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# AN ESSAY ON THE CONCEPT OF DEMONSTRATION ROOFTOP PRAIRIES

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*Abstract.* The concept of demonstration prairies on the roofs of industrial and commercial premises is recommended as a means of stimulating interest in prairie ecology and of providing educational facilities in urban areas. The economics of such rooftop locations for prairie studies and research depends upon the multiple use of land for seemingly incompatible activities. The use of selected vegetation as an integral part of the structure provides the opportunity for the prairie to invade the city, while potentially offering the benefits of effective insulation, microclimatic modification, and reductions in roof maintenance costs. This would be one method to meet the unchallenged thrust of urban expansion at the cost of rural productivity. The use of roof areas for demonstration prairie research in urban areas would reveal the economic, psychological, and aesthetic value of introducing ecological influences to the city.

*Key Words.* rooftop prairies, demonstration prairies, design, prairie education

## INTRODUCTION

I believe that prairie preservation is now an ecological necessity required to relieve the stresses imposed upon all natural resources by the character of modern life. Commercial enterprise must provide some compensation for the consequences of the continuing urban trespass upon the natural and agricultural landscape. In particular, the relentless sacrifice of prairies to urban growth must be reduced and redeemed by deliberate design.

Prairie conservation is both an ethical obligation and an ecological necessity, and it should recognize the entire environment. The importance of species diversity must be emphasized as part compensation for the abrupt interface between the vital grassland biome and the urban environment.

As a regional planner and architect, I maintain that technological capabilities now permit the use of indigenous vegetation on and over any structure. My proposal for the establishment of demonstration rooftop prairies is based upon several economic benefits to be gained from the integration of vegetation in the design of industrial and commercial accommodation, whereby urban conditions can be improved by stimulating public interest in ecology.

I advocate the provision of demonstration prairies by using the roof areas of factories, warehouses, shopping centers, and structures of like size, resulting in the achievement of economies in four directions simultaneously. First, industrial and commercial rooftops are now large enough to offer practical demonstration and experimentation in prairie ecology under controlled conditions, permitting a double use of the same area of land surface. Second, improved summer and winter insulation can be achieved by the use of soil and grasses on the roof, producing substantial economy in energy consumption. Third, the photosynthetic effect of grass covered roofs will reduce thermodynamic extremes, thereby improving the microclimatic conditions of the urban areas. Fourth, any increase in areas of vegetation by the use of rooftops will promote the diversity of species among insects, reptiles, and birds.

Success in promoting ecological variety and in extending habitat depends upon the economic balance between the additional costs invested in the structure required to uphold the weight of prairie topsoil and in the consequential reduction in heating and cooling costs. The consistent cover will protect the roofing materials from the stress of constant expansion and contraction which would result

in further economy in maintenance. There is, moreover, the inestimable social benefit of psychological well-being which the presence of vegetation will confirm amid the stresses of modern urban life. I am not aware of any such experimentation promoted either by industrialists or by prairie ecologists. I wish to explore the prospects for the combination of any such operation which should bring economic benefit to industry and commerce while providing research opportunities for the biologist. This association of seemingly inconsistent endeavors could bring improvement in urban conditions while promoting general educational advancement.

## NEW DESIGN CONCEPT

This new design concept represents a drastic change from the current sterile, scaleless, and monotonous architectural style and urban planning practice. Architects seem unable to balance the provision of personal comfort and social confidence with structural magnitude. Vigorous actions will be required to restore the environmental vitality which only vegetation can provide. In consequence, a design program of "dressing" buildings with selected vegetation should be undertaken by professional architects and planners in the development of new design concept. In the name of cultural seamliness, arid architecture should be redeemed by a vital design where selected vegetation is used as an integral part of the structure.

## ROOFTOP PRAIRIE COMPOSITION

Demonstration prairies should be established on the roofs of industrial and commercial structures wherever the area is sufficiently large to ensure assisted species self-sufficiency. Individuals involved in structural design and urban planning must recognize the problems arising from the destruction of habitat and those landscape characteristics which sustain species diversity. Rooftop area should be reviewed as potential sites for the cultivation of particular species of prairie grasses and forbs. The soil could be composed, root depth determined, humidity controlled, fire effects assessed, and the ecological balance between grasses and forbs planned, observed, recorded, and reviewed in great detail.

## MULTIPLE LAND USES

The necessity for creating prairies on the roofs of industrial and commercial structures is founded upon ethical, environmental, and economical principles of conduct. When taken together, these principles form a triangle of influences which govern the conditions of life. I believe that the prevailing visual natural or man-made seamliness and lack of aesthetic quality represents a dependable alarm system. Degradation of the environment is an impelling signal of something amiss. It is a visual alarm. Ugliness is complementary to the noxious smell, irritating noise, or unpalatable taste. Some relief from this ugliness can be gained by the deliberate use of self sustaining native vegetation in the urban scene in the provision of that natural biological safeguard of variety of species so essential to social stability.

