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III. OBJECTIVES FOR THE PLANNING AREA

The ultimate objective for the planning of this area is to further the welfare of the people by helping to create an increasingly better environment. The basic principles of planning have to do with improving the general amenities of community life and making our communities and regions better places in which to live.[1]

In addition, there are several subsidiary goals that must be fulfilled to achieve the ultimate objective. Perhaps the most basic of these goals is that of the well-being of the people both physically, mentally, and emotionally.

The design proposals should meet all minimum standards of sanitation and safety. For example, noise, dirt, smoke, odors, and air pollution should be kept to a minimum; a pedestrian should be protected from traffic; doctors and their services should be readily accessible; there should be better educational opportunities as well as cultural and recreational opportunities, etc. Aside from these more obvious factors, there must be an environment in which the

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[1] Herbert H. Smith, The Citizens Guide to Planning (West Trenton, New Jersey: Chandler-Davis Publishing Company, 1969), p. 20.

inner life can flourish, no less than the outer life.[2] A chief cause of failure in social experiments has been a misconception of the principal element in the problem, the human. Among the greatest needs of man and of society today are these: "A worthy aim and opportunity to realize it; work and ends worth working for."[3]

Another goal, suppletory to the inner life, is the freedom of choice. An individual must have the maximum freedom in choosing his own habitat, facility, service, activity, or neighbors.[4]

An important part of planning is the injection of diversity and variety into a meaningful organic pattern. A well-functioning area gives each inhabitant a free choice between sociability and privacy, affording him the opportunity to express this human gregariousness in meeting with others or disappearing alone if that is his desire.[5] There should be vast spaces and intimate spots and an admixture of the public and private domain.

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[2] Charles M. Haar, Land Use Planning (Boston: Little Brown and Company, 1959), p. 53. [Haar quoting Mumford].

[3] Ebenezer Howard, Garden Cities of Tomorrow (London: Taber and Taber L.T.D., 1944), p. 128.

[4] Kevin Lynch, Site Planning (Cambridge: The M.I.T. Press, 1967), p. 12.

[5] Victor Gruen, The Heart of Our Cities (New York: Simon and Schuster, 1964), p. 19.

Intermixed in several categories is the economic goals. In the past, technical and economic studies have engrossed city planners to the exclusion of every other element in life, and this can no longer be valid.[6] However, the Planning Area needs a stable and growing economy. The Planning Area has the potential because of its many resources. The pattern needed for biological survival and economic efficiency should lead to the social and personal fulfillment so necessary for the inner life.

The Planning Area when completed should be functionally adequate and have optimum communications. It must be determined how best to provide a proper, harmonious, arrangement of land uses, efficient circulation, desirable light, air, and general amenities of community life to achieve the most appropriate use of the land.[7] This must be done for the entire Planning Area as well as for each of the individual clusters of people. The Planning Area must be the coordination of land uses into a compatible, sensible scheme, and should express a unity of purpose.

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[6] Haar, op. cit., p. 53.

[7] Smith, op. cit., p. 17.

Within the planning of this area there must also be the goal of adaptability. Planning that is successful must be flexible and must be changed to meet changing conditions.[8] No area is static. As each cluster of people grows and develops and fits into the over-all pattern of the region, so does the region prosper or wither. The region must grow with the principle that such growth shall not lessen nor destroy, but ever add to its social opportunities, to its beauty, and to its convenience.[9] Planning of this area must be a continuing operation and would not end with this project.

Image quality is another relevant goal. A development should be shaped to present a coherent visual image. It should be meaningful and continuous with its surroundings.[10] Any cluster, though individual, should be coordinated with the Planning Area. Within the cluster, every detail down to the last house and the view from its windows should be conceived, planned, and built as a related part of the whole setting. For example, every building should gain from the relationship of the buildings around it. This can

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[8] Ibid., p. 18.

[9] Howard, op. cit., p. 140.

[10] Lynch, op. cit., p. 13.

be accomplished through the composition of space, mass, color, texture, etc.[11] Many architects now seem to have a fixation on monumental expression, but the central problem of American architecture is no longer the individual building but the entire city and its environs.[12] Complementing function, areas should be designed to enhance the enjoyment of those who observe them, live in them, or otherwise use them.[13] The inner man should gain from the image quality of the environment.

The goal of implementation is one to be considered. All that is to be proposed should be realistic, technically and economically. It is not my concern here to be involved with the detailed politics of the planning's implementation; I am cognizant that I lack the necessary authority to implement the project.

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[11] Haar, op. cit., p. 57. [Haar quoting Stein].

[12] Gruen, op. cit., p. 159.

[13] Ibid., p. 166.

IV. PROPOSALS FOR THE PLANNING AREA

In the present epoch, man has come to realize that the pursuit of power and material wealth has crippled his capacity for fulfillment. In the past, city planning has generally been based on narrow physical, technical, and economic assumptions that now hold little validity. Man is looking for life with a different center of gravity. The biggest potential of the Planning Area is in offering an atmosphere in which perhaps this new center of gravity can be found. The city has been given over to devitalized mechanisms, desocialized organisms, and a depersonalized society. Somehow the sense of the ultimate dignity of a person has been lost. This has not yet happened in the Planning Area. The Area has not been materially exploited and devastated by debased power motives.

Man has learned that "conquering nature" cannot be the goal any more. Nature must be understood, protected, and man must plan his developments within nature's framework. Man has discovered that when he has misused the land for material benefit, there was not enough money to return the land to its original condition. Man getting the most return for money invested can never again be the prime con-

cern in planning.

The biggest resource potential in the Planning Area is that it is a "nice place to live", as well as to visit. The Area has not been devastated. The aspects of scenic beauty, recreational activities, vast areas of open space, favorable climate, unlimited flora and fauna, and a lack of air and water pollution have all been discussed in the existing conditions section. These should be exploited here, rather than an introduced technology. I propose that an economy based primarily on the living-recreational aspects would flourish. In the near future as many Americans have more free time, they will be leaving the devitalized city and looking for more recreation areas. Also, as more and more Americans retire, with yet a good portion of life to live, they, too, will be seeking an enjoyable place to spend this free time. In the more distant future, as communications and computers reduce the need of working an office job in the center of a metropolitan area, men will be looking for a place to locate away from the city problems.

The Planning Area can offer this segment of the population something unique. Many years hence as the general devastation of the land becomes more severe, so, also, will the desire for an area, such as the existing Planning Area, become more intense. Therefore, a valid economic base for

a living-recreation area will become more and more readily achievable.

With the foregoing statements in mind, as well as the general objectives put forth in Part III, I will propose methods of action.

A. Agricultural Proposals

My first proposals are for the agricultural problems. Currently, agriculture is the prime economic base for the Planning Area. However, growth possibilities in this area are limited. Most of the exploitable land is being used. In general, the farm units are too small to operate economically and competitively. So, there must be consolidation. With the consolidation, there will be even fewer jobs and more people unemployed. In my proposal, agriculture will provide a suppletory economic base; and in addition, maintain vast areas of open space.

In agriculture, there does need to be improvement in the methods of operating so the farms and ranches can produce more efficiently and economically. As part of the Planning Area's governing body, there would be a Planning Office to help plan farm and ranch operations and protect the balance of nature. This office would also provide

information and training programs to help keep the farmers and ranchers informed on new technology, management skills, market facilities, etc.

1. Proposals for Crop Farmers

For the crop farmers, there needs to be a reorganization of irrigation systems that will use adapted methods, improve efficiency, and reduce labor costs. Sprinkler irrigation, border dikes, corrugation, and contour methods are all applicable when properly planned and designed for the kind of soil, type of crop, and land form.[1] The Planning Office would have the authority to stop any systems that would cause damage to the environment. Additionally, there is a need for better planning of crop rotation and better cultural management practices. This will increase yields and reduce weed problems. The processing and marketing of seed production should be expanded. Montana uses approximately 500,000 pounds of grass seed annually and much of this can be produced in the Planning Area.[2] This will also help to reduce and control erosion. Many crop farmers need

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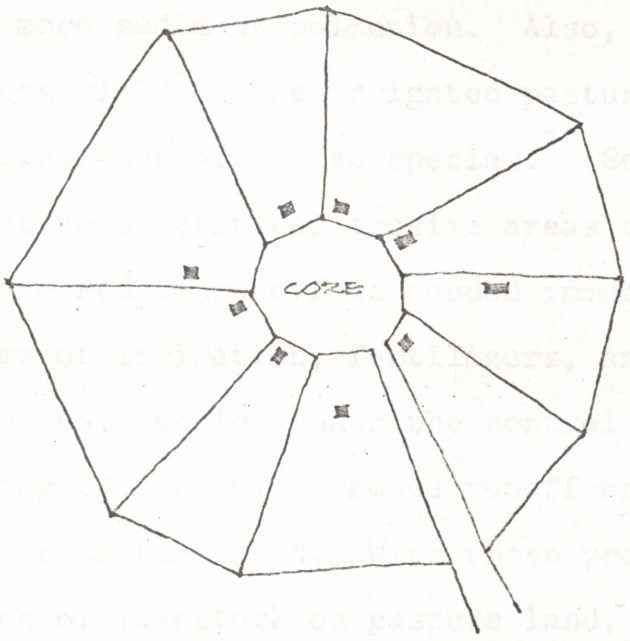
[1] United States Soil Conservation Service, Guidelines for Action Beartooth Resource Conservation and Development Project (Bozeman, Montana: United States Department of Agriculture, 1970) p. 58. See Appendix B for comment on this resource.

[2] Ibid., p. 59.

need to reevaluate the types of farm enterprises. Perhaps for their farms a shift of enterprise would provide a higher net return.

There should be more consolidation as many of the crop farm units are too small to produce competitively since they have high labor and equipment costs. This would be especially true for the low-density farm areas. (See Population Density Map, Figure 4-11, page 212, and Appendix C). I also propose for the more dense farm areas a reorganization of land ownership for two reasons. First, irregular-shaped fields are hard to operate successfully as they are harder to irrigate, the soil and its problems often vary considerably, etc. Secondly, the haphazard organization of home location lends itself to the social cost of space problems. The new organization would allow many advantages for the small farmer. (A schematic for reorganization is seen in Figure 4-1). This would necessarily be adapted only under proper conditions such as similar soils and farming operations, and the form and size would be dependent on topography, water resources, etc. Effectively, a neighborhood is being formed in this proposal. The neighborhood could share and rent equipment, reducing the high equipment cost. They could work together and share

Figure 4-1. Schematic Proposal of a Farm and Ranch Neighborhood.



labor costs. By shipping together, they could reduce transportation costs. They would have the advantages of a consolidated farm. The neighborhood would also be helpful in solving the social cost of space problems. For example, the core in the larger neighborhoods could contain a school, a neighborhood meeting-recreation area, a store, etc.

The smaller neighborhoods could cluster and form a core themselves, just as the larger neighborhoods do.

2. Ranching Proposals

The paramount problem facing the ranching agriculture is the poor distribution of livestock which has resulted in

the overuse of range in some areas. An outgrowth of this is the increased soil erosion and runoff on fragile lands, resulting in more sediment pollution. Also, there is the problem of less yield on the irrigated pasture land since there is an imbalance of forage species.[3] Seeding and temporary fencing of critical erosive areas to increase plant cover and reduce runoff is needed immediately. Improved systems of irrigation, fertilizers, and a balancing of forage species, handled under the control and protection of the Planning Office, will reduce runoff and increase benefits of the pasture land. With these proposals and the redistribution of livestock on pasture land, soil erosion from runoff will be eliminated.

As in the case of the farms, I propose that the ranches in less dense areas be consolidated and in the more dense areas neighborhoods be formed. Small ranchers could benefit by the sharing of land, water, joint feed and stock equipment, joint fencing, labor cost sharing, etc. Much of the land now used for grazing is leased, and with this reorganization perhaps joint ownership could solve the leasing problems and be more economical. If the land did continue to be leased, it would have to be on a long-term

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[3] Ibid., p. 63.

basis to make necessary development feasible.

B. Timber Resource Proposals

The recreational-living potential in the Planning Area outweighs all the timber harvesting economic potential. To begin a large timber harvesting operation would be to lessen the primary resource of the Planning Area. Currently, as was mentioned in Part II, the timber output is small, but approximately average for the state. The Forest Service's currect selective cutting and thinning is meeting the demands of existing saw mills. Undoubtedly, a better forestry program would increase the timber output somewhat, but only to the extent necessary. I see no large expansion as being necessary or desirable.

The proposed Planning Office would regulate and control the timber resources. This office would also develop and implement an effective timber fire protection program between the counties and the state office of the United States Forest Service. It will be necessary for them to establish rural fire districts and provide fire fighters with the necessary equipment and communications for deployment. They need, also, to be alert to detecting disease and insect damage of timber, for early detection

and treatment can avert a disaster.[4] To improve the timber resource, grazing would be eliminated on areas where there is natural reproduction. Necessarily, thinning and pruning would be intensified to improve the quality of growth. Currently, the two mills, Red Lodge and Bridger, are handling the timber output and improvement of transportation will make their operation more economical. Also, for additional timber, the proposed expansion of Nye, would contain a mill to handle the timber from the forests near the headwaters of the Stillwater River.

C. Water Proposals

The water quality is good and must be protected and even improved. A subsidiary of the Planning Office would control and protect the water resources.

The spring runoffs produce an over-supply of water and there needs to be more water storage to reduce flood damage and streambank erosion. With increased water storage, irrigation needs could be met for the full season and recreation benefits increased. Some storage sites could even provide more electrical power. The choice of a location for these must, however, be dictated by concern for proper land-use values. Detention dams on small drainages

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[4] Ibid., p. 66.

would provide stock water and reduce the sediment load in the streams. Rock riprap is needed to protect the critical areas of a stream channel that threaten destruction of valuable land.[5]

With the proposed consolidation of farms and ranches and the neighborhood farms and ranches, the management of water would change. Even now, this would help reduce the number of diversion dams by about 35, and consolidate delivery canals to approximately 80 miles.[6] The new permanent diversions and canal linings that would provide for water control would eliminate the need for gravel dikes that are annually constructed and lost during high water; would reduce seepage loss and improve production on the wet lands below the laterals;[7] could be built with the cost-share benefits provided by the neighborhoods. With these improvements, water pollution would be improved since these would reduce runoff, stabilize highly erodable soils, and avoid stream channel disturbance. (See Appendix C for several feasible watershed proposals).

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[5] Ibid., p. 61.

[6] Ibid., p. 61.

[7] Ibid., p. 62.

D. Mineral Proposals

The mineral resources can provide a substantial suppletory economic base. The current income from minerals averages high for the state and there is an even larger future potential, as many minerals lie dormant. However, in the future, there will be fewer employees needed due to the advances in mining technology. Also, it is obvious that mining cannot be a permanent prime economic base since all mineral resources are finite.

The mining can be compatible with the living-recreational resource if handled properly. The Planning Office would necessarily have the final authority on the type and location of an operation, manner in which the mining was done, etc. Before the Planning Office could have this control, it would be necessary to achieve legislation in the state congress that eradicates the law of preferential mining rights.

Without control on mining activity, some severe problems have developed. Surface exploration of mining claims has destroyed the protective plant cover causing soil loss and sediment damage to streams and farmland. Severe gully erosion has occurred where roads and trails were carelessly constructed on steep slopes. Archeological

treasures have been unknowingly destroyed in mining exploration.[8] Some land has been devastated and waste material has often been carelessly dealt with. The Planning Office would insure reseeding of disturbed areas, check plans for roads to insure that there would be no gully erosion, insure that sediment traps or basins to desilt runoff areas are provided, check on the natural, historical, and archeological values of the area, insure that the land is well handled, and insure that the waste materials are concentrated and disposed of in an acceptable manner to avoid air and water pollution.

Extensive Bentonite deposits occur in the Planning Area. (See Mineral Map, Figure 4-9, page 210). More exploration of these is needed along with processing plants located at Rockvale, Bridger, and Rapelje. Currently, the Bentonite is used extensively for drilling mud in the petroleum industry; for earthen lining of canals, ditches, and reservoirs in the agriculture industry; and manufacturing uses it in foundries and in pelletizing iron ore concentrate. A probable future use is in the manufacture of lightweight aggregate for concrete.

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[8] Ibid, p. 69.

The coal resources are also extensive. There are eight major beds in the Red Lodge field and three discontinuous beds in the Bridger fields, as well as the smaller Silvertip and Stillwater fields. Although the coal is of good quality, in general, the thickness of the beds in relation to high costs makes the present methods of underground mining non-competitive. However, future needs and advances in technology will make it economically feasible to reopen the mines. A future potential for coal lies in the energy conversion process which is already being developed, and industry is already looking toward the processing of coal to obtain substitutes for petroleum derivatives.

Good quality commercial gypsum deposits have been discovered east and south of Bridger. Currently, it is used for sheetrock, as a soil amendment in the reclamation of sodic soils, in the manufacturing of plastic cement, wallboard, and as a cement retarder. A gypsum manufacturing plant could well locate at Bridger.

There are chromite deposits near Red Lodge and Nye. In general, the chrome deposits are low in grade and located in more remote areas. (A better transportation system will help make this mining more feasible). Although the ore is not competitive with the more easily obtained higher

grade foreign ore, the potential for future use is apparent, as the foreign ore has not always proved to be available. Concentrated chromium ores are used in the production of domestic steel and new interest is being shown towards developing these deposits for the other metal constituents present: aluminum, magnesium, and iron.

The precious metals are dispersed throughout the Planning Area. There are known deposits of copper and nickel south of Nye. They are the largest mineral output of Stillwater County, and enlargements of this operation are planned. Also, south of Nye occurs gold, silver, quartz, and a recent discovery disclosed a large deposit of platinum-palladium. Near Warren, lies a large deposit of gold; however, the future economic potential here is not known.

Uranium deposits are known to occur in the Pryor Mountain area, east of Warren. Uranium minerals are valuable as a source of atomic energy, and the Office of Mineral Exploration advises there is a 50 per cent support in the exploration of this mineral where claims have been established. Also in this area are carnotite uranium salts and fluorite, but they currently have no commercial value. Undoubtedly, more deposits will be discovered.

Currently, the second largest producing oil field in Montana is the Elk Basin. There are several other smaller fields in the Planning Area, and oil companies continue to look for more. There are also several gas fields in the Planning Area, and expansion of oil and gas fields is planned.

The Planning Area has various natural stones. The amount mined will vary with the building market. Limestone rock of high grade is quarried near Warren, and is currently used mostly as the source of lime needed to refine sugar. Sandstone rock has been quarried from the Columbus area in the past and can be reopened whenever there is a demand. Marble is located at the head of the Stillwater River, and travertine marble deposits in the Deadman's Creek area are currently being mined. All of these natural stones can be used for new building in the Planning Area.

Suitable clay deposits for the manufacturing of brick and ceramic products are found in the Fort Union formations in western Carbon County. Fromberg has had a brick plant in operation in the past which died with the negative population growth. The Fromberg clays have been described as being easily ground and processed and as having a firing range of 1900 to 2000 degrees Fahrenheit. With growth in the Planning Area, the brick could be a valuable

building material.

The Planning Area has large deposits of sand and gravel for use as construction aggregates. The need for these would grow with the building of new roads and highways. There is a pure white silica sand deposit, west of Silesia, which has not been developed but holds potential and economic value. Silica sand is used in the manufacture of glass, sand blasting, molding, and has other specialized uses.[9]

E. Recreation Proposals

As has been discussed previously, the biggest potential for the Planning Area lies with the recreation-living resource. Currently, this resource is virtually untouched. Development in this area is needed immediately to reverse the negative population trend and to begin a solid growing economic base.

The recreational potential will remain limitless if used properly. The Planning Office would necessarily have

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[9] The technical mineral resource information was compiled with the aid of Comprehensive Plan for Stillwater County, Comprehensive Plan for Carbon County, Guidelines for Action Beartooth Resource Conservation and Development Project, and pamphlets published by the Montana Bureau of Mines and Geology.

the final authority on all projects as they are responsible for protecting this resource. They would also work in conjunction with the U. S. Forest Service, the Bureau of Land Management, and the National Park Service on all projects, as well as any private enterprise planning development in the Planning Area. The Planning Office would coordinate development and financing between the private and public enterprises.

I propose a variety of use programs for the recreation resource for this is a resource of great potential, of which few facets have been developed.

1. Transient Visitor Proposals

The transient visitor would be a person who only plans to travel through the Planning Area or comes to spend a short period of time such as a weekend or a two-week vacation at a facility. For him, the sites should be exploited. Currently, there are many noteworthy historic sites and with the proposed network of roads, more will be accessible. Most of the existing historic sites need to be refurbished and factual information concerning these made available to the visitor. Viewing site's accessibility should also be increased and marked, as well as museums, ice caves, etc. Good advertising should be initiated to

secure recognition of the recreation values. Local points of interest should be listed on national, state, and Planning Area maps. Stopover areas of various types should also be listed. The stopover areas would be located in the proposed clusters along the main routes of transportation. Smaller stopover areas would occur along scenic routes within the Pryor and Beartooth Mountain areas, and be simultaneously trail heads, wildlife areas, dude ranches, camping areas, skiing areas, snowmobiling areas, etc. The Recreation Map Exhibit prepared by the Beartooth R.C. and D. Project, (See Figure 4-10, page 211), is mainly concerned with this type of visitor and lists what exists and what is proposed, specifically for the Pryor Mountain area.

These recreation spots work within the frame of my proposal, but care must be exercised in their expansion, for it is but part of the whole plan. I propose for the near future a controlled expansion of these facilities rather than an increase in number, as the existing are not being used to full advantage. Poor transportation is often the main problem now and must be corrected. (See Transportation Proposals, Section J).

There should be an expansion of winter recreation facilities, for few now exist. Where possible, roads

should be cleared for scenic winter sports. The skiing at Grizzly Peak near Red Lodge is only fair. A promising area for ski facilities and snowmobiling is in the Basin Creek-Silver Run area on the West Fork of Rock Creek. In this region, there are relatively flat areas for base facilities near 8,000 feet elevation.[10] There are also bowls that would provide a variety of ski slopes from beginner to expert. After more detailed studies, development there should begin. There are also other possible ski areas that are more remote. These would perhaps be best developed by helicopter lifts. With the aid of helicopters, whole ski chalets could be transported to more remote spots and moved if a different type of skiing was desired or if the weather changed the snow conditions.

Also, snowmobiling is a fast-growing winter sport. There are a few snowmobile routes and more can be developed. Groups of ranchers could profitably develop routes on land they are not using in the winter. Some possible longer distance snowmobile trails are: the Stillwater River Route to Cooke City, the general area of Basin Creek-Silver Run, and a winter trail through the Pryor Mountain area. These

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[10] Guidelines for Action Beartooth Resource Conservation and Development Project, p. 42.

trails could also be used for trail bikes in the summer. The snowmobile and trail bike areas, however, should be defined and limited as they are but one of the recreation activities here. For variety, some areas must remain more of a wilderness, big game wintering areas must be protected, and the privacy of homes must be respected. The primitive areas would be places where only man and perhaps horse would have access. (See the Recreation Map Exhibit-areas in the mountains off trail routes, Figure 4-10, page 211). This place where no telephone lines, vehicles, etc., would be allowed, would provide areas where a person who wanted to divorce himself from man-made things could find relief in nature. In the future, these areas will become even more significant.

2. Summer Visitor Proposals

The summer visitor would be a visitor who comes to stay the duration of the summer months, June to September. The visitors who now come for the summer months own their own summer home in the area. The problem is that there is no control and the homes are scattered, each taking his own spot of land. To protect the resource of land space, this cannot continue. Cabins by the East Rosebud Lake have already become so dense privacy has been lost as well as

the areas of open space once there. In prime recreation areas, I propose public acquisition of the land and a reorganization of these areas so that more people can take advantage of the space. The four areas in particular that need reorganizing are the East Rosebud Creek and Lake area, the West Rosebud Creek and Mystic Lake area, the Stillwater River area south of Nye, and the West Fork of Rock Creek-Sylvan Peak area. Individual land ownership can for now take place in other controlled areas. Other summer groups should be accomodated in recreation areas, such as youth camps and organizations of retired people. There also needs to be a provision for the people who desire summer homes off season. No one can use his existing summer home for a winter retreat now because of difficulties of access. (The actual proposals can be found in the Cluster Proposals, Section I).

3. Year-round Recreationalist Proposals

There exists now a segment of population, either retired or financially well off, who desire to live in a recreation area year round. I expressed earlier that I feel this segment will grow in the future. There have been no provisions made for these people who could help bring a healthy economic base to the Planning Area. (The actual

proposals can be found in the Cluster Proposals, Section I.)

F. Wildlife Resource Proposals

This section is closely related to the recreation section as the wildlife are one part of the recreation resource as well as maintainers of ecological balances. I choose to speak of the wildlife separately as their problems deserve attention.

To protect the wildlife, studies should be made of all species. The ones that can be hunted should be designated and the hunting should be controlled. As growth occurs, it will perhaps be necessary to subject all hunting rights to a drawing system and in the future, hunting may necessarily be completely curtailed. The Planning Office should work with the Forest Service and the Fish and Game Department to insure protection of this resource. When hunting is permitted, definite areas should be allocated and access insured. There should be public acquisition of key hunting areas and key winter range areas, (areas seen on Recreation Map Exhibit, Figure 4-10, page 211), to insure the welfare of the game. The Planning Office should aid landowners financially in maintaining food and cover for wildlife. Chemical spraying, burning, and clean till-

age reduces food and cover benefits to wildlife. Specific water areas and cattail marshes need to be developed to improve waterfowl habitat and nesting facilities. I propose such a development in the Fromberg area. A program of tree and shrub plantings in and around cultivated areas will improve cover for upland birds. Burning should be avoided during the nesting season.[11] The Planning Office should also form a program for the proper use of chemicals that is compatible with wildlife management, and insure enforcement.

A large problem facing the sport of fishing is the numbers of fish that become isolated and die in irrigation ditches each season where diversion ditch headgates are not controlled.[12] The gradual closures of headgates over a period of several days will give fish a chance to return to the stream. Also, by the proposed reorganization of irrigation systems and combining of ditches, there would be a larger volume of water left in the stream resulting in less fish damage; and with the proposed erosion control, stream pollution would be reduced. Because of the increased fishing pressure, it is necessary to restock lakes, especially mountain ones.

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[11] Ibid., p. 71.

[12] Ibid., p. 73.

G. Other Industry Proposals

From earliest beginnings, the manufacturing industry has been based on the processing of primary products of the Planning Area, such as minerals, timber, agriculture, etc.

With the decline of primary products, the manufacturing industry has declined. Already, I have made several mineral growth proposals and suggested locations where the manufacturing of various materials should be located. Proposals of agricultural centers and related manufacturing will be discussed in the Cluster Proposals, Section I.

Lack of good transportation and the lack of capital is yet another aspect of the manufacturing industry's problems. The transportation proposals will be discussed in the Transportation Proposals, Section J; and, with the proposed growth and the stronger economic base, there will be more capital. I do encourage expansion in the manufacturing industry in areas related to the resources of the Planning Area. An industry such as Boise Cascade could locate along the main east-west transportation route and have nearby access to resources of timber, sheetrock, lightweight concrete, brick, glass, possibly plastics, (plastics, a derivative of oil, is also a possible industry), etc. The manufacturing industries most suited to the area would

be determined by the Planning Office, and would have to meet all Planning Office standards in their operation. It must be remembered, though, that the economic priorities now established are first, recreation-living; second, agriculture; third, mining; and fourth, manufacturing. Manufacturing should never be encouraged to become the prime concern in the Planning Area lest it create the disasters we have seen in so many areas all across the United States.

The industry that has been showing the highest continued growth rate has been the service industry as related to tourism and the recreation resources. It has been averaging 7.25 per cent growth yearly. This figure demonstrates already the growing potential in the recreation field, and is a part of the recreational-living potential. Its growth will continue to increase with the proposed recreation growth.

The construction industry has shrunk with the negative population growth, but will assuredly grow with a population increase. To ease construction costs, the materials of the Planning Area can be used such as brick, natural stones, timber, sheetrock, glass, lightweight concrete, and perhaps even plastic building materials.

The trade industry has been showing a loss in sales and employees. This has occurred because the trades have not been able to supply what the buyer wants. With a growing population, the trades will be able to expand their goods and offer what is wanted. For example, in all of Stillwater County, there is not one furniture store. Certainly, a growth in the trade industry would have to begin with a growing population and construction industry.

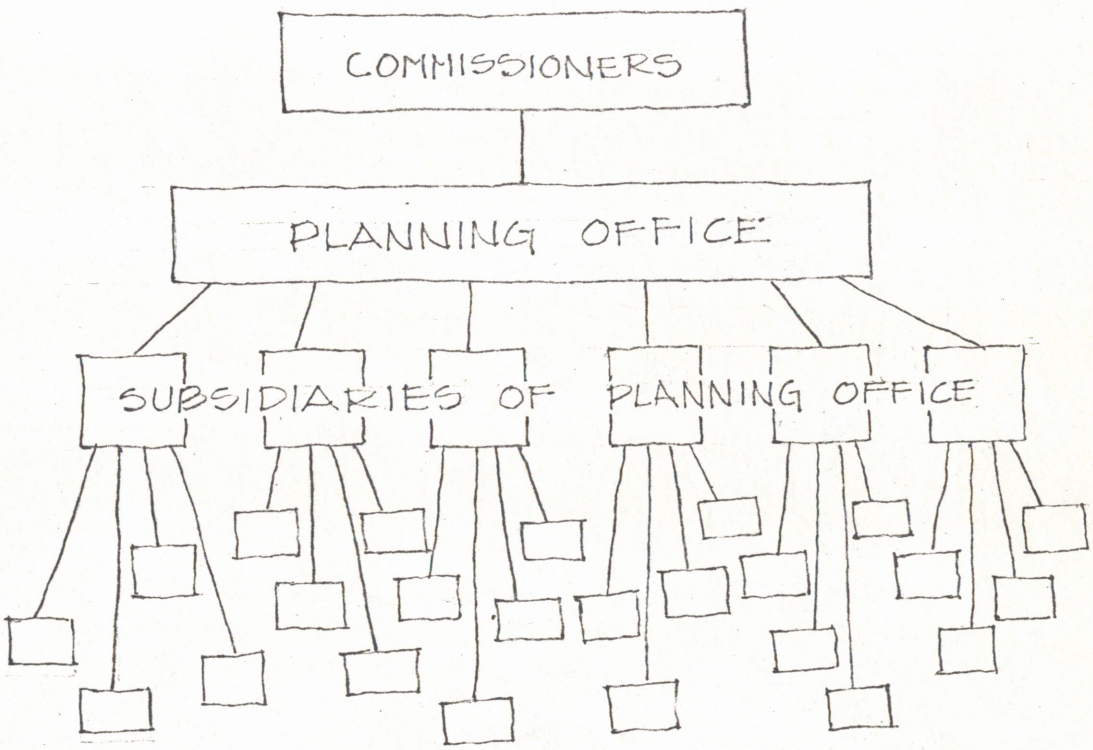
H. Governing Proposals

I believe that the only way to implement my various proposals for the Planning Area is to provide a governing body that has the final authority over both counties. One has seen the trouble with governmental bureaucracy in the past. Such an example can be seen with Urban Renewal and Model Cities. In actuality, neither has the final authority so they often duplicate work and have individual priorities. How can they obtain a unified project proposal? I propose to achieve unity in the Planning Area by joining the governing bodies of the two counties to form one main governing body for the whole Planning Area.

Currently, each county has three county commissioners, representing districts within their county, which are ulti-

mately responsible for governing their respective county. I propose that the existing commissioners join and the six would have the final authority over the Planning Area. The order of power would be to the Commissioners, then to the new Planning Office, then to the other normal county governmental offices now effectively subsidiaries of the Planning Office. (See Figure 4-2).

Figure 4-2. Schematic of Governing Proposal



The new Planning Office would be headed by a qualified planner. This office would serve as the perpetrator and coordinator of planning and have as a prime motive protection and improvement of the resources. All of their work would be subject to negation or ratification by the Commissioners.

All of the normal county governmental offices would be combined to become subsidiaries of the Planning Office, such as the education offices, highway planning offices, county assessor, county treasurer, etc. This would be more economical, efficient, and insure that proposals for the Planning Area do not stop at the Stillwater-Carbon County border.

The existing county seats at Red Lodge and Columbus, as well as governmental seats at Bridger and Beartooth would maintain a small staff of governmental offices responsible for supplying information to the subsidiaries of the Planning Office, and in turn, they would be delegated certain authority for normal activities and for implementation of the Planning Office's proposals. The Planning Office would encourage maximum participation in planning projects by the local people in order that optimum personal-social relationships in an area could be realized. So, if the

local people desired something or didn't like a proposal, they would take this problem to one of the four local governmental seats. If they could not solve the problem, they, in turn, would direct it to the proper subsidiary office of the Planning Office, and this subsidiary would try to solve this problem with the Planning Office, subject to the Commissioner's ratification.

Some specific examples of the Planning Office's and its subsidiaries' duties and authority have been discussed previously; but some additional duties these need to have authority over would be littering; disposal of refuse and waste as well as air pollution and water pollution; disposal of billboards along routes of traffic; zoning, (virtually none exists now); public acquisition of lands; and the sale of property, (so that a farmer or rancher could not sell his land to a developer who wants to build a suburbia of 'ticky-tacky' houses).

I. Cluster Proposals.

I determined the clusters and their locations by using the overlay method with the series of exhibit maps presented in Section K,[General Geology and Ground Water Map, General Soil Map, (See Appendix C, for detailed des-

cription of the soils), Topographic Map, Precipitation Map, Land Ownership Map, Land Use Map, Mineral Resources Map, Recreation Map, and the Population Density Map]; and by combining and correlating the knowledge obtained through the study of the existing conditions, (Part II, History, Topography, Climate, Soil, Flora and Fauna, Water and Mineral Resources, Population and Vital Statistics, Land Modes and its Relation to Economic Considerations, Existing Public Utilities, Existing Clusters and the related social cost of space problems).

In general, all of the following proposed clusters have been chosen to meet the criteria of topography, soil, geology and water resources, availability of the public utilities, (one public utility, transportation, will be taken up in the next section), and the social cost of space problems. Therefore, in the subsequent material, only the more predominant reasons for selection will be discussed. In all cases, the term, "oasis", connotes a more densely populated area which is able to provide goods and services, (including access to places for socialization), for its constituents and other people from the surrounding areas.

1. Primary Oases Proposals

I propose four primary oases linked together in

order to reduce social cost of space problems and in order to supply an adequate population base to support the necessary services. The four primary oases would be the largest cities in the Planning Area which, linked by a prime arterial route, combine to effectively form a regional unit. Each primary oasis would contain a selection of goods and services including cultural and recreational activities, from which goods and services to the whole Planning Area would flow. All of the primary oases would have some common functions; each would have some special functions; each would have some enlarged service areas or satellite settlements which have recognized responsibilities and allegiances to the whole. Having had success with the redistribution of the existing population and the planned growth, in twenty years the primary oases would range in size from 5,000 to 10,000 people.

a. Columbus (Number 1 on the Planning Area Proposals Map Figure 4-12, page 213)

Columbus is currently one of the two existing oases in the Planning Area. Its prime economic base is in providing goods and services for Stillwater County. A secondary economic base is in being a transportation center. I feel that Columbus is in a good location so that both of

these may be exploited. With the proposed transportation, (See Section J), Columbus will be the place where agricultural, mining, and manufacturing products as well as people change their travel from north-south to east-west, or visa-versa. With this transportation situation, this would be a good place to locate agriculture and livestock markets of which the Planning Area has none. Being a transportation center and an area with expanses of open land, it would also be a good location for manufacturing operations to expand. Timberweld is here and such businesses as Boise Cascade could well locate here since many of the materials they would use would be found in the Planning Area.

The only large public airport of the Planning Area will be located near Columbus, and the people coming to the Planning Area for recreation would change transportation here, thus allowing for expansion in the service, cultural, and recreation facilities.

Columbus also has historic value, enjoyable climate, and the Yellowstone River passing through it for related boating and picnicking activities.

Columbus is characterized by the old sandstone buildings throughout the town. They are in good condition and should be restored. New buildings should consider using the sandstone quarry outside of Columbus to maintain the

unique feeling of the Columbus Area. The U. S. 90 bypass north of Columbus will handle most of the east-west automobile traffic in the future so the area now used for Highway 10 could be a good place to locate the proposed mass transportation and exchange. The CBD could then grow northward toward the county courthouse, (a possible focal point).

b. Red Lodge (Number 2 on the Planning Area Proposals Map Figure 4-12, page 213)

In the past, the economic base of Red Lodge was mining, but in more recent years, it has become tourism and the center for providing goods and services for Carbon County as the other existing oasis in the Planning Area.

For the future, I propose growth in what now exists plus a revitalized growth in the mining industry, (coal and chrome). Manufacturing and processing of the resources, (mineral and agricultural), would be in Cluster 10, east of Red Lodge, a satellite of Red Lodge. This would be necessary as Red Lodge lies in a narrow valley and does not have the space needed to house manufacturing efficiently.

Red Lodge would also be somewhat of a transportation center as three main routes converge here, as well as a prime recreation route. Its main economic base, however, would derive from being a recreation center-stepoff as well

as providing goods and services; and secondarily, a center-collection point of agriculture and mining products in the vicinity.

Red Lodge is in a naturally beautiful historic area and the views and history should be considered in the planning. Nearby areas are rich in flora and fauna and recreation potential. Red Lodge does pose some particular planning problems being located in this narrow valley. However, this area is sufficient for growth that is more vertical and condensed. In the future, less dense housing could locate up the sides of the valley. Perhaps the CBD could benefit by overhead pedestrian walkways for circulation through the CBD when two levels of the existing buildings come into use. The CBD could expand to the west and perhaps the unneeded railroad right-of-way land to the west could be made into a public park bordered on the south by the high school and civic center, on the east by the CBD, and on the west by the residential.

c. Bridger (Number 3 on the Planning Area Proposals Map, Figure 4-12, page 213)

Bridger, due to its location, would have a broad economic base. It would be a center of goods and services, the recreation center-stepoff to the Pryor Mountain recreation area, and the center-collection point of agriculture

and mining products, (coal, bentonite, timber, gypsum), in the vicinity. Also, I have proposed the processing of bentonite and gypsum to be located here, and suggest other manufacturing concerns might be interested in this area because of nearby resources.

Bridger could become a very unique place because of the diversity, if the planning is handled properly.

d. Beartooth (Number 4 on the Planning Area Proposals Map, Figure 4-12, page 213)

I propose for this area, just south of Roscoe, to become a center of goods and services and recreation-living because of its location. This area is the stepoff to two of the Planning Area's finest recreation-flora-fauna areas. This city would be designed primarily for living and recreation. Located in a scenic area with favorable climate, it could provide living facilities for the segment of the population who desire a unique place to live year round, such as retired people and wealthy people. I also propose that this be the location of the new governing body for the Planning Area, as it is more central to the population density and lies near the border of the two existing counties. The growth of this cluster would probably take a longer period of time than the other primary oases.

This cluster has been chosen for further development in Part V, as it embodies the prime resource of the Planning Area. For this reason, it is the most typical and important of the four primary oases. Also, because it is a new cluster, it needs long range preliminary planning, and affords the opportunity to reach the primary objectives without the handicap of existing limitations.

2. Secondary Oases Proposals

Bridging the distances between the primary oases are the secondary oases. They are satellite to, or dependent upon, the primary oases. Each secondary oasis would be able to provide goods and services, but not as wide a selection, as there would be less population to support it; each would have some special functions to complement its economy and make it separately important; and each may have secondary satellites dependent on it.

In twenty years, it is planned that the secondary oases would range in size from 1,000 to 5,000 people.

a. Nye (Number 5 on the Planning Area Proposals Map, Figure 4-12, page 213)

Nye would grow to be one of the largest of these clusters. Aside from being an oasis, the economic base would be divided between recreation-living and mining

because of its location. It would service the recreation area and secondary satellite of the Stillwater River as well as the smaller recreation areas of Castle Creek, Meyers Creek and Lodgepole Creek. As Beartooth, Nye is located in an area that would be appropriate for people mainly interested in finding a place to live year round. Citizens of Nye would also be responsible for a timber mill, the mining of coal, chrome, nickel, copper, gold, silver, quartz, marble, platinum, and palladium found in the Stillwater Valley. This unusual combination could provide an interesting planning design solution. Being located near a big game winter range, the historical value of Nye, and a pleasant climate would all add to the character and enjoyment of the community.

b. Absarokee (Number 6 on the Planning Area Proposals Map, Figure 4-12, page 213)

Absarokee is located so to be primarily a gathering point of agricultural products as well as a transportation exchange of mining products and people headed to or from Columbus. Being a transportation center, having early important Indian and settler history, offering nearby recreation, and being located on a naturally beautiful site, would allow for the expansion of goods and services related to tourism. Services concerned with supplying the farmers and

ranchers with the necessary items needed for their operations would also necessarily grow.

c. Rapelje (Number 7 on the Planning Area Proposals Map, Figure 4-12, page 213)

Rapelje would necessarily be a gathering point of agricultural and mining products, (bentonite and oil), heading for Columbus, and a centrally located oasis for the farmers and ranchers in the northern half of Stillwater County. Other than this cluster, only neighborhoods would exist to help reduce the social cost of space problems. With the large deposits of bentonite, a manufacturing plant could well locate here to help the economic base.

I propose the existing Rapelje relocate more to the east to reduce potential water problems. Of all the clusters proposed, this is the only one that faces lack of water problems.

d. Rockvale (Number 8 on the Planning Area Proposals Map, Figure 4-12, page 213)

This cluster would be comprised of four existing clusters; Edgar, Joliet, Silesia, and Rockvale. Due to its location, this cluster would be a gathering point of agriculture and mining products, (bentonite, coal, silica). Rockvale would also serve as a smaller transportation center,

as three main routes of transportation converge here. Located in a green-river area, it would also profit from the tourist trade. I have proposed the processing of bentonite to locate here, as well as a glass manufacturing plant. Other manufacturing plants could also locate here as it would be a nice place for employees to live.

e. Roberts-Boyd (Number 9 on the Planning Area Proposals Map, Figure 4-12, page 213)

This cluster would be formed central to the two existing clusters of Roberts and Boyd. The cluster is located to be a gathering point of agricultural and mineral products, (coal and bentonite). It would also benefit from tourism trade as it is the only cluster between Rockvale and Red Lodge; it is in a green-river area, and offers access to recreation activities in the Cooney Reservoir area and recreation areas between Red Lodge and itself.

f. Washoe-Bearcreek (Number 10 on the Planning Area Proposals Map, Figure 4-12, page 213)

Formed from Washoe, Bearcreek, and Belfry, this cluster would be an obvious satellite of Red Lodge. Because of its location, this cluster would be a mining-manufacturing cluster. This cluster is situated so that the mining and manufacturing cannot interfere with agriculture or recreation.

The residents would be concerned with the mining of coal, oil, and gas, and the processing and manufacture of their derivatives; and they would have access to the Red Lodge area recreational activities.

g. Warren (Number 11 on the Planning Area Proposals Map, Figure 4-12, page 213)

Warren would be the stepoff to a more seclusive recreation area in the Pryor Mountains. It is located to be a collection point for the nearby agriculture and mining, (gold, limestone, uranium, oil, and gas). Some related manufacturing could also locate here.

3. Tertiary Oases Proposals

In twenty years, it is planned that these oases would range in size from 200 to 1,000 people. Because of their size, they would be able to provide only the basic goods and services and would be secondary satellites parasitic to a primary or secondary oasis. These were primarily chosen for recreation-living purposes.

a. Fromberg (Number 12 on the Planning Area Proposals Map, Figure 4-12, page 213)

Fromberg is the exception to the rule for some unique reasons. It was chosen for the good clay and coal in the area and can potentially be supported by a brick

plant and coal mining. It was also proposed as a good location for a waterfowl habitat. This cluster would also receive a certain amount of business from tourists passing through as well as some who would stay to use limited recreation facilities in the area. Because of its location, I don't feel the cluster would grow large enough to be classed a secondary oasis.

b. Recreation Clusters (See Planning Area Proposals Map, Figure 4-12, page 213)

These clusters would be located in an area south of Nye in the Stillwater Valley, (Number 13, a secondary satellite of Nye); the West Rosebud Creek and Mystic Lake area, (Number 14, a secondary satellite of Beartooth); the East Rosebud Creek and Lake Area, (Number 15, a secondary satellite of Beartooth); the West Fork of Rock Creek-Sylvan Peak area, (Number 16, a secondary satellite of Red Lodge); the Bridger-Pryor Mountain area, (Number 17, a secondary satellite of Bridger); and the Warren-Pryor Mountain area, (Number 18, a secondary satellite of Warren). These areas were all chosen because of the vast recreation potential, flora and fauna, and scenic beauty. (See Recreation Proposals, Section E).

