

NEWS

Geological Society of Minnesota

MINNEAPOLIS, MINNESOTA



FIRST CLASS



Mr. and Mrs. R.M. Gunville, Editors
1110 Gardena Ave.
Minneapolis, Minn. 55432

HOWARD, Charles B., Mr. & Mrs.
2409 W. 52nd St.
Minneapolis 55410

RETURN REQUESTED

Sept., Oct., Nov. 1972

OFFICERS

PRESIDENT	Sam Mayo	Box 270, Rt. 6, Excelsior	474-4038
VICE PRESIDENT	Dr. V. O'Malley	942 Lowry Med. Arts, St. Paul	222-4421
SECRETARY	Ethel Swanson	4944 Girard Ave. N., Mpls.	522-7688
TREASURER	Bernice Tepel	1269 S. Cleveland Ave., St. Paul	699-1793
DIRECTORS	Robert Gunville	1110 Gardena Ave., Mpls.	788-1421
	Dr. Harold Harbo	1520 W. 31st St., Mpls.	825-4341
	Marjorie McGladrey	2040 Skillman Ave. W., Roseville	631-0237
	Martha Peterson	3527 Pleasand Ave., Mpls.	825-1147
	Michael Vaclavek	3904 Joppa Ave., Mpls.	926-0185

GEOLOGIC PLAQUES

TABLET INSCRIPTION #28

Geology of Minnesota

Split Rock Region

The scenery of the region between Split Rock and Beaver Bay is the direct result of important events of early geologic time.

Lava Flows, which had accumulated in this region to a thickness of about 30,000 feet, were lifted and arched by a huge mass of molten material rising through the earth's crust farther north. This mass, the Duluth gabbro, is now extensively exposed in the Duluth area.

The lighthouse cliff standing 100 feet high is a fine-grained phase of gabbro named Bever Bay diabase, the massive, resistant character of which makes the shore of this region particularly bold and rocky.

At the base of the lighthouse on top of the cliff is another kind of rock, light green in color and coarse in texture, called anorthosite. It is this rock, anorthosite, which shows an excellent exposure in the highway cut at Silver Bay and stands up as prominent rounded hills from Split Rock to Carlton Peak near Tofte.

Location: Roadside turnout a short distance west of the lighthouse where view is particularly good.

TABLET INSCRIPTION # 29

Geology of Minnesota

Good Harbor Bay

The last period of igneous activity in Minnesota was characterized by the outburst of great lava flows which poured our extensively from cracks in the earth's crust on both sides, and from the floor of Lake Superior. The flows, once started, continued intermittently until hundreds of them had accumulated on the earth's surface.

It is probable that the flows followed one another in rapid succession, but at intervals the volcanic eruption ceased, the region sank and was submerged. During such intervals sandstones were formed under water by sediments washed in from the land. When igneous activity was resumed, these sandstones were buried by new lava flows.

An example of such a geological cycle embracing in succession eruption, sedimentation, and renewed volcanism appears in the cliff across the highway west of this tablet, where a thick deposit of red sandstone lies between dark gray lava flows. Many similar flows are exposed along the shore from Duluth to Grand Portage.

Location: Along lake shore about five miles west of Grand Marais, on wide part of the highway opposite roadcut cliff.

President's Letter

Within the next month, as well as over the next several years, the Geological Society of Minnesota will have several opportunities to be of service to the profession and to broaden the scope of its activities in the fields of education and public information. These are unique opportunities in that they may not occur again, and we urge all of you to take full advantage of them. In return, you will receive the chance to hear first-hand the latest developments in geology and the satisfaction of testing what you have learned in the lectures and the laboratories against the reality of field conditions. In our field trips we have learned how to see and how to interpret what we see; now we can make use of these abilities.

1. THE GEOLOGICAL SOCIETY OF AMERICA CONVENTION

This convention of professional geologists will be held November 13 through 15 at the Convention Center in downtown Minneapolis. We have been asked to serve in several different ways, as hostesses, or in the headquarters offices, or in the technical seminars themselves. This is an excellent chance to meet some of the most eminent men in this field, to listen to their lectures, and to eavesdrop on their conversations.

Mary Kimball (644-6429) and Bob Gunville (788-1421) are in charge of the project for our society.

