PREFACE

This assessment addresses the impacts to the wildlife populations and wildlife habitats due to the Libby Dam project on the Kootenai River and previous mitigation of these losses. Two previous reports (Blair 1955a, U.S. Dep. Inter. 1965) assessed the potential impacts of the Libby Dam project. Blair (1955a) concentrated on big game - primarily deer, elk and bighorn sheep - and reported there would be only minimal impacts to the other wildlife species, with the exception of beaver and muskrat which would lose the available habitat within the impoundment area. U.S. Dep. Inter. (1965) was less conservative in predicting the probable impacts of the project and included more species then the previous assessment (Blair 1955a); however, some of the impacts predicted by the assessment could not be substantiated by available data. Previous mitigation projects were based on the impacts addressed by the Fish and Wildlife Service (U.S. Dep. Inter. 1965). The current assessment, funded by Bonneville Power Administration, documents the best available information concerning the impacts to the wildlife populations inhabiting the project area prior to construction of the dam and creation of the reservoir. Many of the impacts reported in this assessment differ from those contained in the earlier document compiled by the Fish and Wildlife Service; however, this document is a thorough compilation of the available data (habitat and wildlife) and, though conservative, attempts to realistically assess the impacts related to the Libby Dam project. Where appropriate the impacts resulting from highway construction and railroad relocation were included in the assessment. This was consistent with the previous assessments.

In order to develop and focus mitigation efforts, it was first necessary to estimate wildlife and wildlife habitat losses attributable to the construction and operation of the project. The purpose of this report was to document the best available information concerning the degree of negative and positive impacts to target wildlife species. Benefits to non-target wildlife species will be identified during the development of alternative mitigation measures.

Reported loss estimates represent losses considered to have occurred during one point in time, which tends to result in more conservative estimates, except where otherwise noted. When possible, quantitative loss estimates were developed based on historical information from the area or on data from similar areas. Qualitative loss estimates of low, moderate, or high with supporting rationale were developed for each target species. These qualitative estimates will provide the basis for determining relative degree of mitigation efforts as agreed to by the participating entities. Quantitative loss estimates will provide additional support for the level of mitigation necessary and will aid in evaluating the success of future mitigation projects.

It should be noted specific data were not available for impact analysis for some species. In these cases, it was necessary to use best professional judgement based on the cumulative opinion of several knowledgeable biologists.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

I. INTRODUCTION

A. HISTORY

Libby Dam and Lake Koocanusa are located in northwestern Montana, 219 miles upstream from the confluence of the Kootenai and Columbia rivers and about 17 miles upstream from Libby, Montana. This multiple-purpose hydro-electric project is situated at the top of the Columbia River Basin power generating system and is included in the International Water Resource Development Plan for the Columbia River Basin in the United States and Canada. Water released through Libby Dam passes through an additional 16 hydroelectric projects on its way to the Pacific Ocean. The U.S. Army Corps of Engineers constructed the dam and is responsible for the maintenance and operation of the facility.

The Libby Dam project was authorized for at-site power generation, flood control, and related water uses by the Flood Control Act of 1950, Public Law 516 (U.S. Dep. Army 1971a). Since the reservoir is partially located in Canada, an international treaty between the United States and Canada was a prerequisite to the construction of the project. Initial talks during the early 1950's resulted in no treaty and cancellation of the talks. Later negotiations resulted in a treaty signed by both countries in 1964.

Construction of the project began in 1966 and was completed in 1973. Reservoir impoundment was initiated in 1972, full pool was reached in 1974, and powerhouse operations began in 1975. A surface area of 46,500 acres (28,850 in the United States and 17,650 in Canada) is obtained at full pool with a reservoir length of 90 miles (48 in the United States and 42 in Canada), with 229 miles of shoreline (117 in the United States and 107 in Canada) (U.S. Dep. Army 1971a).

In addition to the 28,850 acres inundated by the reservoir, 2,000 acres of habitat were lost due to the relocation of the Burlington Northern (formerly Great Northern) railroad grade, and over 2,100 acres of habitat were lost to the construction of Highway 37 along the east side of the reservoir and the Forest Development Road along the west side of the reservoir.

Lake Koocanusa inundated 52.5 miles of habitat associated with two rivers and 48.8 miles of habitat associated with tributary streams. These were riparian and aquatic habitats, including diverse habitat features such as islands, gravel bars, sloughs, riparian shrubland, and mixed deciduous/conifer riparian areas. Loss of riparian habitat had a large adverse impact on the diverse wildlife communities supported by this habitat type (Carothers 1977, Thomas et al. 1980).

Upland habitats inundated by Lake Koocanusa were primarily timbered with ponderosa pine (*Pinus ponderosa*), Douglas-fir

(Pseudotsuga menziesii), western larch (Larix occidentalis) and spruce (Picea spp.) with scattered areas of upland shrubs. Native grasslands and subirrigated grasslands/hay meadows occupied many areas along the lower terraces adjacent to the river. Abundant big game, upland game birds, and nongame wildlife populations inhabited these areas.

Lands adjacent to the reservoir are primarily under the jurisdiction of the U.S. Forest Service, Kootenai National Forest. The U.S. Army Corps of Engineers administers a limited acreage adjacent to the dam site, with scattered parcels of state and private lands located along the reservoir.

The Flood Control Act of 1950 (Public law 81-516) contained no consideration for the wildlife resource of the area. The Fish and Wildlife Coordination Act of 1958 (Public Law 85-62) provided for the consideration of the wildlife resource. Based on the Coordination Act, an assessment of the impacts to the wildlife resources (U.S. Dep. Inter. 1965) was prepared, and was the basis for the development of measures to mitigate the impacts to the diverse wildlife communities which inhabited the Kootenai River valley prior to the construction of the Libby Dam project. These measures, although well intended, were not of sufficient magnitude to fully compensate for the wildlife losses, and were not planned so as to provide mitigation for the life of the project (100 years).

B. AREA OF CONCERN

The area addressed within this report included the habitats (within the United States) lost due to inundation and where appropriate, due to highway construction and relocation of the railroad grade (Figure 1). In instances where a species was wide ranging and spent part of the year inhabiting ranges away from the area of concern (i.e. deer), a larger area was considered when determining the qualitative impacts of the project. A zone of riparian habitat was located adjacent to the Kootenai River and its tributaries. Areas of subirrigated grasslands and hay meadows were found along the alluvial valley floor. Upland habitats were primarily coniferous forests, with scattered areas of upland shrubs.

Abundant wildlife populations have historically inhabited the area impacted by the project, with white-tailed deer (Odocoileus virginianus), mule deer (O. hemionus), and bighorn sheep (Ovis canadensis) receiving priority management. The northern bald eagle (Haliaeetus leucocephalus alascanus), currently listed as an endangered species, nested within the area and utilized the abundant food supply of fish and big game carrion during the winter. The grizzly bear (Ursus arctos horribilus), currently listed as a threatened species in Montana, historically utilized the area with primarily emphasis on the riparian bottoms. In addition to these specieis, numerous game and non-game species inhabited the diverse vegetational communities located along the Kootenai River valley. Impact analyses include considerations of habitats inundated by the

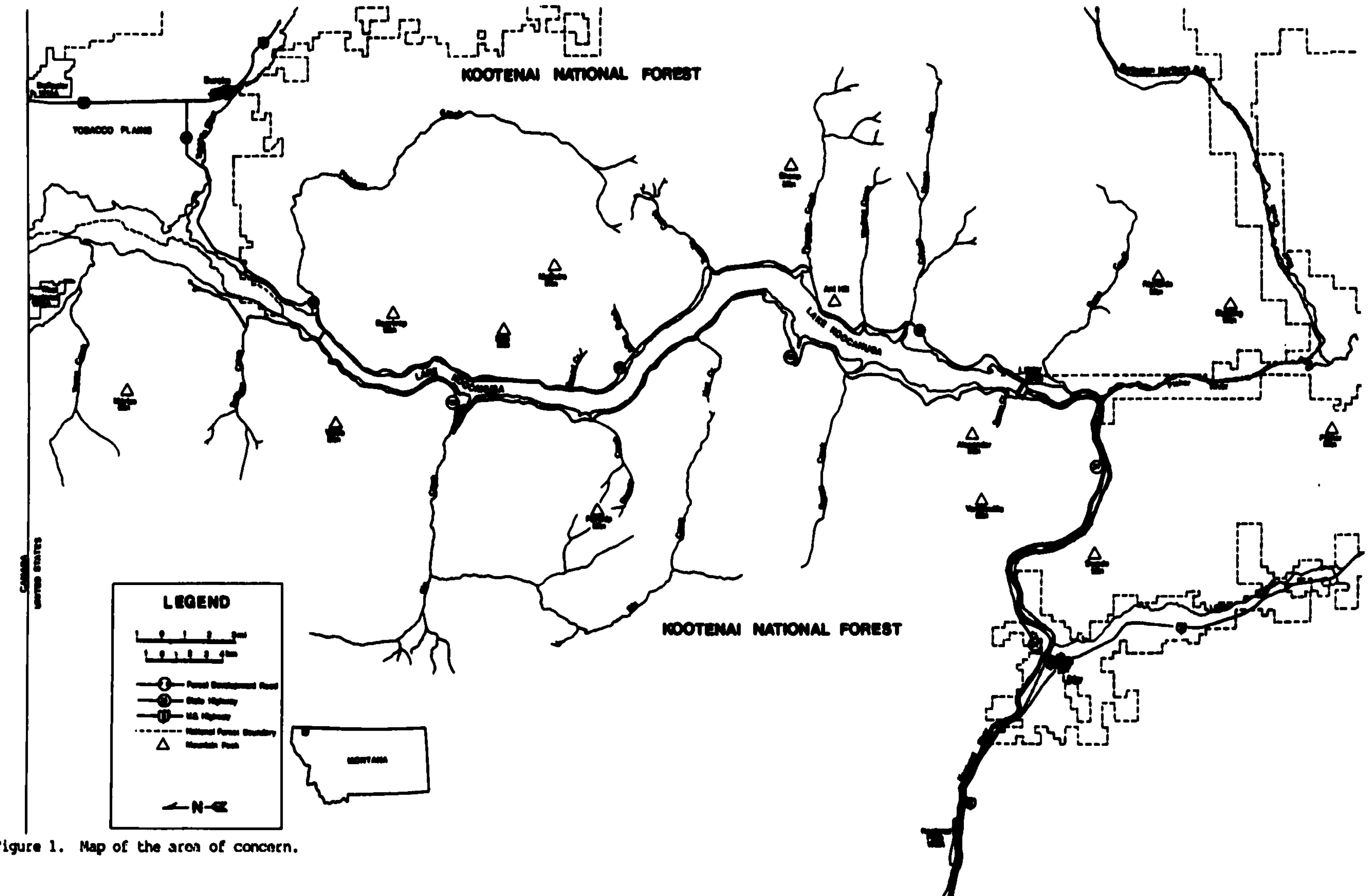

Figure 1. Map of the area of concern.

reservoir, as well as habitats away from the reservoir, where appropriate. Such considerations were often integral to the development of qualitative impact assessments based on the importance of inundated habitats within a regional perspective.

II. METHODS

A. LITERATURE REVIEW

An extensive review was conducted of the files maintained by the Montana Department of Fish, Wildlife and Parks and the U.S. Forest Service, Kootenai National Forest, in order to obtain all the records containing information pertinent to the Libby Dam project area and the wildlife populations that utilized the area. Reports by other agencies - U.S. Corps of Engineers, U.S. Fish and Wildlife Service and the Montana Department of Natural Resources and Conservation - were also reviewed. All the information was summarized and organized in a project card file for information retrieval during future stages of this project.

Personal contacts were made with people from the area who had knowledge of the wildlife populations inhabiting the area prior to project construction, or who could aid in the development of the impact analyses. These contacts provided valuable help in developing the impact analyses when limited data were available for certain wildlife species.

B. HABITAT TYPING

The habitat types within the pool area were combined and mapped into generic habitat mapping units based on wildlife use, vegetative composition, and structure. Conifer habitat units were generalized groupings of habitat types described by Pfister et al. (1977), and were the same as those used by the U.S. Forest Service, Kootenai National Forest, during the development of the current (1983) draft forest plan (Appendix A). A complete description of these habitat units is included later in this section.

U.S. Geological Survey topographic maps (1:24,000) were used as a base map for the habitat mapping. A series of 1963 black and white aerial photos (1:15,840) were used to identify the extent of the various mapping units within the pool area, with the units delineated on the base map or on an acetate overlay. In addition, a series of 1965 black and white oblique photos, with flight lines flown along both sides of the Kootenai River, were used to aid in the identification and delineation of the mapping units. Adjacent habitat types were determined from U.S. Forest Service, Kootenai National Forest, habitat maps based on Pfister et al. (1977). Habitats on areas of private land located adjacent to the reservoir were usually not previously mapped, and an extrapolation of the habitat types on adjacent U.S. Forest Service lands was made for these areas using the available aerial photos as a guide. After the habitat units were mapped, the acreage of each unit was determined and the total acreage of each habitat mapping unit within the pool area compiled.

C. DESCRIPTION OF HABITAT MAPPING UNITS (HMU)

1) Aquatic

This HMU included all the open water areas associated with the rivers, major streams, ponds, lakes, sloughs and marshes located within the area of concern. All the emergent vegetation zones identified within or along the edges of the open water area were included in the mapping unit. Few streams were large enough to be easily identified from the aerial photos, therefore, they were not included in the acreage calculations for this type. The extent of this type was measured in acres, with the length of the two rivers and their tributaries, including intermittent streams, also measured in miles of stream channel.

2) Gravel Bars

These were unstable areas containing sparse vegetation associated with islands and streambanks. These areas were usually covered with water during periods of high flows which inhibited the establishment of vegetative cover.

3) Sub-irrigated Grasslands/Meadows

This HMU included those areas dominated by a variety of grasses, sedges (*Carex spp.*) and rushes (*Juncus spp.*) influenced by the presence of an elevated water table readily available to the root system. Agricultural hay meadows were included within this type and composed the majority of the areas identified as sub-irrigated grasslands. A variety of trees and/or shrubs were sometimes present within this type; however, they composed less than an estimated 10 percent of the total canopy coverage.

4) Deciduous Shrub Riparian

This HMU contained a deciduous shrub overstory with an understory composed of a variety of grasses, forbs, and shrubs. Deciduous or coniferous trees were occasionally scattered throughout; however, they did not comprise more than an estimated 10 percent of the total overstory.

5) Deciduous Tree Riparian

This HMU contained an overstory (greater than 10%) composed of deciduous trees, primarily black cottonwood (*Populus trichocarpa*). A dense shrub and herbaceous understory was usually present. Scattered conifers were found within this HMU; however, they comprised less than an estimated 20 percent of the total tree canopy.

6) Mixed Deciduous/Conifer Tree Riparian

This was an advanced stage of successional development having a tree overstory comprised of deciduous trees combined with a conifer canopy coverage of 20 percent or greater. The majority of the conifers consisted of Douglas-fir, hemlock (*Tsuga heterophylla*), western larch (*Larix occidentalis*), ponderosa pine, spruce, and western redcedar (*Thuja plicata*). The extent of this HMU may have been underestimated due to the difficulty in distinguishing the deciduous trees found within the more dense stands.

7) Grassland

This HMU consisted of open areas dominated by a variety of grasses interspersed with a diversity of forbs. This unit included upland parks and meadows, as well as the non-agricultural grasslands identified within the Tobacco Plains area. Bluebunch wheatgrass (*Agropyron spicatum*), rough fescue (*Festuca scabrella*), Idaho fescue (*F. idahoensis*) and blue grass (*Poa spp.*) were the dominate grasses.

8) Upland Shrub

This HMU included areas dominated by the presence of several species of shrubs, including serviceberry (*Amelanchier alnifolia*), bitterbrush (*Purshia tridentata*), Rocky Mountain maple (*Acer glabrum*), ceanothus (*Ceanothus spp.*) and snowberry (*Symphoricarpos spp.*). These areas were a seral stage of plant succession related to old fires or logged areas. Tree canopy comprised less than an estimated 10 percent of the total canopy coverage for a given map unit.

9) Warm Dry Conifer Type

This group was dominated by ponderosa pine and/or Douglas-fir with an understory consisting of conifer reproduction, shrubs, grasses, and forbs associated with drier sites. These sites were usually located on warmer aspects (south- and west-facing) with poor soils and a reduced availability of moisture. This was often a disclimax successional stage containing a more open canopy coverage.

10) Cool Dry Douglas-fir Type

This group contained an overstory dominated by Douglas-fir with a less developed understory. This type was usually located on warmer aspects; however, the dense Douglas-fir overstory influenced the other plant species associated with this type.

11) Cool, Moist Douglas-fir Type

This group was located on the cooler slopes (north and east) and contained an overstory dominated by Douglas-fir and an understory consisting mainly of low shrubs. Larch and lodgepole pine (Pinus contorta) were found within this type.

12) Cold, Dry Subalpine Habitat Type

This group was located at higher elevations on cool, dry aspects. Dominant conifers within the overstory were subalpine fir (Abies lasiocarpa) and white bark pine (Pinus albicaulis), while the understory consisted of dry site grasses, forbs, and shrubs.

13) Warmer, Moist Habitat Type

This group was associated with warm, moist sites and contained a mixture of conifers in the overstory. Grand fir (Abies grandis), western hemlock, and western redcedar were the primary species forming the dense overstory canopy.

14) Talus Slopes

These were steep rocky areas supporting little or no vegetation.

15) Developed Areas

These included towns, farm buildings, gravel pits and other disturbances associated with human development. Roads and the railroad were not included in this category. The acres disturbed by Highway 37 and the Great Northern Railroad, which both paralleled the Kootenai River prior to the Libby Dam project, could not be accurately determined. The length of the two disturbances were determined and, where appropriate, were subtracted from the disturbances created by the construction of the Forest Development Road along the west side of Lake Koocanusa or the relocated railroad grade along the Fisher River and Wolf and Fortine creeks.

D. TARGET SPECIES LIST

A target species list was developed addressing the primary wildlife species impacted by the project and those of primary concern to the Montana Department of Fish, Wildlife and Parks. The following factors were considered in the designation of target species:

a) Those species determined to have incurred the greatest impacts as a result of the project;

b) Species previously targeted by the Montana Department of Fish, Wildlife and Parks as "species of special concern" (Flath 1981);

c) Species registered as threatened or endangered; and/or

d) Species designated as priority species in the Montana Department of Fish, Wildlife and Parks regional plan.

This list did not address the abundance of nongame species which utilized the habitats associated with the project area. Loss of riparian areas, mountain shrublands and open conifer forests had a detrimental impact on the diverse yearlong or seasonal populations of small mammals, raptors, and other avifauna inhabiting these habitats. Mitigation efforts toward the target species are likely to benefit many of these species.

