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DIVISION OF WILDLIFE RESOURCES

EQUAL OPPORTUNITY EMPLOYER

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

DOUGLAS F. DAY
Director

JIM

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DEC 10 1981
DIVISION OF
OIL, GAS & MINING

December 7, 1981

Mr. Cleon B. Feight, Director
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Dear Jack:

As you know about two years ago our Division initiated a research project designed to determine the effects of coal development on wildlife. This study was cooperatively funded by Eureka Energy Company, Bureau of Land Management, the U. S. Fish and Wildlife Service and ourselves. The study was designed to establish baseline information for the Eureka Energy Company's proposed Sagepoint Dugout Canyon Mine and to then follow through during the construction period and define the impacts of such facilities as conveyor systems, hauling routes, portal areas, preparation plants and handling areas on wildlife. We feel this information is essential to coal mine planning and decision-making processes.

As you no doubt are aware, Eureka Energy Company is presently attempting to sell the proposed Sagepoint Dugout Canyon Mine. As a result of this, we have been notified by Eureka that they will not provide funding (see enclosed letter) toward the completion of this research effort--an effort that would require at least three additional years given prompt construction of the coal facilities. Eureka has been providing $10,000 annually or 29 percent of the total cost of the project.

We are presently considering alternative sources of funding sufficient to satisfy the contribution that Eureka has made in the past. In this regard, we have wondered about the possibility of obtaining funds from the Office of Surface Mining. We do not feel it is appropriate for us to contact them directly because of potential conflict of interests between our agencies and our desire to continue to recognize your agency as the regulatory authority for coal mining. We would, therefore, appreciate your guidance concerning the potentials for obtaining coal program funding for Eureka's portion of this research effort. We have also enclosed a copy of our study outline for your convenient reference.

We feel that any assistance that you can provide in obtaining the needed funds for this purpose would ultimately be beneficial to the coal program as well as to our agencies and others involved in the planning and decision-making process.

Our present agreement with Eureka Energy Company expires on February 1, 1982. It is, therefore, necessary that we obtain the additional funding by that date in order to continue into the third phase of study that would extend from February 1, 1982 through January 31, 1983. Also, anyone entering into this cooperative effort should understand it is intended to continue for an additional three years or through the complete development of the Sagepoint Dugout Canyon Mine.

Your prompt attention to this request for assistance will be greatly appreciated.

Sincerely,

Douglas F. Day
Director

Enclosures

EUREKA ENERGY COMPANY
A SUBSIDIARY OF PACIFIC GAS AND ELECTRIC COMPANY
77 BEALE STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

UTAH WILDLIFE RESOURCES
TO: [illegible] DATE: 12-2
☐ See me ☐ Ans/my signature
☒ Handle ☐ Answer direct/copy to me
☐ For your approval ☐ Your comments
☐ For your information Thank you
☐ Files Director

November 30, 1981

RECEIVED
DEC 10 1981
DIVISION OF
OIL, GAS & MINING

Mr. Douglas F. Day
Director
Division of Wildlife Resources
1596 West North Temple
Salt Lake City, UT 84116

Dear Mr. Day:

We believe your study to determine the effects of coal development on wildlife in southeastern Utah is useful not only to Eureka but also to the State of Utah, and to other mining companies. Although we recognize the importance of this study and its relevance to the Sage Point-Dugout Canyon Project, we are, unfortunately, unable to commit to the requested funding for use on Phase 1-c of the study because, as you may know, we are selling our Utah coal properties. However, we will promptly inform the new owner about this study and related activities.

On behalf of Eureka, I thank your staff for their excellent cooperation and assistance on this project.

Sincerely,

Nicolas Temnikov

Nicolas K. Temnikov
Regulatory Coordinator

NKT:hl

Study Proposal
To Determine

EFFECTS OF COAL DEVELOPMENT ON WILDLIFE IN SOUTHEASTERN UTAH

Utah Division of Wildlife Resources
Douglas F. Day
Director
1979

EFFECTS OF COAL DEVELOPMENT ON WILDLIFE IN SOUTHEASTERN UTAH

Charlie Greenwood, Resource Biologist
Utah State Division of Wildlife Resources
455 West Railroad Avenue
Price, Utah 84501

Abstract

Development of the coal resource in Southeastern Utah shows prospects of preceeding at an explosive pace. Coal mining has been an important economic activity in this area since 1874; and with the construction of local coal fired electric generation plants and the 1973 oil embargo, coal has taken on a much greater importance as a national energy source. Recently, a series of environmental impact statements and development of new regulations by the Office of Surface Mining have paved the way for renewed coal leasing by the federal government.

A recent concern for wildlands and the associated wildlife resources results in a concern for expanding coal developments.

Due to the lack of data in this area, a long-term study has been designed to provide information on the impact of coal mining on wildlife by gathering data before development occurs, during construction of facilities, and while the mines are in full operation. Proposed mine sites, access routes, and conveyor belt systems will be studied for wildlife use. Control areas will also be studied.

The mine projects to be studied are the Eureka Energy Company's Sage Point-Dugout Canyon project, Canyon Fuel Company's Ferron Canyon project, and the Coastal States Energy Company's Skyline Mining project. Currently field work has been funded and work begun at Eureka Energy Company's site. It is hoped that funding will be secured during the next year in order that field work can be expanded to the other two sites.

TABLE OF CONTENTS

APPENDICES (cont.)

EFFECTS OF COAL DEVELOPMENT ON WILDLIFE IN SOUTHEASTERN UTAH

Justification

Development of the coal resource in Southeastern Utah's Wasatch and Bookcliff coal fields shows prospects of proceeding at an explosive pace. Historically, coal mining has been an important economic activity in this area since it was first discovered in 1874. Construction of local coal fired electric generation plants has also benefited the area's coal industry. Also, following the 1973 oil embargo, coal took on a much greater importance as a national energy resource than in the past. But, a moratorium on leasing of federal coal during the last two decades is reputed to have limited development on new coal mining operations. Recently, however, a series of environmental impact statements and development of new regulations by the Office of Surface Mining concerning coal development have paved the way for renewed coal leasing by the federal government. It is anticipated that widespread leasing of federal coal may commence as early as 1980.

Concurrently, but independently of the national recognition of an energy crisis, the American public gained a wildlife ethic and began voicing concern for wildlands and the associated wildlife resources. As a result, two national priorities, wildlife management and coal development have moved to the forefront of concerns for resource managers and industrial developers.

How will expanded coal development impact wildlife? It has become alarmingly obvious that almost no useful information exists relevant to wildlife and coal development in habitats similar to those found in Utah. Due to this lack of data, projections as to the effects of coal development on wildlife are difficult and in most instances, just a guess.

This proposal describes a long term study designed to provide information on the impact of mining on wildlife by gathering data before development occurs, during construction of facilities and while the mines are in full operation.

The area near proposed mine sites and access routes will be studied for wildlife use. Procedures will be used to identify the density of animals immediate to these sites of disturbance. Since wildlife populations fluctuate annually due to natural factors, such as severe weather, undisturbed areas near the proposed mine sites will be concurrently studied to provide control data.

Study procedures will be designed to measure any changes in habitat use by wildlife in the area around mine facilities. This decreased use will be translated into number of hectares of habitat lost proximal to mine activity centers and along access routes. Documentation will be made of reactions of big game to mine developments such as coal conveyor systems. Any enhancement of wildlife habitat due to mining developments will also be reported.

Objectives

Overall Study Objective

To determine the effects on wildlife of coal mine development through a long term study, including investigations before disturbance, during construction and mine operation, with special emphasis on mule deer and Rocky Mountain elk use of winter and summer range.

Specific Objectives

1. To determine the effects of coal conveyor systems on mule deer use of winter range and Rocky Mountain elk and mule deer use of summer range.

   Procedure: Transects will be placed perpendicular to conveyor systems and inspected for deer and elk use to determine if there is diminished activity adjacent to conveyors in comparison to areas more distant. Remote sensing cameras will monitor deer and elk behavior near conveyor systems to provide information on how the animals react while conveyors are in operation.

2. To determine the effects on vertebrate, terrestrial wildlife of mining activity centers, such as plant sites or portals, tipples or loading yards.

Procedure: Wildlife use of habitat adjacent to mining activity centers will be monitored on transects extending perpendicular from activity centers--evaluations will consider amphibians, reptiles, birds and mammals. Small mammals will be studied by use of trapping grids placed adjacent to activity centers. Transect information for all wildlife from the first increment of 100 meters will be compared to information from the more distant 100 meter sections to determine the response of wildlife to activity centers (note that for big game, transect increments will equal 250 meters).

3. To determine the effects on vertebrate, terrestrial wildlife of access roads for employee use and coal haulage.

Procedure: Transects will be placed at selected sites along access routes to mine facilities. They will extend perpendicular to the roads and will avaluate use by amphibians, reptiles, birds and mammals. The extent of influence on wildlife by man's use of access roads will be determined in a similar fashion as discussed for transects associated with activity centers.

REVIEW OF LITERATURE

The wildlife resource in southeastern Utah will be heavily impacted from the increased population associated with mine development. It is estimated that approximately 1,300 acres of wildlife habitat will be permanently lost due to urbanization and another 70 to 300 acres may be occupied for recreational lots and acreages. Additional habitat loss will occur in areas immediately surrounding mine project sites. Recreational pursuits of hunting, fishing, hiking and off-road vehicle use will affect formerly remote, undeveloped areas (Dept. of Interior 1979: IV 12).

A rapid increase in population seems to produce a substantial rise in violations of fish and game regulations. Between 1972 and 1977, the population of Carbon and Emery counties increased by 37 percent. During the same period for these two counties, the Southeastern Regional Office of the Utah Division of Wildlife Resources reported a 235 percent increase in citations issued, mostly involving violations which directly reduced wildlife populations. There has been a significant increase in wanton killing of all wildlife and waste of game. (Personal communication with Larry B. Dalton, Resource Analyst, Utah Division of Wildlife Resources, October 15, 1979, and Dept. of Interior 1979: IV 12).

Wyoming has encountered the same situation due to the development of its mineral resources (Repsis 1977). Between 1970 and 1977, Wyoming experienced a population growth of 27.5 percent. Concurrently, the

Wyoming Game and Fish Commission saw an increase of 25 percent in total arrests for violations of fish and game laws. A common offense was temporarily employed persons, "transients", obtaining resident licenses before they could legally do so. However, the most flagrant wildlife violation was wanton destruction of big game animals. These "thrill killings" were especially associated with areas impacted from mineral development.

Game animals are not the only targets of illegal shooting. A high portion of raptor deaths in western Utah was attributed to shooting (Ellis et al. 1969). The authors surveyed a road paralled by utility poles which were often utilized as perches by hawks and owls. Shooting was the cause of mortality for a majority of the dead raptors found. Highest mortality occurred during periods of heaviest sport hunting in the area.

Utah Division of Wildlife Resources data also compliments Ellis et al. (1969)(Dept. of Interior 1979: IV 13). It may be that the public has developed a greater regard for these protected species since this study was conducted. However, any development of roads in previously undisturbed areas creates opportunity for illegal shooting of wildlife.

The most visible impact of roads on wildlife is animals killed by vehicles. Raptors are especially susceptible when they gorge themselves on carcasses of previous road kills and are unable to take flight. Approximately 50 mule deer were killed on Carbon and Emery County highways

between July 1, 1976, and June 30, 1977 (Utah Division of Wildlife Resources 1978). This is only a minimal figure since most highway mortalities are not recorded. It also does not account for loss of reproductive success in succeeding years. Highway mortality will increase as number of improved roads and vehicular traffic increases (Dept. of Interior 1979: IV 14). However, highway mortality in all but limited areas is not considered a significant factor in overall deer herd mortality (personal communication with Larry B. Dalton, Resource Analyst, Utah Division of Wildlife Resources, October 15, 1979).

