Science and Technology: New Tools New Dimensions

Chronological Summary of Sessions

American Association for the Advancement of Science

1515 Massachusetts Avenue, NW
Washington, DC 20005

Symposium:
Neighborhoods, Cities and Regions:
Governing the Future of Urban Spaces

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A Conceptual Approach Toward the Development of Appropriate Technologies

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President

Center for Maximum Potential Building Systems

NOTE: The following paper has been presented in various forms to almost 20 states in various conference formats and under various titles. Among those presentations of interest is the American Association for the Advancement of Science Annual Meeting, 1978, in Washington, D. C., and the State of New Mexico State Planning and Housing Authority, 1979, in Albuquerque.

The Center for
Maximum Potential Building Systems

The Center has been working in several towns helping develop community based and regionally specific appropriate technologies. A locally integrated, indigenous resource approach has enabled us to produce solar hot water heaters at an average cost of $85 including installation with CETA crews. We are producing bricks using indigenous earth materials, including a wide range of materials other than adobe, for 1/100th the energy cost of conventional building materials. We are building a passive solar school for less than $28 per square foot. We are producing attached solar greenhouses at a 28% cost reduction by stockpiling used wood members at a community warehouse and recycling them using rib truss construction techniques. We can supply a clean burning fuel source for wood burning stoves, using locally available mesquite wood as charcoal, and at the same time reduce fuel transportation costs by nearly 50% by densifying this energy source through a process using portable kilns in the field made out of easily available materials.

To accomplish much of this we use a methodology that enables us to hunt for resources which are locally available, but often untapped. We map indigenous resources at a state level and sometimes at a more local level, showing how this approach can be used in both some urban conditions and in small rural towns. Physical resources mapped to date cover a wide range of earth building materials, including caliche, adobe, volcanic ash, gypsum, sulfur, alumina clay and fly ash waste. In the larger context we map climatic resources, physical resources and human/informational resources. For climatic systems we map areas of the state where particular passive solar systems are relevant. Some systems covered to date include reradiating roofs, trombe walls, thermal chimneys, dessicant systems and earth air heat exchangers. We try to do the same thing with water conservation technologies, waste treatment, wind energy, low temperature geothermal, etc.

In association with these area resources which map potentials, we also map point resources - that is, points of physical or informational concentration for a given system. In one case this could be a person who is expert in adobe soils, in another a caliche brick yard, in a third a passive solar house, and in a fourth an appropriate technology library. From working in the field it is very clear that finding a physical resource alone is useless without being coupled to people with experience and information enough to use it. If none can be found with experience in a particular technology, relevant for specific location as proven by a long history of human settlements in similar biogeographic locations, we try to help create a local example to serve as a regional reference point. But we do so only in response to a local group or individual's initiative in presenting us with a local need that is unmet and for which local, untapped resources can be marshalled - to the benefit of both the ecological and social realms. We find this approach to be effective not just because of its internal logic and simplicity but also because it can easily couple social and energetic issues directly into ecological land planning strategies being used throughout the United States and other parts of the world.

It is apparent that given a microregion we can begin to get a feeling of how "together" that region really is in its evolution towards long-term stabilization. Our perspective emerges as we map and look in turn at: (1) the availability of a whole series of local area resources; (2) the culture's existing knowledge and use of these resources through concrete examples; and (3) the region's ability to communicate or network effectively, through newsletters, conferences, relevant retrieval systems, codes, etc.

We look at alternative technologies not as products but as a result of a process and a program that begins to relink us with the environment, its people, and its social mechanisms for information sharing. We design our technologies in response to those processes of the community or region that are revealed by a close examination of each region's special attributes. What emerges are clear differences and, as a result, diversity of solutions and technologies. What works in dry, clear El Paso, for example, is entirely different from what one would build in hot and humid Houston. Similarly, the earth materials one would use can depend entirely on what materials are locally available and accessible, so that new materials may emerge as potentials that had previously lain fallow and unnoticed. As local differences and a careful adaptation to those differences takes place, each region strengthens its ability to develop within the context of its own special resources and characteristics - and as a result its ability to be self-sufficient grows. In a long-term ecological sense, overall ability to survive grows too - notably because diversity strengthens our adaptability. As we do things closer to home and eliminate the remoteness of time and place in our decisions, our response time is faster. As our situation or resource base changes, we are right on hand to notice, and on hand to take action, and on hand to begin to anticipate these shifts because we live in the region we deal with. As the scale of our efforts narrows and becomes locally based, and the pace of forces and responses more immediate, the opportunities for free enterprise and lively competition grow - the small entrepreneur has a chance to exercise his/her ingenuity again. When this is not the case, it is not hard to see the unfortunate consequences that can easily result. In New Mexico, for example, adobe is becoming increasingly expensive and is close to the price of conventional building materials, so that it is out of reach for the normal person. This has happened partly because there is little to no competition with other indigenous material manufacturers, and because there are emerging tendencies toward price fixing.

We are in the midst of a new kind of development in this country that depends for its stability on new kinds of information and a respect for a different and often much older kind of knowledge. It is period where good information on simple regional approaches that are subject to long-term ecological determinants provide the first faltering steps towards a more fail safe approach. A consistent and clear methodology and a plan for action in this context should be a top priority for local, regional and state planning and development efforts.