E. IMPACT ANALYSIS

A detailed analysis was developed for each species or group of species identified on the target species list. Impact analysis was based on historical population estimates, species distribution information and acres of disturbance. All available data was used in the analysis and, where possible, quantitative and qualitative loss estimates were developed. In many instances, adequate information was unavailable and only qualitative loss estimates were developed. Qualitative loss estimates of high, moderate, or low were used to describe impacts of the hydroelectric project. The following were considered during the development of the qualitative loss estimates:

a) Numbers of animals lost or displaced in relation to the overall population of the species in the region;

b) Seasonal or year-round importance of the habitat lost for a particular species;

c) Loss of sites important to the production and/or survival of offspring, especially to rare species;

d) Ability of the species to establish populations in adjacent areas and the availability of these suitable areas; and

e) Effect on social or territorial mechanisms regulating populations.

F. PREVIOUS MITIGATION

A detailed summary of all previous mitigation related to the project was developed. This summary included mitigations funded by the U.S. Army Corps of Engineers, and completed by the Montana Department of Fish, Wildlife and Parks and the U.S. Forest Service. The acres of habitat affected and the monies spent were summarized in this section.

III. TARGET SPECIES

The primary purpose of the target species list is to focus potential mitigation efforts toward those species which experienced the greatest impacts, and those which will receive the greatest benefit for a given mitigation effort. As mitigation projects are developed, they will be designed to benefit one or more of the target species. In addition, they will provide benefits to many non-target species.

The target species list addresses two categories of mammals affected by the loss of habitat: 1) big game and 2) furbearers. Primary avian target species impacted by the project were classified as: 1) upland game birds; 2) waterfowl; and 3) raptors. Detailed impact analyses are included in the Results (Section IV). The order the species are listed does not necessarily reflect the order of importance or ranked degree of impact.

Mammals

1) Big Game

White-tailed deer (*Odocoileus virginianus*)
Mule deer (*O. hemionus*)
Bighorn Sheep (*Ovis canadensis*)
Elk (*Cervus elaphus*)
Moose (*Alces alces*)
Black bear (*Ursus americanus*)
Grizzly bear (*Ursus arctos horribilus*)
Mountain lion (*Felis concolor*)

2) Furbearers

Beaver (*Castor canadensis*)
Muskrat (*Ondatra zibethica*)
River otter (*Lutra canadensis*)
Pine martin (*Martes americana*)
Mink (*Mustela vison*)
Lynx (*Lynx canadensis*)
Bobcat (*L. rufus*)

Birds

1) Upland Game birds

Ruffed grouse (*Bonasa umbellus*)
Blue grouse (*Dendragapus obscurus*)
Spruce (Franklin's) grouse (*D. canadensis*)
Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*)

2) Waterfowl

Canada goose (*Branta canadensis*)
Mallard (*Anas platyrhynchos*)
Wood duck (*Aix sponsa*)
American wigeon (*Anas americana*)
Harlequin duck (*Histrionicus histrionicus*)
Barrow's goldeneye (*Bucephala islandica*)
Common goldeneye (*B. clangula*)

3) Raptors

Bald eagle (*Haliaeetus leucocephalus alascanus*)
Osprey (*Pandion haliaetus*)

IV. RESULTS

A. HABITAT

At full pool, Lake Koocanusa inundates 28,850 acres of habitat within the United States. During periods of reservoir drawdown, a portion of this acreage is exposed; however, the fluctuating water levels are not conducive to the establishment of vegetation within this zone. Therefore a total loss of the 28,850 acres was assumed. The inundated habitats are summarized in Table 1. Maps illustrating the extent of the habitats are on file in the Regional Office, Montana Department of Fish, Wildlife and Parks, Kalispell, Montana. In addition, copies of the maps will be sent to all cooperating entities.

The 28,850 acres of inundated habitats included 3,314 acres of aquatic habitat and 25,536 acres of terrestrial habitat (island, valley floor, and upland). The 3,314 acres of aquatic habitat was 11.5 percent of the inundated area and consisted of 52.5 miles of riverine habitat (48.4 miles of the Kootenai River and 4.1 miles of the Tobacco River), 48.8 miles of tributary streams and several bodies of standing water. These areas of open water were usually bordered by one or more types of riparian habitat, forming aquatic/terrestrial ecotones. This combination of habitats has been shown to be very important in the maintenance of an abundant and diverse wildlife community (Carothers 1977, Thomas et al. 1980). In addition, islands were found along the entire portion of the river inundated by the reservoir; however, they were more common in the reach from the original townsite of Rexford north to border. A total of 47 islands (23 vegetated and 24 gravel bars) were found within the inundated portion of the river. Of these, 16 of the vegetated islands (69.5 percent) were located upstream from the original townsite of Rexford, while 14 of the gravel bars (58.3 percent) were found within this reach. The remaining islands were distributed throughout the segment of the river from the townsite to the dam site. Replacement of these habitats with a large body of open water lacking well established riparian vegetation resulted in an adverse impact to the diverse wildlife community occupying the riparian habitats.

A variety of terrestrial habitats were inundated by Lake Koocanusa. Riparian habitat types totaled 5,006 acres, 17.3 percent of the inundated area (19.6 percent of the terrestrial habitats). These habitats supported diverse and abundant wildlife communities and provided important components of various big game seasonal ranges. The variety of vegetational structural components within these habitat types provided a diversity of reproductive and foraging habitat for many nongame wildlife species not specifically addressed within this assessment. Non-timbered upland habitats - sub-irrigated grasslands, grasslands, and upland shrub - comprised 5,146 acres, 17.8 percent of the inundated area (20.2 percent of

Table 1. Summary of habitat mapping units inundated by Lake Koocanusa.

Habitat Mapping Unit	Acres Inundated				
	Terrestrial				
	Non-Island	Island	Other	Total	Percent of Total
Aquatic					
River			3,285	3,285	11.4
Standing water			29	29	0.1
Gravel Bar	658	297		955	3.3
Grass	1,583	0		1,583	5.5
Sub-irrigated Grassland	2,933	471		3,404	11.8
Shrub Riparian	431	236		667	2.3
Cottonwood Riparian	583	290		873	3.0
Mixed Riparian	2,116	395		2,511	8.7
Upland Shrub	159			159	0.6
Warm, Dry Conifer	7,159			7,159	24.8
Cool, Dry Douglas-fir	448			448	1.6
Cool, Moist Douglas-fir	5,143			5,143	17.8
Cold, Dry Subalpine Conifer	60			60	0.2
Warm, Moist Conifer	2,149			2,149	7.4
Talus	16			16	0.1
Developments	409			409	1.4
TOTAL	23,847	1,689	3,314	28,850	100.0

the terrestrial habitats). These habitats provided important seasonal habitat components, primarily big game winter range and early "green-up" spring range.

Conifer habitats were mapped into 5 generalized mapping units totalling 14,959 acres, 51.8 percent of the inundated area (58.6 percent of the terrestrial habitats). The warm, dry conifer HMU provided quality big game winter range and comprised the largest portion of the conifer habitats (47.9 percent). The cool, moist Douglas-fir HMU and the warm, moist conifer type comprised the majority of the remaining conifer habitats, 17.8 and 7.4 percent of the inundated area, respectively (20.1 and 8.4 percent of the terrestrial habitats, respectively). The remaining two conifer groupings comprised only 1.8 percent of the inundated area (2.0 percent of the terrestrial habitats).

Scattered areas of talus slopes were found within the inundated area and comprised only 0.1 percent of the area. Developed areas, consisting of three towns - Rexford, Yarnell and Warland - and scattered farmsteads occupied 409 acres, 1.4 percent of the inundated habitats. Additional areas (i.e. roads, and the Great Northern railroad grade) were not considered during the tabulation of acres of habitat lost.

B. WHITE-TAILED DEER

1) Introduction

Use of deer hides as legal tender during the late 1800's caused a decline in the once abundant numbers of white-tailed deer in northwestern Montana. The herds, which became abundant again in the 1940's and 1950's, peaking in abundance sometime during the 1950's, historically used the area impacted by the Libby Dam project. Appendix B summarizes the history of the white-tailed deer population in Lincoln County, Montana.

A comprehensive management plan currently being developed by Montana Department of Fish, Wildlife and Parks outlines management objectives and strategies for various categories of wildlife species. The proposed objectives for white-tailed deer ranked number 1 in management priority, including increased hunter harvest, will require increased availability of animals including increased populations. One of the major management strategies is the protection of habitat, of which mitigation for habitat destroyed on public lands is a consideration.

2) Seasonal Habitat Preference

During the spring through fall seasons, white-tailed deer are widely distributed. Some habitat types, such as riparian areas, are important components of the summer ranges, providing an abundance of food, cover, and water. Studies of the Swan River white-tailed deer herd (Mackie et al. 1980) determined mesic sites in association with a diversity of habitat types, including dense coniferous cover, were important summer range habitat components. With the onset of winter, the deer begin to move onto the winter ranges (Appendix C).

Bottomlands along the Fisher and Kootenai rivers are two primary winter ranges for white-tailed deer within Lincoln County, with known migrations from adjacent summer ranges exceeding 20 miles (Schmautz 1950, Campbell 1973, Flath 1973, 1974). The extent of the white-tailed deer winter range in these two drainages was determined after review of the extensive survey work conducted in the area (Zajanc 1948, Campbell 1972) and from reports summarizing a series of investigations (Blair 1955a, U.S. Dep. Inter. 1965). This review emphasized the importance of the lower elevational areas (2100-4000 ft) as white-tailed deer winter ranges. Use of traditional wintering areas by specific individuals during successive years has been observed (Flath 1972a, Campbell and Knoche 1974).

Zajanc (1948) and Blair (1955a) identified general forest types found on the deer and elk winter ranges as: 1) streambottom types consisting of broad leaf trees, 2) open ponderosa pine types on the south and west exposed slopes with a variety of browse species as ground cover, 3) open grassy and brushy ridge and slope types, and 4) the Douglas-fir, lodgepole pine, larch association on the northeast slopes. White-tailed deer primarily use the first two types. Limited use of the dense Douglas-fir stands, interspersed throughout the winter range occurs during mild winters (U.S. Dep. Agric. 1956). Use of the two primary habitat types is generally from the streambottom up to an elevation of approximately 4000 feet (Bergeson 1942, Blair 1955a, U.S. Dep. Agric. 1956). At elevations above this level, snow accumulations and temperature extremes are usually not conducive to more than minimal use by white-tailed deer.

During a normal winter, white-tailed deer are distributed throughout the two primary habitat types. As conditions become severe, the deer are restricted to the bottomlands and lower benches where snow accumulations are more moderate (Drumheller 1936, Blair 1954b, Blair 1955a).

The normal winter home range for white-tailed deer has an activity nucleus associated with the riparian habitat types (Mackie et al. 1980). Dense cover found along the riparian zones is an essential habitat component, providing the thermal cover necessary to help minimize the overall energy expenditure of the wintering animal. Within the area of concern, white-tailed deer have a tendency to use riparian areas as bedding sites, moving onto adjacent slopes during the early morning to feed. After feeding, they bed on the warm exposed slopes, feeding back to the bottomlands during the late afternoon. This cycle allows for heavier use of the browse on the slopes with corresponding light use of the browse along the bottoms (U.S. Dep. Agric. 1947, 1956). Therefore, when the deer are concentrated in the bottomlands during severe winter weather, they have a larger supply of emergency food available to them.

Browse and conifer reproduction are the primary food supplies utilized by wintering white-tailed deer (Bergeson 1942, Campbell 1972, Firebaugh et al. 1975). Taller browse plants and conifer reproduction are utilized during early to mid-winter when periods of heavy snow accumulation exist, while the lower plants, such as Oregon grape (Berberis repens), are utilized more extensively during the late winter as snow levels subside. Firebaugh et al. (1975) found grasses are utilized only during periods of minimal snow accumulation and forbs are an important food item during the spring "green-up" period.

3) Population Status

The general population trend for the white-tailed deer population in Lincoln County is outlined in Appendix B. The population suffered a decline around the turn of the century due at least in part to the liberal harvest. From 1909 to 1919 the population recovered; however, another decline took place between 1919 and 1933 (Bergeson 1946). During the 1930's and 1940's, the population again recovered with a peak in the population level achieved during the early 1950's. At this time, a liberal, two deer either sex hunting season was established to help curtail the population growth and align the deer population with the available winter habitat. The population appears to have remained fairly stable until the construction of Libby Dam and the extensive logging of the winter range during the late 1960's and 1970's, at which time available data indicate a population decline took place.

Population estimates were made by the Montana Department of Fish and Game for the Kootenai Management Unit and the U.S. Forest Service for the Kootenai National Forest and the various ranger districts. These estimates gave a fair indication of the general population trends over time; however, they were for the most part based on the best professional judgement of the field personnel and were usually not based on survey data. Some extensive winter surveys ha'e been conducted throughout the various winter ranges, and they give a better estimate of the wintering deer populations on the Fisher River-Wolf Creek and Kootenai River winter ranges. These studies are summarized in Table 2.

The density estimates show there are three distinct areas within the winter range, each having a different density of wintering white-tailed deer. The lower Fisher River area is 58 percent of the total winter range (U.S. Dep. Agric. 1956) and supports a majority of the white-tailed deer population. The upper Fisher River has a lower density of deer and the areas used as winter range are not as concentrated as in the lower Fisher River unit. The final area is the Gateway to Jennings unit along the Kootenai River which received the greatest impact from the project. Based on the findings of Zajanc (1948), this area can be sub-divided into three segments. Of these three areas, the northern and southern segments contain both white-tailed deer and mule deer winter range, while the middle segment, from Ural north to Sutton Creek, contains only mule deer winter range. The middle segment, because of its rough, broken topography, is not as conducive to wintering white-tailed deer as is the remainder of the Kootenai River bottom.

4) Assessments of Impacts

Five major impacts have had detrimental effects on the white-tailed deer population within the Libby Dam project area:

1) Construction of Libby Dam and inundation of the impoundment area;

2) Construction of Highway 37 and the Forest Development Road parallel to the reservoir;

3) Relocation of the Burlington Northern Railroad along the Fisher River and Wolf Creek drainages;

4) Logging of a large portion of the remaining crucial winter range; and

Table 2. Summary of deer population estimates for the Libby Dam project area.

Investigator	Year	Area	Acreage surveyed	Density deer/acre: White-tailed deer	Density deer/acre: Mule deer	Population estimate: White-tailed deer	Population estimate: Mule deer
Zajanc	1947-48	L. Fisher R.	16,000	0.24	--	3,840	400
		Other Fisher R.	16,800	0.14	--	2,352	200
		Gateway-Jennings	34,000	0.037	0.059	1,258	2,006
Schmautz and Zajanc	1948-49	L. Fisher R.	9,691	0.75	--	7,250	--
Schmautz et al.	1949-50	L. Fisher R.				6,000-8,000	
Blair	1953-54	L. Fisher R.	26,343	0.41	--	10,917	--
Blair	1953-54	L. Fisher R.	9,301[1/]	1.17	--	10,917	--
U.S. Forest Service	1956	Fisher River	28,160	0.039	--	10,900	--
U.S. Fish & Wildlife	1965	Area of Influence	--	---	--	1,450	1,800
Flath	1970-71	L. Fisher R.	5,440	0.22	--	1,081	--
Flath	1971-72	L. Fisher R.	---	0.21	--	---	--

1/ Estimates based on range restriction due to severe winter weather.

5) Natural plant succession to a more closed canopy Douglas-fir community.

The first three impacts were related to the completion of the Libby Dam project, while the other two impacts would have occurred regardless of the project.

Construction of Libby Dam and inundation of the impoundment area directly removed approximately 11,000 acres of crucial white-tailed deer winter range. This range consisted of bottomlands and low benches the white-tailed deer historically relied on to furnish necessary habitat components during periods of severe winter weather. The project left a narrow belt of winter range along the edges of the reservoir containing a limited supply of the necessary habitat components.

During successive years white-tailed deer have demonstrated a tendency to use the same winter range within the impact area (Flath 1972a, Campbell and Knoche 1974), with similar results observed by Mackie et al. (1980) in the Swan River valley. Inundation of 11,000 acres of winter range eliminated the traditional winter home ranges for a large number of white-tailed deer. Loss of these home ranges caused deer to be lost from the populations or disperse to other areas, as evidenced by Flath (1973) who discovered a migration route along the border of the reservoir to Butler and Cody creeks.

Dispersal of white-tailed deer from inundated winter ranges onto the remaining winter range increased the intraspecific competition for available habitat. Flath (1972a, 1972b) estimated densities of 0.20 and 0.21 white-tailed deer/acre on the lower Fisher River winter range during the winters of 1970-71 and 1971-72, respectively (Table 2). These density estimates, for the two years prior to inundation of the pool area, were below the long-term average of 0.31 deer/acre (see page 23 of this report), and indicate some of the displaced deer could have been, at least temporarily, accommodated by the remaining winter range along the Fisher River. However, the increased number of deer on the remaining winter range would have produced increased use of the available forage and depleted the forage supply available for survival during severe winters. This probably resulted in increased competition for the available forage during periods of severe winter weather, with many deer succumbing due to reduced food availability and poor nutrition (Mautz 1978). If the depletion of available forage and over-utilization of the browse is of sufficient magnitude, a longer term impact is created as the grazing capacity of the winter range is reduced and a lengthy recovery is needed for the grazing capacity to be restored to the previous levels. Although many of the deer were probably accommodated on marginal range adjacent to the reservoir, they were lost from the population during severe winters.

The second impact to the white-tailed deer population inhabiting the Kootenai River valley was the construction of two roads parallel to Lake Koocanusa. Highway 37 was constructed along the east shore of the reservoir through a variety of habitat types and big game seasonal ranges. Approximately 11.3 miles of the new highway bisects white-tailed deer crucial winter range, resulting in a loss of available habitat (302 acres). Additionally the remaining portions of the highway altered habitats utilized by white-tailed deer during the other seasons of the year. The Forest Development Road, constructed along the west shore of the reservoir, bisected white-tailed deer crucial winter range for approximately 17.2 miles, resulting in a loss of 459 acres.

Prior to inundation, Highway 37 paralleled along the west bank of the Kootenai River, and impacted approximately 20.6 miles of white-tailed deer winter range, as determined from a 1967 U. S. Forest Service map (1:126,720). It was assumed the impacts created by the construction of the Forest Development Road along the west side of the reservoir - which probably disturbed more acres per mile due to the type of terrain it traversed - were similar to those already existing due to the original Highway 37. Therefore, they were not considered in the analysis of the impacts to white-tailed deer population.