2. GEOLOGICAL PLAQUES

Our older members look back with fondness to the days when the Geological Society was erecting geological information plaques--some 33 in all--throughout the state. Now we have the opportunity to relive those days and revive that program. The State Highway Department has access to funds for a purpose such as this and, through its Director of Environmental Services, has expressed interest in the installation of plaques at appropriate wayside rests on both State and Interstate highways. A list of suggested locations is published in this issue of the Newsletter. We are to provide the descriptive text for these plaques.

You may decide that not all of the suggested locations are appropriate; if so, such a report is useful in itself. It would not be necessary, however for a particular geologic feature to be within the wayside rest itself; for example, a plaque in one of the rest stops on I-35, near Sandstone, could describe the Kettle River nearby.

Although this work will require some basic research on our part, I understand that the first series of plaques were written by Society members themselves. What they did, we can too--and we have had that many more years of experience! So, on a fine, sunny day why don't you form a group, picnic at one of these wayside rests, and try your hand at writing a geologic description of the area, or its outstanding geologic feature. Just because this is a project of continuing duration doesn't mean it can't be started this fall.

3. SELF-GUIDING GEOLOGIC TRAILS

In response to a suggestion made by G.S.M., the Parks Division of the Department of Natural Resources is interested in testing public response to a program of providing self-guiding geologic trails in certain State parks by initiating a pilot program at one or two of the parks. If successful, the program gradually would be expanded to include such trails at all appropriate State parks. Our part in this program would consist of providing the text for single-page leaflets to be distributed at the park office. These leaflets would contain a brief description of the geology of the area, a map of the park trails, with points of geologic interest marked by number, and, finally, a description of the geologic features to be found at, or seen from, each of the stopping

points. Under the pilot program, G.S.M. also would assist in the initial cost of printing the leaflets. It is hoped that, if it is continued, the program would become self-sufficient.

Several of the State parks lend themselves admirably to this type of public information. Although to make a successful contribution will require knowledge and experience on our part, I think we have members with that knowledge, experience and enthusiasm, who would like to test themselves on how much they have learned. Perhaps all we lack is confidence in ourselves. We will be backed up by a professional geologist, who will review this work and the work on geologic plaques.

In addition, the Department of Natural Resources has asked G.S.M.'s assistance in reviewing and updating articles that have been published from time to time in the Minnesota (Conservation) Volunteer on the geology of certain of our State parks. It is the Department's hope to publish compilations of these, by region, in booklet form, with each booklet prefaced by a summary of the geology of that region. The preparation of these summaries would also be our responsibility. These, however, are tasks for a professional geologist. It is expected that the Board will implement this work shortly.

4. MORTON GNEISS AND MONTEVIDEO GRANITE

For those who do not feel experienced enough to tackle either the plaques or the trails, we have a couple of easy projects. Dr. Merle Harris, past-president of G.S.M., and chairman of an advisory committee to the Department of Natural Resources, has asked for our suggestions for locations of plaques describing these two rock formations, said to be among the world's oldest. We are not concerned with the text of the plaques--only their location along the nearest State highway. Criteria should include not only a good view of the quarries or outcrops, but also safe access from the highway.

SO--THERE'S THE PACKAGE. Presented all at once, it may seem a pretty big mouthful, but remember that the plaque and trail projects are of continuing duration and we can take them one bite at a time. These are great opportunities for G.S.M., and I hope that many of us will participate. If you have any questions, call Sam Mayo (474-4038). Have fun!

Sam Mayo

G.S.M.'S DISPLAY BOOTHS A SUCCESS

by Ethel Shinek

OUR BOOTH AT THE FAIR

The excellent location of our booth in the Education Building attracted a constant stream of State Fair visitors to our exhibits, consisting of Minnesota rock samples, geologic maps, literature, programs, and Mr. Stor's limestone replica and Ginkgo tree.

The Fair Committee, namely Ethel Shinek, Beverly Anderson, Ethel Swanson, and Bernice Tepel, would never have made it without the help of all those who manned the booth for the full 11 days. The committee thanks Paul Stor, Mr. and Mrs. Laughy, Mary Kimball, Marjorie McGladrey, Clyde and Mrs. Case, Jeanette Kramolish, Julie Leitzke, Frances Springer, Marie Woltman, Pearl Downey, Richard Davis, Grace Witt, and Ethel Bergquist. Roger Frohn donated a cigar boxful of polished agates for distribution, and last but not least, we owe our booth's good location to Martha Peterson who selected it.

