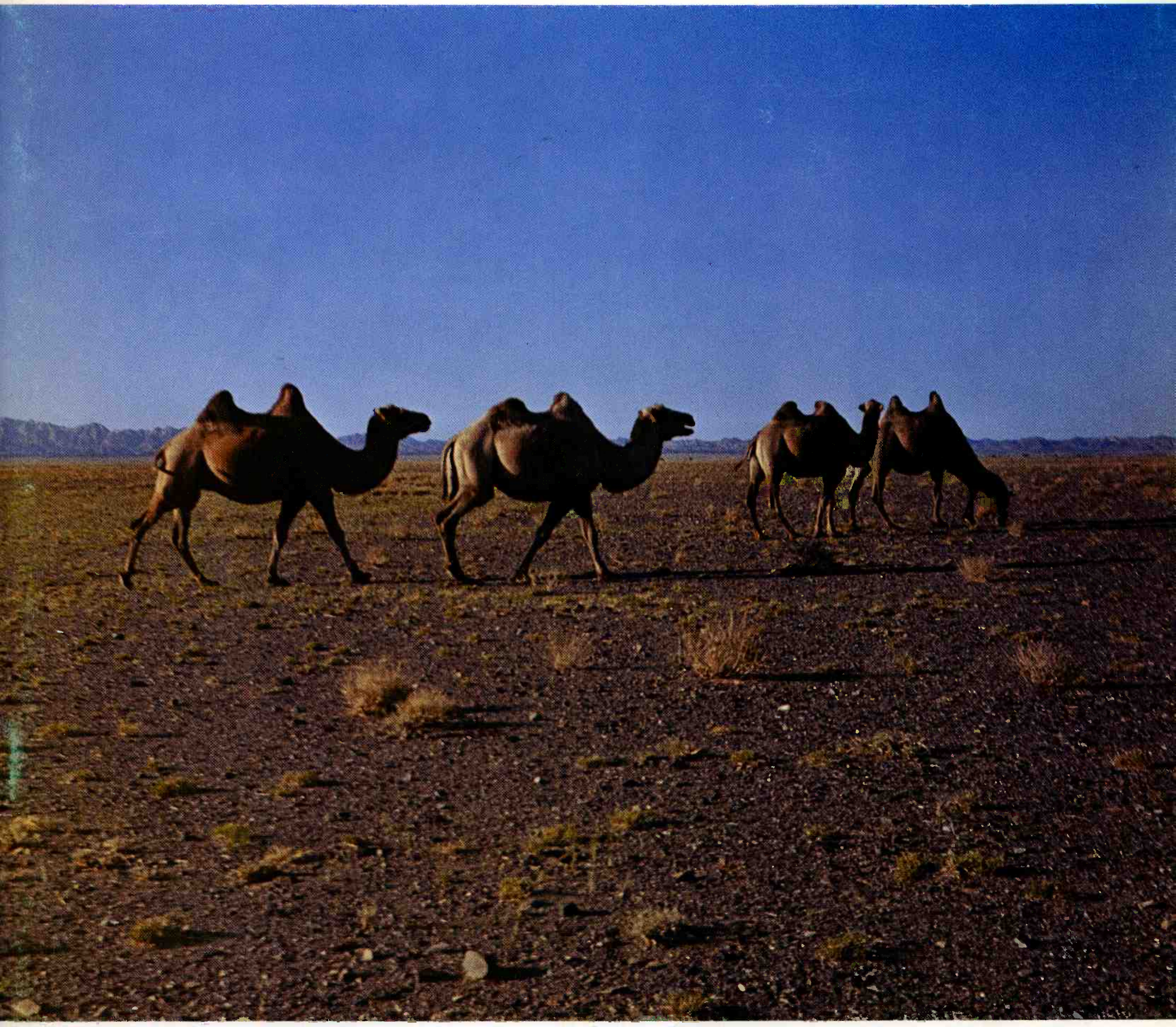
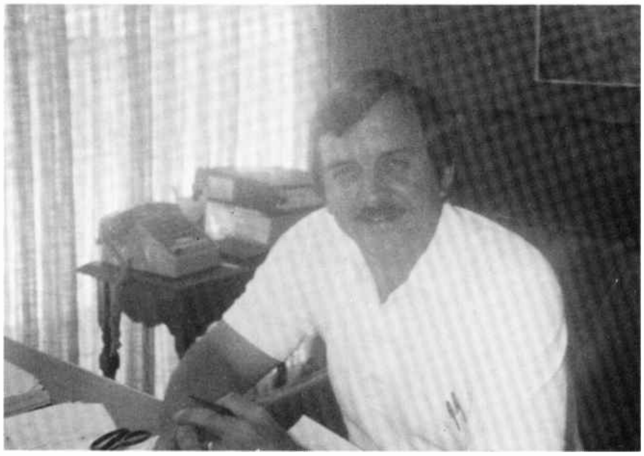
July 1983 No. 19

ARID LANDS NEWSLETTER



Office of Arid Lands Studies • University of Arizona, Tucson

Introducing Dr. Kennith E. Foster



new Director, Office of Arid Lands Studies, College of Agriculture, University of Arizona, upon the reassignment of former Director Jack D. Johnson (1971-1983) to the position of Associate Director, Arizona Agricultural Experiment Station, College of Agriculture, University of Arizona.

Dr. Foster has the BS degree (Agricultural Engineering) from Texas Tech University, 1967; the MS degree in the same field from the University of Arizona (1969), and the Ph.D. degree (Watershed Management) from the University of Arizona (1972). He has been associated with the Office of Arid Lands Studies since 1972, and Associate Director since 1975. He is a member of Sigma Xi and other professional and honorary societies, and has over 60 technical articles in various scientific journals to his credit.

His arid lands interests include water harvesting, economic plants, and natural resources planning.

COVER: Steppe desert, the most productive and widely used rangeland in the Mongolian People's Republic, domestic camels, foreground.

—photo by P.D. Gunin

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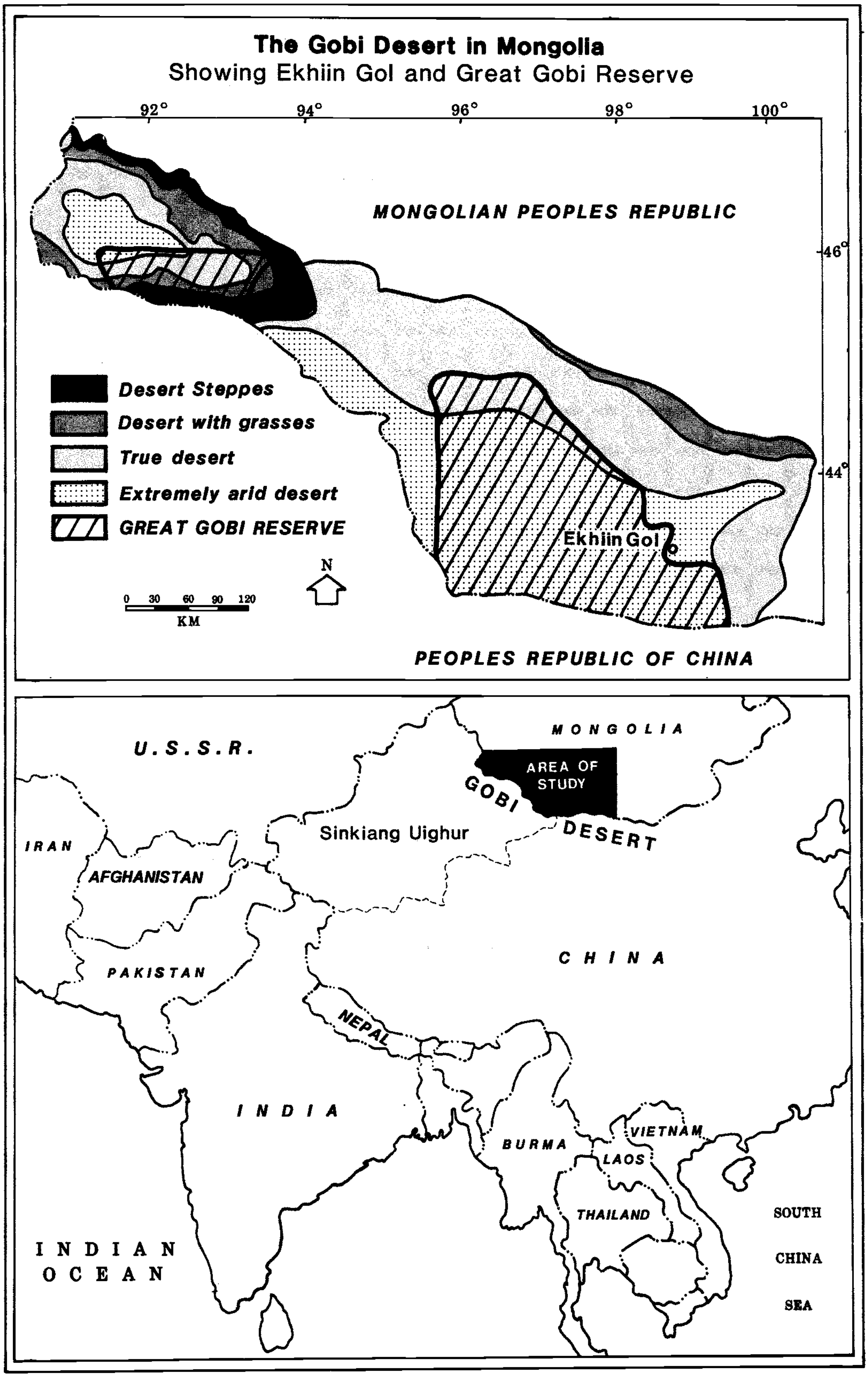
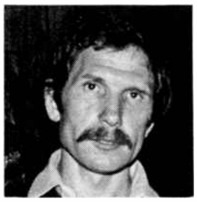


Fig. 1: Location of Ekhiin Gol, the desert station of the Great Gobi Reserve, part of UNEP's biosphere network of arid areas



P.D. Gunin

THE GOBI DESERT:
Specific Environmental Conditions and Problems of Integrated Research

P.D. Gunin and I.T. Fedorova*

I.T. Fedorova

The Gobi Desert is part of the deserts of Central Asia. Its characteristic features are considerable elevation (over 1000m/asl), a rather complex geological structure, and a pronounced continental climate. Situated in the center of the Asiatic continent, and surrounded in the south, west, and east by a high mountain system, the Gobi is influenced only by the East-Asiatic monsoon, and precipitation (largely torrential), therefore, is heaviest in summer.

According to most scientists, the Gobi occupies one-third of the total area of the Mongolian People's Republic and is divided into three parts: Alashan, Trans-Altai, and Jungar Gobi (Lavrenko, 1965; Yunatov, 1950). The present paper is concerned only with the Trans-Altai Gobi, situated south of the mountain system of the Mongolian and Gobi Altai (Fig. 1). According to the definition of aridity of bioclimatic zones adopted when compiling the World Map of Desertification (United Nations, 1977), the bulk of the Trans-Altai Gobi falls within the extra-arid zone, the driest part of Central Asia. It was not by chance that this region is named the 'dead heart' of the continent (Sinitsyn, 1956). The Trans-Altai is characterized by the presence of three subzonal types of deserts: steppe desert, true desert, and extremely arid desert, the latter being dominant (Rachkovskaya/Gunin, 1980). In the extremely arid deserts, the contrast between incoming heat and precipitation is sharpest. Average yearly precipitation there is nearly four times less than in true deserts, and the annual sum of the daily temperatures over 10°C reaches 3500°C. Long-term precipitation data exhibit a highly irregular pattern. In fact, at the desert station Ekhiin-gol annual total precipitation over the last ten years varies from 5-10mm to 100mm. It should be noted, too, that precipitation is spatially nonhomogeneous and often local in nature.

