Utah citizens will be going to the polls this November to vote on whether or not Utah's Land Use Act will become law in the state. What does the act mean in terms of land use in Utah? What is its legislative background? What are its economics? Are there alternatives available in terms of its mechanics?

This issue of Utah Science explores these and other questions voiced by citizens in the state who are both for and against the legislation. As in any university where the free exchange of ideas is the norm, Utah State staff members writing in this issue differ, sometimes markedly, in their opinions. The results should give readers a fairly good cross section of views on one of the most emotion-packed issues to have hit Utah in many years.

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Land Use Legislation:

PEDDLING UPHILL BACKWARDS

B. DELWORTH GARDNER

Few recent issues have been more hotly and extensively debated than land use planning. Proponents present it as the last hope for prudent conservation and use of precious natural resources. Opponents view it as the latest and most serious example of pervasive government encroachment on the rights and liberties of the individual citizen.

In truth, land use planning is neither a panacea that will prevent private exploitation of natural resources nor is it an irrepressible goblin of governmental intervention that will destroy individual freedom. A review of the proposed federal and state legislation instead indicates a reality somewhere in between.

ALTERNATIVE NATIONAL BILLS

Two rival federal bills are under consideration; the so called “Administration Bill,” and the “Jackson Bill,” named after Senator Henry Jackson (D-Washington), the chairman of the Senate Interior Committee.

The Administration Bill was introduced for congressional action in

One is hard pressed to find a legislative issue in recent years that aroused any stronger emotions on both sides.
February, 1971 and was reported out of the House Interior Committee in August of 1972. The Rules Committee of the House, however, has not yet scheduled a vote on this or any other land use bill.

The Jackson Bill has twice passed the Senate, first in 1972 and again in 1973, but has not cleared the House. In fact, the House most recently killed this bill in committee on June 20, 1974.

**MAIN THRUST: STRENGTHEN STATE ROLE**

The main thrust of both bills is similar; to strengthen the state role in land use planning and control vis-à-vis that of local governments, which heretofore have been delegated that responsibility by the states. In both bills, "the federal role is primarily limited to: 1) establishing criteria for state land use plans that will assure a degree of uniformity among the states in carrying out the legislation, and 2) providing for grants to support state planning activities." ² The proposed legislation thus recognizes that land use planning and control is of more than local interest, (at a minimum) local plans should be coordinated at the state level, and perhaps the state should play a direct role in land use decisions of interest to people in several local jurisdictions.

Of course, this is precisely the bone of contention. Many local government officials vehemently oppose relinquishing any land use control authority to state, much less federal, planners and regulators. They argue that local government is closer to the people and local interests are best preserved and protected by individuals accountable only to local voters. Curiously, this is exactly why others deem the present land use planning and control to be inadequate. In many situations the effects of land use decisions spread far beyond municipal, county, and even multi-county boundaries. Thus, citizens of Salt Lake City, for example, have a vital interest in the land use decisions made in Wasatch and Summit Counties where they recreate. The more people there are in a given area and the greater their affluence and mobility, the larger is their stake in multi-county and state planning. We who live in the less-populated states are only now beginning to sense the urgency of this matter. Most of the country is engulfed in the problem already, which accounts for the great pressures on the federal government to promote planning at the state level.

**A LAND USE PROGRAM WITHIN THREE YEARS**

The federal bills differ in details of timing and management. The Administration Bill requires that each state perfect a land use program within three years after enactment, which program would include a "state-wide land use planning process." Federal grants would be available to each state for three years while it develops its program, and afterward, indefinitely, for program management — subject to annual review. The initial authorization is for eight years, with 40 million to be divided among the states granted annually for two years, 30 million for the next four, 20 million for the seventh year, and 10 million for the eighth. The federal share is two-thirds of the total program costs and the state share, one-third.

The Jackson Bill permits three years for program planning and an additional two years for final implementation. Grants are more liberal under this bill: 100 million would be apportioned annually to qualifying states over a period of 8 years; an additional 15 million would be available annually for 8 years for solving critical interstate planning problems. The Indian tribes would divide planning grants of 10 million. Two million is allocated for research and training. Under the Jackson Bill, the federal share is 90 percent of the total for the first five years and 60 percent for the remaining three years.

¹Land Use Planning and Controls Requirements for Agriculture: a statement prepared by an ad hoc committee of the Western Agricultural Research Council for the Western Governors Conference, March, 1974, p. 4. ²Ibid, p. 4.
Emery, Garfield, Grand, Juab, Millard, Morgan, Piute, San Juan, San Pete, Sevier, Summit, Uintah, Utah, Wasatch, Washington, and Wayne.) Utah's Land Use Act thus will be placed on the ballot next November, and all voters will have an opportunity to express their preferences. A simple majority will pass or defeat it.

**PRIMARY PROVISIONS OF THE ACT**

In the first place, the legislature saw that the general welfare of this state demands a planned land use policy to insure the orderly use and development of land and related natural resources and to protect and preserve the private and public interests in such land and resources for the benefit of present and future generations. The achievement of such a policy requires that the state assume a more positive role in encouraging, assisting, and coordinating land use planning within local jurisdiction. This quote from the Act clearly states the major purpose of the Act as well as the rationale for state intervention in local land use decisions.

The Act creates a "land use commission," which is to be the executive body responsible for the state role elaborated above. This commission will have nine members who are to be appointed by the governor and approved by the senate. Each multi-county planning district will provide at least one member, and the following interest groups shall be represented: elected county officials (one from an urban area and one from a rural area), elected city officials (one urban and one rural), a representative of industry, a representative of either the land developers or home builders, a representative of environmental interests, a representative of agricultural interests, and a citizen at large. Commissioners will serve terms of four years, except those initially appointed for shorter terms in order to stagger appointments every two years. The commission shall elect one of its members as chairman.

The Executive Director of the commission shall be the State Planning Coordinator, and offices for the commission shall be established within the offices of the State Planning Coordinator.

**FUNCTIONS, POWERS AND DUTIES**

"The commission is authorized to perform and exercise the following functions, powers, and duties:

1) Formulate a comprehensive state land use plan in which all land and other natural resources in the state are considered through a land use planning process ..." This planning process involves organizing a data base, preparing a resource inventory, compiling demographic and economic data, training local government officials in land use planning, and involving local officials in state planning. The process is also to encompass coordinating local and multi-county area planning activities at the state level, assuring consistency of state agency programs with the state land use plan, and coordinating land use plans of local governments, multi-county associations, and Indian reservations with those of various federal public land management agencies.

2) In cooperation with local governments, the State Commission is to publish a set of guidelines, mutually agreed upon, that will provide direction for local land use plans. The Act specifies the considerations that shall be used in developing the guidelines.

The State Commission is also to:

"3) Develop, articulate, and represent the state position relative to land use policies and programs proposed by federal agencies in accordance with the directions of the governor and the legislature.

"4) Receive, allocate, and disburse funds made available to the state"

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*Ibid, p. 5
under federal land use legislation.

"5) Review and comment on all requests for federal assistance which may have an impact on land use within the state. . . .

"6) Establish . . . a vehicle which will facilitate direct state and local participation in the development, revision, and implementation of land use plans, guidelines, and rules and regulations promulgated for public lands administered by federal agencies in the State of Utah.

"7) Promulgate and formalize agreements with each of the federal agencies . . . that will support and further a single land use planning process . . . within the state.

"8) Explore with and make recommendations to agencies and local governments concerning acquisition of, exchange for, and use changes of federal lands within the state for public or private benefit.

"9) Adapt rules and regulations consistent with the Utah Administrative Rule-Making Act."

CRITICAL AREAS OF GREATER THAN LOCAL CONCERN

The final substantive section of the Act requires the State Commission, in cooperation with local governments, to designate critical areas of greater than local concern that require special planning treatment. Procedures are stipulated for holding public hearings relative to these special areas.

Finally, the Act specifies how the commission is to report its activities to the legislature and appropriates a sum of $306,000 to the commission for the fiscal year ending June 30, 1975.

Utah's bill obviously does not call for a shift of basic land use control from local to state officials. "Coordinate" is the word that best describes the state role as outlined in the bill. The commission would prepare and publish, with agreement of local officials, guidelines and criteria for planning that would at least provide some uniformity to the factors considered by local planners. This is hardly state planning in lieu of local planning. The commission would also coordinate the interests of the state in connection with the plans of the federal agencies in the use of the federal lands in the state.

LOCAL CONTROL STILL HOLDS

Since the commission is held responsible for designating critical areas of greater than local concern, some people believe that the responsibility for planning the use of these areas is thereby moved from the local to the state level. Such an implication is hardly warranted, however. The bill specifically states that the designation of these "critical" areas should be jointly produced by the commission and the involved local planners. A relevant question would seem to be: "What happens if the commission and the local officials differ in their opinions?" The answer is that absolutely nothing in the Act suggests that the state view would prevail. No sanctions or penalties are provided for in the legislation that would force local interests to be subordinated to the broader state interests. No doubt such omission was the specific intent of the legislature. It is precisely this lack that proponents of strong state land use planning find most objectionable about Utah's proposed law. The law is considered weak because the state cannot force its will on local communities. Fears of state domination of local interests that are expressed by some local officials therefore do not seem warranted as related to the realities of the pending state legislation.

In any case, the issue will be settled by the ballot this fall. Utah citizens thus will have the final say as to whether or not they want even minimal recognition of the broader issues to influence land use decisions in the state.

B. DELWORTH GARDNER is professor and head of the Department of Economics.
IN UTAH—
PLANNING

AT THE LOCAL LEVEL

C. M. McKell

Land use planning at the local level is not new in Utah. Early pioneers worked together under the direction of their appointed leaders to determine the best places for communities, farms, and grazing lands. In almost all cases, these early pioneers carefully assessed the potential of the land to support communities in terms of dependable water supplies, safe building sites, productive agricultural land, and safety from floods and other disasters. The communities themselves were planned with regard to location of streets, churches, businesses, homes, and even garden plots for the residents. Cooperation in planning was felt necessary to insure long-term productivity of the land and provide a means for solving conflicting viewpoints.