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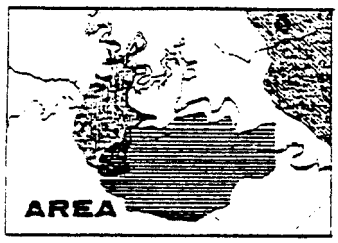
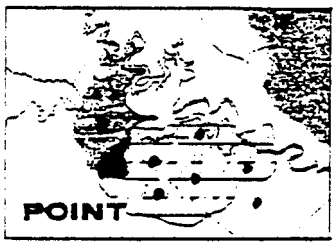
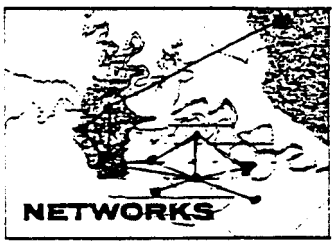
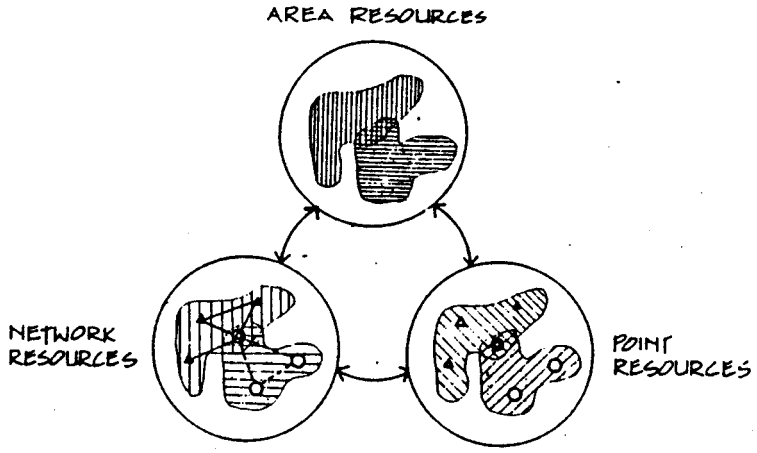
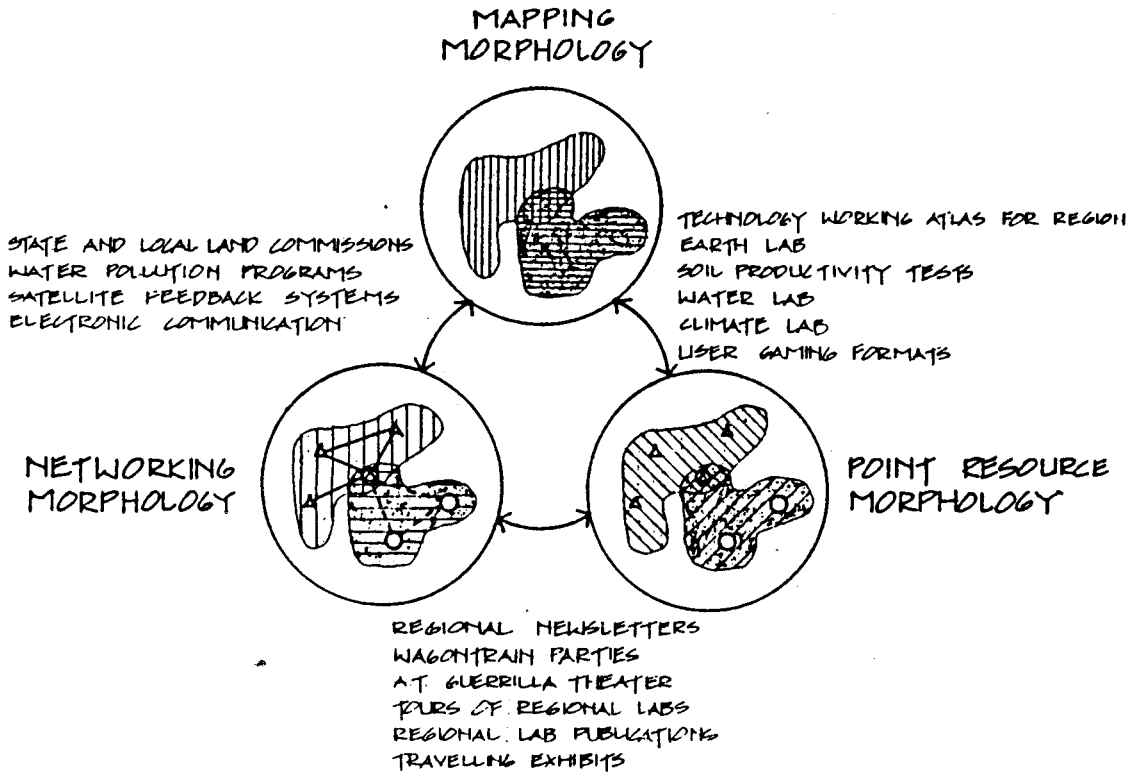
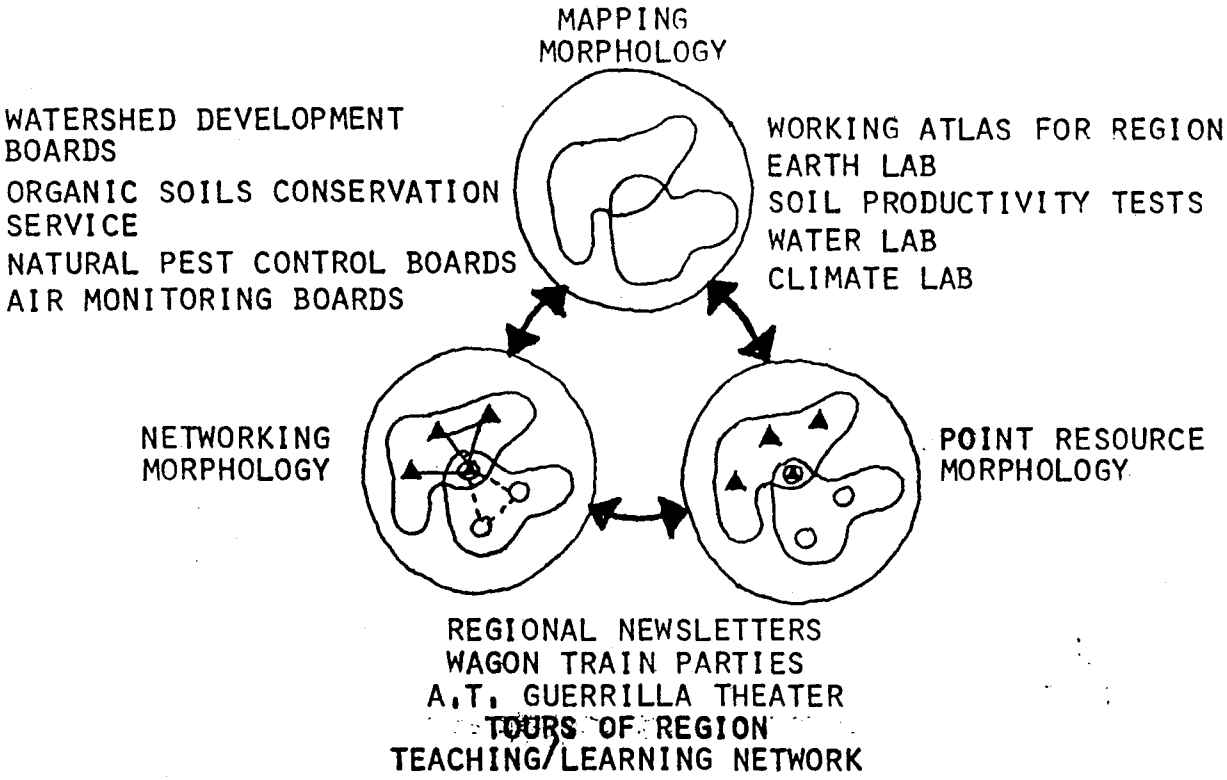