Hydrothermal indices for the area concerned indicate that soils are characterized by nonleaching conditions, and the period of ecosystem biological activity is very limited. Despite the scarcity of atmospheric precipitation, water erosion is strongly manifested. Torrential rains on steep slopes cause rapid stream runoff from the mountains into depressions. In this condition, sloping plains adjoining mountains of medium and low elevations are strongly dissected by a number of temporary watercourses (*sairs*). In the extremely arid deserts, this structural feature of the Gobi plains is particularly vivid. Watershed areas throughout the entire Trans-Altai Gobi are covered by a rubble pavement referred to in the literature as hammada. Under the rubble and rock layer lies a peculiar grey-brown soil with well-defined horizons (Evstifeev, 1980). Soil characteristics vary widely with respect to salinity and the level of gypsum in the soil. Generally soils are underlain by rubble-rocky deluvial-proluvial deposits. The presence of a loamy horizon of low permeability hampers soil wetting, allowing precipitation to collect in various depressions, adversely affecting the water supply of meso-terraces (inter-*sair* spaces). Maximum depth of wetting reaches only 30cm in some years, but in the *sair* beds, moisture in some years may penetrate to a depth of several meters (Yakunin, 1980).

These harsh environmental conditions of the Trans-Altai Gobi completely strip the watershed sites of higher plants, with plant communities concentrated only in the various depressions, predominantly the dry watercourses.

Flora and Dominant Species

The Trans-Altai Gobi flora includes about 300 species of vascular plants, indicating the relative paucity of vegetation in the region. At the same time, the relationships between the systematic plant groups are indicative of the flora's taxonomic heterogeneity. Over half the families contain only one-to-three species. The largest

*Research Directors, Desert Station, Joint Soviet-Mongolian Expedition, USSR Academy of Sciences and Academy of Sciences of the Mongolian People's Republic. The Joint Soviet-Mongolian Integrated Biological Expedition, organized in 1969, conducts studies in the Mongolian People's Republic to identify and assess the region's most valuable biological resources.

The Desert Station at Ekhiin Gol in the Trans-Altai Gobi was established in 1977. Its investigations are directed toward the development of an ecological basis for the rational management, conservation, and transformation of desert ecosystems.

number of species (13-15) are found in only five families, of which Asteraceae, represented by members of the xerophyte steppe and desert flora, has the greatest number, e.g., *Ajania, Artemisia, Asterothamnus, Saussurea,* etc. The family Poaceae includes members of the arid flora: *Stipa, Ptilogrostis, Koeleria, Gleistogenes, Aristida,* as well as boreal flora: *Agrostis, Calamagrostis.* In the extremely arid deserts Chenopodiaceae dominates not only the number of species but many are cenosis-formers, e.g., *Anabasis, Eurotia, Kalidium, Salsola, Haloxylon, Iljinia, Sympegma.*

The territory features all major types of life forms of the arid zone, including two arboreous species associated with oases: *Populus diversifolia* (Fig. 2), *Salix ledebouriana.* The deserts of Central Asia have almost no ephemers or ephemeroids. In certain years with increased amounts of precipitation, the role of desert components in the Trans-Altai Gobi is played by the long-vegetating plants, i.e., the summer-fall annual-biennials *Aristida heymannii, Eragrostis minor, Bassia dasyphylla, Artemisia scoparia, Micropeplis arachnoides* (Rachkovskaya/Volkova, 1977), and others. Herbaceous perennials (over 50 percent) predominate, but their phytocenotic significance in the Trans-Altai Gobi is considerably lower than for the semishrubs and shrubs. *Ephedra, Zygophyllum,* and *Nitraria* are among the notable woody genera. Endemic genera of species are not relatively abundant. The highly specialized endemic *Iljinia regelii* and *Sympegma regelii* are widely distributed in the Trans-Altai Gobi.

Faunal Composition

The wildlife of the Trans-Altai Gobi is specific and unique. Mammalian fauna includes 46 species among which are several that are encountered only in the Gobi Desert of Mongolia. The Trans-Altai Gobi has been economically developed to only a small extent, hence ungulates and carnivores are still abundant. Until recently the Przewalski horse (*Equus przewalskii*) was recorded in western Trans-Altai Gobi and Jungaria. The wild camel (*Camelus ferus,* Fig. 3), listed in the IUCN Red Data Book, is endemic to the Trans-Altai Gobi, its entire population (about 400 head) concentrated in an area of 30,000 sq. km. Currently the Trans-Altai Gobi has one of the largest population in the world of the Asiatic wild ass (*Equus hemionus,* Fig. 4), about 1,000 head (Sokolov et al, 1980), a species likewise listed in the International Red Data Book. In the mountains, *Capra sibirica* and *Ovic ammon* are common. Of the carnivores, the snow leopard (*Uncia uncia*) is characteristic, and the Siberian red wolf (*Cuon alpinus*) is also observed; the Gobi [Mazalai] bear (*Ursus proinosus,* Fig. 5) is a unique and apparently relict species, encountered in desert mountains and hills. Its ecology and systematic status are still obscure, and its numbers do not exceed several dozen head.

Fig. 2: Rare woody species in the Gobi, *Populus diversifolia,* testimony to more favorable conditions in the past.
—*photo by P.D. Gunin*

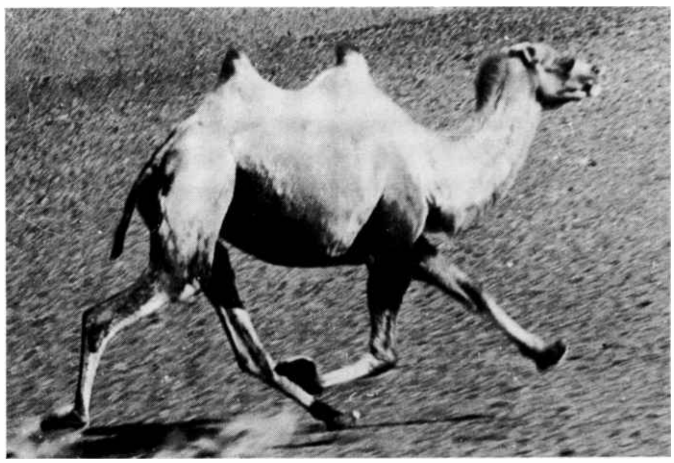


Fig. 3: Wild camel (*Camelus ferus*), endemic to the Trans-Altai Gobi where it has been preserved in harsh Gobi conditions.
—*photo by L.V. Zhirnov*

Fig. 4: Asiatic wild ass (*Equus hemionus*), a species listed in the International Red Data Book, although it is abundant in the Trans-Altai Gobi.
—photo by L.V. Zhirnov

Fig. 5: A mazalai bear cub (*Ursus proinosus*), endemic and relict of the Trans-Altai Gobi.
—photo by Ch. Timur

The Gobi Desert can be called the kingdom of jerboas and reptiles. Despite the predominance in the Trans-Altai Gobi of territories devoid of higher plants, we have not come across any sites lacking examples of these animal groups. Of rodents, whose total species number in the Trans-Altai Gobi is 12, jerboas are dominant. Some jerboa species, e.g., *Euchoreutes naso, Salpingotus kozlovi,* and *Allactaga bullata* are endemic to Central Asia. The numbers of jerobas are not constant, varying within a considerable range due to climatic contrasts and considerble variation of fodder resources (Kulikov/Rogovin, 1980). Fourteen reptile species have been recorded in the Trans-Altai Gobi, including nine lizards and five snakes (Monkhbayar, 1981). The most widely distributed and numerous species is *Phrynocephalus versicolor.* Among the rare species endemic to Central Asia whose biology is poorly understood are the gecko (*Gymnodactylus elongatus*) and the Central-Asiatic agama (*Agama stoliczkana*). Snakes are very small in number, only *Agkistrodon halys* being poisonous.

Trans-Altai Gobi ornithofauna includes 143 species, comprising 43 nesting species all told, and generally individual settled populations. Distribution of the birds according to habitat is very irregular. *Syrrhaptes paradoxus* is the most numerous species, but is very rare in the extremely arid desert portions of the Gobi. Only in certain favorable years (e.g., 1980) have its numbers sharply increased, only to disappear again the following year. The open water (small lakes, springs, brooks) ornithofauna are more diversified because of waterfowl and near-water birds.

Major Ecosystem Types: Significance and Use

Despite the apparent monotony of Gobi landscape, magnified by the black hammada covering nearly all forms of relief, the ecosystems are still diversified (Fig. 6). Intensive desert erosion, extensive rock outcrops, large developed water-erosion networks, and, last, the combination of various forms of relief have conditioned the formation and diverse types of ecosystems. When formulating measures for the conservation and rational development of natural resources, it is necessary to take into account the ecological conditions of the region and the potential of particular ecosystems. In addition, it is important to understand the function of the ecosystems in the flow of energy and matter, and the protection of the gene pool of the region as a whole.

Middle Mountains: Highly Rugged Uplands and Ridges

Middle mountains rise to a height of 300-500m above the surrounding plains, and to heights of 2500-2700m/asl. Situated in the northern and southern parts of the Trans-Altai Gobi, they influence the local circulation of air masses and are conducive to the formation of clouds in summer, thus determining local rainfall. Hence, the

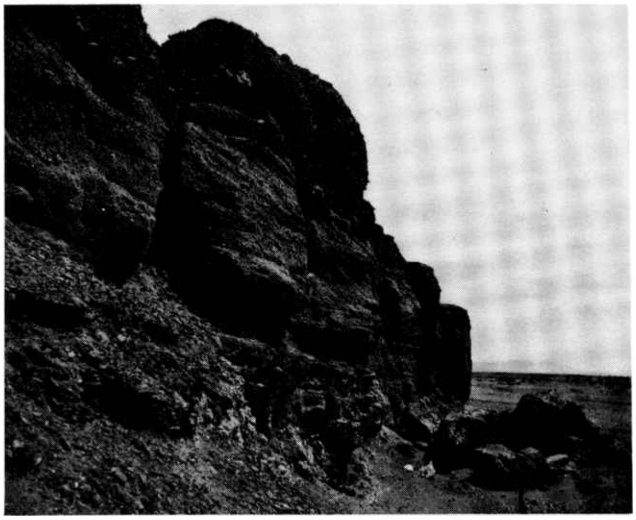


Fig. 6: Complex interlayers of lagoonal-marine Cretaceous Paleogene variegated colored lake deposits overlain by Quaternary proluvial gravel.

middle mountains generally soften the climate of the extremely arid deserts, crerating an area of effective rainfall catchment. The diversity of rock outcrops, rugged relief in combination with a milder climate, and a better water supply, account for the mosaic pattern of the ecosystems and the greater abundance of plant and animal species. All the middle mountain massifs are characterized by the presence of steppe and meadow elements in the vegetative cover. The presence of a better fodder base and water supplies largely accounts for the concentration of numerous large mammalian species in the middle mountains. The mountains exert a great influence on the ecosystems of the surrounding lowlands by providing moisture for the typically desert ecosystems, and, due to the runoff, adjacent areas receive large quantities of silt, sand, rubble, dead organic matter, as well as plant seeds to accumulate as deposits.