With the public acquistion of land for these areas

and a reorganization, the housing could be grouped and thus, more people housed, the area could be used by greater numbers of people, the scenic beauty and balance of nature could be maintained, housing could be designed for the best views and fit to the land, and large areas of land could be maintained for other recreational activities and the big game winter range, (winter ranges occur in the Stillwater Valley, south of Nye, in the East Rosebud Creek and Lake area, in the West Rosebud Creek and Mystic Lake area, and in the West Fork of Rock Creek-Sylvan Peak area). For those who want to own homes in the area, they could be bought, but not the land. The reorganization and building would be controlled by the Planning Office and its subsidiaries.

I have only proposed recreation "areas" as more detailed studies need to be done to find the exact location of a cluster in each area. All of these recreation-living clusters would house all types of recreationalists; transient, summer, and year round. The year round recreationalists included here would be those who want to live in a more remote, less densely populated area and would not mind the harsher winter climate here. The other year round recreationalists are located in Nye, Beartooth, and perhaps Red Lodge. The variety of types of occupants in the recreation

clusters would allow for these to function all year successfully and encourage transient and winter vacationers. Aside from winter sports, living in a winter big game range would be a valuable asset for people who come from big cities.

The Warren-Pryor Mountain cluster would be slightly different in that it would be designed and maintained for the people who are desirous of extreme privacy and want to be out of any mainstream. For these reasons, it would probably be the slowest in developing.

J. Transportation Proposals

One has seen throughout Part II, the Existing Conditions, how the lack of transportation has hindered development. Some of the biggest problems in the mining of minerals, in manufacturing, in wholesale and retail trade, in the social cost of space problems, in developing recreation potential, etc., have been related to poor transportation facilities. Changes in transportation must start immediately for growth to begin.

The transportation proposals link closely with the cluster proposals and are based on the criteria compiled from the overlay studies and a correlation of the material found in Part II, the Existing Conditions. Of prime concern

here was the geology, soil, topography, and proposed clusters and land use.

1. Primary Arterials (See Planning Area Proposals Map, Figure 4-12, page 213)

The primary arterials were chosen so as to carry the major traffic load of the Planning Area. The prime arterial forms a loop-link from Laurel, (on the edge of Yellowstone County), to Bridger to Red Lodge to Beartooth to Columbus, (primary oases which form a regional unit). A branch primary arterial runs from Rockvale to Red Lodge, dividing the main loop and providing shorter travel distances for the densely populated farm and ranch areas in the center of the loop. At Columbus and Laurel, the transportation changes to the major east-west transportation to the West Coast and the Midwest.

Construction should begin immediately to form better highways along the primary arterials. Because of the great inadequacy in the transportation facilities, this is the essential first step. This minor construction should keep in mind the future "mass transportation system". It has been demonstrated all too often in the past how mass transportation was not thought of until the area was already given over to the automobile; and then, public transportation

could not, for practical reasons, be introduced into existing areas. So, the answer has been more and more freeways in many areas, though this has not solved the problem. Rather, it has created more. Meanwhile, the area has been taken over by the automobile and its ugly fumes. I see in the near future where mass transportation will be more feasible than building bigger and better highways.

The mass transportation I propose along the primary arterials would be more than people transportation. It would include shipping of goods, agriculture goods and products, mineral products, manufacturing products, etc., much as the trains of the past did. This would help pay the costs involved in constructing it. I also foresee the farmers and ranchers using it to get to a particular oasis because it would be faster. (Possible speeds for mass transportation increase every year). The distance problems faced by the farmers and ranchers would become less important as the time needed for travel would decrease. The mobility provided by the speed would perhaps be adequate to cope with the facts of space and sparsity and would reduce the feeling of being isolated.

The planned vast influx of recreationalists would also use it if other means were provided for moving around

in the recreation areas. In the future, recreationalists will choose an airplane and/or mass transportation when the predicted highway problems across the United States expands. They will not want to waste their time on the slower smoggy highways, risking their lives. In addition, the mass transportation system could be put underground, which would be reasonable as increased speeds will reduce the use of windows, and would help maintain the natural landscape so desired in the Planning Area. Some automobile transportation would remain also, but it would be secondary to the mass transportation.

2. Secondary Arterials (See Planning Area Proposals Map, Figure 4-12, page 213)

These arterials would carry a lesser amount of traffic and flow to the prime arterial loop of the Planning Area and complete the major road network. Good highways with bussing and trucking will be adequate along these lines until the primary arterials' mass transportation is successful and expansion can be economical. Then, the secondary arterials to the recreation areas, Nye, Rapelje, and Warren, should also have a specialized mass transportation system.

3. Tertiary Arterials (See Planning Area Proposals Map, Figure 4-12, page 213)

These are existing arterials for farm and ranch areas. With the neighborhood proposals executed, these would probably change and more would be constructed. With the neighborhoods and consolidation, fewer roads would be needed and less permanent dirt and gravel roads could be eliminated and permanent roads constructed. Also, with fewer roads to these areas, upkeep would be reasonable and snow could be removed in the winter to help reduce winter isolationalism.

4. Air Service Proposals

Currently, no main air route lies over the recreation-living areas. The main air routes run east-west across the northern half of the Planning Area. I feel that the only airport to grow should be at Columbus, connecting with this main east-west route, so as to preserve the feeling of the wilderness recreation areas. The mass transportation could handle the rest of the faster transportation needed to parts of the Planning Area. Chartered helicopters and small planes would be allowed to land near Bridger and Red Lodge, and could use the existing facilities for this. The helicopters suggested for skiing could locate in Red Lodge, so to use the southeastern portion of the Beartooth Mountains.

K. Exhibits for the Regional Planning Project

The following pages are reduced xerox copies of the original overlays used in this study.

Fig. 4-3.

EXHIBIT FOR

REGIONAL PLANNING PROJECT

JERRILY KRESS ARCH 553

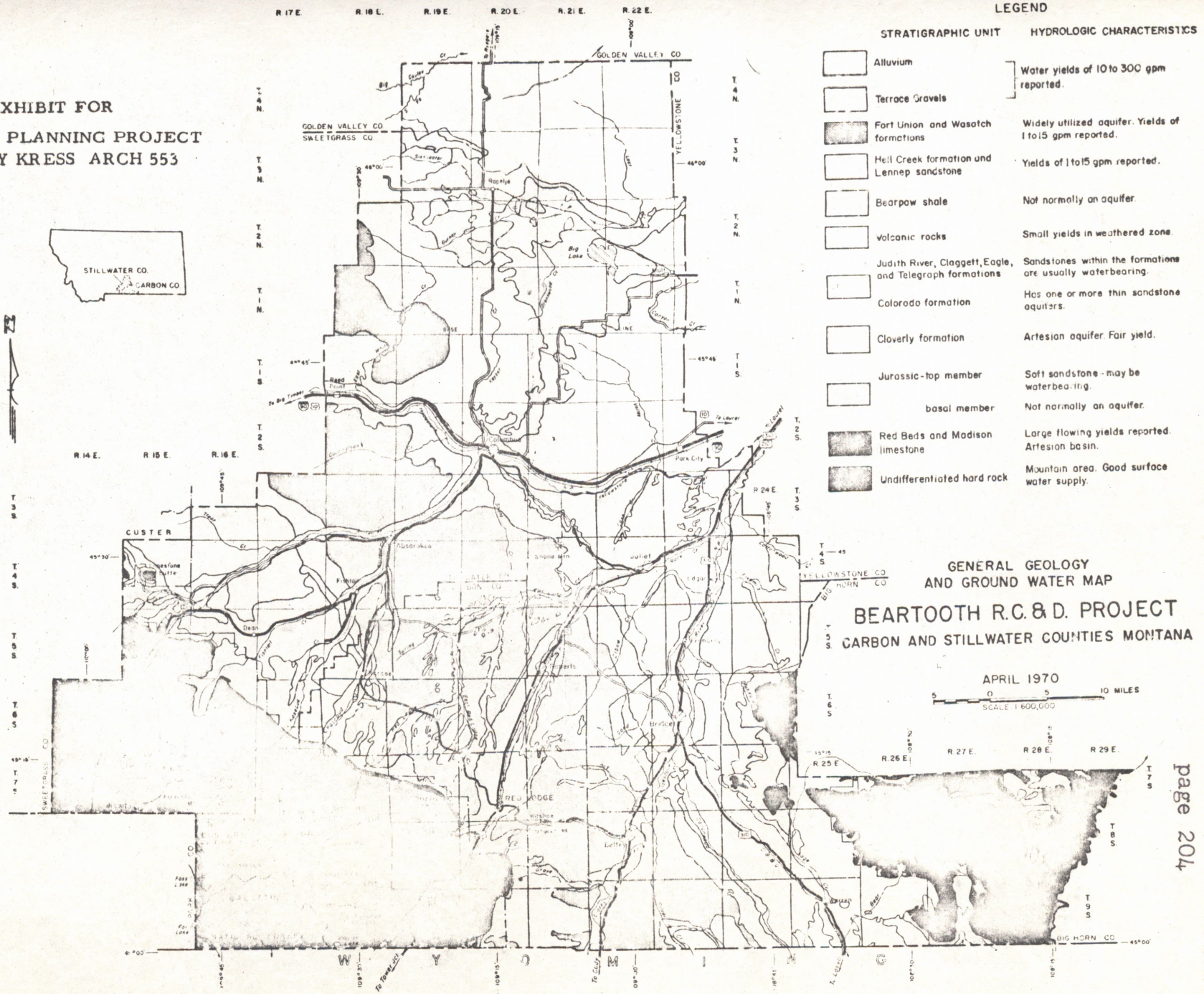


EXHIBIT FOR

EGIONAL PLANNING PROJECT

JERRILY KRESS ARCH 553

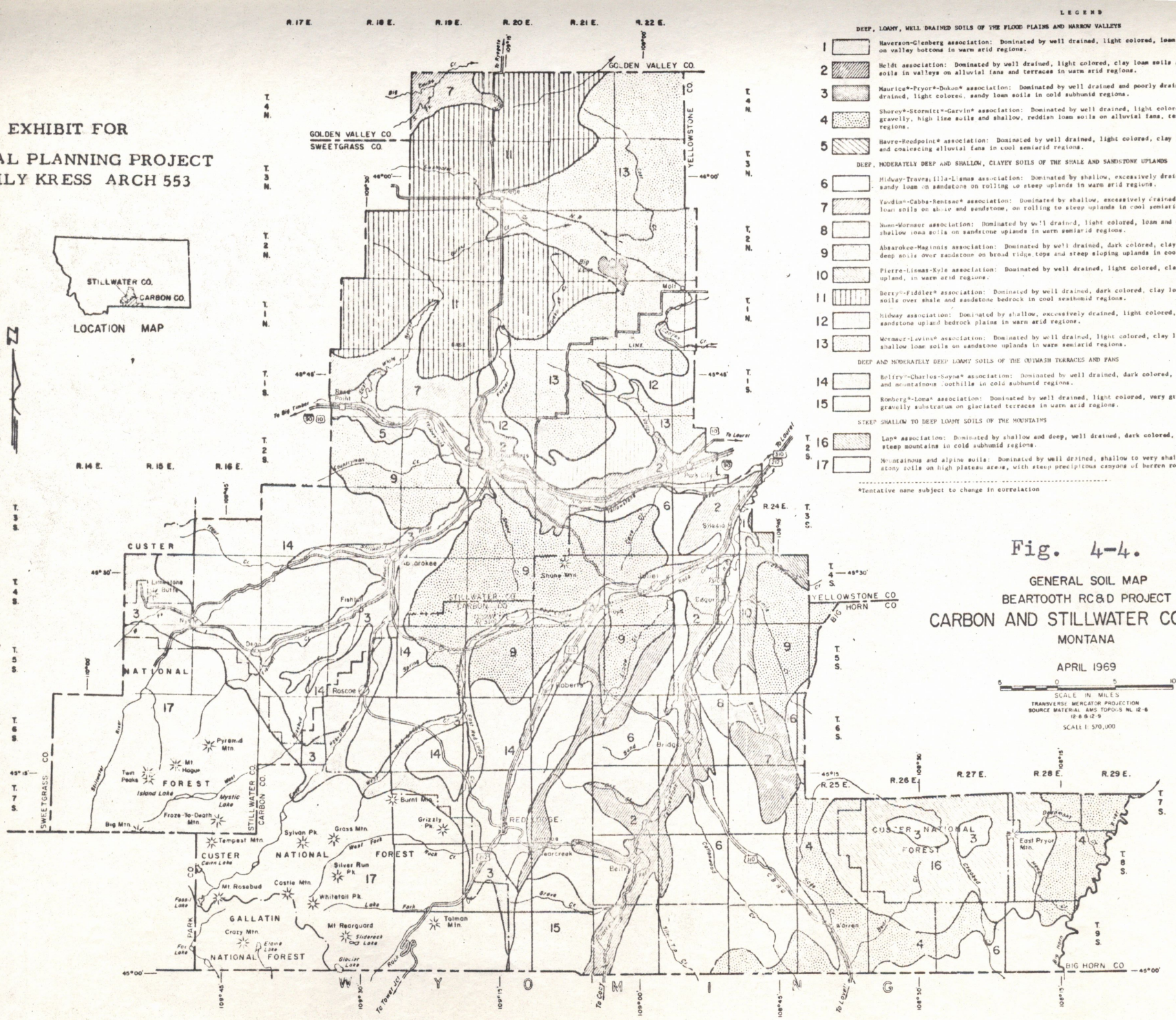


Fig. 4-4.

GENERAL SOIL MAP

BEARTOOTH RC&D PROJECT

CARBON AND STILLWATER COUNTIES

MONTANA

APRIL 1969

5 0 5 10

SCALE IN MILES

TRANSVERSE MERCATOR PROJECTION

SOURCE MATERIAL AMS TOPOS NL 12-6 12-8 12-9

SCALE 1: 570,000

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

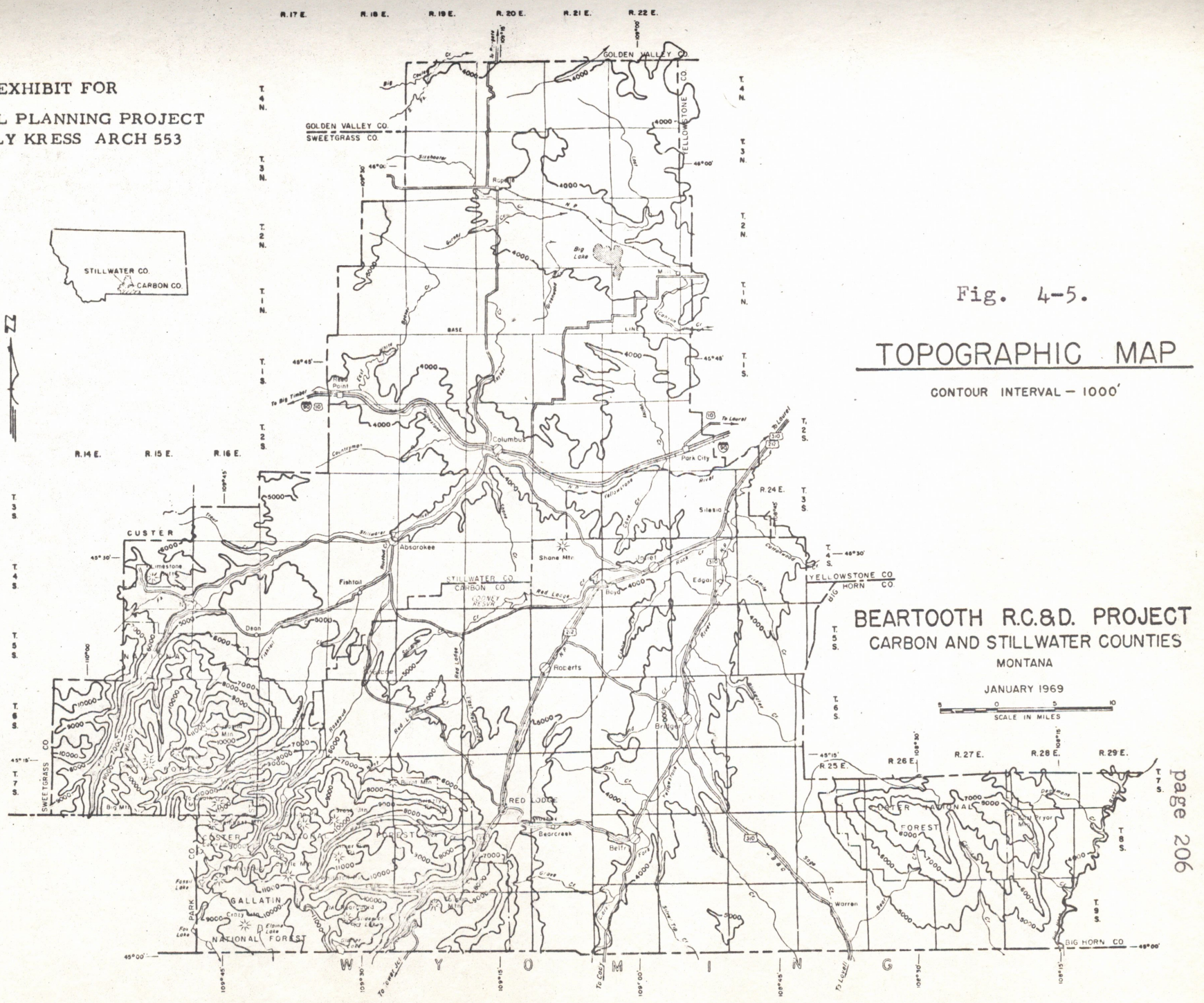


Fig. 4-5.

TOPOGRAPHIC MAP

CONTOUR INTERVAL — 1000'

BEARTOOTH R.C.&D. PROJECT

CARBON AND STILLWATER COUNTIES

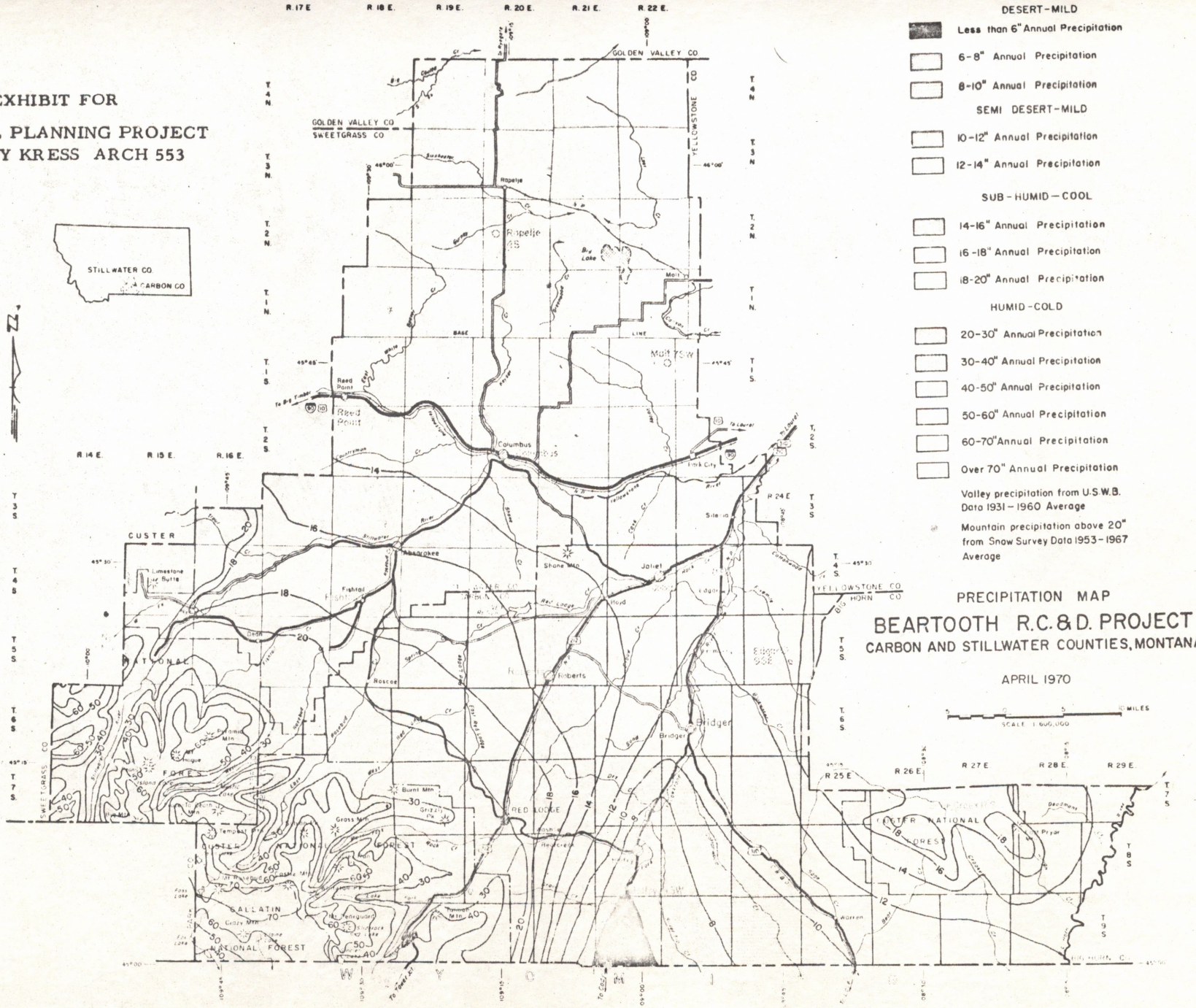
MONTANA

JANUARY 1969

SCALE IN MILES

EXHIBIT FOR

_ REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553



LEGEND

DESERT-MILD

- Less than 6" Annual Precipitation
- 6-8" Annual Precipitation
- 8-10" Annual Precipitation

SEMI DESERT-MILD

- 10-12" Annual Precipitation
- 12-14" Annual Precipitation

SUB-HUMID-COOL

- 14-16" Annual Precipitation
- 16-18" Annual Precipitation
- 18-20" Annual Precipitation

HUMID-COLD

- 20-30" Annual Precipitation
- 30-40" Annual Precipitation
- 40-50" Annual Precipitation
- 50-60" Annual Precipitation
- 60-70" Annual Precipitation
- Over 70" Annual Precipitation

Valley precipitation from U.S.W.B. Data 1931-1960 Average

Mountain precipitation above 20" from Snow Survey Data 1953-1967 Average

PRECIPITATION MAP

BEARTOOTH R.C.&D. PROJECT

CARBON AND STILLWATER COUNTIES, MONTANA

APRIL 1970

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

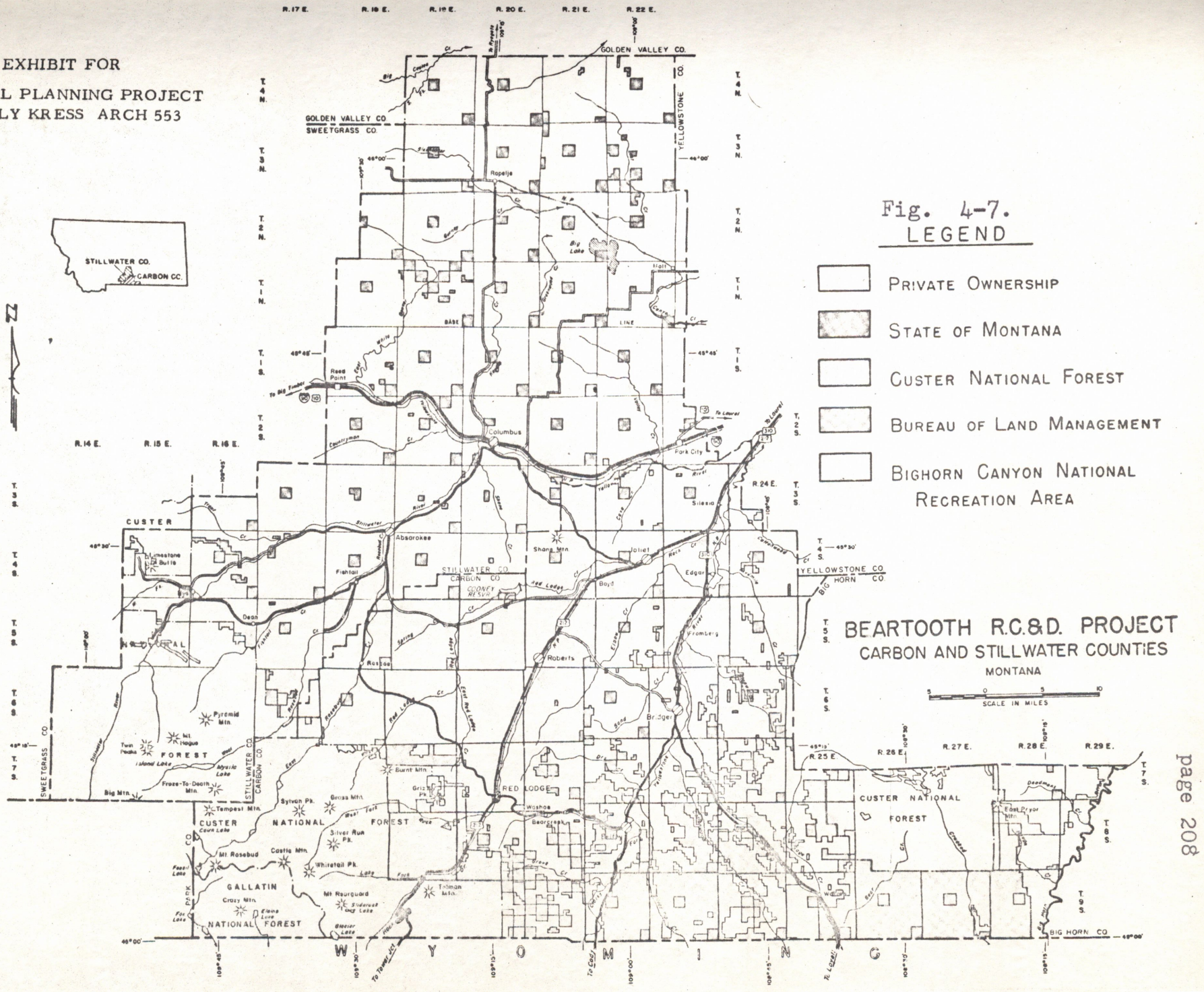


Fig. 4-7.
LEGEND

- PRIVATE OWNERSHIP
- STATE OF MONTANA
- CUSTER NATIONAL FOREST
- BUREAU OF LAND MANAGEMENT
- BIGHORN CANYON NATIONAL RECREATION AREA

BEARTOOTH R.C.&D. PROJECT
CARBON AND STILLWATER COUNTIES
MONTANA

SCALE IN MILES
5 0 5 10

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

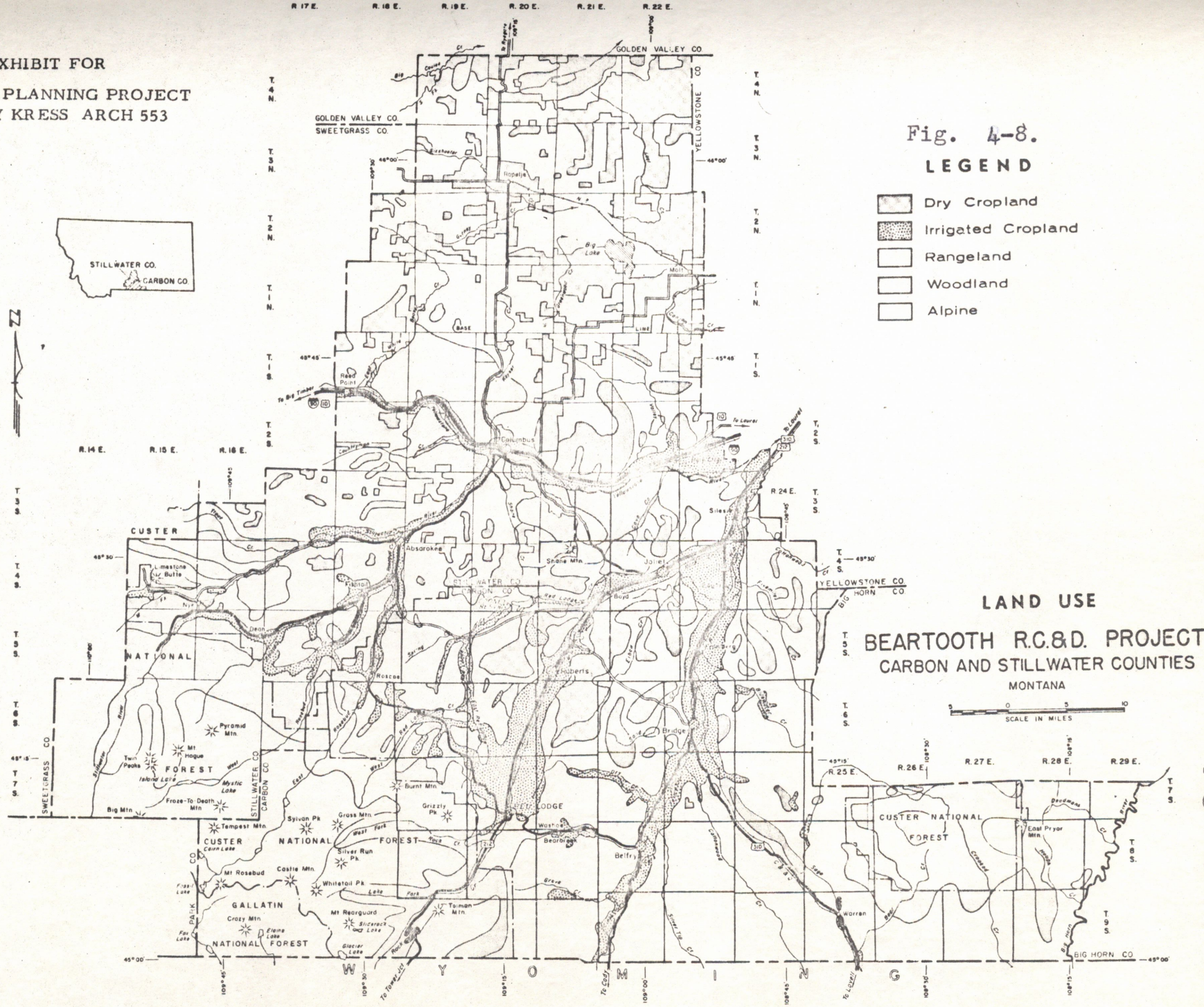


Fig. 4-8.

LEGEND

- Dry Cropland
- Irrigated Cropland
- Rangeland
- Woodland
- Alpine

LAND USE

BEARTOOTH R.C.&D. PROJECT
CARBON AND STILLWATER COUNTIES
MONTANA

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

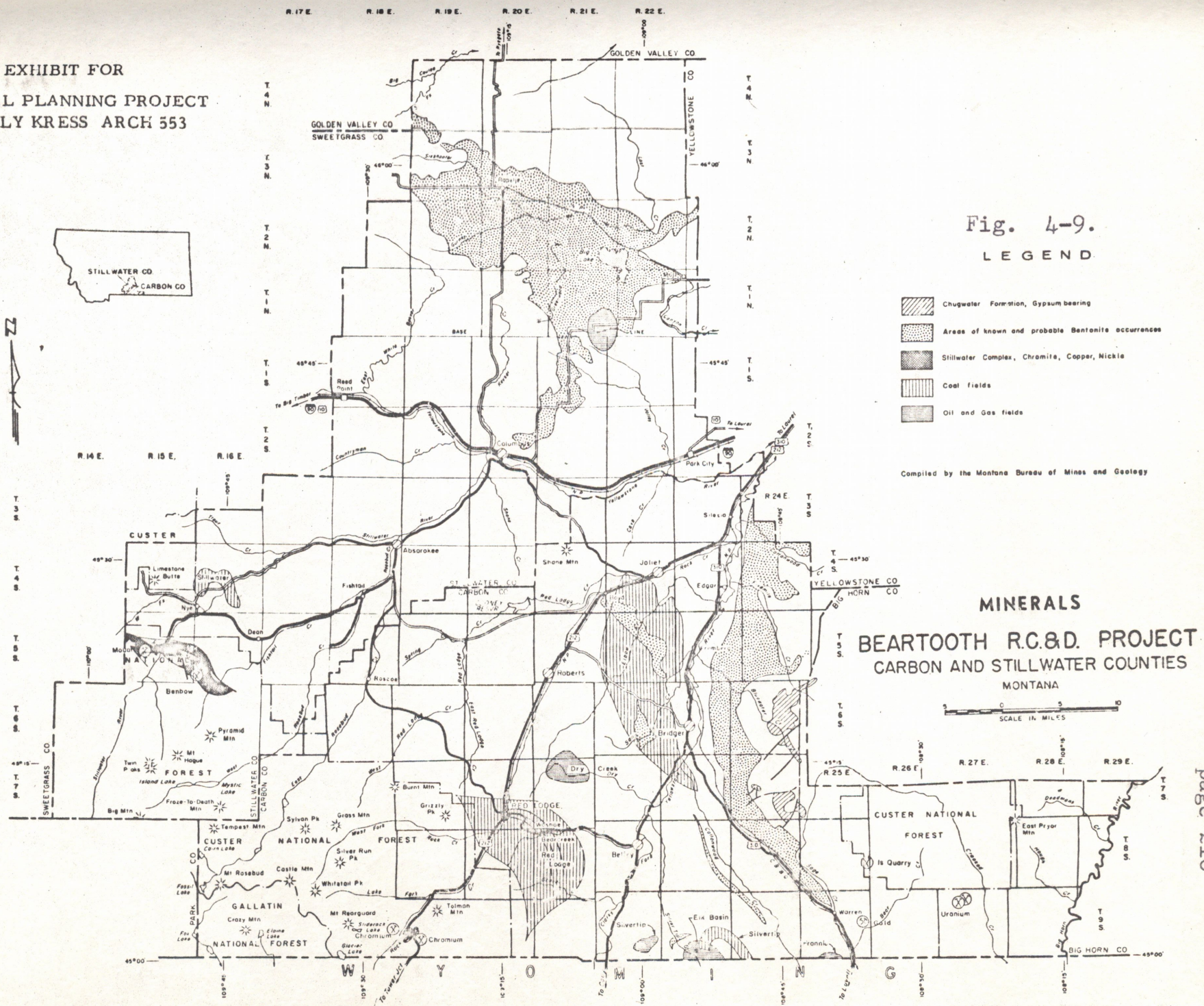


Fig. 4-9.

LEGEND

- Chugwater Formation, Gypsum bearing
- Areas of known and probable Bentonite occurrences
- Stillwater Complex, Chromite, Copper, Nickle
- Coal fields
- Oil and Gas fields

Compiled by the Montana Bureau of Mines and Geology

MINERALS

BEARTOOTH R.C.&D. PROJECT

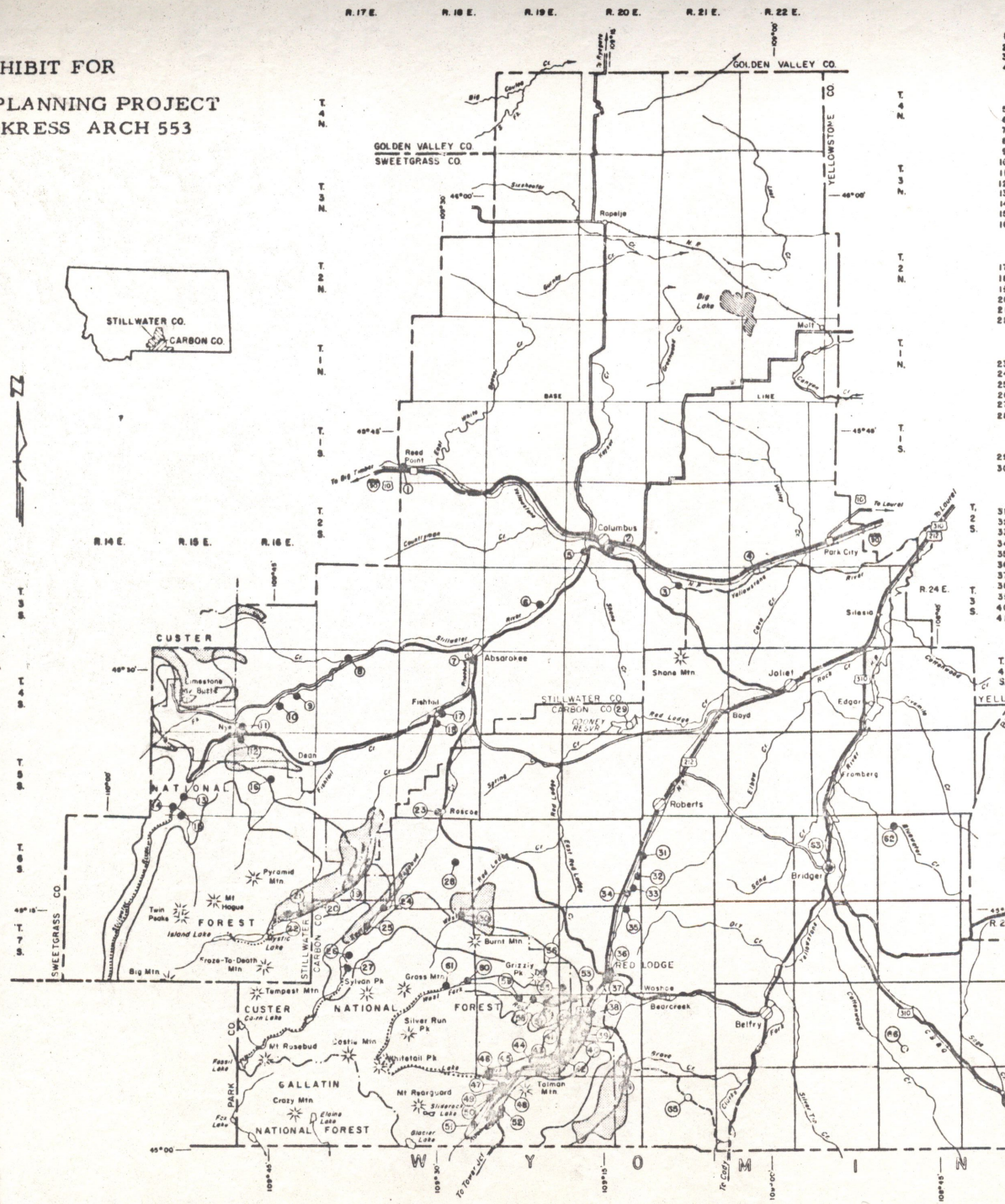
CARBON AND STILLWATER COUNTIES

MONTANA

SCALE IN MILES

EXHIBIT FOR

EGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553



YELLOWSTONE RIVER

1 Indian Fort - F.& G. Access - Ta, T, Tr, W, Boat ramp
2 Irch-Kep-Pe - F.& G. Access - Ta, T, Tr, W, Boat ramp
3 Yellowstone River Float Trips
4 Youngs Point Recreation Area

STILLWATER RIVER

5 Fireman's Point - F.& G. Access - Ta, T
6 White Bird - F.& G. Access - Ta, T, Tr, W
7 Absaroka - F.& G. Access - T
8 Cliff Swallow - F.& G. Access - Ta, T
9 Castle Rock - F.& G. Access - Ta, T, Tr, W
10 Moraine - F.& G. Access only
11 Ray Guthrie - Outfitter, Guide
12 Buffalo Jump - F.& G. Access - Ta, T
13 Beartooth Ranch - Dude ranch, Outfitter, Guide
14 Stillwater wilderness trailhead - T, Racks & corral
15 Woodbine - F.S. Campground - Ta, T, Tr, W
16 Little Rocky - F.S. Campground - Ta, T

WEST ROSEBUD

17 Ralph Yates - Outfitter, Guide
18 Rosebud Isle - F.& G. Access - Ta, T
19 Pine Grove - F.S. Campground - Ta, T, Tr, W
20 Emerald Lake - Fisherman parking - T
21 Emerald Lake - F.S. Campground - Ta, T, Tr, W
22 Mystic Lake trailhead - Hitch rack, corral

EAST ROSEBUD

23 George Arthun - Outfitter, Guide
24 Sand Dunes - F.S. Campground - Ta, T, Tr, W
25 Jimmy Joe - F.S. Campground - Ta, T, Tr, W
26 East Rosebud Lake - F.S. Campground, Ta, T, Tr, W
27 East Rosebud wilderness trailhead - Ta, W, Hitch rack
28 Homewood & Niemi - Hunting preserve

RED LODGE CREEK

29 Cooney Dam Recreation Area - Ta, T, Tr, W, Boat ramp
30 Kiwanis Camp

ROCK CREEK

31 Water Birch - F.& G. Access - Ta, T, Tr, W
32 Bull Springs - F.& G. Access - Ta, T
33 Beaver Lodge - F.& G. Access - T
34 Sharp's Camper Park - Ta, T, Tr, Fish ponds
35 Horsethief Station - F.& G. Access - Ta, T, Tr, W
36 Jim Owens - Outfitter, Guide
37 Red Lodge Picnic Grounds - Ta, T, W
38 Beartooth Ski-Doo - Snowmobile tours
39 Sundance Winter Sports Area
40 Piney Dell Resort - Cabins, Outfitter, Guide
41 Sheridan - F.S. Campground - Ta, T, Tr, W
42 Ratine - F.S. Campground - Ta, T, Tr, W
43 U.S. 212 - F.S. Rest area - T, Parking
44 Camp Westminster Spires - Presbyterian
45 Billings Lions Camp

ROCK CREEK (cont'd)

46 Lake Fork wilderness trailhead - T, Racks & corra
47 Parkside Picnic Area - Ta, T
48 Parkside - F.S. Campground - Ta, T, Tr, W
49 Limber Pine - F.S. Campground - Ta, T, Tr
50 Greenough - F.S. Campground - Ta, T, Tr, W
51 M - K - F.S. Campground - Ta, T, Tr
52 Vista Point - T, Snowmobile takeoff point

WEST FORK OF ROCK CREEK

53 Red Lodge Elks Golf Course - 9 hole
54 Frank Ward - private fishing ponds
55 Palisades - F.S. Campground - Ta, T, Tr, W
56 Red Lodge Mountain Ski Area
57 Timbercrest Girl Scout Camp
58 Wild Hills Lake - Fisherman parking - T, Ta
59 Basin Creek - F.S. Campground - Ta, T, Tr, W
60 Cascade - F.S. Campground - Ta, T, Tr, W
61 West Fork wilderness trailhead - T, Racks & corral

CLARKS FORK

62 Bluewater - F.& G. Access - Ta, T
63 Buck Sanford - Outfitter, Guide
64 Grove Creek Recreation Area - Ta, T
65 Meeteetsee Historic Trail
66 Weatherman Indian Painting Site - parking, trails

PRYOR MOUNTAIN

67 Sage Creek - F.S. Campground - Ta, T, Tr, W
68 Big Ice Cave & picnic area - Ta, T
69 Pryor Mountain Loop Road & snowmobiling
70 Dryhead Overlook - T, parking
71 Vision Quest Overlook - Ta, parking
72 Cave-Lost Water Canyon roughing and natural area
73 Mystery Cave - Ta, T, W
74 Pinnacle Overlook - parking
75 Rustlers Overlook - parking
76 Wild Horse Observation Points - parking
77 Bighorn Canyon Overlook - parking
78 Frogg's Fault Cave - parking
79 Wild Horse Visitor Center - Ta, T, W
80 Medicine Man Petroglyph Site - trail access
81 Tepee Ring Viewpoint - parking
82 Indian Village Encampment - parking, trails
83 Crooked Creek Canyon Trail
84 Gyp Springs Archeological Site - parking
85 Thirsty Bird Archeological Site - parking, trails
86 Petroglyph Recreation Site - Ta, T, W
87 Bear Canyon - B.L.M. Campground, Ta, T, Tr
88 Corwin Rule - Outfitter, Guide

BIGHORN CANYON NATIONAL RECREATION AREA

89 Horseshoe Bend Recreation & Boating Development
90 Access Road - paved
91 Hough Creek Recreation Development
92 Barry's Landing Recreation & Boating Development
93 Bighorn Lake

RECREATION MAP
Fig. 4-10.