The third impact associated with the Libby Dam project was the relocation of the Burlington Northern Railroad along the Fisher River and Wolf Creek drainages. The 19.0 miles of relocated railroad grade eliminated approximately 725 acres of crucial winter range for white-tailed deer. The impacts of this loss of habitat were similar to those created by the inundation of the impoundment area. The importance of the habitat lost is emphasized by the fact the relocated grade is within the riparian zones. These zones are of primary importance as crucial winter range for white-tailed deer.

Prior to inundation the Burlington Northern (Great Northern) railroad grade paralleled along the east side of the Kootenai River. This grade passed through 22.4 miles (856 acres) of white-tailed deer winter range - determined from a 1967 U.S. Forest Service map (1:126,720) - thus producing a pre-project impact to the white-tailed deer population. The extent of the original habitat loss was greater than the loss created by relocating the grade to its present location; however, the new grade passes through a winter range supporting a greater density of wintering white-tailed deer. Therefore, a net impact assessment considering all the factors was determined.

Firebaugh et al. (1975) conducted an intensive study of the impacts of the new railroad grade and concluded it had no measurable affect on the distribution of deer within the winter range; however, there have been some deer mortalities due to collisions with trains moving through the area. Flath (1973) reported the segment of the relocated grade between mileposts 1296 and 1297 contained a high number of mortalities, while mortalities in the remaining segments were scattered and depended upon deer densities resulting from snow accumulation patterns.

Logging of a large portion of the crucial winter range along the Fisher River and Wolf Creek drainages has further reduced the amount of suitable habitat available to support white-tailed deer during periods of severe winter weather. The majority of the area along these two drainages is owned by the St. Regis Paper Company, with smaller holdings belonging to Burlington Northern and the U.S. Forest Service. Because of the predominant private ownership, the main consideration in land use is timber harvest/production, which conflicts with managing habitat for the benefit of deer winter range. This reduction of available wintering habitat has further crowded the winter range and reduced its overall carrying capacity. As the clearcut areas are retimbered, they will support a number of wintering deer; however, since they will be large, even-aged stands, they will not support the number of white-tailed deer that an uneven age stand of various seral stages would support (Mackie et al. 1980).

To date, the advancement of plant succession has had the least detrimental effect of the major impacts. Douglas-fir communities are slowly occupying more of the winter range, and increasing the acreage containing a closed canopy with a reduced production of understory browse. The reduction in available browse has a detrimental effect on the wintering deer herd by reducing the total amount of available forage. Browse has been shown to be the primary food of wintering deer within the impact area (Bergeson 1942, Campbell 1972, Firebaugh et al. 1975). The additional canopy does provide necessary thermal cover if combined properly with other habitat and topographic requirements.

The combination of these impacts on the white-tailed deer population inhabiting the Fisher River and Kootenai River drainages has produced a significant loss of crucial winter habitat. In order to address the measures necessary to mitigate these impacts, the need to determine the interaction of all of the impacts will be necessary.

5) Estimated Losses Due To The Project

- Total losses (12,027 acres of winter range); 1,467-2,221 white-tailed deer. These losses represent a reduction in the ability of the crucial winter ranges to support the estimated number of white-tailed deer.
    - Losses due to inundation of the impoundment area (11,000 acres of winter range); 1,364-2,046 white-tailed deer.
    - Losses due to construction of Highway 37 (302 acres of winter range); 37-56 white-tailed deer.

- Losses due to relocation of the Burlington Northern Railroad grade (725 acres of winter range); 66-119 white-tailed deer.

- Qualitative loss estimate - high.

6) Derivation of Loss Estimates

The main impact to the white-tailed deer population occurred through the loss of crucial winter habitat. Loss of other seasonal habitats was insignificant when compared to this loss and it was assumed the majority of the deer impacted by the loss of spring through fall ranges were also impacted by the loss of winter range. In the determination of actual animals lost from the two segments of the white-tailed deer population, the available density estimates were combined with the acres of crucial winter range lost to produce an estimate of the animals lost from the population. This method assumes the deer are uniformly distributed on the winter range for the entire winter period and each acre of winter range is of equal value. This is not actually the case, as the deer shift their distribution in response to changing snow accumulation patterns. In addition, deer concentrate along the bottomlands during periods of severe winter weather (Blair 1954b), and these areas were more important to maintaining the population than were the upper benches. However, due to the large size of the impact area and the inadequacy of available studies to aid in the determination of losses, and because no better method could be found, this method of impact analysis was used.

Habitat loss estimates due to the project were determined by: 1) measuring the amount of historical white-tailed deer winter range inundated by the reservoir; 2) multiplying the miles of Highway 37 bisecting crucial winter range (11.3 miles) by the acres of habitat lost per mile (26.7 acres); and 3) multiplying the miles of railroad grade through the crucial winter range (19 miles) by the average acres of habitat lost per mile (38.2 acres).

The density figures observed by Zajanc (1948) were used to determine the absolute minimum loss of deer resulting from the inundation of the impoundment area. A white-tailed deer density of .037 deer/acre was combined with the estimated loss of habitat, 11,000 acres, to produce an estimate of 407 white-tailed deer lost from the pre-impoundment population. This loss has to be considered minimal because the original density estimates were based on census strips that included a large amount of upland areas (where wintering populations are known to be less) and areas not associated with crucial winter ranges. Therefore, they were not representative of the higher white-tailed deer densities impacted due to the loss of riparian habitat.

White-tailed densities observed during the various studies along the lower Fisher River were originally assumed to be the same as those along the Kootenai River. To determine an average density over time, the studies presented in Table 2 were used. The high (Schmautz and Zajanc 1949) and low (Flath 1972a) density estimates were eliminated from the analysis and the remaining four density estimates were averaged to obtain a density estimate over time ($\bar{x}$ = 0.31 deer/acre). Using this density for the 11,000 acres of inundated winter range, a loss of 3,410 deer was assumed. Combining the loss estimates based on Zajanc (1948) with the above average density, a range of 407 to 3,410 deer lost due to the project was obtained, with the actual loss assumed to be contained within this range.

According to all available information, the Kootenai River bottom has historically supported fewer white-tailed deer than the lower Fisher River area; however, probably not as low as Zajanc's estimates for the 1947-48 winter. McDowell (1950) reported density figures of 0.13 deer/acre in 1949 and 0.18 deer/acre in 1950 for an average of 0.155 deer/acre for a white-tailed deer population wintering in the Thompson River drainage. After five years of research on white-tailed deer in the Swan River valley, Mundinger (1983, pers. commun.) believes a density of 100 deer per square mile (0.156 deer/acre) is a realistic estimate for winter range. Therefore, a density of 0.155 deer/acre was assumed for the Kootenai River valley prior to inundation, and a loss of 1,705 white-tailed deer was calculated (11,000 acres x 0.155 deer/acre). The assumed density estimate was 50 percent of the average density estimate for the lower Fisher River winter range. In order to develop a range of loss estimates, a ±10 percent (40-60 percent) was assumed. This assumption produced density estimates of 0.124 deer/acre (40 percent of 0.31) and 0.186 deer/acre (60 percent of 0.31). A range of 1,364-2,046 white-tailed deer lost due to inundation of crucial winter range was calculated based on these density estimates.

Construction of Highway 37 resulted in a loss of 302 acres of crucial white-tailed deer winter range. Using the range of density estimates derived above (0.124 and 0.186 deer/acre), a range of 37 to 56 white-tailed deer lost due to the highway construction was calculated.

Crucial winter range lost due to the relocation of the railroad grade was determined to be 725 acres. Using the average winter density for the lower Fisher River-Wolf Creek area ($\bar{x}$ = 0.31 deer/acre), a loss estimate of 225 deer was obtained. The original railroad grade bisected approximately 22.2 miles (856 acres) of white-tailed deer crucial winter range along the Kootenai River. Using the density estimates derived for the loss due to inundation of the winter ranges along the Kootenai River (0.124 and 0.186 deer/acre), a range of 106 to 159 white-tailed deer lost due to the construction of the original railroad grade was calculated. Subtracting the losses due to the construction of the original railroad grade from those created by the relocation of the grade, a range of 66 to 119 white-tailed deer was calculated.

Losses resulting from mortalities caused by the train collisions were not used in the analysis as various investigations determined the losses along the original and relocated grades were similar (Flath 1972a, 1972b). Therefore, the mortality caused by collisions with trains along the new grade was considered to be a substitutive loss and not a new loss attributable to the Libby Dam project.

Combining the various minimum loss estimates for the three impacts attributable to the project (1,364 + 37 + 66), a minimum loss of 1,467 white-tailed deer was calculated. Combining the maximum loss estimates (2,046 + 56 + 119), a maximum loss of 2,221 was calculated. Thus, from 1,467 to 2,221 white-tailed deer were impacted by the construction of the Libby Dam project. The U.S. Dep. Inter. (1965) estimated 1,450 white-tailed deer were in the area of influence of by the Libby Dam project. The above analysis indicates this was a minimal estimate of the population.

A qualitative loss estimate of high was assessed due to the large amount of crucial winter range inundated and the number of white-tailed deer impacted. This was based on criteria (a) through (d) on page 9.

C. MULE DEER

1) Introduction

Mule deer have historically received lower priority for big game management within the Kootenai Management Unit, with white-tailed deer and bighorn sheep receiving management priority. Because of its lcwer management priority, only limited data are available for this species. Appendix B summarizes the history of the mule deer population within the area impacted by the Libby Dam project, and major investigations of the population and/or the habitat requirements of the species.

In a comprehensive management plan, currently being prepared by the Montana Department of Fish, Wildlife and Parks, mule deer are ranked number 3 - behind white-tailed deer and elk - for management within Region One (northwestern Montana). This prioritization will place added emphasis on future mule deer population management.

2) Seasonal Habitat Preference

The majority of the information on the mule deer population is related to its winter distribution. Mule deer prefer to winter at the higher elevations along wind blown ridges and open slopes. Zajanc (1948) and Blair (1955a) reported mule deer wintered on ranges above white-tailed deer and elk, with a definite preference for areas of broken topography such as those found between Ten-Mile Creek and Stonehill. Appendix C illustrates the distribution of mule deer winter range within the area of concern.

Based on these observations, it was determined the portion of the Libby Dam impact area between Jennings and Gateway , particularly the broken topography between Ten-Mile Creek and Sutton Creek, was of importance to mule deer. The higher slopes along the Fisher River and Wolf Creek area received moderate use by wintering mule deer with only scattered individuals present. The bottomlands and lower benches provided important winter range for white-tailed deer, but were of little value for wintering mule deer.

These lower areas did provide excellent spring range with an abundance of nutritious forage necessary to promote good physical condition prior to parturition and lactation (Mautz 1978). The U.S. Dep. of Agric. (1965a) reported the spring grass ranges were receiving approximately equal use by both mule deer and white-tailed deer, indicating the mule deer were moving onto the lower areas where "green-up" occurred earlier in the spring. Brown (1983, pers. commun.) reported, while conducting spring elk surveys within drainages adjacent to the impacted area, mule deer were observed using the lower benches and slopes used by white-tailed deer as winter range.

3) Population Status

The majority of the mule deer population estimates were reported in end-of-the-year completion reports by the Montana Department of Fish and Game or the U.S. Forest Service, and were based on limited field data. Zajanc (1948) estimated there were 2,006 mule deer utilizing 34,000 acres of winter range (0.059 deer/acre) (Table 2). This estimate was based on strip counts made within the winter range, and is considered to be a reliable estimate of the mule deer population inhabiting the area along the Kootenai River from Gateway to Jennings during the winter of 1947-48. U.S. Dep. Inter. (1965) estimated there were 1,800 mule deer within the area of influence (the reservoir site and tributary drainages to their headwaters, except the Tobacco River drainage upstream from Eureka). U.S. Dep. Agric. (1965a) observed mule deer were increasing in the Warland District, indicating the estimate based on the density reported by Zajanc (1948) was the absolute minimum population present during the mid to late 1960's.

4) Impacts

Because of their tendency to utilize the higher ranges and the lower population levels inhabiting the impact area, the detrimental impacts to the mule deer population were less than for white-tailed deer. Inundation of the pool area produced a loss of 11,580 acres of mule deer winter range habitat. This loss of winter range was accompanied by a loss of individuals from the population and/or a dispersal of individuals to other habitats. Any dispersal forced the animals to subsist on marginal habitat or concentrate within already occupied habitat. These animals would have been lost from the population during a severe winter, which would have produced further stresses and increased over-winter mortalities.

The relocation of Highway 37 through the mule deer winter range produced an additional impact on the population. An increased loss of habitat resulted, with 580 acres lost to wintering mule deer - determined by adding the acres disturbed (U.S. Dep. Army 1971b, 1971c). In addition, the lengthy sections of highwall created when the highway was constructed act as a barrier to movement to the habitats between the road and the reservoir. Increased mortality due to collisions has also resulted. Drumheller (1936) realized the potential impacts of such a road and recommended no road be built along the east side of the Kootenai River as it would traverse the entire winter range and create a loss of habitat.

Prior to the Libby Dam project, Highway 37 paralleled the west side of the Kootenai River, and impacted approximately 34.7 miles of mule deer winter range. The construction of the Forest Development Road along the west shore of Lake Koocanusa impacted approximately 29.8 miles of mule deer winter range. This road traversed steeper terrain and more of the mid-slopes than did the original Highway 37. Therefore, even though it impacted less miles of mule deer winter range, the overall impacts were considered to be similar. The habitats impacted by the Forest Development Road were therefore considered to be substitutive and were not included in the final tabulation of the project impacts to the mule deer population.

Loss of spring habitat was a major impact to the mule deer population. Important spring range consists primarily of grassland types at low elevations which "green-up" earlier than surrounding areas (1,583 acres of grasslands and 3,404 acres of sub-irrigated grasslands/hay meadows). These "green-up" areas provide nutritious forage which allows for recovery from the nutritional deficiency existing during the late winter period (Mautz 1978). This recovery is necessary to insure healthy females prior to parturition and lactation, resulting in a higher reproductive rate (Mautz 1978). Loss of the spring ranges caused the deer to subsist on lower nutritional ranges for longer periods, resulting in a lower reproductive rate. In addition, the construction of Highway 37 bisected the spring range, forming an island of habitat between the highway and Lake Koocanusa, which probably receives less use due to increased human activity.

Ecological succession has also removed a portion of the winter range available to mule deer. Establishment of the closed canopy Douglas-fir communities onto previously more open Douglas-fir or ponderosa pine communities has decreased the amount of browse production and the total winter range available for mule deer. Bergeson (1946) noted the big fires of 1898, 1910 and 1919 resulted in increased availability of the food supply by reducing competition from mature conifers and then stimulating the growth of various browse species. The fire suppression policy initiated by the U.S. Forest Service in the 1930's circumvented the role of fire in maintaining the disclimax community preferred by wintering mule deer.

5) <u>Estimated Losses Due to the Project</u>

- Losses due to the reduction in the ability of the winter range to support deer.
  - 685 mule deer lost due to inundation of habitat resulting from formation of the reservoir (11,600 acres of winter range).
  - 31 mule deer lost due to construction of Highway 37 along the east side of the reservoir (580 acres).
- Losses due to collisions with vehicles.
  - 200-300 mule deer lost during the 10 years since completion of the highway.

- Loss of spring range.

  - 4,987 acres of important spring range inundated by the reservoir.

- Qualitative loss estimate - high.

6) <u>Derivation of Loss Estimates</u>

The estimated loss of 685 mule deer, resulting from the inundation of winter range was derived by multiplying the total inundated winter range for mule deer (11,600 acres) by a density estimate of 0.059 deer/acre (Zajanc 1948) (Table 2). Because the density estimate used was from a period of lower mule deer density, the estimated loss was considered to be an absolute minimum loss estimate.

Construction of Highway 37 through the winter range produced a loss of 580 acres of winter habitat (U.S. Dep. Army 1971b, 1971c). The habitat loss was subdivided into two portions: 1) the area from Ten-Mile Creek to Stonehill; and 2) the remainder of the highway from Five-Mile Creek to the Lake Koocanusa bridge. The estimated acreage lost in each section was calculated by multiplying the miles of road in the segment by 26.7 acres per mile. The Ten-Mile to Stonehill segment (432 acres) was multiplied by a density estimate of 0.059 deer/acre (Zajanc 1948) to obtain a loss estimate of 26 mule deer. The remainder of the estimated loss of habitat (158 acres) was multiplied by a density estimate (0.029 deer/acre) which was equal to one-half of the previous density estimate (0.059 deer/acre) to obtain a loss estimate of 5 mule deer. The lower density estimate was used because of the lower number of mule deer using this portion of the winter range (Brown 1983, pers. commun.). A total estimate of 31 mule deer lost due to construction of Highway 37 was obtained by adding the two previous estimates (26 and 5 mule deer). Losses due to collisions with vehicles traveling along the highway were additional with 20-30 animals estimated to be killed for each of the 10 years since the completion of the project. U.S. Dep. Inter. (1965) estimated 1,800 mule deer within the area of influence; however, there was no prediction of how many of these individuals would be impacted by the project.

An estimated 4,987 acres of mule deer spring range (1,583 acres of grasslands and 3,404 acres of sub-irrigated grasslands/hay meadows) were inundated by the reservoir. The deer using these habitats were displaced onto higher, more dormant spring ranges having lower nutritional levels. This resulted in a reduced reproductive rate; however, no population loss estimate could be made directly with the available data, and emphasis was placed on the loss of habitat. In addition to the 4,987 acres of grassland habitats lost due to inundation, a portion of the riparian and conifer habitats inundated by the project also provided areas of early "green-up" as spring range. However, these acres were not considered, making the estimate of 4,987 acres of spring range lost an absolute minimum.

A qualitative loss estimate of high was assessed based on criteria (a) through (d) on page 9. The loss of winter and spring ranges and the assumption adjacent areas were at carrying capacity were considered when determining the degree of loss.

D. BIGHORN SHEEP

1) Introduction

The Ural-Tweed bighorn sheep herd occupies the east face above Lake Koocanusa and is one of the few remaining native bighorn sheep populations in northwestern Montana (Anon. 1975). The historical distribution of the population has been along the east face from Cripple Horse Creek north to Pinkham Creek, and the Kootenai River east to the top of the Pinkham divide (Brink 1941, Couey 1950, Brown 1979). Bealey and West (1935) reported bighorns as far south as Dunn Creek. During the mid-1960's sheep were observed swimming the Kootenai River, at various locations along the west side of the river, and moving north and south across the United States-Canada border (U.S. Dep. of Agric. 1965a, 1966).