Ongoing studies of middle mountains should include a complete inventory of the species composition of flora and fauna, studies of the ecology and biology of rare species of large mammals, and monitoring the dynamics of environmental factors, including quantitative determination of the precipitation and its long-term redistribution.

Piedmont Sloping Plains

As noted above, zoologically the piedmont plains in the Trans-Altai Gobi are situated in three subzones or belts extending southward: steppe deserts, true deserts, and extremely arid deserts. Contrasts exist in the total precipitation which decreases respectively from 110 to 30mm, and in the temperature regime. In summer, daytime temperature of the air and soil surface in th steppe deserts, for instance, is 15-16° C lower than in the ecosystems of the extremely arid (Gunin/Dedkov/Dedkova, 1980).

The steppe deserts (*see* Cover) are dominated by a synusia of semishrubs and shrubs. Grasses and onions, though active in the formation of communities, are a codominant synusium. The large amount of precipitation covers the development of the watershed of well-developed *Anabasis brevifolia* communities with the participation of the onion (*Allium mongolicum*) and the grasses (*Stipa glareosa*). These areas are used largely as rangeland. The negative feature of the communities of steppe deserts, not infrequently causing great economic damage, is the considerable variation of the long-term green mass productivity. In this connection, a promising trend in research may be the development of an optimal watering regime (spray irrigation) to increase rangeland productivity. Of particular interest here is a one-time watering. Experiments initiated at the desert station demonstrate that high yields on natural rangelands can be maintained even in most unfavorable years.

Another practical approach in the study of steppe deserts is the exploration for supplemental reserves of water and moisture. Drilling and the determination of soil moisture storage to a depth of 10-15m revealed that storage of unused moisture in the terraces exists only in the steppe desert. An existing horizon of increased moisture content at a depth of 3.0-8.0m can be used by plants with a deeper root system. A search for shrubs with a deeper root system and high fodder quality for introduction into the area is currently being conducted. Priority is accorded experimentation with indigenous species: saxual (*Haloxylon ammodendron*), the beancaper (*Zygophyllum xanthoxylon*), saltwort (*Salsola richteri*), and others.

The true desert belt is characterized by a poor grass synusium development and a nearly complete absence in the herbaceous layer of onions and grasses — typical forms of the steppe desert. In the set of dominant species and communities, there is a great similarity with the extremely arid desert belt, although there are differences in their spatial structure. Even with species being almost uniformly areally distributed in true deserts, in the extremely arid deserts they develop only along the beds of *sairs*. Dominant forms are saxaul (*Haloxylon ammodendron*), nitrebush (*Nitraria sphaerocarpa*), *Sympegma regelii*, and more rarely, the beancaper (*Zygophyllum xanthoxylon*) and ephedra (*Ephedra przewalskii*). Communities of true deserts frequently develop on plateau-like plains with a very gentle surface slope. Composed of Cretaceous-Paleogenic saline clays and a sandy loam, these forms of relief are uniform and are characterized by the development of rather simple communities represented by two to three species: nitrebush (*Nitraria sphaerocarpa*), *Reaumuria soongorica*, and *Haloxylon ammodendron*. According to its many properties, this desert type is close to the extremely arid type, both in climate and water availability, suggesting common research approaches and its general improvement and use.

Presently no practical recommendations for these desert types have been developed. Research accumulated from other desert regions, however, suggest that studies for the improvement of desert communities by cutting sand- and moisture-collector furrows are promising. Based on detailed ecological studies of extremely arid deserts, furrows were made at several key sites and observations begun on the rate of sand accumulation in the furrows and soil moisture dynamics.

Melkosopochnik Topography

This type of relief frequently occurs in the Trans-Altai Gobi [roughly translated as 'an area of low rounded and isolated hills'], a mass of low hills trending from east to west, variable in area and petrography and occurring both in plains and in depressions. Despite its scarcity, the vegetative cover of this hilly region is complex in structure due to its exposure and elevation zonation.

Generally, the vegetation of these low rounded hills and low mountains is characteristically dominated by semishrubs and shrubs, the most frequently observed being *Anabasis brevifolia, Simpegma regelii,* and *Ephedra przewalskii* communities. In extremely arid deserts, another dominant species typical of this relief is *Haloxylon ammodendron* (Rachkovskaya/Volkova, 1977).

In general, the hilly topography is less rugged than the mountain ranges and the middle mountains, hence is more accessible to livestock, the rangeland in these hilly areas thus more economically significant. In this region as well as in the mountains, wild goats and sheep are encountered. Near sources of water, the goitered gazelle and the Asiatic wild ass constantly hold out, hence exploration for shallow groundwater supplies and investigation into the construction of artificial watering sites for wild and domestic livestock are prerequisite for insuring reproduction. Research has revealed that the trend of the hilly relief transverse to the major watercourses impedes runoff. As a result, temporary waterbodies are formed and water infiltrates into the underlying soil horizons to create lenses of freshwater. Currently a range of indicators has been developed, using individual plants, communities, soil varieties, and relief to reveal the presence of shallow groundwater. An inventory gives evidence of a large number of such sites, hence the conditions for the creation of a network of wells are promising. A special study in the region has also revealed promising damsites in the beds of the largest watercourses crossing the hilly terrain and low mountains. Construction of small water reservoirs is also conducive to maintaining the numbers of large mammals and creating additional water storage for establishing improved rangeland.

Intermountain Valleys and Closed Depressions

Depressions and intermountain valleys occupy the central part of the Trans-Altai Gobi and show the lowest elevations (700-1000m/asl). Most frequently these are in Cretaceous-Paleogenic red beds, characterized by strongly saline clay composition. The thin Quaternary rocks (not more than 10m) consist of sandy gravel and silty material. The terrain consists of large gently sloping cones of hammada-type deposits, sand mass topographic forms, and flat clay takyrs (Fig. 7). Functionally, the depressions and enclosed valleys are areas of proluvium that accumulate water, and areas of Eolian transport of fine-grained soils and salts. The lowest parts of the depressions have the greatest capacity for moisture storage, and the groundwater table is at a depth of 1-2m. Groundwater is frequently mineralized, and large areas are occupied by solonchaks. In some years takyrs are filled with water.

Of all zonal types of communities, saxaul groves of *Haloxylon ammodendron* in depressions have the greatest canopy density (60-70 percent), with some individuals reaching the height of 4-5m. The large depressions are characterized by a zonal distribution of vegetation. In the central (lowest) portion there are rather dense pure Russian thistle communities (*Kalidium foliatum* and *K. gracilis*). Further from the center, the Russian thistle mixes with reeds (*Phragmites communis*) which have the usual creeping form typical of solonchaks. Grasses (*Achnatherum splendens* and *Leymus secalinus*) are abundant. Still further toward the sand ridges the vegetation is replaced by tall saxaul groves with tamarisk (*Tamarix ramosissima*). The typical terrain is large sand ridges, up to 10-12m, with dense tamarisk growth.

Fig. 7: Lowest areas in the Trans-Altai Gobi are occupied by takyrs, largely covered by a clay crust with rather sparse vegetation.

—photo by P.D. Gunin

Abundant vegetation and periodic filling of depressions with water govern the migration of the goitered gazelle and the Asiatic wild ass (Fig. 4). In areas remote from human settlements, the wild camel (Fig. 3) is frequently encountered. Thus the depressions and intermountain valleys constituting not more than 15 percent of the Trans-Altai Gobi play a significant role in maintaining the populations of wild mammals. Consequently, measures are necessary for sustaining these terrain features in their natural condition. Human interference should be confined to providing permanent watering sites.

Oases

A specific feature of desert landscapes of the Trans-Altai Gobi are oases (Fig. 8) whose green vegetation contrasts with the black hammada surface. Their areal extent is negligible but their significance for desert nature is great. In most cases, oases in the Gobi are confined to springs and are formed naturally (Lavrenko/Yumatov, 1960). Grassland soils have developed under mesophyllic vegetation. Individual large trees up to 10-12m in height occur, and groves of *Populus diversifolia* (Figs. 2, 8) make the oases appear like African savannas. The regular distribution of oases (in the Trans-Altai Gobi they occur at 20-30km intervals) provides the wild ungulate populations with food and water. The bear *Ursus proinosus* (Fig. 5), endemic to the Trans-Altai Gobi, dwells there permanently. Favorable moisture conditions and a milder climate make the floral composition of oases very diversified, and attractive to wildlife — birds, mammals, insects.

To preserve the unique wildlife of the Trans-Altai Gobi, the Great Gobi Reserve, largest in Asia, was established in 1975. Currently, as a UNEP project, Soviet and Mongolian scientists are working on the general plan of this reserve.

An important aspect of the project is subsequent work on a complete inventory of Trans-Altai Gobi oases and the species composition of their flora and fauna. Degradation processes recorded in oases communities, manifested in reductions of spring output, soil salinzation, and drying up of woody vegetation, demand preventive measures, including setting up long-term observation sites for monitoring and estimating rates of change of these processes, objectives that are in full harmony with the aims faced by the network of biosphere reserves.

The incorporation of the Great Gobi Reserve into the international network of biosphere reserves and the organization of an ecological monitoring program will undoubtedly be conducive to conservation of the area's rare wildlife and unique ecosystem.

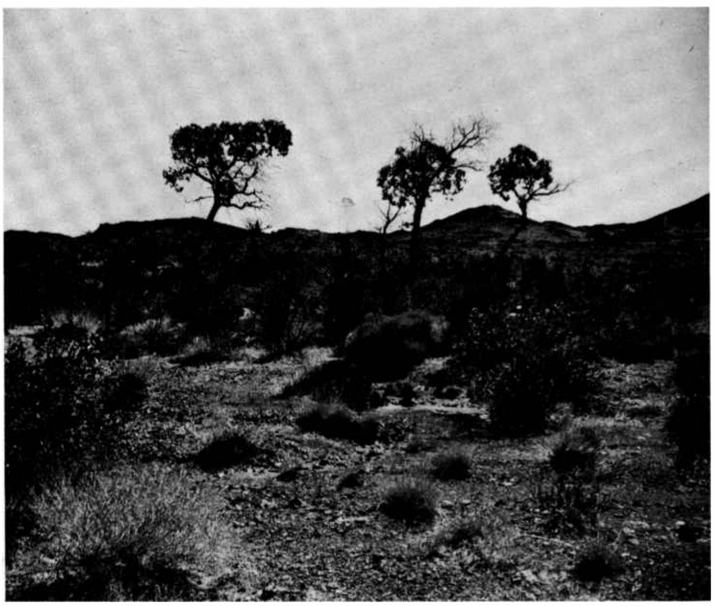


Fig. 8: Oasis, a rare ecosystem type. Its green cover and water sources have always attracted numerous animal species. Growths of trees and seedlings of *Populus diversifolia* in foreground.
—photo by P.D. Gunin

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L to r: Valery Medvedev, interpreter; Drs. Hutchinson, Nechaeva, Taylor. Central Kara-Kum.