MINERAL CLUB SHOWS

G.S.M. also participated in the Bloomington Mineral Club Show at Apache Shopping Center September 9 and 10. Bernice Tepel developed a chart of the stratigraphy of the Minneapolis-St. Paul area, with appropriate rock samples. Mary Kimball and Marjorie McGladrey assisted her

Over a dozen new members signed up as a result of these two shows.

WAYSIDES AND REST AREAS ON MINNESOTA HIGHWAYS
possibly suitable for geological plaques

County	T.H.	Location
Aitkin	169	6 mi. South of Aitkin
Becker	59	7 mi. S. of Detroit Lakes
Big Stone	7	9 mi. South of Beardsley
Cass	2	E. limits of Cass Lake
Chisago	I-35	1½ mi. N. of Harris (N.B.)
	95	N. limits of Taylor's Falls
Clay	I-94	In Moorhead (E.B.)
Cook	61	2 mi. N.E. of Grand Portage
Douglas	I-94	5 mi. W. of Alexandria (E.B.)
	I-94	2 mi. S.E. of Alexandria (W.B.)
Fillmore	52	1 mi. S. of Preston
Freeborn	69	1 mi. S. of Albert Lea
Koochiching	11	3 mi. E. of Manitou
Lake	61	5 mi. N. of Silver Bay
Mower	I-90	South of High Forest (E.B.)
Murray	59	In Avaca
Nobles	I-90	west of Adrian (E.B.)
	I-90	west of Adrian (W.B.)
Otter Tail	10	In Frazee
	I-94	8 mi. S.E. of Fergus Falls (E.B.)
Pine	I-94	18 mi. S.E. of Fergus Falls (W.B.)
	I-35	3 mi. N. of Jct. T.H. 23 (N.B.)
	I-35	5 mi. S. of Moose Lake (S.B.)
Polk	2	2 mi. N. of Lengby
Rock	I-90	1 mi. W. of Minn. border (E.B.)
St. Louis	I-35	W. limits of Duluth (S.B.)
	53	At Independence
Washington	I-35	W. of Forest Lake (S.B.)
Winona	I-90	On Mississippi River (W.B.)
Yellow Medicine	67	9 mi. S.E. of Granite Falls

Remember

THE LECTURE MEETING FOR NOVEMBER 13 HAS BEEN CANCELLED. This date conflicts with the Geological Society of America professional meetings, and Dr. Webers will not be available. The next lab will be held on Nov. 20.



DUES FOR 1973 PAYABLE NOW

It would help considerably the work of the Membership Committee if you would pay dues for 1973 NOW. Marjorie McGladrey is ready to collect them at the regular meetings, or you may contact her by mail at 2040 Skillman Ave.W. Roweville, Minn. 55113.

PICNIC Notes

The Annual Picnic was held August 6 at Camp 1362 near Elk River. About 20 members attended in spite of a rainy, stormy day. Paul Stor offered the use of this lovely place.

The camp, located on Birch Lake amid a wooded area, has some geological features, including an esker. There are also buildings and ample facilities for picnicking. It is a place to return to many times.

WELCOME

The following new members have joined the G.S.M., and we would like to extend to them a special welcome.

Mr. and Mrs. H.T. Downing
4041 Highland Road
Minnetonka, Minn. 55343 (935-4053)

Miss Susan Grovender (home address:)
Centennial Hall (13108 Penn Ave. S.)
612 Delaware St. S.E. (Burnsville, 55337)
Minneapolis, Minn. 55455 (890-3240)

Richard S. Wilcox (433-3401)
Marine on St. Croix, Minn. 55047

John J. Lawless, M.D.
2168 W. Hoyt Ave.
St. Paul, Minn., 55108 (646-3520)

Mr. and Mrs. Robert Handschin
2029 Edgerton Road
St. Paul, Minn. 55117 (774-1431)

Dr. and Mrs. Steven Methner
2459 Youngman Ave. #4C
St. Paul, Minn. 55116 (690-5232)

Mr. and Mrs. Allen Lundgren
765 Redwood Land
New Brighton, Minn. 55112 (633-5442)

Mr. and Mrs. Duane G. Lorscheung
6718 Eliot View Road
St. Louis Park, Minn. 55426 (544-8378)

Mary Ann Finegan
395 Luella, Apt. 203
St. Paul, Minn. 55119 (735-2902)

John P. Podolinsky
10226 Mildred Terrace
Minnetonka, Minn. 55343 (544-1437)