A more significant aspect of the proposed mining roads and facility development is habitat reduction. The effects of roads on wildlife include complete habitat removal of the acreage occupied by the road surface, creation of new habitat for those species which prefer "edge" or integradation of open and wooded areas, and avoidance of areas anywhere near roads or sites of human activity.

Rocky mountain elk are a good example of a species that exhibits avoidance behavior. Elk activity was monitored by telemetry in Wyoming. It was found that elk prefer to stay at least 800 m (0.5 mile) from timber harvesting operations and from persons engaged in out-of-vehicle recreational activities such as hiking, picnicking or fishing (Ward 1973). Logging and recreation roads with regular moving traffic had little effect on elk activity within 400 m (o.25 mile), once the elk became used to them (Ward 1976). The heavily traveled Interstate 80 proved to be a definite barrier to elk movement. Elk tended to stay 300 yards from the Interstate, but did not react while feeding to noise from cars or trucks (Ward 1973).

The amount of area avoided by elk near roads is dependent on type of road and density of roadside cover. Perry and Overly (1976) ran pellet group transects perpendicular to main, secondary and primitive roads, as well as in control areas. Main roads were classified as main routes of travel, secondary roads were somewhat improved with irregular maintenance and primitive roads were unimproved and seldom maintained. The authors generally found a successive increase in pellet group numbers from the road edge with sample plots at 33 m through plots at .2, .4 and .8 km from the road, indicating increasing habitat use at greater distances from the road.

Main roads through open meadows caused reductions in big game use of more than 95 percent from road edge to 0.8 km away. In open forests which provide much more cover, main roads reduced elk use by 46 percent to 0.8 km away. A similar trend occurred with secondary and primitive roads, but reduction in elk use was less severe. Aspect was also influential with substantial reductions in use near roads on west and south aspects (Perry and Overly 1976).

The authors concluded that road construction in elk habitat can have a significant impact and that more than 640 acres of habitat per mile of road can be affected. They felt impact of road construction would be minimized if new roads were located in dense forests and on east facing slopes (Perry and Overly 1976).

An eight year Montana study of elk distribution, determined by annual pellet count surveys, found that decline in pellet group densities adjacent to forest roads can be predicted by tree canopy density (Allen 1977). Topography was also found to be an important influence on how far elk moved away from areas where active logging was in progress. Logging operations on ridgelines, where men and heavy equipment were visible over large areas, produced the greatest movement and the strongest negative response. Where logging occurred below ridgelines, at the ends of ridges and at the mouths of drainages, a somewhat less negative response and shorter movement occurred. Undisturbed forest or even a fairly long span across an undisturbed drainage did not seem to be as effective as crossing a topographic barrier in reducing the distances elk moved.

This avoidance of human activity centers and road traffic may be related to hunting pressure on elk. A study in Rocky Mountain National Park produced no evidence that elk distribution or behavior was affected by abundant tourist activity in autumn or deliberate disturbance in winter and early spring (Schultz and Baily 1978). It was thought that since elk had not been hunted in the park since 1962, they had become less reactive to people. The acceptance of human activity appeared to be a learned response of unhunted elk.

Deer do not seem to exhibit such extreme avoidance of roads. Leedy (1975) discusses several studies which document use of roadsides by a variety of species. He found reports of deer utilizing the mixed vegetation created by clearing for roads, as well as deer coming to highways for salt. However, this behavior may be a result of limited suitable habitat, rather than an acceptance of human activity by deer.

Ferris (1977) found slight avoidance by white-tailed deer of Interstate 95 in northern Maine. Deer utilized forest habitat within 100 m of the right of way/forest edge less than areas at greater distances. Ferris expected deer to feed along the highway edges, particularly during spring. Some deer did utilize the right-of-way vegetation, but more deer were observed in waste areas. These waste areas were small clearings where excess material from right-of-way clearance was deposited and provided similar deer food as that occurring along roadsides. The availability of these waste areas, in otherwise dense forest, was considered the reason why deer were not found as often along roadsides.

Bellis et al. (1971 as cited by Ferris 1977) also felt deer around the Pennsylvania Interstate preferred not to enter the right-of-way, but would if the only attractive forage was found there.

An interstate highway in northern Michigan was constructed on white-tailed deer winter range and appeared to eliminate a portion of the range for deer use (Reilly and Green 1974). The deer migration route was from

the west and northwest. After the highway was constructed, deer no longer wintered east of or adjacent to the interstate. The number of deer killed by vehicles in the area rose dramatically the year after the interstate was constructed and three years later had fluctuated around an average approximately twice that of the pre-interstate annual mortality figures. The authors concluded with the following statement:

> "These data strongly suggests that the decline in the study area's highway mortality has been the result of killing the deer formerly yarding further east or killing the deer formerly occupying the area now taken up by I-75 or both. Therefore, proposals for construction of highways which would intersect deer yards should be evaluated in greater detail for the potentially serious detrimental effect of construction on deer movements and populations within wintering areas." (Reilly and Green 1974:19).

Roads and human disturbance were also mentioned in a study of the migration of a California deer herd. Bertram and Rempel (1977) stated that public use disturbs migratory animals and that roads, trails and public use facilities eliminate habitat. They recommend that necessary roads be screened by roadside vegetation and public use facilities should be discouraged.

A coal conveyor belt will probably be as much a barrier to deer movement as an interstate highway. A thorough computer search of the literature--both American and Canadian--revealed no references about coal conveyor systems with regard to wildlife (personal communication with Jim Coyner, Biologist, U.S. Fish and Wildlife Service, Salt Lake City).

Local wildlife biologist believe that conveyor belt systems utilized for overland movement of coal can become a complete barrier to big game movement. However, sufficient pre-installation studies of big game movements and appropriate conveyor design may allow for passage of wildlife.

Tracks seen by Division of Wildlife Resources personnel near a conveyor presently operating in Huntington Canyon in Emery County, indicate that some individual deer do go very close to the conveyor on occasion. However, the reaction of deer during periods when the conveyor is in operation is unknown at this time.

Attempts at reducing the impact of man-made barriers have involved mitigating measures such as bridges and underpasses for wildlife. These measures have met with varying success. Reed et al. (1975) studied the behavioral response of mule deer to a 10 x 10 foot concrete underpass 100 feet long under Interstate 70 in Colorado. A fence ran parallel to both sides of the highway from the underpass. A video time-lapse surveillance system was used at the underpass to record number of deer entering and their behavior. Even though the deer were highly motivated to continue migrating, their behavioral response indicated an initial and continued reluctance to use the underpass. The authors estimated that about 61 percent of the deer herd under study used the underpass. The remaining deer jumped or got through the fence, moved around the ends of the fences, circumvented around the entire fenced area or remained on the same side of the fence. The authors felt a

larger and more open underpass would result in less reluctant deer movements. They suggested underpasses at least 4.27 m in height and width, minimal in length, and with dirt floors. Artificial lighting is unnecessary.

Leedy (1975) covers the Reed study in his summary of highway-wildlife relationships and adds some information not appearing in other literature. Leedy states that white-tailed deer made considerable use of an underpass, much larger than the one studied by Reed et al., on Interstate 70 west of Baltimore, Maryland (p. 49). On the other hand, Leedy had received communication from a New Jersey Wildlife Biologist about a deer underpass that had been observed on a part-time basis for 18 months. Deer activity had been observed at both ends of the tunnel, but no evidence was seen that deer had passed through it (p. 104).

Ward (1978) studied mule deer use of underpasses along Interstate 80 in Wyoming. The four-lane divided highway passes through winter range utilized by approximately 900 elk, 1200 mule deer and 1000 antelope. The section of Interstate 80 under study was opened for traffic in 1970 and by 1975 there were 561 deer, 153 antelope and 11 elk reported killed by vehicles along 55 miles of highway.

In 1977, an eight foot big game fence was constructed on both sides of the highway in an area where previous study had shown at least 1000 mule deer cross twice a year, resulting in 25 to 55 accidents each year. After the fence was installed, opportunity for deer to cross the road was

provided by two machinery and four box type underpasses. Monitoring of telemetered deer showed that they were concerned about the fence and underpass since they moved up and down the fence and passed approaches to the underpasses. This delay of deer going under the highway caused heavy browsing pressure on the nearby vegetation which was evident for a distance of one-fourth mile (400 m) out from the highway (Ward 1978).

Dirt tracking patches at each end of five of the underpasses were inspected daily and the record of tracks clearly indicated the deer eventually used the underpasses. For the fall and winter of 1977-78, a total of 1919 deer passes were recorded. A small number of deer got through or around the ends of the fence. Ward (1978) felt this large number of deer using the underpasses was a sure sign that they would eventually become accustomed to moving without hesitation. Furthermore, after baiting with alfalfa hay, lettuce and apples, deer stayed in the general area of the underpasses and were even seen feeding and resting under them during the day.

One problem with deer use of underpasses has been travelers stopping to observe deer, since the animals were at an unusually close range. Moving traffic caused the deer little concern, but they moved away if a vehicle stopped. People out of a vehicle caused them to move even faster and farther.

The Ward (1978) and Reed (1975) studies tend to indicate that the effects of man-made facilities can be mitigated to some extent, but considerable research is needed to determine the most effective designs

for mitigating measures. Until the last few years, most of the literature relating to highways and wildlife was concerned with mortality from vehicles. Only recently have investigations been carried out on how developments affect wildlife behavior and habitat use.

One such study is currently being carried out by the U.S. Fish and Wildlife Service through the Denver Wildlife Research Center. Wildlife populations are being monitored near strip mining sites in southeastern Montana and northern Wyoming (Phillips 1977).

The reaction of birds to active large scale disturbance was studied at a strip mine site in Kentucky (Allaire 1978). The study was begun in 1975 before mining, carried through two years of active mining, and after mining was nearly complete in 1978. The effects of blasting, noise and rock dust from mining operations were found to cause a decrease in the density and diversity of birds along a 100 m wide strip of forest adjacent to the active pit. Although decreased, the number of species remained about normal for an eastern deciduous forest, but the decrease in density indicated a decline in the stability and complexity of the bird community during the two years of mining. Preliminary data from 1978 indicates that when mining ended, the population density and diversity began approaching premining levels.

Other information concerning birds and habitat disturbances has come from studies in Maine (Ferris 1977), West Virginia (Michael et al. 1976)

and Arizona (Johnson 1970 as cited by Michael 1976). Ferris (1977) used spot-mapping for censusing breeding birds along 400 m transects perpendicular to an interstate. He also censused wintering birds along transects. Ferris found the interstate did not cause a significant reduction in total populations of breeding or wintering birds in forest habitats adjacent to the highway. The impact on forest birds was mainly the direct loss of habitat taken up by the right-of-way clearing. In addition, the more open mixed "edge" habitat provided by the median and road side clearance attracted new species of birds not found in forest habitats and caused an increase in both vegetation species richness and diversity along the highway.

Johnson (1970 as quoted by Michael et al. 1976) found no measureable effects of a highway on the bird populations that he studied. Michael et al. (1976) suggested the harmful effects of highways on birds may be surpassed by the benefits from the development of "edge" habitat that accompanies highway construction and maintenance. He emphasized that each species must be considered individually, that some will benefit from the construction and presence of highways and others will be negatively affected.