AREA

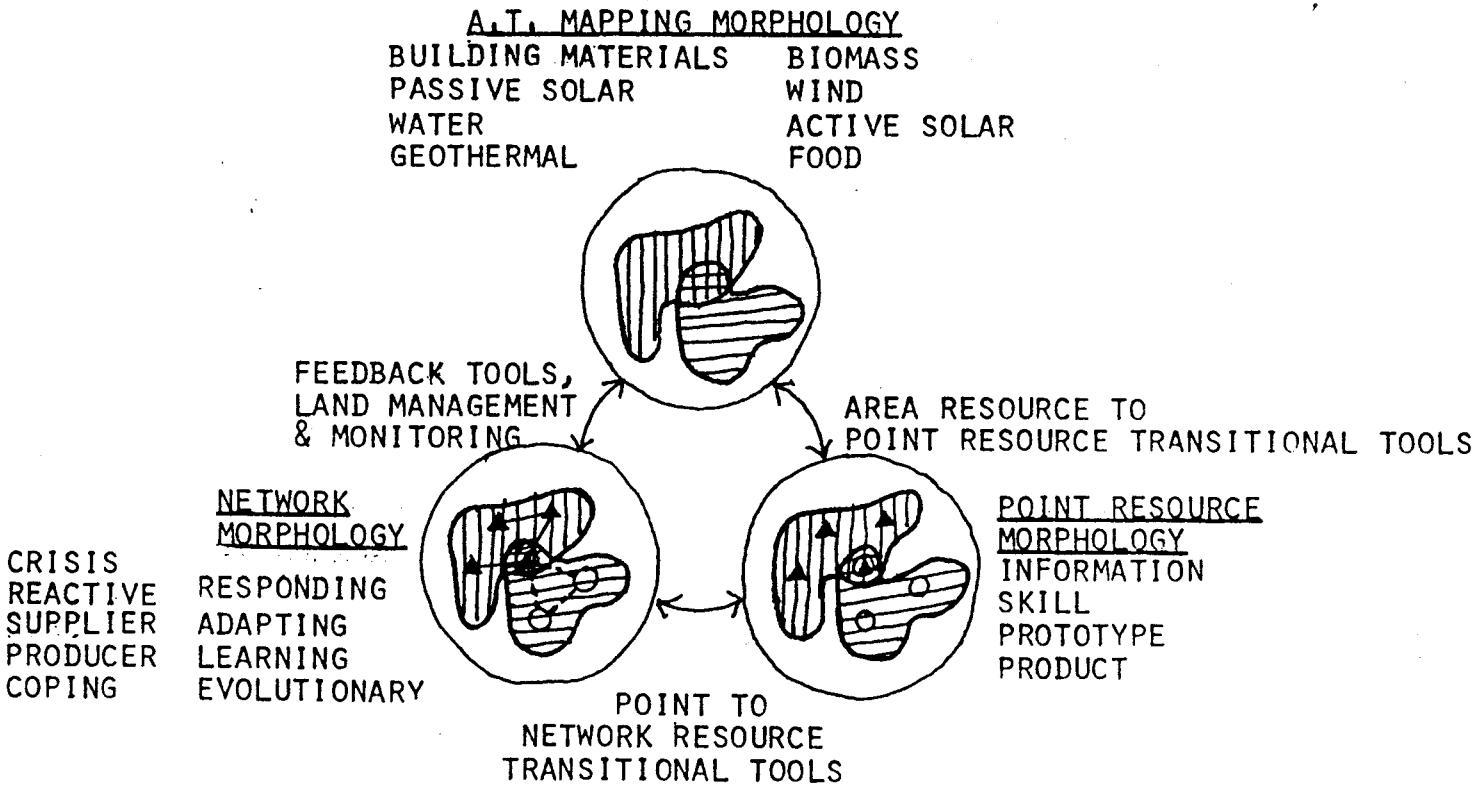

POINT


NETWORKS


AREA RESOURCES
NETWORK RESOURCES
POINT RESOURCES


MAPPING MORPHOLOGY
STATE AND LOCAL LAND COMMISSIONS
WATER POLLUTION PROGRAMS
SATELLITE FEEDBACK SYSTEMS
ELECTRONIC COMMUNICATION
TECHNOLOGY WORKING ATLAS FOR REGION
EARTH LAB
SOIL PRODUCTIVITY TESTS
WATER LAB
CLIMATE LAB
USER GAMING FORMATS
NETWORKING MORPHOLOGY
POINT RESOURCE MORPHOLOGY
REGIONAL NEWSLETTERS
WAGONTRAIN PARTIES
A.T. GUERRILLA THEATER
TOURS OF REGIONAL LABS
REGIONAL LAB PUBLICATIONS
TRAVELLING EXHIBITS