William R. Hoaglund
1030 15th Ave. S.E.
Minneapolis, Minn. 55414 (331-3850)

Mr. and Mrs. Lloyd J. Parsons
1024 S. Crestview Drive
St. Paul, Minn. (739-5250)

David D. Novak, Jr.
2521 Dresden Lane
Minneapolis, Minn. 55422 (588-4918)

James Poppe
908 Parkview Ave.
St. Paul, Minn. 55117 (489-9226)

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Mr. and Mrs. Ernest V. Johnson
3528 16th Ave. S.
Minneapolis, Minn. 55407 (722-1082)

Mr. and Mrs. W.P. Davidson Jr.
516 Summit Ave.
St. Paul, Minn. 55102 (225-9055)

Mr. and Mrs. Kenneth T. Vogel
Rt. 6, Box 260
Excelsior, Minn. 55331

Nicholas J. Coleman
700 Linwood Ave.
St. Paul, Minn. 55105 (226-1001)

Mrs. V.A. Doyle
4813 Roycar Drive
Edina, Minn. 55435 (927-9586)

Glenn N. Sandvik
408 8th Ave.
Two Harbors, Minn. 55616

Frederick P. Bradford
1673 Delaware Ave.
St. Paul, Minn. 55118 (454-2611)



Highlights of the BOARD

At the Annual Meeting Dr. J.S. Lewis and Dr. Alex D. Lowe were elected as new members to the Board of Directors, and Dr. Valentine O'Malley and Mrs. Bernice Telp were elected for their second two-year term.

Retiring from the Board on Dec. 31 are Sam Mayo and Michael Vaclavak.

Beverly Vogt regretfully offered her resignation from the Board in August when she and her family joined Paul in Portland, Oregon. Marjorie McGladrey was appointed to serve in her place.

An old mimeograph machine belonging to the G.S.M. has presented a problem to the Board for some time. The Society did not have enough use for the machine to keep it in good working order, though we might have need of it from time to time. Resale value proved negligible. The problem was solved by donating the machine to the Bethlehem Community Center, 2539 Pleasant Ave. S., Mpls. They will maintain and operate the machine, offering the G.S.M. free use any time the Society wishes.

The next Board meeting will be held Wednesday, November 8, 7:30 p.m., at the offices of Sam Mayo, 133 Foshay Tower, Minneapolis. All members are invited to attend.

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ALICE NELSON TEACHES GEOLOGY ON BIRD CLUB FIELD TRIP

This past summer Alice Nelson, a member of G.S.M.'s Education Committee, had an opportunity to teach some geology to members of the Minneapolis Bird Club. The Bird Club sponsored a bus trip to Banff and Jasper National Parks. Alice was asked to explain to the field trip members about the geology along the way



The finest workers in stone are not copper or steel tools, but the gentle touches of air and water working at their leisure with a liberal allowance of time.

Henry David Thoreau



PAPERBACK TEXTBOOK TO BE MADE AVAILABLE

For those who would like to background themselves in basic concepts of geology, a limited number of copies of the paperback book, GEOLOGY 2nd Ed., by Robert J. Foster (\$2.50), will be available at lectures. This book should be especially useful to new members. At this time the bookstores are out of stock, but will fill our order as soon as possible.

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"Irma - where are you - Irma"

BLACK HILLS FIELD TRIP--1972

by Bob and Marcia Gunville

Geologic events failed to stop Bart and his field trip followers to the Black Hills this past summer. Our purpose--to learn a little about how to interpret the extensive history of this area, and the latest episode of the June flooding almost cancelled our plans. But by careful detours, we were able to see most of the geological features Bart had planned for us. There also was plenty of opportunity to study the effects of water damage.

Our days were full, and our evenings were spent agreeably roasting marshmallows and gypsum while warming our feet and exchanging stories over the campfire. Roasted gypsum is otherwise known as plaster-of-paris, and from ours we fashioned a plaque for Bart. He is a fine teacher, and with the enthusiastic assistance of Fred Reed and Bob Cadwell, we learned much geology while criss-crossing the Black Hills for three intensive days.