This change in species composition also may accompany construction of transmission lines (Anderson et al. 1977). The vegetation along a powerline corridor is disrupted during construction and maintenance, producing a different plant community. This is particularly noticeable in heavily forested areas.

Cleared areas for roads have been found detrimental to small forest mammals. Oxley et al. (1974) found the width or cleared area of roads the most important factor inhibiting the movements of forest mammals, more so than traffic volume or type of road surface (gravel or paved). This limiting of movement may be most consequential if population gene pools are fragmented, where large gene pools are important to the survival of animals living under harsh environmental conditions. Dispersal of small forest mammals may be prevented by divided highways with clearances of 90 m as effectively as by bodies of fresh water twice as wide. On the other hand, the authors found mammals that are adapted to open country are much more ready to venture onto roads.

The effects of highways on all vertebrate wildlife (except reptiles and amphibians) was studied by Michael (1976) in West Virginia. This study was conducted from 1971 to 1975 with data being taken before development of an interstate highway, during construction and one year after it was open to traffic.

Animal sign and wildlife observations were recorded along four one mile long transects placed perpendicular to the road. Small mammal populations were censused by traplines, each 100 meters long, extending perpendicular to the road. Animal distribution along the transects was reported in percentages rather than numbers. The

author recommended for future studies that a different statistical treatment be used, perhaps chi-square tests, but he was in strong favor of using transects perpendicular to roads as a means of determining how far back impact occurred (Michael 1976).

The ecotone area between the right-of-way and the forest had the highest species diversity and number of birds. It was apparent that certain bird species were benefited by habitat created by road construction while forest species of birds lost habitat unless they utilized the ecotone vegetation (Michael 1976).

White-footed mice were found to move within a few feet of traffic in Michael's study. Meadow voles, on the other hand, seemed to avoid the edge of the right-of-way vegetation. In this study, small mammal distribution adjacent to the highway seemed more dependant on where vegetation for food and cover was located, than on effects of the highway (Michael 1976).

Results of Michael's study indicated that effects of the highway extended back no further than one-tenth mile. None of the larger birds or mammals were adversely affected by the highway (beyond the loss of habitat directly taken up by the road), nor were there any benefits evidenced. Michael (1976) expected benefits in the future, especially for small mammals and birds, as the ecotonal vegetation associated with the right-of-way developed.

It is important to note that most of the studies discussed above on birds and small mammals were conducted in eastern deciduous or softwood forest habitats. At present, there is no documentation of how coal mining development will affect wildlife use of any of the habitats occurring in southeastern Utah.

METHODS

Establishment of Experimental and Control Study Areas

Three projects proposed for mining have been selected for study--Eureka Energy Company, Canyon Fuel Company and Coastal States Energy Company. Wildland habitats associated with each project are relatively undisturbed and undeveloped at this time. Generally speaking, the sites encompass major vegetation types occurring in the Bookcliff and Wasatch Plateau coal fields and represent a progression from desert shrub up into montane vegetation types. The experimental portion of the study will evaluate impacts on wildlife from man's use of access roads, coal conveyor systems and disturbance associated with activity centers such as portals, tipples or coal preparation plants.

Due to funding limitations, the study will be conducted in phases. Phase one at the Eureka Energy Company site has been funded for one year of field work between December 1, 1979, and November 30, 1980. Other phases of study will be initiated when sufficient funding is secured (Appendix G).

Eureka Energy Company Study Site

Surface facilities for Eureka Energy Company's proposed mining operation (Sage Point-Dugout Canyon Project) will lie within T. 13 S., R. 12 E. and 13 E., SLM, Carbon County, Utah, which is approximately 15 miles northeast of the city of Price. Coal from this project will be primarily utilized by the Pacific Gas and Electric Company for generation

of electricity. About 8,200 acres of federal (BLM), 1,000 acres of state and 800 acres of private land comprise the surface area of this project. Approximately 932 acres would be occupied by surface facilities. The operation is expected to produce 3.2 million tons of coal per year and employ nearly 1,000 people when in full production (Dept. of Interior 1979: FD-I-1 and 5).

The major vegetation types to be affected by surface facilities and roads consist mainly of desert shrub, the pinion-juniper sagebrush association, mountain brush and some riparian communities.

The P.G.& E. operation was chosen for study because of the site's importance as deer winter range and the proposal of a coal conveyor system with its potential impact on mule deer migrations.

Canyon Fuel Company Study Site

This proposed mining site lies on the Sanpete and Emery County line, north of Ferron Creek, and is approximately 15 miles northwest of the town of Ferron. Mining activities will mainly occur within 1,520 acres of private land located in Township 19 South, Range 5 East, SLM. The portal facilities will occupy approximately 30 acres. However, access routes to the mine and the mine portal will be located in Township 19 South, Range 6 East, SLM, which is part of the Manti-LaSal National Forest, administered by the U.S. Forest Service. A four mile section of existing Forest road will be reconstructed and improved for coal haulage

trucks. A new section of road, approximately four miles long, will be constructed beginning at the existing Ferron-Mayfield road near Stevens Creek and connect to the mine portal area. When in full operation, the mine is expected to produce one million tons of coal per year which will be transported off the Forest at a rate of approximately ten trucks per hour. (Personal communication with John Neibergall, Ferron District Ranger, U.S. Forest Service on October 19, 1979).

This mine site was selected as a study area because it occurs on winter range for Rocky Mountain elk. Data from this site will provide information about the reaction of elk and other wildlife to mining facilities and human activities related to construction and operation of the mine.

Coastal States Energy Company Study Site

The proposed mining site (Skyline mines) is located approximately 25 miles west, northwest of the city of Price, in Carbon and Emery counties, Township 13 South, Range 6 East, SLM. Leases of federal land (Manti-LaSal National Forest) total 6,400 acres and county land makes up an additional small acreage. The operators expect to begin construction in mid-1980, production in 1982 and reach full production of 5 million tons a year by 1989. Approximately 600 people will be employed when full production is reached (Coastal States 1978 a, 1978b).

The original plans show a master 54 inch conveyor belt and the main access road along a 2.4 mile privately controlled right-of-way up Eccles Canyon to the Forest boundary. The coal would be transferred from the conveyor to trains at a loading yard at the mouth of Eccles Canyon (Dept. of Interior 1979).

Eccles Canyon is a steep sided canyon with dense vegetation. North-facing slopes are covered with the conifer-aspen vegetation type and south-facing slopes have the aspen type. A sagebrush-grass type is found along the access road and proposed conveyor route. Riparian habitat occurs along stream bottoms in Eccles Canyon and adjoining side canyons (Dept. of Interior 1979).

Eccles Canyon was chosen as a study site because it is representative of summer range for deer and elk.

Four permanent transects will be established at two selected points along access routes and/or conveyor systems at each study site. These transects are to extend perpendicular to the road or conveyor system. Additionally, four more permanent transects will extend out from two selected activity centers at each study site. Locations for all transects will be selected in view of planned surface facilities in order that evaluation of a single disturbance will not be compounded by other mining activities. Transects lengths for monitoring of use of habitats by each class of wildlife are identified, but lengths may vary depending on restrictions of local geologic features.

Adequate control transects will be selected to represent experimental study transects, since wildlife populations may fluctuate annually or even seasonally due to natural environmental conditions. For all experimental transects and depending on the data collected, either chi-square analysis or analysis of

variance will be utilized to determine if significant differences exist in population means between various years of study. If control data shows significant variations in population means on an annual basis, the covariant analysis may be utilized to evaluate experimental data.

Monitoring of Reptile and Amphibian Populations

Herpetologic studies will be conducted along all permanent transects. Measured areas for monitoring use of habitats by herpetologic populations will be two meters wide and will extend for approximately 600 meters giving a total transect length of 0.6 kilometer, which is nearly equivalent to three-quarters of a mile. The transect area will be closely examined for all reptiles and amphibians during the fourth weeks of June and August each year by a researcher(s) who searches for animals on or under logs and rocks. Statistical comparisons of herpetologic occurrence and use of habitats adjacent to mine facilities will be made for each successive 100 meter lengths of transect; each 100 meter length of transect totals 0.02 hectare.

Being cold blooded creatures, snakes and lizards are attracted to road surfaces which absorb the sun's heat. Access roads will be intensively monitored for a one-week period during July each year to determine the extent of mortality caused by traffic. The relationship of mortality to traffic volume will also be determined as per the results of a two-hour (0800-1000) traffic monitoring period during each mortality survey.

Monitoring of Avian Populations

During the raptor breeding season (February through June), approximately

five days will be spent at each mine site to document numbers of raptor breeding territories and location of aerie sites within a one kilometer radius of all activity centers. In addition and on a yearly basis, raptor use areas within one kilometer of mine activity centers will be monitored throughout their period of use. Data collected by Utah Division of Wildlife Resources concerning summer and winter raptor surveys will be utilized as control to monitor yearly variations in the population of raptors. Statistical evaluation of numbers of raptor breeding territories will be accomplished through chi-square analysis.

Densities for avian species other than raptors and upland or migratory game birds will be determined by Emlen's (1971) transect method. These measurements will be made along the permanent transect routes and only between late March and the end of September each year. Measured areas are to be 100 meters wide and will extend for 0.6 kilometer (600 meters). Statistical comparisons of avian use of habitats adjacent to mine facilities will be made for each successive 100 meter lengths of transect; each 100 meter transect length totals one hectare. Detailed discussions concerning methodology can be reviewed in Appendix A.

Upland and migratory game birds will be documented only as to the frequency of their flushing along the aforementioned permanent transect lines between late March and the end of September each year. Analysis of this data will be an empirical evaluation due to the low density of these species.

Monitoring Mammal Populations

Small and Medium Size Mammals

A trapline with stations spaced ten meters (dense cover) or 15 meters (open cover) apart will be utilized for measurement of small mammal populations along the permanent transects during June and August each year. Each animal will be live-trapped and toe clipped for individual identification. Evaluation of field data on small mammals will be accomplished through the Haynes (1949) method. Line transects will extend for 0.6 kilometer (600 meters).

It is realized that the trapline procedure is ineffective at determining with precision the density of small mammals, since the grid is elongated resulting in a greater exposure of individual traps to the effects of immigration and emigration. However, this procedure is believed to be the most effective for determining the zone of disturbance as it radiates out from a site of disturbance. In terms of density, the error from one year to another will be standard, thus density measurements can be compared statistically to determine if a significant difference exists.

For medium sized mammals, data relative to the frequency of their sign within a two meter wide swath will be collected along all permanent transect routes at least once during each season of the year (spring, fall, summer, and winter).

It is anticipated that live-trapping may be needed to verify the occurrence of some medium sized mammals. If needed 10 to 20 live-traps of suitable size will be placed along each line transect. Since ranges for medium size

mammals in these areas are variable, it would not be possible to make a density estimate of number of animals per unit area.

Line transects for medium sized mammals will extend for 0.8 kilometer (800 meters). In the instance of small mammal traps, their sample area is believed to cover a radius of 5 to 7.5 meters from the trap station depending on vegetation cover; for transects using either 10 or 15 meter spacing, each 100 meter length totals either 0.1 hectare or 0.15 hectare, respectively. Sample area per each 100 meter length of transect for medium sized mammals totals 0.02 hectare. Statistical comparisons of use by small and medium sized mammal of habitats adjacent to mine facilities will be made for each successive 100 meter lengths of transect. Detailed discussions concerning methodology can be reviewed in Appendix B.