MAPPING
MORPHOLOGY
WATERSHED DEVELOPMENT
BOARDS
ORGANIC SOILS CONSERVATION
SERVICE
NATURAL PEST CONTROL BOARDS
AIR MONITORING BOARDS
WORKING ATLAS FOR REGION
EARTH LAB
SOIL PRODUCTIVITY TESTS
WATER LAB
CLIMATE LAB
NETWORKING
MORPHOLOGY
POINT RESOURCE
MORPHOLOGY
REGIONAL NEWSLETTERS
WAGON TRAIN PARTIES
A.T. GUERRILLA THEATER
TOURS OF REGION
TEACHING/LEARNING NETWORK


A.T. MAPPING MORPHOLOGY
BUILDING MATERIALS
PASSIVE SOLAR
WATER
GEOTHERMAL
BIOMASS
WIND
ACTIVE SOLAR
FOOD
FEEDBACK TOOLS, LAND MANAGEMENT & MONITORING
AREA RESOURCE TO POINT RESOURCE TRANSITIONAL TOOLS
NETWORK MORPHOLOGY
CRISIS
REACTIVE
SUPPLIER
PRODUCER
COPING
RESPONDING
ADAPTING
LEARNING
EVOLUTIONARY
POINT RESOURCE MORPHOLOGY
INFORMATION
SKILL
PROTOTYPE
PRODUCT
POINT TO NETWORK RESOURCE TRANSITIONAL TOOLS

SEQUENCING STAGES

AREA RESOURCE

ECOLOGICAL CONSTRAINTS

RESOURCE POTENTIAL

RESOURCE SUITABILITY

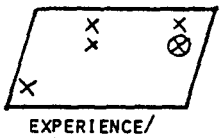
PHYSICAL ACCESS SUITABILITY

OWNERSHIP PATTERNS

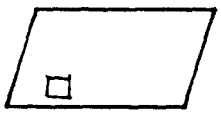
COMBINED COST OF USE

POINT RESOURCE

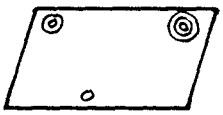
HISTORIC EXAMPLES



EXPERIENCE/ MANUFACTURING



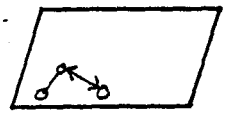
RESEARCH INSTITUTIONS



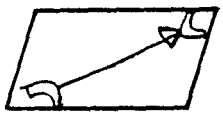
NEWSPAPER COLUMNS/ NEWSLETTERS

LIBRARIES

NETWORK RESOURCE



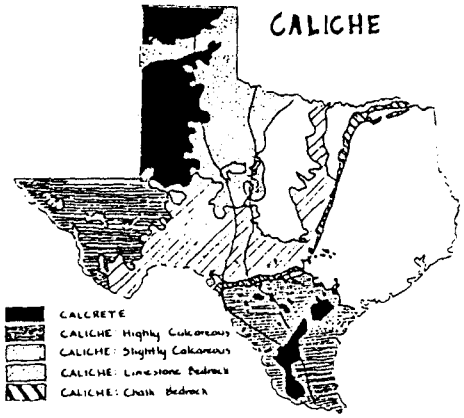
MATERIALS

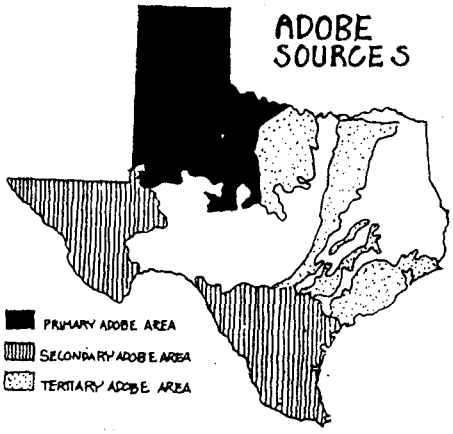


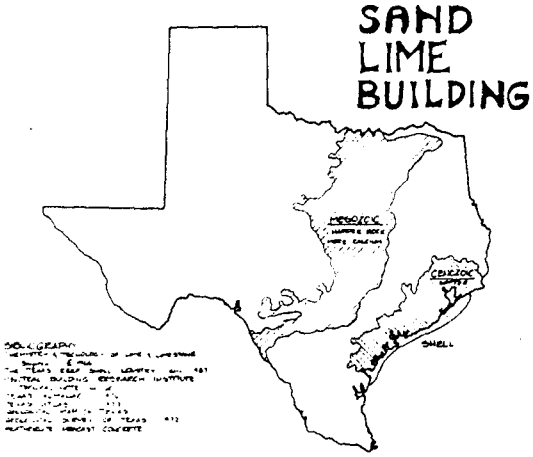
ENERGY

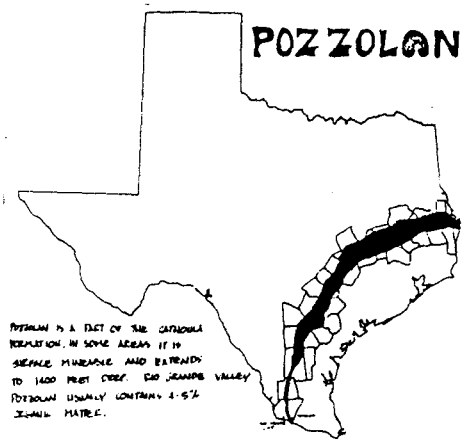
CURRENCY

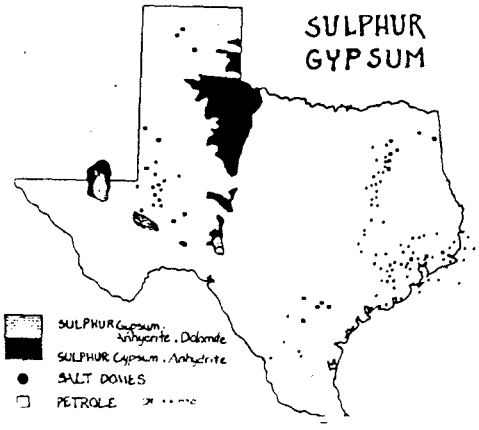
INFORMATION

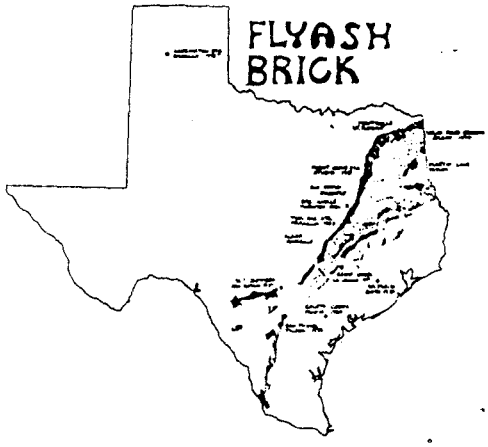

CALICHE
CALCRETE
CALICHE Highly Calcareous
CALICHE: Slightly Calcareous
CALICHE: Limestone Bedrock
CALICHE: Chalk Bedrock