HOW PLANNING WORKS

All segments of society ultimately benefit from wise land use. Land use planning involves the establishment of a series of objectives and criteria for land use in a county so that landowners have a guide for their decisions. For example, a dairy owner can plan to expand his dairy barns and increase his milking parlor facilities with some degree of confidence: The county master plans should assure him he will not be forced out of business by urbanization of an agricultural area. If it came to that point, the Greenbelt Amendment would save him from higher taxes but not from the problems of farming among unsympathetic urban neighbors.

If agriculture is to remain viable in Utah and other areas of the nation, the goals of agriculture must be included in the goals of the master plan and in the day-to-day decisions made by elected officials. Some people feel that complete freedom to use the land as the owner sees fit is the only way that private rights can be assured. Others say that unplanned land use does not take into account the fact that each of us in our use of our land is likely, at sometime, to encroach upon the private rights of our neighbors downstream or on adjacent property. Such uses might include the discharge of waste products, the generation of offensive odors, or the sale of property in a way that drastically affects the potential price of adjacent productive land.

The planning process has its problems with some of the tools used to implement planning such as zoning, taxation, and purchase of development rights. Zoning an area for particular uses such as residential commercial may result in a possible “windfall” profit for owners of the land so zoned while an adjacent land owner is denied the “higher” use category and thus the opportunity for a profit. Some method of creating more equity in such cases is needed.

Another problem is how to reach consensus in setting planning goals. Not all people will agree on each major goal for community or county growth. Considerable effort must be given to public involvement in formulating and reviewing goals and in the day to day conduct of implementing them.

Letting the marketplace decide the resolution of land use issues may not always solve the problem in its entirety because the interests of future generations may not be included in a transaction.

A planning process that takes all of these uses and problems into consideration can help keep various
use patterns healthy over the long term. Without planning, agriculture, as an industry, will find that prime agricultural lands are lost to metropolitan and industrial expansion. Operation of the less productive lands which remain could then be plagued with higher operating costs and inflated taxes caused by community service demands of citizens in outlying, unincorporated subdivisions.

PRESENT-DAY LAND USE PLANNING AT THE LOCAL LEVEL

In today’s Utah, land use planning authority is vested in the elected officials of counties and cities. This authority was originally reserved to the states under the 10th Amendment of the U.S. Constitution, which permits the states to enact laws to promote the order, safety, and general welfare of society. The states delegated the planning power to local governments.

County commissioners receive their authority to regulate land use in the unincorporated territory of counties under Title 17, Chapter 27 of the Utah Code Annotated. The commissioners also have the power to zone all or any part of the unincorporated area of the county.

The legislative body of any municipality in Utah also has authority to regulate land use. Their authority is given in Title 10, Chapter 9 of the Utah Code and reads: “City legislative bodies may enact zoning ordinances which regulate the height, number of stories, size of buildings and other structures, the percentage of lots that may be occupied, the size of yards, courts and other spaces; the density of population and the location and use of buildings, structures and land for trade, industry, residence or other purpose to promote health, safety, morals, and the general welfare of the community.”

The authority vested in the elected officials of counties and cities is not absolute and must not be exercised in such a way that deprives a person of the use of his land. It does insure, however, that no person can use his land to the detriment of others in the community. So it is obvious that a fine balance must exist between the ways land is used by the individual and whether such use promotes or, at the least, doesn’t detract from the well-being of society in general.

ORGANIZATION

At the county level, the organizational structure of land use planning consists of county commissioners who are authorized to make final decisions on land use questions. In counties having populations of over 15,000, a county planning and zoning commission must be appointed by the county commission; otherwise the commissioners themselves may act as a planning commission.

The function of each planning and zoning commission is to study issues from all points of view and make recommendations for decisions by the county commissioners. Planning and zoning commission meetings are public, and the findings and discussions should be made available to the people through the press. The planning commission then gives its recommendations to the county commissioners. Before the county commissioners can make a final decision on an issue, they must hold a public hearing to obtain the views of citizens and in this way hear any conflicting viewpoints. Following a public hearing, the county commissioners may then make decisions.

This scheme of operation is about the same for cities. City councils are authorized to make decisions, but on the recommendation of a zoning and planning board, if such exists. Public hearings are also required before final decisions can be made.

Problems of a magnitude greater than county boundaries sometimes are considered by multi-county councils of governments to obtain a broader viewpoint and coordination. However, the final decisions must be made by each county involved because multi-county councils do not have decision-making power except through individual county commissions.

THE COUNTY MASTER PLAN

Most counties of Utah have developed a county master plan. This master plan is a statement of the way the county should grow and develop in the future. It is an official document to guide the way citizens and county officials make plans for future land use. Obviously a county master plan must be kept up-to-date and reflect any changes in growth or goals that people in the county develop. If the guidelines and concepts of a county master plan are followed, they can exert a stabilizing influence as communities and industry develop.

A master plan generally includes information about the basic resource capabilities of the county, including its soils, prevailing climates, sources and qualities of water, extent and location of agricultural and grazing lands, mineral resources, timber, scenic areas that may support a tourist industry, and other factors relevant to the economic and social life of the county. The plan should also include information about the community or communities within the county, such as population, population projections, employment, industry, agriculture, commercial and industrial developments, schools, transportation, recreation, tourism, and other aspects of the communities that indicate the kinds of requirements that people in the county have for the land.

Based on the total information, a set of guidelines or goals is devised that projects into the future desires of the county’s citizens. Some examples of goals are to: maintain agricultural productivity, encourage (or discourage) development of industries based on natural and mineral resources, preserve open space and scenic beauty, encourage (or discourage) tourism, and discourage growth in areas of hazards such as flood channels, fault zones, and high water tables. Some goals may be of a long term nature and require careful planning and thinking if they are to be
achieved, while others may be relatively short-run.

To implement a county’s master plan, the county and its cities may adopt zoning subdivision ordinances, designate special use areas, and employ various taxing policies to encourage desired patterns of growth or discourage development in areas where it would run counter to the master plan and the desires of the citizens.

THE COUNTY PLANNER

Where problems of land use planning are severe and problems are complicated, counties and cities with sufficient funds may employ a professional planner. A county planner is an official employee of the county and serves the planning commission by providing data on land use requests, making special studies of planning problems, and recommending long-term policy alternatives to the planning commission and to the county commissioners. A multi-county council of governments often employs a professional planner to help them resolve problems of land use that occur over two or more counties.

CITIZEN PARTICIPATION

In a democratic society it is essential that citizens participate in the planning process. Formation of a planning commission composed of citizens from diverse backgrounds is a major way of assuring citizen participation. However, this is only one way. A most important means of citizen participation is for individuals to attend or be aware of the meetings of the planning commission. These meetings should always be advertised ahead of time, and be open to the public, so that those who favor or oppose issues being brought before the commission can be heard during discussions. Recommendations of the planning commission go to the elected officials who should also hold their business in a public meeting. County commissioners are required to hold public hearings on issues before final decisions can be made. Here again, citizen participation is essential in order that all aspects of the issues can be aired publicly and points of view heard in an open forum. Recommendations and final results must then be published in newspapers, radio and other media to further guarantee public participation and access to information.

The mechanics of land use planning obviously can be time consuming but the long-run effect is to help protect the rights of individuals as well as the public good.

C. M. McKELL is professor of Range Science and Director of the Environment and Man Program at USU.

LAND VALUES IN UTAH’S CANYON COUNTRY

"H" K. HANCOCK

Butch Cassidy and other members of the so-called “Wild Bunch” were among some of the earliest to recognize and value the unique aspects of Utah’s remote southeastern Canyonslands. At that time and for some time thereafter, the area was used primarily by outlaws and transients, but Butch Cassidy and all who rode with him have long since departed the ridges and canyons of southern Utah.

Now, little more than a decade has elapsed since any significant portion of our state or nation’s population first began to value the same unique natural aspects of this area. Reasons for seeking solitude and isolation in Utah’s Canyonlands may be different today than in 1880, but the area is surprisingly unchanged.

THE CANYONLANDS

The geographic area of southeastern Utah which has been rather arbitrarily identified as “Canyonlands Country” lies east of the Colorado and Green Rivers, and extends from the Grand/Uintah County line on the north to New Mexico on the south, and encompasses both Grand and San Juan Counties. Although the bulk of both Grand and San Juan are typical “slickrock” canyon country, the tier of four counties immediately west — Kane, Garfield, Wayne, and Emery — exhibit much of this same unique “canyonlands” physiography. The entire area is characterized by spectacular geologic formations, including stone arches and bridges, sheer rock canyons, sandstone spires and ridges, isolated snow-capped mountain
groups, and vegetation ranging from Upper Sonoran desert forms (typical of central and southern Arizona) to Hudsonian types (characteristic of central Canada).

**LAND OWNERSHIP**

As is the case with the other Intermountain states, a large share of Utah land is managed by a number of public agencies. The greatest area is controlled by the U.S. Bureau of Land Management, followed by the U.S. Forest Service, and the Bureau of Indian Affairs, in that order. With 66 percent of the state, and up to 88 percent of certain southeastern Utah counties so managed, and therefore effectively removed from local or state taxation, the problems of a tax-dependent financing of state and local governments often become critical.

Obviously, the nature of land use in the areas which are subject to local taxation, or which somehow generate revenues locally, is quite important. Non- or counter-productive use of lands which are in private ownership or which contribute to the local economy represent much less tolerable situations than might be the case under other conditions. Such uses generate less revenue and further contribute to the problem which too little taxable property creates.

**PRESENT LAND VALUES**

Due partly to the scarcity of privately owned lands just described and partly to the immensity, accessibility, and unique character of the southeastern Utah public lands, the presently recognized land values are substantial and increasing. So far as the private (and potentially salable) lands are concerned, their relative scarcity alone assures an increasing market value.