It is important to note that no attempt will be made by this study to determine the response, if any, of bats and myotis to any activities associated with coal mining.

Mule Deer and Rocky Mountain Elk

Use by mule deer and/or Rocky Mountain Elk of habitats proximal to selected disturbances will be monitored along all of the permanent transects routes. Counts of pellet groups and documentation of the frequency of tracks by these big game species will be the mthods

employed for monitoring of big game use. Each line transect for monitoring of big game will extend for 1.5 kilometers (1500 meters). The standard sample site for counting of pellet groups or documentation of the frequency of deer and/or elk tracks will be a permanently marked circular plot, ten square meters in size (1.78 m radius); 25 plots are to be evenly spaced along each 250 meter segment of line transect (center of each plot will be 10 m apart). This will allow for six sampling units along every line transect at each mine project.

Each plot is to be swept clean of all pellet groups and tracks when established and again each time they are monitored.

On winter ranges, pellet groups are to be counted in the spring immediately after big game move onto summer ranges. Pellet group transects on summer ranges are to be monitored once each month from May through September each year. This frequency of monitoring is necessary since domestic sheep will likely utilize transects on the summer range for a short period and their use needs to be deleted from the study.

Track counts on summer range will be made once every month on all transects from May through September each year. On winter range, track counts will be made once every month on all transects from November through April each year. It is recognized that track counts will not

account for all deer and/or elk passage across transect lines, but they will be relative to use during the few days immediately preceeding a monitoring period. This will reduce most effects from the researcher's presence.

Statistical comparisons of use by big game animals of habitats adjacent to selected mine facilities will be made for each successive 250 meter lengths of transect in order to determine their response to mining activities. Detailed discussions concerning methodology can be reviewed in Appendix B.

Big game reaction to coal conveyor systems at passage points will be monitored by remote sensing cameras. Approaches and behavior near conveyor belts will be recorded on film. This will be correlated to times when the conveyor is in operation to determine if there is any difference in behavior when conveyors are moving or at rest. This evaluation will be subjective.

Vegetation Measurements

Vegetation parameters on each study area will be determined through the methodology utilized by the Soil Conservation Service (National Range Handbook, revised July 13, 1976, United States Department of Agriculture, Soil Conservation Service). This method involves taking random measurements of vegetation using a circular hoop of 9.6 square

feet. The characteristics of vegetation measured include composition, density, percent cover and estimates of annual plant production. This information will be utilized to compare control sites with experimental sites for all line transects.

SCHEDULE OF REPORT PREPARATION

November 1979	Initiation of Project
November 1979 - Completion of Project	Monthly Reports
March 1980	Progress Report
March - Each Year	Annual Report on Research Activities
January - Following Five Years of Study	Completion Report

Monthly Reports

Monthly reports will be sent to all project sponsors at the end of each month and will consist of a one-page summary of each month's activities, problems encountered, if any, and objectives for the next month.

Annual Reports

Annual reports will contain a complete description of all research activities and findings for each calendar year and will be distributed to project sponsors in March of the succeeding year. Each successive annual report will incorporate data from prior reports.

Completion Report

The completion report will be a final summary for five years of research findings and resulting management recommendations. It will incorporate the last year's annual report and will be completed by January 31.

QUALIFICATIONS

Statutory Authority

The Division of Wildlife Resources is the legal wildlife authority for the state of Utah and is charged with the duty to protect, propagate, manage, conserve and distribute protected wildlife throughout the state. As the appointed trustee and custodian of Utah's wildlife, the Division has the authority to initiate both civil and criminal proceedings or any other appropriate action or remedies necessary to safeguard the wildlife resource.

Sections 23-14-14 and 23-22-1 of Utah's Wildlife Code authorizes the Division to accept grants or gifts of money for the benefit of the wildlife resource and to enter into cooperative agreements with public or private organizations for purposes of wildlife conservation.

Supervision and Personnel

The Division's responsibility for reviewing and providing input into developments affecting wildlife was recently concentrated in a Resource Analysis Section, which became fully operational early in 1978. The goal of the Resource Analysis section is to increase the Division's effectiveness and efficiency in protecting wildlife habitat by improving intradivisional and interagency coordination on environmental affairs. Accomplishment of this goal will result from placing greater emphasis on active rather than reactive Division involvement in the land use planning and environment assessment processes of other governmental and private entities. Among

other things, the Resource Analysis section is responsible for preparing a baseline inventory of fish and wildlife resources and for conducting site specific wildlife inventories required to assess impacts.

The state is divided into five regions for administrative purposes with this proposal originating from the Southeastern Regional Office located in Price. Supervision for the proposed research study will be at the regional level. Field personnel (one resource biologist and three biological aids) will receive direction from the Southeastern Regional Resource Analyst. Regional staff members, which includes the Resource Analyst, are directly responsible to the Regional Supervisor, who receives administrative supervision from the Division's Director. The Director maintains a support staff at the state level; but regional supervisors are the key line officers, with their regional staff members serving as specialists in either game, fisheries, resource analysis, or law enforcement.

Personnel assigned to this project and their qualifications are as follows:

SOUTHEASTERN REGIONAL RESOURCE ANALYST, LARRY B. DALTON

Home Address: 13 South 4th Avenue
Helper, Utah 84526

Date of Birth: June 21, 1947

EDUCATION

Attended elementary school in Tooele, Utah. Graduated from Utah's Murray High School in 1965. Received Bachelor of Science degree from Utah State University with a major in wildlife management and a minor in zoology, 1972. Completed requirements for the Master of Science degree, specializing in wildlife science,

at Utah State University in 1976.

PROFESSIONAL EXPERIENCE

July through December, 1971, wildlife conservation officer trainee, Colorado Game, Fish and Parks; 1972-1973, biological aid, Utah Division of Wildlife Resources; 1973-1974, assistant waterfowl superintendent at Ogden Bay Waterfowl Management Area, Utah Division of Wildlife Resources; 1974-1976, waterfowl biologist and superintendent at Desert Lake Waterfowl Management Area, Utah Division of Wildlife Resources; 1976-1978, wildlife and environmental biologist, Southeastern Region, Utah Division of Wildlife Resources; 1978 to present, regional resource analyst, Southeastern Region, Utah Division of Wildlife Resources.

PUBLICATIONS

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Dalton, L. B. 1979. Impacts on Wildlife From Energy Related Growth, and Other Developments. Utah State Division of Wildlife Resources. Unpublished, mimeographed report. 20 pp.

PROFESSIONAL ORGANIZATIONS

Chairman, Carbon-Emery Chapter of Ducks Unlimited
Vice-Chairman, 1978, Desert Bighorn Council
Member, Desert Bighorn Council
Member, Utah Chapter - The Wildlife Society

MINIMUM REQUIREMENTS AND GENERAL DUTIES FOR THE RESOURCE BIOLOGIST

At least a Bachelor of Science degree from an accredited university in the area of biological science with an emphasis on aquatic and terrestrial ecology.

Duty station will be Price, Utah. Any travel associated with the research task will involve staying in motels or campout and the Resource

Biologist will be reimbursed as per the state travel regulations. A vehicle for official use only will be provided.

The Resource Biologist (grade 17-2) will function as a team leader and will participate with the three biological aids in collecting and summarizing data. Employment would be full time via an annual contract and could last the duration of the research project dependant upon employee performance. After one year of satisfactory performance, the Resource biologist could be upgraded to a grade 19 biologist. Since this position is to be contracted, normal benefits provided full time state employees would not be provided.

MIMIMUM REQUIREMENTS AND GENERAL DUTIES FOR BIOLOGICAL AIDS

At least two year's training in Biological or Environmental Sciences at an accredited university with emphasis in aquatic and terrestrial ecology will be required for employment. An ability to prepare written, technical reports will be demanded.

Duty station will be Price, Utah. Any travel associated with the research task will involve staying in motels or campout and the Biological Aid will be reimbursed as per the state travel regulations. A vehicle for official use only will be provided.

The three Biological Aids (grade 11-4) will function in a team effort as field biologists collecting and summarizing data. Employment would be via a contract for six months beginning April 1 and ending September 30, each year.

COST PROPOSAL TO STUDY EFFECTS OF COAL DEVELOPMENT ON WILDLIFE IN SOUTHEASTERN UTAH

FISCAL YEAR- October 1 to September 30

	1980	1981	1982	1983	1984	1985[4]	Total
Personnel Services[1]	$41,121.60	$45,497.64[5]	$48,682.47	$52,090.24	$55,736.56	$16,540.62	$259,669.13
Travel[1]	575.00	615.25	658.32	704.40	753.71	375.00	3,681.68
Current Expenses[1]	5,466.00	5,848.62	6,258.02	6,696.08	7,164.81	1,000.00	32,433.53
Capital Outlay	15,552.00	500.00[2]	500.00[2]	500.00[2]	500.00[2]	0	17,552.00
TOTAL[3]	$62,714.60	$52,461.51	$56,098.81	$59,990.72	$64,155.08	$17,915.62	$313,336.34

[1]Includes a 7 percent annual rate of inflation over each previous year's cost.

[2]If needed for equipment.

[3]Utah Division of Wildlife Resources would contribute 16, 23, 23, 23, 23 and 34 percent respectively of the total budget during each succeeding year of the project.

[4]From October 1 to January 31 - Personnel (Resource Analyst @ $6,050.52 for two months; Resource Biologist @ $6,873.36 for four months; and typist @ $3,616.74 for three months--these costs include salary plus benefits), travel and office space ($83.00) and supplies for preparation of completion report and publication in a scientific journal.

[5]Includes advancement (salary plus benefits plus inflationary factor) of Resource Biologist from Grade 17-2 @ $1,036.00/month to Grade 19-2 @ $1,145.00/month.

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APPENDICES

for

Study Proposal

To Determine

Effects of Coal Development on Wildlife
In Southeastern Utah

APPENDIX A

BACKGROUND METHODOLOGY FOR MONITORING AVIAN POPULATIONS

For most passarine species, the traditional method for calculating densities has been spot mapping of territorial males on a square or rectangular-shaped grid, which covers a certain amount of land area. During the last decade the transect method has become widely used because it is quicker, can sample larger areas and can be used throughout the year - not just during breeding season.

The best known transect method for avian censusing is the Emlen method which involves traversing a specific distance and recording all bird observations and their lateral distance from the line of travel. Some birds are more easily detected than others due to coloration, size, vocalization or behavior. Thus, Emlen (1971) developed a "co-efficient of detectability", which is based on the lateral distance the observer feels he detects all members of a species. This lateral distance evolves naturally from field data where the number of observations begins to noticeably decline. The co-efficient of detectability is different for each species and may change with time of year or vegetation type. Emlen used this co-efficient of detectability to calculate the number of birds in a belt 412 feet on either side of a transect route; transect measurements are readily converted into acres and modification of the belt width to meters allows easy conversion to hectares.

Emlen (1977) later revised his method to bypass the co-efficient of detectability and to better account for non-detectable birds (usually females) during breeding season. During non-breeding season, all cues (sightings, calls, etc.) are used to calculate density based on the width of the lateral strip in which the observer feels nearly all birds were detected. During breeding season, the revised method uses only cues from song producing males and relies on an index of song frequency to calculate density for males. This figure is then doubled to account for females.

A variety of methods for estimating bird density were investigated by Mikol et al. (1979) in conjunction with the study of effects of strip mining on wildlife in northern Wyoming. The authors obtained density estimates by spot mapping bird communities in sagebrush and grassland. To this traditionally reliable estimate, the authors compared 11 different methods for estimating density, all based on transect lines. Methods covered ranged from one used by researchers as early as 1907 to those described in the most recent literature, including Emlen (1971) and the revised Emlen (1977).

