Bulletin Addition Series (irregular), Current Awareness List (monthly), Kew Record of Taxonomic Literature (annual), Index Kewensis (annually in Kew Record of Taxonomic Literature, plus 5-yr. supplements)

9. Founded 1841 as a government institution; herbarium and library established 1853

UNITED STATES

KUNDTSEN RENEWABLE RESOURCES CENTER (1982)

a) academic: Division of Renewable Natural Resources, Max C. Fleischmann College of Agriculture, University of Nevada

b) University of Nevada System Board of Regents

2. 1000 Valley Road, Reno, Nevada 89512

a) located in Reno, Nevada, on the west side of the Great Basin and on the east slope of the Sierra Nevada. Elevation at the Reno Airport 4411 ft. above sea level, 39°30', 119°45'. Field research conducted throughout the Great Basin, including the Mojave Desert portions and the east side of the Sierra Nevada

3. Scope of interest: research on rangeland, forest land, wildlife habitat. Research problems include wildlife management and ecology, forest regeneration, silviculture, range ecology, improvements, and monitoring techniques; remote sensing, hydrology, watershed management, outdoor recreation management, land use planning, and natural resources policy and administration.

6. Staff:

a) Paul T. Tueller, Division Head and Professor of Range Ecology


7. The Center occupies a 4-year-old research and teaching building, with excellent facilities, including a remote sensing laboratory and herbarium

9. Established 1967

WHOSE SUNLIGHT?

In New Mexico there is a state law that entitles homeowners to an ‘unobstructed line-of-sight from a solar collector to the sun. . .’ Now in Wisconsin, that state’s high court has sustained a plaintiff’s rights to sunlight for his solar system that was threatened by interference from adjacent structures.*

‘The rights of neighboring landowners are relative,’ the Court said. ‘The uses by one must not unreasonably impair the uses or enjoyment of the other,’ and in this particular case, ‘his rights to sunlight must be considered.’

It is acknowledged, albeit reluctantly in many quarters, that sunlight may become as much a shared resource as water, and that in one more state such uses of solar energy take precedence when in conflict with other property rights.

*Associated Press, July 3, 1982

This hefty (4 1/2 pounds) source book covers existing knowledge of North American deserts by way of the collaborative work of geologists, ecologists, zoologists, and other experts. The discussion of each of the several deserts comprising the whole of North American deserts is somewhat uneven, depending on the specialty of the individual authors, but overall the book has great merit. The lists of plant and animal species for each desert, plus references, are comprehensive, and appendices citing various research areas and facilities are thorough and inclusive.

Given the enormous amount of research and publication about our North American deserts, over a century of time, it is inevitable that these deserts continue to engage the experts in unremitting efforts to create the definitive work. Here, for instance, the bibliography on the Sonoran Desert chapter, an estimated 1,600 citations, includes over 450 references to publications issued since 1970. And who knows how many more have been done since this work went to press!

Unexpectedly, perhaps, there is a 22-page exposition on North America's arctic desert, with interesting definitions of its boundaries according to whether it is an astronomer, geologist, botanist, or oceanographer speaking. In other areas, the various authors call attention to gaps in research as reflected in the literature, thus insuring more research and eventually another book. But for the time being earlier gaps have been rectified by such presentations as Medellin-Leal's on the Chihuahuan Desert, as well as such aspects of understanding as desert riparian systems and mountain islands, adaptations, sand dunes, and desert varnish. There are numerous maps (of varying quality of reproduction), photographs, and figures.

All in all, this is a book with which we can go forward for the next decade without having to go over the old ground—again.


A Unitar publication covering one of the topics taken up at the 1977 conference held in Sacramento, California [the others being devoted to energy and minerals, agriculture, and desert management]. This volume, on water, is devoted to water policy and planning, nonconventional water resources, water conservation and technology, and case studies from Egypt, Chile, Saudi Arabia, and the U.S.