We began by getting acquainted with the Paleozoic sedimentary beds. During the Cambrian period, and many times since then, the Black Hills area was covered by seas. Certain materials collect on sea bottoms, and they are widespread here. Rocks and pebbles collect near shorelines, later cementing together to form conglomerates. Waves will carry sand a little farther out where it, too will drop off, later forming sandstone. Finer particles, the muds and silts, will settle out in deeper water yet, later turning into shales. And limestone will form in the deepest waters, precipitating out or forming from the shells of marine animals. A sequence of sandstone, shales, limestone in successive layers would indicate a sea moving in, and a reverse order, a retreating sea.

We traced the rise and fall of the earth's crust in the Black Hills region by its rock types. Whenever the earth's crust sagged and the seas invaded, another deposit of material was made. We could get some sense of the depth of the water and how long it remained by the kind of rock it was, and its thickness. When the earth's crust rose the surface eroded, and when it again was under water, a new type of formation was laid down. This invasion and retreat of the seas represents the story of the Black Hills throughout the entire Paleozoic and Mesozoic Eras, from 600 million years to 70 million years ago, the time period when life was developing, starting from tiny sea animals, and on through the age of reptiles and dinosaurs. The sedimentary rocks are of many colors--white, buff, red, gray. Some form cliffs, others gentle slopes. There are those which appear banded, and those with limestone lenses in them. Many have fossil remains.

When we observed a sedimentary rock formation, it provided evidence not only for shallow seas moving in or out, but also information about the land masses surrounding that sea, which were supplying that sediment. For example, the Pahasapa limestone must have been laid down when the surrounding land masses were flat because it is exceptionally pure limestone (CaCO_3) with little if any clastic (rock fragment) material included. In contrast, after a relatively brief period of erosion, very thick beds containing much clastic material were laid down (Himmelusa Formation), indicating newly formed mountains (including the ancestral Rockies) were now in another cycle of erosion, supplying clastic sediment to these seas.

About 40 million years ago, something began to happen in the Black Hills region. Pressures had accumulated which caused the crust to bow upward in an elongated arch. Slowly a piston-like block of older, Precambrian rocks pushed up these layers of sedimentary rocks, leaving them draped in monoclines over the sides of the block. Up in the northern Black Hills, near the end of the uplifted block, the sedimentary beds were folded and wrinkled into synclines and anticlines, which we investigated at various stops. The warping and bending of formations is obvious from many places throughout the area, giving some sense of the strength and power of the forces of nature over a period of time. At some places the crust could not withstand the strain

and broke in faults. We were able to see the displacement of rocks which occurred.

Volcanic activity also happened at this time. Some of the hot, molten rock reached the earth's surface, leaving behind volcanic tuffs and obsidian, but most of the magma was trapped to cool underground, sometimes doming up the sedimentary layers above. Bear Butte is a vivid example of such a dome which is now stripped of its overlying layers.

We inspected these areas and collected samples of various rocks from them.

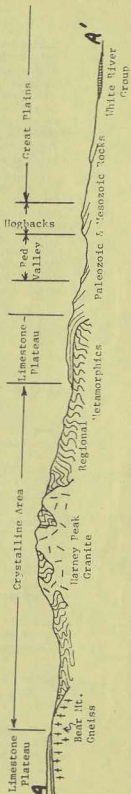
Whenever a land surface rises, erosion immediately starts to tear it down again. The sedimentary rocks of the old sea floors are now gone from many of the highest places, and streams have made vertical cuts deep into the hillsides. It is this stripping away of the younger rocks which provides us with a glimpse at the very old, very long Precambrian history of the earth. It is as though we can peek through a window into the Precambrian past.

The record is very complex here. There is evidence of at least three separate mountain building episodes. The sedimentary rocks, formed when these mountains eroded, have been pulled and distorted into different forms. We saw and collected conglomerates whose original pebbles were stretched into elongated shapes by the intense pressures put upon them.

At different times during this vast period hot, molten rock material from deep within the earth welled up into the hard rocks of the crust. As it cooled, igneous rock formations were made. Rates of cooling varied. Many of these molten collections of magma cooled very slowly, deep underground. Many unusual minerals were formed in bodies geologists call pegmatites, the last bit of melt in a crystallizing magma. The Black Hills abound in pegmatite bodies, and often they are mined for their mineral wealth. The crystals tend to be very large, and we collected fine, large specimens at two old pegmatite mines. We were rewarded with beautiful examples of quartz, feldspar, mica, spodumene, tourmaline, and many others.