This herd has historically received a high level of management consideration. Currently bighorn sheep are ranked fifth in management priority for Region One (northwestern Montana), Montana Department of Fish, Wildlife and Parks (unpubl. files). Due to the current population status of this herd increased management will be needed to insure the existence of a native population.

2) Seasonal Habitat Preference

Areas preferred by the Ural-Tweed bighorn sheep are steep, south- and west-facing terraces formed by a series of cliffs and benches containing an open bunchgrass habitat type with a few scattered ponderosa pine and Douglas-fir (Ensign 1937, Brink 1941, Zajanc 1948, Brown 1979). From observations of radio-collared sheep, Brown (1979) determined there were movements of bighorns between seasonal preference areas.

3) Population Status

The history and population trend of this herd is presented in Appendix D. The available information indicates this population underwent steady population growth from the 1940's until it stabilized in the early 1960's at approximately 150-200 animals. At this time the population suffered a catastrophic decline in numbers. Brown (1979) estimated, at the time of his study, there were approximately 25 bighorns remaining in this population. The current population estimate for this herd is still approximately 25 sheep (G. Brown 1983, pers. commun.) indicating the population has apparently stabilized at this low level.

The population estimates presented in Appendix D and the methodologies on which they were based were examined. Actual field observations, such as the three intensive studies (Ensign 1937, Brink 1941, Brown 1979), were used to temper the less exact estimates. The harvest data from 1954 through 1972 were used to verify the population estimates considered to be representative of the actual population levels. The estimated population levels from 1934 to date are illustrated by Line A, Figure 2.

1934 through 1950

Population observations made by Ensign (1937) and Brink (1941) were an accumulation of sightings by observers on foot. Sheep were undoubtedly missed during these surveys, therefore, the estimates are considered to be the absolute minimum population present through this time period. The estimates contained in the U.S. Forest Service Annual Wildlife Reports for this period correlate well with the estimates contained in the reports of Ensign (1937) and Brink (1941). These estimates were made when a substantial amount of time was spent collecting field data from the Ural-Tweed area and it was assumed the personnel making the estimates had a good knowledge of the bighorn population. The estimation of the population trend through this period of time was determined by plotting a curve through the points representing the realistic population estimates for the area.

1951 through 1960

During this period only the population estimate made by Blair (1955a) was considered to be reliable. The mid-point (162.5) of the range (150-175 head) estimated by Blair (1955a) was used as the population level for this period. The estimates by the Montana Department of Fish and Game and the U.S. Forest Service during this period were considered to be over estimates (R. Weckwerth 1983, pers. commun.). These estimates were made for end of the year reports and were based on little or no field data. Since these estimates were considered to be unrealistic, they were not used in determining the overall population trend.

1961 through 1970

Only one population estimate for this period was located. U.S. Dep. Inter. (1965) in an analysis of the potential impacts of the Libby Dam project estimated there were approximately 170 bighorn sheep inhabiting the Ural-Tweed range. U.S. Forest Service Annual Wildlife Reports for this period were considered to be fairly unreliable, as evidenced by the excessive estimates for the 1950's and were not reviewed.

1970 to date

At the completion of his study, Brown (1979) estimated there was a total population of no more than 25 sheep. In 1981, 22 sheep were observed on the area. These estimates were considered to be reliable indicators of the actual population level at the time of the surveys.

Harvest data from 1954 to 1974 were helpful in evaluating the validity of some of the estimates. Wishart (1978) following a

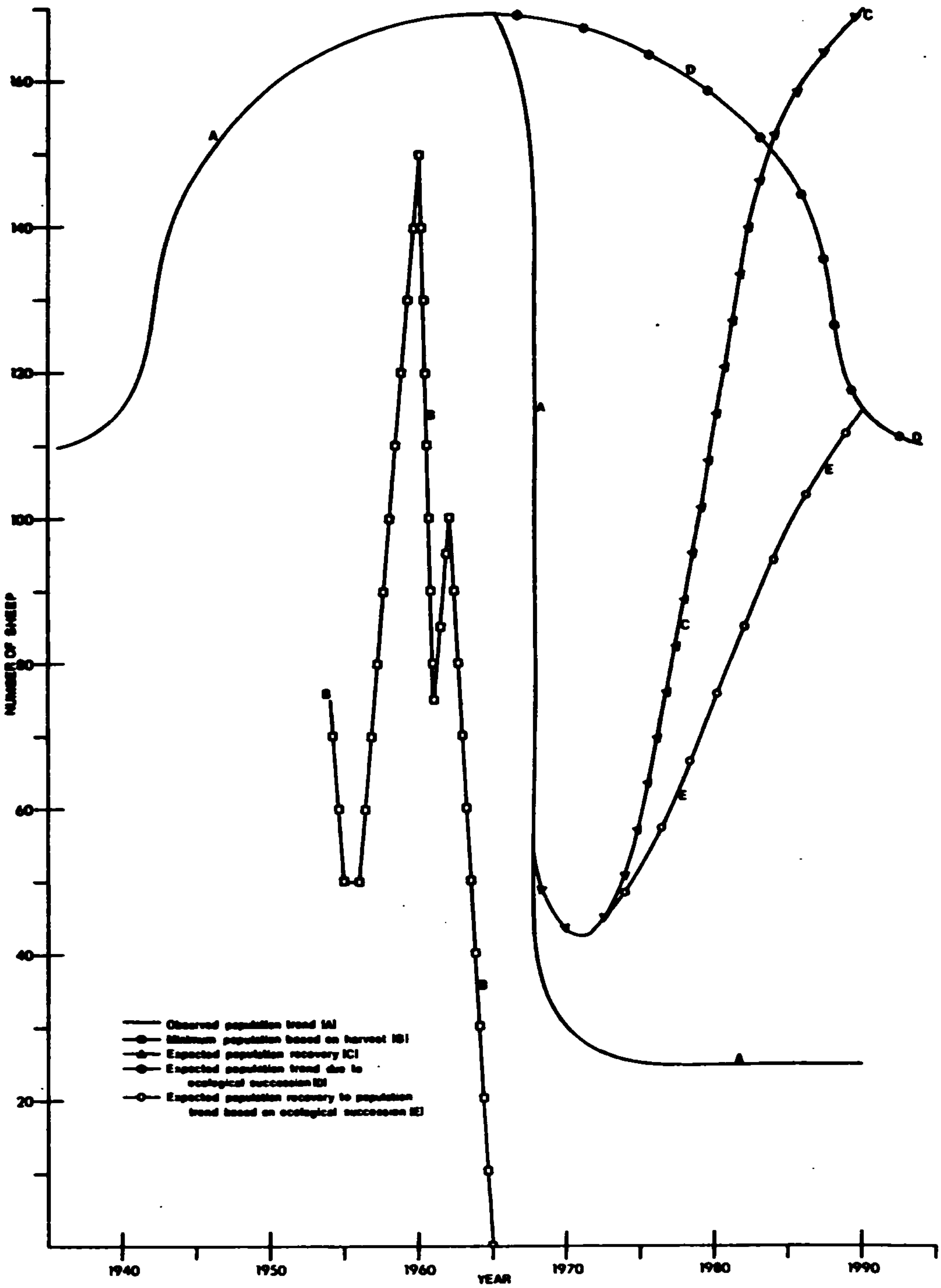

Figure 2. Observed and expected population trends for the Ural-Tweed bighorn sheep herd.

population age structure described by Cowan and Geist (1971), determined a fall population of 100 bighorn sheep of all ages and both sexes was required to yield an average of four to five legal (three-quarter curl) rams annually. This is roughly one legal ram per 25 bighorn sheep. Using this assumption and the harvest estimates for 1954 through 1973, the minimum population based on 100 percent harvest of all legal rams was plotted (Line B, Figure 2). During the early 1960's, three Boone and Crockett rams were harvested from the Ural-Tweed population indicating all the legal rams were not being harvested each year. Since a 100 percent harvest of the legal rams was not occurring, the estimates based on the harvest are absolute minimum population levels.

During the period of 1954 through 1966 up to 30 permits (three-quarter curl rams) were issued for the Kootenai area with a maximum harvest of 10 rams (six from the Ural-Tweed), with an average hunter success of 28.4 percent (Mont. Dep. Fish, Wildl. and Parks, unpubl. files). The estimates of 320-460 bighorn sheep presented by the Montana Department of Fish and Game and U.S. Forest Service for the Ural-Tweed population should have produced at least 13-22 legal rams annually. If this number of legal rams were available, the annual hunter harvest should have been greater. Therefore, a population level in the vicinity of 150-200 bighorn sheep was considered to be more reasonable. This population level corresponds favorably with the population estimate of 170 sheep within the area of influence (U.S. Dep. Inter. 1965).

4) Assessment of Impacts

The population decline resulted from the cumulative impacts of at least two events: 1) ecological succession from an open bunchgrass - ponderosa pine disclimax to a more closed Douglas-fir community, and 2) construction of the Libby Dam project and associated facilities, including relocation of Highway 37 through the bighorn sheep range.

Three studies conducted on the Ural-Tweed range all determined the sheep preferred the open bunchgrass communities with scattered, open stands of timber - ponderosa pine and Douglas-fir (Ensign 1937, Brink 1941, Brown 1979). These compare favorably to studies conducted on other bighorn populations (Couey 1950, Smith 1954, Geist 1971). The quality of the Ural-Tweed range for bighorn sheep has historically been maintained by fire which produced the open bunchgrass communities. This is documented by the abundance of fire scarred trees in the area (Brown 1979) and through aerial photos taken in 1949 which show the presence of numerous fires in the area adjacent to the Kootenai River. However, with the initiation of intensive fire suppression in the 1930's, the role of fire in maintaining the preferred ecological disclimax was circumvented and more densely forested Douglas-fir communities became established on once quality bighorn sheep habitat. A summarization of the incidence of fire in the area between 1940 and 1977 (Brown 1979) illustrates the active fire suppression policy inacted throughout the area (Appendix

E). Stelfox (1976) noted this same type of fire suppression and resulting loss of bighorn sheep habitat due to advanced ecological succession in the Athabasca Valley, Alberta, Canada between 1921 and 1953.

Completion of the Libby Dam project inundated approximately 4,350 acres of bighorn sheep crucial winter range and spring range. This area provided winter forage during periods of adverse climatic conditions when the sheep concentrated at the lower elevations due to snow depths which prohibited movement within the higher ranges. Possibly more importantly, this lower portion of the sheep range provided highly nutritious spring forage for animals which had spent the majority of the winter subsisting on dormant, dried vegetation. The importance of these areas was probably greatest for ewes in the late stages of pregnancy or lactating. Stelfox (1976:29) concluded:

> "Valley bottoms and low-elevation south-facing slopes are evidently important to sheep in late pregnancy, and they influence lamb production and survival because they are the first areas to green-up and provide the high protein forage necessary during late pregnancy and early lactation".

Following the reasoning of Cowan and Geist (1971), Wishart (1978) concluded ewes on poor nutritional diets and in a state of energy drain were unable to pass sufficient nutrients to their offspring reducing the lamb's chances for survival. Brown (1979) documented the historical spring use of the Kootenai River floodplain by bighorn sheep. Since its inundation the sheep have actually shown a tendency to use higher, dormant ranges in the spring (Brown 1979). With the loss of important "green-up" areas, the sheep have been forced to use lower quality dormant vegetation for a longer period of time than normal, resulting in a suspected reduction in physical condition and reproductive success.

Part of the Libby Dam project was the relocation of Highway 37. Formerly this highway was located along the west bank of the Kootenai River with access along the east side limited to the use of unimproved roads and trails. The Burlington Northern (Great Northern) Railroad paralleled the river on the east side; however, with the exception of a few sheep mortalities resulting from collisions and due to a relatively low level of human disturbance, this railroad probably had minimal impact on the sheep population.

Highway 37 bisects the bighorn sheep range creating an island of habitat between Lake Koocanusa and the highway. Due to the increased human disturbance, sheep use of this land is probably at a level below its historical level. In a summary of various studies, Thorne et al. (1979) concluded stress due to human harassment (active or passive) had a detrimental effect on bighorn sheep by increasing the overall energy expenditure and reducing the chances of survival and/or growth of lambs, ewes and young rams. It also may have caused the animals to forage in areas of poorer quality habitat. Horejsi (1976:154) stated:

"harassment has a significant impact on individuals and the population: 1) it may result in death through predation, accidents and increased hunting mortality, 2) it may affect growth and development of individuals, 3) it may cause abandonment of some ranges or parts of them, and 4) it alters activity patterns and distribution on occupied areas."

A shift in lambing and nursery areas from the historical areas observed by Brink (1941) to those occupied after the completion of the project (Brown 1979) was probably directly related to increased human activity and loss of spring habitat. This shift has caused the sheep to use an area of lower nutritional value (an area of later "green-up") as a parturition area, and has probably been a contributing factor in the decrease in the sheep population on the Ural-Tweed range. In addition, the lengthy sections of shear highwalls (up to 0.6 miles) created when the highway was constructed, act as a barrier to movement to the habitats between the highway and the reservoir.

5) Estimated Losses Due to the Project

- Quantitative loss estimate:

  - An estimated loss of 4,350 acres of crucial winter and spring range.

  - An estimated loss of 78 to 102 bighorn sheep as a result of the Libby Dam project.

- Qualitative loss estimate - high.

6) Derivation of Loss Estimate

A figure illustrating the estimated minimum population levels of the Ural-Tweed bighorn sheep herd from 1934 to date was prepared (Figure 2). This figure illustrates the catastrophic population decline that occurred in the late 1960's and early 1970's, with the population stabilizing at approximately 25 animals (Line A). Declines such as this have occurred naturally in numerous bighorn sheep populations. The decline experienced by the Ural-Tweed population closely parallelled those described by Stelfox (1976) for five bighorn sheep populations in Canada's National Parks, where overgrazing and reduced physical condition, resulting in pneumonia-lungworm disease, combined to cause a rapid mortality of at least 75 percent of the population. The decline of the Tarryall population in Colorado was even more dramatic, with an over-winter (1923-24) decline from an estimated 350 bighorn sheep to 12 head, a 96.5 percent decrease (Buechner 1960). The decline of Ural-Tweed population may have been a natural phenomenon-pneumonia-lungworm disease - occurring with or without the construction activity and resultant loss of habitat, or it may have directly resulted from the construction of the Libby Dam project and corresponding increase in human activity and harassment.

The declines of the Canadian and Tarryall populations were followed by a rebuilding of the population. In the Canadian populations, Stelfox (1976) found after a 25 year period the population had achieved their previous levels. Spencer (1943) reported the Tarryall herd had exceeded its previous estimated populations only 16 breeding years after its catastrophic decline. Line C (Figure 2) illustrates a population trend for the Ural-Tweed herd approximating a recovery rate similar to these populations. This population trend shows a dramatic decline leveling off at 25 percent of the original level (42 animals) and then rebuilding to the original population level after a 25 year period (1990). The Ural-Tweed herd should have experienced a population trend similar to this. Since this herd has not started to rebuild (Brown 1983, pers. commun.), a factor which is suppressing the population growth is indicated.

Ecological succession has advanced, largely due to active fire suppression, causing a further loss of suitable bighorn sheep habitat. However, the bighorn sheep population should have responded after the decline of the mid-1960's, rebuilding to a population level somewhere below the peak. To determine the level to which the population should have rebuilt, Line D (Figure 2) was produced to illustrate a natural population fluctuation based on the availability of suitable habitat. This is a normal fluctuation occurring naturally in most populations. Using this reasoning, a 1990 population of 115 sheep was estimated, the same number determined to be present 25 years before the peak (1940). The population trend illustrated by Line E approximates the population recovery that should have occurred following the decline, if only the advancement of ecological succession was suppressing the Ural-Tweed population. The population would have stabilized at approximately 115 sheep.

The remaining factor that could be suppressing the expected population recovery is the Libby Dam project with the resulting loss of habitat and increased human disturbance. The impact of the project and associated facilities was assumed to be the difference in population levels between the existing population (25 animals) and what would be expected if only the advancement of ecological succession was acting on the population (115 animals). Using this assumption, 90 bighorn sheep (115-25) were lost from the Ural-Tweed population as a direct result of the construction of the Libby Dam project and associated impacts. A plus or minus 10 percent range for the estimated population level yielded a range of 78 to 102 sheep impacted by the project.

A qualitative loss estimate of high was assessed based on criteria (a) through (d) on page 9. Inundation of winter and spring ranges, displacement of seasonal ranges (i.e. lambing areas) and additional human disturbance were considered in the development of this assessment.

E. ELK

1) Introduction

The elk population which inhabited the impact area consisted of a number of small isolated herds scattered throughout the area. These herds were descendants of elk transplanted into Lincoln County from Yellowstone National Park and the National Bison Range. A total of nine transplants, totalling 311 animals, were conducted from 1927 to 1966 (Mont. Dep. Fish, Wildl. and Parks unpub. files). Where potential for elk and white-tailed deer competition has existed, the white-tailed deer were given management priority with reductions in the elk population recommended as a means of reducing the interspecific competition (Bergeson 1946, Blair 1955b, U.S. Dep. Agric. 1956). Currently elk are ranked second, behind white-tailed deer, in the management priority listing of wildlife species for Region One (northwestern Montana), Montana Department of Fish, Wildlife and Parks.

2) Seasonal Habitat Preference

During the spring through fall period, elk were scattered in small herds throughout the area of concern. The majority of the habitat types within the area of concern were utilized by elk during this period; preferred areas of foraging habitat were located adjacent to thermal cover and available water.

As snow accumulated in late fall and early winter, the elk migrated onto the winter ranges. These ranges were usually south- and west-facing slopes, and were usually located on the mid to upper portions of the slope, above the area occupied by wintering white-tailed deer and below the area utilized by wintering mule deer (U.S. Dep. Agric. 1956). During periods of severe winter weather, the elk demonstrated a tendency to migrate onto the lower benches and bottom lands, increasing the interspecific competition with wintering white-tailed deer (Blair 1955a).

3) Population Status

The elk herd within Lincoln County steadily increased in size after the initial transplants and was still increasing during the mid 1960's (U.S. Dep. Agric. 1965a, 1965b). In 1941, the first hunting season was opened to reduce the elk herd, suspected of becoming large enough to dominate the white-tailed deer winter range. The season was reopened in 1952 and a general elk season has been in effect since.

The area of the Kootenai River impacted by the Libby Dam project never supported a very large population of elk. Brown (1983, pers. commun.) estimated there were 50 elk using the Kootenai River valley from Jennings to Gateway. These elk were scattered in small herds throughout the area with no occurrence of major seasonal concentrations. U.S. Dep. Inter. (1965) estimated there were 300 elk within the area of influence. No data could be located to justify an elk population of that magnitude unless the entire Fisher River drainage was considered. Therefore, the population estimate of Brown (1983, pers. commun.) was used.