In addition to their obvious aesthetic uses, it is often surprising to note the varied day-to-day uses to which the Utah Canyonlands Country is heir — for instance, mining.

**MINING IN SOUTHEASTERN UTAH**

The unique scenic attractiveness which sets the southeastern Utah "Red Rocks" country apart is its geology. Even though these highly scenic geologic resources constitute the major tourist attraction to the area, its geology offers another and...
even greater attraction to those who recognize the more tangible rewards of mineral production from these strata.

While hardly measurable in terms of extent of surface land use, activity associated with southeastern Utah mineral deposits is now, and has been since shortly after the turn of the current century, playing a very significant role so far as the overall fortunes of the area are concerned.

From its beginnings, the importance of uranium to southeastern Utah has reached far beyond the value of the ore itself. Beginning in the early years of the century, when waste materials from southeastern Utah vanadium\(^8\) mining were made available to Madame Curie for her radium experiments, to the late 1940’s and early 1950’s when exploration for uranium deposits was instrumental in focusing national attention on southeastern Utah, uranium has provided a stimulus without which the uniqueness of southeastern Utah might still be largely unknown. The multiple rewards of access to this area are due primarily to uranium.

At present, the future of uranium (and associated vanadium) mining appears bright in the area. Currently, prices for both minerals are increasing and if forecasts are accurate, will continue to do so for at least the next decade. The current $8 per pound being paid for Uranium-308 “yellow cake”\(^a\) would more than double (reaching as high as $20.90 per pound) by 1983, with the present $2 per pound for vanadium also realizing a substantial increase.

The remaining southeastern Utah mineral wealth constitutes a very limited part of land use in the area. At present the region’s single most important other mineral resource development is the solution extraction of potash. The solution mining process which is in use, however, requires relatively little land area, primarily for shallow ponds to evaporate the potash salts.

“Interesting potential” best describes the remainder of southeastern Utah’s mineral development picture. The known low grade copper ores (with some associated silver) are not sufficiently economically rewarding to develop at this time. The value of the coal deposits just west of the Henry Mountains is currently overshadowed by the availability of deposits in Carbon County and the Kaiparowits Plateau area.

\(^a\)A very low grade, first step concentrate of U-308 ore.

Even though mining and mineral extraction are quite important to the southeastern Utah economy, they are not at present conducted on a scale which would qualify them as a major factor in the land use pattern of the area.

**OIL AND GAS PRODUCTION**

Even though the differences between geologic strata and conditions necessary for the production of uranium and oil and natural gas are significant, the land use considerations for both are similar. Neither requires extensive land areas as they are presently carried on in southeastern Utah. As the figures in Table 1 indicate, the contribution of each to the area economy more than justifies their mineral land use requirements.

At present the future of oil and natural gas production in southeastern Utah appears bright. One of the larger intermountain gas fields now in production is located in northern San Juan County and, as Table 1 shows, the production of crude oil from San Juan wells alone is the single most profitable economic undertaking in the area.

As has been the case with other public land “mineral” leases and de-
development, natural gas and petroleum activity in southeastern Utah underwent a gradual decline in the mid-1960's from which it has now recovered. At present there is as much oil and natural gas production in southeastern Utah (especially San Juan County) as there has ever been. The catalyst which the current energy shortage represents in stimulating this production (as well as expanded exploration) is obvious.

**RECREATION TRAVEL AND TOURISM IN SOUTHEASTERN UTAH**

Among the most important values associated with the southeastern Utah canyon country is its scenic appeal to large numbers of visitors. The unrestricted opportunity to visit and freely enjoy thousands of square miles of unspoiled, spectacularly scenic lands is available in few places in the world today. If the number of those who seek out this canyon country is some measure of the area's "value", it is substantial indeed. The counties of Grand, San Juan, Kane, Garfield, Wayne, and Emery account for a large share of Utah's ability to attract out-of-state visitors.

Although a considerable number of these tourists are not totally dependent on the goods and services provided in the local communities, the economic stimulus which their needs create is critical to the area economy (Table 1).

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Grand County</th>
<th>Gross Income</th>
<th>San Juan County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture (1969)</td>
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<tr>
<td>Crops</td>
<td>$39,650.00</td>
<td>$1,200,741.00</td>
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</tr>
<tr>
<td>Forest Products</td>
<td>$500.00</td>
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<tr>
<td>Livestock,</td>
<td>$494,406.00</td>
<td>$2,180,454.00</td>
<td></td>
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<tr>
<td>Poultry, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil (1973)</td>
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<td>39,288,490.00</td>
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</tr>
<tr>
<td>Natural Gas (1973)</td>
<td>939,924.00</td>
<td>1,913,683.00</td>
<td></td>
</tr>
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<td>Uranium (1973)</td>
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<td>16,172,000.00</td>
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</tr>
<tr>
<td>Vanadium (1973)</td>
<td></td>
<td>1,291,000.00</td>
<td></td>
</tr>
<tr>
<td>Tourism (1972)</td>
<td>2,860,900.00</td>
<td>1,637,200.00</td>
<td></td>
</tr>
</tbody>
</table>

**TOURIST ATTRACTIONS**

An evaluation of the regional tourism resource base reveals the concentration of a greater number of major attractions in the counties of Grand, San Juan, Emery, Wayne, Kane, and Garfield than most other states can muster overall. The spectacular and varied scenic, historic, and recreation attractions in the region have resulted in the establishment of four national parks, three national monuments, one national recreation area, and numerous state parks. Wayside attractions which would be deserving of park or monument status elsewhere are overshadowed here by a physiography so unique that only the truly fantastic seems to warrant identification. With one exception (Zion Nat'l Park) all 5 of Utah's national parks are located within the southeast canyon country. Only one other state (California) boasts as many national parks as Utah.

Added to the attractiveness which the national park areas contribute to southeastern Utah, visitors are drawn by eight major rivers with hundreds of miles of floatable thrills; a number of the most spectacular state parks in the nation; seven individual parcels of three different national forests; snow-capped mountain ranges (including the LaSal Mountains, second highest range in the state); a mule deer population which in 1973 accounted for the largest kill on any of the state's eight BLM districts; and seemingly endless miles of jeeping, hiking, and exploring country on the extensive federal and state lands, almost all of which are open to such uses.

**RECREATION DEVELOPMENT**

Other than the establishment of parks, monuments, recreation areas, and associated public access facilities, recreational development of southeastern Utah lands and waters has been minimal.

The apparent lack of interest in altering the natural landscape in order to provide a more convenient, less rigorous, more comfortable view of southeastern Utah's Canyonlands has been due in part to the visitors' enthusiasm for the region's status quo. One of the most attractive aspects of southeastern Utah's identity is that much of the area is only slightly more accessible than in the days of its settlement.

The obvious question regarding expanded recreation development of southeastern Utah is, "When?" But as experience and perspective are gained from other "developing" areas, the sensible query becomes less "when" than "how?" At present it appears that of the most significant land uses in southeastern Utah, recreation development will demand some of the most knowledgeable, far-sighted decision-making.
Among the most important values associated with the southeastern Utah canyon country is its scenic appeal to large numbers of visitors.

AGRICULTURE IN SOUTHEASTERN UTAH

Of the three major agricultural enterprises in the area, livestock production (confined almost entirely to beef cattle) is most important. The fact that the Bureau of Land Management administers over 61 percent of Grand County and nearly 40 percent of San Juan is a good indicator of land area available for beef production. The additional land which U.S. Forest Service and private holdings contribute to the total area available for grazing further enhances the area's beef production potential.

On the other hand, southeastern Utah land areas which are suited to and available for agricultural crop production are far less extensive than those used for cattle. Even so, the combined economic importance of the wheat, pinto beans, and forest crops taken from the area (primarily in San Juan County) rivals that of beef production.

Due to sharp seasonal variations of temperature and precipitation within the areas best suited to agricultural crops in southeastern Utah, farming is complicated significantly and expansion is limited.

As a rule, most of southeastern Utah's rangelands are best suited to native grass production rather than the more intensive types of crop production agriculture. In addition, the most efficient means of "harvesting" and the most effective use of the range grass is as cattle feed. Given any reasonable profit incentive, then, southeastern Utah ranchers will most likely continue to use the range for cattle, since alternative uses — for instance, switching to crop production to offset the beef price slump — are essentially nonexistent.

There have been a few recent shifts of activity within the cattle industry itself in southeastern Utah. An increasing interest in the development and sale of breeding stock in the past five to seven years has resulted in a dozen or more such operations, where only three or four existed prior to that time. There also appears to be a growing effort on the part of beef producers to inform the public of the importance and desirability of using the public lands for the production of beefsteak. Cattlemen are optimistic that their marketing efforts will help overcome objections which many people have to domestic livestock grazing on public land.

Little change seems likely in the proportion of southeastern Utah land which is presently devoted to the raising of beef cattle. The character of the land; relative remoteness from markets, which discourages more competitive farm-to-market agricultural enterprises; and the fact that there is presently no better, more profitable way in which most of these lands can be used are sufficient reasons for a continued emphasis on beef cattle agriculture in southeastern Utah.

CONCLUSIONS

The present values and uses of southeastern Utah lands should not be expected to undergo drastic changes in the near future. Population figures in Table 2 are a good indicator of the slow rate of change in the area.

<table>
<thead>
<tr>
<th>County</th>
<th>July 1, 1970</th>
<th>July 1, 1973</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emery</td>
<td>5,150</td>
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</tr>
<tr>
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<td>2,450</td>
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</tr>
<tr>
<td>San Juan</td>
<td>9,700</td>
<td>11,000</td>
</tr>
<tr>
<td>Wayne</td>
<td>1,450</td>
<td>1,500</td>
</tr>
</tbody>
</table>
Major land uses in southeastern Utah during the foreseeable future may be summarized in the following way:

1. There will be a general, although gradual, upswing in mining and mineral exploration activity, including natural gas, crude oil, uranium, and potash.