ADOBE SOURCES
PRIMARY ADOBE AREA
SECONDARY ADOBE AREA
TERTIARY ADOBE AREA

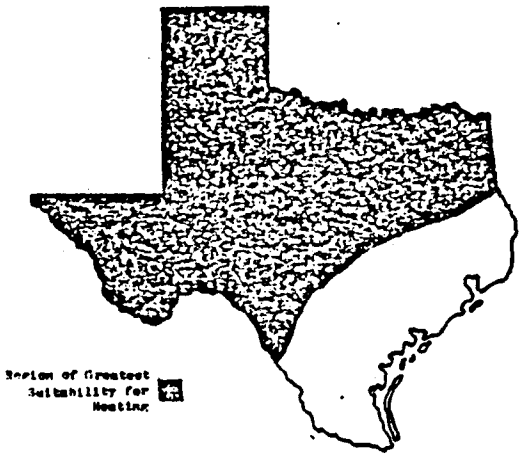

SAND LIME BUILDING
MESOZOIC
CENOZOIC
SHELL


POZZOLAN
POZZOLAN IS A PART OF THE CATHODIC REACTION. IN SOME AREAS IT IS SEPARATE MINERALS AND EXTENDS TO 1400 FEET DEEP. RIO GRANDE VALLEY POZZOLAN USUALLY CONTAINS 1-5% SILICA MATRIX.

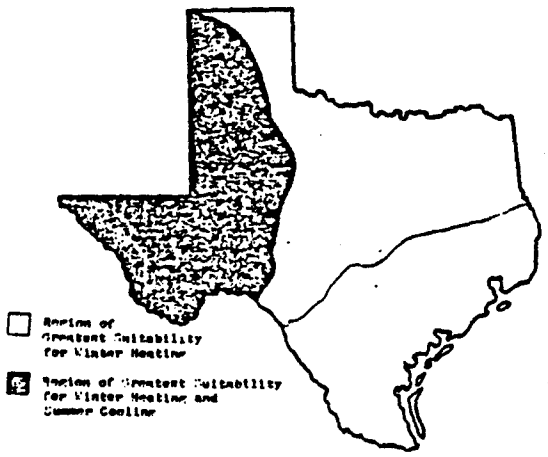

SULPHUR GYPSUM
SULPHUR Gypsum, Anhydrite, Dolomite
SULPHUR Gypsum, Anhydrite
SALT DOMES
PETROLE