Gold is one of the valuable minerals which has been found in the Black Hills. Near the town of Lead is located the famous Homestake Mine, the largest producer of gold in the U.S.A. We had a rainy lunch stop here to see where the old open-pit mine cuts into a whole mountainside of great, banded light and dark rock ribbons, one of which is the gold-bearing Homestake formation. Open pit mining is now abandoned, and gold is extracted from underground.

Gold has been concentrated in pockets of the Homestake formation. These beds had been folded and cross-folded over the millenia. It is believed that the cross-folding allowed hot-water (hydrothermal) solutions of minerals to percolate through portions of the Homestake formation. As mineralization proceeded, gold was deposited in the ore bodies which are now being mined.



The famous faces of Mount Rushmore have been carved into the rock formation called Harney Peak Granite. This Precambrian intrusion of magma caused many interesting changes in the rocks it penetrated, and it cooled into a very hard, light-colored granite. As we drove up the highway toward the back side of Mount Rushmore we could see the effects this hot magma had upon the older rocks which contained it. These changes are termed metamorphism. The degree of metamorphism in the host rocks increased as we approached the once hot intrusive body of magma. We observed the grain size of the schist increase until, near the top, we came upon the granite itself. As we looked at the faces of Mount Rushmore from the front side we could see that the sculpter began his carving at the exact place the granite begins. The adjacent rock is a metamorphosed host rock called phyllite.

We made only a start at learning the history of this fascinating area. The stories that the beautiful scenery tell are endless. And learning a little about how to interpret them was an important part of our exercise. It was, indeed, an absorbing field trip. Not the least of it was the chance to meet and know better other members of the Society.

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WE'VE MOVED!

The following members have changed their addresses:

Mr. and Mrs. Paul Vogt
4841 S.W. 60th Place
Portland, Oregon 97221 (503:292-6939)

Levi N. Stermer
376 W. 5th St.
Winona, Minn. 55987

Mrs. Marion S. Skahan
2122 Aldrich Ave. S., Apt. 307
Minneapolis, Minn. 55405 (374-2727)

Donald J. Langan
4824 Vincent Ave. S.
Minneapolis, Minn. 55410 (920-2953)

Mrs. Eve. O'Leary
1753 Randolph Ave., Apt. 3
Minneapolis, Minn. 55105

Mr. and Mrs. V.H. Nelson
Box 341
Manoursville, Pa. 17754

HISTORY OF THE BADLANDS

The Badlands National Monument was established January 25, 1939 to preserve this region for its weirdly beautiful landscapes, outstanding examples of erosion and remains of prehistoric animals. The 40-mile strip of Badlands covers an area of more than 170 square miles. The area was named by the Indians "mato sica" which means "bad lands to travel across".

The sedimentary rocks - the clays, shales and thin beds of sandstone were deposited during the Oligocene period, 25 to 40 million years ago. During this time the fore-bearers of many of the animals we know today were common. The sabre-toothed tiger, a giant pig, and a gigantic rhinoceros-like beast were numerous. At that time this region was a marshy plain, covered with vegetation and crossed by sluggish streams. These streams flowed from the Black Hills and the mountains to the west, carrying sand and silt that was deposited across this plain to a depth of over 1,000 feet. As the animals died, their remains were buried by the river sediment or sank into the ooze of the decaying vegetation of the marshes. The bones are all that remains of these lost forms, impaled in the multi-colored layers of the Badlands.

Millions of years later the earth's crust began uplifting from west to east, and faster flowing streams cut into the soft sedimentary rocks exposing the red, tan, pink and grey layers of the clay, shales and sandstones. The landscape began to appear as it does today with its beautiful color-banded formations.

The annual precipitation is barely 15 inches, but the process of erosion continues. The occasional rains, some of cloud burst proportions are major factors in the formation of the Badlands terrain. Rapid erosion and fast drying prevent a plant cover from developing which would retard erosion.

Most plant and animal life found in the Badlands are native to the neighboring prairie. Junipers, yuccas, cottonwoods, wild rose and buck-brush are filled with birds, small animals and an occasional reptile.

Westward settlement brought an end to many wild animals of the plains, such as the bison and the bighorn, which have been reintroduced recently. Deer and the prong horn antelope remain in large numbers.

The White River flows through the Badlands area and is the northern boundary of the Pine Ridge Indian Reservation, the home of the "Oglala Sioux". The Pine Ridge, one of the larger Indian Reservations in the United States was established in 1889, has a population of 9,875 and covers an area of 2,072,308 acres.