2. Agriculture, both cropping and cattle grazing, will remain stable or decline, depending on weather conditions and the market.

3. The economic stimulus which tourism and services to recreation travelers represents is presently the fastest growing contributor to the area's economy. Barring more severe energy shortages and substantially higher gasoline prices, tourism and travel should continue to expand into a nearly year-round activity.

It appears that the character of the southeastern Utah country and uses to which it is being put will be sufficiently slow in changing for Butch Cassidy and his bunch to feel quite at home among the red rocks for some time to come.

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Rezoning by Auction -- a new approach to land use decisions

CLARK WISEMAN

People who have studied land use zoning from an academic or social science point of view are mostly critical of zoning and rezoning procedures. They are seldom critical of zoning itself, but instead point out problems resulting from the way it is done.

Zoning auctions are a possible way to reduce or eliminate two of these difficulties, one of which results from the affects of zoning decisions on certain groups of people, the other from a lack of solid information on which zoning decisions are based.

Under current procedures, there is no mechanism that compensates residents for losses due to rezoning.
First, let's talk about rezoning effects. Suppose that land close to where you live is rezoned from residential to commercial or industrial use. Increased noise, traffic congestion, and air pollution mean that you are likely to suffer a loss in terms of environmental amenities. Perhaps the value of your property will decline. (In cities, poorer people often experience losses of this type when commercial enterprises move into “declining” neighborhoods.)

Under current procedures, there is no mechanism that compensates residents for such losses. In addition, there is currently no way to make the developers and other persons who will gain from the changes bear real costs inherent in the reduction of environmental amenities and property values. This can (and does) lead to poorly conceived development of aesthetically pleasing rural areas, since developers are not forced to bear the full social costs and consequences of their actions.

Then there is the fact that, currently, very little information or research enters into the zoning decision process with the result that decisions can easily reflect the values and prejudices of zoning officials rather than objective scientific criteria.

The situation is aggravated by the officials themselves tending to be drawn from groups having a special stake in the zoning process. The failure of zoning authorities to determine and quantify the economic and social effects of zoning and rezoning may only attest to the futility of such an effort. Given the multitude of tradeoffs, between such things as transportation costs and residential seclusion, locational convenience and aesthetic appeal, social gains and costs of economically integrated residential areas, the feasibility of obtaining usably accurate quantitative estimates is doubtful. The information requirements, even if all benefits and costs were measurable (which they are not), would be staggering in quantity.

Before we can define how zoning auctions may alleviate these two problems, we have to describe their “mechanics” of operation.

THE AUCTION APPROACH

Under a zoning auction system, any person or group that wanted an area rezoned to a particular classification would “vote” for the change by submitting (in a scaled bid) the amount of cash they are willing to
The auction method provides a mechanism for compensating individuals whose wealth is adversely affected by zoning changes.

pay to have the change enacted. Anyone opposed to the change could similarly vote (cast a financial bid) to have the present zoning classification maintained. The alternatives bid upon would specify how long the classifications would remain in effect after the choice has been made. If the total sum bid in favor of rezoning exceeds the amount favoring no change, the area is rezoned accordingly and each “losing” bidder is returned his bid plus compensation equal to the amount of his bid. The difference between the two sums bid (less administrative costs) is retained by the local government and may be treated as general tax revenue.

If the sum of the “no change” bids is greater, the area is guaranteed no zoning change for the predefined period. In this case, the “losers” simply receive back the amounts they bid less administrative fees. The money bid by those who voted for “no change” becomes a fund that is not available directly to the bidders. Instead, legal title to the fund would be prorated among the bidders and would become a “property right” attaching to the bidder’s property. That is, no one of the bidders can subsequently sell his land without also selling legal title to the fund share. The fund serves as a base for a “no change” bid in any future rezoning auctions. In other words, to effect rezoning in the future, bids in favor of rezoning must exceed the amount of the fund plus anything additional that might be bid by those having fund shares and others. In future auctions, fund title-holders may add to the amount of the fund or change their “vote” to bid in favor of change if they desire. If, in the future, a zoning change occurs, compensation is paid as described earlier: fund holders are returned their share of the fund, plus, an equal amount of compensation.

JUSTIFICATION FOR THE PROCEDURE

Under the proposal just outlined, if affected parties express preferences by bids for or against the proposed zoning change, then the costs and benefits are, in effect, explicitly “measured” and incorporated in the rezoning decision. It should be emphasized that these losses and benefits need not be explicit, out-of-pocket losses and purely monetary gains. Gains that come in the form of a more pleasing environment or more convenient shopping, and costs in such forms as environmental degradation and traffic congestion are “goods” for which people are willing to pay either to obtain or avoid. While it is virtually impossible for social scientists to measure in advance the benefits and costs encompassed by these forms, the amounts people are willing to bid can be seen to represent their perceptions of the gains and costs involved. The auction procedure gives individuals an opportunity to purchase nonmarketed benefits (or to purchase the avoidance of costs or losses) in much the same way that other goods are purchased in the market place. If all affected persons fully expressed their perceived gains or costs by the sizes of their bids, rezoning by auction would bring about better land use. The auction procedure, therefore, has the potential of allowing large amounts of market information to be incorporated into the rezoning decision process at a relatively small cost.

The distribution of the costs and benefits of rezoning achieved through auctions compares favorably with that of current rezoning practices. The auction method provides a mechanism for compensating individuals whose wealth is adversely affected by zoning changes. In addition, part of the gain accruing to those who successfully bid for rezoning can be captured by injured parties and society at large. Hence, the capricious wealth transfer characteristic of current rezoning practices is reduced.

IS IT FAIR?

A possible objection to zoning auctions results from the ability to bid for or against a zoning change obviously being related to a person’s wealth. The objection is that the poor would be “left out in the cold” due to their limited ability to bid, and that the amenities that can be obtained...
by zoning process should be made available to rich and poor on a more equal basis.

If we accept that zoning amenities, unlike goods such as food and clothing which are sold in uncontrolled markets, are especially important to the poor, then perhaps government policy should equalize the situation. This is a debatable issue. The same reasoning is used to justify many other types of government programs — subsidized medical care, housing, food, legal services, transportation, football stadiums, and education — and there is room for legitimate differences of opinion on what constitutes an “especially important” class of goods.

Additionally some individuals advocate general social programs that are oriented toward reducing differences in wealth — income tax reform, negative income tax, job training and the like. Different opinions regarding these two approaches result largely from different judgments of the efficiency and wisdom of government planning, the proper degree of freedom to spend one’s income as one desires, and similar issues.

Even if it is assumed that the item-by-item approach is preferable and that zoning amenities are a class of goods that should be provided to the poor, another issue remains. There is ample evidence that wealth and economic power are important determinants of current zoning (and other political) decisions. Evaluation of zoning auctions should therefore be made with current procedures as the standard of comparison, not a hypothetical, nonexistent “ideal” system. The relevant question then becomes: Will changing to an auction system reduce the amount of zoning amenities that the poor now obtain?

Another potential problem inherent in the auction approach is more technical and less philosophical than the problem just discussed. The present property owner whose land value would be decreased by a zoning change must pay to protect the status quo. The proposal would seem to imply a wealth transfer away from him in moving from the current procedure to the auction system. Several factors tend to lessen this problem. First, title to the prorata share of the zoning fund will increase his property value, since future purchasers would be guaranteed double the sum of his bid if the area is rezoned in the future. Secondly, if a future zoning change was to some extent anticipated under the current system, then with the auction system the property owner will enjoy a gain in property value by in effect purchasing a guarantee against a future zoning change. For example, suppose that the previous write-down in property value, due to anticipated future rezoning, is $2,000. The current value is $20,000, but it would be $22,000 if there existed a certainty that no rezoning in the area would occur during the next 20 years. Suppose also that the additional loss when and if the area is rezoned is $3,000, reducing the property value to $17,000. The owner should logically be willing to bid up to $5,000 to avoid rezoning since his property value would be higher by that amount ($22,000 less $17,000) if the current zoning status were guaranteed. The amount the owner would bid to preserve the status quo exceeds the true cost to him of the zoning change itself ($3,000) under the current system. The status quo is, in fact, not preserved since a source of uncertainty is eliminated, and the owner is purchasing not only a given zoning classification, but also a capital gain due to the reduction of uncertainty. Finally, the property owner in question suffers a wealth loss as compared with the present system only if we assume that no zoning change would occur. He is better off than he would be if a zoning change were enacted under the present system.

Auctions Only in Some Cases

The sheer volume of rezoning decisions would probably prevent the use of compensatory auction procedure in all cases. A hybrid rezoning process might be used to avoid the capricious wealth transfer effects of the current system and, at the same time, provide a “test” of efficient land use in certain cases. Rezoning decisions might be made by political bodies as they are now, but cases that end on a positive decision to rezone, a “referendum” auction might be held as described above. If the referendum “passed,” losers would be compensated, and no one who revealed his preferences by bid could be worse off than in the prezoning situation. If the referendum “fails,” the zoning authority’s decision would be rescinded. Property owners opposing the change would be no worse off than if the authority’s initial decisions had been final. Only rezoning decisions involving the more significant, clearly defined, and troublesome wealth conflicts might be arbitrated by means of an auction process. The auction system offers considerable promise as a superior decision process in such cases.

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Limited resource availability relative to seemingly unlimited consumer demands implies that choices must be made with regard to the allocation of those resources. The tools of economics are useful in explaining how resources are allocated under alternative types of systems and in determining which allocation is best in the sense of meeting a specified set of goals.

The economic question at issue in the debate over the proposed state land-use planning act is whether it will cause a land and land-related resource allocation different from the allocation that would otherwise be made by the market place. If, as a result of the bill, land will be used differently, the economist can play a vital role in assessing the opportunity cost of the new allocation vis-a-vis alternative allocations, especially that in a no-planning or free market solution.

