SOUTH DAKOTA ACADEMY OF SCIENCE PRESIDENTIAL ADDRESS

April, 1982

Theodore Van Bruggen
Dept. of Biology
University of South Dakota
Vermillion, S. D. 57069

THE SOUTH DAKOTA LANDSCAPE — PAST AND FUTURE

It has been over ten years since the first earthday, a time when students, activists, and scholars banded together, sought publicity for their concerns about pollution, over-population, and generally made the nation aware of the finiteness of our resources. Since that time there has been more awareness of our nearness to nature, the landscape, and its soil. It probably didn't impress you and me as much as the city dweller in the east or west, because we have an ongoing kinship to the farm, ranch and nature. South Dakota is basically a prairie state. Whether we like it or not, admit it or deny it, the fact remains that we are closely tied to this prairie environment. Our outlook, perspective, economy and sense of being are profoundly influenced by this landscape where we find ourselves. The street riots, Viet Nam protests, sit-ins and panty raids of the sixties largely passed us by. Why? We are isolated, somewhat buffered and yes, somewhat conservative. Since coming to this state, I've been reminded many times of the depression and dust bowl syndrome. We even had a university president in the mid sixties who said he was going to drag the university, albeit screaming and kicking, into the twentieth century!

You see, I believe we can learn something of ourselves if we study our past environmental landscape as well as prepare for the future.

Our prairie landscape developed under temperature extremes, extended droughts, an inverse precipitation-evaporation ratio, fire and occasional overgrazing by ruminants. What is here is a result of these seeming extremes. As hardy as it appears, however, on closer examination, the native prairie is a fragile life form which is easily upset and destroyed. Most prairie plant inhabitants are perennials with deep root systems. Grazing, fire, drought, and cold were closely integrated in the long term scheme that maintained this prairie environment. When fences prevented the native and introduced ruminants from moving on to greener pastures, severe overgrazing resulted. The final coup-de-grace to this majestic landscape was made by the moldboard plow—an instrument

that completely sheared off all the deep penetrating roots and exposed the rich topsoil to wind and water erosion—finally altering the landscape in a permanent way. We are long past the time of subjecting it to experimentation, but as I've roamed across this state in the last 25 years, the following thought has often come to my mind, "Have we been better off economically by breaking the sod?" What really has been the advantage, if any, of bringing row crop farming to the prairie instead of maintaining it as grassland for grazing?

We now are inextricably tied to agriculture, the Eastern (east of the river) farmer to row crop farming, the Western (west of the river) rancher to grazing. The only historical measurement of row crop agriculture's success or lack of it in the Great Plains is the experience of the thirties. This has been accurately documented in Paul Sear's book, *Deserts on the March* (1935) and later in the article entitled "Empire of Dust" (1971). Although not in South Dakota, these articles relate to occurrences in the area adjacent to our state in the Nebraska sandhills. Plowing of the Nebraska sandhills was even more destructive of the thin topsoil than in South Dakota. Those who could afford to buy a plow ended up broke, blown away by the wind and water erosion that resulted during the dry years. Those who were too poor to buy a plow ended up buying what livestock the row crop farmers and ranchers had, increased their herds on the unbroken sod and subsequently became the cattle barons of the area. This is a classic example of the biblical adage, "Those who would be first will be last—those who would be last will be first."

However, in spite of the lessons learned, the admonitions and incentives by government agencies at all levels, soil erosion remains as the most important problem for agriculture in South Dakota! In comparison, the surpluses, low prices, the export problems, all pale into insignificance in the long run. In the past year I've seen at least five Associate or United Press releases about the long term seriousness of soil erosion. Less than one month ago, 28 March 1982, the *World Watch Institute*, Lester Brown, Director, reported that the biological systems, "forests, grasslands, fisheries and croplands—that supply all our food and much of the raw materials for industry . . . are deteriorating in much of the world." "One of the four greatest needs," the report goes on to say, "is for greatly expanded soil conservation effort. One-fifth to one-third of the world's cropland is losing topsoil at a rate detrimental to its continued productivity." The concern for soil conservation didn't begin—as many people think—with the passage of the Soil Conservation Act of 1932. Two thousand years ago a young farmer boy in northern Italy wrote, "But ere we stir the unbroken ground, the various course of the seasons must be found, the weather and

