

Visual Impacts: Perception and Modification of Surface Mining Operations on the Black Mesa

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ABSTRACT

Scientists and industrialists are now seeking from their reclamation brethren an explanation of the new criteria and standards which will enable all of us to recognize a visually reclaimed site when we see one. To do so may require more of the viewer than the ability to perceive visually. One must understand the larger game in which reclamation is played.

INTRODUCTION

The title of this paper implies a relationship between visual impacts, perception and the resource base of a given area. The discussion of such a lofty issue will be reduced for practical purposes to: 1.) a discussion of technical treatments regarding the visual resource on surface mined lands and; 2.) the relationship of visual resource modifications and perception of the environment.

The situation on the Black Mesa is a classic example of the resource development-conservation dilemma. We speak of this dilemma in contemporary terms as the energy development environmental protection issue. Any discussion of this subject requires some fairly definite meanings of the word "development" and "conservation". I shall forego the development of background material and simply propose two definitions. Resource development has to do with the conversion of inert natural processes into potential capital. Resource conservation consists of modifying or reducing a people's standard of consumption in the direction of the future.

Resource development on the Black Mesa is designated as the production of coal. Resource conservation of the visual resource involves the elemental reconstruction of the landscape; the rehabilitation of its productive processes; and the creation of a compatible land use for its people.

BACKGROUND

The Navajo and Hopi Nations have chosen to convert their coal resources into social capital. That decision sets into motion the concerns for the rehabilitation of the residual landscape. Guidelines for beginning this task are outlined in the Surface Reclamation Act of 1977. Its goals simply stated are to encourage the development of positive procedures to stimulate the simultaneous achievement of energy supply and environmental objectives. Immediate restoration of the visual resource after disturbance by mining is not possible on the Black Mesa. There are three reasons for this.

WATER SUPPLY

The semi-arid conditions found within the juniper-grassland ecosystem of northeast Arizona make it quite impossible to realize any biomass productivity without the acquisition and manipulation of water. Water is too much a limiting factor here to permit us to develop vegetative cover in its absence. Ground water supplies are not available nor reliable enough to be considered for supplemental use. Surface water from offsite sources are not feasibly available either. On site surface water in the form of precipitation, runoff, and snow melt are the single largest sources of usable water.

OVERBURDEN

The low sulfur content coal lies in a seam some sixty feet below the land surface. Surface

mining techniques have large volumes of overburden that cannot be removed or reshaped beyond some minimal level. Large scale recontouring and subgrade reconditioning treatments will in all likelihood not be cost effective.

UNIQUE CULTURE

The present land management practices of the resident indian population is oriented around sheep grazing. Productivity on these lands is inherently low. Therefore successful grazing requires the indian land manager to utilize available forage over large areas of the landscape. Overgrazing simply complicates and worsens the condition of the available range resource.

The reorientation of an existing culture through the availability of new capital, new values, and new life styles has not converted these people's lives, it has complicated them. The problem of land reclamation on the Black Mesa forces the decision makers to bring not only technical, but ethical and cultural strategies into the planning process. Concerns for rehabilitating the visual landscape are equally involved in this web of values.

The existing visual image is very much fixed by the dynamics of ecosystem productivity, land use production or yield and the intangible values of a culture. Overtime the activities for engaging man with land take on identifiable patterns and characteristics. These resource use practices formed by a peoples own mode of reasoning are consistent with other values and behavior within their culture. What a people may see in their landscape may very well reflect their system of involvement with it. Perception and modification of the visual resource therefore transcends the reconstitution of the physical structure.

TECHNICAL TREATMENTS APPLIED TO THE VISUAL RESOURCE

Landscape treatments involve hydrologists, biologists, and landscape planners and centers on substrate treatments, recontouring treatments and revegetation treatments.

The cast overburden and parent materials makeup the physical conditions in which plant succession takes place. The fundamental purpose of substrate treatments is to modify the negative growing conditions found there. Presently chemical additives (lime carbonate, organic fertilizers, soil binders) and organic topsoils are being tested. A series of mulches (rock, stone, sly material, bark mulch) used in combination with organic soil additives may offer realistic alternatives to a 100% topsoil covering.