BEARTOOTH R.C.&D. PROJECT
CARBON AND STILLWATER COUNTIES
MONTANA

SCALE IN MILES 5 0 5 10

GENERAL

Snowmobiling permitted on roads and trails closed to wheeled vehicles.

Detailed recreation information available from:

U.S. Forest Service
Red Lodge 59068
Bureau of Land Management
Billings 59103
Montana Fish & Game Department
Billings 59101
Bighorn Canyon Nat'l. Rec. Are
Hardin 59035
Beartooth RC&D Project
Joliet 59041

MAP SYMBOLS

● - Existing Development
○ - Planned Development
Ta - Tables
T - Toilets
Tr - Trailers
W - Water

Snow for skiing and snowmobiling - late November to late May.

Snow for snowmobiling - late December to late March.

Critical big game winter range.

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

Fig. 4-11.

POPULATION DENSITY MAP

CITY SIZE
1960

1000 TO 2300 ●
500 TO 1000 ●
300 TO 500 ●
100 TO 300 ●
1 TO 100 ●

DWELLING UNIT •

MARCH 1971

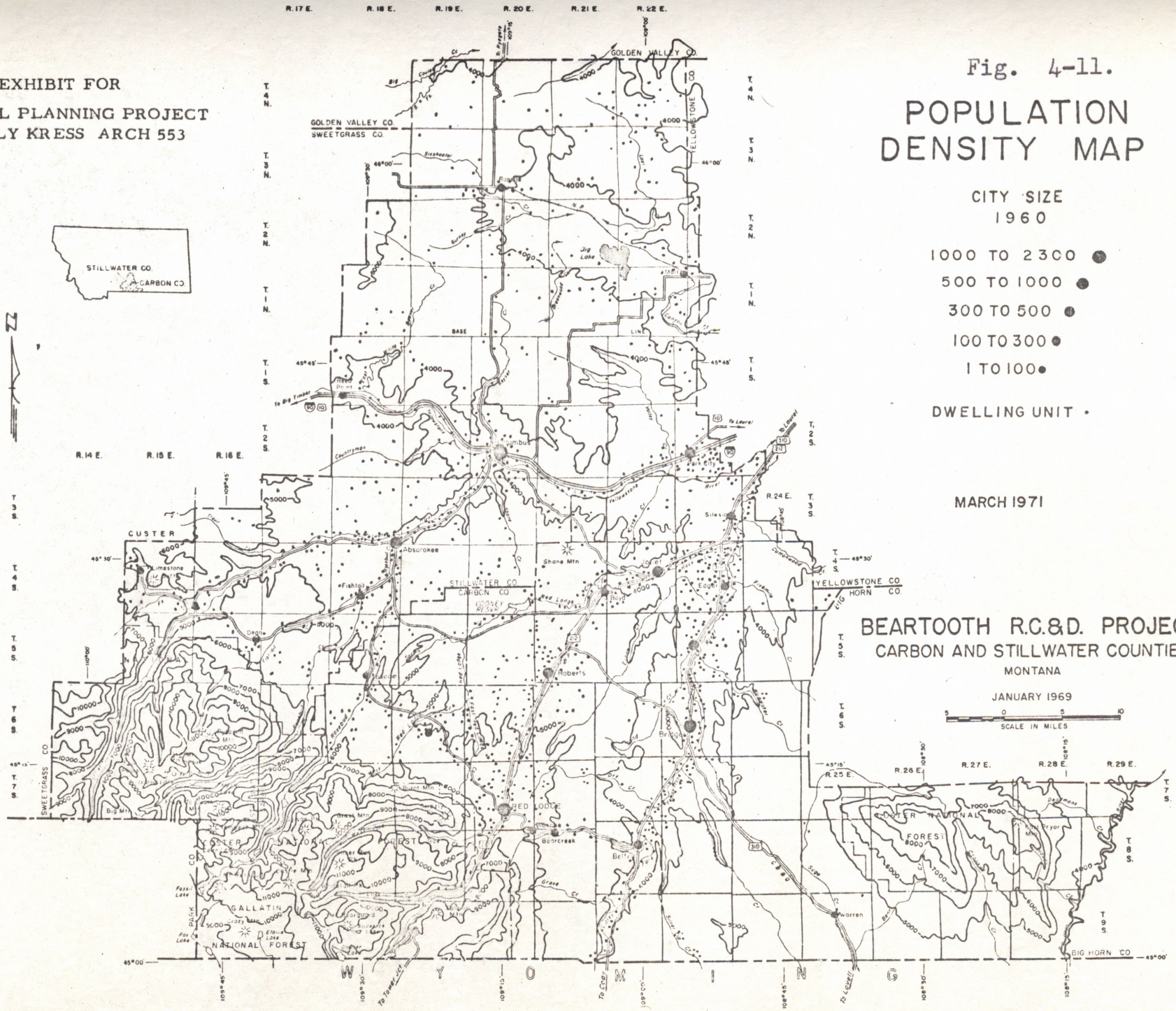
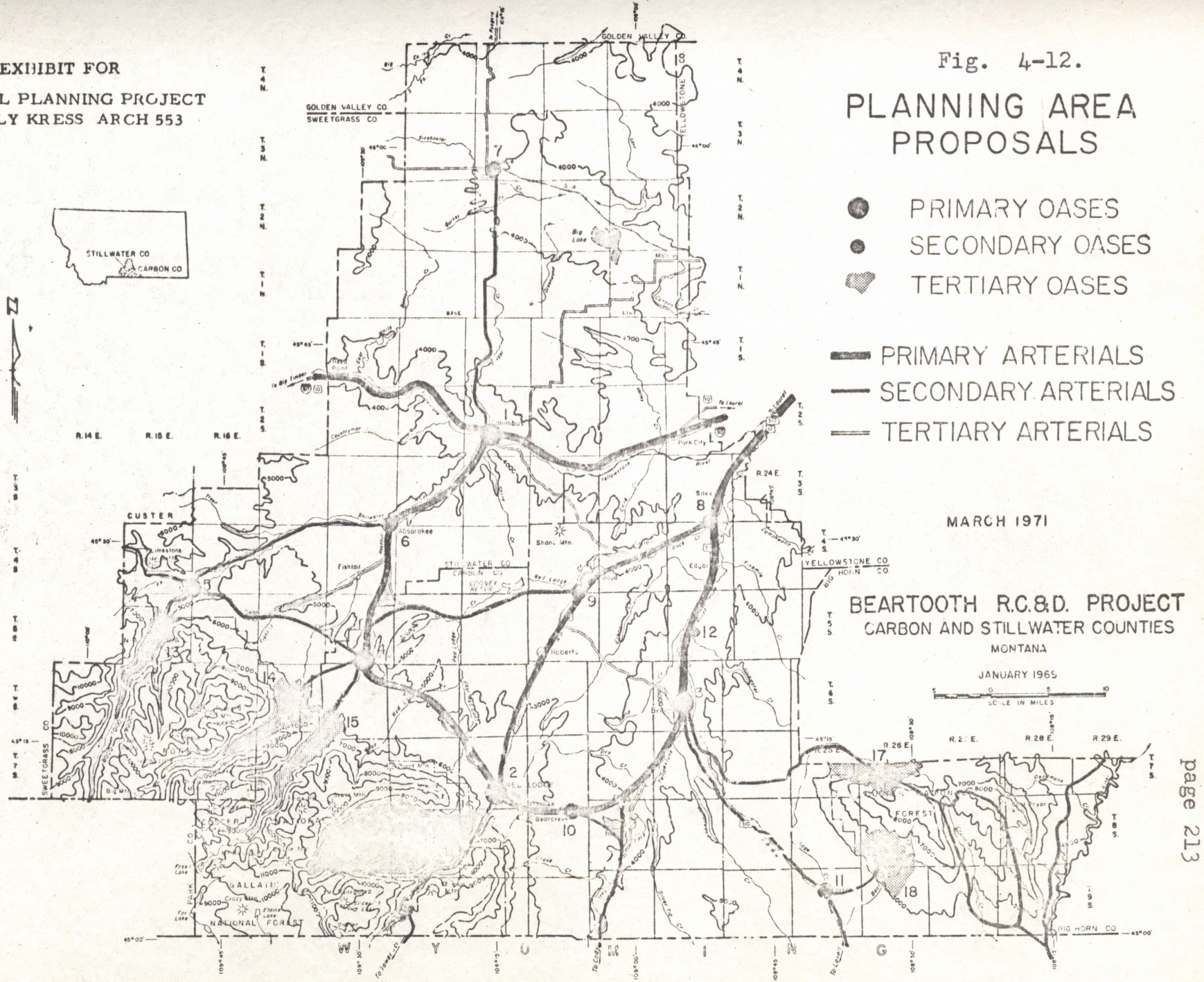

STILLWATER CO.
CARBON CO.
N
R.17 E.
R.18 E.
R.19 E.
R.20 E.
R.21 E.
R.22 E.
R.14 E.
R.15 E.
R.16 E.
R.23 E.
R.24 E.
R.25 E.
R.26 E.
R.27 E.
R.28 E.
R.29 E.
T.4 N.
T.3 N.
T.2 N.
T.1 N.
T.1 S.
T.2 S.
T.3 S.
T.4 S.
T.5 S.
T.6 S.
T.7 S.
T.8 S.
T.9 S.
GOLDEN VALLEY CO.
SWEETGRASS CO.
YELLOWSTONE CO.
BIG HORN CO.
CUSTER
STILLWATER CO
CARBON CO
SWEETGRASS CO
GALLATIN
NATIONAL FOREST
CUSTER NATIONAL FOREST
Absarokee
Shane Mtn
Fishtail
Roberts
Bearcreek
Warren
Silesia
Columbus
Park City
Laurel
Limestone
Big Timber
RED LODGE
Rimrock Mt.
Grove Cr.
Rosebud
Yellowstone
Clarks Fork
Stillwater
Big Horn
Sixshooter
Jig Lake
Flood Point
Countryman
Deadmans
Dry Head
Big Mt.
Fossil Lake
Fox Lake
Elbow Lake
Crazy
Gallatin
Bell Mt.
Grove
Dry Cr.
Deadmans
Bear Cr.
Clarks Fork
Big Horn
Yellowstone
Stillwater
Rosebud

EXHIBIT FOR

REGIONAL PLANNING PROJECT
JERRILY KRESS ARCH 553

Fig. 4-12.

PLANNING AREA PROPOSALS



V. PRELIMINARY CONCEPT FOR THE BEARTOOTH CLUSTER

The purpose of this preliminary planning section is to give one a sketchy idea of how the new cluster of Beartooth might be organized in 1990. (Beartooth is number 4 on the Planning Area Proposals Map, Figure 4-12, page 213).

A. Existing Conditions of Beartooth

Beartooth is located in the East Rosebud Creek Valley in an area that includes the present town of Roscoe. The portion of the valley to be used was chosen so as to provide a good scenic view to the Beartooth Mountains; so as to contain lush foliage and water; and is nestled at lower elevations so to be protected from extremes in climatic conditions. (See drawing, Figure 5-2, page 216, for the feeling one would get looking southwest down the valley to the Beartooth Mountains). This location is also a stepoff to two of the Planning Area's finest recreation-flora-fauna areas, a few miles to the south.

Beartooth's elevation ranges from 4,900 to 5,200 feet above sea level. (See Topographic Map, Figure 5-1, page 215). The climate here is more favorable and temperate than in the recreation clusters to the south, and this

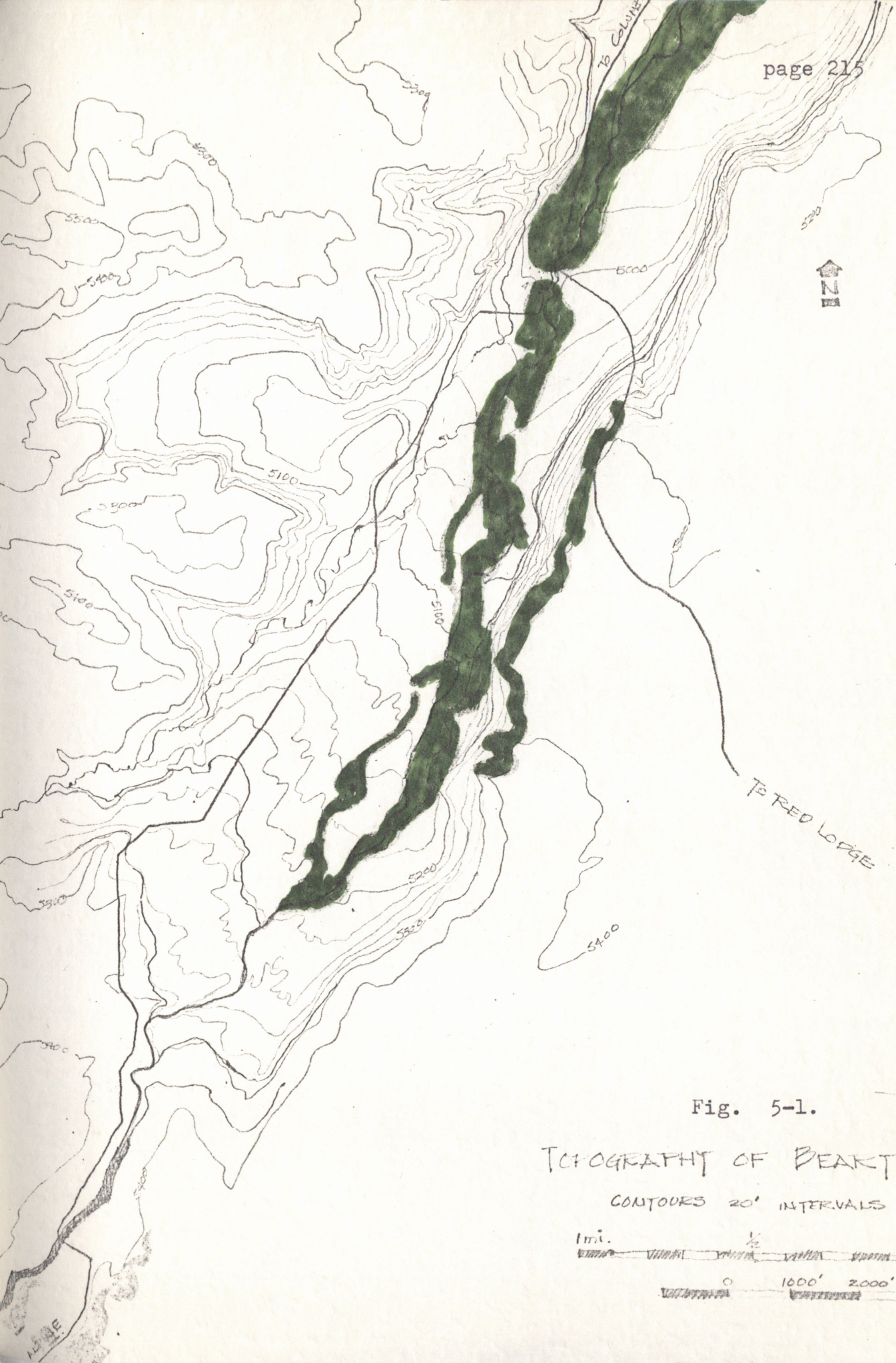


Fig. 5-1.

TOPOGRAPHY OF BEARTOOTH

CONTOURS 20' INTERVALS

1 mi. ½ 0

0 1000' 2000' 3000'

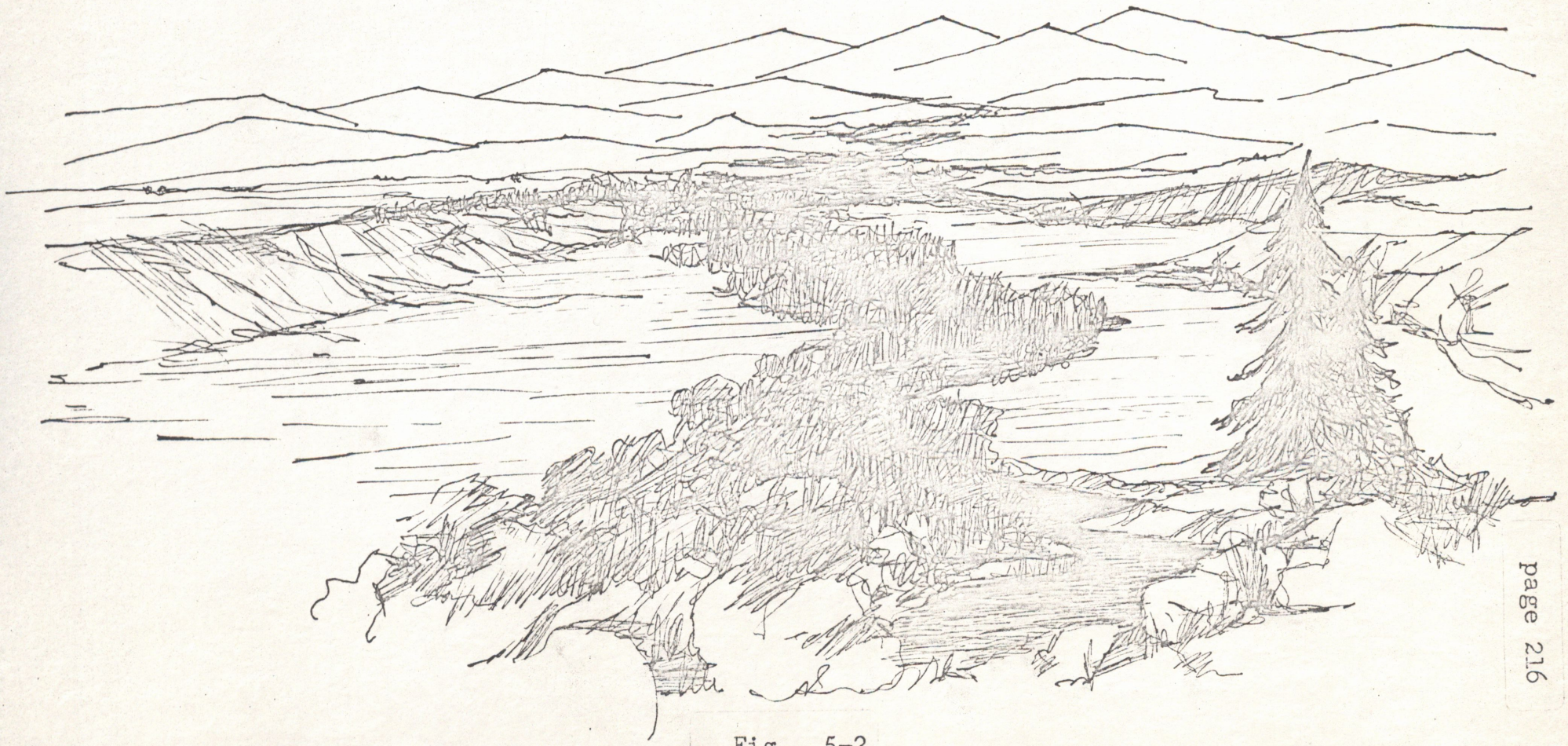


Fig. 5-2.

is partially due to the elevation. Red Lodge, for comparison, sits at 5,762 feet above sea level.

There is an abundance of good water in the area and little air or water pollution of any kind. The soil poses few development problems either, (See Appendix C, Table XXI). The main problems are the flooding plains; however, with the existing dam controlling the East Rosebud and some additional watersheds, this would cease to be a problem. And with what has been discussed in Part II, the public utilities for this area should be able to expand with little difficulty.

The prime economic base for Beartooth will lie in its being a recreation-living cluster. Conjointly, Beartooth's economy will be based on being a center of goods and services, (oasis), for its residents, its recreation satellites, (numbers 14 and 15 on the Planning Area Proposals Map), and the normal surrounding satellite area. Supplementing the economic base would be the concentration of the Planning Area's governing body, to be located here.

B. Objectives for Beartooth's Planning

The basic objectives of my preliminary planning can be found in Part III, page 151 ff. This cluster particularly must be designed for recreation-living. This incorporates

the people and nature. Nature is the biggest asset here and the people using this area must be provided with the tools whereby they may effectively deal with themselves and others. The tools would be provided through design and planning within nature's framework.

1. People

Within the social psychological context, people perceive themselves and relate in four ways. Spaces or tools must be proposed to reinforce this.

The first social psychological relationship might be termed I-me. The individual defines himself in a personal study space. It is obvious that this relationship has ramifications in every level of society. Tools for this must be provided from a space to be completely alone with oneself in nature, to a space to be alone in the home, to a space to be alone in the center of a city.

Another viable relationship is I-you (familiar). These relationships are of the first level of importance, such as one's spouse and children, and/or best friend, and God. Tools or spaces for this relationship would occur in the home, and in related society spaces for use on the family level, and perhaps in a church.

The third relationship could be termed I-you

(plural). This perception of interpersonal relationships is one in which people "care" about those around them and these people might be termed friends. These relationships are established within smaller interactive spaces, such as within a school area, within a work area, within an elderly people's organization, etc. In the past, these relationships have often been established within the home because of a lack of facilities. This meant the domestic scene was constantly invaded by more social activities which put an enormous strain upon the housewife and the I-me and I-you (familiar), relationships. A certain amount of this activity can occur in the home but there needs to be more neutral meeting places.

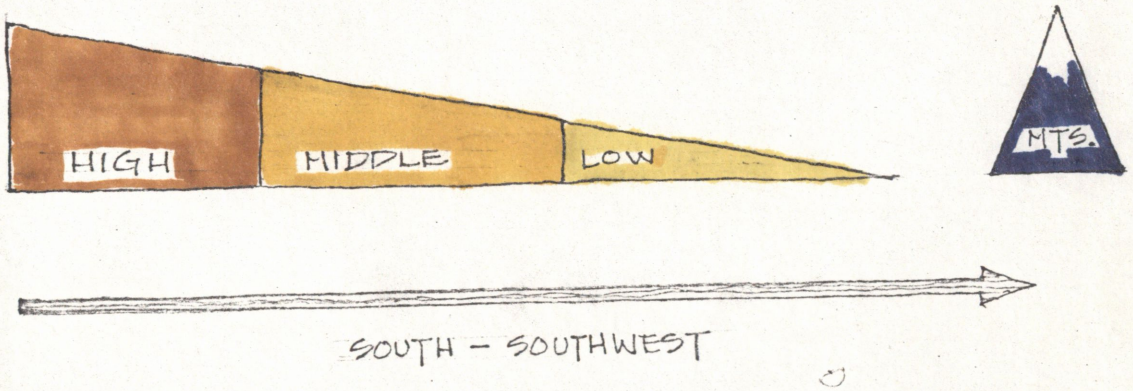
The last relationship is the I-it. This refers to the city as a whole and all the people associated with it. The relationship is necessary. The city contains a richness of social mix with diverse social and economic organizations. If the individual can accept the city as part of himself, he will be able to relate, and thus, use this to reevaluate his perception of himself (a necessary part of inner growth). For the city to be most effective, it needs to provide the interface condition with the most diverse cultural influence. But this condition must be provided in a familiar or "kind" way, for if the adjustment is too harsh, the individual will

not be able to relate.

2. Nature

As has been discussed throughout this study, nature is the most valuable asset and must be protected. But also what nature can offer must be used, for only in use lies its validity as an asset. Within the framework of its ecological balances and natural beauty, man can find a place to live and work. All of the introduced, man-made systems should take advantage of the view to the Beartooths, and even in the most dense areas, the feeling of the mountains and foliage should be maintained to the greatest possible extent. A proposed scale of density of people and systems to accomplish the above could be illustrated by Figure 5-3.

Fig. 5-3. A Sectional Scale of Density of People and Systems along the Length of the Valley.



C. Proposals for Beartooth

Due to the existing conditions, the objectives, and the proposed density of people and systems, a basic preliminary plan of area arrangements within Beartooth was formed, (See Figure 5-4, page 222). Necessarily, in this proposal, basic elements or areas were separated from each other; each was endowed with specific characteristics; and the boundaries between them were defined. The achievement of infinite variety will occur within this organic order.

The basic layout of elements is linear derived from the form of the valley with concern for maintaining the scenic views. (These were also the predominant reasons behind the proposed density of people and systems, Figure 5-3, page 220). Both the medium and low density communities have been placed south of the Primary Core, so that residents of either community can look south to the scenic Beartooth Mountains where the rural-outdoor, nature-type feeling is maintained or north to a more complex, urban feeling.

What is proposed here is for an optimal number of people, (10,000). If tremendous growth beyond 10,000 people became necessary, a new cluster would be formed instead of trying to force this cluster to handle volumes of people it had not been designed for.

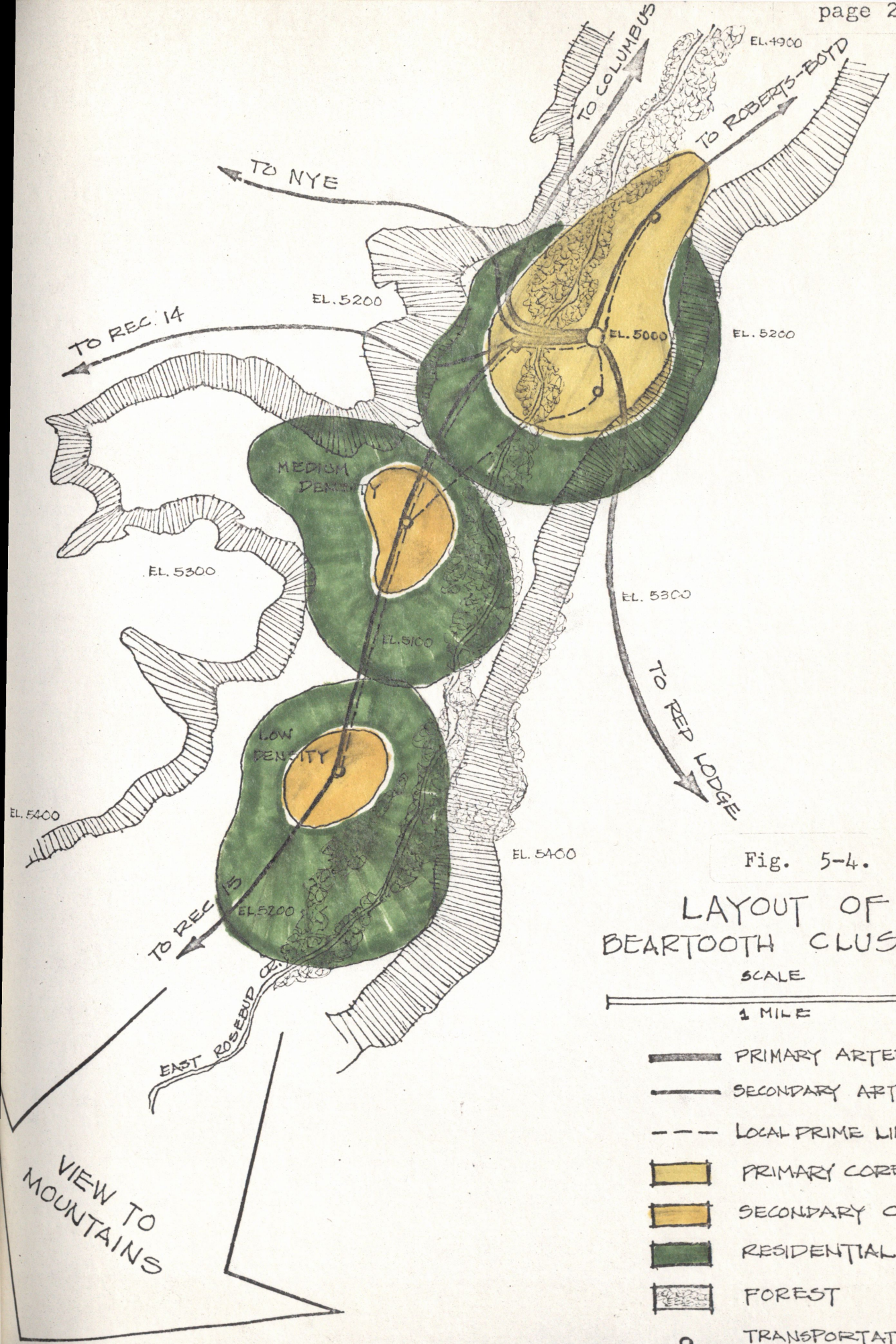


Fig. 5-4.

LAYOUT OF BEARTOOTH CLUSTER

1. Transportation Proposals

A manner of mass transportation of people and goods has been proposed for the Planning Area to be completed in twenty years. Beartooth is proposed to be located on the primary arterial loop and will be the terminal for four secondary arterials; two to continue from it southwest to recreation clusters, 14 and 15; one west to Cluster 5; and one northeast to Cluster 9. (See Figure 5-4, page 222). Much of the arterial mass transportation will be through-transportation or a changing to the secondary arterials. A primary Transportation Terminal will be located in the center of the Primary Core to accomodate these transients, the people who come to use the oasis facilities, and the people who want to use Beartooth as a stepoff to the recreation areas and facilities.

I feel this city is in a good location to develop public transportation even further. One of the main priorities for the planning here is maintaining the feeling of nature with open spaces. Where the automobile has been most freely used, the disorganization and disruption of our urban centers is most marked. The amount of land needed for the automobile is horrendous. The way of life is designed for the automobile. The scale is in terms of the

automobile rather than the human. Once a large area has been given over to the automobile, public transportation cannot for practical reasons be introduced into existing cities. The opportunity is here to plan ahead in coordination with a comprehensive public transit system. This type of system could have validity here for the maintaining of nature, for the people who come here for recreation via other mass transportation systems without cars, for older retired people who are not physically capable of driving or who do not have the money to invest in a car, etc. It is difficult to speculate how people will react to mass transportation in the future, much less in twenty years; but I do feel that the individual will have to be making concessions as far as owning his own vehicle for operating everywhere and anywhere.

I propose, within Beartooth, that a specialized public transportation system be initiated and that the use of private vehicles be kept to a minimum, particularly within the Primary Core.

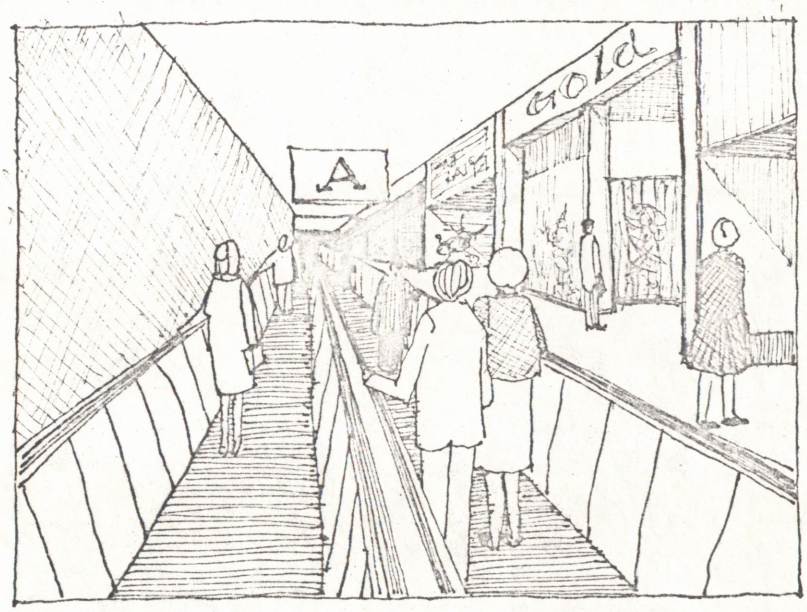
The Primary Transportation Terminal in the center of the core, besides handling the flow of people and goods on the high speed primary and secondary arterials connecting with other clusters in the Planning Area, will be the origin of a system of local, prime linkages radiating out into

other core areas and connecting to the secondary cores of the Residential Communities. (See Figure 5-4, page 222). Both of these will be public, rapid transit systems, and shall be separated and isolated from the other more leisure and pedestrian activities of the community. Their primary goal is functional, being the fast, convenient movements of people and goods as required in the life of a city. They might be located underground or on a lower level, sacrificing a direct contact with the amenities of nature for greater convenience. They will be isolated so as not to permit their undesirable, mechanized and inhuman characteristics of noise, fumes, confusion, and danger of rapid movements to pollute or destroy the individual's appreciation of life in a natural scenic environment. This proposed lower level would also accomodate many other functional requirements of a service nature, such as parking and servicing of vehicles, handling of goods including bulk storage, loading and unloading, work areas for packaging,etc.

These public, rapid transit systems would be extended by a system of secondary linkages, pedestrian and low-speed mechanized systems compatible with pedestrian movement, such as moving sidewalks, (See drawing, Figure 5-5, page 226), small carts, etc. These, on upper levels would fan out from the Secondary Transportation Terminals and serve

to link all of the various building masses. Some of these would be interior and others exterior, moving through the green open spaces, plazas and courts, with ever-changing close and distant views of natural beauty.

Fig. 5-5.



2. Primary Core Proposals

Within the cluster layout, I have also proposed an area which I term the Primary Core. A definition and the potential of the I-it relationship has been discussed in Section B. Some of the Primary Core's characteristics are

its high density, compactness, intensity of public life, and a small grained pattern in which all types of human activities are intermingled in close proximity. It is naturally complex because of its diverse social mix. Complex and diverse organization of the Primary Core would allow a wide and varied perceptual input which would allow the individual to react in an individual and personal way.

The Primary Core would be roughly divided into four main areas. (See Figure 5-6, page 228). The busiest and most dense would be the central area around the Primary Transportation Terminal. For the convenience of the transients who come to use the oasis facilities and the people of the city, this would contain retail trades, services, hotels and motels, and entertainment. West of the creek, an area would contain government offices, civic facilities, and legal services, while the southermost unit could contain community institutions such as schools, hospitals, libraries, museums, and medical services. In the area to the north, adjacent to prime agricultural lands, would be found agricultural supplies, equipment and vehicles, construction and other light industry and warehouses.

The heavily wooded area along the East Rosebud Creek would be retained and developed as a large city park.

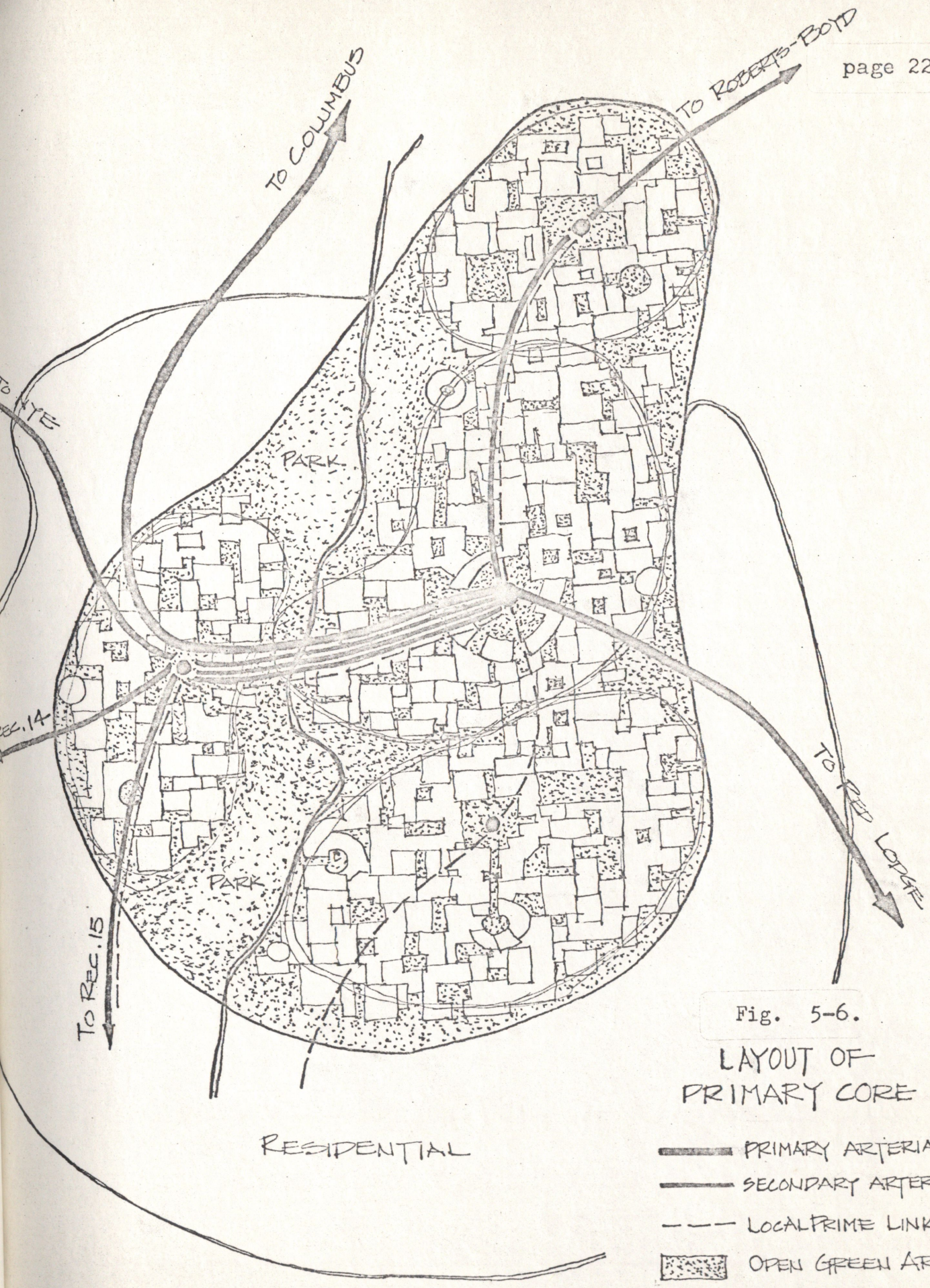


Fig. 5-6.

LAYOUT OF PRIMARY CORE

Around each of the transportation terminals a large open area or plaza with greenery would provide natural beauty and accomodate the heavy concentration of people and activities. Dispersed throughout the core, green open areas and courts between building masses would keep the beauty of the natural environment ever present to enhance the life-style of the inhabitants of this recreation-living cluster. (See drawing, Figure 5-7, page 230, for an impression of how a court in the most dense part of the city might feel).

The buildings would grow to three or four stories, and all the structures would be coordinated for shade, sunlight, artificial lighting, view, green spaces, through forms that related to the environment, etc. As was mentioned in Section B, spaces for the I-me, I-you (familiar), and I-you (plural), relationships must be provided. The Primary Core would be designed to have everchanging moods and patterns and provide a range of sensual experiences (such as noise, motion, visual and spacial experiences) in a diverse and complicated, but organized manner.

3. Residential Communities

I have proposed two Residential Communities,and each community has what I term a Secondary Core. The cores act as catalysing elements so that around them the life of a

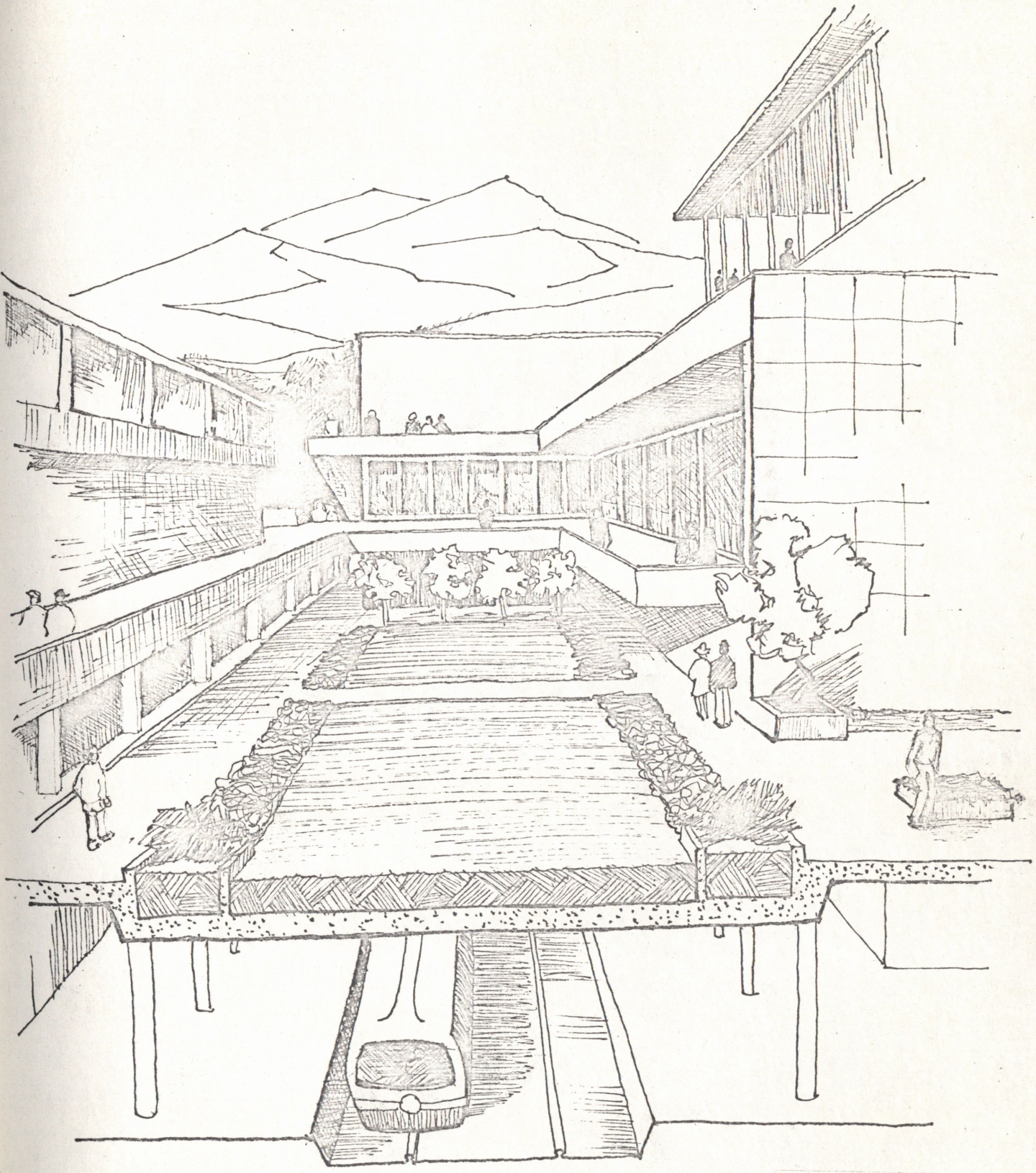


Fig. 5-7.

community will develop. The cores serve to unite people. A core would be the container for planned and unplanned gatherings and provide for diverse human activities. Facilities would be built here to promote the feeling of community, to help fulfill the need for spaces in which the I-you (plural) relationships can occur. (See Section B). There would be accessible, attractive gathering places where people can gather for social and recreational activities. Such facilities as swimming pools, restaurants, bowling alleys, shopping centers, public parks, churches, etc., would be located within the cores as well as nursery and elementary schools. Each community's facilities might vary depending on the community's needs and desires. The design would be done in such a manner that the gathering places within the core would be alive day and night. For interaction within the cores, this is also the logical place to locate the secondary transportation centers, which feed to the individual residences.

One Residential Community has been proposed for middle density, which would be approximately eight to ten people per acre. The other was proposed as low density which would be four people per acre. Some growth in these areas could take place on the sides of the valley.

Figure 5-8, page 233, shows a schematic of the medium density Residential Community and a possible layout of homes. Some of the garden apartments or townhouses could be low-cost housing projects for older, retired people. And in the center of these projects, places where the retired or elderly could gather and enjoy group activities could be provided. The single family dwellings have been clustered so as to leave larger common open spaces and large areas have been left between each sector for the I-you (familiar) and I-me outdoor activities.

Necessarily, a variety of home types and spaces for the different types of social psychological relationships must be provided. An individual must have the maximum freedom in choosing his own habitat, facility, service, activity, and neighbors.

I am not proposing a suburb, but rather the ante-thesis of a suburb. I propose a rural retreat, but with a more integrated foundation of life.