The proposed land-use planning bill is unlikely to affect private land-use decisions unless it impiles some form of land-use controls such as zoning. At least one planner sees the latter as an integral part of the planning process:

"With the creation of a master plan for an area, there must also be created a means of directing and implementing the goals it sets forth. To accomplish this implementation, zoning ordinances are created."1

The following discussion is confined to only that part of the land-use planning process that would involve some control over various land uses. It is recognized that such controls may not necessarily be a part of the planning process. Section 4(2) states that the local land-use plan should take into consideration the "nature and quantity of land to be used or suitable for agriculture and forestry; recreation and tourism, manufacturing, extractive and other industries; transportation and utility facilities, etc . . . ."

It is not clear from this statement that land-use controls are or are not implied by the act.

Statewide land-use planning has been suggested as a means of eliminating or at least reducing the severity of some of the problems associated with particular uses of land. Several important questions are still unanswered, however. Will land-use planning, at least as envisioned by the legislature, resolve these problems? If such planning is successful in conflict resolution, could that goal have been attained more efficiently and equitably with some alternative program or set of regulations?

Probably the major difference between land-use controls and unplanned development is that zoning decisions substitute the judgment of one group (a planning commission, city or county commissioners, or state agency) as to how land should and will be used for the judgment of producers and consumers of land resources as made manifest in the marketplace. This might be optimal, but many questions remain. What standards are to be used in evaluating alternative plans? How will we determine if plan A is better than alternatives B, C, and D? How will we eliminate political pressures, both legal and extralegal, from influencing the use defined for particular parcels? In short, how will planning by committee prove better than planning by the market place?

While zoning can and has been used as a tool to minimize some of the problems associated with conflict-

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ing land uses, there is much evidence that such land-use controls have had significant influence in increasing land prices thus making housing more expensive, in directing land resources into less valuable uses, and in increasing the severity of local public finance problems.2

At the same time there are a number of urban areas that have no zoning and little control over land-use.3 In those areas characterized by the absence of zoning, land-use decisions have typically been made in response to market forces. The problem of incompatible land-uses in these areas (e.g., an industrial plant in the middle of a residential subdivision) has been resolved largely through the establishment of restrictive covenants at the time that land is subdivided.

It is the author’s opinion that the real pressure for comprehensive land-use planning has arisen because of the problems attendant to the development (residential and commercial) in certain areas of the state (such as the canyons east of Salt Lake City, the Bear Lake area, the new mountain subdivisions scattered about in some of the lower-density areas) that have had particular appeal in their undeveloped conditions. Some of the problems identified are truly legitimate, but others have little substance. Furthermore, in many cases, the real problems might well be rectified more efficiently by ways other than land use planning. These alternatives should be fully explored.

It must be emphasized that land-use control (zoning) is essentially an exclusionary device. That is, by zoning a piece of property in one way many other uses are simply prohibited. It does not insure that the prescribed use will necessarily be good or bad, but that in some way it will be the best use for that and other nearby particular parcels of land. It is easy to arbitrarily assign uses to land; it is more difficult to legislate good taste and design. In fact, the latter is probably largely determined by market forces. If a significant number of people in an area want well-designed homes, architecturally tasteful shopping centers and apartment complexes, and well landscaped parks, they can make these preferences known via the market. The lack of such characteristics is usually an indication that the citizenry doesn’t want or refuses to pay for such quality, and that they have about what they collectively want or can afford.

Some legal scholars argue that zoning is unconstitutional because nonresidents who are affected by such rules (particularly when it affects the cost and location of housing) are denied the right to vote on the individuals or issues involved. This may be contrary to the voting rights decision of the Supreme Court under the equal protection clause. The following succinctly summarizes this issue:

“Suburban control of metropolitan land development is a troubling reminder that the American idea of representative democracy has not yet been achieved. Suburbs alone regulate the use and development of most vacant land in metropolitan areas, yet this regulation has a pervasive effect upon the lives of people outside the borders of the suburbs... The denial of representation is all the more serious because identifiable groups are likely to be permanently excluded from participation. Restrictive land-use policies purposely exclude those who, if they have access to the ballot box, would vote to change current policies. Small and relatively homogeneous groups, immune from political competition are thus able to perpetuate their power over other, generally poorer groups.”4

Land-Use and Related Problems

Proponents of land-use legislation view it as necessary to combat a variety of problems. The following list is indicative (certainly not exhaustive) of some of the problems generally associated with unconstrained land development.

1. The cost of extending public

It is easy to arbitrarily assign uses to land; it is more difficult to legislate good taste and design.

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3For example, see Bernard H. Siegan, Land-Use WithoutZoning (Lexington Massachusetts: D.C. Heath) 1972 and Prince George’s County, Maryland, Economic Development Committee, A Study of Income and Expenditures by Family Dwelling, Apartment and Business Units and Individual School Children for the Fiscal Year 1963-64. (1963).

4Houston, Texas is the best example of a large city with no zoning ordinance.

utility services and providing continuing public services (police and fire protection, road maintenance, garbage collection, etc.) to subdivisions in predominantly rural areas is extremely high and puts an unfair burden on present residents of the local government unit.

2. Farmers are forced out of business as land necessary to agricultural production is transferred to residential and recreational uses.

3. Areas of unusual scenic beauty such as lakes, mountain sides, are being encroached upon by subdivisions, apartment and condominium complexes, and recreational developments.

4. The new and potentially new residents of the area will greatly change the culture and character of the area.

It will be useful to examine each of these problems with special reference to effect land-use controls will have on them, and to consider the possibility that other rules, regulations, and policies might be able to resolve the problem more efficiently.

The problem of public service costs is particularly troublesome because of the difficulties inherent in assigning the pro rata share of these costs to the various citizens in the locality as well as in identifying appropriate allocation of administrative and other overhead costs. For many county governments, the per family cost of providing many public services of a given quality is high because the population of the county is (1) insufficient to take advantage of economies of scale and (2) sufficiently dispersed that transportation and other costs associated with distance are much higher per family than in an area where population is more concentrated.

If the new population will be concentrated in one or several subdivisions, the per capita costs of providing public service should be reduced and a case could be made for present county residents subsidizing in-migrants so as to increase county population and lower per family costs of public services. If the added revenue from new residents is insufficient to cover the increased costs associated with their location, however, some change in the tax rate and/or tax system is probably warranted.

The number of farmers being forced out of business by development must be few indeed in Utah since the state's property tax ethic allows agricultural land to be taxed at its value in agricultural use rather than at its market value. Some economists argue that such a tax policy introduces a potential resource misallocation in that land entirely within or adjacent to developed land in an urban setting could be more efficiently converted to a nonagricultural use.

The preservation of particularly scenic or otherwise unusually valuable land-related resources (critical areas) is obviously a worthwhile objective. Where such land is privately owned and there are no economic forces at work to change its use and character there is no particular problem. The friction and conflict arise when demands for development are manifest and proposals are made to change the use of that land.

One way to preserve the land in its present state is to exclude by zoning any use that will substantially change its appearance; but this shifts virtually the entire cost of maintaining the resource in its current state onto the landowner, and causes him to incur a loss of wealth. An alternative would be for those citizens who wish to keep the land undeveloped to bid the land away from the developer (pay the market price), and then keep the land in any form they wanted. If it was determined that society in general would benefit by preserving the current use of the land, then perhaps the government should purchase the land and add it to the stock of socially-owned resources. Certainly the latter two alternatives are more equitable than the first in that those who want the resource maintained will pay for that privilege.

The use of land-use planning to maintain the culture and character of an area by excluding the possibility of development and the population

If land use controls are to be used, consideration should be given to the economic forces that would otherwise be determining the use of the land in question.

SUMMARY

If land use controls are to be used, consideration should be given to the economic forces that would otherwise be determining the use of the land in question. Land-use policies made in a vacuum sealed off from such forces are doomed to failure; there will be continuous pressure to change the zoning of parcels if the market determined use differs significantly from the use defined by the planner with ultimate resolution of the conflict decided in the courts. It is simply not sufficient to determine the use of a land parcel on the basis of its "best-use suitability," however that may be defined, when it has significantly greater value in an alternative use which may require little or no alteration in its character to make it usable for other activities.

The following court cases are but a few that have overturned exclusionary zoning practices: Board of County Supervisors of Fairfax County vs. Carper, 200 Va. 653, 107 S.E. 2nd 290 (1959); National Land and Investment Co. vs. Easttown Township Board of Adjustment, 41 Pa. 504, 215 A 2d 597 (1965); and Molina vs. Mayn and Council of the Borough of Glassboro, 116, N.J. Superior, 195 (Law Div.), 281 A. 2d, 401 (1971).

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PUBLIC POLL ON LAND USE PLANNING

H. REED GEERTSEN AND H. BRUCE BYLUVD

In recent years, the State of Utah has experienced tremendous pressures for growth and development. The state's natural resources and scenic beauties are currently attracting considerable regional and national interest. Shale oil deposits alone may lead to unprecedented growth in the Uintah Basin if fully developed. Recognition of the state's natural beauties is likewise evidenced by the recent upsurge in subdivision activity. Nearly one-half of the subdivision plats filed since 1962 have been recorded in the last 3 years. Many of these subdivisions have been undertaken without adequate consideration of potential damage to the environment or needs and interests of the general public.

With increasing pressures for growth and development, the state of Utah, as well as the American people, are rapidly approaching the crossroads of far-reaching decisions concerning what life is going to be like in the future.

There will be three basic options: (1) stop growth entirely; (2) let growth continue with few restrictions; or (3) adopt a program of planned growth on desired future outcomes. The first option would require a radical shift in values, and appears to be the most controversial and difficult to achieve. The second approach, if followed, would produce serious economic and environmental problems within a few
years. The third option would implement the necessary controls to achieve at least a minimum balance between costs to society and individual benefits. In a democratic society, it is unwise to choose any of the above options without careful consideration of what is desired by the public, for plans that encounter strong public resistance are not likely to prove useful in the achievement of long-range goals.