4) Assessment of Impacts

Inundation of habitat and loss of habitat due to construction of the relocated railroad grade and the new road system had negligible impacts on the resident elk population. These developments did increase the total amount of human disturbance within the impact area, producing a slight detrimental effect on the seasonal distribution of animals.

5) Estimated Losses Due to the Project

A negligible number of elk were estimated to be lost from the population inhabiting the impact area.

6) Derivation of Loss Estimates

Because of the low levels of impacts to the elk population and the abundance of habitat to which impacted animals could disperse, negligible losses were estimated to have occurred.

F. MOOSE

1) Introduction

A population of moose inhabits the Kootenai River valley; however, little information is available on the seasonal distribution, habitat preference, and status of the population. Currently moose are ranked seventh in the prioritization of management objectives for Region One (northwestern Montana), Montana Department of Fish Wildlife and Parks.

2) Seasonal Habitat Preference

Available information on the seasonal distribution of moose within the Kootenai River valley indicates the Pinkham Creek and Pinkham Ridge areas are the preferred areas for moose (Drumheller 1936, Zajanc 1948) with small populations of 4 to 5 animals in each tributary of the Kootenai River (U.S. Dep. Agric. 1965a). Shrub fields in old burns and logged areas appeared to be preferred as forage sites (U.S. Dep. Agric. 1965a, 1966). Moose have been observed wintering from the lower elevations to areas as high as 6000 feet in elevation. Zajanc (1948) observed no moose or moose tracks during his survey of the Gateway to Jennings area. He stated there were probably a few moose residing in the Five Mile and Ten Mile creeks, and the moose range would include any of the stream bottom type found in the Fisher River area.

3) Population Status

A scattered population of moose inhabited the area impacted by the Libby Dam project. As indicated by the available data, the population was increasing during the 1950's and 60's; however, no reliable population or density estimates were available for the project area. The U.S. Dep. Inter. (1965) estimated a population of 300 moose within the reservoir area of influence; however, no data could be found to support a population estimate of this magnitude.

4) Assessment of Impacts

Bottomlands and lower benches inundated by the reservoir probably all provided habitat utilized by moose during one or more seasons. Loss of this habitat resulted in a loss of moose from the population and/or displacement of individuals to other areas. Unless displaced individuals located quality, unoccupied habitat they were eventually lost from the population.

Construction of the Burlington Northern railroad grade along the lower Fisher River and Wolf Creek also removed habitat utilized by moose. Flath (1972a) reported three moose were killed along the relocated railroad grade during the winter of 1970-71.

5) <u>Estimated Losses Due to the Project</u>

- Quantitative loss estimate

  - 5-15 moose were lost due to inundation of the impoundment area and the subsequent reduction in the capability of the habitat to support these animals.

  - 20-40 moose have been lost due to train collisions along the relocated railroad grade during the 13 years since the grade was completed.

- Qualitative loss estimate - low.

6) <u>Deviation of Loss Estimates</u>

The loss due to inundation of habitat was derived by reviewing the available data and using the best information to develop a reasonable loss estimate. This estimate is based strictly on best professional judgment and relates to acreages of habitat lost.

The loss resulting from relocating the Burlington Northern railroad grade was estimated by multiplying two annual loss estimates (1.5 and 3.0 moose/year) by the 13 years since the completion of the new grade, resulting in an estimated loss of 20-40 moose. This annual loss estimate was based on the findings of Flath (1972a) and the fact the railroad grade was located within the riparian zone, a priority habitat of the moose.

A qualitative loss estimate of low was assessed based on criteria (a) and (b) on page 9. The loss of quality moose habitat, due to inundation and the relocation of the railroad grade, was used in the determination of the impact assessment.

G. BLACK BEAR

1) Introduction

Black bear were probably relatively numerous within the Libby Dam impact area prior to inundation of the pool area. Loss of 25,536 acres of terrestrial habitat reduced the availability of high quality forage areas and denning sites. This loss of habitat resulted in a reduction in the number of black bears within the Kootenai River valley, and was suspected to have affected the reproductive rate of the population adjacent to the reservoir.

Historically there has been very little species management directed at the black bear. Currently, black bear is ranked fourth in the management prioritization for Region One (northwestern Montana). Montana Department of Fish, Wildlife and Parks. This ranking will allow for the development of management strategies for this species.

2) Seasonal Habitat Preference

Riparian areas and lower benches along the Kootenai River provided high quality seasonal habitat for black bears. Large cottonwood trees located along the bottoms provided of preferred denning sites as described by Jonkel and Cowan (1971) and Gillespie (1977). Lower benches and broken topography also provided suitable denning sites; however, in comparison to the riparian sites these locations were suboptimal. Riparian areas provided abundant lush vegetational forage during the spring and an abundant late summer and fall food supply of berries and mast. Lindzey and Meslow (1977) observed black bears preferred seral stage vegetation (such as found in the riparian understory and in shrubland areas) to older aged, less productive stands. Jonkel and Cowan (1971) determined black bears concentrated at lower elevations during spring with movement, primarily by males, to higher elevations after the breeding season.

It has been determined the quality of the habitat regulates the reproductive success of the black bear (Rogers 1974). Female black bears on good to high quality habitat not only obtain sexual maturity at an earlier age, therefore allowing them to produce more young during a lifetime, but also have a greater reproductive rate (more years in which litters are produced and more young per litter). Survival of young and yearling bears is also greater during years of good food production (Rogers 1974).

3) Population Status

No reliable pre-project estimates were available for the black bear population within the area of concern. The U.S. Forest Service Annual Wildlife Reports estimated the number of black bear within the ranger districts for the Kootenai National Forest. These were rough estimates based on limited data and were not used in the analysis. Jonkel and Cowan (1971) studied a black bear population north of Whitefish, Montana (approximately 35 miles east of the impact area) for 7 years. During the course of their study they estimated the following densities of black bears: 1960 - 1.0 bear per 640 acres; 1961 - 1.25 bear per 640 acres; and 1966 - 0.6 bear per 640 acres. In obtaining these estimates they used the total land area, even though portions of it were known to be unsuitable to black bears. High quality riparian habitat along the Kootenai River probably supported a high density of black bears similar to the 1960 estimate of Jonkel and Cowan (1971). Due to a more stable food supply the black bear population probably did not undergo severe population fluctuations and therefore the low value of 0.6 bears per 640 acres and the high value of 1.25 bears per 640 acres were not used in the population estimates. Using a density estimate of 1.0 black bear per square mile (640 acres) a population for the terrestrial habitats (25,536 acres) was estimated at 40 animals. In addition, the same density of black bears was assumed to inhabit the Fisher River, Wolf Creek and Fortine Creek drainages which were impacted by a loss of habitat related to the relocation of the Burlington Northern railroad grade.

4) Assessment of Impacts

Formation of Lake Koocanusa inundated 28,850 acres of various habitats, of which 25,536 acres were terrestrial habitats. Replacement of these habitats with a large body of water had a negative impact on the black bears inhabiting the impact area and adjacent habitats. Inundation of 9,197 acres of high quality habitats (1,583 acres of grassland, 3,404 acres of sub-irrigated grassland, 667 acres of shrub riparian, 159 acres of upland shrub, 873 acres of cottonwood riparian, and 2,511 acres of mixed riparian) probably had the greatest impact on the resident black bear population. Inundation of these habitats resulted in the loss of preferred foraging areas (Lindzey and Meslow 1977) and denning sites (Jonkel and Cowan 1971, Gillespie 1977). Inundation of 14,959 acres of conifer habitats also had a negative impact on the black bear population. These habitats may not have been as preferred as the grassland and riparian areas; however, they did provide habitat components known to be used for foraging and denning.

The inundated habitats also provided seasonal use areas for black bears whose home ranges were primarily on areas adjacent to the reservoir. Loss of the high quality habitat (grasslands and riparian habitat) necessitated maintenance - foraging and denning - of the bears on poorer quality higher elevational ranges, which probably resulted in a reduced reproductive rate and reduced survival of young (Rogers 1974).

5) <u>Estimated Losses Due to the Project</u>

- Quantitative loss estimate:

  - 40 black bears lost due to inundation of habitat (25,536 acres) resulting in a reduction in the ability of the habitat to support these animals.

  - 3 black bears lost due to the relocation of the Burlington Northern Railroad grade resulting in a loss of habitat (2,000 acres) and a reduction in the ability of the habitat to support bears.

- Qualitative loss estimate - high.

6) <u>Derivation of Loss Estimates</u>

The loss estimates were calculated using the density estimate of 1.0 black bear per 640 acres. The reservoir inundated approximately 25,536 acres of terrestrial habitat reducing the black bear population by 40 animals (25,536/640). The railroad grade relocation removed 2,000 acres of habitat, primarily riparian types, resulting in an estimated loss of three black bears (2,000/640). These estimates assume all the lost habitats were utilized by black bears. The density estimate obtained from Jonkel and Cowan (1971) was based on similar reasoning. Bears, which included the high quality habitat inundated by the reservoir as part of their home range, experienced a reduced reproductive rate and survival of young. This was related to the loss of high quality habitat and maintenance (foraging and denning) of the bears on poorer quality, high elevational ranges. This was an unmeasurable direct loss to the black bear population, and emphasizes the fact the loss estimates identify the absolute minimum numbers of black bears affected.

The qualitative loss estimate was determined by using criteria (a) through (d) on page 9. It was determined the inundated habitat was important to the maintenance of a segment of the black bear population within the Kootenai River valley, and influenced the reproductive success and survivability of black bears utilizing adjacent areas.

H. GRIZZLY BEAR

1) Introduction

The grizzly bear, classified as a threatened species in Montana (U.S. Endangered Species Act, 1973), is a native of the Kootenai River valley. A variety of habitats over a wide elevational gradient are required to fulfill the seasonal habitat requirements of the grizzly bear. Formation of Lake Koocanusa inundated approximately 25,536 acres of terrestrial habitat which provided seasonal habitat requirements for the grizzly bear population utilizing the area of concern. Region One, Montana Department of Fish, Wildlife and parks has ranked the grizzly bear eighth in management priority.

2) Seasonal Habitat Preference

Grizzly bears utilize a diversity of habitats during the spring through fall period. After emergence from their dens in the spring grizzly bears select snowchutes, ridgetops and low elevation riparian areas where succulent forage high in proteins, sugars, and fats is readily available (Jonkel 1982). Mealey et al. (1977), Singer (1978), and Servheen (1983) have documented the importance of stream bottoms, wet seeps, and alluvial areas during the spring. The high water table and alluvial soil deposits in these areas support diverse communities of mesophytic shrubs, forbs, and grasses. Forested types containing these same types of plants, as well as security cover, are also heavily utilized by grizzly bears (Mealey et al. 1977). The succulent vegetation reduces the physiological stress the grizzly bears undergo during the weight loss period from den emergence to the early summer when berries start to ripen (Jonkel and Cowan 1971). In some areas big game carrion is an important spring food (Jonkel 1982). With the abundant big game populations wintering along the Kootenai River valley, a ready source of carrion was available as a food source for grizzly bears.

During summer, grizzly bears are less restricted in habitat selection because most grizzly bear range is snow-free, and many habitats provide succulent vegetation (Jonkel 1982). Many bears follow the "green up" to higher elevations during this period, and movements to upper elevations can be abrupt, with little use of timbered habitats at middle elevations during this period (Servheen 1983). As the various berries ripen in mid-summer, the bears take advantage of this abundant, nutritious food supply to improve their physical condition prior to denning (Jonkel 1982). The shrubfields at the lower elevations ripen earlier and produce a downward movement of bears (Pearson 1975).

Fall is a crucial time for bears because they must gain weight rapidly in preparation to denning (Jonkel 1982). Rogers (1974) reported a positive correlation between berry and mast production and the productivity of black bears. During late fall, bears are forced to lowland habitat where they take advantage of the available food (scattered berries and succulent vegetation). Singer (1978) observed a fall concentration of grizzly bears along the North Fork of the Flathead River.

Many factors affect the time of den entrance, however, generally grizzly bears enter their dens in November, often following a heavy snowfall (Craighead and Craighead 1972). Dens are characteristically located at high elevations in remote areas with steep slopes, deep soils, and heavy snow accumulations (Pearson 1975).

Competition for food resources plays a part in the distribution of grizzly bears within the region. While grizzly bears are not strictly territorial (Craighead and Mitchell 1982), male bears utilize and defend activity centers distributed on the basis of preferred feeding areas (C. Jonkel 1983, pers. commun.).

3) Population Status

Limited information on the distribution and number of grizzly bear within the area of concern is available. U.S. Dep. Agric. (1965a, 1966) reported the presence of grizzly bears on both sides of the Kootenai River. Unpublished files for the Kootenai National Forest document the historical observations of grizzly bears within the forest. These reports document the area probably did not contain a large number of grizzly bears, although the bears were distributed throughout the area of concern.

The current grizzly bear recovery plan (U.S. Dep. Inter. 1982) delineates occupied habitat in northwestern Montana. A gap between the two occupied ecosystems - Northern Continental Divide and the Cabinet-Yaak - exists along the Kootenai River valley where historical observations of grizzly bears have been made. This indicates a decline in the population that at one time occupied at least a portion of the area of concern.

4) Assessment of Impacts

Formation of Lake Koocanusa inundated approximately 25,536 acres of terrestrial habitats that could have been utilized by grizzly bears. Loss of this habitat had an adverse impact on the grizzly bears within the area of concern by removing important seasonal habitat components. Inundated riparian and forested areas providing the mesophytic plants preferred by grizzly bears were probably utilized by the bears. Upland grasslands (1,583 acres), sub-irrigated grasslands (3,404 acres), shrub riparian (667 acres), cottonwood riparian (873 acres), mixed riparian (2,511 acres), upland shrub (159 acres), and a portion of the coniferous forests (14,959 acres) provided important seasonal habitat components for grizzly bears. The displacement from the preferred spring and fall habitats caused the bears to utilize a smaller amount of optimal habitat and probably caused the bears to use suboptimal habitats and/or move to other areas. The use of suboptimal habitats probably caused a reduction in the overall reproductive rate similar to that found by Rogers (1974) for black bears. Lake

Koocanusa also inhibits the movement of grizzlies between the habitats on the two sides of the drainage. Inhibition of the movements has probably caused a reduction in the habitats available to the bears and possibly was responsible for the creation of unoccupied habitat between the two ecosystems.

5) Estimated Losses Due to the Project

- Quantitative loss estimate:

  - Due to lack of density and population information no quantitative loss estimate was made.

- Qualitative loss estimate - low to moderate.

6) Derivation of Loss Estimates

No density and limited distribution data was available for the area of concern, therefore no quantitative loss estimate was developed. It was assumed some bears were probably lost from the population due to the Libby Dam project.

A qualitative loss estimate of low to moderate was based on criteria (a) through (e) on page 9. The following impacts were considered during the development of the qualitative loss estimate: 1) loss of the high quality riparian habitat which provided seasonal habitat requirements; 2) loss of succulent vegetation along the lower areas which is preferred forage during the spring and late summer; 3) barrier to seasonal movements between the habitats along the two sides of the drainage; and 4) disruption of grizzly bear social mechanisms regulating their distribution in the area.

I. MOUNTAIN LION

1) Introduction

Mountain lions probably utilized the majority of the impact area prior to construction of Libby Dam and inundation of the pool area. Large concentrations of big game animals present within the area, particularly during winter, provided an abundant food supply for this species. Many reports noted the presence of mountain lion sign on the winter ranges; however, due to the lack of information, no estimate of the mountain lion population inhabiting the impact area prior to project construction was developed. Mountain lions are currently ranked eleventh in the priority listing for management within Region One (northwestern Montana) Montana Department of Fish, Wildlife and Parks.

2) Seasonal Habitat Preference

Mountain lions are known to occur in a wide variety of bottomland and upland habitats in the North Fork of the Flathead River drainage (Key 1979), approximately 45 miles east of the Kootenai River valley. Hornocker (1983, pers. commun.) noted use of river-bottom habitats in northwestern Montana, as well as upland mixed coniferous forests in the South fork of the Flathead River drainage (Hornocker and Hash 1981). Brown (1983, pers. commun.) has observed relatively extensive use of the dense conifer bottoms (redcedar, western hemlock and/or spruce) by mountain lions in the Libby area. Big game winter ranges were probably important winter habitat for lions as well, since deer and elk are preferred prey (Hornocker 1970). Brown (1979) observed a mature bighorn ram that was killed by a mountain lion on the Ural-Tweed winter range. Hoffman and Pattie (1968) noted mountain lion distribution and abundance in Montana is closely tied to deer populations.

3) Population Status

No population data were available for the mountain lion population within the Kootenai River valley. It was assumed the lions were distributed throughout the area of concern, and utilized the abundant big game populations as a prey base.

4) Assessment of Impacts

Loss of habitat capable of sustaining a prey base (white-tailed deer, mule deer, elk, and bighorn sheep) for mountain lions is likely to have had a detrimental impact on the lion population in the area of concern (M. Hornocker 1984, pers. commun.). It was assumed a reduction in the prey base resulted in the loss and/or redistribution of the mountain lion territories within the impact area, resulting in the loss of a number of mountain lions. Loss of the dense conifer bottomlands also negatively impacted the resident mountain lion population.

Presence of the reservoir may have affected territorial behavior and interrupted movements of some of the resident mountain lions. Mountain lions occupy fairly large home ranges with extensive movements within the ranges (Seidensticker et al. 1973). Loss of all or portions of one or more mountain lion territories may have had an additional negative impact on the population. Displacement of lions into adjacent territories creates stress which may adversely affect the productivity of the population (M. Hornocker 1983, pers. commun.). Brown (1983, pers. commun.) has observed mountain lion tracks crossing the reservoir during the winter. He suspected this movement was by males searching for mates during the breeding season.

5) Estimated Losses Due to the Project

- Quantitative loss estimate - based on the reduction of the preferred prey base.

  - White-tailed deer

    - 12,027 acres of winter range inundated; 1,467-2,221 white-tailed deer lost due to reduced availability of winter range.

  - Mule deer

    - 12,180 acres of winter range inundated; 716 mule deer lost due to reduced availability of winter range.

    - 200-300 mule deer lost due to collision with vehicles during the 10 years since completion of Highway 37.

    - 4,987 acres of spring range were lost.

  - Bighorn Sheep

    - 4,350 acres of winter/spring range lost; 78 to 102 bighorn sheep lost due to reduction in suitable habitat and increased disturbance.

- Qualitative loss estimate of moderate was assessed.