Kara-Kum Canal

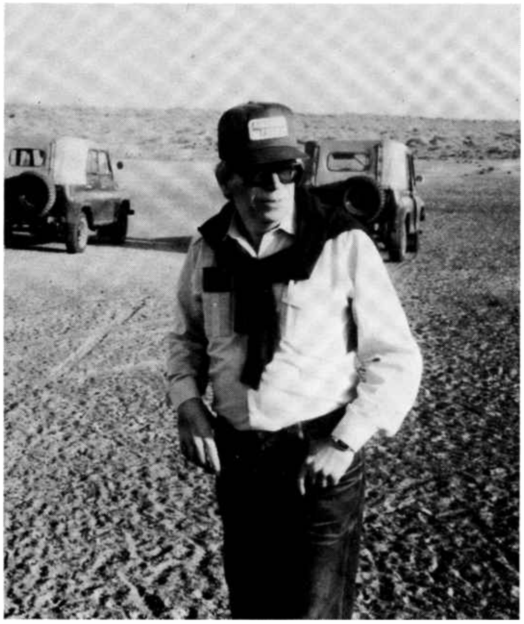
US ARID LANDS SCIENTISTS VISIT THE USSR

As part of an exchange under a US/USSR joint agreement on Protection of Arid Ecosystems, a group of US arid lands scientists returned the earlier US visit of their Soviet counterparts [see *Arid Lands Newsletter*, No. 17, p. 17] through an invitation to travel to some of the desert areas of the Soviet Union for two weeks in April 1983. The group included Professors Frederick Wagner and Martyn Caldwell, Utah State University, Logan; Drs. Charles F. Hutchinson and Jonathan G. Taylor, University of Arizona, Tucson; Dr. Richard Mack, Washington State University, Pullman; and Dr. Joseph J. Dowhan of the U.S. Fish & Wildlife Service, Washington, D.C., the US agency assigned responsibility for carrying out the joint agreement. Yu. A. Starikov, attached to the USSR State Committee for Hydrometeorology and Protection of National Environment, Moscow, was largely responsible for arranging the USSR itinerary which included the Institute of Deserts of the Turkmen SSR Academy of Sciences and its Central Kara-Kum Field Research Station, as well as its Repetek Biosphere Reserve.

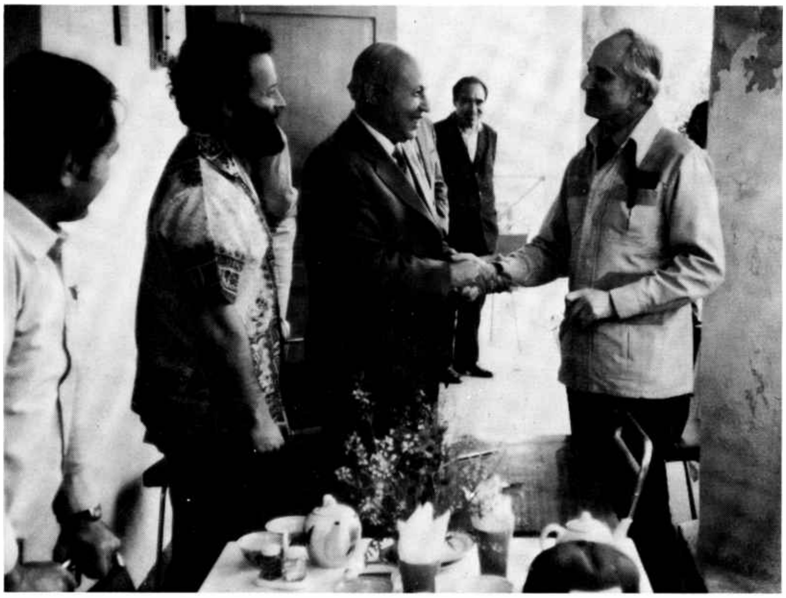
In addition, the field station of the Turkmen Agricultural Institute for Sand Reestablishment through Farming, near Ashkhabad, was visited under the aegis of its Rector, Academician A.K. Rustamov; and the Chardjou Forestry project under the guidance of its Director, V. Ya. Movchan. There were also opportunities to see and enjoy historical sites in Ashkhabad, Bukhara, and Samarkand.

The visits provided the occasions to discuss informally, in the field and over luncheons and dinners, the benefits to be derived from such an exchange of experiences in comparable environments — made easier by the presence of other old friends from the Institute of Deserts: Academician Nina Nechaeva and Dr. M. Mukhammedov of its Laboratory of Range Ecology; Deputy Director N.S. Orlovsky; the Director of its Repetek Sand-Desert Research Station, S. Veyisov; and N.G. Kharin, head of its Laboratory of Remote Sensing. They were also joined by Deputy Director Z. Sh. Shamsutdinev of the Karnab All-Union Karakul Sheep Breeding Research Institute. Representing UNEP was Dr. I.S. Zonn, Coordinator of the UNEP/USSR Project to Combat Desertification, Moscow.

In signing the agreement, Academician A.G. Babaev representing the USSR and Dr. Wagner the US expressed the consensus of all the participants that rational use of arid ecosystems' resources will require monitoring of specially selected sites as well as establishment of criteria and guidelines for the protection of biosphere reserves in arid zones, including game reserves, national parks, sanctuaries/refuges; that no one country has a monopoly on solutions to the global problems of the world's arid lands; and that only through cooperation such as evidenced in this exchange of scientists concerned about issues in common will answers be found.



Dr. Zonn in the central Kara-Kum



Dr. Wagner, right, expressing the US group's thanks to Dr. Babaev, left.

HERB/SPICE PRODUCTION IN EGYPT AND ISRAEL:

A Comparison of Methods and Development

Brian Mathew*

Brian Mathew

Since ancient times herbs and spices have been cultivated and traded in both Egypt and Israel. The Bible mentions the tithing of herbs and spices, while the earliest records of herbs as medicinal plants date from the age of the Egyptian pyramids, some four thousand six hundred years ago. The 'Ebers' papyrus, discovered in 1874, documents over eight hundred medicinal plants used in ancient Egypt, many of which are still grown there today.

Later in history the region became a through route for spices on their way from the Orient to the new markets of Europe. A rich class of Arab merchants and princes grew up on this trade, which was to last from the first century B.C. until the 15th century when the Portuguese found a sea route around Africa to India and the Far East, and thus broke their hold on this valuable trade. Today the Middle Eastern herb/spice trade is no longer a source where vast fortunes are made. In fact, herb production was not even mentioned in the 1980 World Bank report on the Arab Republic of Egypt. It is there in fact, however, accounting for $1.7 million in exports to the U.S. alone for the year 1981.

In Israel, the commercial production of herbs and spices has recently taken a new shift; previously production was largely for home consumption, being grown mostly by small Arab farmers. About ten years ago, however, the Israeli Ministry of Agriculture became interested in the possibilities of a modern herb/spice industry in the country, and by now at least three Israeli companies are currently involved in export production.

Because the highly technical nature of modern Israeli herb/spice production contrasts with the labor intensive methods used in Egypt, perhaps this brief study will provide some insight into the development of this relatively minor 'crop' and its attendant advantages for each method.

The present trend in Egyptian agriculture is toward cash crops such as oranges, potatoes, and, to a small but growing extent, herbs and spices, a trend largely the result of falling returns on grain and traditional Egyptian cash crop cotton. Cotton production, still Egypt's main export cash crop and raw material for industry, has been hampered to a certain degree by the nature of the State 'cooperative' monopoly marketing system which leaves the cotton farmer with only 60 percent of the true value of his crop, but herbs and spices, like potatoes and citrus, are free of government controls on marketing and production.

Methods of Production

Egypt

Bedding for herb plants in Egypt is largely a hand dug activity, herbs being grown in either seedling beds or planted directly to a field bed. The principle in both is a square with a level base, the seedling bed measuring 4 sq. m., the field bed 2 sq. m. Within these squares at intervals of 30-50 cm are ridges on which the herbs are planted and around which water may flow from an open irrigation canal at each irrigation cycle, from one bed to another until the farthest bed from the source is filled, at which point the mud wall to this bed is closed. This is repeated until each bed is 10 cm deep, or 6 cm in the seedling beds.

Much of the growing information presented here came from Dessimi, a village on the west bank of the Nile approximately 70 km south of Cairo (Fig. 1). Here, as in most of Egypt, there is little rainfall during the year, all forms of agriculture thus being dependent on irrigation. Herbs and spices are no exception; if anything, they are more dependent on regular supplies of water than other crops. In many respects, problems exist here in the cost and ability to irrigate that are typical. Dessimi, like much

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Fig. 1: The pump outlet at Dessimi

of the Nile Valley, is over seven meters above the water table. The Government supplies water at a rate of one Egyptian pound/50 piasters for 200 cubic meters, or enough to supply one feddan (0.42 ha) for one watering. This water, however, can be supplied only 20 days/mo., effectively five days of every 10, and pumping system breakdowns often interrupt the schedule.

The Dessimi farm studied here had its own artesian well and electric pump, a facility few farmers have to rely on when the Government system is not working. But the cost of this water is four times the Government system's water. High returns, therefore, have to be achieved and maintained to make the use of this well economically viable. Offsetting the higher costs, however, is one major advantage this farm's artesian well has over the Government-supplied water: it is clean and free from bilharzia, a debilitating disease found in slow-running or stagnant water.

Herbs grown at Dessimi include anise, caraway, coriander, fennel, basil, marjoram, spearmint, cornflower, marigold, chamomile, and Great Mullein. Exported yields of seed per feddan of the first four of these, for example, show:

anise	250/350 kg/feddan
caraway	470/900 kg/feddan
coriander	470/700 kg/feddan
fennel	330/470 kg/feddan

In September-October, five to six seeds are planted by hand every 30-40 cm in an irrigated field bed. The next irrigation is carried out after germination, about one week later. After one month, when the plants should be above five cm high, the crop can now be thinned, leaving only the best plants in each group.

Pests and diseases include aphids and other insect pests which are sprayed once they become a nuisance; 'Lancer,' a total plant killer, is used before planting to kill all the weeds; however, when the herbs are growing, only hand weeding is carried out because of the expense of selective herbicides. *Helmenthosporium fusarium,* a fungal root disease occurring in saturated soils, can devastate a crop of seed or leafy herbs, and is a major risk factor. Fumigation of the soil is a remedy but impractical.

Fertilizer is applied to these seed herbs as follows:

organic: 30 m^3/feddan animal manure prior to planting

inorganic: 60 kg/feddan during first two months

The harvest is in April, the crop being cut down by hand with a sickle, then put under canvas on shelves for a week to dry, after which it is beaten by hand on a stone to remove the seeds. Seeds are then collected and sieved on a 1.5 mm^2 holed sieve, plant debris remaining while the seed falls through. The seed should then be sieved again — though not all producers do this — to extract grit and sand which fell through with the seed. This is done on a .5 mm^2 sieve which holds the seed while letting

Fig. 2: Hand sieving cornflower, Dessimi

the small waste fall way. All this sieving is done by hand (Fig. 2).