The first result of an ongoing mutual research program between the Desert Institute in Egypt and the University of Bremen by which there is an exchange of scientific staff for investigation of problems of agricultural ecology, desertification, and land-use systems in newly reclaimed irrigation areas of the Nile stream oases and the Nile delta. Topics covered by this bibliography (citations only, no annotations) include vegetation, climate, hydrology, geology, soils, population, settlements, industry, tourism, history, politics, and statistics. Maps. Author index.


This latest of Unesco's contributions to its International Hydrological Programme (a continuation of its earlier International Hydrological Decade) displays through a casebook format a wide range of problems concerning the application of results from representative and experimental basins considered on the basis of new methods for calculation, generalization and extrapolation of data such as experimental studies, statistical processing, mathematical modelling and space techniques. The three components are: estimation of water resources characteristics, assessment of effects of man's activities, and application to development and management. A variety of techniques for analyses are presented from around the world, including many arid areas. Maps, tables, figures, equations, references.

This first volume of a 2-vol. report illustrates the utilization of mathematical models in predicting the availability of groundwater resources based on standard observational data networks so that corrective measures can be taken to prevent their depletion. Alluvial valleys and fans, mountain valleys, phreatic aquifer fans, fractured rock, karst, small artesian basins are topics investigated through numerous case histories from many arid areas. Maps, charts, figures, illustrations, references.


This special issue of the journal Daedalus is devoted entirely to a study in depth of how black Africa sees itself as well as how its progress is seen in the West, after the passage of time since the end of colonialism. Articles include such topics as African economic development in theory and practice, resources of tropical Africa, African population, the charismatic leader ('The Gordian Knot of African Politics'), and patterns of social conflict, with contributors drawn from Nigeria, Ivory Coast, South Africa, and western authors from Wales, Canada, the U.S., and Australia. Tables, voluminous notes and references.


The author reminds us of the 'sense of shared stewardship for our common planetary home' in this look at the global environment ten years after Stockholm, the 1972 UN Conference on the Human Environment. In the section on Human Conditions, he writes of the population factor which shows that the less-developed countries will account for close to four-fifths of the world's people by the year 2000. In the section on Natural and Unnatural Conditions, he covers oceanic affairs, pollution, global atmospherics, croplands and wastelands, deforesting and reforesting the Earth, biological diversity and economic development. The book has a foreword by the late Barbara Ward.


Salinization in the Indus valley, the Sind and Punjab provinces results from the extension of irrigation without any drainage system, a circumstance prevailing since the latter part of the 19th century. Now the so-called Barani plan is being introduced as an alternative to the old system and its dependence on foreign financial help, a plan built around the concept of managing local resources with small hydraulic systems. Maps, 60 references.


Six series of Landsat-1 and -2 images, taken between 1972 and 1976, were analyzed to describe the flow regimens of streams and the regional distribution of vegetation. Findings provide a factual basis for a surface-water data collection program and for preparing maps of plant distribution and agricultural land use. A false-color composite mosaic of the nine images was prepared showing catchment areas and major drainage basins. Most streams are ephemeral, no lakes were detected, sebkhas were common along the Red Sea coast. Much of the land under cultivation is restricted to valley floors, valley slopes, and irrigated terraces adjacent to stream channels. Little or no vegetation could be detected over large regions. (-SWRA W82-00022)


Over 100 papers in either English or Spanish, with summaries in the alternate language. Topics covered include information needs, inventory procedures and planning, land classification, economical mapping and remote sensing systems, cost-efficient sampling schemes, efficient resource measuring techniques, resource data analysis systems, research proposals, and descriptions of the Todos Santos Experimental Forest where participants were taken on a field trip. The Proceedings are intended to serve as a blueprint to show nations of the world 'how they can share their experiences in solving some most difficult problems.'