FLYASH BRICK

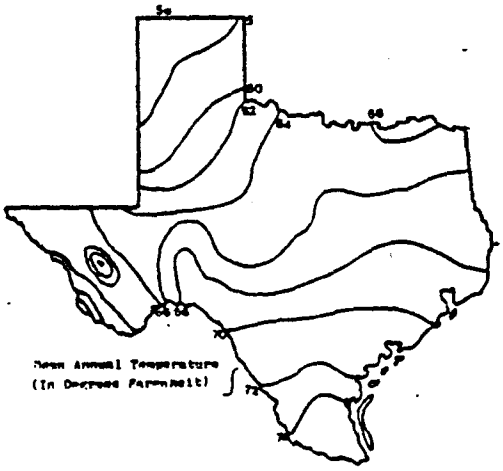
Trombe



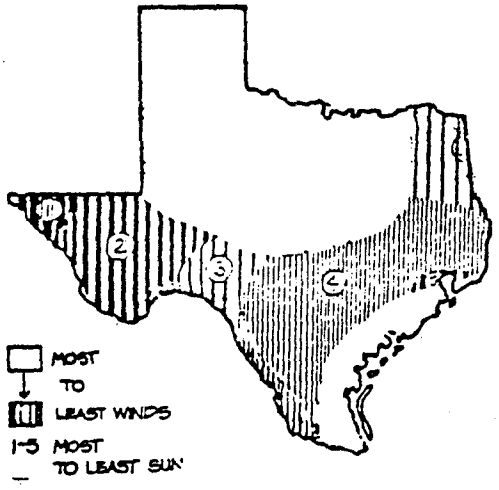
Skytherm



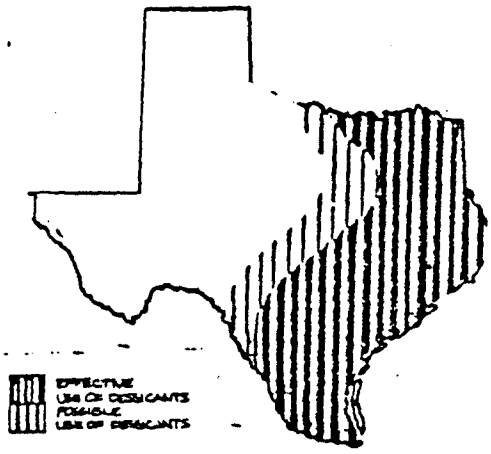
Earth-Air Heat Exchanger



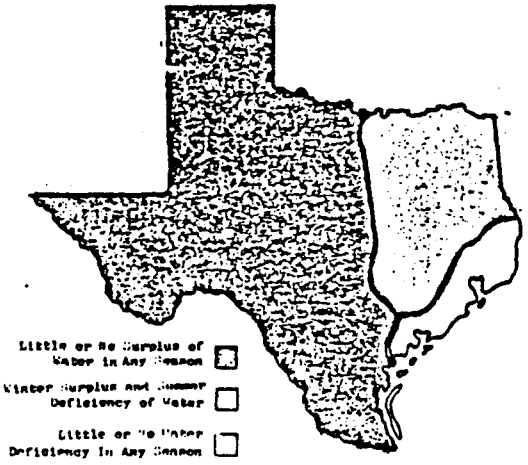
THERMAL CHIMNEY



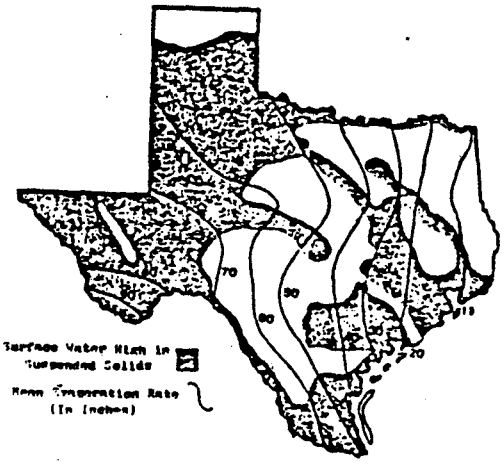
DESSICANT SYSTEMS



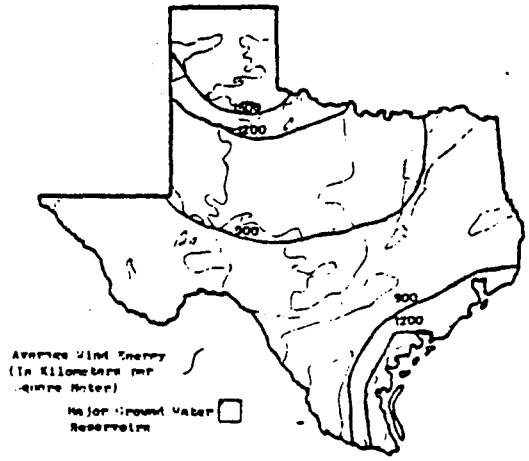
Water Conserving Bathrooms



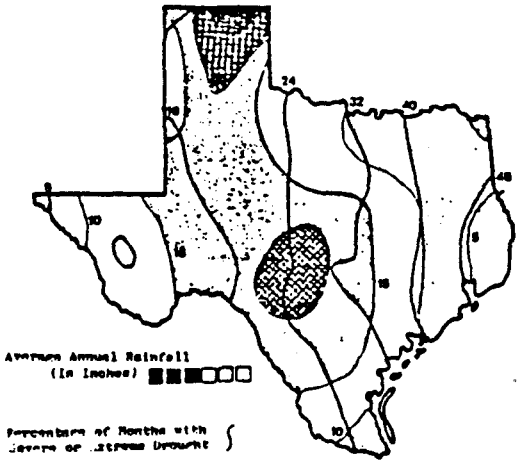
Solar Still



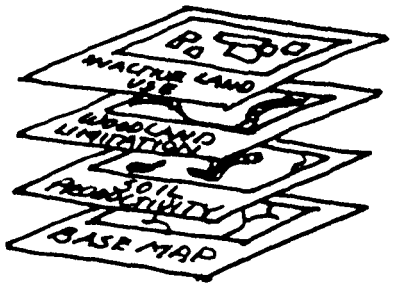
Water Pumping Windmills



Water Catchment and Storage

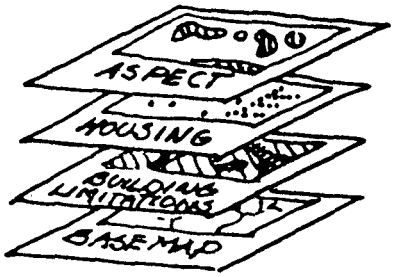


POTENTIAL BIOMASS



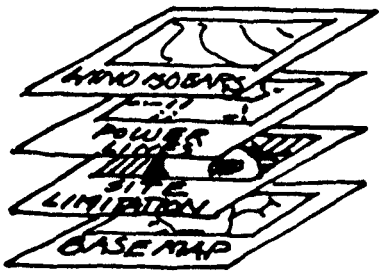
- WHERE BIOMASS CAN BE GROWN
- WHERE BIOMASS CAN TECHNICALLY BE GROWN (IE PRODUCTIVE SOILS)
- ROAD ACCESS

SOLAR



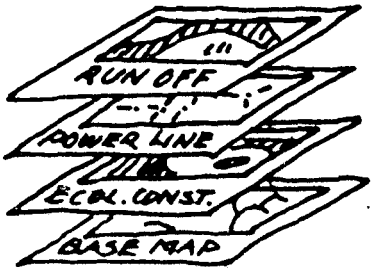
- WHERE THE SUN SHINES BRIGHTEST AND LONGEST
- WHAT EXISTING HOUSES CAN BENEFIT FROM THE SUN
- WHERE SOLAR ENERGY INSTALLATIONS CAN BE DEVELOPED

WIND



- WHERE THE WIND BLOWS FASTEST
- RELATIONSHIP OF EXISTING ELECTRIC LINES TO WIND TURBINE SITES
- WHERE WIND ENERGY CAN BE DEVELOPED