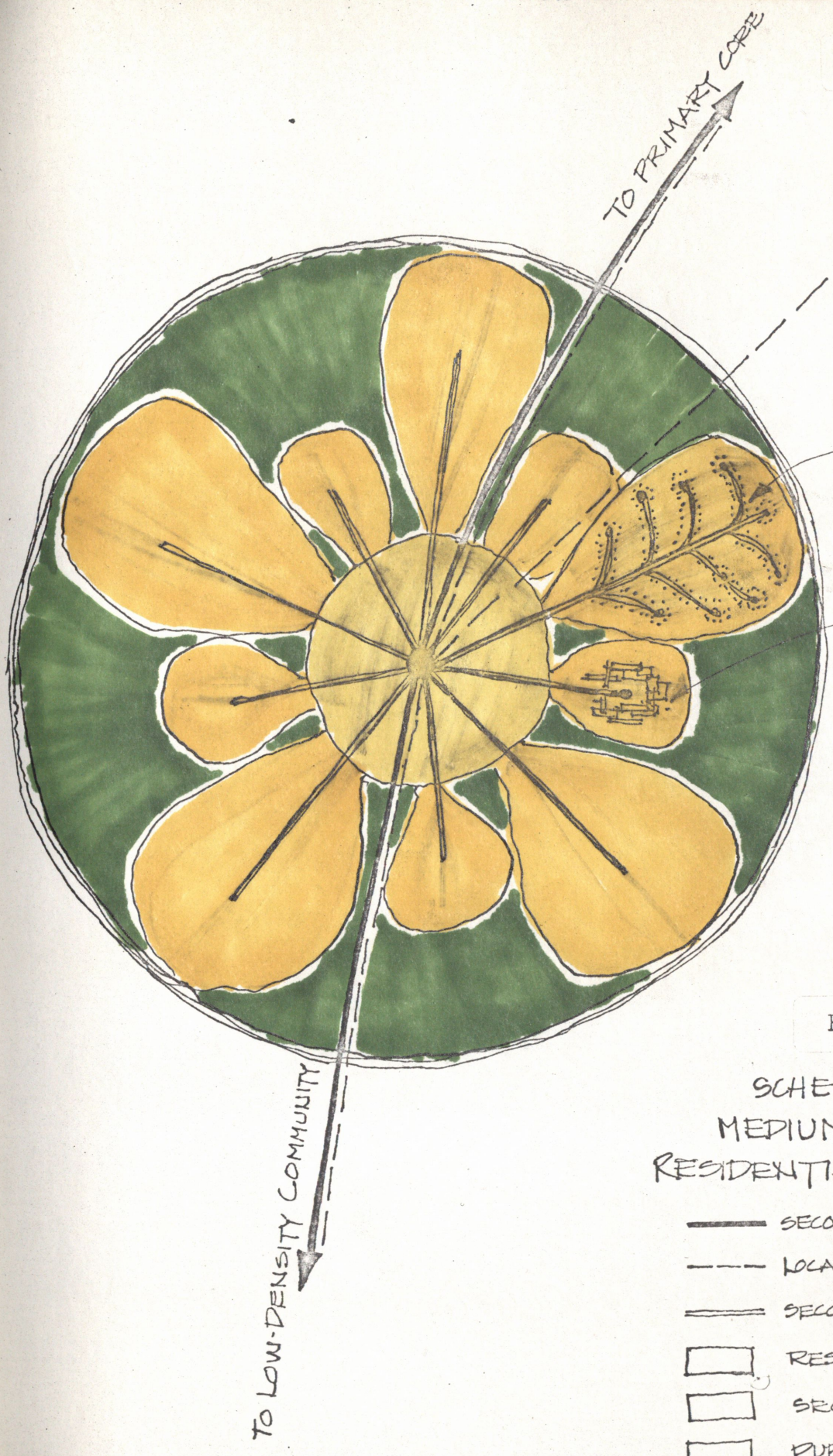


Fig. 5-8.

SCHEMATIC OF MEDIUM DENSITY RESIDENTIAL COMMUNITY

- SECONDARY ARTERIAL
- LOCAL PRIME LINKAGE
- SECONDARY LINKAGES
- RESIDENTIAL CORE
- SECTORS
- PUBLIC OPEN SPACE
- TRANSPORTATION TERMINAL

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APPENDIX A

Supplementary material for Part II

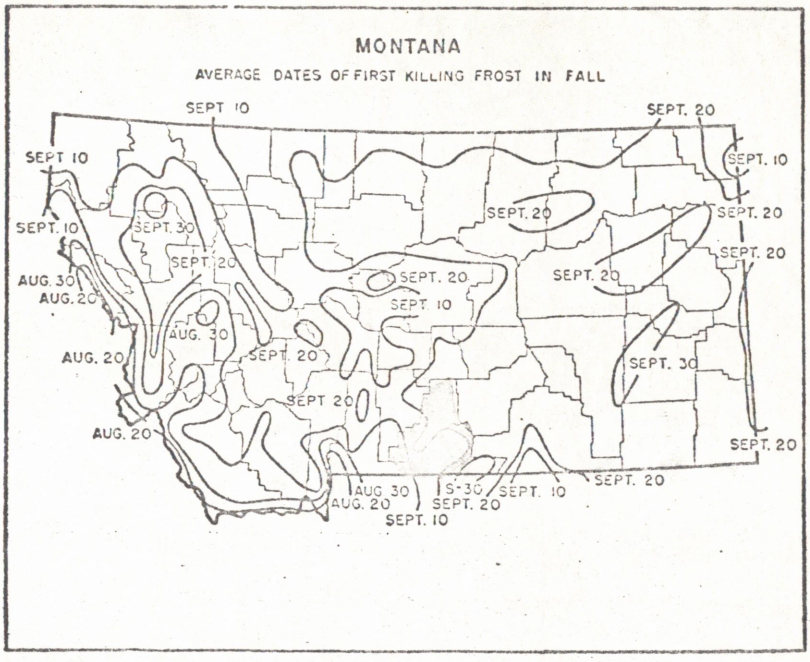


Fig. A-1.

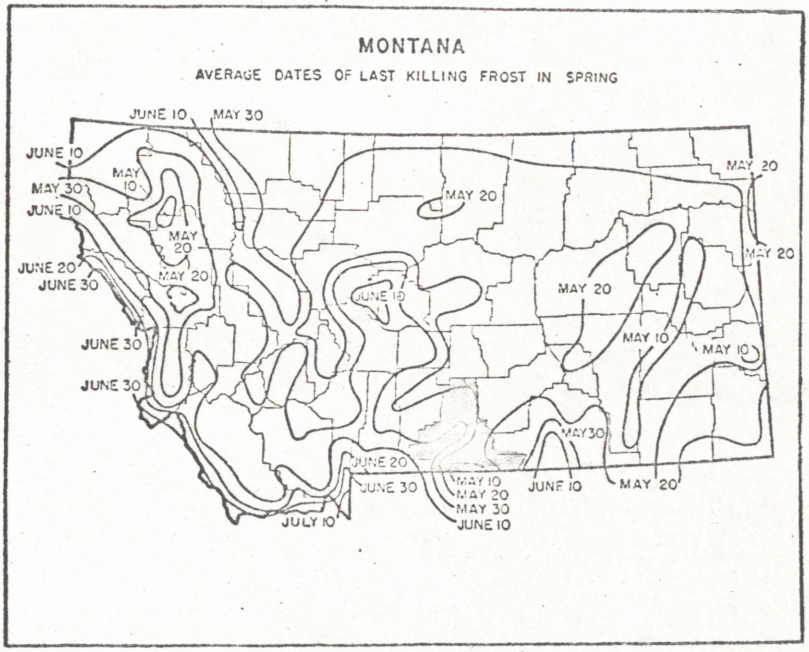


Fig. A-2.

Source: U. S. Dept. of Agriculture, Yearbook of Agriculture, Climate and Man, 1941.

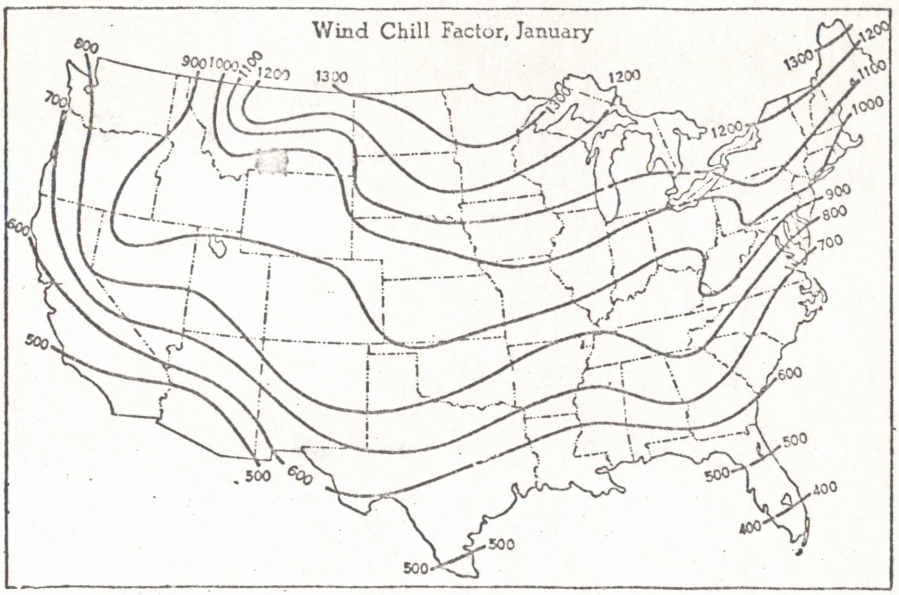


Fig. A-3.

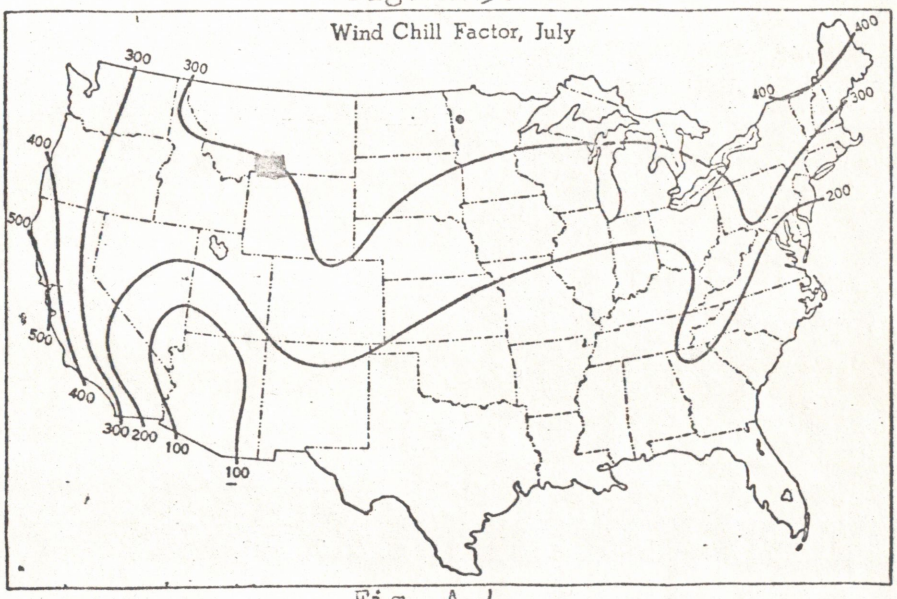


Fig. A-4.

Chill Factor	Description	Temperature (°F.) with Wind 5 m.p.h.
50 or less	hot	87
100	warm	84
200	pleasant	76
400	cool	60
600	very cool	45
800	cold	29
1,000	very cold	13
1,200	bitter cold	-2
1,400	exposed flesh freezes	-18

Source: U. S. Dept. of Commerce, Weather Bureau, Weekly Weather and Crop Bulletin, Vol. XLII, No. 48, Nov. 28, 1955.

COMPREHENSIVE AREA PLAN
CARBON COUNTY, MONTANA

RED LODGE – CARBON COUNTY PLANNING BOARD
RED LODGE, MONTANA

– SOIL STRUCTURE MAP –

PREPARED BY

MUELLER ENGINEERING
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LANDSCAPE ARCHITECTS, PLANNING CONSULTANTS

THIS PROJECT (PREPARED UNDER CONTRACT FOR THE RED LODGE – CARBON COUNTY PLANNING BOARD) WAS FINANCED IN PART THROUGH A PLANNING ADVANCE FROM THE FARMERS HOME ADMINISTRATION, DEPT. OF AGRICULTURE.

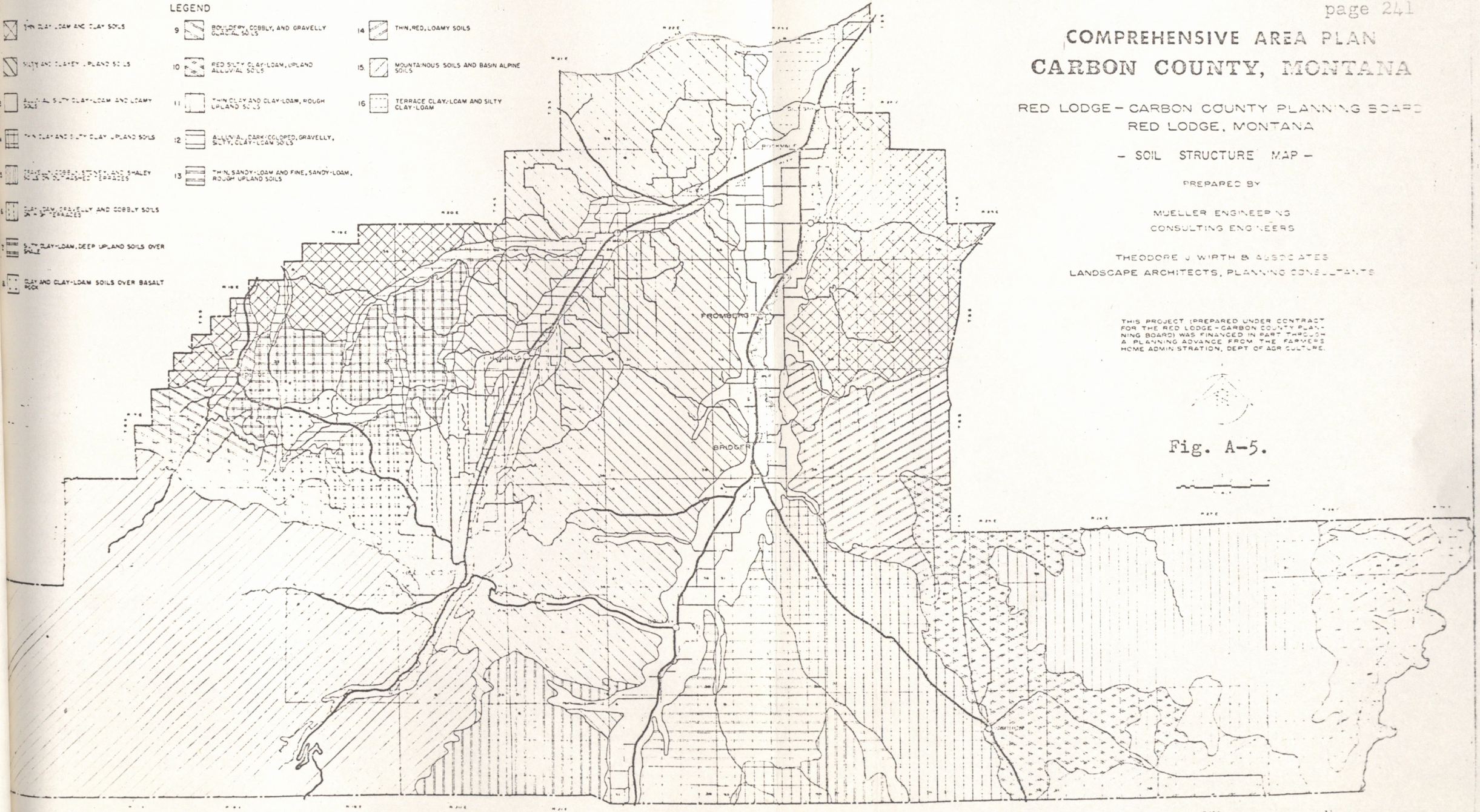


Fig. A–5.

SOIL ASSOCIATIONS - CARBON COUNTY

The Soil Conservation Service of the U.S. Department of Agriculture is currently engaged in a detailed study of the soils of Carbon County. Work has progressed to a point where a general soil map of the county has been prepared. The map shows 16 Soil Associations which are an initial breakdown of the different soils in the area. Each association contains a few major and several minor soils in a pattern characteristic to that particular association. Each association is named for the major soil series contained within its boundaries.

Following is a list of the soil associations shown on the Soil Structure Map of Carbon County (prepared by Theodore J. Wirth and Associates), Figure A-5 , and a brief description of the general characteristics and use of each soil.

II.2.1 Englen-Nerraw-Lismas association: thin clay loam and clay soils

This soil association covers 95,720 acres and occurs in two locations in Carbon County. The areas are chacterized by dendritic drainage patterns with many steep-sided valleys and precipice escarpments. On the broad benches between drainages, tillable soils occur which are some of the best dry farming soils in the Bridger area.

II.2.2 Elso-Midway-Traversilla association: silty and clayey upland soils

The area covered by this association lies between the drainages of the Clark's Fork River and Rock Creek and contains 276,480 acres. The area con-

sists of a series of benches, terraces, broad slopes, valleys, and basins drained by a dendritic drainage pattern. Tillable soils are found throughout the association and some small irrigated tracts occur in the valley bottoms. The association soils are light colored and occur in an area where precipitation amounts range from 10 to 20 inches annually.

II.2.3 Heidt-Havre-Glendive association: Alluvial silty clay loam and loam soils

This association forms a long narrow strip along the Clark's Fork River drainage and covers an area of 50,000 acres. The drainage pattern is typical dendritic with the Clark's Fork River as the main stem. The alluvial soils of the valley floor, stream terraces, and alluvial fans are used for hay, grain, pasture, and irrigated row crops. Soils high in salt content and poorly drained soils are also common throughout the association.

II.2.4 Lismas-Pierre-Traversilla association: thin clay and silty clay loam soils

This association covers 74,300 acres and is located in the south-central portion of Carbon County. It can be described as a steep hilly area cut by many steep narrow dendritic valleys. The predominate soils is a thin clay with many barren shale beds throughout the area. The soils in the area are thus unsuitable for cultivation.

II.2.5 Pomberg-Loma-Ruby-Lismas association: gravelly, cobbly, and shaley soils

This association is located in five small areas of South and Southeastern Carbon County and covers a total of 48,640 acres. Each area is typically a high old outwashed alluvial terrace with gently to steeply rolling landscapes. The soils are mainly coarse gravels overlying shale

beds and are unsuitable for cultivation. Chief use at present is for natural grazing.

II.2.6 Charlos-Bearpaw-Char association: clay loam, deep upland terraces

The high terraces northeast of Red Lodge on both sides of Rock Creek make up the 40,300 acres of this association. The majority of the area is level to gently sloping outwashed terraces with narrow dendritic drainageways. The soils of the terraces are used extensively for the growing of grains, hay, and pasture, while the drainageways are used only for grazing purposes.

II.2.7 Belfry-Senia-Yawdim association: silty clay loam, deep upland soils

This association is located along Red Lodge Creek in Northwestern Carbon County and covers 56,640 acres. The area is characterized by an intricate dendritic drainage pattern with subsequent steep hills, smooth terraces, and narrow dendritic valleys. The soils are used primarily for range land although some of the stream bottoms and gently sloping foothills are used for raising grain and hay.

II.2.8 Blaine-Merino-Castagne association: clay and clay loam soils over basalt

This association is located at the head of Red Lodge Creek and covers an area of 8,320 acres. It is characterized by an igneous upheaval which is surrounded by steep escarpments and narrow divides. The soils of the association are used primarily for grazing, although some hay and grain are grown along the smoother less sloping foothills.

II.2.9 Glaciated soil association: bouldery and cobbly glacial soils

An area of 28,160 acres is covered by this old glaciated association which is located along the foothills of the Beartooth Mountains near the

western edge of the county. Geologic features include strongly sloping to steep morainic fans, channels, bars, and terraces. The soils are used primarily for range or grazing purposes.

11.2.10 Bowler-Stormitt-Shorey association: red silty, clay loam alluvial soils

This association is made up of the old alluvial stream terraces and alluvial fans along the west and south slopes of the Pryor Mountains. An intricate dendritic drainage pattern divides the 62,080 acre area into terraces and steep valleys. Soils of the association are used primarily for grazing. Some small areas are used for growing dryland grains and hay.

11.2.11 Limestone rockland: thin clay and clay loam over limestone

The Pryor Mountains, which are the chief feature of this 131,560 acre association, is a limestone upthrust dissected by deep canyons. Over 90 per cent of this association is limestone rock which the remaining ten per cent is clay or dark colored clay-loam soils. These soils are used for livestock grazing and timber production.

11.2.12 Pleplant-Adel-Red Lodge association: alluvial dark colored soils

This 38,400 acre association is found along the Rock Creek and Red Lodge drainages of Western Carbon County. The soils are dark colored alluvial soils which lend themselves well to irrigation. Hay and grain are grown in this association.

11.2.13 Sandstone Rockland: thin sand loam and fine sandy loam soils

The majority of this 52,480 acre association in south-central Carbon County is steep sandstone cliffs, rock outcrops, and other rugged relief. There are some sandy soils and sandy soils with clay interspersed within. Most of the association is used for rangeland although some of the

narrow dendritic valleys afford some cultivation.

11.2.14 Abac-Bowler-Stormitt association: thin, red, loamy soils

Three areas which total 93,800 acres make up this association. The areas flank the Pryor Mountains on the east, south, and west with the largest area beginning just east of Bridger. Many steep sandstone and shale cliffs face the uplifted Pryor Mountains throughout the association. Bars and embankments cut by a dendritic drainage pattern characterize the area. Most of the soils in the area are used for livestock grazing, although some cultivation for grain and hay has taken place along some of the larger stream drainages.

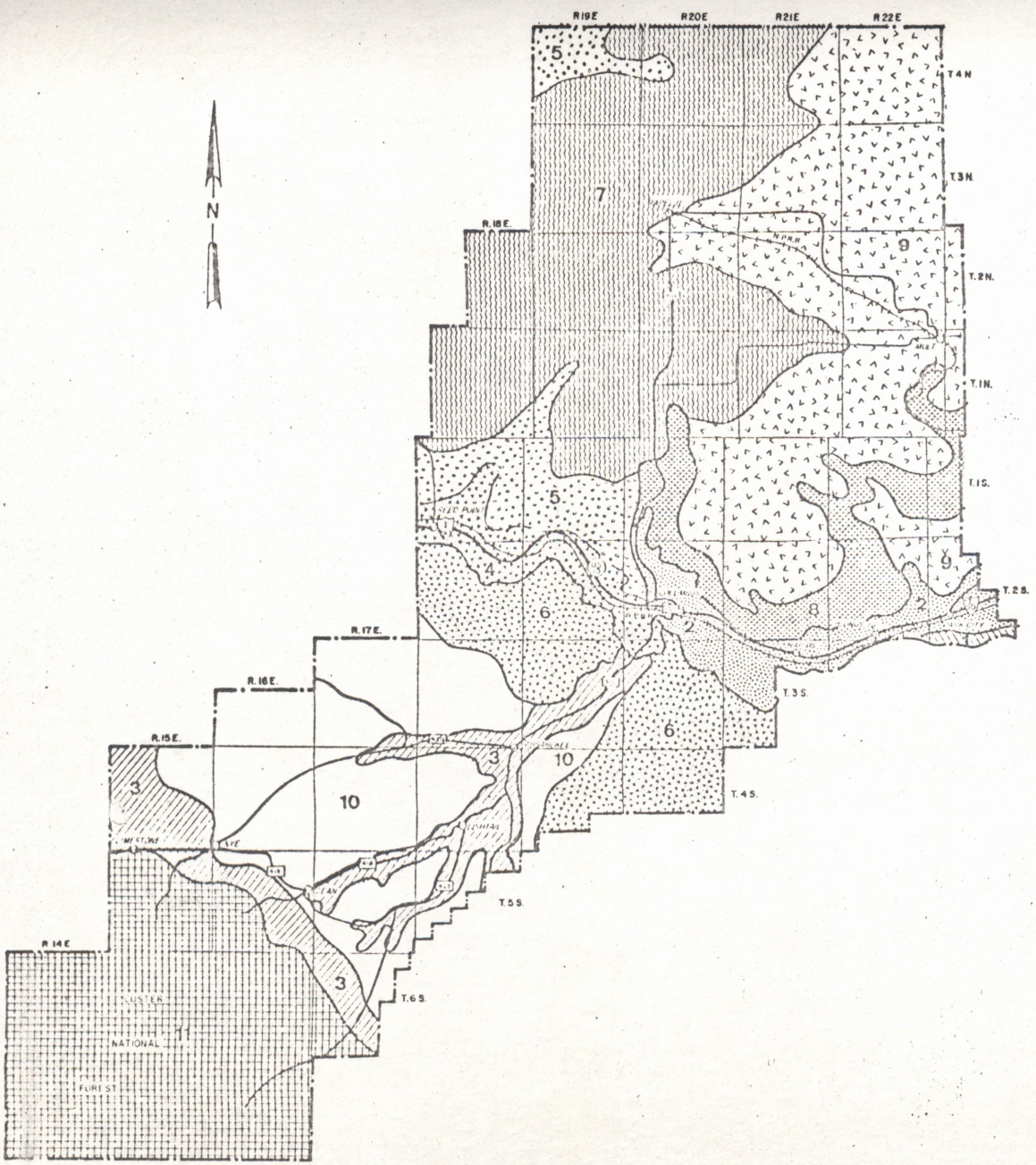
11.2.15 Mountainous soils and Basin alpine soils:

This association covers 257,680 acres and contains the steep glaciated Beartooth Mountains which have been the source of much of the soil material in the valleys and lowlands of Carbon County. Elevations range from 5,000 feet to over 12,000 feet within the association and precipitation amounts range from 20 inches per year to over 40 inches per year. The main soils of this area are of high humus content typical of soil developed under a coniferous forest floor. The soil is very shallow, grading to very rocky, coarse material immediately below the surface. A dark-brown and extremely friable soil is found in the alpine meadows above timberline. Vegetation at these elevations is limited to short grasses and small flowering plants. The association is used mainly for recreational purposes.

11.2.16 Treasure-Chinook-Larimer association: terrace clay loam and silty clay loam soil

This association covers an area of 10,240 acres in the extreme northern part of Carbon County. It mainly consists of a high terrace between the

Clark's Fork River and the Yellowstone River drainages. The terrace is drained by a dendritic drainage pattern and grades from gently rolling benchlands to steep rough breaks to the south and west. The soils on the terrace are well suited for cultivation and are used for the growing of hay, grain, and irrigated row crops. Other soils of the association, specifically those in the steep valleys and upland breaks, are extremely gravelly and are used mainly for open rangeland.



COMPREHENSIVE AREA PLAN
FOR
SEWER AND WATER
STILLWATER COUNTY

PREPARED FOR
COLUMBUS - STILLWATER CITY - COUNTY PLANNING BOAR
COLUMBUS, MONTANA

PREPARED BY
MUELLER ENGINEERING, INC.
CONSULTING ENGINEERS

THEODORE J. WIRTH & ASSOCIATES
LANDSCAPE ARCHITECTS, PLANNING CONSULTANTS

GENERAL SOILS MAP

Fig. A-6.

LEGEND

1 HAVERSON-GLENBERG ASSOCIATION
2 HELDT ASSOCIATION
3 MAURICE-PRYOR-DUKON ASSOCIATION
4 HAVRE-REEDPOINT ASSOCIATION
5 YAWDIM-CABBA-RENTSAC ASSOCIATION
6 ABSAROKEE-MAGINNIS ASSOCIATION
7 BERRY-FIDDLER ASSOCIATION
8 MIDWAY ASSOCIATION
9 WORMSER-LAVINA ASSOCIATION
10 BELFRY-CHARLOS-SAYNE ASSOCIATION
11 MOUNTAINOUS AND ALPINE SOILS

SCALE IN MILES
5 0 5 10

SOURCE: SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

SOIL ASSOCIATIONS - STILLWATER COUNTY

The Soil Conservation Service at Joliet, Montana, is presently engaged in a soil survey of Stillwater County. Work has progressed to the point where a general soil map of the county has been prepared by Theodore J. Wirth and Associates. A reproduction of this map is included as Figure A-6. It should be emphasized that this information is only general.

The map shows eleven soil associations which are an initial breakdown of the different soils in the area. Each association contains a few major and several minor soils in a pattern characteristic to that particular association. Each association is named for the major soil series contained within its boundaries.

Haverson-Glenberg Association. This soil association is found at one location near Park City. The soils are dominated by well drained, light colored loam, sandy loam, and alkali loam soils which are found on valley bottoms in warm arid regions.

Heldt Association. An area along the Yellowstone River between Columbus and Park City is dominated by this soil which consists primarily of well drained, light colored, clay loam soils and light colored, very gravelly high lime soils. They are located in valleys on alluvial fans and terraces in warm arid regions.

Maurice-Pryor-Dukon Association. The majority of the Stillwater River and Rosebud Creek valleys are dominated by this soil. Consists of well drained and poorly drained, light colored sandy loam soils. Found in cold sub-humid regions.

Havre-Reedpoint Association. This association, found in the area along the Yellowstone River from Reedpoint to Columbus, is dominated by well drained, light colored clay loam soil and loam soils. It is common to valley bottoms and coalescing alluvial fans in cool, semi-arid regions.

Yawdin-Cabba-Rentsac Association. This soil is found in two areas of the county as shown on the Soil Map. It consists of shallow excessively drained light colored clay soils in shale, and loam soils on shale and sandstone. The type is commonly found on rolling to steep uplands in cool, semi-arid regions.

Absarokee-Maginnis Association. This soil type is found in two locations around Columbus. The type is dominated by well drained, dark colored clay loam soils and light colored moderately deep soils over sandstone. It is found in broad ridge tops and steep sloping upland areas in cool sub-humid regions.

Berry-Fiddler Association. This soil is found over a large area of the northwestern portion of the county. It is dominated by well drained, dark colored clay loam soils and moderately deep and shallow soils over shale and sandstone bedrock. This soil is found in cool semi-arid regions.

Midway Association. A soil dominated by excessively drained, light colored clay soils in shale and sandy loam soils on sandstone upland bedrock plains. It is associated with warm-arid regions.

Wormser-Lavina Association. A soil common to the eastern half of the county. It is dominated by well drained, light colored clay loam and soils with clay subsoils and shallow loam soils on sandstone uplands. Commonly found in warm semi-arid regions.

Belfry-Charlos-Sayne Association. Found in the southwest area of the county. The soil is dominated by well drained, dark colored loam soils and sandy soils on high terraces, steep uplands and mountainous foothills. It is found in cold

sub-humid regions.

Mountainous and Alpine Soils. The soil found in the extreme southeast portion of the county, mostly within the forest boundary. It is dominated by well drained shallow to very shallow dark colored non-limey, gravelly and stoney soils on high plateau areas, with steep precipitious canyons of barren rock. The area is cold and humid.

MONTANA AMPHIBIANS AND REPTILES[1]

Common Name	Scientific Name	General Distribution
Long-toed Salamander	Ambystoma macrodactylum	Mountainous areas, moist areas
Tiger Salamander	Ambystoma tigrinum	East of Divide, moist areas
Rough-skinned Newt	Taricha granulosa	Limited areas NW Montana, ponds
Tailed Frog	Ascaphus trvel	Mountainous areas, swift streams
Central Plains Spadefoot	Scaphiopus bombifrons	East of Divide, near moist areas
Western Spadefoot	Scaphiopus hammondi	Western half of state east of Divide, near moist areas
Western Toad	Bufo boreas	Western half of state anywhere
Great Plains Toad	Bufo cognatus	Southern half of state, east of Divide
Woodhouse's Toad	Bufo woodhousei	Along Canadian border, east half of state
Pacific Tree Frog	Hyla regilla	Western half of state
Striped Tree Frog	Pseudacris nigrita triseriata	East of Divide, moist areas
Northern Striped Tree Frog	Pseudacris nigrita septentrionalis	Along Canadian border, east half of state, moist areas
Northern Wood Frog	Rana sylvatica	Glacier Park, moist areas
Leopard Frog	Rana pipiens	Entire state, moist areas
Spotted Frog	Rana pretiosa	Entire state, moist areas
Common Snapping Turtle	Chelydra serpentina	Eastern Montana, lower Missouri
Ornate Box Turtle	Terrapene ornata	SW corner of state, land areas
Western Painted Turtle	Chrysemys picta	Entire state, ponds, lakes
Western Spiny Soft-shelled Turtle	Trionyx ferox	Missouri River to Great Falls
Eastern Short-horned Lizard	Phrynosoma douglassi brevirostre	Eastern half of state, plains area
Desert Short-horned Lizard	Phrynosoma douglassi ornatissimum	Southern portion of western half of state, plains area
Sagebrush Lizard	Sceloporus graciosus	Southern portion of eastern half of state, plains area
Western Skink	Eumeces skiltonianus	Western half of state, valleys and lower mountains
Northern Alligator Lizard	Gerrhonotus coeruleus	Western half of state, mountainous areas
Great Basin Rubber Snake	Charina bottae utahensis	Western half of state, mountainous areas
Blue Racer	Coluber constrictor flaviventris	East of Divide, plains area
Western Yellow-bellied Racer	Coluber constrictor mormon	West of Divide, valley areas
Western Hog-nosed Snake	Heterodon nasicus nasicus	SE and eastern areas of state
Western Milk Snake	Iampropeltis triangulum gentilis	
Gopher Snake	Pituophis catenifer sayi	Entire state, valleys and plains areas
Wandering Garter Snake	Thamnophis elegans vagrans	Most of state, most altitudes
Plains Garter Snake	Thamnophis radix haydeni	East of Divide, low and moist places.
Common Garter Snake	Thamnophis sirtalis parietalis	Most of state, moist areas
Western Rattlesnake	Crotalus viridis viridis	Most of state except at higher altitudes

[1]Source: Montana State University, Zoology Dept.

Fig. A-7.

MONTANA NATIVE TREES

CONIFERS

Common Name	Scientific Name
Commercial species:	
Douglas-fir	Pseudotsuga taxifolia
Fir, alpine	Abies lasiocarpa
Fir, grand	A. grandis
Hemlock, mountain	Tsuga mertensiana
Hemlock, western	T. heterophylla
Juniper, Rocky Mountain	Juniperus scopulorum
Larch, alpine	Larix lyalli
Larch, western	L. occidentalis
Pine, lumber	Pinus flexilis
Pine, lodgepole	P. contorta var. latifolia
Pine, ponderosa	P. ponderosa
Pine, western white	P. monticola
Pine, whitebark	P. albicaulis
Redcedar, western	Thuja plicata
Spruce, Engelmann	Picea engelmanni
Spruce, western white	P. glauca var. albertiana
Noncommercial species:	
Pacific Yew	Taxus brevifolia

HARDWOODS

Commercial species:	
Ash, green	Fraxinus pennsylvanica var. lanceolata
Aspen, quaking	Populus tremuloides
Birch, paper	Betula papyrifera
Birch, water	B. fontinalis
Boxelder, inland	Acer negundo var. interius
Cottonwood, northern black	Populus trichocarpa var. hastata
Cottonwood, narrowleaf	P. angustifolia
Cottonwood, plains	P. sargentii
Elm, American	Ulmus americana
Willow	Salix spp.
Noncommercial species:	
Alder, thinleaf	Alnus tenuifolia
Chokecherry, black	Prunus virginiana var. melanocarpa
Hawthorn, black	Crataegus douglasii
Maple, bigtooth	Acer grandidentatum
Maple, Rocky Mountain	A. glabrum
Mountain-ash, western	Sorbus sitchensis
Mountain-mahogany, curlleaf	Cercocarpus ledifolius

[1]Source: U. S. Dept. of Agriculture, Forest Service, Forest Resources of Montana, Forest Resource Report No. 5, 1952.

Fig. A-8

Fig. A-9.

MONTANA MAMMALS[1]

Common Name	Scientific Name	Distribution and Occurrence
Common Shrew	Sorex cinereus	Dry woods, throughout the state.
Vagrant Shrew	Sorex vagrans	Moist woods and meadows in western portion, common.
Merriam Shrew	Sorex merriami	Sagebrush and grasslands in eastern counties, quite rare.
Northern Water Shrew	Sorex palustris	Banks of fast streams and shores of high altitude lakes in mountains.
Pigmy Shrew	Microsorex hoyi	Dry woods of northwestern Montana only, rare.
Little Brown Bat	Myotis lucifugus	Throughout the state, common.
Yuma Bat	Myotis yumanensis	Throughout the state, less common than above.
Little Long-eared Bat	Myotis evotis	Throughout the state, fairly common.
Long-legged Bat	Myotis volans	Higher elevations in western half of the state.
Say Bat	Myotis subulatus	Most of the state.
Big Brown Bat	Eptesicus fuscus	Throughout the state, may hibernate in buildings during winter.
Red Bat	Lasiurus borealis	Eastern portion of the state.
Hoary Bat	Lasiurus cinereus	Deep woods in summer, probably occurs throughout the state in migration.
Spotted Bat	Euderma maculata	Known only from single specimen obtained at Billings.
Silver-haired Bat	Lasionycteris noctivagans	Wooded areas, common.
Black Bear	Ursus americanus	Forested areas, rather common.
Grizzly Bear	Ursus arctos	Remote wilderness areas especially at high elevations, rare.
Fisher	Martes pennanti	Northwestern portion of the state, very rare.
Marten	Martes americana	Most higher mountain regions, common.
Short-tailed Weasel	Mustela erminea	Generally in forested areas, common.
Long-tailed Weasel	Mustela frenata	Throughout the state, common.
Least Weasel	Mustela rixosa	Eastern half of the state, rare.
Mink	Mustela vison	Marsh areas and stream banks throughout the state, common.
Black-footed Ferret	Mustela nigripes	Eastern part of the state in prairie dog colonies, extremely rare.
Wolverine	Gulo gulo	Wilder portions of western mountains, rather rare.
Striped Skunk	Mephitis mephitis	Throughout the state in farm land and open country, common.
Spotted Skunk	Spilogale gracilis	Known only from two specimens obtained in Ravalli County.
Badger	Taxidea taxus	Throughout the state, common.
Otter	Lutra canadensis	On large streams, mostly in western portion, rare.
Raccoon	Procyon lotor	River bottoms, eastern portion of the state.
Red Fox	Vulpes fulva	High mountains of western half of the state, now appearing in eastern counties, rare.
Kit Fox	Vulpes velox	Originally common in eastern counties, now probably extinct.
Coyote	Canis latrans	Throughout the state, common.
Timber Wolf	Canis lupus	Originally present throughout the state, now confined to Glacier National Park and vicinity, rare.
Cougar	Felix concolor	Western counties, rare.
Canada Lynx	Lynx canadensis	Heavily forested areas in western part of state, rare.
Bobcat	Lynx rufus	In many areas in the state, common.
Golden-mantled Marmot	Marmota flaviventris	Rocky areas and mountains of most of the western part of the state, common.
Hoary Marmot	Marmota caligata	Above timberline in Glacier National Park & neighboring high mountain ranges, rare.
Columbian Ground Squirrel	Citellus columbianus	Western one-third of the state, common.
Richardson Ground Squirrel	Citellus richardsonii	Eastern two-thirds of the state, common.
Uinta Ground Squirrel	Citellus armatus	Yellowstone Park and surrounding areas, common.
Thirteen-lined Ground Squirrel	Citellus tridecemlineatus	Grassland in eastern and central areas.
Mantled Ground Squirrel	Citellus lateralis	Rocky areas in the mountains of central and western regions, common.
Black-tailed Prairie Dog	Cynomys ludovicianus	Formerly abundant in eastern Montana, now much reduced by poisoning.
White-tailed Prairie Dog	Cynomys leucurus	Known only in Carbon County.
Least Chipmunk	Tamias minimus	Primarily in sagebrush areas in eastern and central Montana, common.
Yellow Pine Chipmunk	Tamias amoenus	Lower elevations in western Montana, common.

MONTANA MAMMALS (continued)

Common Name	Scientific Name	Distribution and Occurrence
Rufous-tailed Chipmunk	Tamias ruficaudus	Higher elevation in northwestern mountains, common.
Uinta Chipmunk	Tamias umbrinus	Higher elevations in the vicinity of Yellowstone National Park.
Red or Pine Squirrel	Tamiasciurus hudsonicus	Coniferous forest in western counties, common.
Northern Flying Squirrel	Glaucomys sabrinus	Dense forest in western counties, common.
Northern Pocket Gopher	Thomomys talpoides	Throughout the state, common.
Wyoming Pocket Mouse	Perognathus fasciatus	Dry areas in eastern counties, rare.
Beaver	Castor canadensis	Along streams and lakes throughout the state, common.
Ord Kangaroo Rat	Dipodomys ordii	Sandy soil and sagebrush in the eastern half of the state.
Grasshopper Mouse	Onychomys leucogaster	Grasslands of eastern Montana.
Harvest Mouse	Reithrodontomys megalotis	Grasslands of eastern Montana.
Deer Mouse	Peromyscus maniculatus	Throughout the state in virtually all habitats, common.
White-footed Mouse	Peromyscus leucopus	Eastern Montana.
Bushy-tailed Wood Rat	Neotoma cinerea	Deserted cabins in rocky mountain areas, common.
Northern Bog Lemming	Synaptomys borealis	Only in wet meadows of west side of Glacier National Park, rare.
Mountain Phenacomys	Phenacomys intermedius	Mostly near timberline in high mountain ranges.
Red-backed Mouse	Clethrionomys gapperi	Moist coniferous forests in western half of state, common.
Meadow Vole	Microtus pennsylvanicus	Wet meadows throughout the state, common.
Longtail Vole	Microtus longicaudus	Wet woods of central and western Montana, common.
Mountain Vole	Microtus montanus	Dry grasslands of western and central Montana, common.
Richardson Vole	Microtus richardsoni	Stream banks at high elevations in the mountains.
Prairie Vole	Microtus ochrogaster	Dry grasslands of eastern Montana, common.
Sagebrush Mouse	Lagurus curtatus	Sagebrush areas in eastern and central mountains, rare.
Muskrat	Ondatra zibethica	Ponds and streams throughout the state, common.
Rocky Mountain Jumping Mouse	Zapus princeps	High mountain meadows and wet woods near water in the western half of the state.
Prairie Jumping Mouse	Zapus hudsonius	Known only in southeast Montana.
House Mouse	Mus musculus	Around human habitations throughout the state, common.
Norway Rat	Rattus norvegicus	Known only in some of the cities.
Porcupine	Erethizon dorsatum	Throughout the state, common.
Pika	Ochotona princeps	Slide rock areas in higher mountains, common.
Snowshoe Rabbit	Lepus americanus	Forested areas in western half of the state, common.
White-tailed Jack Rabbit	Lepus townsendii	Open areas throughout the state, common.
Black-tailed Jack Rabbit	Lepus californicus	Known only in Grasshopper and adjacent drainages in Beaverhead County.
Mountain Cottontail	Sylvilagus nuttallii	Lower elevations in western Montana, common.
Desert Cottontail	Sylvilagus audubonl	Eastern counties, common.
Pigmy Rabbit	Sylvilagus idahoensis	Known only in Grasshopper drainage in Beaverhead County.
Elk	Cervus canadensis	Certain suitable areas in central and western Montana, common.
White-tailed Deer	Odocoileus virginianus	Forested areas in western Montana and brushy river bottoms in eastern Montana, common.
Mule Deer	Odocoileus hemionus	Suitable habitats throughout the state, common.
Moose	Alces americana	Suitable areas in western half of the state, fairly common.
Woodland Caribou	Rangifer caribou	Formerly occurred in Lincoln County, now enter the state from British Columbia, but only rarely and in winter.
Pronghorn Antelope	Antilocapra americana	Most of eastern and central Montana, common.
Bison	Bison bison	Formerly occurred throughout the state, now confined to Yellowstone National Park, the National Bison Range, and in scattered bands on private ranches.
Bighorn Sheep	Ovis canadensis	In scattered bands in the western half of the state, successfully reintroduced into the Badlands of Garfield County.
Mountain Goat	Oreamnos americanus	High mountain ranges of northwestern Montana, successfully transplanted in the Crazy Mountains.