setting of the winds, the culture suiting to the several kinds of seeds and plants, and what will thrive and rise, and what the genius of the soil denies." This from the epic poet Vergilius, perhaps the first soil conservationist of record. Or, after the colonists made their first clearings, Jefferson lamented—"The fields are no sooner cleared than washed," or, Patrick Henry, "Since the achievement of our independence, He is the greatest patriot who stops the most gullies." Alas, the history of American agriculture, as noble as it may seem in terms of productivity, is a case of continual plunder for immediate gains. Neil Sampson, a long-time worker in soil conservation, in 1981 wrote the book, *Farmland or Wasteland, A Time To Choose.* He is convinced that we are on a collision course with disaster. He documents that on a world-wide basis our top soil started out to be about nine inches thick on the average when man began mechanically cultivating the soil. After a little more than 100 years, almost one-half of that soil is gone forever. Right now we lose, on the average, five tons of top soil per acre per year in the prime farmland area of the midwest. North American soils are in as much a threat of depletion as is Middle East oil.

Whose responsibility is it to conserve soil? Are the farmers worried? They own that land. The placement of catalytic converters on automobiles in 1975 resulted in a cost increase to the consumers, however, the costs of soil conservation cannot be passed on in a similar manner. In most instances, the individual farmer must have a conscience to leave that soil in as fertile a state as he received it. For many years the controversy has raged whether the Federal Government, State, Soil Conservation Districts, the farmer, or all of these collectively have the responsibility. So, we have incentives, accusations, attempts to coerce or shame land owners to conserve on the basis of a "land ethic," or social pressures, or even religion. (The net result in most cases is a shambles of our conservation efforts or a political football tossed from one group to another.) Neil Sampson in his book states that in the final analysis each farmer must want to conserve soil and farmland. A sense of morality is involved. Farmers will respond to social pressure more than to all the incentive programs government can design. We dare not let up on soil conservation!

Each fall, farmers plow fields black. In the winter the soil flies away, blackening the snow. It does little good to recount past failings and to chastise those we think responsible. I predict that the time will come when closely monitored adherence to soil conservation practices, mandated by legislative action, will be imposed on all who till the soil.

In 1970, on April 16, David Gates, then director of the Missouri Botanical Garden, talked to a university audience about environmental trends. He made a statement that impressed me. He said

that he believed we are now living close to the peak quality of life of all time in terms of history, but there are evidences that it is fading. We are fortunate here in South Dakota, because we have an abundance of life quality, clean air and water, space, and a better than average level of old-fashioned virtue and morality.

What about the present and future of the South Dakota environment? First of all, I have a healthy respect for most west river ranchers. They live with a year by year measure of the prairie's fragility in how they graze or overgraze their ranches. The result of their mismanagement is almost immediately reflected in the size of their cow-calf herd. I don't wish to indict the east river row crop farmer, but they, in general, are not as prudent with the soil as their west river neighbors.

A second present and future concern I have are with the tree claims established in the 1920's and 1930's. Many are being removed by bulldozer, grazed and ruined by livestock, abandoned and not replanted. I am a firm advocate of having this tree claim program re-established at the same level as the 1920's and 1930's. Some encouraging signs are noticeable in several counties. Their commissioners and soil conservation districts in the area are putting in thousands of trees. Any large scale tree or shrub windbreak has a profound effect on reducing wind erosion, holding snow, conserving energy, and providing valuable habitat for wildlife.

Thirdly: Too long have we muddled, misunderstood and mangled a reasonable water program in this state. Business thrives on competition; it may even be good for politics. But see what competition has done, or more accurately, not done, for solving our water development problem in South Dakota. The time has long gone by when the principals involved should have exercised cooperation instead of competition. We are 20 years behind where we should be in having an environmentally sound plan for the multiple use of water in this state. The water in the Missouri river system is not highly charged with minerals and is acceptable for both human consumption and irrigation in most parts of the state. With recent legislation approved, perhaps now we are on the way to making it a reality. In connection with that, as a recreational resource our state is in a unique position. Our water resource for fishing, boating, and all water sports is second to none. I applaud the efforts in fishery research on the lakes behind the mainstem dams by both state and federal agencies. It should be encouraged and supported by all of us.