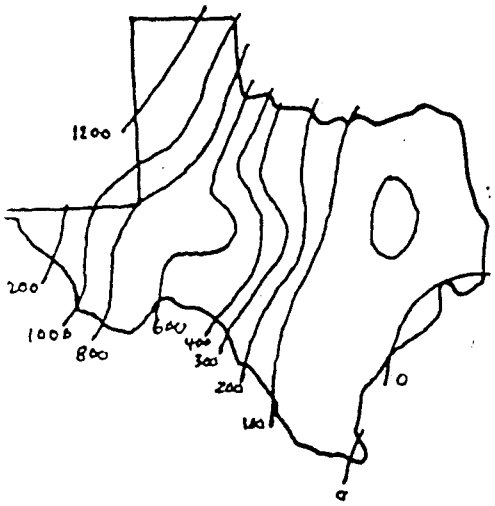
HYDRO MAP



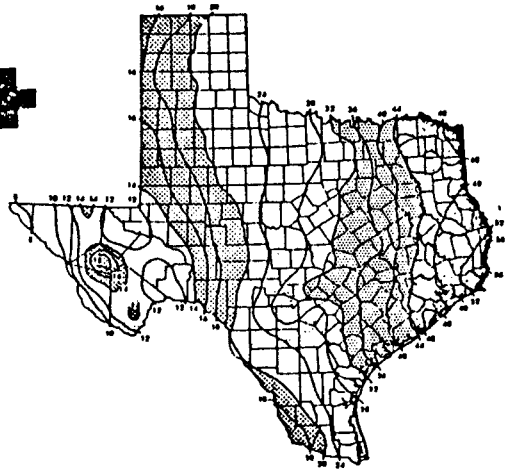
- WHERE THE STREAMS ARE
- WHERE GROUND WATER AND HYDRO ELECTRIC CAN BE DEVELOPED
- THE EXISTING RELATIONSHIP OF ELECTRICITY LINES TO HYDRO ELECTRIC SITES

PASSIVE SOLAR SUITABILITY STUDIES

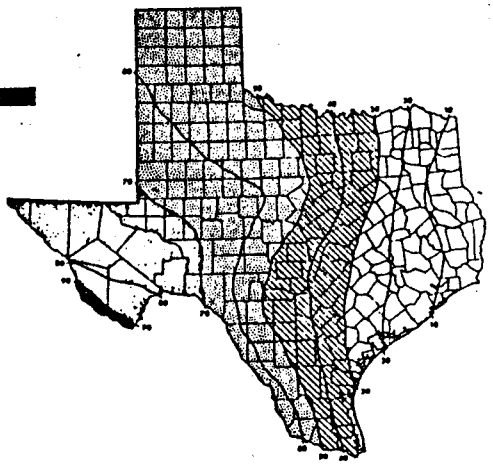
RERADIATION POTENTIAL



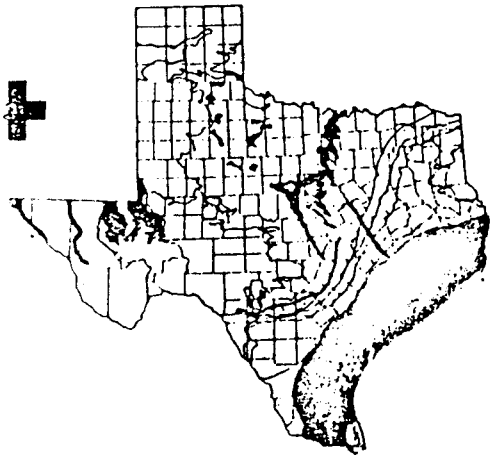
MEAN ANNUAL PRECIPITATION



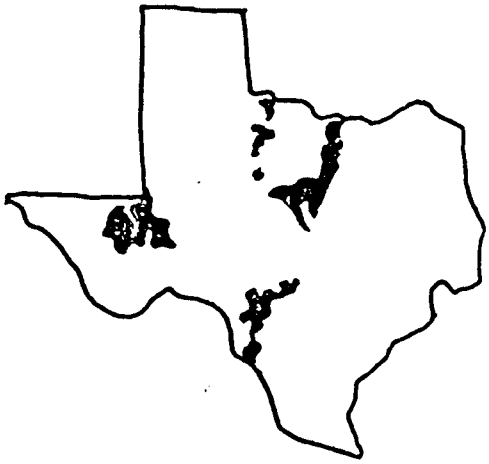
MEAN EVAPORATION RATE



USABLE FRESH WATER AQUIFERS



RERADIATION SUITABILITY

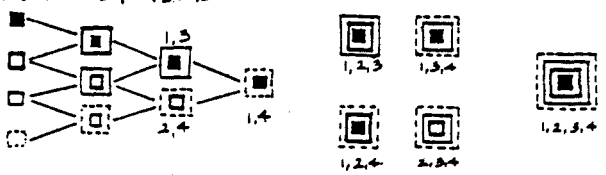


NOCTERNAL WATER TRICKLE RADIANT ROOF SUITABILITY - COOLING

POINT RESOURCE MORPHOLOGY

INDIGENOUS BUILDING SYSTEMS

1. INFORMATION
2. SKILL
3. EXTRACTOR
4. STRUCTURE



PASSIVE CLIMATIC SYSTEMS

1. INFORMATION
2. SKILL
3. STRUCTURE

WATER CONSERVATION

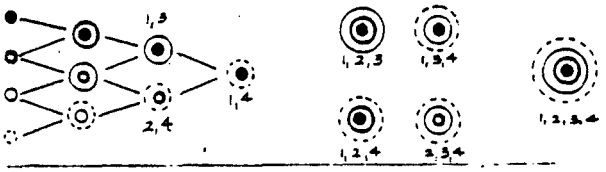
1. INFORMATION
2. SKILL
3. EXISTING TECHNOLOGY

BIOMASS

1. INFORMATION
2. SKILL
3. EXISTING TECHNOLOGY

WIND ENERGY

1. INFORMATION
2. SKILL
3. POWER PLANT
4. PRODUCT

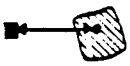
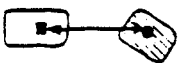
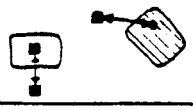
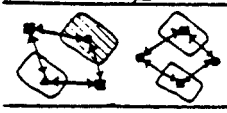
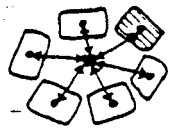