The authors found the 1971 Emlen method more reliable than his 1977 method. Belt transects of 40, 100 and 200 m wide, and techniques used by Balph, Frye and Emlen (1971), were found to be the most acceptable methods.

Mikol et al. (1979) believes a belt transect is the easiest method to use in the field and for analyzing data but does not take into account differences in species conspicuousness. Seasonal variation in both density and conspicuousness of some species requires several visits to an area spread over the breeding season, with about 90 percent of the species present recorded in five visits and 100 percent in eight visits. Making density estimates based on a mean of several days' counts was favored, but using the maximum number recorded for any day should be considered in certain conditions.

For this study, experimental and control transects for a specific mine project will be monitored for all avifauna during the same week to avoid effects from changes in weather. Experimental sites will be surveyed early one day then sites at the control area will be visited the same day. The procedure will be reversed the second day, with the control area being visited first and the experimental sites second. This will compensate for the effects of variations in daily avian activity.

During the breeding season, permanent transects at each mine project will be measured for avian density for all species other than raptors and upland or migratory game birds using Emlen's 1971 method on two consecutive days with a periodicity of about every three weeks beginning in late March and continuing through June for a total of eight visits per transect. It has been suggested (Mikol et al. 1979)

that this spread of visits will result in observation of 100 percent of the species present and account for variations in both density and conspicuousness of some species as the breeding season progresses. For these same species post breeding populations and fall migrants will be censused by Emlen transects monitored for five consecutive days during only the months of July and September.

APPENDIX B

BACKGROUND FOR MONITORING MAMMALS

Small and Medium Size Mammals

Small mammals include insectivores (shrews) and small rodents (mice, voles, chipmunks, ground squirrels). These small animals are easily over-looked, but are a vitally important part of the wildlife community. They provide prey for raptors, foxes, coyotes and other carnivores. They influence vegetation succession by eating and dispersing seeds and they modify the physical properties of surface soils. Because these mammals are restricted to small home ranges, they are affected by any environmental variations in a given area. Thus, they can be useful indicators of subtle environmental changes over long periods of time (States et al. 1978).

Studies of small mammals involve capturing animals to provide information on species composition, density estimates and other biological information. During both the months of June and August, one week will be spent at each of the study sites for small mammal censusing. This will cover the early and post breeding season. Traps will be out five days, giving four actual trap nights. All captured animals will have information taken as to species, weight, sex, age class (adult or juvenile), and reproductive condition. Each trap will be numbered beginning at the site of disturbnace, so that the exact location of each captured animal can be recorded.

Two basic methods are available for calculating density of small mammals--removal trapping and mark-recapture (Hayne 1949). Removal trapping is dependent on the first day's catch being largest, with each successive day's catch showing a decline in number. Linear regression is then used to predict the point at which all mammals would be caught giving the total number in the population. In mark-recapture, every animal caught is marked with a dye or by toe clipping and released. Since more and more animals are marked on successive days, the proportion of marked animals in the population increases. Calculations of density are based on these changes in proportion. Assumptions common to both methods are that no immigration or emigration occurs in the area being sampled and that the probability of capture remains the same, i.e. individuals do not become "trap-happy" or one species does not become more active as members of another dominant species are removed.

For this study, the mark-recapture method will be used, since the same area will be trapped during early and post breeding seasons and during successive years. The removal method would be inappropriate.

Estimates of small mammal population densities from "mark-recapture" data will be derived from the modified Peterson-Lincoln model described by Hayne (1949) and other earlier researchers (Schumacher and Eschmeyer 1943 as cited by Caughley 1977).

Ninety-five percent confidence intervals will be provided for each density figure. Density estimates and confidence are to be computed as follows:

$$\hat{N} = \sum M^2 n / \sum Mx$$

$$\hat{V} = \frac{1}{-1}\left[\sum\left(\frac{x^2}{n}\right) - \left(\frac{\left(\sum Mx\right)^2}{\sum nM^2}\right)\right]$$

$$SE = \pm\sqrt{\frac{(\hat{N})^3\,\hat{V}}{\sum Mx}}$$

$$CI = \hat{N} \pm \left[2\ (SE)\right]$$

Where:

N = population estimate.
n = sample size.
M = total number previously marked in the population.
p = number of sample periods.
x = number of recaptures.
V = variance.
SE = standard error.
CI = confidence intervals.

Because of the many biases affecting rodent density estimates and data needs of complex population formulae, the Effective Trap Night (ETN) may be used in developing indicies for expressing relative abundance and in making comparisons of populations. ETN's are the gross trap nights minus the number of traps sprung and containing no animals or containing only recaptures. ETN indicies can be expressed as the number of effective trap nights per capture or individuals captured per effective trap night as a percentage.

Censusing methods for medium size mammals are quite variable and are generally different for each species. Considerable manpower and equipment is needed for a thorough study of any wide-ranging mammal species. Therefore, this study will not attempt procedures for making density estimates for medium size mammals, but will identify through trapping, if needed, and observation of sign what species inhabit the study sites and determine their frequency of use of habitats surrounding disturbed sites season by season and from year to year.

Mule Deer and Rocky Mountain Elk

Mule deer and Rocky Mountain elk are some of Utah's most economically important species, not only to the state due to hunting license revenues, but to numerous businesses that supply hunting and recreational equipment. The proposed mine projects for study will occupy either summer or winter range for big game as follows:

Eureka Energy Company	Deer Winter Range
Coastal States Energy Company	Deer and Elk Summer Range
Canyon Fuels Company	Elk Winter Range

Summer range represents the use area normally inhabited during the months of May through October. It is in this habitat use area that young animals are produced and reared (due to the artificial response of big game to hunters during October, no measurements of big game use will be made during this month). Winter range is the use area that deer and elk are normally forced to inhabit due to deep snow conditions on other portions of their range during the months of November through April.

This habitat use area is quite often the most limiting of factors that influence carrying capacity of the entire big game range.

Counts of pellet groups and tracks are traditional and accepted methods for monitoring big game on a habitat use area. The fecal droppings from big game ungulates are distinct for each species and resemble a group of pellets (winter) or layered biscuits (summer). Transect routes are walked and the presence or absence of pellet groups and tracks is recorded for each sample plot. Assuming the area that falls within the circular plots receives the same usage by deer and elk as the surrounding area, the data can be used to evaluate deer and/or elk use along transect routes as they extend out away from disturbance sites. After each plot is inspected, it will be swept clean of pellet groups and tracks to avoid counting them the next time the transect is monitored.

In instances where there is a need for data concerning big game migration paths and their relationship to barriers that would be created by the mining project, appropriate data will be collected. These data should only need to be recorded during one year of "normal weather conditions". A second year of evaluation would be needed if the year selected for observation provided abnormal climatic conditions. The process for data collection would involve monitoring of tracks along the proposed barrier route when big game would be crossing the barrier (biweekly on summer range and daily on winter range). It is likely that collection of these data may necessitate additional funding beyond the scope of the research proposal.

APPENDIX C

TABLE OF CONTENTS FOR FINAL REPORT

APPENDIX D

DETAILED ANALYSIS OF COST PROPOSAL TO STUDY EFFECTS OF COAL DEVELOPMENT ON WILDLIFE IN SOUTHEASTERN UTAH

Employee Wages and Benefits

Resource Analyst, Grade 23-8 @$1,768.00/month for 4 months.	$ 7,072.00*
Resource Biologist, Grade 17-2 @$1,036.00/month for 12 months.	12,432.00
Three Biological Aides, Grade 11-4 @$787.00/month for 6 months each.	14,166.00
One typist, Grade 12-1 @$754.00/month for 5 months.	3,770.00
Permanent Employee Benefits at 22% for: Resource Analyst for 4 months = $1,555.84	1,555.84*
Temporary Employee Benefits at 7% for: Resource Biologist (contracted) for 12 months = $870.24	2,125.76

Three Biological Aides for 6 months each = $991.62

Typist for 5 months = $263.90

TOTAL EMPLOYEE WAGES AND BENEFITS	$41,121.60

Travel

Instate Travel - 10 days @$37.50 per day.	$375.00
Out-of-State Travel - 5 days @$40.00 per day	200.00
TRAVEL TOTAL	$575.00

Current Expenses

Communication Services (telephone)	$200.00
Postage and Mailing	50.00
Professional and Technical Services (Data Processing $100, Consultant and Computer $500)	600.00
Rental Office Space - 10' x 20' @$1.25/sq.ft./year	250.00*
Motor Vehicle Operating Supplies and Maintenance One 4 x 4 vehicle for Resource Biologist - 14,400 miles per year at $.19/mile	2,736.00

Other Equipment Operation	200.00
Household, Laundry and Janitorial Supplies One sleeping bag, camp stove, lantern and ice chest for the Resource Biologist	125.00
Office Supplies	225.00
Books	150.00
Clothing and Uniforms Uniforms for the Resource Biologist ($240) for three Biological Aides at $30.00 each ($90)	330.00
Food (campout)	250.00
Photographic Supplies	150.00
Small Tools and Instruments	200.00
TOTAL CURRENT EXPENSES	$5,466.00

Capital Outlay

Educational Equipment One 35 mm Cannon camera w/1.5,55 mm lens	$ 300.00
Medical, Surgical and Laboratory Equipment One spotting scope ($190) and one pair of binoculars ($110) for Resource Biologist. One pair of binoculars ($110) for each Biological Aides.	6,120.00

Two remote sensing cameras @$750.00 each ($1,500)

Small Mammal Trapping Equipment: 550 Sherman live traps @$5.00 each ($3,250) and 80 Tomahawk live traps @$12.00 ($960)

Note: Utah Division of Wildlife Resources will provide 200 Sherman traps and 6 Tomahawk traps for this study in order to provide for transects using 800 traps. Their value is $1,072.

Office Furniture and Equipment One Victor Medalist 210 calculator	160.00

New Blazer or similar type vehicle, 3/4 ton, short wheelbase, 4 x 4	7,900.00
TOTAL CAPITAL OUTLAY	$15,552.00
GRAND TOTAL	$62,714.60

*Monies ($9,949.84) committed to the study by Utah Division of Wildlife Resources--this amounts to 16 percent of the first year's annual budget.

APPENDIX E

COORDINATION MEETINGS

Meeting Location

Utah Division of Wildlife Resources Southeastern Regional office at 455 West Railroad Avenue in Price, Utah.

Project Initiation - October, 1979

Meeting for Project Start-Up - Last week in November, 1979

Representatives of all sponsoring agencies will meet to discuss·

Concerns related to the execution of proposed research activities.
Selection of control sites.
Implications of project's research objectives to their management needs.
Need for future meetings.

Meetings During Study - As Needed

One to three informal meetings will be scheduled during the five-year study period if needed.

Occurrences which may necessitate meetings might include:

A major change in land use at a study area or control site.
Budget problems brought on by unforseen events.
A major change in policy direction of one of the project's sponsors.

Meeting for Project Completion - Second Week in January, Following Five-Years of Study

This meeting will provide project sponsors with the opportunity to review and make suggestions on a draft of final completion report.