Recontouring the substrate-topsoil layer is designed to influence water regime balances in terms of water retention, drainage, and soil-water availability relationships. The purpose of the recontour plan is to capture and harvest water and deliver it to designated vegetative areas on site. The recontourment plan must be designed with microclimatic, visual modifications and land use strategies in mind.

The substrate which is set into a predetermined configuration with proper consideration given to water retention and drainage problems provides a fixed set of growing conditions for selected plant species. These conditions set standards for selecting a proper collection of suitable plant material. Our best rehabilitation efforts rely heavily on the reintroduction of vegetation so as to establish the process of self-repair (plant succession) and self-adjustment (species tolerance) on the site itself. Through these preliminary treatments a visual modification strategy can be developed.

VISUAL ACCESSIBILITY

Visual accessibility is a term used to describe the kind of vantage points, roads or avenues that afford the incidental viewer or traveler a view of the scar. When applied skillfully and strategically topographical screening, vegetative buffers and scenic enrichment through textural and tonal additives can greatly enhance the picture plane the viewer perceives. The designer is essentially working with position and vantage point characteristics to locate treatment activities that enhance the visual image.

ORIENTATION AND CONFIGURATION OF THE SCARRED AREA

Surface mining operations are designed to respond to the position and location of the ore bearing seam, the climatic conditions and the existing topography. Visual rehabilitation schemes must work with these residual landforms and within recontouring cost constraints. The goal is to retrofit this residual land form back into its surroundings. The designer must manipulate the physical form of the

overburden piles so that they simulate characteristics of the adjacent landscape. This gross form manipulation is further enhanced by fine line form manipulation. This is accomplished by treating the tonal character of the exposed surface (i.e. soil, rock, vegetational) so as to yield a desired reflectance characteristic in both color and light quality. Textural characteristics of the natural elements can be manipulated in a similar manner. The land planner is essentially employing the principles of biology (succession, growth form etc.) and the principles of three dimensional perception to integrate the landscape into one visual image.

CONTEXTUAL INTEGRITY

The undisturbed visual image of the landscape is a product of cultural and natural forces interacting together. When the physical scene is changed so is our perception of it. The culture of a people consists of a set of activities and a fund of beliefs and techniques for manipulating their resources. One fact is universal to all cultures. By shaping their environment they shape themselves and their future as well. The visual resource like its mineral and biological counterparts does not exist, within our perceptions at least, until we define it. Like its counterparts the visual resource is not separately defined until we extract it from its surroundings. The dismantling of our environment reveals to us its systematic workings and organizational levels if we look critically at it. Reintegrating the landscape contextually back into its setting both structurally and functionally is a task of a much different nature. This requires of us the highest order of understanding of ourselves and our relationship with our environment.

RESOURCES AND PERCEPTION

The problems of contemporary life in any setting are insoluble. Our actions are mediated by values through which we balance opposing impulses. We shape, or in the case of visual modifications to mined lands, reshape the landscape by finding appropriate principles to guide us. The natural environment is perceived and understood at its most fundamental level by the science of ecology. Natural resources are defined by our values, techniques and activities. The perception of the two in the dynamic state of alteration and change transcends simple physical reconstruction techniques. Somehow we must apply these to the resolution of our problem.

Visual resource restoration within surface mined lands on the Black Mesa is three things. Its technical. We attempt to integrate biological and perceptual elements. It is also ethnological in nature. We realize the vague line of dependency between culture and environment is particular to each setting. To ignore this reality is to invite failure. Finally it is ethical in character. We have unleashed powerful, inventive and exploratory urges upon ourselves and the landscape. They seem to be part of our inheritance here in the western world. The legislative and technological constraints associated with visual modification treatments simply demonstrate the increasing price we have to pay for indulging them and the ingenious ways in which we contrive to meet that price, no matter how steep it becomes.