Israel

A realistic comparison of herb production in Egypt and Israel will, of necessity, focus on the difference between labor-intensive and machine production. In Israel, where herb production on a commercial scale was introduced a decade or so ago, the emphasis is on the use of tractors to construct row bedding (Fig. 3), multiples of herbicides to cut weeding to a minimum, specially designed and contructed herb/spice harvesters, sprinkler and drip feed irrigation systems. The Hevel Ma'on group of kibbutzim in the Negev (Fig. 4), for instance, have built a processing plant involving a chain of machines linked by conveyor belts and including a solar-heated dryer, various rubbing machines, mechanical sieves, and air separators. Such methods would, of course, fail to make full use of the vast human potential as a valuable resource in Egypt. Nevertheless, the use of appropriate technology through adaptations of some of these methods is gradually being developed in the latter country. An export company in Alexandria has constructed two herb machines, one an electric sieve, the other a flower crusher, both designed and built by a young engineer in Alexandria. The more modern factory atmosphere there provides an appropriate compromise since the machines still require workers to fill and operate them.

The most promising fundamental change in Egyptian herb production is one that would revolutionize agriculture in general there, namely the introduction of a national pipe-fed irrigation system to replace the present canal network. The advantages would include irradication of water-carried diseases, minimizing loss through seepage and evaporation and the employment of a substantial number of workers in a constructive and productive new industry. Costs would be considerable, but considering the benefits, long-term and immediate, the idea may be one whose time has come. Certainly the technical and scientific know-how in Egyptian universities and research institutions is recognized worldwide as outstanding.

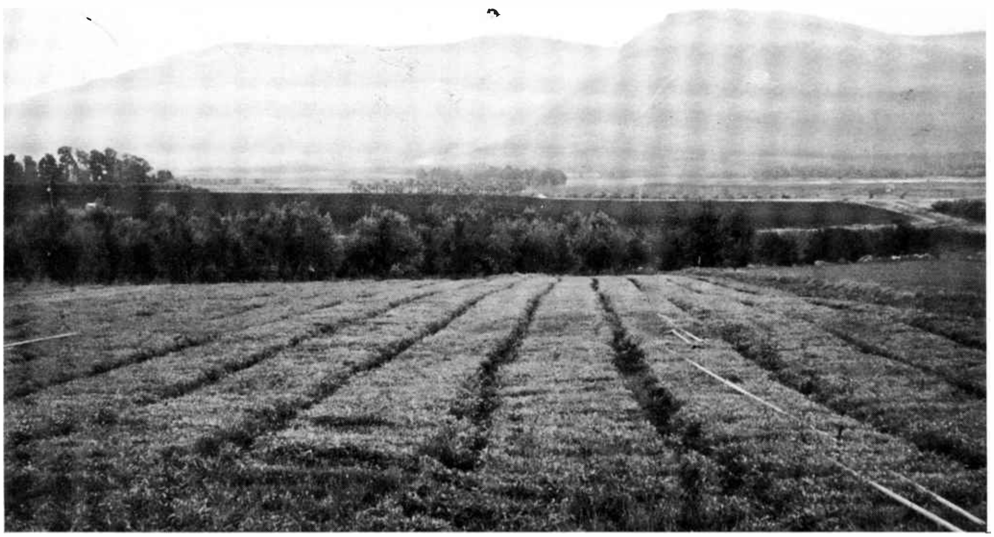


Fig. 3: Sage grown in Israel. Note bedding pattern

Fig. 4: Reservoir created near Kibbutz Reim (one of the Hevel Ma'on group) with water pumped from wadi winter flow [northern Negev]

Exports: The World Market

Egypt exports a fair proportion of her total produce to the U.S.: in 1980, according to U.S. Department of Commerce trade figures for imports for 1976-1981 inclusive (from which figures shown in the following tables were taken), 61 percent of all basil exported from Egypt went to the U.S., and a general figure of 30 percent could be put to five other herbs exported to the U.S. that year. The American market seems to be very relevant to Egyptian herb production, as shown by the following tables:

Table 1: Increase in metric tonnage of herbs/spices exported by Egypt to the U.S., 1976-1981

	1976		1981	
	Egypt	Total*	Egypt	Total*
anise seed	93.8	478.1	200.2	524.2
basil leaf	150.3	412.3	573.1	744.9
caraway seed	162.2	2795.0	312.0	3031.2
fennel seed	82.8	872.3	254.4	1416.0
marjoram leaves	161.4	310.2	299.2	343.0
mint leaves	71.1	138.1	163.9	214.7

*Total imports to the U.S. to illustrate the market potential via increase in imports as a whole, 1976-1981.

Table 2: Herb Prices F.O.B. 1981 in U.S. $/metric ton

	Egypt	Europe
anise seed	$1,779.7	$3,091.3
basil leaves	839.6	1,162.0
caraway seed	792.0	1,077.0
marjoram leaves	1,036.8	1,605.1
oregano leaves	1,046.0	2,088.6

The difference in price between European and Egyptian herb exports is so great (Table 2) that some unscrupulous European countries have been known to import Egyptian produce, clean it, and re-export it as their own countries'.

Israel, the newcomer to herb production in this region, exports its herbs at or near European prices, $2,062.2 per metric ton of oregano in 1981, for instance, compared to Egypt's $1,046.0. A concerted effort by Egyptian producers to prepare a cleaner product, free of impurities, will initiate a reputation internationally for reliability and consistency of quality, which in turn will induce the higher prices that Egypt needs to compete equally with other producers.

Fig. 5: Israeli farmer, exporter, and agricultural extension officer discuss a parsley crop

Governmental Role

Much of Israel's success in its herb/spice industry can be attributed to positive governmental involvement. The agricultural extension service (Fig. 5), acting as a conveyor of research and information between the Ministry's research centers and the producers, brings together in the 'Council of Vegetables' opportunity for democratic discusion of the allocation of State grants for research and new projects. This team — farmers, government researchers, extension service — thus makes maximum use of all the parameters of the industry's development.

In Egypt the Ministry of Agriculture and the University of Cairo's herbarium are directing medicinal herb research through many of their facilities. There is evidence, too, that recognition of the value of interaction on the field level between all components of successful production is to be a prime factor in the development of herb/spice 'crops,' as well as in other agricultural fields.

A Medicinal Future for Herb Production

Most herbs have medicinal value, and many presently grown in Egypt are produced for this specific function: chamomile, millflower, cornflower, Great Mullein, for example. These are largely exported to West Germany where a large market exists for homeopathic and general herbal remedies. While these provide a valuable export trade for Egypt, their use locally is of value as a carryover from the skills ancient Egyptians cultivated for simple and complex ailments. The World Health Organization is now showing an interst in these 'forgotten' areas of medical knowledge, which, if properly utilized, WHO theorizes, could save valuable capital which at present flows overseas to pay for expensive imported medicines. Its policy is to evaluate this traditional medicinal usage in the light of modern science and thus encourage regional practitioners to acknowledge the value of many of these plants to health care. Even though the people themselves may use such remedies as *Cyprus galingale,* a weed grass in the Nile Delta, for curing colds and throat infections, and many other such plants growing as weeds throughout rural Egypt, conventional medicine tends to regard such cures with suspicion. Perhaps the prestigious WHO can prevail.

Guest Editorial

DESERTIFICATION: Not Again! Yes, Again!

by Jack D. Johnson

'There is a tide in the affairs of men . . . ' said the Bard long ago. So now is there a tide to bring together a number of personal events in the affairs of this man, using as an excuse the Editor's invitation to produce a guest editorial as a sort of goodbye to the Office of Arid Lands Studies where I have been privileged to serve as its Director for over twelve years (1971-1983), during which time *Arid Lands Newsletter* was born eighteen issues ago, and during which time the phenomenon of desertification has become an obsession with arid lands scientists and researchers the world over.

At the recent annual meeting of the American Association for the Advancement of Science, I was a contributor to its symposium entitled 'Whatever Happened to Desertification?' with an address on 'Where Do We Go From Here?' One of the surprising conclusions about the entire session turned out to be what I would characterize as a rather upbeat positive outlook on the part of most of the participants, which is not to downgrade UNEP's formidable responsibility in terms of setting its global plan of action in action! This has been made no less easy by the continued confusion — or at least disagreement — over just exactly what desertification is, the extent to which it exists, and its economic impacts worldwide.

In 'Where Do We Go From Here?' my approach was essentially a look at some high technologies and how, in a few decades, those technologies will help us achieve a better place to live. While it is true that ill-advised or improperly applied technology does indeed lead to degradation of the land and the environment generally, it remains my contention that with *proper application* of high technology, we can not only increase the intensity of agricultural activities, thus realizing greater economic benefit, but do so with less environmental damage. To achieve this, as examples, I see:

. . . Application of remote sensing technologies to obtain real-time decisions so that a farm or range manager can use the information so derived to make *management decisions* rather than the current use of remote sensing technology which is essentially for planning and regulatory purposes.

Presently there are drones and blimps being developed which at very low cost can transect given land areas of Earth cruising at altitudes of about eleven miles to provide active and passive data on a continuous basis throughout the growing seasons. While the costs of such equipment and technology appear to be quite large, costs indeed become miniscule when spread over a large surface area. If the use of such real-time data were available, all needed then is an increase in crop yields of about one percent to make the system profitable.

. . . Similarly, we see computer applications with satellite transmittal of data giving the farmer access to market conditions, extension information, market/commodity prices, and other such information systems necessary to determine both economic and management conditions, as well as to underwrite his decisions relating to water application, quality of range conditions around boreholes, detection of brush fires, and other relevant environmental conditions incident to proper management.

. . . New irrigation techniques such as laser leveling and drip systems increase yields on less water. One Arizona experiment reported that on an 11-acre cotton test farm, the drip-irrigated yield was 4.6 bales/acre using 31 inches of applied water, whereas an adjacent furrow-irrigated field required 85 inches of water to produce 3 bales/acre.

. . . Biotechnology provides great opportunities for genetic engineering of plant materials to fix gaseous nitrogen or to resist a variety of pests so that more product is produced with less water, less fertilizer, less chemicals.

. . . I cannot resist the opportunity to plug, once again, the potential of hydrogen as the energy of the future, the only energy source to support combustion without pollution. Not only does hydrogen as a fuel source offer opportunities within agriculture for the operation and development of nonpolluting engines, but it is also possible that through biological and solar systems, farms indeed may become involved in the process of production of hydrogen.

. . . New crops such as grain amaranth, tepary bean, jojoba, guayule, buffalo gourd, and the whole field of halophytes offer opportunities for bringing new arid lands into agricultural production. While halophytes generally produce at a much lower level than plants producing in a freshwater regime, the over one million ha of sandy coastal deserts, as well as interior deserts close to brackish water supplies, create a potential that simply cannot be ignored.

While I may be criticized for seeing a technological fix to a problem which many will say was created by technology in the first place, I think it unfair to blame technology for the problem. It is man's application of that technology, *in some cases his greedy application,* that has created the problem. I think we have learned much in the last decade, perhaps even turned the corner on environmental pollution, but we still have tragedies before us, as we certainly will have in the future.