[1]Source: Montana State University, Zoology Dept.

Fig. A-10.

MONTANA BIRDS[1]

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
ALPINE TUNDRA			
White-tailed Ptarmigan	Lagopus leucurus	S, W, R	
Water Pipit	Anthus spinoletta	S, C	In winter, grassland
Grey-crowned Rosy Finch	Leucosticte tephrocotis	S, F	In winter, grassland.
Breeds in northwestern mountains, in rock cliff areas.			
Black Rosy Finch	Leucosticte atrata	S, F	In winter, grassland
Breeds in southwestern mountains.			
SUBALPINE CONIFEROUS FOREST			
Spruce Grouse	Canachites canadensis	S, W, C	
Great Gray Owl	Strix nebulosa	S, W, R	
Breeds in northwest, where it is known as winter resident.			
Black-backed Three-toed Woodpecker	Picoides arcticus	S, W, F	
Particularly important, along with hairy woodpecker, in controlling bark beetle infestation.			
Northern Three-toed Woodpecker	Picoides tridactylus	S, W, F	
Particularly important, along with hairy woodpecker, in controlling bark beetle infestation.			
Pileated Woodpecker	Dryocopus pileatus	S, W, F	Streamside woodland, montane forest
Northwest mainly. Largest of the woodpeckers.			
Gray Jay	Perisoreus canadensis	S, W, C	
Clark's Nutcracker	Nucifraga columbiana	S, W, C	Montane forest, alpine tundra
Mountain Chickadee	Parus gambeli	S, W, C	Montane forest, upland woodland
Boreal Chickadee	Parus hudsonicus	S, W, R	
Northwest only.			
Winter Wren	Troglodytes troglodytes	S, W, C	Montane forest
Northwest mainly.			
White-winged Crossbill	Loxia leucoptera	S, W, R	Montane forest
Breeds only in northwest; wanders widely and erratically.			
Townsend's Solitare	Myadestes townsendi	S, W, C	Montane forest, alpine tundra
Nests in rocky areas.			
Evening Grosbeak	Hesperiphona vespertina	S, W, C	Woodland, montane forest
Most common in spring and fall.			
Pine Grosbeak	Pinicola enucleator	S, W, C	Woodland, montane forest
Oregon Junco	Junco oreganus	S, W, C	Montane forest, woodland, alpine tundra
Goshawk	Accipiter gentilis	S, W, F	Montane forest
Winters in small numbers in breeding habitat.			
Brown Creeper	Certhia familiaris	S, W, F	Montane forest
Red-breasted Nuthatch	Sitta canadensis	S, W, C	Montane forest
Golden-crowned Kinglet	Regulus satrapa	S, W, C	Montane forest
Barrow's Goldeneye	Bucephala islandica	S, F	Lakes, rivers
Nests in tree holes along margins of sub-alpine lakes in northwest.			
Williamson's Sapsucker	Sphyrapicus thyroideus	S, R	Montane forest
Western mountains.			
Hammond's Flycatcher	Empidonax hammondi	S, C	
Prefers tall, dense conifers.			
Dusky Flycatcher	Empidonax oberholseri	S, C	Montane forest
Prefers open, brushy slopes.			
Rufous Hummingbird	Selasphorus rufus	S, F	
Northwest mainly.			
Tennessee Warbler	Vermivora peregrina	S, R	Shrubland
Northwest only.			
Audubon's Warbler	Dendroica auduboni	S, C	Montane forest
Ruby-crowned Kinglet	Regulus calendula	S, C	Woodland, montane forest
Olive-backed Thrush	Hylocichla ustulata	S, C	Montane forest
Feeds mainly in the trees; mostly at lower elevations.			
Hermit Thrush	Hylocichla guttata	S, C	Montane forest
Feeds mainly on the ground; mostly at higher elevations.			
Mountain Bluebird	Sialia currucoides	S, C	Alpine tundra, montane forest
Migrates widely over grassland and upland shrubland.			
Cassin's Finch	Carpodacus cassinii	S, C	Montane forest, woodland
Pine Siskin	Spinus pinus	S, C	Montane forest, woodland
White-crowned Sparrow	Zonotrichia leucophrys	S, C	Shrubland
West of divide, breeds mainly in shrub stratum. Migrates throughout state.			
Winter Visitors From the Coniferous Forests of Canada			
Boreal Owl	Aegolius funerea	W, R	
Northwest only.			
Hawk-Owl	Surnia ulula	W, R	
Northwest only.			
Birds of the Pacific Coastal Forest and Restricted to Northwestern Montana, Where This Dense Cedar-White Pine-Hemlock Forest Occurs			
Vaux's Swift	Chaetura vauxi	S, R	
Nests in colonies, within hollow trees, or in chimneys.			
Townsend's Warbler	Dendroica townsendi	S, C	
In very dense forest.			
Varied Thrush	Ixoreus naevius	S, C	
Chestnut-backed Chickadee	Parus rufescens	S, W, R	

[1]Source: Montana State University, Zoology Dept.

MONTANA BIRDS (continued)

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
MONTANE CONIFEROUS FOREST			
Sharp-shinned Hawk	Accipiter striatus	S, W, F	Woodland, subalpine forest
Pygmy Owl	Glaucidium gnoma	S, W, C	Subalpine forest
Saw-whet Owl	Aegolius acadicus	S, W, R	Subalpine forest
Hairy Woodpecker	Dendrocopos villosus	S, W, C	Woodland, subalpine forest
Steller's Jay	Cyanocitta stelleri	S, W, F	Woodland, subalpine forest
White-breasted Nuthatch	Sitta carolinensis	S, W, F	Woodland, subalpine forest
Pygmy Nuthatch	Sitta pygmaea	S, W, R	
Mainly in southwest.			
Robin	Turdus migratorius	S, W, C	Subalpine forest, woodland, grassland, alpine tundra
Red Crossbill	Loxia curvirostra	S, W, F	Subalpine forest
Wander widely, erratically, perhaps in response to crops of conifer seeds, on which they feed.			
Bohemian Waxwing	Bombycilla garrula	W, C	Woodland, subalpine forest
Large winter flocks wander in search of berry crops on which they feed.			
Bufflehead	Bucephala albeola	S, R	Streamside woodland
Nest in tree holes along lake and river margins. Northwest mainly.			
Common Goldeneye	Bucephala clangula	S, C	Streamside woodland, subalpine forest
Nest in tree holes along lake and river margins. Northwest mainly.			
Blue Grouse	Dendragapus obscurus	S, C	Winters in subalpine forest
Migrates to lower elevations to breed.			
Common Nighthawk	Chordeiles minor	S, C	Subalpine forest
Yellow-bellied (Red-naped) Sapsucker	Sphyrapicus varius	S, F	Streamside woodland, subalpine forest
Calliope Hummingbird	Stellula calliope	S, C	Subalpine forest
Western Wood Pewee	Contopus sordidulus	S, C	Woodland, subalpine forest
Olive-sided Flycatcher	Nuttallornis borealis	S, F	Subalpine forest
Violet-green Swallow	Tachycineta thalassina	S, C	Upland woodland
Nests on cliffs or in tree holes.			
Western Tanager	Piranga ludoviciana	S, C	Woodland, subalpine forest
Solitary Vireo	Vireo solitarius	S, F	Woodland
Nashville Warbler	Vermivora ruficapilla	S, R	
Northwest only.			
Chipping Sparrow	Spizella passerina	S, C	Subalpine forest, woodland
Passenger Pigeon	Ectopistes migratorius	M	
Formerly common throughout the state, but the species has been exterminated.			
UPLAND WOODLAND			
Screech Owl	Otus asio	S, W, F	Conifer forest, streamside woodland
Lewis' Woodpecker	Asyndesmus lewis	S, C	Montane forest
Orange-crowned Warbler	Vermivora celata	S, C	Conifer forest, streamside woodland
Breeds in aspen or cottonwood groves or on shrubby cut-over land.			
Purple Martin	Progne subis	S, R	Conifer forest, streamside woodland
In east only.			
Western Bluebird	Sialia mexicana	S, R	
West of Continental Divide only.			
Eastern Bluebird	Sialia sialis	S, R	
East of Continental Divide only.			
Pinon Jay	Gymnorhinus cyanocephala	S, W, F	
Juniper-pine woodlands of southeast only.			
Blue Jay	Cyanocitta cristata	S, W, R	Conifer forest
Breeds in east, straggler to west.			
Oven-bird	Seiurus aurocapillus	S, R	Montane forest
Pine hills of southeast only.			
White-winged Junco	Junco aikeni	S, W, F	Montane forest
Pine hills of southeast only.			
Turkey	Meleagris gallopavo	S, W, R	
Not native; introduced into various parts of state (Long Pine Hills, Judith Mountains, and Bitterroot Valley).			
STREAMSIDE WOODLAND			
Long-eared Owl	Asio otus	S, W, C	Woodland
Barred Owl	Strix varia	S, W, R	
In east only.			
Downy Woodpecker	Dendrocopos pubescens	S, W, R	Montane forest
Flicker	Colaptes auratus	S, W, C	Woodland, conifer forest
Two forms, Red-shafted in the west, and Yellow-shafted in the east, intergrade widely central Montana.			
Black-capped Chickadee	Parus atricapillus	S, W, C	Woodland
Wood Duck	Aix sponsa	S	
Common in Bitterroot Valley, rare elsewhere. Nests in treeholes along rivers.			
Hooded Merganser	Lophodytes cucullatus	S, F	Montane forest
Nests in treeholes along rivers.			
Cooper's Hawk	Accipiter cooperii	S, F	Woodland, montane forest
Red-headed Woodpecker	Melanerpes erythrocephalus	S, C	
In east only.			
Chimney Swift	Chaetura pelagica	S, F	Shrubland, grassland
In east only.			
Black-chinned Hummingbird	Archilochus alexandri	S, R	
Northwest only.			
Western Flycatcher	Empidonax difficilis		Montane forest

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
STREAMSIDE WOODLAND (Continued)			
Least Flycatcher In east only.	Empidonax minimus	S, C	
Tree Swallow Nest in treeholes, near water.	Iridoprocne bicolor	S, C	Conifer forest
Baltimore Oriole Extreme east only.	Icterus galbula	S, R	
Bullock's Oriole	Icterus bullockii	S, C	
Cedar Waxwing Wanders widely from year to year.	Bombycilla cedrorum	S, C	
Red-eyed Vireo	Vireo olivaceus	S, C	
Warbling Vireo	Vireo gilvus	S, C	Woodland
House Wren	Troglodytes aedon	S, C	Montane forest
Black-headed Grosbeak	Pheucticus melanocephalus	S, C	
Rusty Blackbird In east only.	Euphagus carolinus	M, R	
STREAMSIDE SHRUBLAND			
(Species of this community are also found in the shrub stratum of the preceding community)			
Ruffed Grouse Prefers dense shrub growth.	Bonasa umbellus	S, W, C	Coniferous forest
Black-billed Magpie Ranges into conifer forest in fall.	Pica pica	S, W, C	Woodland
Common Crow	Corvus brachyrhynchos	S, C	Woodland
Song Sparrow	Melospiza melodia	S, W, C	
Black-billed Cuckoo In east only.	Coccyzus erythropthalmus	S, R	
Yellow-billed Cuckoo In extreme east only.	Coccyzus americanus	S, R	
Carolina Wren In east only.	Thyrothorus ludovicianus	S, R	
Common Grackle In east only.	Quiscalus quiscula	S, S	
Yellow-breasted Chat Mainly in east, in valleys.	Icteria virens	S, F	
Traill's Flycatcher	Empidonax trailli	S, C	
Catbird	Dumetella carolinensis	S, C	
Veery Mainly in west.	Hylocichla fuscescens	S, F	
Yellow Warbler	Dendroica petechia	S, C	
MacGillivray's Warbler	Oporonis tolmiei	S, C	Montane forest
Yellowthroat	Geothlypis trichas	S, C	Marshland
Wilson's Warbler Breeds at higher elevations.	Wilsonia pusilla	S, C	
American Redstart Breeds at lower elevations.	Setophaga ruticilla	S, C	
Lazuli Bunting	Passerina amoena	S, C	Upland shrubland, grassland
American Goldfinch	Spinus tristis	S, C	
Rufous-sided Towhee	Pipilo erythropthalmus	S, C	Upland shrubland
Fox Sparrow Breeds in western mountains, migrates throughout state.	Passerella iliaca	S, F	Alpine tundra
Lincoln's Sparrow Breeds in western mountains, migrates throughout state.	Melospiza lincolnii	S, C	
White-crowned Sparrow East of Divide, breeds mainly in streamside shrubs. Migrates throughout state.	Zonotrichia leucophrys	S, C	Upland shrubland, coniferous forest
Slate-colored Junco	Junco hyemalis	M, F	Upland shrubland
Migrants Through the Eastern Part of the State, Many of Them Rare. They Frequent a Variety of Habitats, But are Perhaps Most Common in Streamside Shrubland.			
Gray-cheeked Thrush	Hylocichla minima	M, R	
Myrtle Warbler	Dendroica coronata	M, F	
Blackpolled Warbler	Dendroica striata	M, F	
Black-and-White Warbler	Mniotilta varia	M, R	
Bay-breasted Warbler	Dendroica castanea	M, R	
Blackburnian Warbler	Dendroica fusca	M, R	
Swamp Sparrow	Melospiza georgiana	M, R	
White-throated Sparrow	Zonotrichia albicollis	M, R	
Harris' Sparrow	Zonotrichia querula	M, R	
UPLAND SHRUBLAND			
Sage Grouse In east only.	Centrocercus urophasianus	S, W, F	
Poor-will Mainly in east.	Phalaenoptilus nuttallii	S, C	Upland woodland
Mourning Dove	Zenaidura macroura	S, C	Streamside shrubland, woodland
Sage Thrasher In east only.	Oreoscoptes montanus	S, R	
Brown Thrasher Extreme east only.	Toxostoma rufum	S, C	Streamside shrubland
	Passerella gramineus	S, C	Grassland

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
UPLAND SHRUBLAND (Continued)			
Brewer's Sparrow Mainly in east.	Spizella breweri	S, C	
Clay-colored Sparrow In east only.	Spizella pallida	S, C	
Green-tailed Towhee Southwestern mountains.	Chlorura chlorura	S, R	Streamside shrubland
Sage Sparrow In southeast only.	Amphispiza belli	S, F	
Field Sparrow In southeast only.	Spizella pusilla	S, R	Upland woodland
GRASSLAND			
Prairie Falcon	Falco mexicanus	S, W, R	Upland shrubland
Burrowing Owl	Speotyto cunicularia	S, W, C	
Sharp-tailed Grouse	Pedioecetes phasianellus	S, W, F	
Greater Prairie Chicken Now extinct in state; formerly in extreme east.	Tympanuchus cupido	S, W	
Horned Lark Mainly on dry short grass prairie.	Eremophila alpestris	S, W, C	Alpine tundra
Western Meadowlark Montana's State Bird.	Sternella neglecta	S, W, C	
Swainson's Hawk	Buteo swainsoni	S, C	Woodland, upland shrubland
Ferriginous Hawk Mainly in east.	Buteo regalis	S, C	Upland shrubland
Eastern Kingbird	Tyrannus tyrannus	S, C	Streamside woodland
Western Kingbird	Tyrannus verticalis	S, C	Upland woodland
Say's Phoebe Nests in rocky areas, under bridges and on buildings.	Sayornis saya	S, C	Upland shrubland
Sprague's Pipit In east only.	Anthus spragueii	S, F	
Loggerhead Shrike	Lanius ludovicianus	S, F	Upland woodland, shrubland
Bobolink Wet, tall-grass prairie.	Dolichonyx oryzivorus	S, F	
Brown-headed Cowbird Lays eggs in nests of other small birds.	Molothrus ater	S, F	Streamside woodland
Brewer's Blackbird A very widespread species.	Euphagus cyanocephalus	S, C	Shrubland, marshland, woodland
Chestnut-collared Longspur In east only, nests on wet, tall-grass prairie.	Calcarius ornatus	S, C	
McCown's Longspur In east only, nests on dry, short-grass prairie.	Rhynchophanes mccownii	S, C	
Lark Sparrow	Chondestes grammacus	S, C	Woodland, upland shrubland
Savannah Sparrow Usually in tall-grass areas.	Passerculus sandwichensis	S, C	Marshland, upland shrubland
Grasshopper Sparrow Short-grass areas.	Ammodramus savannarum	S, F	
Baird's Sparrow In east only.	Ammodramus bairdii	S, R	
Lark Bunting Mainly in east.	Calamospiza melanocorys	S, C	
LeConte's Sparrow Northwest only.	Passerherbulus caudacutus	S, R	Marshland
Sharp-tailed Sparrow Northeast only.	Ammospiza caudacuta	S, R	Marshland
Shorebirds That Breed on Grassland, But Feed and Migrate on Wetlands.			
Mountain Plover In east only.	Eupoda montana	S, R	
Upland Plover	Bartramia longicauda	S, R	
Long-billed Curlew	Numenius americanus	S, F	
Marbled Godwit In east only.	Limosa fedoa	S, R	
Winter Visitors From the Arctic or Alpine Tundra, and Coniferous Forest.			
Rough-legged Hawk	Buteo lagopus	W, C	Upland shrubland
Snowy Owl	Nyctea scandiaca	W, R	
Northern Shrike	Lanius excubitor	W, F	Shrubland, upland woodland
Water Pipit	Anthus spinoletta	W, C	Breeds in alpine tundra
Tree Sparrow	Spizella arborea	W, C	Shrubland
Common Redpoll Irregular in occurrence.	Acanthis flammea	W, C	
Rosy Finch (Black and Grey-crowned)	Leucosticte sp. Large flocks, irregular occurrence.	W, C	Breeds in alpine tundra
Lapland Longspur Erratic occurrence; in large mixed flocks.	Calcarius lapponicus	W, F	
Snow Bunting	Plectrophenax nivalis	W, F	Wetland margins

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
Introduced Game Birds of Open Country			
Ring-neck Pheasant	Phasianus colchicus	S, W, C	Shrubland
Principally found on farmland and grainfields.			
Grey (Hungarian) Partridge	Perdix perdix	S, W, F	
Principally found on farmland and grainfields.			
Chukar Partridge	Alectoris graeca	S, W, R	Upland shrubland
Bobwhite	Colinus virginianus		
Introduced in 1890's; successful for a time, now extinct.			
WETLANDS: LAKE AND RIVER MARGINS, MARSHLAND			
Inhabitants of Marshland			
Virginia Rail	Rallus limicola	S, R	
Sora	Porzana carolina	S, F	
Common Snipe	Capella gallinago	S, W, F	Grassland (wet)
Marsh Hawk	Circus cyaneus	S, W, C	Grassland
Winters in small numbers.			
Short-eared Owl	Asio flammeus	S, W, C	Grassland
Long-billed Marsh Wren	Telmatodytes palustris	S, R	
Yellow-headed Blackbird	Xanthocephalus xanthocephalus	S, F	Grassland (wet)
Redwinged Blackbird	Agelaius phoeniceus	S, C	Grassland (wet)
Summer Residents of Marshland and Lakes			
Common Loon	Gavia immer	S, F	
Mainly in west.			
Western Grebe	Aechmophorus occidentalis	S	
Rare breeder, but common migrant. In west only.			
Red-necked Grebe	Podiceps grisegena	S, F	
Mainly in west.			
Horned Grebe	Podiceps auritus	S, R	
Eared Grebe	Podiceps caspicus	S, C	
Pied-billed Grebe	Podilymbus podiceps	S, C	
Mainly in south.			
Great Blue Heron	Ardea herodias	S, C	
American Bittern	Botaurus lentiginosus	S, F	
Summer or Permanent Residents of Marshland, Lakes and Rivers			
Double-crested Cormorant	Phalacrocorax auritus	S, R	
Mainly in east.			
White Pelican	Pelecanus erythrorhynchos	S, F	
Mainly in east.			
Trumpeter Swan	Olor buccinator	S, W, C	
In Yellowstone-Hebgen-Red Rocks lakes area. Absent elsewhere. Once almost exterminated but the largest colony in the U. S. of about 500 birds, now occurs in Montana. At one time bred over much of the state.			
Canada Goose	Branta canadensis	S, W, C	
Winters on open waters in western part of state.			
Mallard	Anas platyrhynchos	S, W, C	
Gadwall	Anas strepera	S, F	
Pintail	Anas acuta	S, C	
Green-winged Teal	Anas carolinensis	S, W, C	
A few winter in western part of state.			
Blue-winged Teal	Anas discors	S, F	
Cinnamon Teal	Anas cyanoptera	S, F	
Mainly in west.			
American Widgeon	Mareca americana	S, C	
Shoveler	Spatula clypeata	S, F	
Redhead	Aythya americana	S, C	
Canvasback	Aythya valisneria	S, F	
Lesser Scaup	Aythya affinis	S, C	
Ruddy Duck	Oxyura jamaicensis	S, F	
Common Merganser	Mergus merganser	S, W, C	
Mainly in west.			
Sandhill Crane	Grus canadensis	S, R	
American Coot	Fulica americana	S, C	
Wison's Phalarope	Steganopus tricolor	S, C	
American Avocet	Recurvirostra americana	S, F	
Willet	Catoptrophorus semipalmatus	S, R	
Mainly in east.			
Killdeer	Charadrius vociferus	S, W, C	
Winters in small numbers in western part of state.			
Ring-billed Gull	Larus delawarensis	S, C	
California Gull	Larus californicus	S, F	
Franklin's Gull	Larus pipixcan	S, R	
In east only.			
Common Tern	Sterna hirundo	S, F	
In east only.			
Black Tern	Chlidonias niger	S, F	
Bald Eagle	Haliaeetus leucocephalus	S, W, R	
Mainly in west.			
Osprey	Pandion haliaetus	S, R	
Mainly in west.			

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
Summer or Permanent Residents of Forest Streams and Lakes			
Wood Duck	Aix sponsa	S	Streamside, woodland
Common in Bitterroot Valley. Nests in tree-holes along stream margin.			
Bufflehead	Bucephala albeola	S, F	Montane forest
Nest in tree-holes along margins of lakes and streams.			
Common Goldeneye	Bucephala clangula	S, W, C	Montane forest
Nest in tree-holes along margins of lakes and streams.			
Barrow's Golden-eye	Bucephala islandica	S, W, F	Subalpine forest
Nest in tree-holes along margins of lakes and streams.			
Harlequin Duck	Histrionicus histrionicus	S, F	Conifer forest
In west only, nesting along mountain streams.			
Hooded Merganser	Lophodytes cucullatus	S, R	Montane forest
Nests in tree-holes along stream margins.			
Spotted Sandpiper	Actitis macularia	S, C	
Breed along streams in valleys and mountains.			
Belted Kingfisher	Megaceryle alcyon	S, W, C	
Dipper	Cinclus mexicanus	S, W, C	
In western mountains.			
Northern Water-thrush	Seiurus noveboracensis	S, R	
In western mountains.			
Migrant Visitors to Wetlands			
Black-crowned Night Heron	Nycticorax nycticorax	M	
Status uncertain; may breed and be increasing in extreme east.			
Whistling Swan	Olor columbianus	M, F	
White-fronted Goose	Anser albifrons	M, F	
Mainly in east.			
Snow Goose	Chen hyperborea	M, C	
Ross' Goose	Chen rossii	M, F	
Ring-necked Duck	Aythya collaris	M, F	
May breed in state.			
White-winged Scoter	Melanitta deglandi	M, R	
Red-breasted Merganser	Mergus serrator	M, F	
Northern Phalarope	Lobipes lobatus	M, F	
Baird's Sandpiper	Erolia bairdii	M, C	
Least Sandpiper	Erolia minutilla	M, C	
Semipalmated Sandpiper	Ereunetes pusilla	M, F	
Sanderling	Crocethia alba	M, F	
In west only.			
Greater Yellowlegs	Totanus melanoleucus	M, C	
Lesser Yellowlegs	Totanus flavipes	M, C	
Solitary Sandpiper	Tringa solitaria	M, C	
Migrants on Wetlands, But Breeding on Grassland			
Upland Plover	Bartramia longicauda	M, R	Nests in grassland
Formerly common.			
Long-billed Curlew	Numenius americanus	M, F	Nests in grassland
Formerly common.			
Marbled Godwit	Limosa fedoa	M, R	Nests in grassland
Rare Migrant Shorebirds			
Semipalmated Plover	Charadrius semipalmatus	M, R	
American Golden Plover	Charadrius dominicus	M, R	
In east only.			
Black-bellied Plover	Squatarola squatarola	M, R	
Buff-breasted Sandpiper	Tryngites subruficollis	M, R	
White-rumped Sandpiper	Erolia fuscicollis	M, R	
Stilt Sandpiper	Micropalama himantopus	M, R	
Pectoral Sandpiper	Erolia melanotos	M, R	
Long-billed Dowitcher	Limnodromus scolopaceus	M, R	
Eskimo Curlew	Numenius borealis	M	
Now probably extinct as a species. Formerly migrated through eastern part of state.			
Migrant Gulls and Terns			
Herring Gull	Larus argentatus	M, F	
In east only.			
Bonaparte's Gull	Larus philadelphia	M, R	
Forster's Tern	Sterna forsteri	M, C	

MONTANA BIRDS (continued)

Common Name	Scientific Name	Seasonal Occurrence, Relative Abundance	Other Communities In Which Found
AZONAL			
(Some birds cannot be classified as members of any principal community, either because they are wide-ranging raptors or scavengers, or because their habitat requirements are met by special environmental features within any of the habitats.)			
Wide-Ranging Raptors and Scavengers			
Horned Owl	Bubo virginianus	S, W, C	
Golden Eagle	Aquila chrysaetos	S, W, F	
Turkey Vulture Mainly in east.	Cathartes aura	S, W, F	
Common Raven	Corvus corax	S, W, F	
Red-tailed Hawk	Buteo jamaicensis	S, C	
Sparrow Hawk	Falco sparverius	S, C	
Pigeon Hawk	Falco columbarius	S, R	
Peregrine Falcon	Falco peregrinus	S, W, R	
Nesters on Rock Cliffs or Rocky Slopes			
Black Swift Northwest only.	Cypseloides niger	S, C	(locally)
White-throated Swift	Aeronautes saxatilis	S, C	(locally)
Canon Wren Mainly in west.	Catherpes mexicanus	S, R	
Rock Wren Mainly in open country.	Salpinctes obsoletus	S, C	
Cliff Swallow Also nest in colonies on buildings.	Petrochelidon pyrrhonota	S, C	
Nesters in Dirt Banks			
Bank Swallow Nests in large colonies	Riparia riparia	S, C	
Rough-winged Swallow Nests in small groups or single pairs	Stelgidopteryx ruficollis	S, F	
Nesters on Buildings			
Barn Swallow Before man, nested on cliffs and in caves.	Hirundo rustica	S, F	
Starling Introduced species. Also nests in tree holes.	Sturnus vulgaris	S, W, C	
House Sparrow Introduced species.	Passer domesticus	S, W, C	
Rock Dove Introduced species.	Columba livia	S, W, C	
VERY RARE STRAGGLERS			
(Accidental wanderers into the state: mostly shorebirds and waterfowl.)			
Wood Ibis	Mycteria americana	M	Wetlands
White-faced Ibis	Plegadis chihi	M	Wetlands
Oldsquaw	Clangula hyemalis	W	Lakes, rivers
Surf Scoter	Melanitta perspicillata	M	Lakes, rivers
Gyrfalcon	Falco rusticolus	W	Grassland, wetlands
Willow Ptarmigan	Lagopus lagopus	W	Grassland
Whooping Crane Formerly migrated through eastern Montana, but now apparently only through the Dakotas. About 20 individuals of this once numerous species still exist.	Grus americana	M	Wetlands
American Woodcock In east only.	Philohela minor	M	Streamside shrubland
Knot	Calidris canutus	M	Wetlands
Hudsonian Godwit In east only.	Limosa haemastica	M	Wetlands
Long-tailed Jaeger	Stercorarius longicaudus	W	Wetlands
Sabine's Gull	Xema sabini	M	Lakes, rivers
Least Tern	Sterna albifrons	M	Wetlands
Allens' Hummingbird Western mountains only.	Selasphorus sasin	M	Shrubland
Philadelphia Vireo	Vireo philadelphicus	M	Shrubland
Palm Warbler	Dendroica palmarum	M	Shrubland
Dickcissel	Spiza americana	S	Grassland
Hoary Redpoll In extreme east only, found with flocks of Common Redpolls.	Acanthis hornemanni	W	Grassland

MONTANA FISHES[1]

Common Name	Scientific Name	Distribution	Occurrence	Use
Paddlefish Family				
Paddlefish	Polyodon spathula	E		S
Sturgeon Family				
White sturgeon	Acipenser transmontanus	W		S
Shovelnose or hackleback	Scaphirhynchus platorynchus	E		S
Pallid sturgeon	S. album	E	Rare	S
Gar Family				
Shortnose gar	Lepisosteus platostomus	E	Rare	O
Northern longnose gar	L. osseus	E		O
Mooneye Family				
Goldeye	Amphiodon alosoides	E		R
Salmon Family				
Kokanee or sockeye salmon	Oncorhynchus nerka	W, I		S
Coho or silver salmon	O. kisutch	W, I		S
Brook trout	Salvelinus fontinalis	E, I		S
Lake trout	S. namaycush	W, I		S
Dolly Varden or Bull trout	S. alpinus	W		S
Brown trout	Salmo trutta	E, I		S
Coastal cutthroat	S. clarki clarki	E (I), W		S
Yellowstone cutthroat trout	S. clarki lewisi	E, W (I)		S
Golden trout	S. aguabonita	E, I		S
Rainbow trout	S. gairdneri	E, I		S
Whitefish Family				
Lake whitefish	Coregonus clupeaformis	W, I		S
Mountain whitefish	C. williamsoni	E, I		S
Pigmy whitefish	C. coulteri	W	Rare	F
Grayling Family				
Grayling	Thymallus arcticus	E, W (I)		S
Sucker Family				
Largescale sucker	Catostomus macrocheilus	W		R
Longnose sucker	C. catostomus	E		R
White sucker	C. commersoni	E		R
Northern carpsucker	Carpiodes carpio	E		R
Mountain sucker	Pantosteus jordani	E		R
Blue sucker	Cycleptus elongatus	E	Rare	R
Northern redhorse	Moxostoma aureolum	E		R
Minnow Family				
Carp	Cyprinus carpio	E (I)		R, O
Northern creek chub	Semotilus atromaculatus	E		F
Lake chub	Couesius plumbeus	E		F
Flathead chub	Platygobio gracilis	E		F
Longnose dace	Rhinichthys cataractae	E		F
Utah chub	Gila atraria	E, I		F, O
Peamouth chub	Mylocheilus caurinum	W		R
Redside shiner	Richardsonius balteatus	W		F
Shiners (various)	Notropis, various species	E		F
Northern redbelly dace	Chrosomus eos	E		F
Fathead minnow	Pimephales promelas	E		F
Silvery minnow	Hybognathus nuchalis	E		F
Northern pearl dace	Margariscus margarita	E		F
Northern squawfish	Ptychocheilus oregonense	W		R
Catfish Family				
Northern brown bullhead	Ictalurus nebulosus	E		S
Northern black bullhead	Ictalurus melas	E, I		S
Channel catfish	Ictalurus lacustris	E		S
Stonecat	Noturus flavus	E		S
Tadpole madtom?	Schilbeodes mollis	E		F?
Pike Family				
Northern pike	Esox lucius	E		S
Cod Family				
Burbot or ling	Lota lota	E		S
Perch Family				
Yellow perch	Perca flavescens	E, I		S, O?
Yellow walleye or pikeperch	Stizostedion vitreum	E, W (I)		S
Iowa darter	Poecilichthys exilis	E		F
Sunfish Family				
Smallmouth bass	Micropterus dolomieui	E, I		S
Largemouth bass	M. salmoides	E, I		S
Pumpkinseed	Lepomis gibbosus	E, I		S, O?
Drum Family				
Freshwater sheepshead	Aplodinotus grunniens	E		R
Sculpin Family				
Torrent sculpin	Cottus rhotheus	W		F
Slimy sculpin	C. cognatus	E		F
Rocky Mountain mottled sculpin	C. bairdi	E		F
Stickleback Family				
Brook stickleback	Eucalia inconstans	E		F

[1]Source: Montana State University, Zoology Dept.

Fig. A-11.

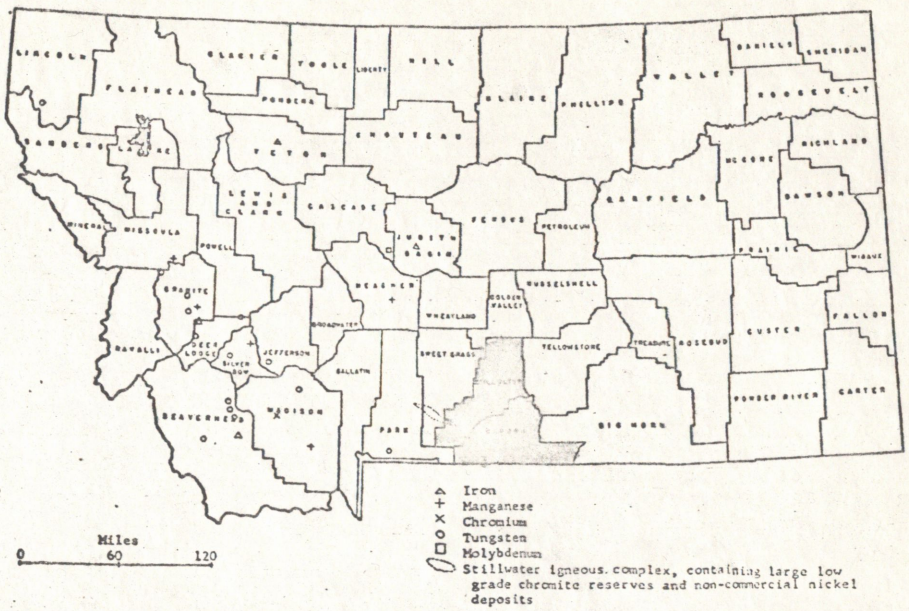
TABLE XV

	Stream	Location	Drainage Area (Sq.Mi)	See Notes	Discharge (CFS) Max.	Date	Min.	Date	Runoff-(1000 Acre-Feet) Max.	Date	Min.	Date
1.	East Rosebud Creek	6.5 mi. upstream from Roscoe	105	1	1,980	6-12-21	25	2-27-28	*	*	*	*
2.	East Rosebud Creek	Roscoe	125	1 & 2	1,330	6-13-23	4	1-12-23	175	1924	123	1922
3.	Clarks Fork Yellowstone	Chance	1154	2	10,900	5-26-28	32	4-26-61	1060	1928	469	1931
4.	"	Fromberg	1940	1 & 2	12,700	7- 3-09	**	**	1220	1909	765	1910
5.	"	Edgar	2032	2	10,900	6- 2-36	36	4-22-61	1128	1943	505	1931
6.	Bluewater Creek	Bridger (Near Fish Hatchery)	27.5	2	2,650	6-29-64	19	7-14-60	20.4	1962	19.5	1963
7.	Bluewater Creek	Fromberg	53.2	1 & 2	500	6- 9-64	4.4	7-17-63	28.3	1963	28.3	1962
8.	Rock Creek	Below Glacier Lake	3.89	1	90	7-10-63	0	***	8.8	1963	3.6	1962
9.	Rock Creek	Red Lodge	124	1	3,110	6- 4-57	14	11-19-54	182.1	1943	83.9	1955
10.	Rock Creek	Joliet	539	1 & 2	1,930	6- 6-52	18	2-11-49	2428	1948	1331	1949
11.	Rock Creek	Rockvale	569	1 & 2	2,310	6- 8-32	****	7-14-35	1390	1921	62.2	1940
12.	West Fork of Rock Creek	0.6 mi. below Silver Run Creek	63.1	1	933	6- 6-52	10	11-17-39	*	*	*	*
13.	West Fork of Rock Creek	2 mi. upstream from mouth	66.9	1 & 2	1,850	6-22-37	2.5	11-18-39	80.6	1944	24.5	1936
14.	Red Lodge Creek	Above Cooney Reservoir	143	2	1,360	6-17-57	****	1949	*	*	*	*
15.	Red Lodge Creek	Below Cooney Reservoir	210	2	3,590	6-17-57	****	10- 6-48	128.6	1942	17.6	1961
16.	Willow Creek	Above Cooney Reservoir	53.3	2	848	6-17-57	0.4	11-26-48	*	*	*	*

Data taken from: "Water Resources Survey" Carbon County, Montana
State Water Conservation Board, Helena, Montana, 1966

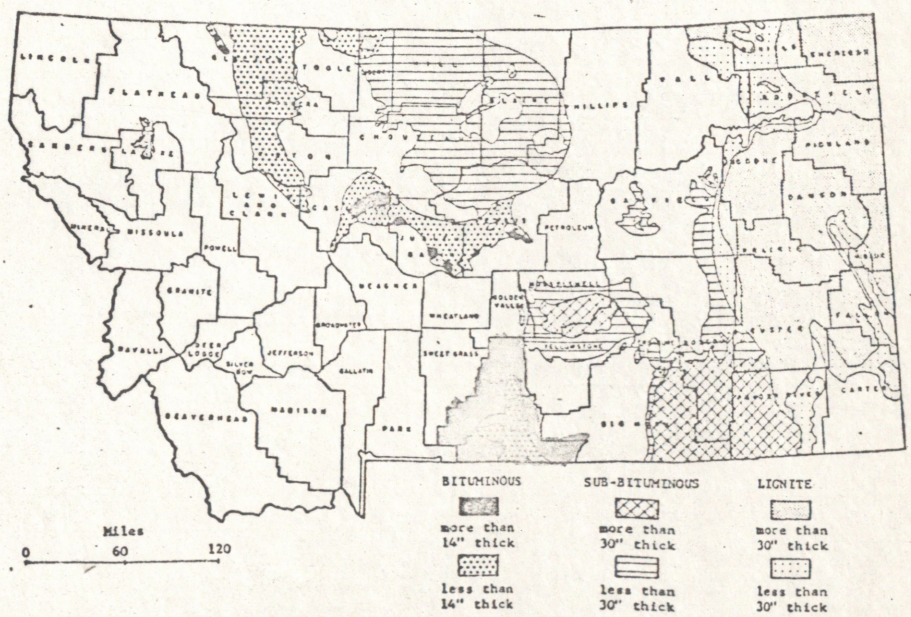
Notes: 1. Only fragmentary records are available for these stations
2. Irrigation diversions occur above these stations

* Not recorded
** None determined
*** Controlled discharge
**** No flow



IRON AND IRON ALLOY METAL RESOURCES OF MONTANA
Adapted from Chace, F. M. et al, 1947 (See Bibliography).

Fig. A-12.



MONTANA COAL FIELD AREAS
Adapted from Combo, J. X. et al, 1949 (See Bibliography).

Fig. A-13.

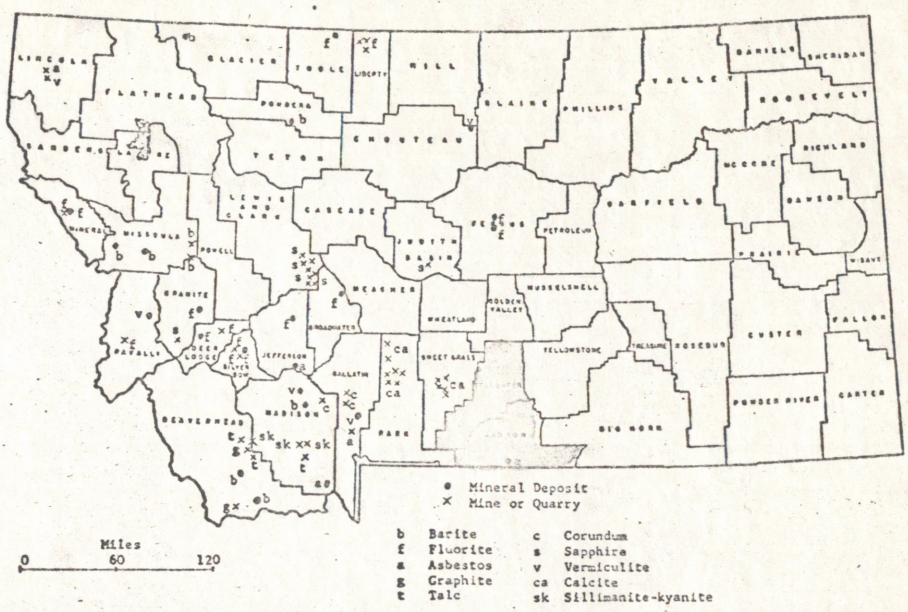
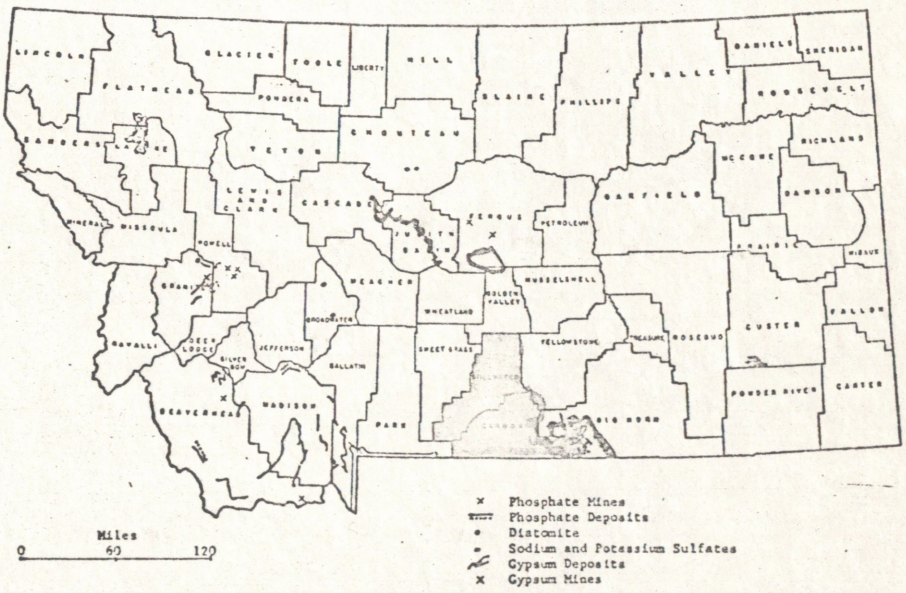
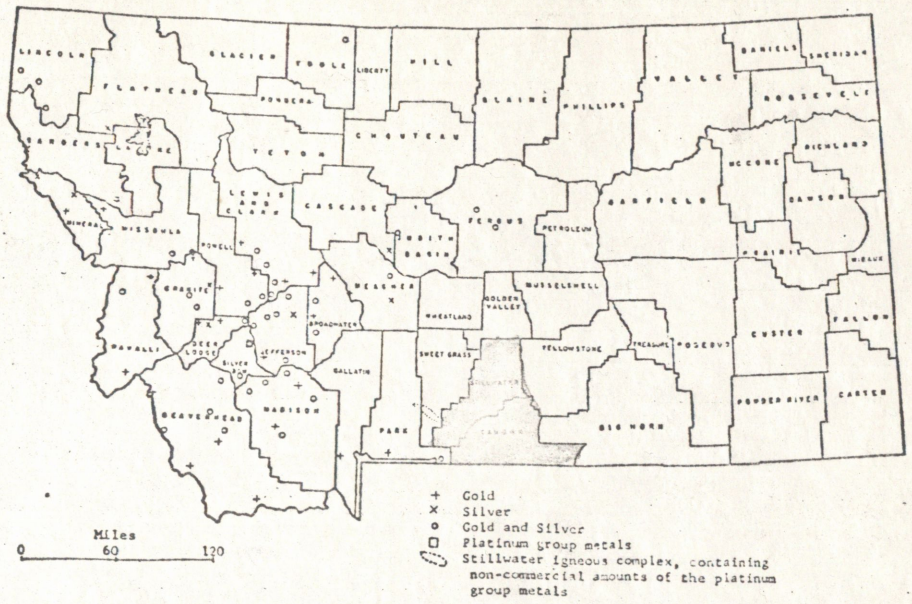


Fig. A-14.



NONMETALLIC MINERAL RESOURCES OF MONTANA
Adapted from Knechtel, M. M. et al, 1948 (See Bibliography).