6) Derivation of Loss Estimates

The quantitative loss estimate was expressed as a loss of the known prey base - big game populations. Loss of white-tailed deer (1,467-2,221) was based on the reduction in available winter range (12,027 acres). The mule deer loss (716) was based on the reduction in available winter range (12,180 acres) and spring range (4,987 acres). Loss of bighorn sheep (78-102 animals) was based on the inundation of 4,350 acres of winter/spring range. The qualitative loss estimate was based on the quantitative losses and on criteria (a), (b), (d), and (e) on page 9, and was considered to be conservative. The loss estimate did not consider the additional prey base - ie. snowshoe hares (Lepus americanus).

J. FURBEARERS

1) Introduction

The 52.5 miles of riverine habitat, 48.8 miles of tributary streams, several bodies of standing water, riparian habitats, and mosaics of forest and shrubland habitats inundated by Lake Koocanusa supported populations of many species of furbearers. Beaver, muskrat, mink, river otter, pine marten, lynx and bobcat were the species considered to be the primary furbearers within the area of concern. Site-specific data descriptive of the occurrence and habitat preferences of preproject furbearer populations were unavailable. Research reports specific to furbearer populations in the region (Key 1979, Hornocker and Hash 1981, Zackheim 1982, Melquist and Hornocker 1983, Wright et al. 1983) did provide descriptions of key habitat requirements and seasonal distributions. As a group, furbearers are currently ranked ninth in the management prioritization.

2) Seasonal Habitat Preferences

Beaver. Beaver occur in lakes, rivers, and marshes throughout Montana (Wright et al. 1983). Atwater (1939) noted optimal habitats for beaver in the South Fork of the Flathead River valley were those areas where willows or populars were available along permanent water courses; these were generally the larger tributaries. It was assumed beavers utilized the Kootenai and Tobacco rivers, larger tributaries, and backwater and slough areas within the area of concern.

River Otter. River otters probably utilized the majority of the aquatic habitats within the area of concern. Zackheim (1982) defined high quality river otter habitat in southwestern Montana as streams with undercut banks and dense riparian vegetation. Also, the presence of side channels and sloughs improves habitat quality. Melquist and Hornocker (1983) found otters in west central Idaho preferred valley habitats to mountain habitats, and streams (rivers) to lakes, reservoirs or ponds. Mudflats, marshes, and backwater sloughs were important to family groups during summer (Melquist and Hornocker 1983). Fish are the main food item for the river otter (Greer 1955a, 1955b, Zackheim 1982, Melquist and Hornocker 1983). Marshes and sloughs provide a supply of slower fishes and prey items utilized by juvenile otters (Zackheim 1982).

Mink. Mink are highly reliant on aquatic and riparian habitats (Key 1979, Melquist et al. 1981, Wright et al. 1983). They are common carnivores along stream courses where they forage in riparian vegetation, overhanging banks, and log jams.

Pine Marten. Areas of mature coniferous timber and small openings are preferred by marten (Newby 1955) because of the diversity of year-round foods provided by such areas (Koehler and Hornocker 1977). Bottomland and lower valley slopes where old growth was interspersed with fire-caused openings probably provided the highest quality marten habitat within the area of concern.

Lynx. Koehler et al. (1979) found dense seral timber stands to be preferred habitat for lynx due to the high densities of snowshoe hares, their preferred prey. Snowshoe hares reach their highest densities in dense seral forest (Adams 1959). Dense stringers of mature Douglas-fir and western larch are also important habitats for lynx (Koehler et al. 1979).

Bobcat. Though regional habitat utilization data for this species area lacking, it is more a species of open shrubland and rocky habitats (Hoffman and Pattie 1968). Brown (1984, pers. commun.) felt the inundated bottomlands along the valley were conducive to bobcat inhabitation.

3) Population Status

Quantitative data for the furbearer species within the area of concern are lacking. Therefore, with the exception of the river otter population estimates were not compiled for any of the furbearers. Melquist and Hornocker (1983) observed a density of 1.0 river otter/2.7-5.8 km of river habitat. Using this density range it was estimated 14-31 river otters inhabited the 52.5 miles of inundated riverine habitat.

4) Assessment of Impacts

Beaver. Over 52.5 miles of riverine habitat, 48.8 miles of tributary streams, several bodies of standing water, and 4,051 acres of riparian habitats were inundated by the project. The majority of these habitats provided the components necessary for quality beaver habitat. These habitats were replaced with a reservoir which is marginal or unsuitable for beavers. The fluctuating water levels of the reservoir hinder establishment of preferred foods (willow, popular, etc.) and expose denning sites during periods of drawdown.

Muskrat. Muskrat populations were closely associated with habitats created by beavers and grassy areas adjacent to the river and tributaries. These habitats were lost within the pool area.

River Otter. Preferred river, stream, and backwater habitats for a population of river otters was replaced by Lake Koocanusa, which represents marginal or unsuitable habitat for otters.

Mink. Riparian habitats (4,051 acres) along 52.5 miles of river and 48.8 miles of tributary streams were lost to inundation and replaced by a reservoir; marginal habitat for mink due to a lack of riparian vegetation.

Pine Marten. Most of the 25,536 acres of terrestrial habitats inundated by the reservoir was assumed to be utilized by pine marten. The 14,959 acres of coniferous habitats inundated by the reservoir were assumed to be the preferred year-round habitat for this species.

Lynx. An undetermined acreage of seral lodgepole pine stands and dense mature Douglas-fir and western larch were included in the 14,959 acres of coniferous habitats inundated by the reservoir. Loss of these areas reduced the overall prey availability and available home ranges for lynx, resulting in a reduction of the population within the area of concern.

Bobcat. Habitats inundated by the reservoir were probably preferred by bobcats. It was assumed the impacts to this species were fairly extensive due to the large amount of bottomland habitat inundated. A loss of the available prey base and suitable home range sites resulted in a reduction of the population within the area of concern.

5) Estimated Losses Due to the Project

Species	Quantitative loss estimate	Qualitative loss estimate
Beaver	---	High
Muskrat	---	Moderate
River Otter	14-31	Moderate
Mink	---	Moderate
Pine Marten	---	Low
Lynx	---	Low
Bobcat	---	Moderate

6) Derivation of Loss Estimates

Due to the lack of population data for the majority of the furbearers, quantitative loss estimates were not determined. Loss of 14-31 river otter was estimated based on the densities (1.0 otter/ 2.7-5.8 km of waterway) observed by Melquist and Hornocker (1983).

Qualitative loss estimates were based on the loss of important habitats needed to support the pre-project populations. It was assumed there was a high population of beaver within the area of concern prior to construction of Libby Dam and the reservoir - supporting marginal beaver populations - replaced the high quality aquatic/riparian communities. Moderate populations of muskrat, river otter, mink and bobcat were assumed to have occurred within the inundated area. The total loss of the habitats supporting these populations occurred, resulting in a total loss of the populations. Zackheim (1982) and Melquist and Hornocker (1983) reported winter conditions appear to influence patterns of otter habitat use, as there is limited accessibility to water and reduced foraging areas. A low to moderate population of pine marten and a low population of lynx were assumed to have inhabited the project area. Low qualitative loss estimates were determined for these species based on the population levels and the total loss of habitats.

K. UPLAND GAMEBIRDS

1) Introduction

Four species of upland game birds inhabited the area of concern prior to inundation of the pool area (U.S. Dep. Agric. 1938, 1948, 1958, Weckwerth and Couey 1962). It was assumed ruffed grouse and blue grouse were common in the riparian areas, upland shrub and a variety of forest types, while spruce grouse were common in the denser coniferous forests. The Columbian sharp-tailed grouse inhabited the inundated grass and shrub areas of the Tobacco Plains.

2) Seasonal Habitat Preference

Ruffed grouse. The mixture of deciduous and conifer habitat types within the area of concern provided yearlong habitat for the resident ruffed grouse population. Ruffed grouse typically utilize a mixture of deciduous and coniferous habitats on a year-round basis (Edminster 1947, Hungerford 1951). Open hardwood stands with moderately dense herbaceous and sapling understory is preferred habitat for courtship (drumming), nesting and brood rearing (Landry 1980), though Stoneberg (1964) documented a nest in lodgepole pine along the North Fork of the Flathead River. Riparian areas and some of the coniferous forests (with scattered hardwoods) on lower benches are probably the preferred year-round habitat of ruffed grouse in northwestern Montana (U.S. Dep. Agric. 1966, Stoneberg 1964, Wright et al. 1983).

Blue grouse. Blue grouse typically breed in open, park-like stands of conifers interspersed with openings of herbaceous cover (Mussehl 1963, Bendell and Elliot 1966, Martinka 1972). U.S. Dep. Agric. (1966) noted blue grouse nested along the lower benches in areas of Douglas-fir and ponderosa pine. South-facing slopes with fire-induced openings within the area of concern were probably preferred by this species. This habitat use pattern was noted by Stoneberg (1964) for blue grouse along the North Fork of the Flathead River. This species displays altitudinal migration, moving upslope to spruce-fir forests in the subalpine and at the subalpine-alpine ecotone in winter (Bendell and Elliot 1966, U.S. Dep. Agric. 1966).

Spruce (Franklin's) grouse. Spruce grouse inhabit mixed coniferous forest, generally preferring subalpine spruce-fir and lodgepole pine (Johnsgard 1975). Jonkel and Greer (1963) noted spruce grouse occurred in spruce-fir forests, interspersed with fire-induced seral stands of western larch and lodgepole pine, in the Whitefish Mountains approximately 25 miles east of the area of concern. Stoneberg (1964) noted a preference for "medium" to "dense" (>2,500 stems/acre) stands of lodgepole pine along the North Fork of the Flathead River. Similar habitats were probably utilized by this species within the Kootenai River drainage.

Columbian sharp-tailed grouse. The present distribution of Columbian sharptails coincides with Kuchler's (1964) sagebrush steppe type and the fescue-wheatgrass type (Miller and Graul 1980). Brown (1971) noted fragmentary populations persisted where major remnant stands of bunch grass and shrubs of the native prairie remain. Sharp-tailed grouse rely primarily on vegetation for food (Pepper 1972) with bud and fruits of deciduous trees used heavily in the winter (Ziegler 1979). Bown (1980) determined a remnant population of Columbian sharp-tailed grouse was still using the grasslands of the Tobacco Plains area north of Eureka.

3) Population Status

No quantitative data were available for the mountain grouse populations along the Kootenai River drainage. The U.S. Forest Service Annual Wildlife Reports (U.S. Dept. Agric. 1938, 1948, 1958) stated ruffed grouse were common and more plentiful than the other two species of mountain grouse. Blue grouse were next in abundance and were listed as scarce to common, while the spruce grouse was listed as rare to scarce. The population of Columbian sharp-tailed grouse has been decreasing and exists as a remanant population (Bown 1980). Because of habitat limitations in northwestern Montana, Brown (1971) felt the Columbian sharptail was an endangered (non-legal status) species.

4) Assessment of Impacts

Ruffed grouse. An unknown quantity of year-round habitat for ruffed grouse was lost to inundation. This species was likely to have occurred throughout the bottomland and bench areas along the Kootenai River and its tributaries. The 4,051 acres of riparian habitat, 159 acres of upland shrub, and a portion of the 14,959 acres of coniferous habitat (Table 1) provided the year-round habitat components needed to sustain a ruffed grouse population.

Blue grouse. Breeding habitat for blue grouse, in the form of open coniferous forests on lower slopes and benches, was lost to inundation. Loss of permanent or "persistent" display sites - located in optimal habitat, generally occupied by older males, and competed for (Lewis and Zwickel 1981) - may have affected the overall pro-ductivity of the local blue grouse population. These persistent display sites are typically downed logs, stumps or rocks in areas where thickets of conifer trees are interspersed with low shrub cover, on lower elevation portions of breeding habitat (Martinka 1972, Lewis and Zwickel 1981). Suboptimal or "transient" display sites are found in less suitable habitats higher in the breeding range, and are frequently vacant (Lewis and Zwickel 1981). The fact there are typically surplus males in blue grouse populations in spite of vacant "transient" display sites, emphasizes the importance of persistent sites to breeding success in this species. If many such sites were lost to inundation, productivity of the blue grouse population may have been reduced when males were forced to utilize transient, suboptimal sites. Loss of

4,051 acres of riparian habitats - primarily those habitats along the tributaries - 159 acres of upland shrub, 7,159 acres of warm, dry conifer (Table 1) reduced the amount of available brood-rearing habitat for this species.

Spruce grouse. This species lost year-round habitat when 14,959 acres of conifer habitat were inundated. Dense regeneration stands (fire-induced) within these habitats provided the necessary components to maintain a spruce grouse population (Jonkel and Greer 1963, Stoneberg 1964, Johnsgard 1975).

Columbian sharp-tailed grouse. Grassland and upland shrub areas inundated within the Tobacco Plains provided year-round habitat for sharptails. A total loss of 1,360 acres of grassland habitat as well as 2,557 acres of sub-irrigated grasslands were inundated by the reservoir north of the original townsite of Rexford (these acres were determined during the habitat mapping of the pool area contained within the Rexford Topographic Map). Loss of these areas resulted in a loss of habitats essential to maintaining the remnant population.

5) Estimated Losses Due to the Project

- Quantitative loss estimates - none were developed due to the lack of density and population information for the area.

- Qualitative loss estimates:

  - Ruffed grouse - high
  - Blue grouse - moderate
  - Spruce grouse - low
  - Columbian sharp-tailed grouse - low

6) Derivation of Loss Estimates

Quantitative loss estimates were not developed due to a lack of population size and density estimates for the area.

A qualitative loss estimate of high for impacts to the ruffed grouse population was based on loss of 4,051 acres of riparian habitat, 159 acres of upland shrub habitat, and 14,959 acres of coniferous habitats. These habitats were important year-round habitats needed for the maintenance of a resident ruffed grouse population. Loss of these habitats resulted in a subsequent loss of the resident ruffed grouse population from the inundated area. Criteria (a) through (d) on page 9 were considered in developing this estimate.

Blue grouse habitat losses were estimated to have had a moderate impact on the blue grouse population within the Kootenai River valley. This was based on the importance of open coniferous forests (7,159 acres) and upland shrub lands (159 acres) as breeding and brood rearing habitat. The loss of 4,051 acres of riparian habitat also had a negative impact on the brood rearing habitat. Criteria (a) through (e) on page 9 were considered in the development of this estimate.

Impacts to spruce grouse within the area of concern were rated as low based on the loss of preferred habitats and the estimated population levels of the species within the area of concern. Criteria (a), (b) and (d) on page 9 were used in development of this estimate.

Loss of 1,360 acres of grassland and 2,557 acres of subirrigated grasslands within the area of the Tobacco Plains resulted in a low impact to the remnant population of Columbian sharp-tailed grouse found within the area of concern. Criteria (a) through (c) on page 9 were considered during the development of this estimate.

L. WATERFOWL

1) Introduction

A diversity of waterfowl species utilized the Kootenai River prior to impoundment by Libby Dam. The majority of the ducks utilizing the area were probably cavity nesters, primarily wood duck, common goldeneye and Barrow's goldeneye. Cottonwood and mixed deciduous/coniferous riparian areas found along the Kootenai River and the major tributaries provided abundant sites for cavity nesting waterfowl. Mallard and American wigeon were two upland nesters found along the river and its tributaries, while the Harlequin duck was an uncommon resident found along swift moving portions of the Kootenai River. Joslin (1978) noted the presence of Harlequin ducks in the vicinity of Kootenai Falls. A variety of other dabbling and diving ducks occurred in the area of concern during migration (U.S. Dept. Agric. 1965b, 1966).

A Canada goose population was found along the Kootenai River. It was assumed this species nested primarily on the islands and used the islands and gravel bars for feeding and loafing similar to the use observed by DeSimone (1980) for the islands in the area of the proposed reregulation dam. The scattered agricultural bottomlands located along the river provided additional nesting and high quality brood rearing habitat for the goose population.

2) Seasonal Habitat Preference

Canada goose. Islands, backwater sloughs, and gravel bars were probably used by the Canada goose for nesting, brooding and loafing, respectively. This pattern of habitat use has been documented by DeSimone (1980) on the Kootenai River, and by Geis (1956) on the mainstem of the Flathead River. The large number of islands, primarily north of the original townsite of Rexford provided secure nesting habitat as described by Ball et al. (1981) for Washington. The abundant cottonwood stands along the riparian zone also provided suitable nest sites. In addition, the numerous sub-irrigated grasslands/hay meadows, which occurred primarily upstream from the original townsite of Rexford, provided abundant brood rearing habitat similar to that noted by Ball et al. (1981).

Ducks. The various riparian habitats, sub-irrigated grasslands/hay meadows, and island habitats within the inundated area offered suitable nesting habitat for a variety of duck species. Several cavity nesting species, including wood duck, Barrow's goldeneye and common goldeneye, probably utilized cottonwood and coniferous snags within the riparian zones. Backwater areas also provided secure brood rearing habitat similar to that discussed by Bellrose (1976). The mallard was probably the most common upland nester with American wigeon found in lesser numbers. Bottomland areas, riparian shrublands, and backwater and beaver pond areas were probably utilized by these species. The harlequin duck is known to nest along swift streams and rivers in Glacier National Park (Kuchel 1977) and in the swift portions of the Kootenai River in the vicinity of Kootenai Falls (Joslin 1978). It was assumed this species utilized swift portions of the Kootenai River and its tributaries inundated by Lake Koocanusa.

During spring and fall the open water areas - river, ponds, sloughs, and marshes - provided feeding and resting areas for migrating waterfowl. Open water stretches were utilized by wintering waterfowl.

3) Population Status

Canada goose. The portion of the Kootenai River upstream of the original townsite of Rexford river (area on the Rexford topographic map) probably supported a viable Canada goose population. This area contained 15 vegetated islands (65.2 percent of the vegetated islands) and 14 non-vegetated islands (58.3 percent of the non-vegetated islands) for a total of 29 islands (61.7 percent of the total number of islands) (Table 3). These islands contained a diversity of habitats, including 122.2 acres of gravel bars, 471.4 acres of sub-irrigated grasslands, 235.1 acres of shrub riparian, 290.1 acres of cottonwood riparian, and 353.8 acres of mixed riparian habitats. These islands provided the habitats needed to support a Canada goose population as observed by Ball et al. (1981) in Washington. Additional geese probably used the portion of the river downstream from the townsite of Rexford; however, it was assumed this habitat was suboptimal and fewer geese were present in the area. Nesting by geese occurred on the numerous small lakes adjacent to the impact area, and it was assumed a number of these geese moved to the river for brood rearing once hatching had occurred.