PURPOSE OF STUDY

Are Utahns concerned about the future growth and development of the Beehive State? What do they think should be done? Public planning agencies and legislative bodies realize the need for this type of information as evidenced by the sharp increase in public hearings dealing with issues such as land use planning. Unfortunately, this type of information often emphasizes the views by special interest groups and thus may misrepresent the feelings of the general public. In response to this need for accurate information, a long-range project was undertaken at Utah State University under Environment and Man Program sponsorship to establish a representative panel of Utah residents who could be easily contacted for their views from time to time as important issues arise in the state. In the study reported here, 1643 individual household heads or spouses were interviewed in the Fall of 1973 to determine how people in Utah feel about various land use decisions and related programs currently facing the state.

STUDY DESIGN

The sampling procedures for this study were developed in consultation with the officials in the U.S. Bureau of Census. At their suggestion, the state was stratified into planning districts and different sample sizes were determined for each of these areas. After randomly selecting households, the specific person to be interviewed was randomly chosen and designated prior to the household visit. Out of the 1643 households that participated in this study, a minimum of 150 were from the smallest planning district in the state. Statistical adjustments for disproportionate sampling in the various districts were made through standard computerized weighting procedures.

Information on basic demographics as well as land use planning and related environmental issues was collected through structured interviews with respondents in their homes in the Fall of 1973. Prior to the interview, each respondent was told that his answers would be anonymously combined with those of other randomly selected persons throughout the state.

An important test of a sample is its closeness with known characteristics of the population. A comparison of the present sample with 1970 census figures on race, size of household, head-spouse ratio, and age of household head were nearly identical with no differences exceeding two percent.

The data presented in this report are confined to representative estimates for the entire state; however, estimates for specific planning districts were also computed and are available upon request from the authors.

FINDINGS

Are Utahns Concerned About Land Use and Environmental Problems? (Yes, but some problems rank higher than others.)

From a list of potential problem areas, respondents were asked to rate the seriousness of each problem for the state of Utah both now and in the future (Table 1). Using health services as a point of reference, it is clear that Utahns are concerned about environmental problems. Over one-third of those interviewed feel that air pollution and loss of prime agricultural land to subdivisions are serious problems currently facing the state of Utah. Water pollution and highway strip developments are likewise a matter of concern.

In terms of future problems, over 50 percent of those interviewed feel that air and water pollution along with loss of prime land to subdivision will be serious problems in the future. About one-third feel that recreation homes in mountain lands and overpopulation will also be serious problems in the future.

It is interesting that the problem areas of most concern are also those that will require the most cooperative planning to alleviate. Unfortunately, these data were obtained in October 1973, shortly before the energy crisis hit the headlines. It would be informative to see how these problem areas compare with the energy crisis. One might expect to find a growing dilemma in the minds of the people of Utah; namely, how can we meet the energy crisis and at the same time preserve our natural environment?

The above findings clearly indicate that people in Utah are concerned about different aspects of land use and related environmental problems in the state. What kinds of action then do Utahns favor in response to these problems? The remainder of this report concerns this general question.

Do Utahns Favor Land Use Planning? (Three out of four say, Yes.)

Land use planning has been suggested by several individuals and groups as a necessary procedure for insuring both orderly growth and preservation of our state’s environment. However, the question of how people in the state of Utah feel about land use planning has produced much confusion, second guessing, and wishful thinking. The response of 1643 Utah household heads or spouses to the general question of land use planning, however, leaves little doubt as to their feelings. One question asked was, “On the basis of what you know or have heard about land use planning, are you in favor or opposed to it in your county? . . . in the state?” Roughly 73 percent of those contacted favor land use planning for the state as well as for their county. On the other hand, only 6 percent are opposed to its use (Chart 1).

Additional analysis not reported in Chart 1, showed noticeably more support along the Wasatch Front, Mountain Lands, and Southern regions than in the Central Utah, Un-
Table 1. Public Perceptions of the Current and Future Seriousness of Selected Problem Situations in the State of Utah (Reported in Percentages)

<table>
<thead>
<tr>
<th>Types of Situations</th>
<th>At Present Time*</th>
<th>In the Future**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Serious Problem</td>
<td>Some Problem</td>
</tr>
<tr>
<td>Air Pollution</td>
<td>33.4</td>
<td>57.2</td>
</tr>
<tr>
<td>Water Pollution</td>
<td>24.2</td>
<td>51.0</td>
</tr>
<tr>
<td>Loss of Prime Agricultural Land to Subdivision</td>
<td>35.6</td>
<td>36.0</td>
</tr>
<tr>
<td>Unsightly Business Along Highway</td>
<td>20.3</td>
<td>47.0</td>
</tr>
<tr>
<td>Health Services</td>
<td>16.1</td>
<td>38.5</td>
</tr>
<tr>
<td>Recreation Homes in Mountain Lands</td>
<td>16.5</td>
<td>30.3</td>
</tr>
<tr>
<td>Location of Electrical Power Lines</td>
<td>6.1</td>
<td>16.1</td>
</tr>
<tr>
<td>Too Many People</td>
<td>5.5</td>
<td>16.1</td>
</tr>
</tbody>
</table>

*The following question was asked: “For the following situations, please indicate how much of a problem you think each one is at the present time for the State of Utah.”

**The following question was asked: “Which, if any, of the foregoing situations do you think will be a serious problem for Utah in the future?”

Table 1. Public Perceptions of the Current and Future Seriousness of Selected Problem Situations in the State of Utah (Reported in Percentages)

As basing decisions on what is good for the environment or what is best for the majority of the people. Another 15 percent said it was simply deciding how to use the land. Slightly more than 11 percent identified land use planning with development and increased use while 15.3 percent said it was the same as zoning or public control of land. Another nine percent mentioned a variety of land related activities ranging from urban renewal to crop rotation. The remaining fourth of those interviewed said they had no idea what land use planning means.

In relating definitions of land use planning to public support or opposition, it is rather clear that those who seem to have some idea of what land use planning means also tend to be the most in favor of its use in the state (Chart 2). However, a high degree of support can also be found among those who know very little or even have opposite views of what land use planning means. In this regard, the idea of planning appears to have a positive connotation in the minds of most Utahns, at least when identified with land use decisions.
Should Someone Regulate Uses of Land? (Yes)

Most Utahns favor land use regulations, even when it comes to building the type of house a person wants in a residential area (Table 2). Although they prefer local regulations on matters of concern to communities, they do favor major state involvement where soil erosion, flood risk, or building activities near scenic spots, lakes, or historical sites are likely. Although a significant proportion feel the state should assume major responsibilities for certain situations, very few favor much federal involvement.

Additional findings not shown in Table 2 emphasize the public's desire for balanced input from local and state sources. Over 90 percent of those interviewed agreed that local citizens should have more say in how land is used in their area. However, less than 30 percent felt that the state should stay out of local

Table 2. Public Perceptions of the Need for Regulations for Different Types of Land Use* (Reported in Percentages)

<table>
<thead>
<tr>
<th>Type of Situation</th>
<th>No Regulations</th>
<th>Local Regulations</th>
<th>County Regulations</th>
<th>State Regulations</th>
<th>Federal Regulations</th>
<th>Other</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building the type of house a person wants in a residential area</td>
<td>26.8</td>
<td>52.3</td>
<td>11.4</td>
<td>4.1</td>
<td>0.4</td>
<td>5.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Developing a residential subdivision near a town or city that will require public utilities</td>
<td>6.8</td>
<td>49.5</td>
<td>22.4</td>
<td>11.1</td>
<td>0.8</td>
<td>9.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Developing a shopping center outside existing city limit</td>
<td>14.3</td>
<td>23.7</td>
<td>39.9</td>
<td>13.0</td>
<td>0.1</td>
<td>9.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Creating soil erosion and flood risk by overgrazing on privately owned mountain land</td>
<td>11.3</td>
<td>19.5</td>
<td>17.3</td>
<td>31.8</td>
<td>8.4</td>
<td>11.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Building or subdividing near scenic spots such as rivers, lakes, national parks or historical sites</td>
<td>5.9</td>
<td>15.6</td>
<td>10.3</td>
<td>43.2</td>
<td>9.2</td>
<td>15.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*The following questions were asked: "In the following situations, do you think a person should have the right to make his own decisions or should there be some regulations? If regulations are needed, should the major responsibility for these regulations be at the local, county, state, federal or some other level?"
decisions regarding land use and development. Most of those interviewed (65 percent) expressed a desire for state assistance in these decisions.

**Does Utah Need a State Planning Commission? (Yes, especially for the state as a whole)**

In response to the question, "Do you think we need a State Planning Commission to coordinate new or proposed uses of land . . . in the state? . . . in each county? . . . in each community?" Most of the respondents answered "yes" (Chart 3). The support declines, however, as one moves from state to local levels of jurisdiction. Nearly three-fourths favor a planning jurisdiction over county decisions, and 55 percent favor a commission with some jurisdiction over local land use decisions. Still, the response is nearly two to one in favor of a state planning commission even with regard to local land use.

The role that persons in Utah feel the state should play in county and land use decisions is defined in Chart 4. Several preferences were expressed in response to the open-ended question, "What role, if any, should the state play in deciding how land should be used in your county?" Eleven percent think the state should play a major role while 10 percent visualize equal participation by state and county governments. The largest population of the people interviewed (32 percent) feel that the state should be an advisor and coordinator. It is important to note that only 25 percent feel that the state should play no role in county land use decisions. On the whole, it appears that most Utahns are looking to the state for some leadership and coordination in land use planning and decision making.

**Who Should be Most Involved in Local Land Use Decisions? (Most people say property owners along with local officials, soil and land scientists and professional planners)**

The types of individuals that people in Utah think should be involved in deciding how land should be used in local areas are ranked in descend-
ing order for the state as a whole in Chart 5. As may be seen, nine out of ten think individual property owners should be involved. Nearly six out of ten favor professional planners, soil and land scientists, and elected local officials. For the state as a whole, all three categories of individuals receive about the same support. The high preference for professional planners again reaffirms the positive orientation of most Utahns toward planning in land use. A surprising finding is the low preference for involvement of real estate brokers in land use decision making; they rank about the same as local renters. In the middle are land developers and land developers and state officials who rank about the same, with 5 out 10 supporting their involvement.