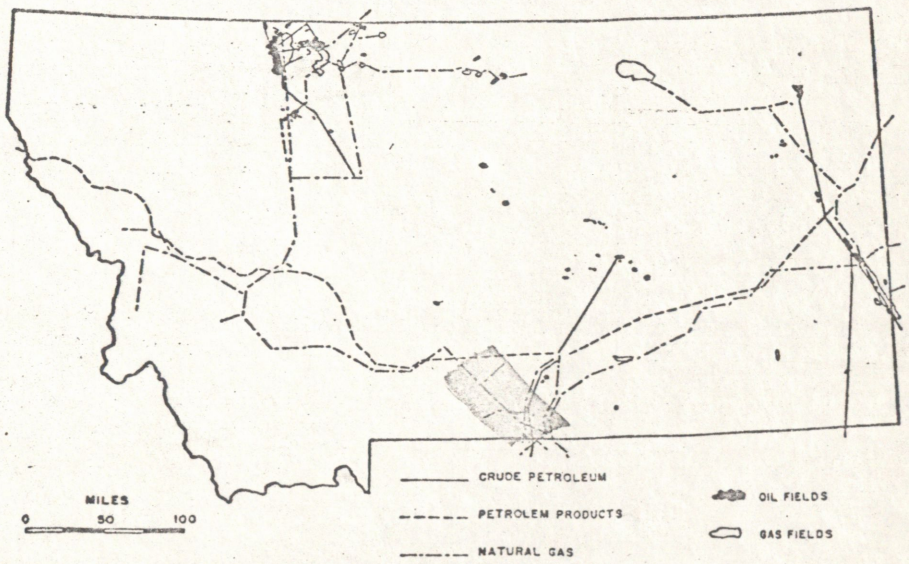
Fig. A-15.



PRECIOUS METAL RESOURCES OF MONTANA

These maps locate the more important reserves of the indicated metal ores, but they include some districts more notable for large past production than for present reserves. Adapted from Chace, F. M. et al, 1947 (See Bibliography).

Fig. A-16.



PETROLEUM AND NATURAL GAS PIPELINES AND FIELDS

Sources: U. S. Dept. of the Interior, Geological Survey, Oil and Gas Fields and Test Wells for Oil and Gas in Montana, 1954, O. M. 170; U. S. Federal Power Commission, Major Natural Gas Pipe Lines in United States as of December 31, 1954; and Montana Power Company, Gas Transmission System, August 24, 1956.

Fig. A-17.

NUMBER OF DEATHS AND CRUDE DEATH RATES, SELECTED CAUSES, MONTANA AND THE UNITED STATES, 1956[1]

Fig. A-18.

Cause of Death	Number of Deaths Montana	Death Rate[2] Montana	Death Rate[2] United States
All causes	6,450	987.7	935.4
Infective and parasitic diseases, total	108	16.5	15.1
Tuberculosis of respiratory system	43	6.6	7.8
Tuberculosis, other forms	5	0.8	0.6
Syphilis and its sequelae	23	3.5	2.3
Gonococcal infection and other venereal diseases	1	0.2	0.0
Other bacterial diseases	15	2.3	1.7
Septicemia and pyemia	5	0.8	0.7
Meningococcal infections	7	1.1	0.5
Other	3	0.5	0.5
Diseases attributable to viruses	18	2.8	1.9
Acute infectious encephalitis	2	0.3	0.3
Infectious hepatitis	10	1.5	0.5
Other	6	0.9	1.1
Other infective and parasitic diseases	3	0.5	0.8
Neoplasms, total	959	146.9	150.9
Malignant neoplasms of buccal cavity and pharynx	21	3.2	3.3
Malignant neoplasms of digestive organs and peritoneum	357	54.7	52.9
Stomach	103	15.8	13.2
Large intestine, except rectum	96	14.7	15.6
Other	158	24.2	24.1
Malignant neoplasms of respiratory system	137	21.0	19.6
Malignant neoplasms of breast and genito-urinary organs	275	42.1	42.9
Malignant neoplasms of other and unspecified sites	64	9.8	15.6
Neoplasms of lymphatic and hematopoietic tissues	77	11.8	13.7
Leukemia and aleukemia	41	6.3	6.8
Other	36	5.5	6.9
Other neoplasms	28	4.3	2.9
Allergic, endocrine system, metabolic, and nutritional diseases, total	147	22.5	21.3
Diabetes mellitus	98	15.0	15.7
Other	49	7.5	5.6
Diseases of the blood and blood-forming organs, total	20	3.1	2.3
Mental, psychoneurotic, and personality disorders, total	33	5.1	2.0
Psychoses	9	1.4	0.6
Disorders of character, behavior, and intelligence	24	3.7	1.4
Alcoholism	22	3.4	1.2
Other	2	0.3	0.2
Diseases of the nervous system and sense organs, total	769	117.8	114.5
Vascular lesions affecting central nervous system	712	109.0	106.3
Cerebral hemorrhage	524	80.2	66.6
Cerebral embolism and thrombosis	113	17.3	26.2
Other	75	11.5	13.5
Other	57	8.7	8.2
Diseases of the circulatory system, total	2,449	375.0	395.2
Arteriosclerotic and degenerative heart disease	1,725	264.2	293.3
Other diseases of the heart	251	38.4	12.6
Hypertensive diseases	219	33.5	49.8
Diseases of arteries	217	33.2	24.3
Diseases of veins and other diseases of circulatory system	37	5.7	15.2
Diseases of the respiratory system, total	286	43.8	40.2
Pneumonia	211	32.3	26.8
Other	75	11.5	13.4
Diseases of the digestive system, total	238	36.4	36.0
Diseases of liver, gallbladder, and pancreas	102	15.6	16.5
Cirrhosis of liver	63	9.6	10.7
Other	39	6.0	5.8
Diseases of stomach and duodenum	40	6.1	6.6
Other	96	14.7	12.9
Diseases of the genito-urinary system, total	122	18.7	19.3
Nephritis and nephrosis	83	12.7	10.6
Other	39	6.0	9.2
Deliveries and complications of pregnancy, childbirth and the puerperium, total	2	0.3	1.0
Diseases of the skin and cellular tissue, total	4	0.6	0.8
Diseases of the bones and organs of movement, total	13	2.0	1.7
Congenital malformations, total	84	12.9	12.6
Certain diseases of early infancy, total	286	43.8	38.6
Birth injuries, asphyxia, and infections of newborn	161	24.7	20.9
Other diseases of early infancy	125	19.1	17.7
Symptoms, senility, and ill-defined conditions, total	226	34.6	11.4
Accidents, poisoning, and violence, total[3]	704	107.8	71.3
Accidents	570	87.3	55.8
Therapeutic misadventure and late complications of therapeutic procedures	4	0.6	0.9
Suicide	98	15.0	10.0
Homicide	32	4.9	4.6

DEATHS FROM ACCIDENTS, SUICIDE, AND HOMICIDE, MONTANA, 1956[1]

Cause of Death	Number of Deaths, Montana	Death Rate[2] Montana	Death Rate[2] United States
Total, all causes	704	107.8	71.3
Accidents, total	570	87.4	55.3
Railway	9	1.4	0.8
Motor vehicle traffic	248	38.0	23.2
Motor vehicle nontraffic	17	2.6	0.5
Other road vehicle	4	0.6	0.2
Water transport	8	1.2	0.9
Aircraft	15	2.3	0.9
Poisoning by solid and liquid substances	1	0.2	0.9
Poisoning by gases and vapors	5	0.8	0.7
Accidental falls	80	12.2	12.1
Blow from falling object	26	4.0	0.8
Caused by vehicle	4	0.6	0.1
Caused by machinery	19	2.9	1.2
Caused by electric current	4	0.6	0.6
Caused by fire and explosion of combustible material	24	3.7	3.8
Caused by hot substances, corrosive liquid and steam	4	0.6	0.4
Caused by firearm	26	4.0	1.3
Inhalation and ingestion of food causing obstruction or suffocation	9	1.4	0.9
Mechanical suffocation	3	0.5	0.6
Caused by animals	4	0.6	0.1
Drowning and submersion	39	6.0	2.9
Excessive cold	6	0.9	0.2
Lightening	2	0.3	0.1
Other and unspecified	13	2.0	2.6
Therapeutic misadventure and late complications of therapeutic procedures	4	0.6	0.9
Suicide and self-inflicted injury	98	15.0	10.0
Poisoning by analgesic and soporific substances	3	0.5	0.5
Poisoning by other solid and liquid substances	2	0.3	0.4
Poisoning by other gases	9	1.4	1.1
Hanging and strangulation	4	0.6	2.2
Submersion (drowning)	4	0.6	0.4
Firearms and explosives	72	11.0	4.7
By cutting and piercing instruments	4	0.6	0.3
Other	0	0	0.5
Homicide and injury purposely inflicted by other persons (not in war)	32	4.9	4.6
Assault by firearm and explosive	25	3.8	2.4
Assault by cutting and piercing instruments	2	0.3	1.1
Assault by other means	4	0.6	0.8
Injury by intervention of police	1	0.2	0.1

[1]Source: Montana State Board of Health, 1956 Annual Statistical Supplement, and U. S. Department of Health, Education, and Welfare, Vital Statistics—Special Reports, National Summaries, Volume 48, Number 4, 1958.

[2]Rates per 100,000 estimated midyear population (as estimated by U. S. Bureau of the Census).

REPORTED CASES OF SPECIFIED NOTIFIABLE DISEASES, MONTANA AND THE UNITED STATES, 1956[1]

Disease	Number of Cases Montana	Rate per 100,000 Montana	Rate per 100,000 United States
Measles	7,011	1073.7	365.9
Scarlet fever and streptococcal sore throat	468	71.7	105.5
Infectious hepatitis	384	58.8	11.5
Whooping cough	276	42.3	19.0
Acute poliomyelitis	55	8.4	9.0
Meningococcal infections	29	4.4	1.6
Tularemia	5	0.8	0.3
Psittacosis and ornithosis	5	0.8	0.3
Diphtheria	4	0.6	0.9
Acute infectious encephalitis	4	0.6	1.6
Typhoid fever	3	0.4	1.0
Rocky Mountain spotted fever	3	0.4	0.2
Brucellosis (undulant fever)	1	0.2	0.8
Malaria	1	0.2	0.1

[1]Source: U. S. Department of Health, Education, and Welfare, Public Health Service, National Office of Vital Statistics, Vital Statistics of the United States, Vol. I, 1956.

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

1970 CENSUS OF POPULATION

September 1970

U.S. DEPARTMENT OF COMMERCE / Bureau of the Census

PC(V2)-28

MONTANA

advance report

General Population Characteristics

(This series consists of 52 reports—number 1 for the United States and numbers 2 through 52 for the States and the District of Columbia in alphabetical order rather than order of publication.)

This report presents 1970 census statistics on the basic demographic characteristics of the inhabitants of the State. Data on age, sex, race, and relationship to head of household are shown for the State, each standard metropolitan statistical area, each place of 10,000 inhabitants or more, and each county or comparable area.

The data presented here are being issued in advance of their publication in Final Report Series PC(1)-B, which will provide additional information on the population characteristics of the inhabitants of the State. The final report for this State will be published in about 2 months.

Statistics on selected housing characteristics for the areas shown in this report are currently being issued in Advance Report Series HC(V1). An outline of the publication program for the 1970 Census of Population and Housing can be obtained free of charge from the Bureau of the Census, Washington, D.C. 20233, or any U.S. Department of Commerce Field Office.

A UNITED STATES DEPARTMENT OF COMMERCE PUBLICATION

1970 CENSUS OF HOUSING

September 1970

U.S. DEPARTMENT OF COMMERCE / Bureau of the Census

HC(V1)-28

MONTANA

advance report

General Housing Characteristics

(This series consists of 52 reports—number 1 for the United States and numbers 2 through 52 for the States and the District of Columbia in alphabetical order rather than order of publication.)

This report presents 1970 census statistics on selected housing characteristics for this State. Data are shown for the State, each standard metropolitan statistical area, each place of 10,000 inhabitants or more, and each county or comparable area.

The data presented here are being issued in advance of their publication in Final Report Series HC(1)-A, which will provide additional information on the housing characteristics for the State. The final report for this State will be published in about 2 months.

Statistics on selected population characteristics for the areas shown in this report are currently being issued in Advance Report Series PC(V2). An outline of the publication program for the 1970 Census of Population and Housing can be obtained free of charge from the Bureau of the Census, Washington, D.C. 20233, or any U.S. Department of Commerce Field Office.

For sale by the Bureau of the Census, Washington D.C. 20233, and U.S. Department of Commerce Field Offices, 30 cents.

TABLE 16- FARM PRODUCT SALES by COMMERCIAL FARMS 1/

Item	Carbon County	Stillwater County	Total
All Farm Products	$8,145,161	$6,749,113	$14,894,274
All Crops	2,874,196	2,574,731	5,448,927
All Livestock	5,265,959	4,160,130	9,426,089

1/ Census Definition 1964 Census of Agriculture (Data not additive)

TABLE 17- LIVESTOCK NUMBERS 1959 and 1964 2/

	All Cattle & Calves	Dairy Cows	Hogs & Pigs	Sheep & Lambs	Chickens
Carbon County					
1959	49,188	2,997	7,015	60,999	40,446
1964	61,894	2,216	7,768	51,499	25,453
Stillwater County					
1959	45,739	1,595	5,911	35,998	26,591
1964	51,260	1,046	6,407	21,129	16,206
Total					
1959	94,927	4,592	12,926	96,997	67,037
1964	113,154	3,262	14,175	72,628	41,659

2/ Census of Agriculture 1959 and 1964

TABLE 18- LAND USE of INVENTORIED ACREAGE - PRIVATE and STATE LANDS
Based on 1967 Conservation Needs Inventory

Land Use - Acres	Carbon	Stillwater	Total	
Corn	2,082	1,400	3,482	
Sugar Beets (1969)	7,546	1,252	8,798	
All other row crops	6,701	398	7,099	
Small grain	48,858	92,935	141,793	
Summer fallow	32,214	91,500	125,714	
Rotation Hayland & Pasture	4,000	14,800	18,800	
Hayland	70,987	30,000	100,987	
Conservation use only	4,066	2,743	6,809	
Temporary idle land	500	2,000	2,500	
Orchards	320	50	370	
Abandoned cropland	--	10,000	10,000	
TOTAL cropland	179,274	247,078	426,352	- 24%
Pasture land	19,704	14,681	34,385	
Range land	539,074	610,785	1,149,859	
TOTAL pasture and range	558,778	625,466	1,184,244	- 69%
Commercial woodland	28,623	39,916	68,539	
Non-commercial woodland	13,971	28,556	42,527	
TOTAL woodland	42,594	68,472	111,066	- 6%
Other land (in farms)	8,400	2,735	11,135	
Other land (not in farms)	1,903	2,140	4,043	
TOTAL other	10,303	4,875	15,178	- 1%
TOTAL	790,949	945,891	1,736,840	- 100%

TABLE 19- AVERAGE YIELDS of CULTIVATED CROPS
BASED on 1967 HARVESTED ACRES 1/

Crop	Carbon		Stillwater		Project Area	
	Dry	Irr.	Dry	Irr.	Dry	Irr.
Winter wheat	32 bu.	52 bu.	34 bu.	60 bu.	33 bu.	56 bu.
Spring wheat	27 bu.	36 bu.	18 bu.	38 bu.	23 bu.	37 bu.
Barley	42 bu.	57 bu.	31 bu.	52 bu.	37 bu.	55 bu.
Oats	46 bu.	71 bu.	38 bu.	63 bu.	42 bu.	67 bu.
Corn silage	--	23 T.	--	20 T.	--	21.5 T.
Alfalfa hay	1.5 T.	2.8 T.	1.5 T.	2.4 T.	1.5 T.	2.6 T.
Sugar beets	--	17.0 T..	--	19.3 T.	--	18.2 T.
Dry beans	--	1850 lbs.	--	1730 lbs.	--	1790 lbs.

1/ Data from Montana Agricultural Statistics.

TABLE 20- COST and RETURN STUDY - PRIVATE LANDS

Based on estimates and local ranchers' experience and figures, the costs and net returns per year from privately owned rangeland in Stillwater and Carbon Counties are as follows: (these are conservative broad estimates).

Carbon & Stillwater Counties	Fair Range Condition		Good Range Condition	Total Present Estimated Cost and Return	Potential Returns
	Over-stocked 1/	Properly Stocked 2/	Properly Stocked 3/		4/
Calf Crop %	70%	85%	90%		90%
Average weaning weights	325#	410#			410#
Winter feed period	5 mo.	4 mo.	3 mo.		
Gross Income from Beef	$1,096,818	$1,137,578	$2,060,984	$4,295,380	$4,836,598
Annual Rangeland Costs	$ 73,332	$ 138,761	$ 168,648	$ 380,741	$ 395,704
Annual Livestock Costs	$1,080,647	$ 681,895	$ 951,830	$2,714,372	$2,048,877
Net Return	$ -57,161	$ +316,922	$ +940,506	$1,200,267	$2,392,017

1/ Constitutes 25% of total rangeland area
2/ Constitutes 35% of total rangeland area
3/ Constitutes 40% of total rangeland area
4/ Estimated potential after range is in good condition and properly stocked.

POPULATION, BY COUNTY, MONTANA, 1870-1957[1]

Fig. A-19.

County	1957[2]	% Change, 1940-1950	1950	1940	1930	1920	1910	1900	1890[3]	1880	1870
Montana, total	678,000	5.6	591,024	559,456	537,606	548,889	376,053	243,329	132,159	39,159	20,595
Beaverhead	6,500	—3.9	6,671	6,943	6,654	7,369	6,446	5,615	4,655	2,712	722
Big Horn	8,800	—5.7	9,324	10,419	8,543	7,015					
Blaine	7,900	—11.0	8,516	9,566	9,006	9,057					
Broadwater	2,500	—15.3	2,922	3,451	2,738	3,239	3,491	2,641			
Carbon	8,400	—15.7	10,241	11,366	12,571	15,279	13,962	7,533			
Carter	2,300	—14.7	2,798	3,280	4,136	3,972					
Cascade	71,000	26.3	53,027	41,999	41,146	38,836	28,833	25,777	8,755		
Chouteau	8,000	—4.7	6,974	7,316	8,635	11,051	17,191	10,966	4,741	3,058	517
Custer	11,700	21.5	12,661	10,422	11,242	12,194	14,123	7,891	5,308	2,510	38
Daniels	3,800	—13.5	3,946	4,563	5,553						
Dawson	11,700	5.5	9,092	8,618	9,881	9,239	12,725	2,443	2,056	180	177
Deer Lodge	21,400	21.5	16,553	13,627	16,293	15,323	12,988	17,393	15,155	8,876	4,367
Fallon	3,800	—1.6	3,660	3,719	4,568	4,548					
Fergus	13,900	—0.2	14,015	14,040	16,531	28,344	17,385	6,937	3,514		
Flathead	34,300	29.8	31,495	24,271	19,200	21,705	18,785	9,375			
Gallatin	24,700	19.9	21,902	18,269	16,124	15,864	14,079	9,553	6,246	3,643	1,578
Garfield	2,000	—17.8	2,172	2,641	4,252	5,368					
Glacier	10,900	6.8	9,645	9,034	5,297	4,178					
Golden Valley	1,200	—16.8	1,337	1,607	2,126						
Granite	3,300	—18.5	2,773	3,401	3,013	4,167	2,942	4,328			
Hill	17,700	7.4	14,235	13,304	13,775	13,958					
Jefferson	4,100	—13.9	4,014	4,664	4,133	5,203	5,601	5,330	6,026	2,464	1,531
Judith Basin	2,900	—12.4	3,200	3,655	5,238						
Lake	11,800	2.6	13,835	13,490	9,541						
Lewis & Clark	29,300	10.9	24,540	22,131	18,224	18,660	21,853	19,171	19,145	6,521	5,040
Liberty	2,900	—1.3	2,180	2,209	2,198	2,416					
Lincoln	12,300	10.3	8,693	7,882	7,089	7,797	3,638				
McCone	3,400	—14.2	3,258	3,798	4,790	4,747					
Madison	5,600	—17.8	5,998	7,294	6,323	7,495	7,229	7,695	4,692	3,915	2,684
Meagher	2,600	—7.1	2,079	2,237	2,272	2,622	4,190	2,526	4,749	2,743	1,387
Mineral	2,900	—2.5	2,081	2,135	1,626	2,327					
Missoula	46,500	22.2	35,493	29,038	21,782	24,041	23,596	13,964	14,427	2,537	2,554
Musselshell	4,900	—5.4	5,403	5,717	7,242	12,030					
Park	12,900	3.7	11,999	11,566	10,922	11,330	10,731	7,341	6,881		
Petroleum	900	—5.3	1,026	1,083	2,045						
Phillips	5,400	—19.7	6,334	7,892	8,208	9,311					
Pondera	7,400	—4.8	6,392	6,716	6,964	5,741					
Powder River	2,600	—14.8	2,693	3,159	3,909	3,357					
Powell	7,400	2.4	6,301	6,152	6,202	6,909	5,904				
Prairie	2,500	—1.4	2,377	2,410	3,941	3,684					
Ravalli	11,400	0.9	13,101	12,978	10,315	10,093	11,666	7,822			
Richland	10,300	—1.5	10,366	10,209	9,633	8,989					
Roosevelt	12,400	—2.3	9,580	9,806	10,672	10,347					
Rosebud	6,800	1.4	6,570	6,477	7,347	8,002	7,985				
Sanders	8,200	0.8	6,983	6,926	5,692	4,903	3,713				
Sheridan	7,100	—14.6	6,674	7,814	9,869	13,847					
Silver Bow	59,600	—9.0	48,422	53,207	56,969	60,313	56,848	47,635	23,744		
Stillwater	5,600	—4.9	5,416	5,694	6,553	7,830					
Sweet Grass	3,100	—2.6	3,621	3,719	3,944	4,926	4,029	3,086			
Teton	7,100	4.5	7,232	6,922	6,968	5,870	9,546	5,080			
Toole	8,400	1.4	6,867	6,769	6,714	3,724					
Treasure	1,200	—6.5	1,402	1,499	1,661	1,990					
Valley	11,800	—25.2	11,353	15,181	11,181	11,542	13,630	4,355			
Wheatland	2,900	—3.0	3,187	3,286	3,751	5,619					
Wibaux	1,600	—11.8	1,907	2,161	2,767	3,113					
Yellowstone	75,700	35.7	55,875	41,182	30,785	29,600	22,944	6,212	2,065		
Yellowstone Nat'l Park (part)			58	43	52						
Crow Indian Reservation								2,660			

[1]Source, 1870-1950: U. S. Department of Commerce, Bureau of the Census, Census of Population; 1957: State Board of Health, Helena, Montana.

[2]July 1. Not comparable with Census data.

[3]Figures exclude all persons residing on Indian reservations.

FOREST LAND, BY TYPE OF USE, RELATIONSHIP TO TOTAL LAND AREA, AND TIMBER VOLUME, BY COUNTY, MONTANA, 1949[1]

Fig. A-20.

County[2]	Forest Land					Timber Volume	
	Commercial (acres)	Noncommercial and Reserved (acres)	Total (acres)	Total Land Area (acres)	Percent of Total Land Area in Forest Land	Live Saw Timber[4] (M bd. ft.)	Live All[5] Timber (M cu. ft.)
Montana, total	15,756,502	6,602,550	22,359,052	93,642,180	23.9	55,959,687	16,438,234
Eastern Montana	6,847,664	2,492,604	9,340,268	77,664,020	12.0	16,270,925	7,134,634
Western Montana	8,908,838	4,109,946	13,018,784	15,978,160	81.5	39,688,762	9,303,600
Beaverhead	862,997	197,557	1,060,554	3,555,840	29.8	2,276,123	1,288,148
Big Horn	179,185	22,381	201,566	3,221,120	6.3	113,345	71,534
Blaine	80,872	6,528	87,400	2,730,880	3.2	60,835	26,570
Broadwater	170,777	16,260	187,037	795,520	23.5	423,233	201,274
Carbon	85,793	99,796	185,589	1,324,800	14.0	107,615	43,038
Carter	56,527		56,527	2,120,320	2.7	111,331	33,333
Cascade	234,323	84,568	318,891	1,701,120	13.7	178,755	86,884
Chouteau	51,037	8,521	59,558	2,508,300	2.4	22,372	9,390
Custer	25,092		25,092	2,409,600	1.0	26,693	11,146
Daniels	3,193		3,193	923,520	.3	42	233
Dawson	5,952	1,160	7,112	1,509,120	.5	6,032	3,369
Deer Lodge*	103,524	23,898	127,422	263,480	48.4	44,360	21,200
Deer Lodge	79,373	50,147	129,520	208,840	62.0	115,149	87,678
Fallon	378		378	1,045,120	(3)	664	183
Fergus	341,040	58,488	399,528	2,720,000	14.7	225,326	85,695
Flathead*	1,610,032	1,294,644	2,904,726	3,313,280	87.7	8,843,064	1,882,200
Gallatin	528,651	224,401	753,052	1,610,880	46.7	2,351,088	952,423
Garfield	69,611		69,611	3,067,520	2.3	21,463	13,954
Glacier	110,519	289,306	399,825	1,903,360	21.0	49,720	20,027
Golden Valley	19,921	14,342	34,263	753,920	4.5	16,508	9,239
Granite*	648,574	157,320	805,894	1,098,880	73.3	1,328,123	418,800
Hill	7,929		7,929	1,884,160	.4	6,217	3,728
Jefferson	427,083	52,735	479,818	1,056,640	45.4	714,912	475,308
Judith Basin	211,045	84,865	295,910	1,203,200	24.6	323,880	120,578
Lake*	444,879	91,767	536,646	960,000	55.9	2,406,135	537,400
Lewis & Clark*	234,281	159,123	393,404	443,350	88.7	604,764	157,700
Lewis & Clark	590,409	281,029	871,438	1,782,570	48.9	1,462,369	595,730
Liberty	2,809	2,764	5,573	933,760	.6	3,550	1,859
Lincoln*	1,845,865	422,811	2,268,676	2,377,600	95.4	11,116,472	2,543,000
McCone	635		635	1,688,320	(3)	3,494	774
Madison	404,695	201,032	605,727	2,259,200	26.8	1,360,845	580,579
Meagher	445,361	52,941	498,302	1,506,560	33.1	1,630,647	673,614
Mineral*	539,444	220,706	760,150	782,720	97.1	1,943,593	510,900
Missoula*	1,193,795	270,607	1,464,402	1,682,560	87.0	4,794,840	1,160,500
Musselshell	247,381		247,381	1,207,040	20.5	273,644	105,713
Park	398,100	307,342	705,442	1,681,280	42.0	2,363,149	760,760
Petroleum	22,668		22,668	1,064,960	2.1	5,941	3,867
Phillips	26,559	2,539	29,098	3,368,960	.9	31,562	16,361
Pondera	60,474	10,590	71,064	1,051,520	6.8	112,943	43,891
Powder River	196,791	2,189	198,980	2,102,400	9.5	209,038	78,816
Powell*	546,554	414,209	960,763	1,495,680	64.2	1,366,749	404,800
Prairie	2,170		2,170	1,105,280	.2	11,939	2,644
Ravalli*	544,156	691,669	1,235,825	1,525,760	81.0	2,213,928	487,400
Richland	5,889		5,889	1,321,600	.4	29,848	6,717
Roosevelt	765		765	1,526,400	.1	1,021	357
Rosebud	151,941	661	152,602	3,220,480	4.7	119,066	50,682
Sanders*	1,108,694	346,787	1,455,481	1,799,040	80.9	4,963,049	1,147,000
Sheridan	1,533		1,533	1,088,000	.1	67	98
Silver Bow*	88,990	16,405	105,395	235,810	44.7	63,685	32,700
Silver Bow	109,202	12,390	121,592	222,430	54.7	439,713	161,647
Stillwater	134,154	88,084	222,238	1,150,080	19.3	122,805	70,944
Sweet Grass	172,796	96,339	269,135	1,181,440	22.8	564,161	209,035
Teton	189,925	45,901	235,826	1,468,160	16.1	201,076	123,315
Toole	13,282		13,282	1,257,600	1.1	6,494	3,466
Treasure	24,418		24,418	629,760	3.9	19,772	7,995
Valley	14,300		14,300	3,252,480	.4	45,849	11,367
Wheatland	25,256	28,593	53,849	912,000	5.9	37,509	20,799
Wibaux	5,436		5,436	568,960	1.0	903	315
Yellowstone	58,412	175	58,587	1,686,400	3.5	62,215	23,982
Yellowstone Park (part)		139,980	139,980	172,100	81.3		

[1]Source: U. S. Dept. of Agriculture, Forest Service, Forest Resources of Montana, 1952.

[2]An asterisk indicates areas west of the Continental Divide; all other areas east of the Divide.

[3]Less than 0.05 percent.

[4]Trees 11.0 inches and larger in diameter, measured by International ¼-inch rule.

[5]The volume, excluding bark, of sound trees and the sound volume of cull trees from 1-foot stump to a 4.0-inch minimum top diameter including the sound volume of limbwood for hardwood species to a 4.0-inch minimum top diameter.

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Fig. A-21.

VALUE OF MINERAL PRODUCTION, BY COUNTY, MONTANA, 1959 AND 1960

(thousands of dollars)

County[1]	1960	1959	Minerals produced in 1960 in order of value
Montana, total[2]	179,062	167,328	
Beaverhead	(*)	(*)	Tungsten, phosphate rock, talc, lead, stone, zinc, gold, silver, copper, sand and gravel, mica
Big Horn	245	322	Petroleum, sand and gravel, stone.
Blaine	493	572	Petroleum, coal, sand and gravel
Broadwater	264	166	Iron ore, gold, sand and gravel, lead, silver, zinc, stone, copper
Carbon	1,765	1,493	Petroleum, stone, coal, uranium, sand and gravel
Carter	72	112	Petroleum
Cascade	730	742	Sand and gravel, clays, coal, stone
Custer	143	154	Sand and gravel, coal
Daniels, Roosevelt[3]	8,932	10,633	Petroleum, sand and gravel
Dawson, McCone[3]	3,652	3,604	Petroleum, sand and gravel, coal
Deer Lodge	852	532	Lime, stone, sand and gravel, silver, gold
Fallon, Prairie, Wibaux[3]	27,854	26,745	Petroleum, sand and gravel
Fergus	(*)	(*)	Gypsum, clays, sand and gravel
Flathead	405	552	Stone, sand and gravel, silver, gold
Gallatin	(*)	(*)	Cement, stone, sand and gravel, mica
Garfield, Petroleum[3]	468	394	Petroleum
Glacier, Pondera, Teton, Toole[3]	9,810	10,671	Petroleum, sand and gravel, copper, stone, silver, gold
Golden Valley	0	(*)	
Granite	1,403	1,063	Manganese, zinc, silver, lead, copper, gold, manganiferous ore
Hill	45	121	Sand and gravel
Jefferson	266	132	Stone, lead, silver, zinc, gold, copper
Judith Basin	207	219	Iron ore, sand and gravel, lead, silver, zinc
Lake	26	(*)	Sand and gravel
Lewis & Clark	1,709	(*)	Zinc, sand and gravel, lead, copper, silver, gold
Liberty	78	125	Petroleum
Lincoln	(*)	(*)	Vermiculite, sand and gravel, zinc, lead, silver, gold
Madison	1,347	964	Gold, talc, silver, copper, zinc, mica
Meagher	62	(*)	Lead, copper, zinc, silver, gold
Mineral	(*)	57	Lead, sand and gravel, zinc, silver, copper, gold
Missoula	136	195	Sand and gravel, barite, stone, gold, silver
Musselshell	2,931	2,427	Petroleum, coal
Park	(*)	(*)	Sand and gravel, stone, gold, silver
Phillips	(*)	146	Sand and gravel, stone, gold, silver
Powell	(*)	(*)	Phosphate rock, lime, sand and gravel, stone, gold, copper, zinc, lead, silver
Ravalli	(*)	(*)	Fluorspar, sand and gravel, lead, silver, zinc, gold
Richland	(*)	(*)	Coal, petroleum
Rosebud	9,092	7,059	Petroleum, coal
Sanders	(*)	(*)	Lead, zinc, stone, silver, sand and gravel, copper, gold
Sheridan	1,622	1,512	Petroleum, coal
Silver Bow	66,353	51,719	Copper, silver, manganese, zinc, phosphate rock, gold, lead, sand and gravel
Stillwater	(*)	(*)	Chromium, stone, petroleum, gold, silver
Sweet Grass	(*)	0	Sand and gravel
Treasure	46	(*)	Sand and gravel
Valley	495	1,726	Sand and gravel
Yellowstone	1,685	1,877	Petroleum, sand and gravel, clays
Undistributed[4]	30,431	32,059	Gem stones, natural gas, natural gas liquids, petroleum, and sand and gravel that cannot be assigned to specific counties.

(*) Value withheld to avoid disclosing data of individual companies.

[1] Chouteau, Powder River and Wheatland counties did not report production.

[2] Totals have been adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

[3] Daniels and Roosevelt; Dawson and McCone; Fallon, Prairie and Wibaux; Garfield and Petroleum; and Glacier, Pondera, Teton and Toole counties have been combined because of joint oilfield production.

[4] Includes values indicated by (*).

Source: U. S. Bureau of Mines, Area Report B-87, *The Mineral Industry of Montana in 1960*, Advance Summary.

Fig. A-22.

GENERAL MANUFACTURING STATISTICS, BY COUNTY, MONTANA, 1958

County	Total Number of Establishments	No. of Establ. With: 1-19 Employees	No. of Establ. With: 20-99 Employees	No. of Establ. With: 100 or More Employees	All Employees: Number	All Employees: Payroll ($1,000)	Value Added by Manufacture ($1,000)	Capital Expenditures, New ($1,000)
Montana, total	925	751	135	39	20,197	94,090	196,915	21,693
Beaverhead	4	4			10	41	104	3
Big Horn	6	5		1	143	(*)	(*)	(*)
Blaine	4	3	1		40	(*)	(*)	(*)
Broadwater	10	10			39	126	244	29
Carbon	10	9	1		67	173	357	28
Carter	3	3			5	11	15	
Cascade	55	34	15	6	2,786	13,169	45,086	3,052
Chouteau	3	3			11	39	40	(*)
Custer	9	8	1		75	321	1,070	45
Daniels	2	2			(*)	(*)	(*)	(*)
Dawson	10	10			52	187	853	48
Deer Lodge	17	11	1	5	2,431	(*)	(*)	(*)
Fallon	4	4			16	91	119	12
Fergus	19	17	2		213	785	2,191	143
Flathead	115	98	15	2	1,868	9,292	17,044	2,128
Gallatin	42	32	8	2	771	3,146	7,666	475
Garfield	1	1			(*)	(*)	(*)	(*)
Glacier	5	4	1		66	(*)	(*)	(*)
Golden Valley	0							
Granite	12	12			38	104	242	32
Hill	17	14	3		182	789	1,742	98
Jefferson	3	3			11	(*)	(*)	(*)
Judith Basin	3	3			10	18	64	22
Lake	21	19	2		212	704	206	268
Lewis & Clark	37	27	9	1	723	3,445	4,436	354
Liberty	2	2			(*)	(*)	(*)	(*)
Lincoln	82	76	5	1	1,442	6,834	10,742	1,514
Madison	3	3			6	(*)	(*)	(*)
McCone	1	1			(*)	(*)	(*)	(*)
Meagher	13	10	3		173	466	525	643
Mineral	4	2	1	1	264	(*)	(*)	(*)
Missoula	86	62	18	6	2,812	12,539	22,499	2,738
Musselshell	4	4			12	39	151	(*)
Park	26	23	2	1	416	1,547	3,508	163
Petroleum	0							
Phillips	2	2			(*)	(*)	(*)	(*)
Pondera	3	3			16	(*)	(*)	(*)
Powder River	2	2			(*)	(*)	(*)	(*)
Powell	14	14			70	268	356	28
Prairie	1	1			(*)	(*)	(*)	(*)
Ravalli	25	20	5		296	1,213	1,997	260
Richland	11	9	1	1	196	1,040	3,762	41
Roosevelt	8	8			36	104	218	7
Rosebud	6	3	3		84	239	187	39
Sanders	34	26	7	1	529	2,379	3,185	338
Sheridan	4	4			24	105	137	11
Silver Bow	50	36	11	3	1,106	5,388	10,718	1,108
Stillwater	7	6	1		38	110	235	(*)
Sweet Grass	5	5			14	29	104	18
Teton	7	7			20	58	110	37
Toole	9	7	2		153	(*)	(*)	(*)
Treasure	0							
Valley	6	5	1		50	192	293	56
Wheatland	2	2			(*)	(*)	(*)	(*)
Wibaux	1	1			(*)	(*)	(*)	(*)
Yellowstone	95	71	16	8	2,616	13,902	35,518	5,287

(*) Withheld to avoid disclosing figures for individual companies.

Source: U. S. Department of Commerce, Bureau of the Census, *1958 Census of Manufactures, Montana.*

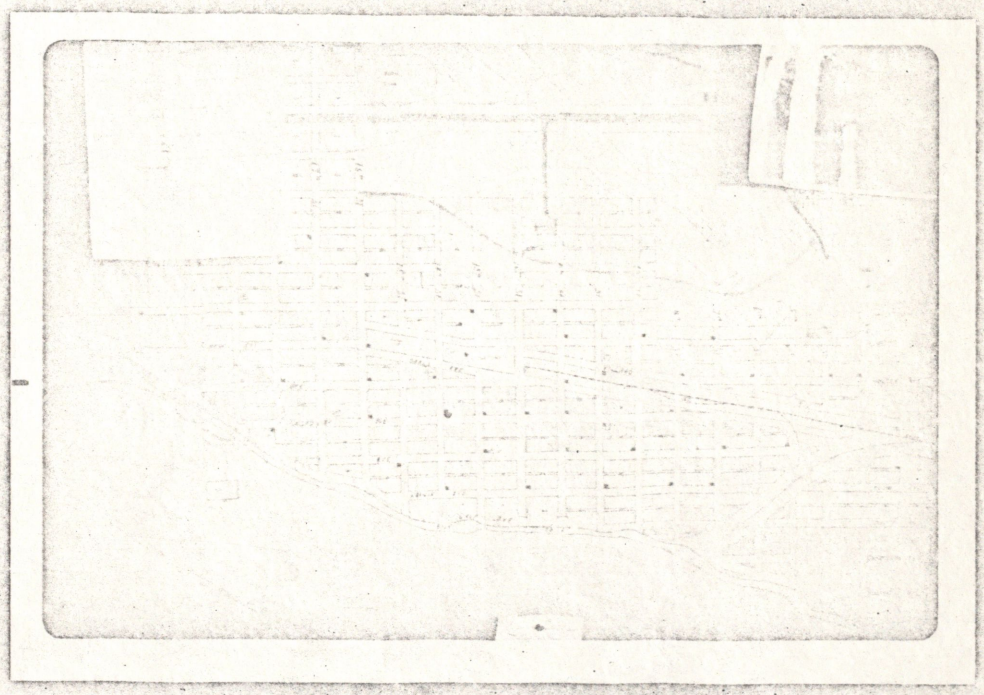


Fig. A-23. Zoning Map

An ordinance providing for a city zoning system in the City of Red Lodge, Carbon County, Montana, fixing the boundaries of zoning districts, regulating, classifying and restricting the location of trades, industries and enterprises and the location of buildings, designed, erected or altered for specific uses and limiting the height and size of such buildings and the use of the lot areas and regulating and determining the areas of the yards and other open spaces surrounding buildings hereafter erected and providing penalties for the violation thereof.

The City of Red Lodge is hereby divided into three districts termed respectively as follows: "A" Business District, "B" Industrial District, "C" Residential District.

BUSINESS DISTRICT:
a. Height: No building shall exceed three stories in height.
b. Front Yard: No front yard required.
c. Rear Yard: No rear yard required.
d. Side Yard: No side yard required.
e. Use: No business, trade or industry shall be permitted in any of the "A" district which is noxious or offensive by reason of the emission of odor, dust, smoke, gas, vibration or noise, or which imposes any extraordinary hazard to life or property.

INDUSTRIAL DISTRICT:
a. Height: No building shall exceed three stories in height in this district.
b. Front yards, rear yards and side yards shall have the same requirements as those in the "A" Business District.
c. Use: Buildings and premises may be used for any Industrial purpose authorized by law and meeting City, County, State and National requirements as to health, safety and fire protection - except that no industry shall be permitted which has been declared a nuisance in any court created under the laws of the State of Montana.

RESIDENTIAL DISTRICT:
a. Height: No building shall exceed three stories in height in this district.
b. Front Yard: There shall be a front yard having a depth of not less than twenty feet; provided, however, that where lots comprising forty percent or more of the frontage developed with buildings between cross-streets having an average front yard with a variation in depth of not more than six feet, no building hereafter erected or altered shall project beyond the average front yard so established. Where buildings front on a side street (or a street not parallel to an alley), the front yard shall have a depth of not less than ten feet.
c. Rear Yards: There shall be a rear yard having a depth of not less than twenty feet where the rear lot-line coincides with an alley line; otherwise the depth shall be not less than one-half of the height of the building.
d. Side Yards: There shall be a side yard on each side of the building; each side yard having a width of not less than five feet - the width, however, shall be not less than one-third of the height of the building. However, no building fronting the street parallel to an alley on a corner lot, shall have a side yard on the street-side less than ten feet. On corner lots, the side yard regulations shall be the same as for interior lots, except noted above, but, in case of reversed frontage where the corner lot is developed so that the buildings face an intersecting street, there shall be a side yard on the street-side of the corner lot not less than the front yard required on the lots in the rear of such corner lot and no accessory building on said corner lot shall project beyond the front yard line of the lots in the rear. Where an accessory building such as a garage is attached to a building, it shall be not less than five feet from the side line of the lot, but garage buildings and accessory building may be built adjoining the alley.
e. Lot area per family: Every building hereafter erected, structually altered or maintained shall provide a lot area of not less than 50 foot frontage and 100 foot depth hereafter erected.

ENFORCEMENT:
This ordinance shall be enforced by the building inspector or his assistants, subject to such variation and interpretations which may be made by the Board of Adjustments. Appeal of any decision of the enforcing officer may be made to the Board of Adjustments as provided in the law of the State of Montana. An application for a building permit shall be obtained from the Building Inspector before building, alterations or additions commences. Water permits, sewer permits, gas permits may be obtained at the City Hall, Red Lodge, Montana.

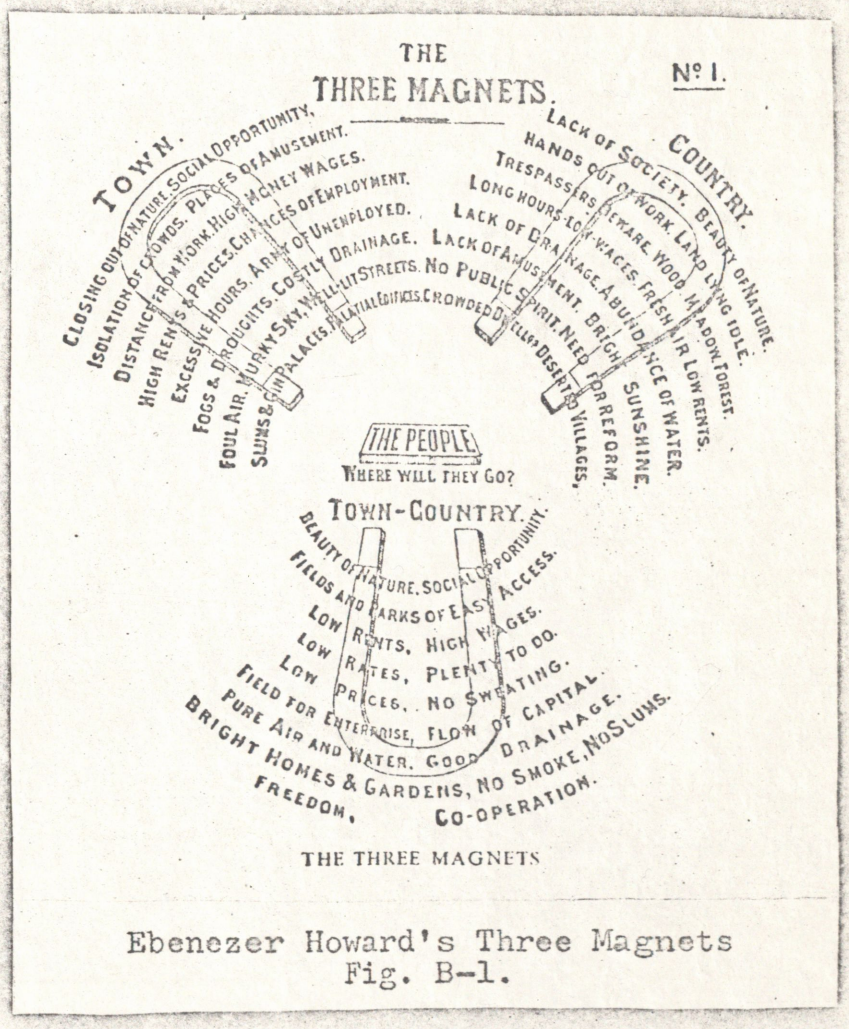
PASSED AND APPROVED the 25th day of July 1947.