ACTIVE SOLAR SYSTEMS

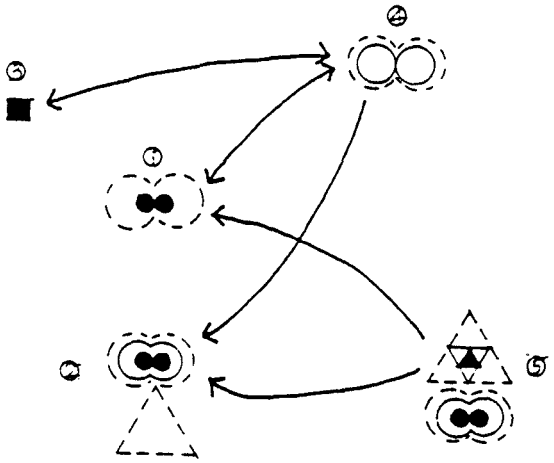
1. INFORMATION
2. SKILL
3. SOLAR SYSTEM
4. PRODUCT

PT. RESOURCE SYMBOL	GROUP	MORPHOLOGY
	SAN ANTONIO APPROPRIATE TECHNOLOGY GROUP SAN ANTONIO TEXAS	INFORMATION INDIGENOUS BUILDING PASSIVE CLIMATE WATER CONSERVATION BIOMASS SKILL PASSIVE CLIMATE BIOMASS ACTIVE SOLAR STRUCTURE PASSIVE CLIMATE
	POSSUM BEND FARM RANGER, TEXAS	INFORMATION WATER CONSERVATION BIOMASS WIND ACTIVE SOLAR SKILL WATER CONSERVATION ACTIVE SOLAR STRUCTURE WATER CONSERVATION ACTIVE SOLAR
	SYMBIOTIC PROCESSES LAB AUSTIN, TEXAS	INFORMATION INDIGENOUS MATERIALS BIOMASS WIND SKILL INDIGENOUS MATERIALS WIND STRUCTURE INDIGENOUS MATERIALS WIND
	CENTER FOR MAXIMUM POTENTIAL BUILDING SYSTEMS AUSTIN, TEXAS	INFORMATION INDIGENOUS BUILDING PASSIVE CLIMATE WATER CONSERVATION BIOMASS WIND ACTIVE SOLAR SKILL INDIGENOUS BUILDING PASSIVE CLIMATE WATER CONSERVATION BIOMASS WIND ACTIVE SOLAR STRUCTURE INDIGENOUS BUILDING PASSIVE CLIMATE WATER CONSERVATION WIND ACTIVE SOLAR

NETWORK MAPPING : MORPHOLOGY

SYMBOL	TITLE	DESCRIPTION	EXAMPLE
	AREA RESOURCE	SPACIAL DISTRIBUTION SHOWING THE POTENTIAL USE OF A PARTICULAR APPROPRIATE TECHNOLOGY	
	DEFINED AREA RESOURCE	SPACIAL DISTRIBUTION POTENTIAL OF AN APPROPRIATE TECHNOLOGY AFTER BEING SUBJECT TO ECOLOGICAL LAND PLANNING DETERMINENTS.	
	POINT RESOURCE	DEMONSTRATES THE LOCATION OF A PARTICULAR APPROPRIATE TECHNOLOGY IN USE, COINCIDING WITH ITS AREA RESOURCE. IT ASSUMES THIS TECHNOLOGY FITS ECOLOGICAL PERAMATERS.	
	MULTIPLE POINT RESOURCE	A POINT RESOURCE THAT UTILIZES A COMBINATION OF AREA RESOURCES	EARTH MATERIALS WITH PASSIVE SOLAR TECHNOLOGY.
	NETWORK RESOURCE	DEMONSTRATES THE EXISTENCE OF A REGIONAL DISTRIBUTION BASED ON APPROPRIATE TECHNOLOGY SOURCE POINT. AN INCLUDE APPROPRIATE TECHNOLOGY HARDWARE OR INFORMATION.	
	PARTIAL FEEDBACK NETWORK	THE EXISTENCE OF ACTUAL EXCHANGE MATERIAL OR ENERGY FOR INFORMATION DEALING WITH APPROPRIATE TECHNOLOGY.	
	COMPLETE FEEDBACK NETWORK	REGIONAL EXAMPLE OF ONE APPROPRIATE TECHNOLOGICALLY PRODUCED MATERIAL OR ENERGY FOR ANOTHER AT BASED MATERIAL OR ENERGY, EACH WITH ITS OWN AREA RESOURCE	
	OVERLAPPING FEEDBACK NETWORK	MORE THAN ONE LOCAL SOURCE SUPPLYING SIMILAR APPROPRIATE TECHNOLOGY LIFE SUPPORT NEEDED.	SEVERAL EARTH BUILDING DISTRIBUTORS AT ONE LEVEL
	INCOMPLETE SET	BASIC INDIVIDUAL LIFE SUPPORT AREA RESOURCES AND POINT RESOURCES EXISTING IN AREA BUT LACKING COMBINED USE BY ANY ONE POINT RESOURCE	EARTH USE SEPARATE FROM PASSIVE SOLAR, SEPARATE FROM WIND ENERGY USE
	COMPLETE SET	ALL EXISTING AREA RESOURCES MUTUALLY USED BY POINT RESOURCES.	
	DIVERSE SET	TWO OR MORE COMPLETE SETS (PARALLEL USE OF DIFFERENT AREA RESOURCES BY A NUMBER OF POINT RESOURCES)	TWO DIFFERENT EARTH CONSTRUCTION TECHNIQUES WITH TWO DIFFERENT H_2O CONSERVATION TECHNIQUES.
	BENEVOLENT SET	A BENEVOLENT ENVIRONMENT IN WHICH ALL ESSENTIAL LIFE SUPPORT EXISTS WITHIN AREA RESOURCES AND ARE BEING RECOGNIZED BY LOCAL POINT RESOURCES	LOCALLY AVAILABLE FOOD PRODUCTION, WATER, BUILDING MATERIALS, PASSIVE SOLAR, ACTIVE SOLAR, BIOMASS

PARTIAL FEEDBACK NETWORK



AUSTIN, TEXAS

POINT RESOURCE PARTICIPANTS

① WHEATSVILLE FOOD CO-OP
② WOODY HILLS FOOD CO-OP
③ NEXUS HOUSING CO-OP
④ ZIGS ORGANIC FARM
⑤ GREEN BRIAR SCHOOL