So, 'Where do we go from here?' How about combining technology with common sense? so that the continuing trends toward desertification can be reversed when the proper technologies are applied with restraint and with the involvement of those most concerned with the results?

As I take up my new tasks in the University's Arizona Agricultural Experiment Station, I will bear in mind that it was one of the earliest components of the institution when it was founded nearly a century ago, and that even then it was committed to all the problems, needs, and solutions of arid lands about which I have learned in depth in my years with the Office of Arid Lands Studies.

Dr. Jack D. Johnson

An arid lands bumper sticker observed in Tucson:

USE WATER!
Shade trees cool buildings
Plant an air-conditioner today

KEW COMES TO TUCSON:
An Interview With G.E. Wickens, Royal Botanic Gardens

There are a few basic components of Earth that bind us all in common: water, for instance, air, sun. But beyond these, perhaps, is that other common denominator without which water/air/sun would operate in vain, namely plants. This was borne in upon me recently with stunning impact when Dr. Gerald Wickens, Principal Scientific Officer of the Royal Botanic Gardens, Kew, visited the University of Arizona's Office of Arid Lands Studies (OALS) and its Environmental Research Laboratory (ERL) in mid-June 1983. In arranging his schedule, I had attempted to make sure he had an opportunity to be briefed by ERL's Dr. James O'Leary on its halophyte program, tour the OALS Bioresources Research Facility[1], visit the buffalogourd plots at the University Farm[2], spend a morning at the University's Page Ranch International Center for Arid Lands Agricultural Systems[3], an afternoon at the Boyce Thompson Arboretum with Carol and Frank Crosswhite, view the University's Herbarium, be taken behind the public scene at the Arizona-Sonora Desert Museum by our Dr. W.G. McGinnies, and enjoy a daylong safari with Gary Nabhan to the Papago Indian Reservation to learn about the ethnobotany of the Sonoran Desert.

Throughout this vigorous program in the scorching weather of a Tucson summer, it was plants that bound us to him, this London-born economic botanist based in green and rainy England. In the interview he granted me at the end, he told me of Kew's ongoing SEPASAT program, initially funded by OXFAM as part of their work in seeking solutions for the problems of malnutrition in poorer countries of the arid regions of the world, and now specifically oriented to a Survey of Economic Plants for Arid and Semiarid Tropic regions. SEPASAT's goals for the survey are built around plants, plants, plants, and Wickens' own extensive projects in Africa, particularly the Sudan and northern Nigeria, have given him a handle on the arid world's ecology, its plant uses, how to map its vegetation, to achieve these goals:

. . . additional food plants
. . . better forage for cattle
. . . more firewood sources
. . . better plant cover to stabilize the soil
. . . 'live-fences' to protect growing crops

He was particularly interested in ERL's halophyte program since his world search for plants includes what he terms 'dual purpose plants,' in this case those that meet the criteria as food plants while producing in an environment hostile to most other plants.

I asked what publications might be issued from the results of SEPASAT's three-year program, aware of Kew's preeminence in information resources relating to world plants. Wickens expects that their investigation will provide opportunity to draw up and publish a world list with basic condensed information about each of the plants of actual or potential agronomic or other economic value for tropical arid and semiarid regions, building on the unpublished as well as published data present at Kew, and on the information gleaned

—Wickens with Matts Myhrman, at the Page Ranch
—photo by Linda Leigh

from visits such as those he is making in the US, Somalia, and elsewhere. Such a list will indicate the gaps in knowledge, as well, to guide further future research. He pointed out that in many arid areas existing plant life may be impoverished, many ecological niches unfilled. Species in one part of the world may help or transform the ecology of another — 'with due regard,' he cautioned, 'for understanding that a correlation of plant growth with environmental data can by "iffy." Food plants grown successfully in one area may not be introduced into another area with automatic assurance of equal success, though we're thankful that many may be and have been, since they provide additional sources of sustenance for man and beast.'

'Another thing to be aware of,' he went on, 'is that locally there are too many instances where overstocking before new vegetation has re-established the carrying capacity for a given area negates all efforts combined to reverse desertification.'

'Are you saying, then,' I interposed, 'that your projected list should not be used indiscriminately without recognizing local environmental circumstances that might alter a specific plant's ability to adapt to a different biosphere?'

'Only that our list be used thoughtfully,' he answered, 'that the work which follows its use be done in the knowledge of what is already known as revealed by the documentation, that we quit trying to reinvent the wheel, so to speak, that we use what is already known to get on with the work so desperately needed by so many.'

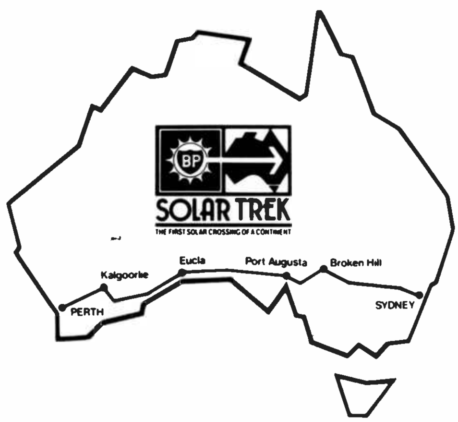
We were quiet for a moment, each of us looking inward at our own experience and background and expectations. And we ended on a philosophical note, the one which haunts me as all of you 'out there' who know me will recognize: 'Do you believe in the desert mystique that has made some of the British among the world's most knowledgeable and articulate arid lands specialists —from Doughty and Philby and Lawrence, to Dick Grove and John Cloudsley-Thompson and Jeremy Swift and Peter Beaumont?'

Wickens got up and held out his hand to say goodbye: 'I'll leave that speculation to you, Madame Editor, while I get on with my plants.' He started out the door after gathering up his briefcase, paused a moment to look back with a smile: 'I think you're right, you know. There really is such a thing!'

—Patricia Paylore

[1] see *Arid Lands Newsletter,* No. 16, p. 20-24, May 1982
[2] - - - - - - - No. 8, p. 1-7, June 1978
[3] - - - - - - - No. 17, p. 8-13, October 1982

Larry Perkins seated in the solar vehicle



Solar Trek logo outlining the route

AUSTRALIA'S SOLAR POWERED CAR

'The Quiet Achiever,' traveling at an overall average speed of nearly 24 km/hr, completed a marathon crossing of the Australian continent, from the Indian Ocean to the Pacific, in late December 1982-early January 1983. Originally planned to require four weeks, the journey was actually completed in less than three, 172 hours running time over the 4,084 km course. Jokingly described as looking 'like a bathtub on four bicycle wheels,' the Quiet Achiver is a space-framed lightweight tubular steel chassis surrounded by fiberglass faring to give ultimate aerodynamic efficiency. Twenty solar modules, covering an area of 90 sq ft, supported on an aluminum lid, form the roof. The sun's rays striking the top are converted to electrical power fed into two conventional automotive 12-volt batteries where it is stored to provide the driving force.

Designed by Hans Tholstrup and constructed by racing driver Larry Perkins, these two shared the driving in four-hour stints, with the Confederation of Australian Motor Sport's convoy monitoring the entire journey from Perth to Sydney and recording all data to verify that the vehicle used only solar power throughout the trek. 'Even when there was no direct sunshine,' Perkins reported, 'the solar cells absorbed more than enough solar radiation to keep the batteries fully charged.' Virtually trouble free mechanically, the two drivers did have to endure temperatures reaching up to 47°C, with the only fresh air being that admitted through small holes around the axles and the wheel openings in the fiberglass body.

'. . . Solar power today has similarities with man's dream to fly,' says Tholstrup. 'The Wright brothers saw the start of that dream when "Kittyhawk" flew no further than the length of today's jumbo jet. . . . Similar dreams have motivated the desire to cross a continent by solar power alone, and what better country to do it in than Australia!"

BP Australia, Ltd. is the principal sponsor of the project, one of several energy developments in which it is engaged, including wave/tidal, wind, and biomass. Contact: Mr. Lance Aird, BP House, 30 Flinders Street, Adelaide, South Australia 5000, from whom the photographs shown here were received and whose permission to use is gratefully acknowledged.

Along the highway in outback Australia

INTERNATIONAL VISITORS TO UA/OALS

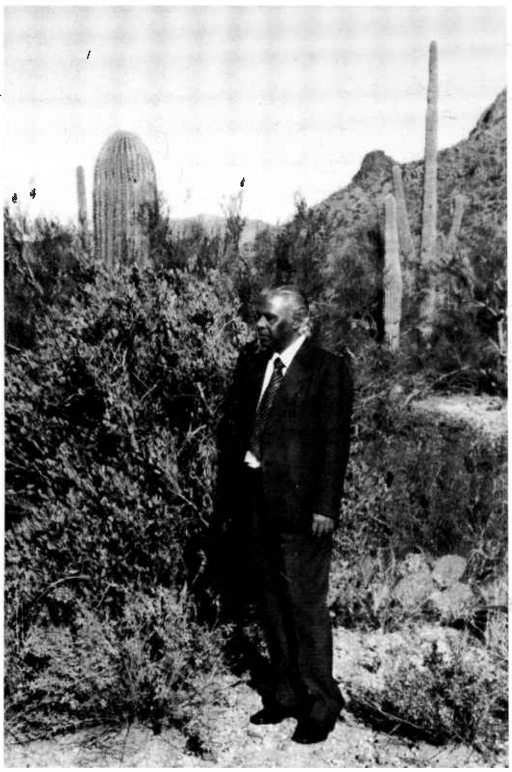
FRANCE

Dr. Claude Grenot, Ecole Normale Supérieure, Laboratorie de Zoologie, Paris, and *Dr. Norman R. French,* Research Institute of Colorado, Ft. Collins, Colorado, visited the University in March 1983 to review information on North American and North African deserts. The team is collaborating on a comparative analysis of biotic zones based on a classification of their formulation. They expect to resume their work in Paris later this year.

Claude Grenot

INDIA

Dr. R.L. Karale, All India Soil and Land Use Survey, Tarnaka, Hyderabad, April 1983.



Dr. Karale in the desert near Tucson.

ZAMBIA

M. Francis Mbewe, Director of Planning, Ministry of Agriculture & Water Development, Lusaka, April 11, 1983, to investigate the introduction of jojoba into landlocked Zambia's undeveloped semiarid rangeland.

In our informal conversation, I learned that while the country could scarcely qualify as arid, with its many swamps, rivers, and lakes (including Lake Kariba on the border with Zimbabwe, the world's largest man-made lake), M. Mbewe reminded me that Zambia did have a six-month cool dry/hot dry season, and that the specter of desertification was not confined to the Sahara! It was to prevent further encroachment of already visible signs of aridity that he was looking into some of the methods by which his country might remain a tropical one. Of its total area of 290,600 sq. mi., some 50 percent is occupied by its national forests, including long-time protected areas as well as so-called tree plantations of exogenous species like eucalyptus and pine. Some of these plantations are now almost 20 years old, having been established after independence in 1964. There are large game reserves as well.

An interesting highlight of our conversation concerned the existence of a Southern Africa Development Coordinating Conference which deals with cooperative agricultural activities and trade relations between its member states of Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe.