Are Utahns Willing to Pay More Taxes for Local Improvements? (Yes, environmental protection ranks higher than medical services or schools)

More household heads and spouses in the state of Utah are willing to pay higher taxes to protect the environment or clean up pollution than they are for improved medical services or schools (Chart 6). Over 83 percent expressed some willingness to pay more taxes to protect the environment. A high priority is likewise placed on reducing pollution, improving medical services, and improving schools. Improved recreational opportunities and better regulation of land development also have a positive rating in terms of increased tax support. On the other hand, more than half said “no” to more taxes for promoting tourism or developing local industry. These responses, however, are based on the assumption that any increases in revenue would be spent in local areas.

CONCLUSIONS

Using household heads and their spouses as an indication of the feelings of people in Utah concerning land use planning and related issues, several points stand out very clearly.

First, there is a widespread concern for our state’s environment both as it is now and as it may be in the future. In fact, several environmental conditions are considered to be much more serious than health services.

Second, Utahns definitely support the general idea of land use planning although there is no clear consensus as to its meaning. When rephrased in terms of land use decisions, people in Utah express a strong desire for local involvement in decision-making, but at the same time they favor active state planning and coordination, particularly in certain types of land use decisions. In this regard, a state planning commission is felt to be necessary to work with counties in planning the long range uses of land in the state.

Finally, the public appears to be willing to financially support efforts to improve environmental safeguards in local areas.

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Chart 5. Land Use Decisions

Chart 6. Does Utah Need a State Planning Commission for Land Use? (reported in percentages)

*The following question was asked: “Do you think we need a state planning commission to coordinate new or proposed uses of land...in the state? in each county? in each community?”

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WILDERNESS FISHING: a study in recreational land use

JOHN F. HOAGLAND AND JAMES J. KENNEDY

The Unita Mountains, the only major mountain range in our country with an east-west orientation, are a unique Utah and national resource. Their peaks of up to 13,500 feet also harbor hundreds of alpine lakes famous for their trout and grayling fishing. Presently there are 244,000 acres of this mountain range (Figure 1) classified as the High Uinta Primitive Area and this area is now being considered by Congress as part of the national wilderness system.

With the growing popularity of wilderness trips and its easy access, portions of the Uinta Primitive Area receive heavy use. About 80 percent of Utah's population reside in five urban Wasatch Mountain-front counties, from which the Primitive Area is a one to three hour drive. This access produces some problems for the U.S. Forest Service managers. Between 1 July and 10 September 1971 about 91,500 visitor-days were spent in the Primitive Area resulting in some over-use of trails, campsites, and lake shores.

There is some debate among wildland managers as to what kinds of people use the most easily accessible and over-used portions of the Primitive Area. A common belief is that many of these users go primarily to fish: That is, they go to accessible lakes, (stay a short period of time and are only concerned with catching fish. It's also speculated that these fish-motivated users have little appreciation of the wilderness environment.

Our research examined this hypothesis. We wanted to discover what percentage of Primitive Area users fish, how important fishing was in their entire wilderness experience, and how they enjoyed their wilderness fishing. If the High Uintas become a national wilderness area, such information may prove useful in providing user satisfaction as well as aid...
in resource protection and management.

**WILDERNESS ANGLERS INTERVIEWED**

Data were collected through an interview questionnaire administered on the popular Highline Trail leading eastward into the Primitive Area (see Figure 1). A stratified sample of 25 percent was used to obtain proper representation of weekday, weekend, and holiday users. Each group was contacted and asked if any member of their party intended to fish. One fishing member, 14 years or older, was then interviewed. The total number of anglers interviewed was 131.

**FISHING IS SECONDARY**

Our study found that over half (61 percent) of the groups contacted contained one or more members intending to fish while visiting the Primitive Area. The sample also revealed that 58 percent of these anglers caught fish in the Primitive Area (usually a mean of about 9 fish a day).

Such high numbers of successful anglers suggests that fishing is a strong attraction in the Primitive Area. To examine this idea, anglers were asked in open-ended questions to rank their most important reasons for entering the Primitive Area. Unsurprisingly, fishing ranked only third (11 percent mentioning) as an important motive for visiting the Uintas. The respondents indicated that escape from routine (38 percent mentioning), and getting outdoors (21 percent mentioning) came before fishing as an attracting force.

The reported catch rates and verbal ratings of fishing enjoyment indicated that anglers were enjoying their Uinta experience. To further test the importance of fishing and its subsequent benefits, we asked how disappointed anglers would be in catching less than their normal number of nine fish per day. A majority of the anglers (69 percent) claimed they would experience no disappointment with possible 50 percent catch reductions and nearly half of them (48 percent) reacted similarly to catching no fish. When asked why catch reductions would or would not disappoint them, most anglers (61 percent) stated that fishing was "secondary" or that other aspects of their trip, such as retreating to a relaxing wilderness environment, were more important.

Considering the apparent "secondary" nature of fishing, a sample of anglers leaving the area were confronted with similar hypothetical catch reductions. Such data indicate that the catch may be more important than anglers want to admit and that fishing may only be secondary as long as a reasonable catch rate is maintained.

When asked how important fishing was in their overall wilderness experience, over half of the anglers stated it was just "fairly important." Here, anglers again attached a seemingly secondary status to wilderness fishing, although well over half the anglers expressed the desire to maintain the wilderness fishery through stocking practices and many were knowledgeable about such practices in the Uinta Mountains. Although the wild environment may be the main attraction for Uinta anglers, maintenance of trout fishing through stocking appears to be acceptable in a wilderness situation.

We also considered the effects of crowding in overall fishing enjoyment. The fishermen interviewed said they expected to see about 16 other fishermen a day (mean) and most anglers (65 percent) stated that this amount of fishermen did not bother them at all. When asked if they would be disappointed with seeing twice as many other fishermen as expected, only 34 percent claimed they would not be bothered, 36 percent would be slightly bothered, and 30 percent bothered very much. Such responses to crowding suggest that too many other fishermen might be more disturbing than catching fewer fish.

In a brief comparison of both angling and nonangling groups we found that anglers traveled greater distances to achieve their destinations. It was originally thought that anglers would travel only to the more accessible lakes, fish, and soon come out. The fact that the best fishing is found at greater distances from the trailhead, as well as the fact that anglers are visiting the country for more than the fishing rewards, helps explain this
discovery. “Escape” and “primitiveness” also seem to draw the anglers deeper into the Primitive Area.

In sum, over half the parties contacted on the Highline trail contained members intending to fish, but fishing does not appear to be the major factor that lures the angler to the Primitive Area. The “primitive” environment and a need to “get away from it all” seem more important than fishing, but fishing is an important on-site activity and a secondary motivating factor. Catch reduction and crowded conditions appear as no threat to the angler who feels angling is of secondary importance. However, the dissatisfactions of less successful anglers and the desire to maintain the lakes through stocking reveal the importance of fishing and allude to its complexity in the total wilderness experience.

SOME RECOMMENDATIONS

Our results indicate that the most important management objective for the proposed wilderness area is to maintain it as an uncrowded wilderness retreat. Protecting the natural condition of lakes, meadows, trails, plus dispersing use pressure, should be more important than improving the average number and size of fish caught.

Although about half of the Uinta wilderness users contacted carried a fishing rod, of those who did, very few could be classified as “meat fishermen.” Heavy stocking or other practices that would further increase the use of popular wilderness lakes tactic on the Highline Trail contained nonanglers alike.

If the Uintas become a national wilderness area, picnic tables, toilets, gravelized trails, or other man-made facilities will not be allowed. These restrictions are designed to maintain the “natural appearance” of an area, but they also limit the number of users that an area can accommodate without site deterioration. There are many high elevation Uinta lakes not included in the proposed wilderness area that are easily accessible by trail and are as scenic and as good fishing as proposed wilderness lakes. These lakes might be managed primarily for fishermen with stocking and some man-made facilities such as pit-toilets. They could siphon use pressure from the proposed wilderness area, hold more people, and be managed to provide better fishing. The result would be increased enjoyment for both those who go to the Uintas to fish and those who want to escape to a natural, wild environment.

We might also suggest that fishing regulations be changed to discourage those people who just want to accumulate fish. A regulation that no fish can be packed out, for example, might be desirable on certain areas of the Uintas. These recommendations recognize that many primitive area users do not fish and for those who do, fishing is only part of a complex total wilderness experience.

What to Look For

in a Lease

LARRY K. BOND

Unencumbered owner-operated farms have long been a stated goal of American land tenure policy. For most farmers, however, this tenure goal represents the last rung on the agricultural ladder. As they move up the agricultural ladder, many farm families find leasing arrangements expedient as a way to obtain additional capital for use in their businesses. Moreover, the continuing technological revolution in agriculture and the inexorable trend toward hugeness in farm businesses, many families find unencumbered farm ownership incompatible with living standard goals. Rented property must then be relied upon to provide part of their capital on a more or less permanent basis.

During the past twenty years the percent of crop land operated by part owners and tenants in Utah has increased from 53 percent to 73 percent. The question is, “What effects do customary leasing practices have on Utah agriculture?” A direct answer is not possible but the terms of a lease can definitely affect farm efficiency and its scale of operations. Total accord between landlord and tenant may not always be possible, but a lease should contain provisions which will minimize landlord-tenant misunderstanding and discord. Some characteristics of an ideal lease are discussed in the following sections.