Fourth: I am delighted by the state's purchase of many miles of railroad right of ways. We have serendipitously preserved a marvelous corridor of prairie plant habitat. It has great aesthetic

value, in addition to providing necessary habitat for upland game protection. I hope the rails make just enough money to keep the trains going, but not enough revenue to give officials the idea that they must mow and spray those "weeds" on the right-of-ways. If we could only convince the management of railroad and roadside maintenance people that leaving these areas alone will enhance the gradual succession of native species to occur! After 15-25 years we'll have a pleasant roadside habitat that reflects our prairie landscape in a beautiful way. These areas don't need fertilizers, they are cheap to maintain and the only management needed is an occasional controlled burning in late winter or early spring!

Fifth: We have almost 1600 species of native or adventive plants that occur in South Dakota. Some are exotic, some weeds, others naturalized. However, all provide the diversity that I firmly believe we should strive to maintain. We have drastically disturbed the natural environment of this state. I know well that we need to destroy the diversity and disturb the natural habitat in order to grow row crops. I'm not advocating the purist dream that our land be preserved in its natural state and still raise crops, vegetables, beef and pork. But, we need more stewardship and less raping. A good lab project for high school biology classes is to stretch a fine gauze net over one square yard of rich prairie soil or woodland. Remove all the plants, insects, animals, fungi in that little square.

One learns two things. First, there is a great amount of life going on there—much more than imagined. Second, if one divides his "harvest" up into species, he will find that while there is one dominant species by number, there are a number of other species. Nature has stocked each square yard of earth with a sufficient diversity of genetic "alphabets" so that if there should be a change in the environment, some of the minority groups will survive. If one were to try this same simple experiment on a square yard of man-cultivated land, the story would be different. Constant cultivation and drenching of herbicides and insecticides will have wiped out all but the dominant and/or resistant species. Such man-made environments—like stands of corn or wheat, rice paddies, even gardens, are highly vulnerable to environmental change. The dust bowls of North America of the thirties, the ravaged bare hillsides of Turkey and Greece, the near and Middle East, the deserts of India and the Mediterranean, all show a similar dearth of diversity.

Now, repeat the square yard experiment on a freeway, a parking lot or flat roof of a building; you'll soon discover there's nothing left to count! Did you know that except for a few trees and some native grasses, sunflower and cranberry, none of the 20 most important crops cultivated for food in this country are native?

All have been imported. These foreign species are not adapted to survive on their own and are exceedingly vulnerable to pests because of the density to which they are planted. We owe it to our children and our children's children to protect and preserve as much of this state's diverse landscape, along with its plant and animal habitats, as we possibly can!

Sixth: I think we, the scientific community of this state, should conduct investigations in our own disciplines that relate to improving our environment and its landscape. With a little imagination and innovation, I dare say that each person here with an active research program could think of a way that his or her research interest would be applicable to that end. Even planting a tree or picking up an empty beer can is doing something. I guess I'm an eternal optimist but our environment, our landscape, our quality of life here is almost ideal. We have the technology and know the basic principles we must apply to maintain or even improve this environmental landscape. True, we may have to think smaller, change our Adam Smith philosophy that "only the progressive state is cheerful and hearty, that the declining state is only miserable." Everywhere the earth is teaching us lessons, if only we would see. Nothing of real value would be lost if development were to cease. I think that development is irrelevant to cultural richness and progress. What is wrong with higher labor-intensive modes of production? What is wrong with each of us becoming involved with growing more of our own food, living a simpler life, enjoying simpler pleasures? We scientists are so wrapped up in scientific reductionism (understanding nature by dissecting it into its smallest parts) that most of the time we don't enjoy the forest, or appreciate its steady-state integrity because we're always analyzing the tree or parts of it.

I believe in a real commitment to stewardship based on virtue—a religious commitment, if that's what it takes. Ecology will ultimately engulf economics. We must move away from the values of growth, profligacy, and exploitation typical of "economic man," toward sufficiency and frugality. I urge you all to study carefully our environment, recognize its nuances, and then quietly fit in to it or adapt your requirements in making your demands from it. We may have to change our culture rapidly—and—we might like it! But, we may even find that the earth is more beautiful than it is useful.

REFERENCES CITED

Sears, Paul, 1935. **Deserts on the March.** University of Oklahoma Press, Norman.

Sears, Paul, 1971. "Empire of Dust," pages 2-15 in **Patient Earth.** John Harte, Robert Socolow, editors.