The sand sea that composes a large part of the Namib Desert covers approximately 34,000 km² and extends from the Great Escarpment on the east to the Atlantic on the west, south of the Kuiseb River. It contains most of the principal dune types recognized worldwide, many of great height and separated by broad flat interdunes. Large interior dunes of linear type are discussed, as well as star dunes, coppice dunes, dome dunes and blowouts.

Dust is discussed on an interplanetary scale. Areas included are the U.S., Africa, the USSR, China, the West Indies, and Mars. Because of the growing international importance of the effect of desert dust on man, abstracts of all 21 papers are given in five languages: English, French, German, Russian, and Chinese. Disciplines represented by the 46 authors include geology, physical geography, microbiology, engineering, physics, meteorology, soil science, chemistry, oceanography, agricultural science, and highway engineering. The origin of desert dust from the standpoint of source areas as well as meteorological requirements, the physical characteristics of the dust, and its influences on climate and agriculture and its importance in pollution are all covered.

Obstacles to improved management of Mexican drylands. University of New South Wales, Australia, under a grant from the United Nations University's Sub-Programme on the Assessment of the Application of Knowledge of Arid Lands Problems. 58 p.

Based on the author's field work in 1979-1980, this report covers Mexico's drylands; their physical characteristics as well as land tenure and land use; socioeconomic obstacles to increased dryland production; and the application of existing knowledge and technology as illustrated by several case studies. References.

Prevention of sand drifts on railways, roads and irrigation systems. Centre of International Projects GKN'T/USSR-UNEP Project, P.O. Box 438, 107053, Moscow B-53, USSR. 182 p.

In addition to coverage of topics such as shifting sands and damage from them, basic bylaws of sand transport, principles and methods of sand-drift prevention on railways, motorways and irrigation works, and the effectiveness of measures to protect engineering installations from sand drifts, there is a very interesting chapter on some of the case histories of sand control and prevention of drift over technical installations in sandy deserts, as well as a bibliography of 171 citations which has pulled together the international literature on the subject.


In Russian, English, French, and Spanish. This brief review of the topic is of the most value for its exposition of the establishment in the USSR of a training center, with special emphasis on problems of environmentally sound management and utilization of river basin water resources. Preparation of a manual based on course lectures is planned, together with teaching aids, audiovisual materials, and field work from the Central Asian Irrigation Research Institute. Irrigation techniques, drainage, recycling, and other topics are addressed. The training program is already underway, with 46 specialists from the developing countries of Asia, Africa, and Latin America already having completed the course.
In response to a number of requests for an index to the contents of *Arid Lands Newsletter* from its beginning, this cumulative index has been prepared, covering the 16 issues published up to the present one. Numbers following the colon (:) indicate the page on which the citation referred to will be found. Semicolons (;) separate references under the same term. Dates have been omitted, not only to save space but to simplify the information. If needed, however, the date of any number cited can be determined from the following table:

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The University of Arizona’s Office of Arid Lands Studies (OALS) provides worldwide information services through its Arid Lands Information Center (ALIC). ALIC’s functions are: 1) to build, maintain and provide access to the OALS arid lands document collections; 2) to provide reference services, including online and manual bibliographic searches to researchers, U.S. and other governement agencies, international organizations and the general public; and 3) to facilitate the dissemination and exchange of information with other arid lands scientists and research institutions.

ALIC’s special services and capabilities are described as follows:

SPECIAL COLLECTIONS: ALIC maintains a unique collection of literature on arid lands of the world. Its emphasis is on the problems and potentials for productive use of arid and semiarid environments. The collection complements the arid lands collection of the University of Arizona by specializing in obscure documents. Comprehensive in-house collections include the topics of economic botany (jojoba, guayule, hydrocarbon producing plants), desertification, and the Republic of Niger.

ALIC is currently entering the documents into a completely searchable computerized processing system. Entries include author, title, publication date, source and keywords. The keywords are assigned from the recently revised Thesaurus of Arid Lands Terminology developed by Patricia Paylore.

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