Ducks. Highest densities of geese and ducks probably occurred during mitigation periods, when the river and associated aquatic habitats were used for feeding and resting. The slow water areas, backwater areas, sloughs and beaver ponds, and agricultural fields provided suitable feeding sites for the migrating birds. The U.S. Dep. Agric. (1965b, 1966) reported the area was used primarily for rest stops during migration and resident waterfowl populations were present throughout the Fisher River and Rexford ranger districts, with a low population within the Fisher River District and a more abundant population within the Rexford District. The level of spring use was probably greater than the fall use due to freeze-up of the waterfowl sloughs and potholes adjacent to the river. Winter use of the area was light with common merganser and common goldeneye the primary winter residents (Bealey and West 1935, U.S. Dep. Agric. 1965b).

No quantitative population estimates could be determined for the various species of waterfowl; however, qualitative seasonal population estimates were determined based on the available information (Table 4).

Table 3. Summary of island habitat inundated by Lake Koocanusa.

U.S.G.S. Topographic map	VEGETATED ISLANDS Number	Percent total	Acres	Percent total	Acres/ island	NON-VEGETATED ISLANDS Number	Percent total	Acres	Percent total	Acres/ island	TOTAL Number	Percent total	Acres	Percent total
Rexford	15	65.2	1472.6	93.2	98.2	14	58.3	74.3	68.6	5.3	29	61.7	1546.9	91.6
Beartrap Mt.	1	4.3	10.8	0.7	10.8	—	—	—	—	—	1	2.1	10.8	0.6
Webb Mt.	2	8.7	38.1	2.4	19.0	1	4.2	3.8	3.5	3.8	3	6.4	41.9	2.5
Inch Mt.	4	17.4	32.4	2.0	8.1	4	16.7	3.8	3.5	0.9	8	17.0	36.2	2.1
Ural Mt.	—	—	—	—	—	2	8.3	10.6	9.8	5.3	2	4.3	10.6	0.6
Volcour	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Alexander Mt.	1	4.3	26.7	1.7	26.4	3	12.5	15.8	14.6	5.3	4	8.5	42.5	2.5
TOTAL	23	99.9	1580.6	100.0	68.7	24	100.0	108.3	100.0	4.5	47	100.0	1688.9	99.9

Table 4. Qualitative population estimates for the waterfowl populations within the Libby Dam project area.

Species	Season of Use			
	Winter	Spring	Summer	Fall
Canada Geese	--	moderate	moderate	moderate
Mallard	low	moderate	moderate	low
Wood Duck	--	low-moderate	low-moderate	low-moderate
American Wigeon	--	low	low	--
Harlequin Duck	--	moderate	low	low
Barrow's Goldeneye	low	low	low	low
Common Goldeneye	moderate	moderate	moderate	moderate

4) Assessment of Impacts

Breeding habitat for a variety of waterfowl species was lost when the Libby Dam project was constructed. Nesting habitat for cavity and upland nesting species was provided by: the 23 vegetated islands and a portion of the 24 non-vegetated islands; deciduous, cottonwood and mixed deciduous/coniferous riparian areas; and sub-irrigated grasslands. A total of 52.5 miles of riverine habitat (3,285 acres), 48.8 miles of tributary habitat and 29 acres of standing water were replaced by a large body of water. Lake Koocanusa contains two islands with coniferous habitat which are not conducive to waterfowl nesting or feeding. Though numerous snags are available for nesting waterfowl, loss of brooding habitats had the greatest impact on local waterfowl populations. Most of the species assumed to have nested in the valley are dependent on an interspersion of grassy or emergent cover and open water for broods (Bellrose 1976). These areas provide a combination of escape cover and macroinvertebrate prey (Sugden 1973) essential to brood survival. Examples of such habitats present prior to the formation of the reservoir were sloughs, marshes and backwater areas along the two rivers and their tributaries. Since many species initiate nesting during low early spring flows, later water releases from Libby Dam may also flood many of the waterfowl nests on the downstream islands. In addition, the sub-irrigated grasslands inundated by the project provided brood rearing areas for the Canada goose population similar to those des-cribed by Ball et al (1981). Harlequin duck brood habitat, charac-terized by swift water habitats of interspersed pools and riffles (Kuchel 1977), and known to be present along the existing free-flowing river (Joslin 1978), was also inundated by the project.

Shoreline habitats along Lake Koocanusa are currently unsuitable as waterfowl brood-rearing areas. Fluctuating water levels have led to extensive mudflat areas lacking the emergent or herbaceous vegetation necessary for food and cover, prerequisites for brood survival. Changes in macroinvertebrate species composition due to the impoundment of the river (McMullin 1979, Bonde and Bush 1982) may also have affected food resources available to broods.

Creation of a large reservoir increased the open water areas available as resting habitat for migratory flocks of waterfowl. Lack of established stands of aquatic vegetation in the littoral zone, caused by fluctuating water levels, limits food availability and lowers the value of the reservoir to migratory waterfowl when compared to natural lakes in the region.

Winter habitat for waterfowl was lost when the primarily open-water river habitats were replaced by a reservoir which completely or partially freezes over each winter. It was assumed the winter habitat along the Kootenai River was suboptimal.

5) Estimated Losses Due to the Project

- Quantitative loss estimates - none were developed due to lack of population data.

- Qualitative loss estimates -

Canada goose	-	moderate to high
American wigeon	-	negligible
Mallard	-	moderate
Wood duck	-	low to moderate
Barrow's goldeneye	-	low
Common goldeneye	-	moderate
Harlequin duck	-	low to moderate

6) Derivation of Loss Estimates

Quantitative loss estimates were not developed due to the lack of population or density data prior to construction of the Libby Dam project. Qualitative population levels (Table 4) were used in the development of the qualitative loss estimates.

Qualitative loss estimates were developed based on: 1) the known distribution and habitat requirements of the species assumed to occur at the site; 2) limited description of habitats in the pool area prior to inundation; and 3) an assessment of the regional importance of the waterfowl populations at the site. The latter assessment was based on the professional opinion of biologists involved with this project, and available data from elsewhere in the region.

Impacts to the Canada goose population were estimated to be moderate to high based on the probable pre-project population level of this species, and a loss of the majority of suitable nesting sites and brood rearing habitat along the full length of the inundated river (criteria (a) through (d), page 9). Though suitable nesting sites - snags, stumps, and trees - are present along the reservoir, brood habitat is lacking.

Qualitative loss estimates for mallard and American wigeon were moderate and negligible, respectively. These losses were based on the loss of resting and brood rearing habitat combined with the pre-project population levels (criteria (a) through (c), page 9). The fluctuating water levels limit the availability of suitable brood-rearing and feeding habitats for these species.

A number of cavity-nesting waterfowl species lost preferred nesting and brood habitat when riparian areas (nesting sites) adjacent to suitable brood habitat were lost when the project was constructed. The 3 cavity nesting species considered on the target species list were assessed various degrees of impact based on their pre-project population sizes (Table 4). Common goldeneye, wood duck, and Barrow's goldeneye were assessed a moderate, low to moderate and low impact, respectively.

Suitable habitat for harlequin duck nesting and brooding occurred along the Kootenai and Tobacco rivers and their tributaries within the inundated area, and this species is known to occur along the Kootenai River (Joslin 1978). Since this species is highly reliant on swift-water habitats, it was assumed inundation of the project area resulted in a low to moderate impact to the regional harlequin duck population.

M. BALD EAGLES

1) Introduction

Use of the Kootenai River by the northern bald eagle, an endangered species within the United States, has been concentrated from late fall to early spring. The spawning run of mountain whitefish (Prosopium williamsoni) combined with the abundant carrion associated with the wintering populations of big game provided a stable food supply during this period. Limited nesting has been documented along the Kootenai River from the confluence of the Fisher River north to the United States-Canada border.

2) Seasonal Habitat Preference

From mid-October to late March, a number of winter resident and migratory bald eagles have been observed using the open water areas along the Kootenai and Fisher rivers (Craighead and Craighead 1979, unpublished U.S. Forest Service files, Rexford Ranger District). Based on the historic information it was assumed portions of the river remained ice-free during the winter and provided suitable habitat for winter bald eagles. Preferred streamside perch trees are large (remnant) snags of western larch and western redcedar which project above the surrounding forest; cottonwood, Douglas-fir, birch and spruce are also frequently used (McClelland 1973, Craighead and Craighead 1979, U.S. Dep. Inter. 1983). Barren areas associated with gravel bars, river bars and shoreline also provided foraging and nesting sites. Craighead and Craighead (1979) observed bald eagles partitioned the available habitat along the open water area, limiting the total number of eagles that could occupy a given reach of the river.

During the nesting season, active territories have been observed along the Kootenai River valley. Nesting bald eagles typically select tall snags or live trees within a few hundred yards of water (Evans 1982). Within the region, nests are associated both with rivers and lakes (Shea 1973, B. McClelland 1983, pers. commun.). The one known active nest site along the Kootenai River in Montana is located in the riparian zone along the river.

In their report, Craighead and Craighead (1979) found a variety of food items were utilized. Start of the fall concentration of bald eagles coincided with a major spawning run of mountain whitefish up the Fisher River. After the spawning run, fish killed or injured while passing through the generating turbines contained within the Libby Dam powerhouse, and big game carrion associated with the extensive winter ranges provided the majority of the food supply. Limited use of waterfowl carcasses was also observed.

3) Population Status

During the winter of 1978-79, an average density of one bald eagle per 2.58 miles of open water was observed by Craighead and

Craighead (1979). Using this density estimate a total of 20 bald eagles were estimated to winter along the 52.5 miles of river inundated by the Libby Dam project. Two historical reports of bald eagle winter use along the Kootenai River were located. Zajanc (1948) reported the large number of eagles (species designation not made) observed along the river may have been preying on the bighorn sheep and limiting the size of the Ural-Tweed herd. U.S. Dep. Agric. (1968) reported bald eagles were observed along the river from Libby north to the United States-Canada border. These reports indicate the estimate of 20 wintering bald eagles along the inundated portion of the Kootenai River was probably a minimal estimate. During the winter of 1978-79, Craighead and Craighead (1979) observed 1 to 4 bald eagles wintering along Lake Koocanusa.

In addition to the wintering population, a limited amount of nesting occurs along the Kootenai River valley. U.S. Forest Service records indicated the historical presence of 2 to 3 bald eagle nesting territories within the project area before con-struction. During the 1983 nesting season there were 3 active territories (1 known and 2 suspected) along Lake Koocanusa (G. Altman 1983, pers. commun., D. Godtel 1983, pers. commun.). The total productivity of these nests is not known. A nest which was active in 1980 is no longer active (D. Godtel 1983, pers. commun.).

4) Assessment of Impacts

The major impact to the bald eagle population utilizing the project area was the loss of wintering and nesting habitats. Formation of Lake Koocanusa inundated 52.5 miles of river which remained relatively ice free during the winter and provided suitable foraging habitat. The lake becomes at least partially ice covered during severe winters with only limited use by bald eagles (Craighead and Craighead 1979). Loss of this habitat may have been partially offset by the additional food supply (injured fish) provided below the dam; however, due to the habitat partioning observed by Craighead and Craighead (1979), displacement of individuals to this area probably did not take place.

Presence of a road along both sides of the reservoir increased the level of human disturbance and when combined with the inundation of nesting habitat has limited the availability of suitable nest sites along the reservoir.

5) Estimated Losses Due to the Project

- 16-19 bald eagles lost due to inundation of winter habitat.

- Qualitative loss estimate - moderate (wintering only).

6) Derivation of Loss Estimate

A population of 20 wintering bald eagles was estimated to use the inundated reach of the Kootenai River prior to the construction of the Libby Dam Project. This estimate was calculated by using a density of 1 bald eagle per 2.58 miles of river for the 52.5 miles of river. During the winter of 1978-79, Craighead and Craighead (1979) reported 1 bald eagle was consistently observed using the reservoir and up to 4 birds may have used the area. A range of losses, based on the combination of the population estimate (20 bald eagles) and the observation of wintering eagles (1-4), was estimated to be 16 to 19 bald eagles. Abundance of injured or dead fish available below the dam may have provided food for additional wintering eagles displaced from the pool area; however, due to the partitioning of the winter habitat observed by Craighead and Craighead (1979) it is unlikely this displacement occurred. The estimate of losses is probably conservative as the inundated reach, particularly the area upstream from the original townsite of Rexford, may have been better habitat than the lower reaches (A. Christensen 1983, pers. commun.).

N. OSPREY

1) Introduction

No records were located indicating the extent of the osprey population along the Kootenai River prior to construction of the Libby Dam project; however, it was assumed an unknown number of osprey were present.

2) Seasonal Habitat Preference

Osprey require a combination of suitable nesting sites - on islands, or within upland forests adjacent to lakes and reservoirs - and prey (fish) availability. Ospreys have been documented nesting along both rivers and lakes in Montana (MacCarter and MacCarter 1979, Swenson 1981, Grover 1983). Preferred nest sites are typically large deciduous and coniferous snags, live coniferous trees, or powerpoles (MacCarter and MacCarter 1979).

3) Population Status

Surveys conducted by the U.S. Forest Service within the Fisher River Ranger District provided limited data on the osprey population along the portion of Lake Koocanusa within the district (U.S. Dep. Agric. unpubl. files). Since 1974, a maximum of 4 active osprey nets have been known to exist within the district in during a nesting season. A complete survey of the reservoir has not been completed; however, Brown (1983, pers. commun.) indicated, during aerial censuses of big game populations, a large number of osprey nests were observed and the estimates of osprey use of the area by the U.S. Forest Service were probably low. Nest sites observed during the surveys were not recorded so a density estimate could not be developed.

4) Assessment of Impacts

Increased use of reservoirs over pre-impoundment rivers by nesting ospreys has been documented elsewhere in Montana (Swenson 1981, Grover 1983). Grover (1983) reported 1.0 occupied nest per 1.15 miles along Canyon Ferry Reservoir compared to 1.0 nest per 20.7 miles along the free-flowing river. It was assumed, if a complete osprey nest survey within the reservoir area and a portion of the free-flowing Kootenai River was conducted, an increase in the osprey population within the impact area since the completion of the Libby Dam project would probably be indicated.

5) Estimated Losses/Gains Due to the Project

- Quantitative loss/gain estimate - none could be developed.

- Qualitative loss/gain estimate - low positive.

6) Derivation of Loss Estimates

A quantitative loss estimate was not developed due to lack of density or population data. A qualitative assessment of low positive impacts was assessed due to the probability of an increase in the osprey population; a trend noted at other Montana impoundments (Swenson 1981, Grover 1983). The low rating may be a conservative estimate; however, due to the lack of pre-project population information and the probability the Kootenai River valley - particularly the area north of the original townsite of Rexford - was good quality osprey habitat prior to inundation, a greater positive benefit could not be assessed.

V. PREVIOUS MITIGATION

1) Introduction

Mitigation of impacts to the wildlife populations and habitat resulting from the construction of the Libby Dam project has consisted of 3 types of projects: 1) land acquisition; 2) habitat manipulation; and 3) habitat improvements. The original basis for these efforts was the impact assessment compiled by the U.S. Fish and Wildlife Service (U.S. Dep. Inter. 1965). The document reported 1,450 white-tailed deer, 1,800 mule deer, 170 mountain sheep, 300 Rocky Mountain elk and 300 moose inhabited the reservoir area of influence and estimated $1,300,530 would be needed to acquire and enhance lands needed to mitigate the impacts to these big game species. In 1971, the U.S. Fish and Wildlife Service determined, based on costs per hunter day, the value of the impacted species was $1,374,413.90; of this total $70,601.00 would be spent enhancing U.S. Forest Service lands and $1,303,812.90 would be spent acquiring no more than 12,000 acres of easements or fee title for wildlife grazing lands (U.S. Dep. Inter. 1971a, 1971b). Legislation authorizing the Libby Dam project (Public Law 81-516) did not contain specific provisions for fish and wildlife. The Fish and Wildlife Coordination Act of 1958 (Public Law 85-62) provided the basis for consideration of the wildlife resources within the area of concern, and provided land acquisition for wildlife mitigation had be specifically authorized by Congress (U.S. Dep. Army 1972).

2) Land Acquisition

The Water Resources Development Act of 1974 (Public Law 93-251) authorized the expenditure of $2,000,000 for acquisition of up to 12,000 acres of wildlife grazing lands in mitigation of habitat losses resulting from the overall Libby Dam project. The Montana Department of Fish, Wildlife and Parks acted as a consultant to the U.S. Corps of Engineers and identified and prioritized several parcels of suitable wildlife habitat that qualified as wildlife replacement lands. During the late 1970's three separate parcels, totalling 2,443.81 acres, were acquired by the U.S. Army Corps of Engineers exhausting the $2,000,000 (Table 5). Title to these lands was subsequently transferred to the Montana Department of Fish, Wildlife and Parks.

DeRozier Unit. This unit, located adjacent to the United States - Canada border northeast of Eureka, consists of 1,417.0 acres. This area is located primarily in the foothill transition zone between the Tobacco Plains and the Whitefish Range. A portion of this unit is utilized by mule deer and elk as winter range (Zajanc 1948). Extensive spring use by mule deer - particularly of the hayfields - has been observed (J. Cross 1984, pers. commun.), while mule deer, white-tailed deer and elk utilize the area during the summer. A number of historical grizzly bear observations have been documented on or adjacent to the unit with the most recent being in the early 1970's (U.S. Dep. Agric. unpubl. files). It was

Table 5. Summary of acquisition of wildlife grazing lands as mitigation for the Libby Dam project.

Unit	Tract	Landowner	Deed Dated	Acreage	Amount
DeRozier	100	Glen Wood	6 Jun 1978	1,357.00	$ 811,000
	101	Alta Stoddard	2 Nov 1978	40.00	48,000
	102	Lloyd Maynard	19 Oct 1978	20.00	28,300
	Subtotal			1,417.00	$ 887,300
Kootenai Falls	204	Dale Sheppard	10 Oct 1979	106.69	150,000
	Subtotal			106.69	$ 150,000
West Kootenai	200	John Miller	19 Jan 1980	385.32	$ 362,200
	201	Harold Sturdevant	14 Feb 1980	146.55	120,905
	202	John Miller	16 Nov 1979	300.00	282,000
	203			88.25	82,955
	Subtotal			920.12	$ 848,060
TOTAL				2443.81	$1,885,360*

*This total does not include the administrative overhead costs incurred by the U.S. Army Corps of Engineers during the purchasing process (K. Brunner 1984, pers. commun.).

assumed black bears also use the area. Historical Columbian sharp-tailed grouse habitat is located in proximity to this area, and the unit may be used by this species. Use by the three mountain grouse species is likely to occur as a diversity of upland and timbered habitats are found within the boundaries of the unit.