APPENDIX B

Critique of selected bibliography

Howard, Ebenezer. Garden Cities of Tomorrow. London: Faber and Faber, Ltd., 1944.

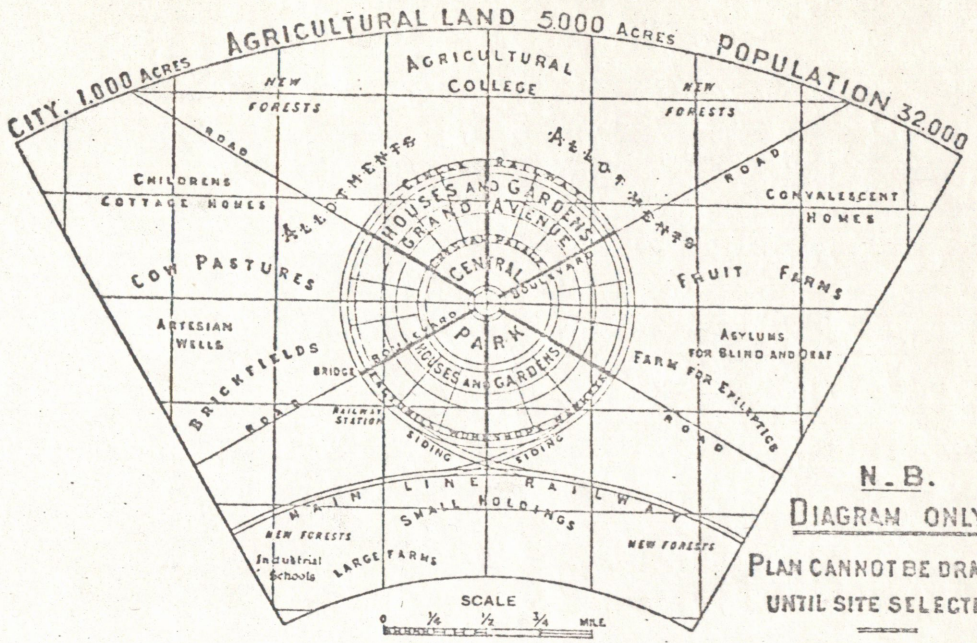
This book was first published in 1898 and is one of the earliest books on planning. Howard defined the situation at that time in terms of magnets. He saw the Town magnet as representing society-mutual help, science, art, culture, and religion. The Country magnet was God's symbol of love and care for man. Man comes from and is sustained by resources from the country. The country also provides the inspiration of art, music, and poetry. He saw the solution as the Town-Country magnet which combines the best of both of the other magnets. His diagram, Figure B-1, demonstrates the three magnets and their attributes. From this Howard proposed what is termed a Garden City to achieve his objectives. Schematics of how this city would be planned can be seen in Figures B-2 and B-3. Howard discusses his plan in detail and how it would be accomplished. I feel that Howard's prime contribution was to outline the nature of a balanced community as he saw it in his epoch, and to show what steps were necessary in an ill-organized and disoriented society to bring his plan into existence.



Ebenezer Howard's Three Magnets
Fig. B-1.

— N°2 —

GARDEN-CITY



N.B.
DIAGRAM ONLY.
PLAN CANNOT BE DRAWN UNTIL SITE SELECTED

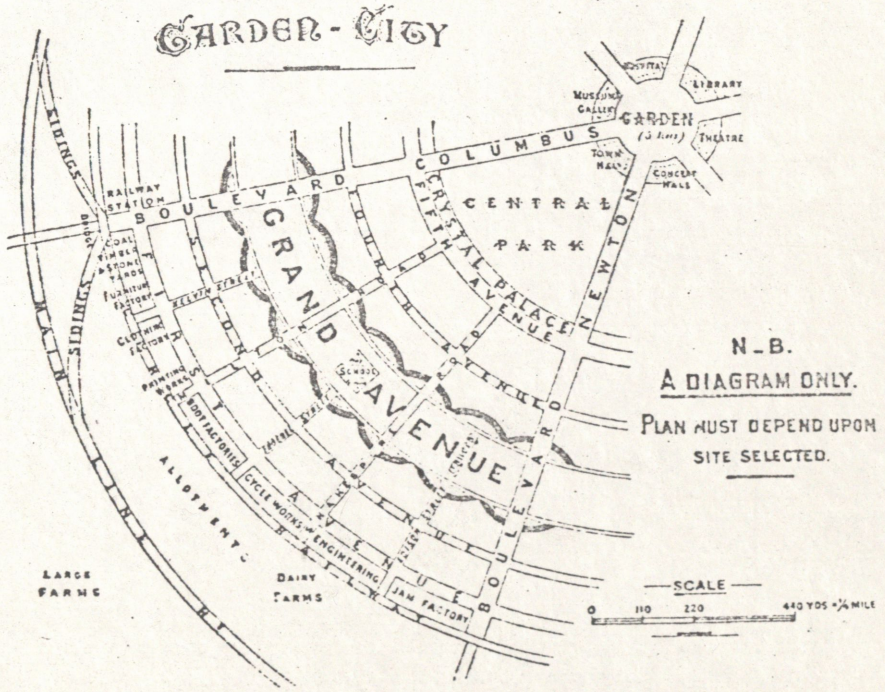
GARDEN CITY AND RURAL BELT

Fig. B-2.

WARD AND CENTRE

GARDEN-CITY

N°3.



N.B.
A DIAGRAM ONLY.
PLAN MUST DEPEND UPON SITE SELECTED.

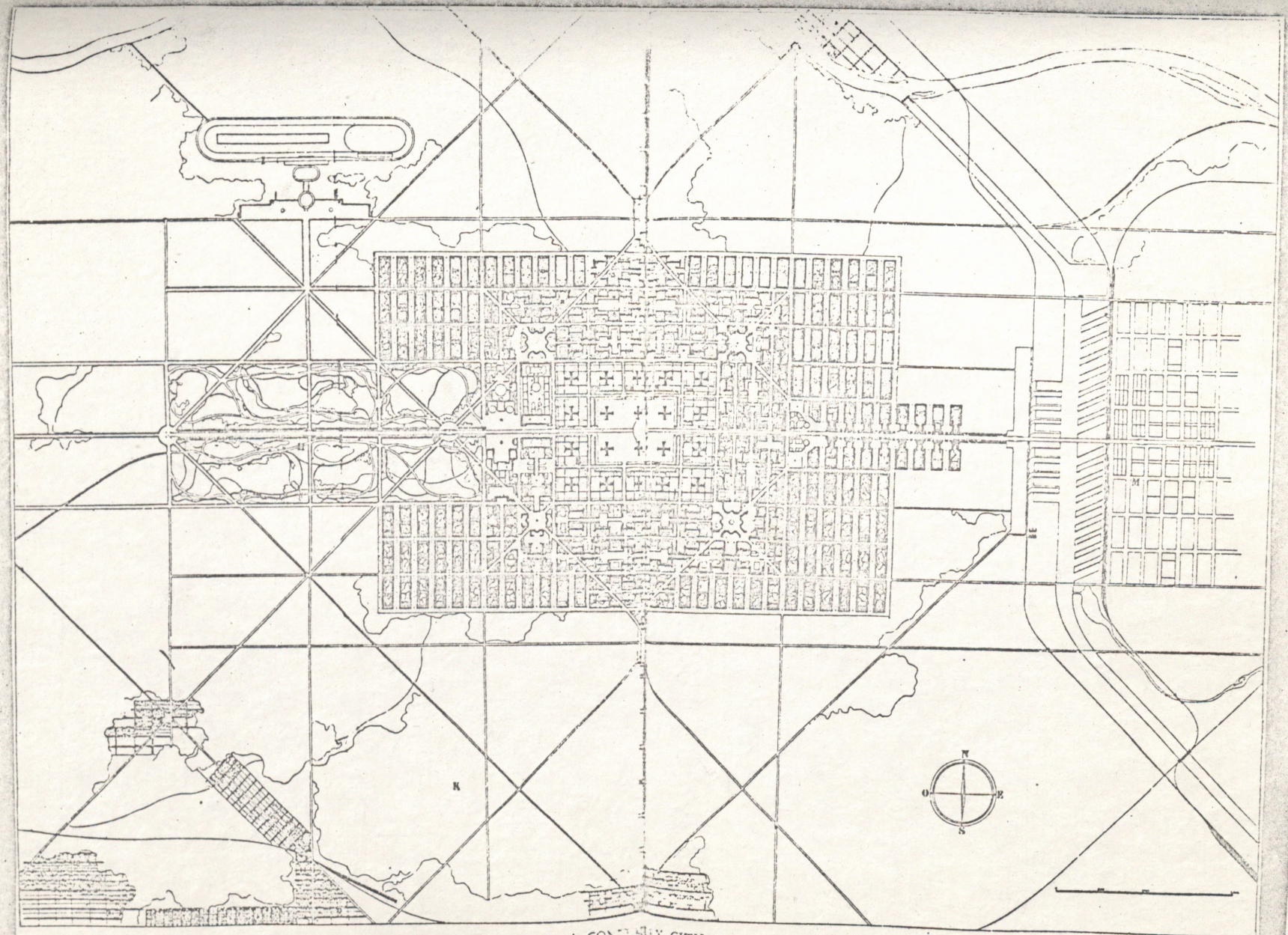
WARD AND CENTRE OF GARDEN CITY

Fig. B-3.

Le Corbusier. The City of Tomorrow. London: The Architectural Press, 1947.

This book is another hallmark of planning. It speaks of other cities and the problems created. Corbusier feels to solve a city problem, one must realize how they are conceived, by what relationships they are brought together, how they answer to a need which has become articulate, and how they rank in one's personal scheme of chosen images. The outgrowth of this was his "contemporary city" proposal. A schematic of this can be seen in figure B-4. He felt at that time that the modern city lived by the straight line and that the curve was paralyzing. He states that the right angle is the essential and sufficient implement of action for it enables us to determine space with absolute exactness. Corbusier also expresses the need for the soul of a city, which is of no value practically, but is a poetry of feeling. As does Howard, Corbusier outlines in detail what this city would consist of. He uses some of Howard's thoughts, but the city proposed is Corbusier.

The value of Corbusier's book, as well as Howard's, lie in their method of problem solving for the needs as they saw them at a given time in space.



A CONTEMPORARY CITY

The heavy black lines represent the areas built upon. Everything else is either streets or open spaces. Strictly speaking the city is an immense park. Its layout furnishes a multitude of architectural aspects of infinitely varying forms. If the reader, for instance, follows at a given route on this map he will be astonished by the variety he encounters. Yet distances are shorter than in the cities of today, for there is a greater density of population.

A. *Station.*
B. *Sky-scraper.*
C. *Housing blocks with "set-backs."*
D. *Housing blocks on the "cellular" system.*
E. *Garden cities.*

G. *Public Services.*
H. *Park.*
I. *Sports.*
K. *Protected zone.*
M. *Warehouses, Industrial city, Goods station.*

Fig. B-4

Wirth, Theodore J., and Associates. [Mueller Engineering]. Comprehensive Area Water and Sewer Plan for Carbon County. Billings, Montana: August, 1968.

Wirth, Theodore J., and Associates. [Mueller Engineering]. Comprehensive Area Water and Sewer Plan for Stillwater County. Billings, Montana: 1970.

These reports proved to be a collection of statistical material on numerous existing conditions. This became but filler in their report though, as little of the datum was referred to, discussed, or used for any proposals. The statistical material that they personally compiled was often found to be inaccurate. The population projections were especially unreasonable. They projected a large growth in population with no reasons for growth sighted. Perhaps this was done to sell their oversized sewer and water proposals. Several county officials expressed dissatisfaction with these reports as they believed at the onset that these were to be a comprehensive plan of more than simple sewer and water facilities.

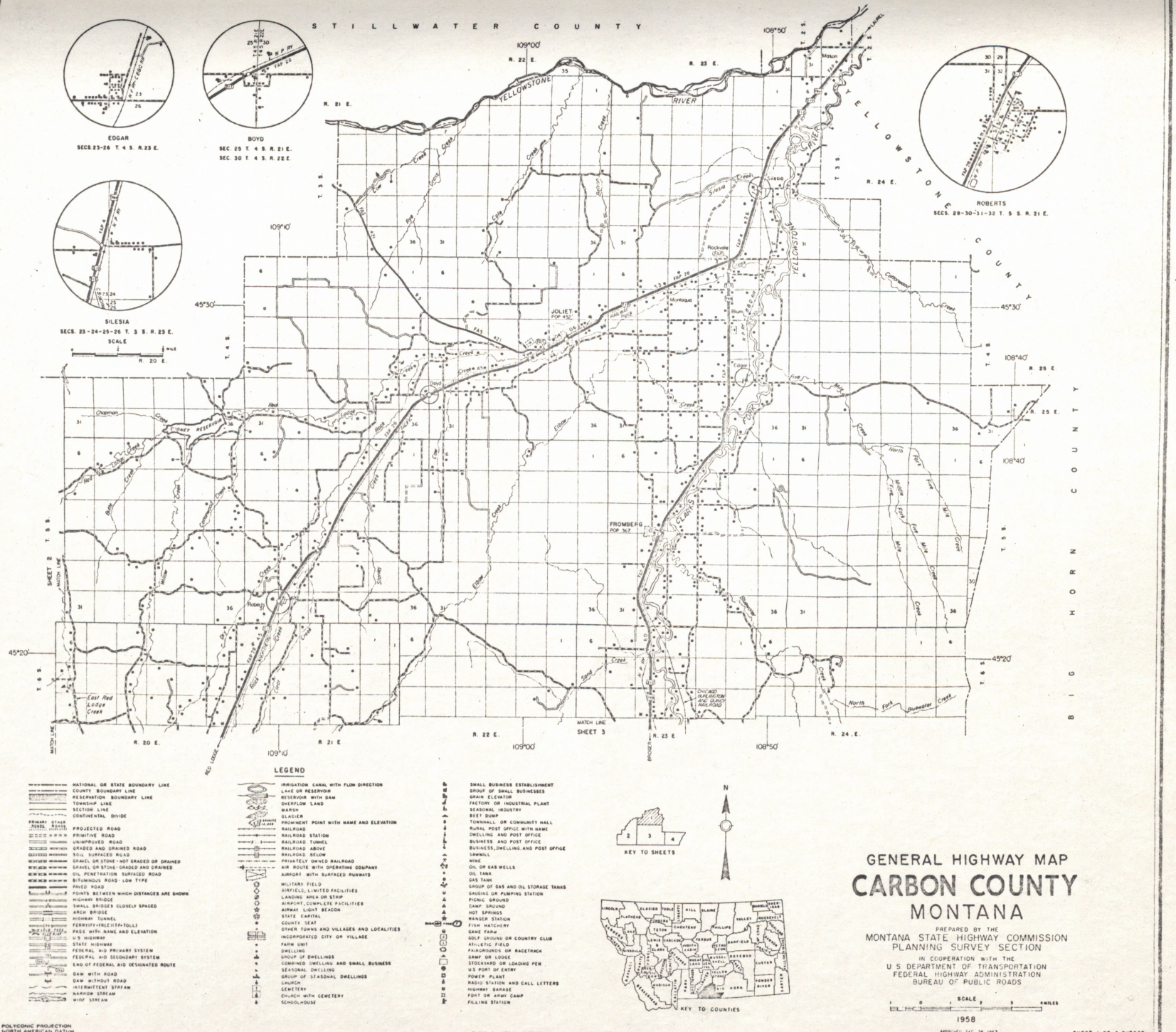
For these reasons, this reference was used only when the data was attributed to a reliable source or if the data was concerned with their specialty of sewer and water.

United States Soil Conservation Service. Guidelines for Action Beartooth Resource Conservation and Development Project. Bozeman, Montana: 1970.

This particular study includes the southwestern portion of Montana and the northern portion of Wyoming. One part of their study was of Carbon and Stillwater Counties. I discovered the Soil Conservation Service was involved with their project in January of 1971. At that time they had completed their study of the existing conditions and proposed their goals. I found that much of my work was varified by theirs. I have not been concerned with the proposals that they are currently working on, as I see the recreation-living aspect much more important than they do. Also, my proposals are based on the present and the future, while their ideas seem more concerned with solving the symptoms of the present.

APPENDIX C

Supplementary material for Part IV



LEGEND

- NATIONAL OR STATE BOUNDARY LINE
- COUNTY BOUNDARY LINE
- RESERVATION BOUNDARY LINE
- TOWNSHIP LINE
- SECTION LINE
- CONTINENTAL DIVIDE
- PROJECTED ROAD
- PRIMITIVE ROAD
- UNIMPROVED ROAD
- GRADED AND DRAINED ROAD
- SOIL SURFACED ROAD
- GRAVEL OR STONE - NOT GRADED OR DRAINED
- GRAVEL OR STONE - GRADED AND DRAINED
- OIL PENETRATION SURFACED ROAD
- BITUMINOUS ROAD - LOW TYPE
- PAVED ROAD
- POINTS BETWEEN WHICH DISTANCES ARE SHOWN
- HIGHWAY BRIDGE
- SMALL BRIDGES CLOSELY SPACED
- ARCH BRIDGE
- HIGHWAY TUNNEL
- FERRY (FREE) (TOLL)
- PASS WITH NAME AND ELEVATION
- U.S. HIGHWAY
- STATE HIGHWAY
- FEDERAL AID PRIMARY SYSTEM
- FEDERAL AID SECONDARY SYSTEM
- END OF FEDERAL AID DESIGNATED ROUTE
- DAM WITH ROAD
- DAM WITHOUT ROAD
- INTERMITTENT STREAM
- NARROW STREAM
- WIDE STREAM
- IRRIGATION CANAL WITH FLOW DIRECTION
- LAKE OR RESERVOIR
- RESERVOIR WITH DAM
- OVERFLOW LAND
- MARSH
- GLACIER
- PROMINENT POINT WITH NAME AND ELEVATION
- RAILROAD
- RAILROAD STATION
- RAILROAD TUNNEL
- RAILROAD ABOVE
- RAILROAD BELOW
- PRIVATELY OWNED RAILROAD
- AIR ROUTE WITH OPERATING COMPANY
- AIRPORT WITH SURFACED RUNWAYS
- MILITARY FIELD
- AIRFIELD, LIMITED FACILITIES
- LANDING AREA OR STRIP
- AIRPORT, COMPLETE FACILITIES
- AIRWAY LIGHT BEACON
- STATE CAPITAL
- COUNTY SEAT
- OTHER TOWNS AND VILLAGES AND LOCALITIES
- INCORPORATED CITY OR VILLAGE
- FARM UNIT
- DWELLING
- GROUP OF DWELLINGS
- COMBINED DWELLING AND SMALL BUSINESS
- SEASONAL DWELLING
- GROUP OF SEASONAL DWELLINGS
- CHURCH
- CEMETERY
- CHURCH WITH CEMETERY
- SCHOOLHOUSE
- SMALL BUSINESS ESTABLISHMENT
- GROUP OF SMALL BUSINESSES
- GRAIN ELEVATOR
- FACTORY OR INDUSTRIAL PLANT
- SEASONAL INDUSTRY
- BEET DUMP
- TOWNHALL OR COMMUNITY HALL
- RURAL POST OFFICE WITH NAME
- DWELLING AND POST OFFICE
- BUSINESS AND POST OFFICE
- BUSINESS, DWELLING AND POST OFFICE
- SAWMILL
- MINE
- OIL OR GAS WELLS
- OIL TANK
- GAS TANK
- GROUP OF GAS AND OIL STORAGE TANKS
- GAUGING OR PUMPING STATION
- PICNIC GROUND
- CAMP GROUND
- HOT SPRINGS
- RANGER STATION
- FISH HATCHERY
- GAME FARM
- GOLF GROUND OR COUNTRY CLUB
- ATHLETIC FIELD
- FAIRGROUNDS OR RACETRACK
- CAMP OR LODGE
- STOCKYARD OR LOADING PEN
- U.S. PORT OF ENTRY
- POWER PLANT
- RADIO STATION AND CALL LETTERS
- HIGHWAY GARAGE
- FORT OR ARMY CAMP
- FILLING STATION

KEY TO SHEETS

KEY TO COUNTIES

GENERAL HIGHWAY MAP
CARBON COUNTY
MONTANA

PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE 1 0 1 2 3 4 MILES

1958

POLYCONIC PROJECTION
NORTH AMERICAN DATUM

BASED ON AERIAL PHOTOGRAPHY OF 1955 AND FIELD INVENTORY OF 1956

APPROVED DEC. 29, 1953
REVISED DEC. 31, 1958

SHEET 1 OF 4 SHEETS

Fig. C-1.1.

Fig. C-1.2.

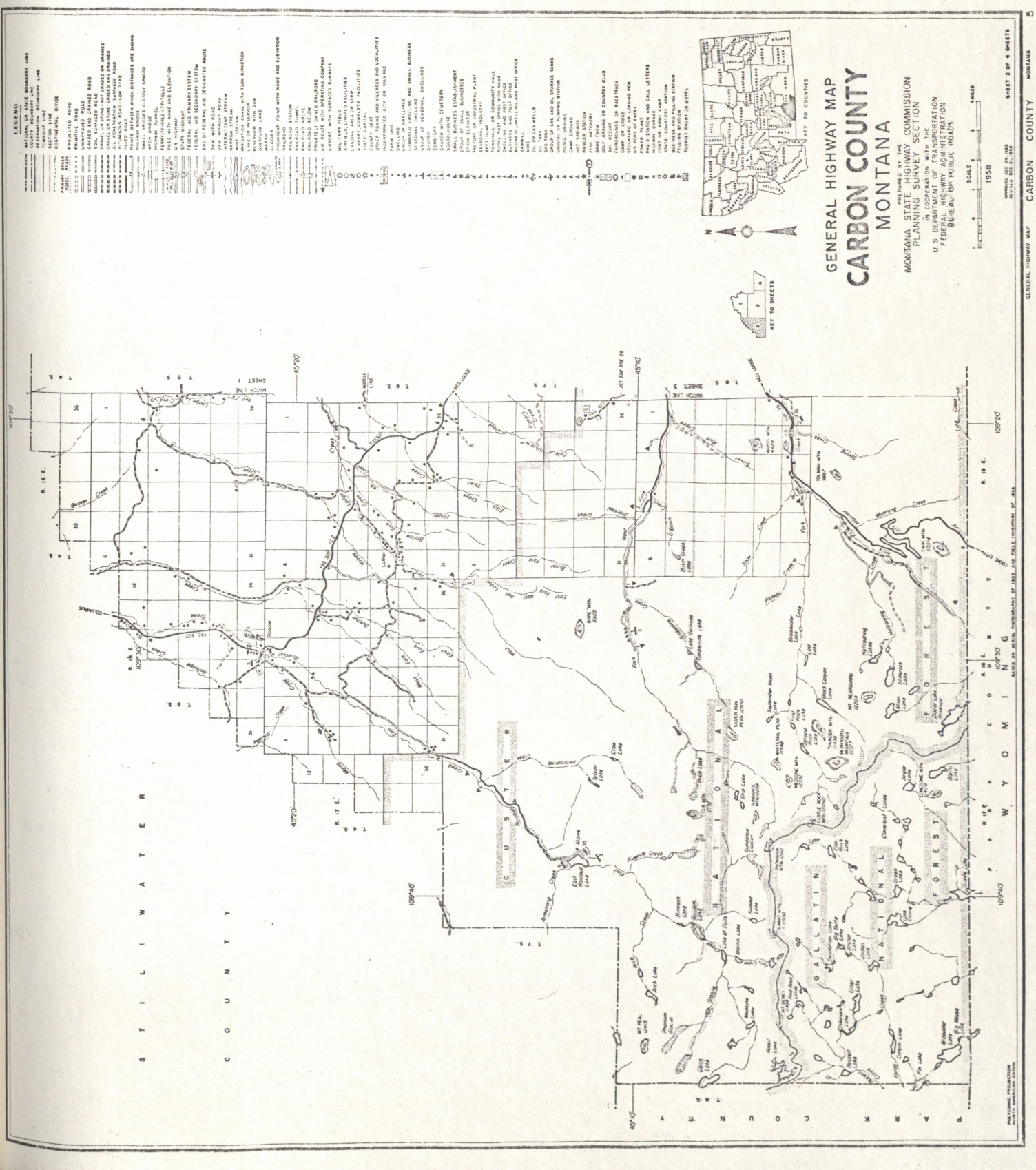
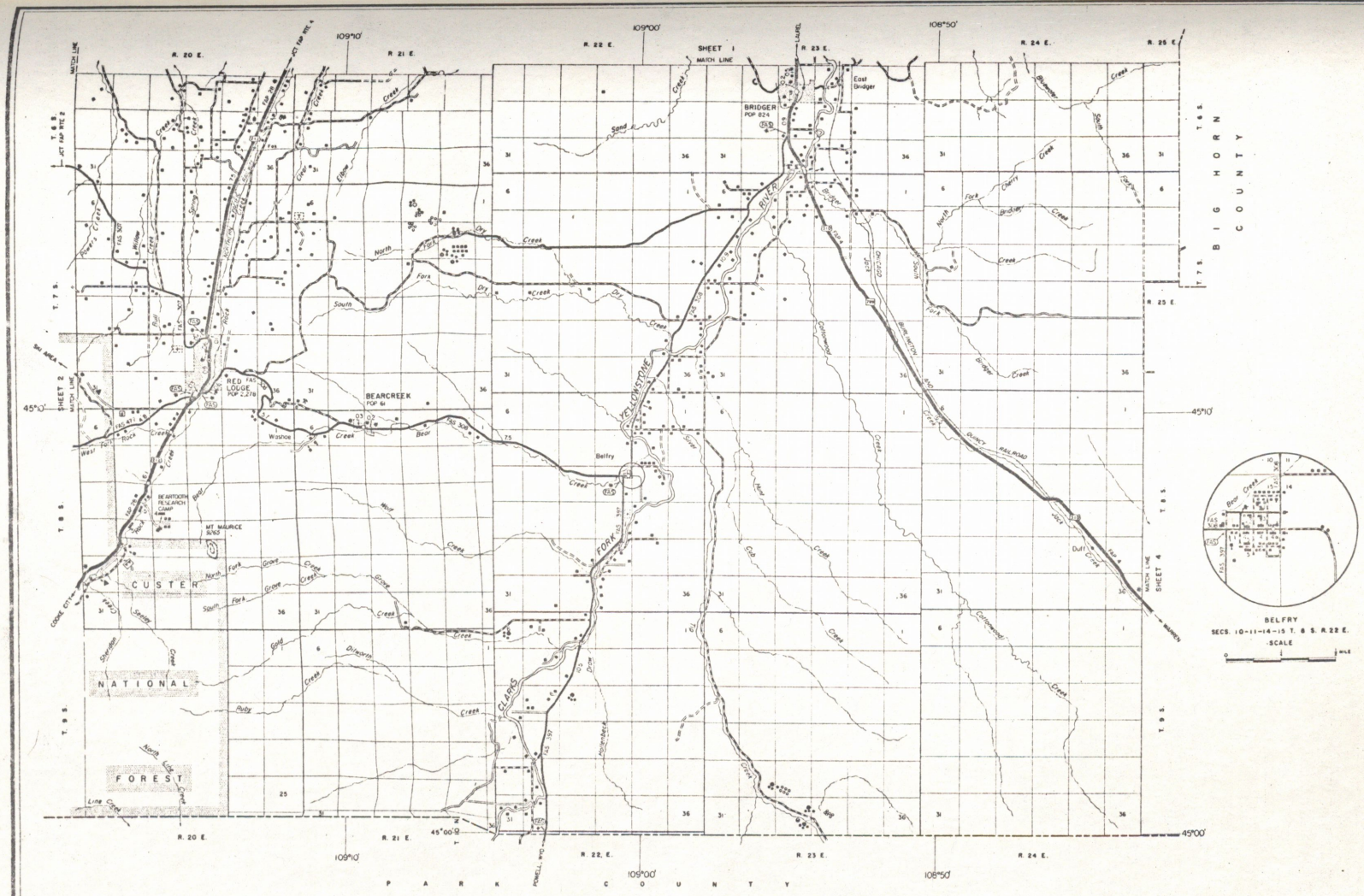

GENERAL HIGHWAY MAP
CARBON COUNTY
MONTANA
PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
1958
SCALE
MILES
SHEET 2 OF 4 SHEETS
KEY TO COUNTIES
KEY TO SHEETS
LEGEND
STILLWATER COUNTY
CUSTER NATIONAL FOREST
GALLATIN NATIONAL FOREST
PARK COUNTY
WYOMING
GENERAL HIGHWAY MAP CARBON COUNTY MONTANA

Fig. C-1.3.

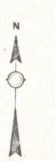


LEGEND

- NATIONAL OR STATE BOUNDARY LINE
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- RESERVATION BOUNDARY LINE
- TOWNSHIP LINE
- SECTION LINE
- CONTINENTAL DIVIDE
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- POINTS BETWEEN WHICH DISTANCES ARE SHOWN
- HIGHWAY BRIDGE
- SMALL BRIDGES CLOSELY SPACED
- ARCH BRIDGE
- HIGHWAY TUNNEL
- FERRY (FREE) (TOLL)
- PASS WITH NAME AND ELEVATION
- U.S. HIGHWAY
- STATE HIGHWAY
- FEDERAL AID PRIMARY SYSTEM
- FEDERAL AID SECONDARY SYSTEM
- END OF FEDERAL AID DESIGNATED ROUTE
- DAM WITH ROAD
- DAM WITHOUT ROAD
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- NARROW STREAM
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- IRRIGATION CANAL WITH FLOW DIRECTION
- LAKE OR RESERVOIR
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- AIRPORT WITH SURFACED RUNWAYS
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- AIRFIELD, LIMITED FACILITIES
- LANDING AREA OR STRIP
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- STATE CAPITAL
- COUNTY SEAT
- OTHER TOWNS AND VILLAGES AND LOCALITIES
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- FILLING STATION
- FAIRGROUNDS OR RACETRACK
- CAMP OR LODGE
- STOCKYARD OR LOADING PEN
- DORMITORY
- POWER PLANT
- RADIO STATION AND CALL LETTERS
- HIGHWAY GARAGE
- FORT OR ARMY CAMP
- TOURIST COURT OR MOTEL



KEY TO SHEETS





KEY TO COUNTIES

GENERAL HIGHWAY MAP
CARBON COUNTY
MONTANA

PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE
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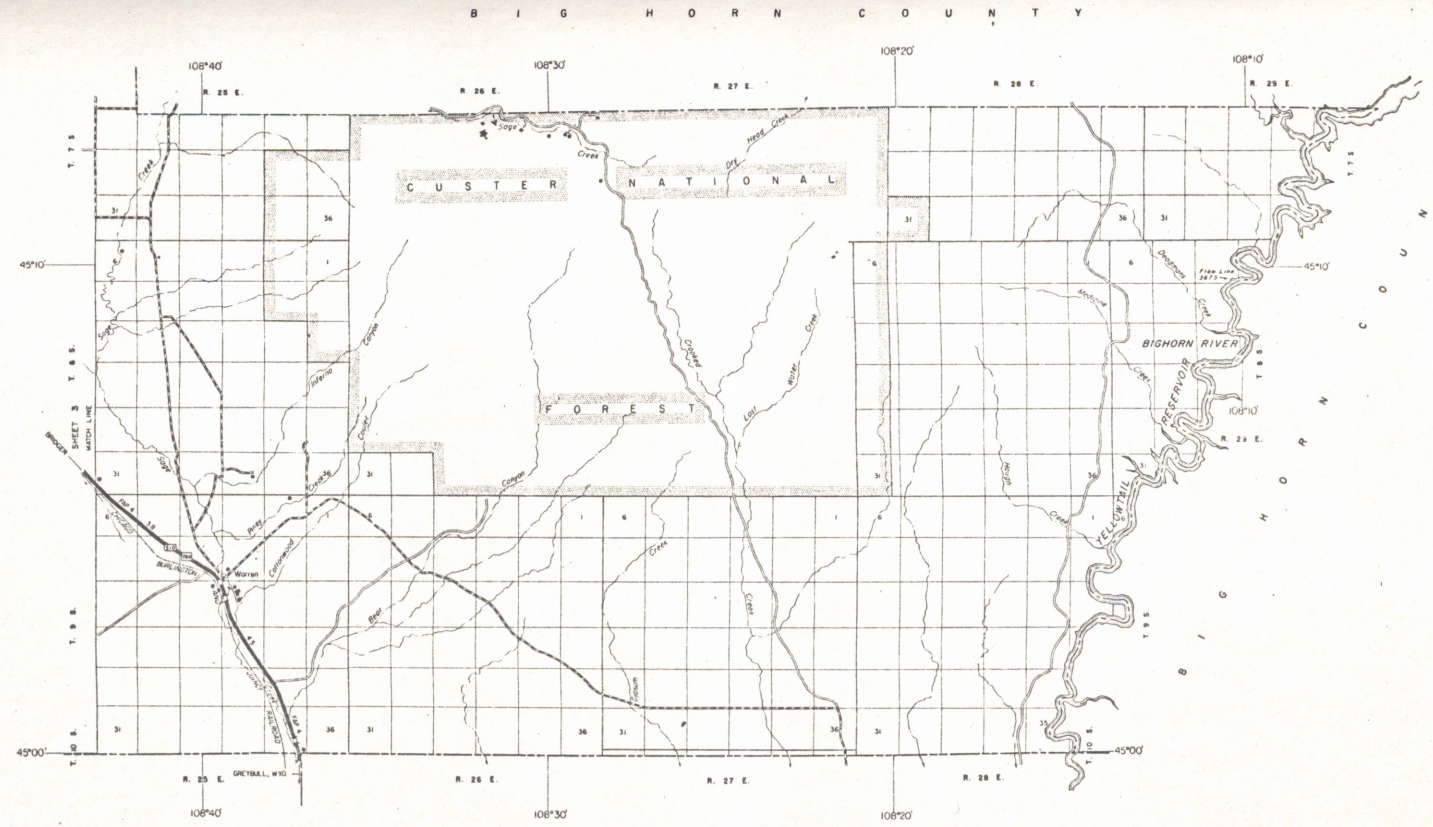
1958

POLYCONIC PROJECTION
NORTH AMERICAN DATUM

BASED ON AERIAL PHOTOGRAPHY OF 1955 AND FIELD INVENTORY OF 1956

APPROVED DEC. 24, 1963
REVISED DEC. 31, 1958

SHEET 3 OF 4 SHEETS



LEGEND

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- POWER PLANT
- RADIO STATION AND CALL LETTERS
- HIGHWAY GARAGE
- FORT OR ARMY CAMP
- STATE COURTESY STATION

KEY TO SHEETS

KEY TO COUNTIES

GENERAL HIGHWAY MAP
CARBON COUNTY
MONTANA

PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS

SCALE 0 1 2 3 4 MILES

1958

APPROVED DEC 24, 1963
REVISED DEC 31 1966

SHEET 4 OF 4 SHEETS

POLYCONIC PROJECTION
NORTH AMERICAN DATUM

BASED ON AERIAL PHOTOGRAPHY OF 1955 AND FIELD INVENTORY OF 1966

Fig. C-14.

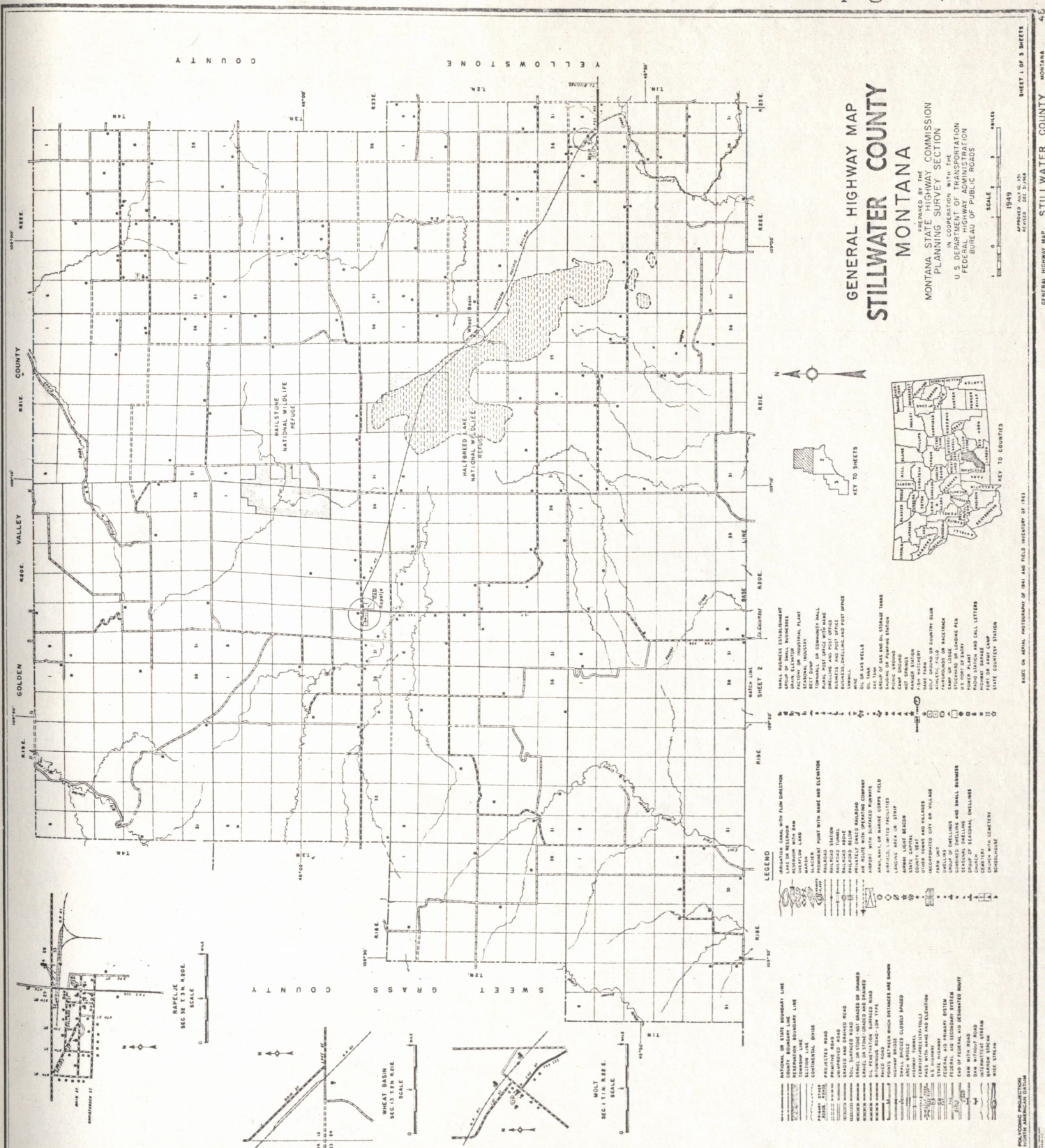
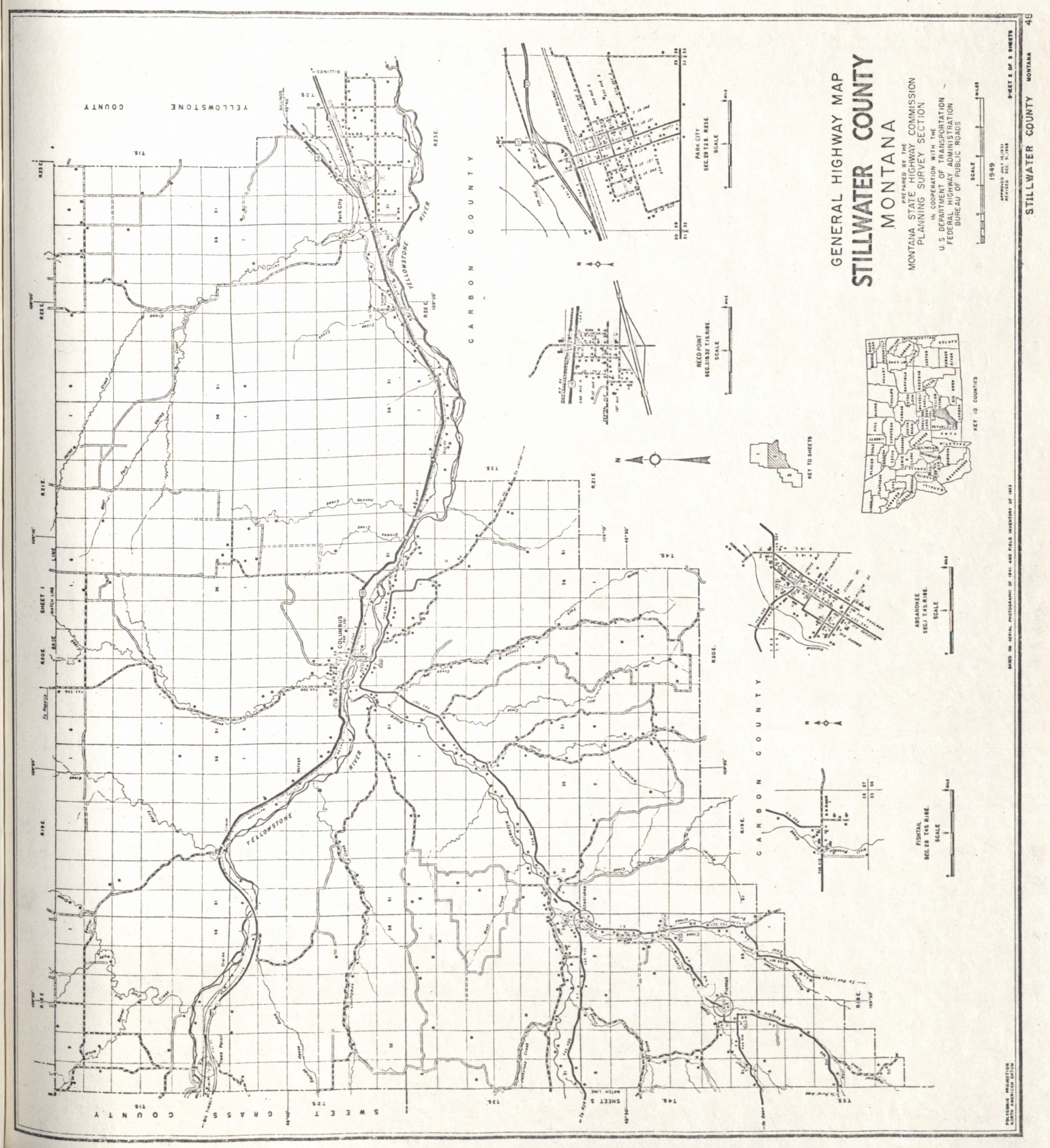

GENERAL HIGHWAY MAP
STILLWATER COUNTY
MONTANA
PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
SCALE
1949
APPROVED ACT NO. 124
REVISED DEC. 31, 1948
SHEET 1 OF 3 SHEETS
BASED ON AERIAL PHOTOGRAPHY OF 1941 AND FIELD INVENTORY OF 1943
POLYCONIC PROJECTION
NORTH AMERICAN DATUM
LEGEND
KEY TO SHEETS
KEY TO COUNTIES
GOLDEN VALLEY COUNTY
SWEET GRASS COUNTY
YELLOWSTONE COUNTY
HAILSTONE NATIONAL WILDLIFE REFUGE
HALFBREED LAKE NATIONAL WILDLIFE REFUGE
Wheat Basin
Molt
Absarokee
RAPELJE SEC 32 T 3 N R 20 E.
WHEAT BASIN SEC 13 T 2 N R 21 E.
MOLT SEC 1 T 1 N R 22 E.
SCALE
GENERAL HIGHWAY MAP STILLWATER COUNTY MONTANA

Fig. C-2.1.