SHARING OF DIRECT VARIABLE COSTS

Direct variable costs must be shared by lessor and lessee on the same proportionate basis as returns. These costs include such items as fertilizer, insecticides, and water — items whose “productive life” is limited to the life of the lease contract, and which have a significant effect on the quantity of output. If a crop is to be shared on a 50-50 basis, direct variable costs must also be shared on a 50-50 basis. Any differential in the sharing of direct variable costs may cause inefficient production and less than maximum profit for the farm firm.
As an example, assume that the farm operator knows that by putting on $8.00 worth of fertilizer per acre he can increase the value of his production by $10.00 per acre. If the $8.00 includes all costs of application, an owner-operator could profitably operate at this point and even expand his production somewhat since the marginal or additional returns exceed marginal or additional costs. With a 50-50 sharing of both costs and returns, an owner-tenant operation could also profitably operate at this point while expanding production.

If returns are shared on a 50-50 basis but the entire cost of the fertilizer is paid by the tenant, however, the tenant's marginal return for the fertilizer input is $5.00 since he only gets half of the crop. Obviously the tenant would not be in favor of expanding production by using fertilizer since his marginal costs ($8.00) are greater than his marginal receipts ($5.00). Hence, production is held at a less than optimum level because of the leasing arrangements.

Efficiency of production for this farm firm suffers because less than the optimum quantity of fertilizer is combined with other resources in the production process. Furthermore, the relative reduction in the use of fertilizer may change the profitability of a particular crop relative to some other crop. The result could be that more of another (less profitable) crop is produced on the farm than if it were owner-operated. Moreover, using less than an optimum amount of fertilizer also implies that the scale of operations is restricted, even though the acreage of the farm remains constant. In turn, this limits the amount of products produced for society and the potential combined landlord-tenant income.

The equal sharing of costs and returns would have little effect on the efficiency of seed bed preparation, however, and while the amount of seed used per acre might be slightly less than optimum if the tenant has to pay all the associated costs, these basic inputs must be applied if a crop is to be grown. Likewise, absence of a provision that assures equal sharing of direct variable costs and returns is not likely to affect harvesting operations.

SHARES OF COMPETITIVE ENTERPRISES MUST BE THE SAME

Two enterprises compete for resources if the output of one can be increased only by decreasing the production of the other. If two competing enterprises are shared on an equal basis, both landlord and tenant will have the same incentive in choosing between enterprises. To illustrate, suppose that costs and returns of enterprise A are shared on a 50-50 basis. A net return of $30.00 per acre is expected, so each party would receive $15.00. Now suppose that costs and returns of enterprise B are also shared on a 50-50 basis, and the net returns expected to B would amount to $40.00 per acre. Each party would have a net return of $20.00 per acre. Since both parties receive a larger net return from enterprise B, both will have the same enterprise preference.

But if returns from these two enterprises are not shared on the same basis, the situation changes. To illustrate, let the net returns to each party from enterprise A be the same as in the previous example — $15.00. Let costs and returns from enterprise B, however, be shared on a ½-½ basis, with total net returns remaining at $40.00 per acre. The landlord would receive $10.00 and the tenant $30.00. This sets the stage for potential conflict since the landlord’s share from enterprise A is greater than his return from enterprise B while just the opposite is true for the tenant. The party with the greatest bargaining power will likely specify enterprise choice. If that choice is different than would occur under an owner-operator, there would be a misallocation of resources as far as society is concerned.

ADVANTAGES OF LONG-RUN LEASES (20-30 YEARS?)

Because of normal uncertainties, an owner-operator may discount expected returns from resource investments. A tenant, however, may discount future returns at a higher rate than an owner-operator due to the added uncertainties of his tenure. This may adversely affect factor combinations and scale of operations.

Uncertainties, caused by the time span of the lease, may affect a tenant’s choice of factors of production where substitution is possible. Productivities of factors that are transformed into product only over a period of years may be discounted at higher rates than those of factors that are transformed into product during a single production period. Long-term profits from the farm-firm standpoint might benefit from using factors that are transformed into products over a period of years rather than factors that are transformed in one or a short span of years. If the lease is for such a short time that it creates additional uncertainty, however, the tenant may deem it to his advantage to employ factors that are transformed into products over a shorter period, say one production period.
RANGE COW BEHAVIOR

AND ENERGY CONSERVATION

JOHN C. MALECHEK AND BENTON M. SMITH

Energy and protein are widely recognized as two major nutrients limiting range animal production throughout much of the world. Both of these nutrients are especially scarce during stress periods such as drought and during winter months.

On some winter ranges, individual plants are small and widely scattered. Animals grazing such areas inevitably expend substantial energy in their daily search for foods and this problem can be compounded by an energy burden imposed by cold, windy weather. For example, a typical northern Utah cow is relatively comfortable in temperatures as low as 10°F, provided there is no wind, she is dry, and she has access to all the forage she desires. To maintain the same state of comfort at 20°F but with a 20 mph wind (a condition not uncommon on many of our open winter ranges), the cow would have to consume 11 percent more food just to combat the effects of cold. Obtaining this extra forage can be difficult on snow covered ranges (Figure 1).

LIVING WITH WINTER

There are numerous examples of how animals adapt physiologically to cold. Thickening of hair coat is probably the most common. Less well recognized are behavioral adaptations that allow animals to conserve or make more effective use of a limited energy supply. Recent research indicates, however, that such adaptations may be important to efficient animal production.

We observed a herd of approximately 500 pregnant Hereford cows grazing on a large crested wheatgrass (Agropyron cristatum) range in northern Box Elder County from mid-November to mid-January. This area is typical of the open, treeless winter ranges found throughout much of the Great Basin. Bitter cold temperatures, strong winds, and snow accumulations of up to 10 inches are common on such ranges.

The data in Table 1 were compiled from two winters of periodic 24-hour observations on the cow herd. They represent the average duration of activities under a wide range of environmental conditions.

The cows deviated appreciably from this average routine in response to the periodic winter storms. For example, strong winds on any particular day greatly reduced the distance cows traveled that day in comparison to the average. On the average, cows in our study walked 3.6 miles per day in the course of eating and moving to and from water. When wind speeds were in excess of 2 mph, however, travel was restricted to as little as 1.5 miles per day.

Deviations from the average daily activity schedule (Table 1) were also associated with changes in air temperature. As temperatures rose, the cows spent more than average time grazing, and conversely, as temperatures fell they spent more time standing idle, or if the sun was shining, standing so that the sun shone on their sides.

Table 1. Extent of activities by cattle on winter range.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration per day (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing</td>
<td>9.45</td>
</tr>
<tr>
<td>Ruminating</td>
<td>0.63</td>
</tr>
<tr>
<td>Standing</td>
<td>8.30</td>
</tr>
<tr>
<td>Lying</td>
<td>1.11</td>
</tr>
<tr>
<td>Travelling</td>
<td>3.93</td>
</tr>
<tr>
<td>Total</td>
<td>24.00</td>
</tr>
</tbody>
</table>

1Includes only the traveling of cows moving directly from one place to another. A considerable amount of the average 3.89"-mi. covered daily was in conjunction with grazing.

Figure 1. Cows grazing crested wheatgrass on snow-covered winter range.
REACTING TO THE BAROMETER

There were indications that the cows may have been able to sense the changes in atmospheric pressure that precede the onset and passage of storm fronts. Periods marked by abrupt changes in barometric pressure were followed by periods when cows grazed for longer-than-average times. Since changes in barometric pressure are associated with many other changes in atmospheric conditions, however, it is difficult to say whether the cows were responding directly to pressure changes or some other climatic event.

Grazing, walking, and standing all require an expenditure of energy by an animal, and, depending upon conditions, these expenditures can represent a sizable part of that animal’s total daily energy budget. Using previously published data on the unit-energy costs for various activities, we calculated that the total cost of walking, standing, and grazing represented roughly one-third of the total energy required daily to maintain the pregnant cow. The remaining two-thirds of the daily energy requirement would be devoted mainly to such processes as ruminating (cud chewing), basal metabolism (including such functions as breathing, blood circulation, and secretion of glands), maintenance of body temperature temperature (known as “thermo-regulation”), and building the unborn calf.

ENERGY CONSERVATION

All of these physiological processes ultimately depend upon energy liberated from food, and the cow has little or no voluntary control over them; hence they offer no possibilities for energy conservation. On the other hand, voluntary activities can be controlled to some extent and apparently offer some energy-saving alternatives to the range cow. For example, cows can seek sheltered depressions and stand with their tails to the wind, thus curtailing the energy expensive activities of walking and grazing, and losses of body heat. Such behavior probably effects at least a short-term saving of energy, this saving can then be applied to the higher priority function of thermoregulation.

A range cow, however, is obligated to spend a certain amount of energy walking and grazing to obtain her daily ration of food. Our cows reduced the effort devoted to this task during 1- or 2-day periods, suggesting that they would subsequently need to increase these efforts if they were to maintain a condition of balance with respect to their average daily consumption of food. This is indeed what the cows appeared to do, but they scheduled their activities so that their increased food-gathering efforts occurred during the “warmer” days when there was less energy drain (in the form of body heat loss) from the animals’ systems. The net result appeared to be a subtle but finely-tuned regulation of activities designed to conserve energy.

In human beings such a need for energy conservation is somewhat foreign. For us, energy conservation usually produces extra pounds deposited around the waistline, and we often find it necessary to make conscious (and strenuous) efforts to expand energy in order to remove those “stored” energy deposits from beneath our belts. Our range animals, however, operate on a very narrow margin between food sufficiency and food shortage during winter months. For them, the small energy savings realized through efficient conservation might sometimes mean the difference between having a balanced energy “budget sheet” or a deficit. A cow that accumulates daily energy deficits over the winter must ultimately lose weight and, if losses are extreme, efficient calf production will be severely handicapped.

We calculated that, on cold days, the cows in our study reduced their activities to a point at which, in effect, they saved 14 percent of the energy they normally expended on warm days. This saving was probably great enough to allow them to thermoregulate or keep warm despite adverse climatic conditions.

In summary, our results suggest that domestic cattle still resort to behavioral tactics that were probably very important prior to domestica
tion. Beef producers might benefit from learning more about such traits designing management techniques to capitalize upon them.

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