Zambia's mineral resources are substantial, including copper, cobalt, lead, and zinc. Its export crops include cotton, maize, corn, peanuts, and tobacco. Imports include agricultural chemicals, oil, farm equipment, and high tech, with local technicians trained and ready to develop and operate the latter.

In Zambia, as elsewhere in the Third World, urbanization emerges as a trend, the urban 40 percent of Zambia's total population of over five million reflecting a move away from subsistence agriculture and its traditional seminomadic cattle raising.

Educated at the University of Zambia and later in the U.S. and Canada, M. Mbewe comes across as well-qualified to handle the agricultural planning for Zambia that will solve its emerging environmental problems and give it the leadership in the region that it deserves.

ISRAEL

Dr. Yair Etzion, Head, Desert Architecture Unit, Sede Boqer Campus of the Ben-Gurion University of the Negev, April 11, 1983. Projects underway in the Negev include a modular open building system responsive both to the special necessities of desert design, and to the special economics of desert construction; earth sheltered dwellings; and a model desert community based on the integration of knowledge acquired during research and development of earlier desert settlement projects.

Professor Dov Pasternak, Ben-Gurion University of the Negev, Beer-Sheva, April 18, 1983

ITALY

Professor Guiseppe Sironi, Director, R&D, Enichimica S.P.A., Milan, February 11, 1983, to discuss potential guayule development in Southern Italy.

M. Abdelmuhsin M. Al-Sudeary, President, International Fund for Agricultural Development (IFAD), spoke on the University of Arizona College of Agriculture's Distinguished Visitor Lecture Series, May 9, 1983, on 'Global Problems of Hunger and Poverty.' He was introduced by Dean Bartley P. Cardon as an alumnus of the University of Arizona, having received an M.S. degree here in Plant Breeding in 1966. A native of Saudi Arabia, M. Al-Sudeary has held a number of offices in international agencies after serving for ten years in the Ministry of Agriculture & Water in Riyad.

Abdelmuhsin M. Al-Sudeary

He described for us in his lecture IFAD's role in the promotion of individual initiatives for the Third World's rural poor and its landless workers. Its members now include 139 countries, and its over $1 billion of assets are employed in the execution of of projects in 80 countries. Over two-thirds of this support goes to programs in countries with less than $300 annual per capita income.

Citing the world's 400 million undernourished, he tried to drive home to his listeners the importance of a universal acceptance of every man's right to food and adequate nutrition. While conceding that measures taken so far are totally inadequate on a global scale, partly due to the element of mistrust of outside agencies that dominates the response of millions of affected individuals to efforts of help, he was nevertheless optimistic that successful examples of people of differing opinions coming together in a common purpose can be multiplied to become the norm rather than the exception.

!!! FIRE !!!

It is one thing to sit comfortably in Tucson during one of the wettest winters we have enjoyed for a long while (precipitation to date, 1983: 4.06"; normal, 2.60") and read about Australia's summer brushfires that devastated much of South Australia and Victoria during January. But it is quite another thing, a sobering one, to hear directly from my friend John Zwar, Superintendent of Port Augusta's Parks and Gardens Department, who lived through it personally. Writing me in late February about the 'Silent Achiever' and the Greening of Australia — stories elsewhere in this issue of *ALN* — he then told me the frightening story of what it was like to suffer through the daily dust storms that derived from the 'worst-ever' drought, and the explosive fires that engulfed life and land.

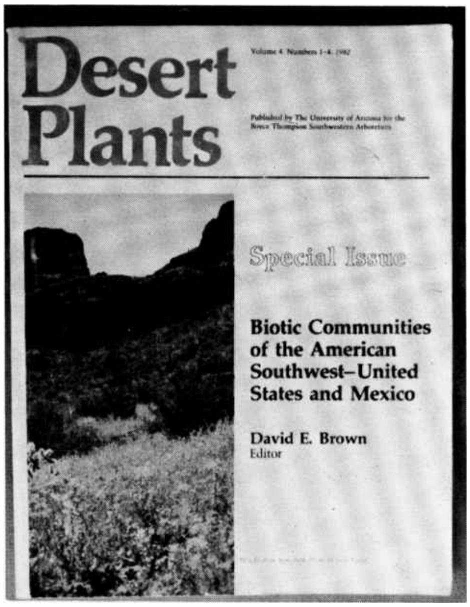
If any of you out there are thinking 'It couldn't happen here,' think again.

—pp

??? HAVE YOU SEEN ???

Brown, David E., ed. (1982) Biotic communities of the American Southwest-United States and Mexico [A special issue of *Desert Plants*, v. 4, nos. 1-4, 1982]. Boyce Thompson Southwestern Arboretum, P.O. Box AB, Superior, Arizona 85273. $13.95. 342 p. [companion map in color by Brown and Charles H. Lowe available separately only, from Rocky Mountain Forest and Range Experiment Station, USDA Forest Service, 240 West Prospect, Ft. Collins, Colorado 80526].

Topics covered are tundras, forests and woodlands, scrublands, grasslands, desertlands, and wetlands. There is an historical background section, together with appendices of scientific and equivalent common names of plants and animals used as examples in the text, and a digitized classification system for the biotic communities covered. Tables, references, many photographs.



Crawford, Clifford S. (1982) Biology of desert invertebrates, Springer-Verlag, N.Y. 314 p. $39.30.

Contents: Deserts and desert invertebrates; Adaptations to zeric environments; Life history patterns; Invertebrate communities: composition and dynamics; and Invertebrates in desert systems. For each major section, an introductory passage is followed by an hypothesis and derived predictions, in light of which available data are presented and considered. Line diagrams, photographs, comprehensive list of references.

Dan, J./Gerson, R./Koyumdjisky, H./Yaalon, D.H. (1981) Aridic soils of Israel: Properties, genesis and management. Volcani Center, Bet Dagan, Agricultural Research Organization, Special Publication 190. 353 p.

Soils of Israel's arid regions in general, as well as specific areas of the Judean Desert, the lower section of the Jordan Valley, the southern coastal plain, the Be'eri badlands, the sandy region of the western Negev, the northwestern part of the Negev Hills and mountains, the southern and eastern parts of the Negev mountains, the Paran and Hiyyon plains, and the Arava Valley are covered, as well as an introduction through the environmental setting and the geomorphic aspects of the Elat Mountains. Methods of analysis of the representative soil samples taken from the various soil horizons at sites described in the book are detailed, and a correlation list of the great groups and subgroups with similar soils in the American soil taxonomy is appended. Numerous references, tables, maps, charts, figures.

Desert Resources and Technology, vol. 1, 1983 Scientific Publishers, Maan Bhawan, Ratanada Rd., Jodhpur 342001/Geotec-Academia, A-42 Shastri Nagar, Jodhpur 342003, India. ISSN 0253-5130. [No price given]

Edited by Professor Alam Singh, contents of the first volume appear to carry out the aim of this publication to 'present up-to-date information on a number of topics of desert resources and technology selected for their intrinsic importance:' water reclamation for potable use, desalination of water, unsaturated flow in an arid environment, solar and wind energies utilization, reclamation and use of ravine lands, pasture development, economic and medicinal plants of Indian Desert, and fauna of the Great Indian Desert. Drawings, photos, references.

Institute of Desert [Research], Academia Sinica, Lanzhou, Gansu, PRC (1981) Study on the geomorphology of wind-drift sands in the Taklamakan Desert [translated title]. Lanzhou. 110 p.

Contents: General situation of Quaternary paleogeography and characteristics of sand materials, formation and development of geomorphology of wind-drift sand and its morphological features, the rule of sand dune movement, some geomorphological problems of preventing shifting sands (movement of dunes near irrigated oases, wind erosion of soil in newly cultivated fields, harmfulness of drift sands to highway or railway and their prevention). Maps, tables, photos.

--- --- (1981-) Journal of Desert Research, vol. 1, no. 1- Lanzhou (?).

Two issues at hand, with English contents and English abstracts for most articles.

--- --- (1982-) Memoir, no. 1- Lanzhou(?).

The first two issues of a new serial issued by the Academia Sinica's Institute of Desert [Research ?], containing articles on desertification, plant species for fixing moving sands, development of surface water resources in construction of new oases in desert regions, studies on the Tarim Basin, northern Shanxi, etc. English abstracts would be helpful along with information about ordering.

Le Houérou, H.N., ed. (1980) Browse in Africa, the current state of knowledge. Papers presented at the International Symposium on Browse in Africa, Addis Ababa, April 8-12, 1980, and other submissions. International Livestock Centre for Africa, P.O. Box 5689, Addis Ababa, Ethiopia. 491 p.

Over 50 papers covering regional studies, multiple use, biology and primary production, secondary production, nutritive value and use by animals; establishment, utilization and management; intensive production, integration of browse in pastoral or agropastoral systems, socioeconomic constraints to the use of browse in development programs, gaps in knowledge and research priorities. Recommendations include establishment of a seed bank and exchange of genetic materials, introduction of a coordination mechanism designed to insure rational distribution of research on improving the use of resources and to avoid duplication. The conclusions, arrived at as a summation of the symposium, included a unanimous conviction that more important emphasis should be put on curricula and training programs in African countries for the management of grazing ecosystems, including the role of browse in the equilibrium of those systems. Maps, tables, charts, lists of species, references.

Louw, Gideon N./Seely, Mary K. (1982) Ecology of desert organisms. Longman Inc., N.Y. 194 p. ISBN 0-582-44393-8.

Contents: Desert environment and principles of adaptation; Escape from the desert environment; Tolerance of the desert environment: 1) Morphological adaptations, 2) Physiological and behavioral adaptations; Reproduction in the desert environment; Structure of some typical desert communities; Functional aspects of desert communities; Evolutionary ecology of deserts; Man and the desert. Maps, photos, drawings, figures, tables, references (over 300).

Quarterly Journal of Engineering Geology, 1982, vol. 15, no. 2:

Burdon, D.J.: Hydrogeological conditions in the Middle East, p. 71-82.

Wright, E.P., et al: Hydrogeology of the Kufra and Sirte basins, Eastern Libya, p. 83-103.

Babiewicz, W., et al: Hydrogeology of the Umm er Radhuma aquifer, Saudi Arabia, with reference to fossil gradients, p. 105-126.

Shata, A.A.: Hydrogeology of the Great Nubian sandstone basin, Egypt, p. 127-133.