Fig. C-2.2.


GENERAL HIGHWAY MAP
STILLWATER COUNTY
MONTANA
PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
SCALE
1949
APPROVED OCT. 10 1951
REVISED DEC. 31 1956
SHEET 2 OF 3 SHEETS
STILLWATER COUNTY MONTANA
CARBON COUNTY
YELLOWSTONE COUNTY
SWEET GRASS COUNTY
YELLOWSTONE RIVER
Park City
Columbus
Reed Point
Absarokee
Fishtail
PARK CITY SEC. 23 T. 5 S. R. 22 E.
REED POINT SEC. 5 T. 3 S. R. 24 E.
ABSAROKEE SEC. 7 T. 6 S. R. 21 E.
FISHTAIL SEC. 28 T. 4 S. R. 18 E.
KEY TO SHEETS
KEY TO COUNTIES
SHEET 1
SHEET 3
MATCH LINE
BASED ON AERIAL PHOTOGRAPHY OF 1951 AND FIELD INVENTORY OF 1953
POLYCONIC PROJECTION
NORTH AMERICAN DATUM

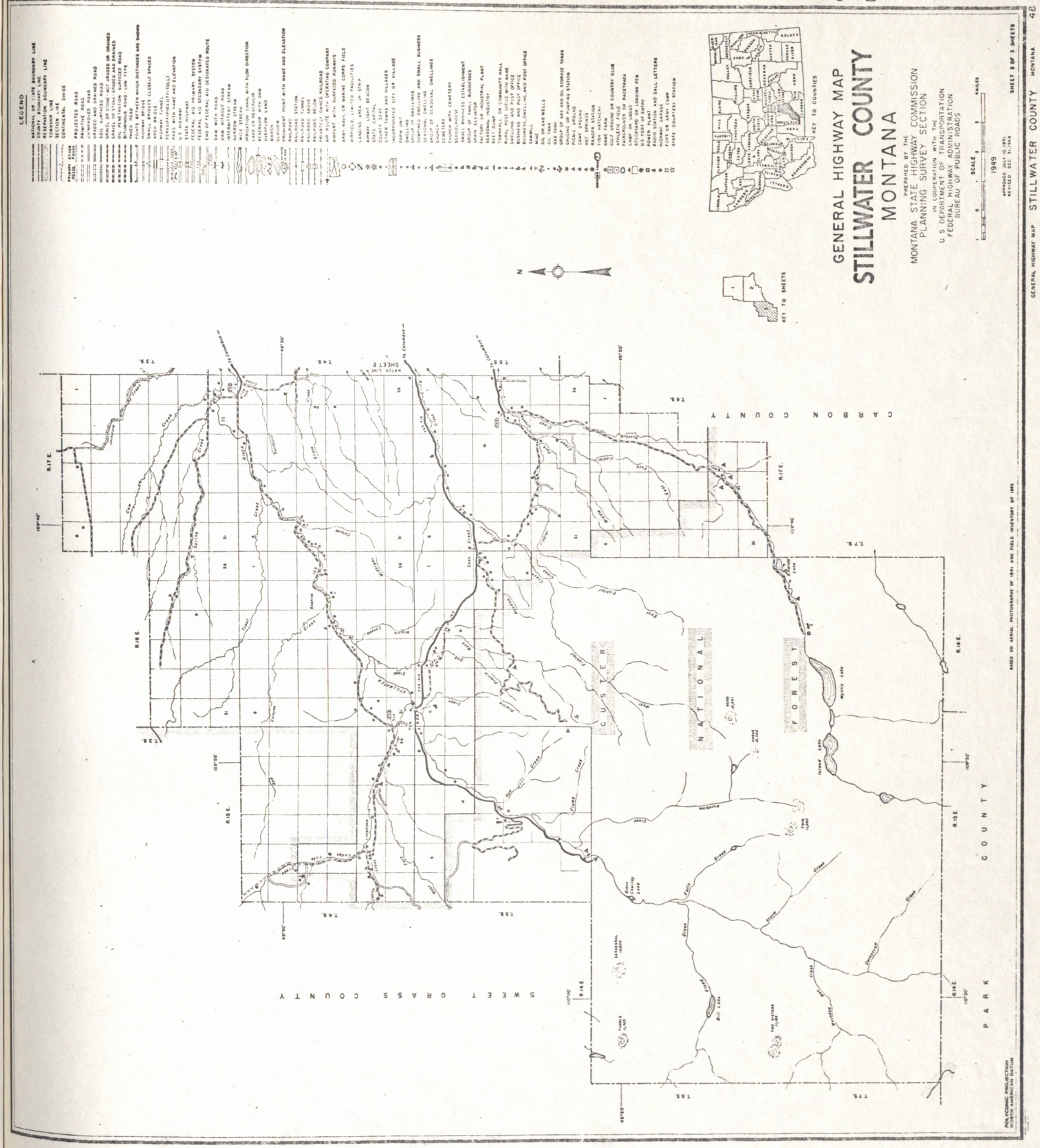

GENERAL HIGHWAY MAP
STILLWATER COUNTY
MONTANA
PREPARED BY THE
MONTANA STATE HIGHWAY COMMISSION
PLANNING SURVEY SECTION
IN COOPERATION WITH THE
U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
1949
APPROVED JULY 10, 1951
REVISED DEC. 31, 1954
SHEET 3 OF 3 SHEETS
BASED ON AERIAL PHOTOGRAPHY OF 1941 AND FIELD INVENTORY OF 1951
POLYCONIC PROJECTION
NORTH AMERICAN DATUM
LEGEND
KEY TO COUNTIES
KEY TO SHEETS
SHEET 2
MATCH LINE
SWEET GRASS COUNTY
CARBON COUNTY
PARK COUNTY
CUSTER NATIONAL FOREST
GENERAL HIGHWAY MAP STILLWATER COUNTY MONTANA

Fig. C-2.3.

Feasible Watersheds - The Missouri River Basin Investigations revealed several potential PL-566 projects in the Beartooth RC&D project area. The following is a brief resume of those watersheds that have a favorable benefit-cost ratio (B:C ratio).

(1) 14b-2 - Fishtail to Butcher Creek - 237,887 acres: 135,115 acres in Stillwater County and 102,772 acres in Carbon County. This watershed has 10 acres urban flooding, 1,670 acres with short late season supply and 1,536 additional potential irrigable lands. There is a need for late season storage plus ditch reorganization; estimated B:C ratio 1.6 to 1.0.

(2) 14b-3 - Lower Stillwater River - 133,522 acres: 126,321 acres in Stillwater County and 7,201 acres in Sweetgrass County. About 3,000 acres of irrigated cropland need improved diversions and ditch reorganization; estimated B:C ratio 1.6 to 1.0.

(3) 14b-4 - Shane, Beaver Creeks - 103,055 acres: 89,004 acres in Stillwater County and 14,051 acres in Carbon County. Flooding occurs on 460 acres of cropland, 150 acres are short of irrigation water, 750 acres of additional land could be irrigated if storage and distribution systems were provided; estimated B:C ratio 2.3 to 1.0. This project could be serviced as a group facility.

(4) 14c-6 - North Fork Cherry, South Fork Bridger, etc. - 169,815 acres in Carbon County. Improved distribution systems on existing irrigated acreage and provide water for 800 additional acres; estimated B:C ratio 5.2 to 1.0. This project could qualify as a group facility.

(5) 14c-7 - Grove Creek ... to Gold Creek - 151,749 acres in Carbon County. There are about 2,300 acres which need drainage, 3,100 acres need improved or reorganized irrigation systems, including canal lining. Some areas have a short supply for late season use. The estimated B:C ratio is 3.1 to 1.0 or 5.0 to 1.0 depending on each phase of the project.

(6) 14c-9 - Red Lodge Creek to Rock Creek - 201,530 acres in Carbon County. There are 80 acres of urban land and 4,000 acres of cropland or pastureland subject to flooding. Nearly 42,400 acres of cropland need improved irrigation

systems including laterals, 850 acres need drainage and some areas have a shortage of water for late season use. The estimated B:C ratio is 1.8 to 1.0. This does not include the recreational benefits from reservoir storage.

(7) 14c-10 - Elbow Creek, Poverty Flat - 121,903 acres in Carbon County. There are 9,000 acres of irrigated land that could be improved with drainage or reorganization of irrigation systems. Estimated B:C ratio of 6.0 to 1.0. Another 3,343 acres need improved irrigation systems and 1600 acres of new land could be irrigated. Estimated B:C ratio of 2.07 to 1.0. There is an excellent potential for recreation on off-stream storage.

(8) 14c-11 - Bluewater Creek - 102,575 acres in Carbon County. Water storage would provide flood control and water to irrigate 200 acres of new land, as well as water for both municipal and industrial use and excellent recreation. This project could qualify as a group facility.

(9) 14-25 - Valley Creek - 74,547 acres in Stillwater County. This project will provide both flood prevention and recreation at an estimated B:C ratio of 1.1 to 1.0.

(10) Part of 14-26 - Park City-Laurel Drain: Drainage only; acres remaining are unknown. There are also parts of two feasible watersheds in the Musselshell Drainage that would benefit Golden Valley County.

SUPPLEMENT FOR BEARTOOTH RC&D SOIL MAP - FIG. 4-4, PAGE 205

The seventeen soil associations in the Beartooth RC&D Project have been placed in four main groups, as shown on the legend of the general soil map. In the first group are soils of the flood plains and narrow valleys; soils in the second group occur on gently rolling uplands and are underlain by shale or sandstone; the third group of soils are found on the outwash fans and terraces; and in the fourth group are soils of the steep mountains.

The general soil map was compiled from information available from detailed soil maps and field soil survey notes made in Carbon and Stillwater Counties. More detailed descriptions of the named soils can be obtained at the Soil Conservation Service offices in Joliet and Columbus.

The general soil map is most useful to people who want a general idea of soils in the area, and want to compare soils in different parts of the area. In the development of broad resource plans, you can locate large tracts of land that are suitable for certain kinds of farming or other land use. The general soil map is not suitable for detailed planning and management of a farm operation, because the soils in any association ordinarily differ in slope, depth, stoniness, drainage and other characteristics that affect their use. On site investigation is needed for the intensive use and management.

SOIL ASSOCIATIONS

DEEP, LOAMY, WELL DRAINED SOILS OF THE FLOOD PLAINS AND NARROW VALLEYS.

1. Haverson - Glenberg association:

This association comprises 24,800 acres or about 1 percent of the area. It is dominated by well drained, light colored loam and sandy loam soils with some areas of saline-alkaline loam soils on nearly level stream terraces. Elevations range from 3,000 to 3,500 feet. The annual precipitation is 10 to 14 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 120 to 130 days. Soils in this association are used primarily for row crops, small grains, hay and pasture.

Haverson soils have light colored loam or clay loam surface layers and calcareous light colored, stratified fine sandy loam, silt loam and clay loam subsoils. This soil is on nearly level stream terraces and comprises about 65 percent of the association. Areas will range from about 20 to 40 acres in size.

Glenberg soils have light colored fine sandy loam or loam surface layers and calcareous stratified light colored, fine sandy loam substratum. This soil is on nearly level to gently sloping flood plains or stream terraces and comprises about 30 percent of the association. Areas will range from about 5 to 15 acres in size.

Other soils make up to 5 percent of the association. These soils occupy fan terraces. Some resemble the Haverson soils, except they have developed subsoil layers over stratified alluvium. Shallow very cobbly soils occupy some stream terrace edges. Recent deposits of sand, gravel and silt occupy the river edges and some flood plains.

2. Heldt association:

This association comprises about 173,300 acres or 7 percent of the area. It is dominated by well drained, light colored clay loam soils and very gravelly high lime soils. It occurs in valleys, on stream terraces and alluvial fans. Elevation ranges from 3,000 to 4,000 feet. The annual precipitation is 5 to 12 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 120 to 130 days. Soils in this association are used primarily for row crops, small grains, hay and pasture.

Heldt soils have light colored, silty clay loam or clay loam surface layer and a week blocky silty clay loam subsoil. Stratified alluvium can occur at depths of 10 to 30 inches or more. This soil occurs on nearly level to gently and moderately sloping stream terraces and fans and comprises about 60 percent of the association. Areas will range from about 20 to 300 acres in size.

Fort Collins soils have a dark colored silty clay loam or clay loam surface layer and a brown blocky silty clay loam subsoil layer. This is underlain by a light gray fine sandy loam calcareous substratum. Depth to bedrock is more than 60 inches. This soil is on nearly level to gently sloping stream terraces and comprises about 30 percent of the association. Areas will range from about 40 to 160 acres in size.

Other soils make up 10 percent of the association. These soils occur on fans and stream terraces and resemble the Heldt and Fort Collins soils in some respects. Textures most common are fine sandy loam and clay loam. Locally saline-alkaline soils occur on low terraces.

3. Maurice* - Pryor* - Dukon* association:

This association comprises about 198,000 acres or about 8 percent of the area. It is dominated by well drained and poorly drained, dark colored loam soils, and well drained, light colored sandy soils. Elevations range from 4,000 to 8,000 feet. The annual precipitation is 18 to 22 inches; mean annual soil temperature is 42 to 45° F. The frost free season is 90 to 110 days. Soils in this association are used primarily for range, irrigated pasture, meadow hay and a small acreage of small grains.

* Soil series names that are subject to change or have changed in field correlation.

Maurice soils have a dark colored loam or cobbly loam surface layers over very gravelly and cobbly silt loam subsoil layers. This soil is on nearly level to gently sloping alluvial stream terraces and comprises about 60 percent of the association. Areas will range from about 5 to 30 acres in size.

Pryor soils have a light colored, fine sandy loam on fine sand surface layer over a brown fine sandy loam or sandy loam subsoil. Sandstone bedrock occurs from 48 to 54 inches. This soil is under a thick stand of pine and comprises about 10 percent of the association. Areas will range from about 600 to 1,000 acres in size.

Dukon soils have a thin organic layer over a dark colored silty clay loam or silty clay surface layer. The subsoil is a very pale brown clay loam or silty clay loam, 18 to 24 inches thick. The substratum is a pale brown very fine sandy loam to clay loam. This is underlain by weathered shale and sandstone at about 50 inches. This soil occurs on moderately sloping to steep rolling upland and comprises about 25 percent of the association. Areas will range from 600 to 1,000 acres in size.

Other soils make up about 5 percent of the association. These soils occur on the nearly level stream terraces and gently rolling footslopes. Recent deposition of very cobbly material occupies the stream channels.

4. Shorey - Stormitt* - Garvin association:

This association comprises about 90,000 acres or about 4 percent of the area. It is dominated by well drained, light colored clay loam, very gravelly clay loam and shallow reddish brown loam soils. It occurs on alluvial fans, terraces and rough steep upland bedrock plains. Elevation ranges from 3,500 to 5,000 feet. The annual precipitation is 10 to 14 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for range, hay and small grains.

Shorey soils have light colored loam or clay loam surface layers over a brown silty clay loam subsoil. This is underlain by a nearly white or pale brown highly calcareous silty clay loam for more than 60 inches. This soil is on nearly level to gently and moderately to strongly sloping alluvial fans and footslopes and comprises about 40 percent of the association. It occurs in irregular pattern in areas of about 80 to 100 acres in size.

* Soil series names that are subject to change or have changed in field correlation.

Stormitt soils have light colored loam or very gravelly loam and stony loam surface layers. The subsoil is a light brown to pinkish white silty clay loam and very gravelly silty clay loam. This soil is on nearly level to gently and moderately to strongly sloping fans and stream terraces and comprises about 40 percent of the association. It occurs in irregular pattern in areas of about 80 to 600 acres in size.

Garvin soils have a reddish brown loam or fine sandy loam surface layer. The substratum is a pale red loam or clay loam about 16 inches thick over bedrock. This soil is on strongly sloping to steep rough upland shale bedrock plains and comprises about 15 percent of the association. Size of area varies because of the rough relief.

Other soils make up about 5 percent of the association. These soils occupy swales and stream terraces that are nearly level to gently sloping. These soils resemble the Shorey and Stormitt soils, except they have noncalcareous subsoil layers over deep alluvium. Highly alkaline soils may occur where shale beds are close to the surface.

5. Havre - Reedpoint* association:

This association comprises about 173,000 acres or about 7 percent of the area. It is dominated by well drained, light colored clay loam and loam soils. It occurs on valley bottoms and coalescing alluvial fans that are nearly level to gently and moderately sloping. Elevation ranges from 3,500 to 4,000 feet. The annual precipitation is 12 to 15 inches; mean annual soil temperature is 42 to 47° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for small grains, hay and pasture. A small acreage is used for row crops.

Havre soils have a light colored loam or clay loam surface layer and stratified loamy subsoil. The subsoil consists of 1 to 2 inch thick layers of fine sandy loam, clay loam, clay, silt loam and sandy loam textures. This soil is on nearly level stream terraces and valley bottoms and comprises about 45 percent of the association. Areas will range from 5 to 40 acres in size.

Reedpoint soils have a dark grayish brown clay loam or silty clay loam surface layer. The subsoil is a brown prismatic to blocky clay or clay loam over a deep brownish gray calcareous clay loam substratum. This soil is on nearly level to gently and moderately sloping coalescing alluvial fans and comprises about 40 percent of the association. Areas will range from 20 to 80 acres in size.

* Soil series names that are subject to change or have changed in field correlation.

Other soils make up about 15 percent of the association. These soils have profile characteristics that resemble the Havre and Reedpoint soils, except they have thicker surface layers and subsoils over deep alluvium. Saline soils may occur where drainage is poor.

DEEP, MODERATELY DEEP, AND SHALLOW CLAY SOILS OF THE SHALE AND SANDSTONE UPLANDS.

6. Midway - Travessilla - Lismas association:

This association comprises about 247,500 acres or about 10 percent of the area. It is dominated by shallow, excessively drained, light colored clayey and sandy soils developing on shale and sandstone bedrock. These soils occur on rolling to steep and hilly upland bedrock plains. Elevation ranges from 3,500 to 5,000 feet. The annual precipitation is 6 to 14 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 120 to 130 days. Soils in this association are used primarily for grazing. Small acreages along the large drainages are cultivated.

Midway soils are shallow light colored clay or clay loam soils over clayey, silty or sandy shale bedrock. The surface and subsoil layers are light grayish brown clay loam. The substratum consists of shale at depths of 20 inches or less. This soil occurs on moderately to strongly sloping and steep landscapes and comprises about 40 percent of the association. Areas will range from about 1,000 to 1,500 acres in size.

Travessilla soils have a thin light colored loam surface layer. The substratum of loam or fine sandy loam is 20 inches or less over sandstone bedrock. This soil occurs on strongly sloping to very steep landscapes and comprises 30 percent of the association. Areas will range from about 1,000 to 1,500 acres in size.

Lismas soils have a clay or silty clay surface and subsoil layers underlain by clay shale at depths less than 20 inches. The substratum of clay shale is high in alkali salts which limits production on this soil. This soil occurs on moderately to strongly sloping and steep landscapes and comprises about 20 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Other soils make up about 10 percent of the association. These are deep alluvial soils that occupy the swales, short footslopes, terrace remnants and narrow drainages. These soils have thicker surface layers and developed subsoils over deep alluvium and saline spots commonly occur.

7. Yawdim* - Cabba* - Rentsac* association:

This association comprises about 24,800 acres or about 1 percent of the area. It is dominated by shallow and moderately deep, well drained, light colored clayey or loamy soils on rolling to steep uplands. Elevation ranges from 3,500 to 4,500 feet. The annual precipitation is 15 to 19 inches; mean annual soil temperature is 42 to 45° F. The frost free season is 110 to 120 days. Soils of this association are used primarily for grazing and sparsely forested areas. A small acreage is cultivated.

Yawdim soils have light colored surface and subsoil layers of clay loam or clay underlain by thin substratum of clayey, silty and sandy shale at depths of 20 inches or less. This soil occurs on rolling to steep upland bedrock plains and comprises about 50 percent of the association. Areas will range from about 1,000 to 1,500 acres in size.

Cabba soils have a light colored surface and subsoil layers of loam, silty clay loam or clay loam underlain by white to olive colored clayey or sandy shale at 20 inches or less. This soil occurs on moderately sloping to rolling and steep landscapes and comprises about 30 percent of the association. Areas will range from 500 to 1,000 acres in size.

Rentsac soils have light colored surface layers of loam, silt loam, channery loam and very channery loam subsoils underlain at depths of 20 inches or less by sandstone bedrock. This soil occurs on moderately and strongly sloping to steep landscapes and comprises about 15 percent of the association. Areas will range from 250 to 1,000 acres in size.

Other soils of the association are found on wide footslopes, broad divides and narrow valleys. These soils have thick loam surface layers over clay loam subsoils formed in stratified loamy substratums. Small acreages of cultivated crops are grown on these soils.

8. Nunn - Wormser association:

This association comprises about 24,800 acres or about 1 percent of the area. It is dominated by well drained, light colored loam and clay loam soils with clay subsoils, and shallow loam soils on sandstone. Elevation ranges from 3,500 to 4,000 feet. The annual precipitation is 10 to 14 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 120 to 130 days. Soils of this association are used primarily for row crops, small grains, hay and pasture.

* Soil series names that are subject to change or have changed in field correlation.

Nunn soils have a light colored silty clay loam or clay loam surface layer and a silty clay loam or clay prismatic to blocky subsoil. This is underlain by a brown or yellow thick calcareous silty clay loam substratum. This soil occurs on nearly level to gently sloping stream terraces and fans and comprises about 60 percent of the association. Areas will range from about 200 to 500 acres in size.

Wormser soils have light colored loam or clay loam surface layers and a brown clay loam or clay prismatic to blocky subsoil. This is underlain by a gray sandstone at depths between 20 and 60 inches. This soil is on moderately sloping to steep landscapes and comprises about 30 percent of the association. Areas will range from 50 to 80 acres in size.

Other soils make up about 10 percent of the association. These soils occur in narrow valleys on broad footslopes and divides. They resemble the Nunn and Wormser soils, except they do not have developed subsoil and may be shallower to bedrock. Saline soils may occur in places.

9. Absarokee - Maginnis association:

This association comprises about 346,500 acres or about 14 percent of the area. It is dominated by well drained, dark colored clay loam soils and light colored, moderately deep clay loam soils over sandstone. This association is on gently to moderately sloping broad ridges and steep upland bedrock plains. Elevation ranges from 3,500 to 4,500 feet. The annual precipitation is 15 to 19 inches; mean annual soil temperature is 42 to 45° F. The frost free season is 110 to 120 days. Soils of this association are used primarily for dryland crops and range.

Absarokee soils have dark colored surface layers of loam or clay loam over brown blocky clay or clay loam subsoils. The substratum below 18 to 20 inches is a pale olive clay for a depth of 35 to 40 inches. Pale olive massive stratified clayey, silty and sandy shale occurs within depths of 40 inches. This soil is on gently to moderately and strongly sloping upland bedrock plains and comprises about 60 percent of the association. Areas will range from 250 to 1,000 acres in size.

Maginnis soils have a dark colored surface layer of clay loam or channery clay loam over a grayish brown very channery clay loam subsoil. The substratum is hard sandstone bedrock at depths of 20 inches or less. This soil is on gently to moderately and sloping footslopes and narrow divides and comprises about 35 percent of the association. Areas will range from about 200 to 500 acres in size.

Other soils make up 5 percent of the association. These soils occupy the narrow valleys, wide footslopes and broad divides that are gently to moderately sloping. These soils resemble the Absarokee and Maginnis soils, except they are deeper to bedrock and are on less sloping landscapes.

10. Pierre - Lismas - Kyle association:

This association comprises 49,500 acres or about 2 percent of the area. It is dominated by well drained, light colored clay soils on moderately to strongly sloping and steep hilly shale bedrock uplands. Elevation ranges from 3,500 to 4,000 feet. The annual precipitation is 10 to 14 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for grazing. A small acreage is cultivated. Small grains and hay are principal crops.

Pierre soils have a light colored clay or silty clay surface and subsoil layers underlain by shale at depths of 20 to 40 inches. This soil is on moderately to strongly sloping shale bedrock uplands and comprises about 40 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Lismas soils have a clay surface and subsoil layers underlain by clay shale at 20 inches or less. The substratum of clay is high in alkali salts which limits production on these soils. This soil occurs on moderately to strongly sloping and steep landscapes and comprises about 30 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Kyle soils have a clay surface and subsoil layers to depths of more than 60 inches. This soil is on gently to moderately and strongly sloping valley footslopes, alluvial fans and valley floors and comprises about 25 percent of the association. Areas will range from 100 to 250 acres in size.

Other soils make up about 5 percent of the association. These are barren shale, very shallow to sandstone and deep swales and terrace remnants. The deeper soils resemble the Lismas and Kyle, except they may be more than 20 inches to bedrock or may lack a subsoil layer. Many dense alkali soils occur in the association but are small in size.

11. Berry* - Fiddler* association:

This association comprises about 198,000 acres or about 8 percent of the area. It is dominated by well drained, dark colored clay loam soils and moderately deep and shallow soils over shale and

* Soil series names that are subject to change or have changed in field correlation.

sandstone bedrock. Elevation ranges from 4,000 to 4,500 feet. The annual precipitation is 12 to 15 inches; mean annual soil temperature is 45 to 47° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for dryland cultivation and range.

Berry soils have a grayish brown silty clay loam or clay loam surface layer over a prismatic to blocky silty clay subsoil. The substratum is a light colored calcareous silty clay loam to a depth of about 30 inches. Below about 30 inches is clayey, silty and sandy shale. This soil is on gently to moderately and strongly sloping landscapes and comprises about 60 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Fiddler soils have a dark colored channery loam or channery sandy loam surface layer. The substratum is a pale brown very channery loam to a depth less than 10 inches over indurated sandstone. This soil is on moderately sloping to steep hilly uplands and comprises about 35 percent of the association. Areas will range from about 50 to 100 acres in size.

Other soils make up about 5 percent of the association. These soils occur on terrace remnants, very shallow bedrock plains and deep alluvial fans and stream terraces. They resemble the Berry and Fiddler soils except the substratums are gravelly or hard sandstone. Other minor soils are deep over bedrock and have thicker surface layers.

12. Midway association:

This association comprises 24,800 acres or about 1 percent of the area. It is dominated by shallow excessively drained, light colored clay soils on shale and sandstone upland bedrock plains. The annual precipitation is 12 to 14 inches; mean annual temperature is 47 to 49° F. The frost free season is 110 to 120 days. Soils in this association are used for grazing. Only small fields along large drainages are cultivated.

Midway soils have light colored clay or clay loam surface and subsoil layers underlain at depths of less than 20 inches by clayey, silty or sandy shale beds. This soil occurs on strongly sloping to steep and very steep bedrock plains and comprises about 90 percent of the association. Areas will range from about 1,000 to 1,500 acres in size.

Other soils make up about 10 percent of the association. These soils include deep, very shallow and barren shale or rockland areas. The deep soils are on the valleys of the large drainages or colluvial footslopes. Many sandstone cliffs and rock outcrops occur. The very shallow soils occur on narrow ridges and divides. The valley soils are on gently to moderately sloping areas.

13. Wormser - Lavina association:

This association comprises about 74,300 acres or about 3 percent of the area. It is dominated by well drained, light colored clay loam and loam soils with clay subsoils and shallow loam soils on sandstone uplands. The annual precipitation is 12 to 15 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for small grains and range.

Wormser soils have a light colored loam or clay loam surface layer and a brown clay loam prismatic to blocky subsoil. This is underlain by a light brownish gray clay loam substratum. Hard gray sandstone occurs at depths of less than 60 inches. This soil is on moderately to strongly sloping landscapes and comprises about 55 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Lavina soils have very thin brown loamy surface layers. A brown prismatic blocky structured subsoil, resting on hard sandstone bedrock at depths of 20 inches or less. This soil is on moderately to strongly sloping and steep bedrock uplands and comprises about 35 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Other soils make up about 10 percent of the association. These soils are on wide medium length footslopes, swales, broad divides and narrow valley floors of drainageways. They resemble the Wormser and Lavina, except for more variation in depth and some may lack a subsoil development. Sandstone rock outcrops are common on the steeper areas.

DEEP AND MODERATELY DEEP LOAMY SOILS OF THE OUTWASH TERRACES AND FANS.

14. Belfry* - Charlos - Sayne* association:

This association comprises 222,800 acres or about 9 percent of the area. It is dominated by well drained, dark colored loam and sandy soils. It occurs on high terraces, steep uplands and mountain footslopes. Elevation ranges from 4,000 to 6,000 feet. The annual precipitation is 16 to 22 inches; mean annual soil temperature is 40 to 45° F. The frost free season is 90 to 110 days. Soils in this association are used primarily for growing small grains, meadow hays, pasture and range.

* Soil series names that are subject to change or have changed in field correlation.

Belfry soils have dark colored loam or silty clay loam surface layers and a prismatic blocky silty clay loam subsoil, underlain by a nearly white calcareous clay loam substratum. Depth to shale bedrock is more than 40 inches. This soil is on moderately to strongly sloping and moderately steep hilly to steep landscapes and comprises about 40 percent of the association. Areas will range from about 500 to 750 acres in size.

Charlos soils have dark colored loam and gravelly loam surface layers and a prismatic to blocky clay loam subsoil 10 to 30 inches thick. The substratum for more than 60 inches is a gravelly clay loam and gravel, cobbles, boulders, coarse sand and fine sand. This soil is on nearly level to gently and moderately sloping outwash terraces and comprises about 30 percent of the association. Areas will range from about 200 to 500 acres in size.

Sayne soils have dark colored clay loam or loam surface layers and a weakly developed brown clay loam subsoil. This is underlain by a clay loam substratum for 30 to 40 inches. Bedrock of clayey shale and sandstone is 30 to 40 inches below the surface. This soil is on narrow ridges, divides and knolls that are moderately to strongly sloping and comprises about 20 percent of the association. Areas will range from about 200 to 450 acres in size.

Other soils make up about 10 percent of the association. These include dark colored soils on alluvial fans, deep soils in narrow drainageways and shallow soils on very steep bedrock uplands. They resemble the Belfry, Charlos and Sayne soils, except for amounts of lime in substratum, depth to gravel and bedrock.

15. Romberg* - Loma* association:

This association comprises about 49,500 acres or about 2 percent of the area and occurs on glaciated outwash terraces. It is dominated by well drained, light colored, very gravelly and stony loam soils, with very gravelly substratums. Elevation ranges from 3,500 to 5,000 feet. The annual precipitation is 5 to 12 inches; mean annual soil temperature is 47 to 49° F. The frost free season is 110 to 120 days. Soils in this association are used primarily for grazing. A small acreage is used for growing hay and small grains.

Romberg soils have a light colored gravelly loam or stony loam surface layer and a gravelly clay loam subsoil. This is underlain by pale brown calcareous gravelly clay loam substratum.

* Soil series names that are subject to change or have changed in field correlation.

This soil is on moderately to strongly sloping glaciated outwash terraces and comprises about 50 percent of the association. Areas will range from about 1,000 to 1,500 acres in size.

Loma soils have a light colored loam or stony loam surface layer and a blocky cobbly or stony loam subsoil 20 to 25 inches thick. This is underlain by a coarse sand and stony and gravelly lime segregated substratum. This soil is on moderately to strongly sloping and steep glaciated outwash terraces and comprises about 40 percent of this association. Areas will range from about 500 to 600 acres in size.

Other soils make up to about 10 percent of the association. These include deep sandy loam soils and shallow clay loam soils on valley bottoms and smooth footslopes. The deep soils resemble the Romberg soils and the shallow soils the Loma soils. Areas of steep sandstone cliffs and limestone are included, but are of limited extent. Small grain and hay crops are grown on the valley bottoms and narrow drainages.

STEEP, SHALLOW AND VERY SHALLOW LOAMY SOILS OF THE MOUNTAINS.

16. Lap* association:

This association comprises about 99,000 acres or about 4 percent of the area. It is dominated by shallow and deep well drained, dark colored loam soils over limestone on moderately sloping to steep and very steep mountain slopes. Elevation ranges from 5,000 to 9,000 feet. The annual precipitation is 14 to 20 inches; mean annual soil temperature is 42 to 45° F. The frost free season is 50 to 90 days. Soils of this association are used for summer grazing.

Lap soils have a thin grayish brown gravelly loam or stony loam surface layer and a very pale brown, very gravelly calcareous loam substratum. Depth to hard limestone is 20 inches or less. This soil is on steep mountain slopes of limestone bedrock and comprises about 90 percent of the association. Areas will range from about 500 to 1,000 acres in size.

Other soils make up about 10 percent of the association. These include deep dark colored soils, with strong prismatic and blocky subsoils. The substrata is usually heavy red clay over limestone or sandstone. Shallow and moderately deep soils with highly calcareous substrata are found on the gently to moderately and strongly sloping mountain tops and smooth slopes.

* Soil series names that are subject to change or have changed in field correlation.

17. Mountainous and Alpine soils:

This area comprises about 445,500 acres or about 18 percent of the area. It is dominated by well drained, shallow and very shallow, dark colored, non-limey, gravelly and stony soils. They occur on high plateaus and steep precipitous barren rock canyons. Elevation ranges from 6,000 to 12,610 feet. The highest peak is Silver Run Peak at 12,610 feet. A number of other peaks are 12,000 feet or higher. The area is dotted with many small lakes. The annual precipitation is 22 to 70 inches; mean annual soil temperature is less than 35 to 40° F. The area is used primarily for recreation and wildlife.

Soils of the mountain meadows are deep to moderately deep, well drained stony or gravelly loamy soils with dark colors predominating. Most stream valleys have deep gravelly and stony alluvium with a very thin surface layer. Permafrost areas are in the alpine meadow area. Length of growing season is 50 days or less. Local glaciation occurs on the headwalls of the steep granitic walled canyons.

LIMITING SOIL PROPERTIES and OTHER FACTORS
by NUMBER in TABLE 21 for
SELECTED LAND USES

Limitations are indicated in the table as "slight," "moderate," or "severe." The number indicates the major hazard or limitation.

1. Flooding or ponding
2. Seasonal high water table
3. Shrink-swell potential
4. Frost heave potential
5. Susceptibility to settling
6. Depth to bedrock
7. Unfavorable slopes
8. Slow permeability less than .65 inches per hour
9. Moderate permeability .65 to 1.0 inches per hour
10. Rapid permeability more than 1.0 inches per hour
11. Load-bearing capacity
12. Surface texture and depth
13. Coarse fragments (large gravel, cobbles and stone)
14. Stickininess and plasticity
15. Unfavorable clay or silty content
16. Hazard or ground water pollution
17. Unfavorable lime content
18. Piping hazard

TABLE 21. ESTIMATED SOIL LIMITATIONS OR SUITABILITY FOR SELECTED USES

SOIL ASSOCIATION AND SYMBOL	SOIL SERIES	% OF THE SOIL ASSOC.	SOIL LIMITATIONS FOR										SUITABLE AS SOURCE OF	
			BUILDING SITE	SEPTIC TANK FILTER FIELD	HIGHWAY & STREET LOCATION	POND SITE RESERVOIR AREA	RECREATION			LAWN AND LAND-SCAPING	CROPPING	EMBANK-MENT MATERIAL	TOP-SOIL	FILL MATERIAL OTHER THAN EMBANK-MENT
							CAMPING	PICNIC AREA	PLAYGROUND					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1 Haverson-Glenberg association	Haverson	65	Severe 1,2,4	Severe 2,16	Severe 4,5	Mod. 1,8	Severe 1,2	Mod. 1,2	Severe 1,2	Slight	Mod. 1,2	Fair	Good	Fair
	Glenberg	30	Severe 1,2, 4	Severe 1,2, 12,16	Severe 1	Severe 10	Severe 1,2	Moderate 1	Severe 1,2	Slight	Mod. 1,2	Fair	Good	Good
2 Heldt association	Heldt	60	Severe 3,15	Severe 8	Moderate 3, 15	Slight	Moderate 12 14	Moderate 12 14	Moderate 12 14	Moderate 12 14	Slight	Fair	Fair	Fair
	Fort Collins	30	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Poor	Good	Fair
3 Maurice-Pryor-Dukon association	Maurice	60	Severe 1,2	Severe 1,2, 16	Moderate 2, 4	Severe 10	Moderate 13	Moderate 13	Severe 13	Moderate 13	Severe 13	Poor	Poor	Good
	Pryor	10	Severe 6,7	Severe 7	Mod. 6, 7	Severe 6,7	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Poor	Good	Good
	Dukon	25	Severe 7,6	Severe 7	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Good	Fair	Good
4 Shorey-Stormitt-Garvin association	Shorey	40	(Slight 1/ → Moderate 2/ → Severe 3/)			Slight	(Slight 1/ → Moderate 2/ → Severe 3/)					Fair	Fair	Good
	Stormitt	40				Slight						Fair	Fair	Good
	Garvin	15	Severe 6,7	Severe 6,7	Severe 6,7	Severe 6,7	Severe 7,6	Severe 7,6	Severe 7,6	Severe 7,6	Severe 6,7	Poor	Good	Poor
5 Havre-Reedpoint association	Havre	45	Severe 1,4	Severe 2,16	Severe 4,5	Moderate 9	Severe 1	Moderate 1	Severe 1,2	Slight	Moderate 1	Poor	Good	Fair
	Reedpoint	40	Mod. 3,4	Severe 8	Mod. 3,8	Slight	Moderate 12	Mod. 12,14	Moderate 12	Mod. 12,14	Slight	Good	Fair	Fair
6 Midway-Travessilla-Lismas association	Midway	40	Severe 6,7	Severe 6,7	Severe 6,7	Slight	Severe 7, 15	Severe 7, 14	Severe 6,7	Severe 6,7, 12	Severe 6,7	Good	Poor	Fair
	Travessilla	30	Severe 6,7	Severe 6,7	Severe 6,7	Severe 10, 7	Severe 7,6	Severe 7,6	Severe 6,7	Severe 6,7, 12	Severe 6,7	Poor	Poor	Poor
	Lismas	20	Severe 6,7	Severe 6,7	Severe 6,7	Slight	Severe 7,15	Severe 7,14	Severe 6,7	Severe 6,7, 12	Severe 6,7	Good	Poor	Poor
7 Yawdim-Cabba-Rentsac association	Yawdim	50	Severe 6,7	Severe 6,7	Severe 6,7	Slight	Severe 7,15	Severe 7,14	Severe 6,7	Severe 6,7, 12	Severe 6,7	Good	Poor	Fair
	Cabba	30	Severe 6,7	Severe 6,7	Severe 6,7	Slight	Severe 7,15	Severe 7,14	Severe 6,7	Severe 6,7, 13	Severe 6,7	Good	Poor	Fair
	Rentsac	15	Severe 6,7	Severe 6,7	Severe 6,7	Severe 10, 7	Severe 7,6	Severe 7,6	Severe 6,7	Severe 6,7, 13	Severe 6,7	Good	Poor	Fair
8 Nunn-Wormser association	Nunn	60	Severe 3,15	Severe 8, 15	Moderate 3, 15	Slight	Moderate 12 15	Moderate 12 14	Moderate 12 14	Moderate 12 14	Slight	Good	Fair	Fair
	Wormser	30	Slight	Severe 8, 15	Moderate 3, 15	Slight	Moderate 12 15	Moderate 12 14	Moderate 12 14	Moderate 12 14	Slight	Good	Fair	Fair
9 Absarokee-Maginnis association	Absarokee	60	Moderate 3 6	Severe 6,8	Severe 3,11	Slight	Moderate 12 14	Moderate 12 14	Moderate 7, 14	Severe 12 14	Moderate 6, 15	Poor	Fair	Fair
	Maginnis	35	Moderate 6 7	Severe 6,8	Moderate 6, 7	Moderate 10 6	Moderate 12 14	Moderate 12 14	Moderate 6, 7	Severe 12 14	Severe 3,15	Fair	Fair	Fair

1/ 0 to 5 percent slopes 2/ 5 to 15 percent slopes 3/ More than 15 percent slopes

TABLE 21. ESTIMATED SOIL LIMITATIONS ON SUITABILITY FOR SELECTED USES (CONT'D)

SOIL ASSOCIATION AND SYMBOL	SOILS SERIES	% OF THE SOIL ASSOC.	SOIL LIMITATIONS FOR										SUITABLE AS SOURCE OF	
			BUILDING SITE	SEPTIC TANK FILTER FIELD	HIGHWAY & STREET LOCATION	POND SITE RESERVOIR AREA	RECREATION: CAMPING	RECREATION: PICNIC AREA	RECREATION: PLAYGROUND	LAWN AND LANDSCAPING	CROPPING	EMBANKMENT MATERIAL	TOPSOIL	FILL MATERIAL OTHER THAN EMBANKMENT
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
10 Pierre-Lismas-Kyle association	Pierre	40	Severe 3,7	Severe 8,3	Severe 3,11	Slight	Severe 12, 15	Severe 12, 14	Severe 12, 14	Severe 12, 14	Moderate 7, 15	Poor	Poor	Poor
	Lismas	30	Severe 6,7	Severe 8,3	Severe 6,7	Slight	Severe 12,15	Severe 12,14	Severe 12,14	Severe 12,14	Severe 6,7	Poor	Poor	Poor
	Kyle	25	Severe 3,7	Severe 8,3	Severe 3,11	Slight	Severe 12, 15	Severe 12, 14	Severe 12, 14	Severe 12, 14	Moderate 8, 15			
11 Berry-Fiddler association	Berry	60	Moderate 3, 6	Severe 6,8	Severe 3,11	Slight	Moderate 12 14	Moderate 12 14	Moderate 7, 14	Moderate 7, 14	Moderate 7, 6	Fair	Fair-Good	Fair
	Fiddler	35	Mod. 6,7	Severe 6,7	Severe 6,7	Severe 10,6	Severe 7,6	Severe 7,6	Severe 6,13	Severe 6,7	Severe 6,7	Poor	Poor	Poor
12 Midway association	Midway	90	Severe 6,7	Severe 6,7, 8	Severe 6,7	Slight	Severe 7,14	Severe 7,14	Severe 6,7	Severe 6,7, 12	Severe 6,7	Good	Poor	Fair
13 Wormser-Lavina association	Wormser	55	Slight	Severe 8	Moderate 3, 15	Slight	Moderate 12 14	Moderate 12 14	Moderate 12 14	Moderate 12 14	Slight	Good	Fair	Fair
	Lavina	35	Mod.6,14	Severe 6,7	Severe 6	Severe 10	Mod.12,14	Mod.12,14	Severe 6	Moderate 6	Severe 6,7	Poor	Fair	Fair
14 Belfry-Charlos-Sayne association	Belfry	40	Severe 3,7	Severe 7,8	Moderate 3, 7	Slight	Moderate 12 14	Moderate 7, 12	Moderate 7 14	Slight	Moderate 7 14	Fair	Good	Fair
	Charlos	30	Slight	Moderate 2, 16	Slight	Moderate 9	Slight	Slight	Moderate 14 6	Slight	Slight	Fair	Good	Good
	Sayne	20	Severe 6,7	Severe 6,7	Severe 6,7	Slight	Severe 7	Severe 7,14	Severe 6,7	Severe 6,7	Severe 6,7	Good	Poor	Fair
15 Romberg-Loma association	Romberg	50	Severe 13, 9	Severe 13, 7	Moderate 13 7	Severe 10 7	Severe 13 7	Severe 13 7	Severe 13 7	Severe 13 12	Severe 13 7	Poor	Poor	Poor
	Loma	40	Severe 13,9	Severe 13,7	Mod. 7,13	Severe 10, 7	Severe 13,7	Severe 13,7	Severe 7,13	Severe 12,13	Severe 13,7	Poor	Poor	Poor
16 Lap association	Lap	90	Severe 6,7	Severe 6,7	Severe 6,7	Severe 6,10	Severe 7	Severe 7	Severe 7	Severe 7	Severe 7	Poor	Poor	Poor
17 Mountaineous and alpine soils		100	- - - - -	- - - - -	- - - - -	- - - - -	- - TOO VARIABLE TO RATE - -			- - - - -	- - - - -	- - - - -	- - - -	- - - -

1/ 0 to 5% slopes 2/ 5 to 15% slopes 3/ More than 15 % slopes

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