As an ethical principle, we can no longer afford to build for human convenience alone. We must accommodate other species

while providing for our own requirements. We can no longer afford to do one thing at a time or to provide for only one purpose in one place. The economics of zoning by spacial monopoly in land uses is ecologically unsound in recognition of the evident benefits of variety.

It is ecologically unethical to allow the prairie landscape to become ever more industrialized. Planning for diversity is an ecological investment. By designing for multiple land uses which do not defy environment nor ecological ethics, economic return may be achieved from each surface and subsurface location and from thermal conditions resulting from such combinations.

Historic and modern examples of multiple land uses are many, and illustrate the combined effects of ethical judgment and environmental consistency, resulting in economic benefit. The horizontal character of modern industrial and commercial structures is especially appropriate in permitting multiple uses in the same area, and deserves particular design consideration. The construction of subterranean accommodations have been created without imposition on the landscape above. The loess hills of Iowa may offer accommodation similar to that which has sustained successive cultures in central China for several thousands years. The agricultural productivity may be maintained without interruption from the activities below.

The deliberate remodeling of the topography to provide accommodation with the advantage of the earth's consistent thermal properties is also recommended in prairie landscapes. While these design concepts became popular during the fuel crisis of the 1970s, the real value of this ancient concept of living in close harmony with the land. This has been demonstrated at Pawito on the Platte River escarpment south of Columbus, Nebraska by the distinguished planner Doyen Emiel Christensen.

#### ROOFTOP PRAIRIE ECONOMICS

Environmental considerations now determine that we can no longer treat the landscape as a market place commodity of fluctuating value. The landscape must be respected as the ultimate insurance of human survival. Structural and maintenance economy, however, take precedence over the ethical, cultural, and environmental implications in coordinating prairie ecology with urban vitality. Industrialists and investors must be convinced that the provision of rooftop demonstration prairies is justified by the resulting remuneration. The biologist, also, must be persuaded that the crisis in prairie ecology justifies practical planning beyond the protection of incidental areas of undisturbed prairies.

The economic equation of rooftop prairies depends upon the depth of topsoil required. Increased construction costs arise from the stronger purlins, beams, columns, and foundations needed to carry the earth load and for the water sprinkling system needed to sustain vegetation. An initial increase of 8 to 10% must be added to the basic investment in buildings in the prairie regions to provide for any changes in structural design. This increase may be redeemed over a decade by the reduction in roof maintenance costs

resulting from the insulation of grass and earth reducing damage caused by the continuous expansion and contraction of the exposed roofing materials. This topsoil and plants can be expected to provide substantial savings in the cost of winter heating, summer cooling, and in the choice of conventional insulating materials. The economic equation of roof top cultivation includes the consequence of microclimatic modifications and the reduction of environmental stress due to the reflection of heat from hard surfaces. New roofing materials are available which reduce the risks of leakage, are easier to apply, and will respond effectively to the demands of rooftop prairies.

#### EDUCATIONAL OPPORTUNITIES

Rooftop prairies should offer the prairie ecologist new educational opportunities to involve city dwellers. Industrial rooftops provide an experimental platform on which to demonstrate a variety of experiments under conditions of control and observation which would be difficult to achieve under field circumstances.

The most significant factor of the rooftop prairie is that of choice of soil and its natural or composed microbial composition. The experimental value of this composition includes irrigation control provided as an extension of the water system of the industrial or commercial investment. Rooftop prairie may be designed to maintain arid or marsh prairie biome, according to the climatic characteristics at variance with the location of the investment. Other variables could include species composition, plant densities, cover and biomass, fertilization, patterns, and climax chronology. The isolated rooftop prairie offers a mutual economy which should appeal to the industrialist and the biologist.

#### OTHER USES

These isolated rooftops would probably deny the effects of game and grazing large animals. But, the free arrival of other wildlife will be of special interest to those studying adaptability. The rooftop prairie should be of special interest to urban apiculturists. In addition to grasses, rooftop prairies could be planted with clovers, vetches, perennial mints, and leguminous plants native to the area. These would form bee pastures easily accessible to the urban enthusiast.

#### SUMMARY

In summary, the concept of establishing prairie landscaped should bring together three apparently incompatible objectives: 1) a professional and public interest in prairie ecology, 2) an improvement in the urban environment and microclimatic conditions, and 3) economies in structural maintenance and energy conservation. The threefold forces of ethics, environment, and economics are interactive in producing a much needed interest in prairie ecology and will advance the understanding of the benefits of the prairie as a basis of design and planning for the general improvement of the urban scene.