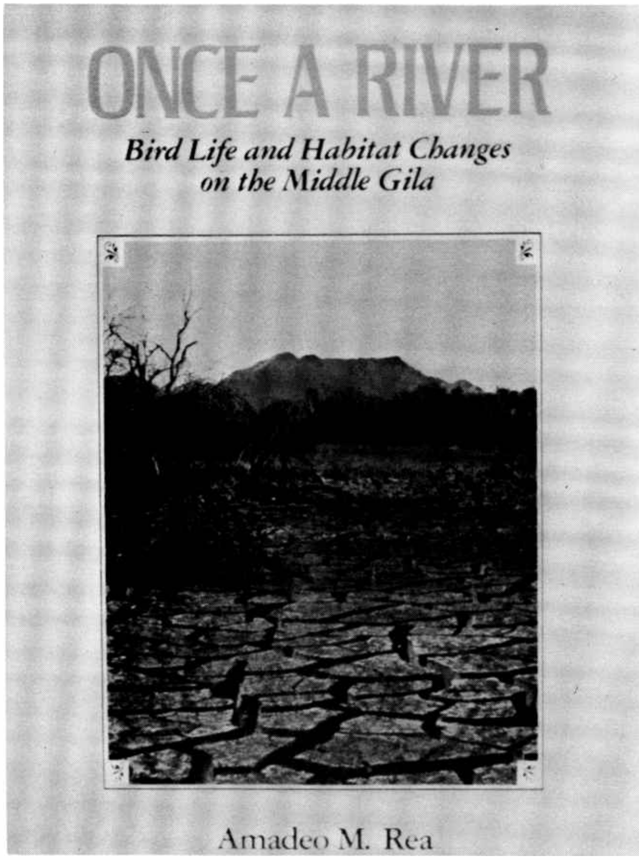
Khouri, J.: Hydrogeology of the Syrian steppe and adjoining arid areas, p. 135-154.

Smiley, Terah L., ed. (1982) The geological story of the world's deserts. Societas Upsaliensis pro Geologia Quaternaria, Box 555, S-751 22 Uppsala, Sweden. Striae 17. 133 p. ISBN 91-7388-035-3.

Eight major desert areas, representing various desert types in their geologic formation and history as well as their importance to man, are discussed by experts in this compilation prepared for the Commission for the Study of the Holocene, International Union for Quaternary Research: Australian deserts, the Kalahari, the Sahara, the Middle East, China, India, North America, and the Atacama. Taking off from the statement that 'aridity of the world's deserts is primarily caused by massive air subsidence which in turn is often modified by the geological features and processes,' these authors point out that it is impossible to fully understand one of these without an understanding of the other. Each area discussed has a different set of physical properties to be studied and understood, each has certain limitations imposed by its properties, and local geology plays a large role in setting these limitations. Numerous references for each desert, plus charts, tables, maps, photographs.

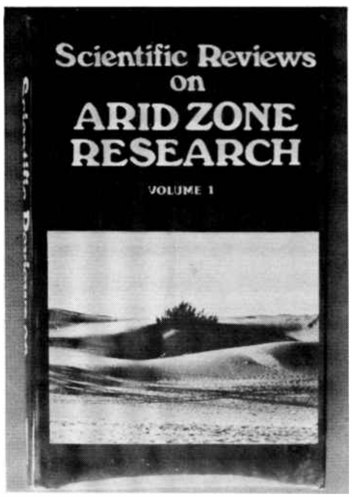
Rea, Amadeo M. (1983) Once a river: bird life and habitat changes on the Middle Gila. University of Arizona Press, Tucson. 285 p. $24.50. ISBN 0-8165-0799-6.

In his foreword Bernard Fontana points out that this book offers 'an in-depth look at the results of human activities on a narrowly defined stretch of a southwestern stream where it formerly coursed from east to west down the lengthwise center of the Gila River Indian Reservation. While Rea's immediate concern is with avifauna, the story that unfolds is one of the destruction of a habitat leading to a place that was "once a river." Cutting, chopping, damming, gouging, bulldozing, leveling, pumping, ripping, poisoning, and grazing are only a few of the forces employed to fuel insatiable human appetites, all at work on the Gila. All in the name of "bigger is better"; all in the name of Progress.' Beyond the details of a specific site, the author addresses the broader issue of habitat deterioration, offering evidence in this handsomely illustrated work evidence of change that might be apprehended elsewhere. It is a case history of a loss that perhaps need never have occurred. Maps, tables, species accounts, comprehensive bibliography.



Scientific Reviews on Arid Zone Research, vol. 1, 1982— Scientific Publishers, Ratanda Rd. Jodhpur, 342001, India (v. 1, 377 p.). [No price given.]

In a prefatory note to vol. 1, Managing Editor Pawankumar notes that the main purpose of this new arid lands publication is to 'bring an interdisciplinary approach to the problems of desert development. The series will include original work and review articles covering biology, technology, sociology, land utilization and environment.' While the emphasis initially is on Indian problems, there are also articles in vol. 1 by such world authorities as Cloudsley-Thompson, Egypt's S.I. Ghabbour, and Randall Baker. Maps, drawings, tables, photos, references.



Terra Aridae, No. 1, Julio 1982- Universidad de Chile, Facultad de Ciencias Agrarias, Veterinarias y Forestales, Centro de Estudios de Zonas Aridas, Casilla 1004, Santiago, Chile.

This issue, No. 1, at hand, covers a detailed 'Cartografía de la vegetación de la Zona Arida Mediterránea de Chile.' Transects covered include Puerto Oscuro, Combarbalá, Monte Patria, Ovalle, and La Serena. Plant lists, maps, drawings, tables.

Wake, John (1982) The threat from Turkey. Big Farm Management, June 1982, p. 66, 68.

A first-hand account of a visit to Turkey's agricultural areas, an assessment of the country's agricultural potential, and descriptions of some of its land reclamation schemes, irrigation development, and marketing plans. The most promising markets are those of Turkey's Middle Eastern neighbors where there is a great demand for imported food, with the advantage that transport links already exist as well as strong Islamic cultural connections. Reciprocal trading of food for oil is already established between Turkey and Iraq, Iran, and Libya, and is likely to spread to other Arab states. Still to be overcome are differences in management of imported livestock in the country's arid steppe landscape where new farms are being established.

Walls, James, ed. (1982) Combating desertification in China. A report on a seminar sponsored by the Academy of Sciences of the People's Republic of China and the United Nations Environmental Programme. UNEP, Nairobi, Kenya, Reports and Proceedings Series, 3. 70 p. ISBN 92-807 1025 4.

Lectures delivered and field studies conducted during a training course on combating desertification held in 1978 at the Institute of the Desert, Lanzhou. Topics included the transformation of deserts in China: a summary view of the People's experiences in controlling sand; monitoring desertification in China; development and use of surface water resources in the construction of new oases in desert regions; stabilizing sand dunes with vegetation; establishment of forest shelter belts in oases; use and improvement of pasture in China's steppe zone. Maps, tables, photos.

West, Neil E., ed. (1982) Temperate deserts and semi-deserts. Elsevier Scientific Publishing Co., Amsterdam and New York (Ecosystems of the World, 5). 522 p. U.S. $170.25 ISBN 0-444-41931-4.

By integrating recent information from many fields, we are provided a current description of the structure and functioning of terrestrial ecosystems found under dry temperature climates. These cold winter deserts and semideserts are found primarily in Eurasia, in western U.S., and to a lesser extent in Patagonia. Broad topics include coverage of these areas, but the individual specific deserts treated to in-depth analysis are extremely valuable. Such sections as those on Afghanistan, the Karakum, Kazakhstan, Middle Asia are examples, as well as the better known Colorado Plateau and Great Basin. Systemic list of genera, indexes, many maps, tables, photos. Editor West's concluding comparisons and contrasts between the temperate deserts and semi-deserts of three continents is a fine overview.

??? DID YOU KNOW ???

• • • that the United Nations Association of Australia is sponsoring the UNAA Decade of Trees? Its objectives, as set forth in its Newsletter, 'Green Australia,' are to increase public awareness of the value of trees, and to promote action on an individual, community and government level to conserve, regenerate and plant trees. There, as elsewhere in the arid world, the number of trees is declining. Now a widespread view has developed that past and current efforts do not match the importance and urgency of arresting this decline, particularly in rural areas where there are important associated problems of soil erosion, soil salinization, and dieback. Coordinated with UNAA's activities are those of the Australian Year of the Tree, officially launched by the Prime Minister a year ago. All parties involved hope to demonstrate the usefulness of such a partnership of government/nongovernment aims as it is continued down to the community/ individual level. There is even a logo, Greening Australia, a unique tree symbol that is used to endorse the concept on the usual products such as 'T' shirts, calendars, etc.

Greening Australia

• • • that Turkey hopes to bring the green back to the arid steppes of northern Mesopotamia, where one of the world's earliest civilizations once flourished? Harnessing the historic Euphrates River through a series of dams and irrigation canals could result in the area's becoming a breadbasket for the entire Middle East, as well as providing electricity for the country's industrial needs. Already completed is the Keban Dam (38.48N/38.45E) and construction has started on the Karakaya Dam, some 100 miles downstream. The $3.5 billion estimated cost of the final dam in the system, the Ataturk Dam, is not yet assured, although construction has been under way since 1977 on irrigation tunnels which will draw water from this dam's projected 375 sq. mi. reservoir. Many archeological teams are already at work in the area in an attempt to save remnants of ancient northern Mesopotamia before the reservoir area is flooded. Still unresolved is the opposition of both Iraq and Syria on grounds the dams will give Turkey the ability to cut them off from the southward flow of the Euphrates.

CLIMATOLOGICAL ASPECTS OF DESERTIFICATION:
Facts, Theories and Methods

The third course offered by the International School of Climatology and partially financed by the European Economic Community will be held in Erice-Trapani, Sicily, October 10-22, 1983. Intended for those with a background in meteorology, geophysics, and/or ecology, it will be of interest to individuals from other disciplines concerned with desertification, as well. Some fellowships available for travel and/or living expenses will be awarded on a competitive basis. Contact:

Dr. R. Fantechi, Director
Commission of the European Communities
Environment Research Programmes (DG XII)
Rue de la Loi 200B
Bruxelles, Belgium

Interested parties in the US, contact:

Michel M. Verstraete
National Center for Atmospheric Research
P.O. Box 3000
Boulder, Colorado 80307

The Course intends to go beyond the controversy about the main cause — man or climate —of desertification, understood here as the various processes leading to a reduction of the biological potential of the land. It will try to address such questions as:

- what is the present state of knowledge on the climatological aspects of desertification
- how to make the best use of the existing atmospheric data for better management and planning in regions at risk
- what are the gaps to fill
- how can modern remote sensing techniques be applied to the problem
- what do the climatologists need to know about desertification
- in what ways can atmospheric scientists in collaboration with those from other disciplines contribute to understanding, monitoring, and finally control of desertification
- how to present the climate-related information to potential users

Through lectures, informal discussions between all participants, panels, and other innovative devices, it is expected that recommendations will emerge from the course conclusions.

Total fee for the course will be approximately $500 US which covers tuition, full board and lodging.

ARID LANDS: TODAY AND TOMORROW

An International Arid Lands Research & Development Conference

OCTOBER 21 - 25, 1985
(with special workshops extending to November 1)

University of Arizona, Tucson, Arizona

sponsored by UNESCO and the University of Arizona, marking a quarter of a century since UNESCO's Arid Lands Major Project, and a century since the founding of the University of Arizona

Invited and solicited papers will be presented on the four following themes related to land and water use in arid and semiarid zones:

- Food Production Systems
- Water Use and Conservation
- Human Habitat: Structures and Organization
- Natural Resource Use and Conservation

Other major events will include

- premiere showing of the 1985 Centennial Sonoran Desert film
- a series of arid lands films from around the world
- poster sessions
- publishers' book displays
- post-conference field trips to places of natural and cultural interest within North American deserts

In addition, a meeting of the US-USSR Cooperative Program on the Production of Arid Ecosystems will be held conjointly with the conference.

Look forward to the Call for Papers, scheduled in early 1984.