APPENDIX F

WORK PLAN FOR CANYON FUEL COMPANY PROJECT

Month	WEEK 1	2	3	4
October		Layout and Maintenance of Transects Update Literature Review Assimilate Data		Update Literature Review Assimilate Data
November		Monitor (fall) Medium Sized Mammals Monitor Big Game Transects (Tracks)		Monitor Big Game Transects (Tracks)
December	Monitor Big Game Transects (Tracks)		Assimilate Data	Vacation Resource Biologist
January		Monitor (winter) Medium Sized Mammals Monitor Big Game Transects (Tracks)		Assimilate Data
February	Monitor Big Game Transects (Tracks)		Assimilate Data	

APPENDIX F

WORK PLAN FOR CANYON FUEL COMPANY PROJECT

Month	WEEK 1	2	3	4
March	Monitor Big Game Transects (tracks)		Assimilate Data	
April	Two Day Emlen Transects Monitor Big Game Transects (Tracks) Raptor Survey			Two Day Emlen Transects Monitor (spring) Medium Sized Mammals Raptor Survey
May		Monitor Big Game Transect (winter pellet) Two Day Emlen Transects Raptor Survey		
June		Two Day Emlen Transects Mammal Trapping		Reptile and Amphibian Survey Raptor Survey
July		Emlen Transects (5 day) Road Mortality (Herpetologic) Monitor (summer) Medium Sized Mammals		Vacation for All Field Personnel
August		Mammal Trapping		Reptile and Amphibian Survey
September		Emlen Transects (5 day) Vegetation Survey		

APPEN. F

WORK PLAN FOR COASTAL STATES ENERGY COMPANY PROJECT

Month	WEEK 1	2	3	4
October	Layout and Maintenance of Transects Update Literature Review Assimilate Data			Update Literature Review Assimilate Data
November	Monitor (fall) Medium Sized Mammals			
December			Assimilate Data	Vacation Resource Biologist
January	Monitor (winter) Medium Sized Mammals			Assimilate Data
February			Assimilate Data	

APPENDIX F

WORK PLAN FOR COASTAL STATES ENERGY COMPANY PROJECT

Month	WEEK 1	2	3	4
March			Assimilate Data	
April		Two Day Emlen Transects Monitor (spring) Medium Sized Mammals Raptor Survey		
May			Monitor Big Game Transects (pellet and track) Two Day Emlen Transects	Two Day Emlen Transects Raptor Survey
June			Monitor Big Game Transects (pellet and track) Two Day Emlen Transects Mammal Trapping	Reptile and Amphibian Survey Raptor Survey
July			Monitor Big Game Transects (pellet and track) Emlen Transects (5 day) Road Mortality (Herpetologic) Monitor (summer) Medium Sized Mammals	Vacation all Field Personnel
August			Monitor Big Game Transects (pellet and Track) Mammal Trapping	Reptile and Amphibian Survey
September			Monitor Big Game Transects (pellets and track) Emlen Transects (5 day)	Vegetation Survey

APPENDL

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT

Month	WEEK 1	2	3	4
March		Monitor Big Game Transects (Tracks)	Assimilate Data	Two Day Emlen Transects
April			Two Day Emlen Transects Monitor (spring) Medium Sized Mammals Raptor Survey	
May	Monitor Big Game Transects (winter pellet) Two Day Emlen Transects Raptor Survey			
June	Two Day Emlen Transects Mammal Trapping			Reptile and Amphibian Survey Raptor Survey
July	Emlen Transects (5 day) Road Mortality (Herpetologic) Monitor (summer) Medium Sized Mammals			Vacation for All Field Personnel
August	Mammal Trapping			Reptile and Amphibian Survey
September	Emlen Transects (5 day) Vegetation Survey			

APPEN F

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT

Month	WEEK 1	2	3	4
October			Layout and Maintenance of Transects Update Literature Review Assimilate Data	Update Literature Review Assimilate Data
November			Monitor (fall) Medium Sized Mammals Monitor Big Game Transects (tracks)	Monitor Big Game Transects (Tracks)
December		Monitor Big Game Transects (Tracks)	Assimilate Data	Vacation Resource Biologist
January			Monitor (winter) Medium Sized Mammals Monitor Big Game Transects (Tracks)	Assimilate Data
February		Monitor Big Game Transects (tracks)	Assimilate Data	Field Training for Emlen Procedures

APPENDL

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT

Month	WEEK 1	2	3	4
March		Monitor Big Game Transects (Tracks)	Assimilate Data	Two Day Emlen Transects
April			Two Day Emlen Transects Monitor (spring) Medium Sized Mammals Raptor Survey	
May	Monitor Big Game Transects (winter pellet) Two Day Emlen Transects Raptor Survey			
June	Two Day Emlen Transects Mammal Trapping			Reptile and Amphibian Survey Raptor Survey
July	Emlen Transects (5 day) Road Mortality (Herpetologic) Monitor (summer) Medium Sized Mammals			Vacation for All Field Personnel
August	Mammal Trapping			Reptile and Amphibian Survey
September	Emlen Transects (5 day) Vegetation Survey			

APPENDIX G

Statement of Work and Cost Proposal for Phase I-a at the Eureka Energy Company Site

Utah Division of Wildlife Resources will secure and supervise a qualified Resource Biologist to conduct all work associated with the proposal. Funding of the $26,152 for Phase I-a at the Eureka Energy Company site will be a tripartite effort involving Utah Division of Wildlife Resources ($5,777), Bureau of Land Management ($10,000), and Eureka Energy Company ($10,375). Appropriate cooperative agreements or contracts will be developed for the timely transfer of funds from the Bureau of Land Management and Eureka Energy Company to the Division of Wildlife Resources. The Division of Wildlife Resources will be responsible for all project expenditures and submission of required reports to cooperators.

Work on Phase I will begin in December, 1979 and will be completed by January 31, 1981. Field work will sample the appropriate biological activities for one year between December 1, 1979 and November 30, 1980. December 1980 and January 1981 will be utilized to prepare and complete an annual report. During the interim of field work, monthly progress reports will be prepared and submitted to project cooperators prior to the 10th of the following month.

Objectives for Phase I-a are as follows:

1. Accomplish all objectives of the study proposal to determine the effects of coal development on wildlife in Southeastern Utah

between December 1, 1979, and November 30, 1980, on the Eureka Energy Company site. This amounts to collection of pre-development, baseline data along eight permanent, experimental transects and sufficient numbers of permanent, control transects.

2. Provide wildlife resource information needed for a wildlife plan for use by Eureka Energy Company in an application for a Mining and Reclamation permit for development of a coal resource. This effort shall be restricted to:

   a. Determination of corridors of mule deer movement and intensity of use in relation to a planned, overland coal conveyor belt from the Fish Creek and Dugout Canyon portals to the coal preparation and handling area (Reference, Sage Point-Dougout Canyon project, map SDL - 6.5 (e)). This data is to be evaluated and will result in written recommendations from Utah Division of Wildlife Resources concerning placement and design of big game crossing structures along the conveyor system.

   b. Identification and ranking of all habitat use areas for mule deer on the mine plan and designated adjacent areas--specific emphasis on crucial-critical use areas. (Note that all habitat use areas for mule deer on the mine plan and adjacent areas were identified to Eureka Energy Company by Utah Division of Wildlife Resources as wildlife resource information pursuant to 30 CFR, part 783.20 and transmitted on October 11, 1979, to Mr. John C. Osmond. Preferred gathering places were identified on project map SDL - 6.5 (d) as crucial-critical winter ranges for mule deer).

   c. Determine the intensity of use by mule deer of high priority and crucial-critical winter ranges on the mine plan and adjacent areas--specific emphasis on crucial-critical use areas. (Note that the 1978-79 winter was the most severe recorded for the geographic area that surrounds the mine plan and adjacent areas. Therefore, use by mule deer (herd unit 27b) of the winter range on Eureka's project area during the 1978-79 winter represented maximum use by the existing population of deer. During late April and early May of 1979, Utah Division of Wildlife Resources biologists conducted intensive measurements (920 plots to measure use through pellet group counts) of mule deer use on winter ranges at Eureka Energy Company's site. Use by mule deer in the crucial-critical area averaged

29.26 deer days use per hectare based on a sample of 700 plots; in the high-priority use area, the average was 21.35 deer days use per hectare based on a sample of 220 plots. Total deer days use of the entire winter range at Eureka's project averaged 27.42 deer days use per hectare during the 1978-79 winter. Currently the mule deer population is significantly lower than carrying capacity of the range. Based on a 10-year average of pellet group density from permanently marked transects located on high-priority winter range in herd unit 27b, deer use has averaged 38.8 deer days use per hectare. From this expected valve, statistical analysis indicated that only 761 plots needed to be evaluated to estimate deer use within ± 10 percent precision at a probability level of 95 percent--the Division estimates utilized data from 920 plots.) This task has been completed and shows 37 percent more use by mule deer of crucial-critical winter ranges over high-priority winter ranges. during a "worst case condition.") This information was transmitted to Mr. John C. Osmond in a letter dated November 29, 1979.

d. Determine numbers of raptor breeding territories and location of aerie sites within a one kilometer radius of planned surface facilities (Note this is an objective of the study proposal and is only identified as a separate work project to alleviate concerns expressed by the company.)

e. Determine winter concentration areas for bald eagles on Eureka Energy Company's site. (Note that for the last five years, Utah Division of Wildlife Resources has been collecting use area information concerning distributions of wintering bald eagles in Southeastern Utah. During this period, several studies specific to endangered wildlife, of which the bald eagle represents one species, have been conducted local to the Sage Point-Dugout Canyon project. Information transmitted to Mr. John C. Osmond as wildlife resource information pursuant to 30 CFR, part 783.20 on October 11, 1979 represents current knowledge based on considerable field efforts. Additionally, as part of the study proposal objectives, distribution of wintering bald eagles will be monitored in relation to Eureka's project.) This task has been completed and supplimentary information may result from the research study.

f. Determine if any physical evidence exists to indicate the presence of black-footed ferrets in prairie dog colonies that may be impacted by surface facilities and right-of-ways associated with the Sage Point-Dugout Canyon project. This would be accomplished by an on-the-ground search during late April and mid May.

g. Determine habitat and life requirements for the Black Swift and Western Blue Bird through a detailed literature search. This information will then be related to the situation at Eureka Energy Company's site. If suitable habitat exists on the site and company plans will impact those habitats, the presence or absence of the two species will be determined from an on-the-ground survey. (Note that this information is currently being secured due to other needs by Utah Division of Wildlife Resources in relation to unsuitability criterion No. 14 of 43 CFR.)

Cost Proposal for Phase I-a at the Eureka Energy Company Site--
December 1, 1979, through January 32, 1980

Personnel Services		$20,098.00
Resource Analyst 23-8 - Supervision for 1.3 months @ $1,768/month	2,299.00*	
Benefits 22%	506.00*	
Biologist 17-2 @ $1,036/month for 14 months	14,504.00	
Benefits 8%	1,160.00	
Typist 12-1 @ $754/month for 2 months	1,508.00	
Benefits 8%	121.00	
Travel	None	
Current Expenses		3,332.00
Motor vehicle operation @ $.18/mile for 9,900 miles	1,782.00	
Other equipment operation 20 hr. aircraft (cesna 185) @ $37.50/hour.	750.00	
Office Supplies	200.00	
Photo Supplies	150.00	
Small Tools	200.00	
Office Space	250.00*	
Capital Outlay		2,722.00
200 Sherman traps @ $5.00 ea.	1,000.00*	
Six Tomphaw traps @ $12.00 ea.	72.00*	
200 Snap traps @ $1.25 ea.	250.00*	
1973 Ford pick-up truck (1/2 ton)	1,400.00*	
Grand Total		$26,152.00

*$5,777 (22 percent) that would be committed by Utah Division of Wildlife Resources
$10,000 (38 percent) funded by Bureau of Land Management
$10,375 (40 percent) funded by Eureka Energy Company

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT
December 1, 1979 - January 31, 1981

Month	Week 1	Week 2	Week 3	Week 4
December 1979 (20 field)	Lay out transects (experimental--5 days) Monitor Big Game Transects (tracks--2 days) (air. 2 hrs.)	Lay out transects (exp. 5 days) Monitor Big Game Transects (tracks--2 days) (aircraft - 1 hr.)	Monitor Big Game Transects (tracks--3 days) Layout Transects (control 3 days) (aircraft - 1 hr.)	Compensatory Time Resource Biologist
January 1980 (8 office) (14 Field)	Monitor Big Game transects (tracks--3 days) (aircraft--1 hr.)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (2 days)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Monitor(2d) (winter) Medium Sized Mammals Office (4 days)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.)
February 1980 (6 Office) (13 Field)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (3 days)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (1 day)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (1 day)	Monitor Big Game Transects (tracks--3 d) (air - 1 hr.) Raptor Survey (territories--1 day) Office (1 day)
March 1980 (6 Office) (15 Field)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (2 days)	Monitor Big Game Transects (tracks--3 d) (air - 1 hr.) Raptor Survey (Territories--1 day) Office (1 day)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (2 days)	Monitor Big Game Transects (tracks--3 d) (aircraft - 1 hr) 2-day Emlen Transects Office (1 day)
April 1980 (5 Office) (16 Field)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (1 day)	Monitor Big Game Transects (tracks--3 days) (aircraft - 1 hr.) Office (2 days)	Monitor (spring) Medium Si. Mammals (2 days) 2-day Emlen Transects. Raptor Survey (territories--1 day)	Monitor Big Game Transects (tracks--3 days) Survey for Evidences of black footed terrets--2 d Off. 2d
May 1980 (3 Office) (18 Field)	Monitor Big Game Transects (winter pellets and tracks--4 days) 2-day Emlen Transects Raptor Survey (Terr.--1 day)	Monitor Big Game Transects (winter pellets--3 days) Raptor Survey (Terr --1 day) Office (1 day)	Monitor Big Game Transects (winter pellets--3 days) Office (2 days)	2-day Emlen Transects Raptor Survey (Territories 2 days)
June 1980 (5 Office) (16 Field)	Concurrent 5-day mammal trapping and 2-day Emlen Transects	Survey for Evidences of black footed ferrets (5 days)	Maintenance of Transects (3 days) Office (2 days)	Reptile and Amphibian survey (2 days) Raptor Survey (territories--1 day) Office (3 days)
July 1980 (1 Office) (16 Field)	Concurrent 5-day Emlen Transects and road mortality (Herpetologic) study Monitor (summer) medium s. Mammals (2d) Office (1 day)	Vegetation Surveys (5 days)	Vegetation Surveys (4 days)	Vacation July 28, 29, 30. 31, and August 1)

CONTINUED

August 1980 (8 Office) (12 Field)	Concurrent 5-day mammal trapping and Mainten. of Transects (5 days)	Vegetation Surveys (5 days)	Office (5 days)	Reptile and Amphibian Survey (2 days)
September 1980 (12 Office) (9 Field)	Concurrent 5-day Emlen Transects and Vegetation Survey (5 days)	Vegetation Survey and clean all pellet group trans. (4 days)	Office (5 days)	Office (7 days)
October 1980 (20 Office) (12 Field)	Update Literature Review (4 days) Analyze Data (4 days)	Update Literature Review (2 days) Analyze Data (2 days)	Maintenance of Transects (2 days) Update Literature Review (1 day) Analyze Data (2 days)	Update Literature Review (1 day) Analyze Data (4 day)
November 1980 (10 Office) (8 Field)	Office (5 days)	Office (4 days)	Monitor (fall) Medium Sized Mammals (2 days) Monitor Big Game Transects (tracks--3 days)	Monitor Big Game Transects (tracks--3 days) Office (1 day)
December 1980 (14 Office) (3 Field)	Prepare Draft Report First Year's Data (5 days)	Prepare Draft Report First Year's Data (2 days) Monitor Big Game Transects (tracks--3 days)	Complete Draft Report First Year's Data (7 days)	Vacation Resource Biologist (DWR Staff Review and Cooperators Review of Draft Report)
(5 Vacation) January 1980 (16 Office) (5 Field)	Prepare Final Report First Year's Data (cooperators Complete Review of Draft Report)	Prepare Final Report First Year's Data (Incorporate Cooperators Comments) (5 days)	Monitor (winter) Med. Sized Mammals concurrent with Monitor Big Game Transects (tracks--5 days) (2-day Final Review by RA and 3-day Final Typing and Proffing)	Final Typing and Proffing Concurrent with Review by RA and Biologist 5 days)
	Field Days - 185 Office Days - 114 Vacation Days - 10			

APPENDIX H

Statement of Work and Cost Proposal for Phase I-b at the Eureka Energy Company Site

Utah Division of Wildlife Resources continues to supervise a qualified Resource Biologist to conduct all work assoicated with the proposal. Funding of the $37,374 for Phase I-b at the Eureka Energy Company site will be a Quadripartite effort involving Utah Division of Wildlife Resources ($8,930), Bureau of Land Management ($10,000), US Fish and Wildlife Service ($4,940) and Eureka Energy Company ($10,000). Note that a cooperative program between the Bureau of Land Management and Utah Division of Wildlife Resources will provide an additional $3,504 to the project in the form of YACC labor. Appropriate cooperative agreements or contracts will be developed for the timely transfer of funds from the Bureau of Land Management, US Fish and Wildlife Service and Eureka Energy Company to the Division of Wildlife Resources. The Division of Wildlife Resources will be responsible for all project expenditures and submission of required reports to cooperators.

Work on Phase I-b will begin on February 1, 1981 and will be completed by January 31, 1982. Field work will sample the appropriate biological activities for that year. The appropriate reports will also be prepared in that time frame. During the interim of field work, monthly progress reports will be prepared and submitted to project cooperators prior to the 10th of the following month.

Objectives for Phase I-b are as follows:

1. Accomplish all objectives of the study proposal to determine the effects of coal development on wildlife in Southeastern Utah between February 1, 1981, and January 31, 1982, on the Eureka Energy Company site. This amounts to collection of pre-development, baseline data along eight permanent, experimental transects and four permanent, control transects.

2. Provide wildlife resource information needed for a wildlife plan for use by Eureka Energy Company in an application for a Mining and Reclamation permit for development of a coal resource. This effort shall be restricted to:

a. Determination of corridors of mule deer movement and intensity of use in relation to a planned, overland coal conveyor belt from the Fish Creek and Dugout Canyon portals to the coal preparation and handling area (Reference, Sage Point-Dugout Canyon project, map SDL - 6.5 (e)). This data is to be evaluated and will result in written recommendations from Utah Division of Wildlife Resources concerning placement and design of big game crossing structures along the conveyor system.

   Note that data collection on this job may be initiated as early as November 1, 1980 as part of Phase 1-a and will continue only through May 15, 1981. Collection of such data is not planned for the 1981-82 winter.

Cost Proposal for Phase I-b at the Eureka Energy Company Site
February 1, 1981, through January 31, 1982

Personnel Services		$30,021.00
Resource Analyst 23-8- Supervision for 1.2 months @ $1,964/month	$ 2,357.00*	
Benefits 24%	$ 566.00*	
11% Cost of Living Increase for 58% of project (effective 7-1-81)	$ 188.00*	
Biologist 19-3 @ $1,349/month for 12 months	$16,188.00	
Benefits 24%	$ 3,885.00	
11% Cost of Living Increase for 7 months (effective 7-1-81)	$ 1,288.00	
Typist 12-1 @ $853/month for 2 months	$ 1,706.00*	
Benefits 24%	$ 409.00*	
11% Cost of Living Increase for 100% of project (effective 7-1-81)	$ 232.00*	
Two YACC Workers @ $584/month for 3 months each	$ 3,504.00**	
Benefits	None	
Current Expenses		$ 3,829.00
Motor vehicle operation @ $.23/mile for 9,900 miles	$ 2,277.00	
Other equipment operation 10 hr. aircraft (Cesna 185) @ $50.00/hour	$ 500.00	
Office Supplies	$ 200.00	
Photo Supplies	$ 150.00	
Small Tools and other Field Equipment	$ 200.00	
Office Space	$ 250.00*	
Uniform Allowance for Resource Biologist	$ 252.00	
Capital Outlay		$ 3,222.00
300 Sherman traps @ $5.00 ea.	$ 1,500.00*	
Six Tomphaw traps @ $12.00 ea.	$ 72.00*	
200 Snap traps @ $1.25 ea.	$ 250.00*	
1973 Ford pick-up truck (1/2 ton)	$ 1,400.00*	
Grand Total		$37,374.00

*$8,930 (24 percent) that would be committed by Utah Division of Wildlife Resources
$10,000 (27 percent) funded by Bureau of Land Management
$10,000 (27 percent) funded by Eureka Energy Company
$4,940 (13 percent) funded by US Fish and Wildlife Service
**$3,504 (9 percent) funded by YACC Program with BLM and DWR

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT
February 1, 1981 - January 31, 1982

Month	Week 1	Week 2	Week 3	Week 4
February 1981 (3 Office) (15 Field)	Monitor conveyor belt (2 days) office (1 day). Monitor Big Game transects (2 days) (Aircraft 2 hours)	Monitor conveyor belt (2 days) Monitor Big Game transects (1 day) office (1 day) (Holiday 1-day)	Monitor conveyor belt (2 days) Monitor Big Game transects (2 days) (Holiday 1-day) (Aircraft 2 hours)	Monitor conveyor belt (2 days)Monitor Big Game transects (1 day) Raptor Survey (1 day) office (1 day)
March 1981 (6 Office) (16 Field)	Monitor conveyor belt (2 days) Monitor Big Game transects (3 days) (Aircraft 2 hours) office (1 day)	Monitor conveyor belt (2-D) Monitor Big Game transects (1 day) Raptor Survey (1-D) office (2 days)	Monitor conveyor belt (2-D) Monitor Big Game transects (2-D) (Aircraft 2-hours) office (1 day)	Monitor conveyor belt (2-D)Concurrent Big Game transects and Emilen transects (1-D) office (2 days)
April 1981 (4 Office) (17 Field)	Monitor conveyor belt (2-D) Concurrent Big Game, medium mammals & Emilens (2-D) (Aircraft 2 hours) office (1 day)	Monitor conveyor belt (2-D) Concurrent Big Game, medium mammals & Emilen (2 days) office (1 day)	Monitor conveyor belt (2-D) Concurrent Big Game, medium mammals & Emilens (2 days) Raptor Survey (1 day) office (1 day)	Monitor conveyor belt (2-D) Concurrent Big Game, medium mammals & Emilens (2-D) office (1 day) Holiday (1-D)
May 1981 (3 Office) (17 Field)	Monitor conveyor belt (2-D) Concurrent Big Game & Emlen transects (2-D) Raptor Survey (1-D) office (1 day)	Monitor conveyor belt (2-D) Concurrent Big Game & Emlen transects (2-D) Raptor Survey (1 day)	Monitor conveyor belt (2-D) Concurrent Big Game & Emlen transects (1 day) Raptor Survey (1-day) office (1-D)	Monitor conveyor belt (2-D) Concurrent Big Game & Emlen transects (1-D) office (1 day) (Holiday 1 day)
June 1981 (1 Office) (21 Field)	Concurrent mammal trapping & Emlen transects (5 days)	Concurrent mammal trapping & Emlen transects (5 days)	Concurrent mammal trapping & Emlen transects (5 days)	Concurrent mammal trapping & Emlen transects. (5 days)Raptor Survey (1-D)office (1 day)
July 1981 (1 Office) (15 Field) (5 Vacation)	Concurrent (5 day)Emlen transects Herpetologic road mortality survey, medium mammals, reptile& Amphibian survey & Big Game pellets(Holiday 1-D)	Concurrent (5 day) Emlens, Reptile & Amphibian survey, medium mammals, & Big Game pellets.	Concurrent (5 day) Emlens, Reptile & Amphibian survey, medium mammals, & Big Game pellets. Holiday (1 day)	Vacation Resource Biologist (5 days) office (1 day)
August 1981 (1 Office) (20 Field)	Concurrent mammal trapping Emlen transects & Reptile & Amphibian surveys (5 days)	Concurrent mammal trapping Emlen transects & Reptile & Amphibian surveys. (5 days)	Concurrent mammal trapping Emlen transects & Amphibian surveys (5 days)	Concurrent mammal trapping Emlen transects & Amphibian surveys (5 days) office (1 day)

Continued

Month	Week 1	Week 2	Week 3	Week 4
September 1981 (11 Office) (10 Field)	Concurrent Emlen transects & Vegitation surveys (5 days) (Holiday 1 day)	Concurrent Emlen transects & Vegitation surveys. (5 days)	Office (5 days)	Office (6 days)
October 1981 (17 Office) (4 Field)	Update Literature Review (2 days) Analyze data (1-D) Maintenance of transects (2 days)	Update Literature Review (3 days) Analyze data (2 days) Holiday (1 day)	Update Literature Review (2 days) Analyze data (1 day) Maintenance of transects (2 days)	Update Literature Review (3 days) Analyze data (3-D)
November 1981 (11 Office) (8 Field)	Concurrent Big Game & medium mammal transects (2 days) office (3 days)	Concurrent Big Game & medium mammal transects (2-D) Office (3 days) (Holiday 1 Day)	Concurrent Big Game & medium mammal transects (2 days) office (3 days)	Concurrent Big Game & medium mammal transects (2 days) office (2 days) (Holiday 1 day)
December 1981 (9 Office) (8 Field) (5 Vacation)	Monitor Big Game transects (3 days) Prepare draft report second years data (3 days)	Monitor Big Game transects (3 days) Prepare draft report second years data (3 days)	Monitor Big Game transects (2 days) Complete draft report second years data (3 days)	Vacation Resource Biologist (DWR Staff review & cooperators review of draft report) (5 days) (Holiday 1 day)
January 1982 (12 Office) (8 Field)	Concurrent Big Game & medium mammals (2-D) Prepare final report second years data (cooperators complete review of draft report) (3 days)	Concurrent Big Game and medium mammals (2 days) Prepare final report second years data (incorporate cooperators comments) (3 days)	Concurrent Big Game and medium mammals (2 days) Review by R. A. & Biologist final typing & proofing (3 days)	Concurrent Big Game & medium mammals (2 days) Final typing & proofing by R. A. & Biologist (3 days)

Office Days	79
Field Days	159
Vacation Days	10

APPENDIX I

Statement of Work and Cost Proposal for Phase I-c at the Eureka Energy Company Site

Utah Division of Wildlife Resources continues to supervise a qualified Wildlife Biologist to conduct all work associated with the proposal. Funding of the $34,279 for Phase I-c at the Eureka Energy Company site will be a Quadripartite effort involving Utah Division of Wildlife Resources ($9,279), Bureau of Land Management ($10,000), U.S. Fish and Wildlife Service ($5,000) and Eureka Energy Company ($10,000). Appropriate cooperative agreements or contracts will be developed for the timely transfer of funds from the Bureau of Land Management, U.S. Fish and Wildlife Service and Eureka Energy Company to the Division of Wildlife Resources. The Division of Wildlife Resources will be responsible for all project expenditures and submission of required reports to cooperators.

Work on Phase I-c will begin on February 1, 1982 and will be completed by January 31, 1983. Field work will sample the appropriate biological activities for that year. The appropriate reports will also be prepared in that time frame. During the interim of field work, monthly progress reports will be prepared and submitted to project cooperators prior to the 10th of the following month.

Objectives for Phase I-c are as follows:

1. Accomplish all objectives of the study proposal to determine the "Effects of Coal Development on Wildlife in Southeastern Utah" between February 1, 1982 and January 31, 1983 on the Eureka Energy Company site. This amounts to collection of predevelopment data along eight permanent, experimental transects and four permanent, control transects.

Cost Proposal for Phase I-c at the Eureka Energy Company Site
February 1, 1982, through January 31, 1983

Personnel Services		$ 26,939.00
Resource Analyst 23-8 - Supervision for 1.2 months @ $2,044/month	$ 2,453.00*	
Benefits 24%	$ 589.00*	
11% Cost of living increase for 58% of project (effective 7-1-82)	$ 194.00*	
Biologist 19-2 @ $1,322/month for 9 months	$ 11,898.00	
Benefits 24%	$ 2,856.00	
11% Cost of living increase for 4 months (effective 7-1-82)	$ 721.00	
Biologist 19-3 @ $1,370/month for 3 months effective 11-2-82)	$ 4,110.00	
Benefits 24%	$ 986.00	
11% Cost of living increase	$ 561.00	
Typist 12-3 @ $934/month for 2 months	$ 1,868.00*	
Benefits 24%	$ 448.00*	
11% Cost of living increase for 100% of project (effective 7-1-82)	$ 255.00*	
Current Expenses		$ 4,118.00
Motor vehicle operation @ $.28/mile for 10,467 miles	$ 2,931.00	
Other equipment operation 3 hr. aircraft (Cesna 185) @ $45.00/hour	$ 135.00	
Office Supplies	$ 200.00	
Photo Supplies	$ 150.00	
Small Tools and other Field Equipment	$ 200.00	
Office Space	$ 250.00*	
Uniform Allowance for Biologist	$ 252.00	
Capital Outlay		$ 3,222.00
300 Sherman traps @ $5.00 each	$ 1,500.00*	
Six Tomahawk traps @ $12.00 each	$ 72.00*	
200 Snap traps @ $1.25 each	$ 250.00*	
1973 Ford pick-up truck (1/2 ton)	$ 1,400.00*	
Grand Total		$ 34,279.00

* $9,279 (27 percent) that would be committed by Utah Division of Wildlife Resources
$10,000 (29 percent) funded by Bureau of Land Management
$10,000 (29 percent) funded by Eureka Energy Company
$5,000 (15 percent) funded by U.S. Fish and Wildlife Service

WORK PLAN FOR EUREKA ENERGY COMPANY PROJECT
February 1, 1982 - January 31, 1983

Month	Week 1	Week 2	Week 3	Week 4
February 1982 (4 office) (14 field)	Monitor big game transects (4 days) Analyze data (1 day)	Monitor big game transects (3 days) (Holiday 1 day) Analyze data (1 day)	Monitor big game transects (3 days) (Holiday 1 day) (Aircraft 1 hour) Analyze data (1 day)	Monitor big game transects (2 days) Raptor survey (2 days) Analyze data (1 day)
March 1982 (5 office) (18 field)	Monitor big game transects (4 days) Analyze data (1 day)	Monitor big game transects (3 days) Raptor survey (2 days) Analyze data (1 day)	Monitor big game transects (4 days) Aircraft (1 hour) Analyze data (2 days)	Concurrent big game transects and Emlen transects (5 days) Analyze data (1 day)
April 1982 (4 office) (18 field)	Concurrent big game, medium mammals & Emlen (5 days) Aircraft (1 hour) Analyze data (1 day)	Concurrent big game, medium mammals & Emlen (5 days) Analyze data (1 day)	Concurrent big game, medium mammals & Emlen (3 days) Raptor survey (2 days)	Concurrent big game, medium mammals & Emlen (3 days) Analyze data (2 days)
May 1982 (1 office) (18 field)	Concurrent big game & Emlen transects (3 days) Raptor survey (1 day) Analyze data (1 day)	Concurrent big game & Emlen transects (4 days) Raptor survey (1 day)	Concurrent big game & Emlen transects (3 days) Raptor survey (1 day) Analyze data (1 day)	Concurrent big game & Emlen transects (5 days) (Holiday 1 day)
June 1982 (1 office) (21 field)	Concurrent mammal trapping & Emlen transects (5 days)	Concurrent mammal trapping & Emlen transects (5 days)	Concurrent mammal trapping & Emlen transects (5 days) Raptor survey (1 day)	Concurrent mammal trapping & Emlen transects (5 days) Analyze data (1 day)
July 1982 (5 office) (15 field)	Concurrent (5 days) Emlen transects Herpetologic road mortality survey, medium mammals, reptile & amphibian survey & big game pellets (Holiday 1 day)	Concurrent (5 days) Emlens, reptile & amphibian survey, medium mammals & big game pellets	Concurrent (5 days) Emlens, reptile & amphibian survey, medium mammals & big game pellets Holiday (1 day)	Office (5 days)
August 1982 (2 office) (20 field)	Concurrent mammal trapping Emlen transects & reptile & amphibian surveys (5 days)	Concurrent mammal trapping Emlen transects & reptile & amphibian surveys. (5 days)	Concurrent mammal trapping Emlen transects, reptile & amphibian surveys (5 days)	Concurrent mammal trapping Emlen transects & amphibian surveys (5 days) Office (2 days)

Continued

Month	Week 1	Week 2	Week 3	Week 4
September 1982 (2 office) (19 field)	Emlen transects (6 days) Holiday (1 day)	Emlen transects (5 days)	Emlen transects (4 days) Prepare next year's budget (1 day)	Emlen transects (4 days) Prepare next year's budget (1 day)
October 1982 (14 office) (6 field)	Update literature review (2 days) Analyze data (1 day) Maintenance of transects (2 days)	Update literature review (3 days) Holiday (1 day) Maintenance of transects (2 days)	Update literature review (2 days) Analyze data (1 day) Maintenance of transects (2 days)	Update literature review (3 days) Prepare next year's statement of work and work plan (2 days)
November 1982 (10 office) (10 field)	Concurrent big game & medium mammal transects (3 days) Prepare draft report (2 days)	Concurrent big game & medium mammal transects (3 days) Holiday (1 day) Prepare draft report (2 days)	Concurrent big game & medium mammal transects (2 days) Prepare draft report (3 days)	Concurrent big game & medium mammal transects (2 days) Holiday (1 day) Prepare draft report (3 days)
December 1982 (14 office) (8 field)	Monitor big game transects (3 days) Prepare draft report third year's data (3 days)	Monitor big game transects (3 days) Prepare draft report third year's data (3 days)	Monitor big game transects (2 days) Complete draft report third year's data (3 days)	DWR staff review & cooperators' review of draft report (5 days) Holiday (1 day)
January 1983 (12 office) (9 field)	Concurrent big game & medium mammals (3 days) Prepare final report third year's data (cooperators' complete review of draft report- 3 days)	Concurrent big game and medium mammals (2 days) Prepare final report third year's data (incorporate cooperators' comments-3 days)	Concurrent big game and medium mammals (2 days) Review by R. A. & Biologist final typing & proofing (3 days)	Concurrent big game & medium mammals (2 days) Final typing and proofing by R. A. and Biologist (3 days)

Office Days 74
Field Days 176