Since this unit was purchased in 1978 no authorized livestock grazing has taken place. A field examination of the area indicated the range has responded favorably to this rest, with vigorous stands of grasses present throughout the majority of the area and many stands of shrubs becoming established, adding to the habitat diversity within the unit. Limited management and maintenance of the unit has been accomplished through a share-cropper who hays a portion of the unit.

When the majority of the unit was purchased the water rights were not transferred and have not been subsequently transferred. Lack of water for irrigation has allowed for degradation of the hay fields - mule deer spring range. The Montana Department of Fish, Wildlife and Parks has filed for the water rights; however, a hearing determining the validity of the claim has yet to be conducted.

West Kootenai Unit. This unit consists of 920.12 acres of timbered, upland habitat west of Lake Koocanusa and adjacent to the United States - Canada border. The majority of the area is utilized by wintering big game, with mule deer, white-tailed deer, elk and moose known to use the area (Campbell 1973). Spring though fall use of the area by these species also occurs but at a lower level of use. Use of the area by black bear, ruffed grouse, blue grouse, and spruce grouse was assumed to occur.

This unit is primarily timbered with a diversity of conifer species. No authorized grazing occurring on the unit since it was purchased in 1979 and 1980. Limited maintenance of the area has been accomplished through the use of small Christmas tree sales, where the buyer preformed a given maintenance for the right to cut a given number of Christmas trees (J. Cross 1984, pers. commun.).

Kootenai Falls Unit. This unit (Sheppard Meadows) consists of 106.69 acres of floodplain and lower bench habitat along the north side of the Kootenai River, upstream from Kootenai Falls. The primarily big game use of this area is winter and spring range for bighorn sheep and mule deer (Zajanc 1948, Joslin 1978).

These units (Table 5) provided a potential for increased big game wintering habitat, which would have partially mitigated the loss of big game winter range resulting from the Libby Dam project; however, operation and maintenance funds have not been allocated. A Memorandum of Understanding (February 9, 1976) indicated the Montana Department of Fish, Wildlife and Parks was to assume management responsibility for the mitigation lands once the U.S.

Army Corps of Engineers had transferred title of the lands to the Department. The Department has since been unable to allocate adequate funds for habitat improvement, and without these funds the full potential of the units will not be realized. Without an increase in winter range grazing capacity, an increase in big game winter populations has not been possible. Therefore, due to the lack of operation and maintenance funds, these units have only minimally mitigated the impacts to the big game populations resulting from the construction of the Libby Dam project.

Another problem inherent to the land acquisition program was the length of time between the initiation of the Libby Dam project and the final transfer of the lands to the Montana Department of Fish, Wildlife and Parks. Construction of the Libby Dam project was initiated in 1966, Congress authorized funds for acquisition of wildlife grazing lands in 1974, the U.S. Army Corps of Engineers purchased the three management units between 1978 and 1980, and final tranfer of the lands to the Montana Department of Fish, Wildlife and Parks occurred in 1982 resulting in a time period of 16 years. During this time, inflation consumed a large portion of the purchasing power of the mitigation funds allowing for only a minimal acreage of mitigation lands to be purchased. Many opportunities to purchase lands of high wildlife value for lower cost were lost during this period due to no authorization for funding and lack of agreement on how the mitigation process should proceed.

2) <u>Habitat Manipulation</u>

The U.S. Forest Service agreed to conduct habitat improvements on 6,971 acres of wildlife habitat on Forest Service lands adjacent to the Libby Dam project. These projects were to be conducted by the U.S. Forest Service with funds provided by the U.S. Army Corps of Engineers. Approximately 78 percent of these projects were completed as of the end of Fiscal Year 1974 (U.S. Dep. Agric. unpubl. files). Since then the remainder of the projects have been completed (U.S. Dep. Agric. unpubl. files, D. Godtel 1983, pers. commun). These projects included habitat manipulations for the improvement of big game winter range (6,814 acres) and habitat improvement on 5 units to benefit waterfowl (157 acres).

Big game habitat manipulations were varied and included logging, thinning, slashing, broadcast burning and/or seeding. These treatments were completed separately or in combination in order to produce the desired results. In conjunction with these projects, the U.S. Army Corps of Engineers also funded the Montana Department of Fish, Wildlife and Parks to monitor the vegetative and wildlife responses to the treatments.

Habitat manipulations were conducted on big game winter ranges and were one-time treatments. Review of the annual monitoring reports (Campbell 1972, 1973, Campbell and Knoche 1974, Knoche 1974, Knoche and Brown 1975) indicated the desired results may not have been obtained and the full potential of this mitigation measure was not realized. Even if the desired results were achieved, after a period of time (10-20 years), the areas need to be treated again to reverse ecological succession and maintain the increased level of forage production. Without this treatment the production of big game forage will decrease and the beneficial effect of the mitigation project will be lost.

Waterfowl habitat improvements were designed to increase waterfowl (duck and goose) production on 5 wetland areas. Fencing, seeding, island construction and dike construction were used in various combinations to provide quality waterfowl nesting and brood rearing habitat. Nest boxes were placed at some of the areas to promote increases in cavity nesting species.

3) Habitat Improvements

The U.S. Army Corps of Engineers have completed some wildlife projects related to mitigation but not completed as mitigation projects. These projects were designed to enhance waterfowl nesting on lands, downstream of the dam site, belonging to the Corps. These projects consist of 11 Canada goose nesting structures and 11 nesting boxes for cavity nesting waterfowl species (M. Tibbs 1983, pers. commun.).

VI. SUMMARY

The Libby Dam project inundated approximately 28,850 acres of diverse wildlife habitats, including 3,314 acres of aquatic and 25,536 acres of terrestrial habitats. Approximately 52.5 miles of riverine habitat and 48.8 miles of tributary stream habitat were inundated, including several backwater/slough areas adjacent to the rivers. Twenty-nine acres of standing water were inundated by the project. Riparian areas, totalling 4,051 acres, inundated by the project included shrub, cottonwood and mixed deciduous/coniferous riparian habitats. Sub-irrigated grasslands/hay meadows, totalling 3,404 acres, were found throughout the valley floor; however, they were concentrated north of the original townsite of Rexford. Non-forested upland habitats interspersed with the forested types included 1,583 acres of grasslands and 159 acres of upland shrublands. The conife: habitats were grouped into 5 generic types totalling 14,959 acres. Talus slopes totalling 16 acres were scattered throughout the pool area. Developments totalled 409 acres and were primarily associated with farmsteads, except for the areas associated with the 3 townsites. Loss of these habitats adversely affected the diverse wildlife populations inhabiting the Kootenai River valley. Quantitative and qualitative loss estimates were developed for selected target species and species groups (Table 6) based on available data descriptive of pre- and post-construction population and habitat associations of wildlife species in the project area and similar, nearby areas in northwestern Montana.

Big game species inhabiting the area of concern were impacted to varying degrees by the construction of the Libby Dam project. White-tailed deer (1,467-2,221 animals), mule deer (716 animals), bighorn sheep (78-102 animals), and black bear (43 animals) populations suffered declines due to the project. These loss estimates were the basis for a qualitative loss estimate of high for each of the species. In addition, beaver and ruffed grouse, both dependent on the riparian areas, were also impacted at a level determined to be high. A moderate to high level of impact was assessed for the effects of the project on the Canada goose population inhabiting the pool area prior to inundation.

Moderate loss estimates were developed for the mountain lion population (loss of prey base), populations of several species of furbearers - muskrat, river otter, mink and bobcat - (loss of habitat), the seasonal (breeding) population of blue grouse, 2 species of waterfowl - mallard and common goldeneye - (loss of breeding, nesting and brood rearing areas), and the winter population of bald eagle (loss of foraging habitat). Low to moderate qualitative impact assessments were determined for the grizzly bear, wood duck, and harlequin duck populations. These species incurred substantial impacts; however, the impacts did not affect the regional populations to the degree other target species were impacted.

A low level of impact was assessed for the majority of the remaining species, including moose, pine marten, lynx, spruce

Table 6. Summary of loss estimates for selected target species affected by construction of the Libby Dam project on the Kootenai River, Montana.

Species (group)	Impacts	Loss Estimate: Qualitative	Loss Estimate: Quantitative: Number of animals	Loss Estimate: Quantitative: Acres
White-tailed deer	Loss of winter range	High	1,467-2,221	12,027
Mule Deer	Loss of winter range	High	716	12,180
	Traffic related mortalities		200-300	---
	Loss of spring range			4,987
Bighorn Sheep	Loss of winter/spring range	High	78-102	4,350
Elk	Loss of seasonal habitat	Negligible	Negligible	
Moose	Loss of seasonal habitat	Low	5-15	---
	Railroad related mortalities		20-40	---
Black Bear	Loss of seasonal habitats; foraging areas; denning sites	High	43	---
Grizzly Bear	Loss of seasonal habitats;	Low-moderate	---	---
Mountain Lion	Loss of year-round habitat;	Moderate	---	---
	Loss of white-tailed deer prey base;		1,467-2,221	12,027
	Loss of mule deer prey base			
	Winter range		716	12,180
	Spring range		---	4,987
	Traffic related mortalities		200-300	---
	Loss of bighorn sheep prey base		78-102	4,350
Furbearers				
Beaver	Loss of habitat, food source, dens	High	---	---
Muskrat	Loss of habitat	Moderate	---	---
River Otter	Loss of habitat	Moderate	14-31	---

Table 6. (Continued).

Species (group)	Impacts	Loss Estimate: Qualitative	Loss Estimate: Quantitative: Number of animals	Loss Estimate: Quantitative: Acres
Furbearers (cont.)				
Mink	Loss of habitat	Moderate	---	---
Pine Marten	Loss of habitat	Moderate	---	---
Lynx	Loss of habitat	Low	---	---
Bobcat	Loss of habitat	Moderate	---	---
Upland Gamebirds				
Ruffed grouse	Loss of year-round habitat	High	---	---
Blue grouse	Loss of breeding and seasonal habitat	Moderate	---	---
Spruce grouse	Loss of year-round habitat	Low	---	---
Columbian sharp-tailed grouse	Loss of year-roung habitat	Low	---	---
Waterfowl				
Canada goose	Loss of breeding, nesting, and brood rearing habitat for each species.	Moderate-high	---	---
Mallard		Moderate	---	---
American wigeon		Negligible	---	---
Wood duck		Low-moderate	---	---
Barrow's goldeneye		Low	---	---
Common goldeneye		Moderate	---	---
Harlequin duck		Low-moderate	---	---
Bald Eagle	Loss of winter habitat	Moderate	16-19	---
Osprey	Increased nesting habitat	Low (positive)	---	---

grouse, Columbian sharp-tailed grouse, and Barrow's goldeneye. In the cases of these target species either the low populations and/or the limited supply of suitable habitat did not warrant a greater impact assessment. The impacts to 1 species, elk, were rated as negligible due to the minimal populations inhabiting the Kootenai River valley prior to formation of Lake Koocanusa.

During the assessment process only 1 target species (osprey) was determined to have benefitted from the construction of Libby Dam project. The nesting density of osprey along Lake Koocanusa was assumed to be greater than the density found along the Kootenai River prior to inundation.

Previous mitigation has been conducted through the cooperation of the U.S. Army Corps of Engineers, Montana Department of Fish, Wildlife and Parks, and the U.S. Forest Service. Mitigation included land acquisition, habitat manipulation, and habitat improvement. The majority of the projects were short-term and were not designed to provide benefits to the wildlife populations for the duration of the Libby Dam project (100 years). Land acquisition did provide wildlife habitat which could be managed for the benefit of wildlife for the complete life of the project; however, only minimal funds have been available for the operation, maintenance and enhancement, and the three management units have not reached their potential benefit to the wildlife populations.

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Upland Gamebirds				
Ruffed grouse	Loss of year-round habitat	High	---	---
Blue grouse	Loss of breeding and seasonal habitat	Moderate	---	---
Spruce grouse	Loss of year-round habitat	Low	---	---
Columbian sharp-tailed grouse	Loss of year-roung habitat	Low	---	---
Waterfowl				
Canada goose	Loss of breeding, nesting, and brood rearing habitat for each species.	Moderate-high	---	---
Mallard		Moderate	---	---
American wigeon		Negligible	---	---
Wood duck		Low-moderate	---	---
Barrow's goldeneye		Low	---	---
Common goldeneye		Moderate	---	---
Harlequin duck		Low-moderate	---	---
Bald Eagle	Loss of winter habitat	Moderate	16-19	---
Osprey	Increased nesting habitat	Low (positive)	---	---

grouse, Columbian sharp-tailed grouse, and Barrow's goldeneye. In the cases of these target species either the low populations and/or the limited supply of suitable habitat did not warrant a greater impact assessment. The impacts to 1 species, elk, were rated as negligible due to the minimal populations inhabiting the Kootenai River valley prior to formation of Lake Koocanusa.

During the assessment process only 1 target species (osprey) was determined to have benefitted from the construction of Libby Dam project. The nesting density of osprey along Lake Koocanusa was assumed to be greater than the density found along the Kootenai River prior to inundation.

Previous mitigation has been conducted through the cooperation of the U.S. Army Corps of Engineers, Montana Department of Fish, Wildlife and Parks, and the U.S. Forest Service. Mitigation included land acquisition, habitat manipulation, and habitat improvement. The majority of the projects were short-term and were not designed to provide benefits to the wildlife populations for the duration of the Libby Dam project (100 years). Land acquisition did provide wildlife habitat which could be managed for the benefit of wildlife for the complete life of the project; however, only minimal funds have been available for the operation, maintenance and enhancement, and the three management units have not reached their potential benefit to the wildlife populations.

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APPENDIX

APPENDIX A

Conifer habitat mapping units based on groupings
of Pfister habitat types (1977).

GROUP 1. Warm dry Douglas-fir and ponderosa pine habitat types

130	Pipo/Agsp	210	Psme/Agsp
140	Pipo/Feid	220	Psme/Feid
141	Pipo/Feid-Feid	230	Psme/Fesc
160	Pipo/Putr	310	Psme/Syal
161	Pipo/Putr-Agsp	311	Psme/Syal-Agsp
162	Pipo/Putr-Feid	313	Psme/Syal
170	Pipo/Syal	321	Psme/Caru-Agsp
171	Pipo/Syal-Syal	324	Psme/Caru-Pipo
		340	Psme/Spbe

GROUP 2. Cool and dry Douglas-fir habitat types

262	Psme/Phma-Caru	320	Psme/Caru
280	Psme/Vagl	322	Psme/Caru-Aruv
281	Psme/Vagl-Vagl	323	Psme/Caru-Caru
282	Psme/Vagl-Aruv	350	Psme/Aruv
283	Psme/Vagl-Xete	360	Psme/Aruv
		370	Psme/Arco

GROUP 3. Cool and moist Douglas-fir habitat types.

250	Psme/Vaca	291	Psme/Libo-Syal
260	Psme/Phma	292	Psme/Libo-Caru
261	Psme/Phma-Phma	293	Psme/Libo-Vagl
290	Psme/Libo	330	Psme/Cage

GROUP 4. Cold and dry subalpine habitat types.

640	Abla/Vaca	730	Abla/Vasc
690	Abla/Xete	731	Abla/Vasc-Caru
691	Abla/Xete-Vagl	732	Abla/Vasc-Vasc
692	Abla/Xete-Vasc	750	Abla/Caru
710	Tshe/Xete	850	Pial-Abla
720	Abla/Vagl	860	Laly-Abla
		870	Pial

GROUP 5. Cold and moist subalpine habitat types.

610	Abla/Opho	653	Abla/Caca-Gatr
620	Abla/Clun	654	Abla/Caca-Vaca
621	Abla/Clun-Clun	660	Abla/Libo
622	Abla/Clun-Arnu	661	Abla/Libo-Libo
623	Abla/Clun-Vaca	663	Abla/Libo-Vasc

GROUP 5. (Continued).

624	Abla/Clun-Xete	670	Abla/Mefe
625	Abla/Clun-Mefe	680	Tsme/Mefe
630	Abla/Gatr	740	Abla/Alsi
650	Abla/Caca	830	Abla/Luhi
651	Abla/Caca-Caca	831	Abla/Luhi-Vasc
		832	Abla/Luhi-Mefe

GROUP 5a. Cold and moist spruce habitat types

410	Picea/Egar	440	Picea/Gatr
420	Picea/Clun	450	Picea/Vaca
421	Picea/Clun-Vaca	460	Picea/Smst
422	Picea/Clun-Clun	470	Picea/Libo
430	Picea/Phma	480	Picea/Smst

GROUP 6. Warm and moist red cedar, hemlock, and grand fir habitat types

520	Abgr/Clun	550	Thpl/Opho
521	Abgr/Clun-Clun	570	Tshe/Clun
522	Abgr/Clun-Arnu	571	Tshe/Clun-Clun
523	Thpl/Clun-Arnu	572	Tshe/Clun-Arnu
530	Thpl/Clun	591	Abgr/Libo-Libo
531	Thpl/Clun-Clun	592	Abgr/Libo-Xete
533	Thpl/Clun-Mefe		

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a/ Abgr - *Abies grandis*
Abla - *Abies lasiocarpa*
Agsp - *Agropyron spicatum*
Alsi - *Alnus sinuata*
Arco - *Arnica cordifolia*
Arnu - *Aralia nudicaulis*
Aruv - *Arctostaphylos uva-ursi*
Caca - *Calamagrostis canadensis*
Cage - *Carex geyeri*
Caru - *Calamogrostis rubescens*
Clun - *Clintonia uniflora*
Egar - *Equisetum arvense*
Feid - *Festuca idahoensis*
Fesc - *Festuca scabrella*
Gatr - *Galium trifloium*
Laly - *Larix lyallii*
Libo - *Linnaea borealis*
Luhi - *Luzula hitchcockii*
Mefe - *Menziesia ferruginea*
Opho - *Oplopanax horridum*
Phma - *Physocarpus malvaceus*
Pial - *Pinus albicaulis*
Picea - *Picea spp.*
Pipo - *Pinus ponderosa*
Putr - *Purshia tridentata*
Psme - *Pseudotsuga menziesii*
Smst - *Smilacina stellata*
Spbe - *Spirea betulifolia*
Syal - *Symphoricarpos albus*
Thpl - *Thuja plicata*
Tshe - *Tsuga heterophylla*
Tsme - *Tsuga mertensia*
Vaca - *Vaccinium caespitosum*
Vagl - *Vaccinium globulare*
Vasc - *Vaccinium scoparium*
Xete - *Xerophyllum tenax*

APPENDIX B

History of the deer populations and related studies within the area impacted by the Libby Dam Project.

1893 Deer hides were used as legal tender (Tester 1942, Bergeson 1946) from 1893 to 1900, and were valued at 50 cents each.

1898 The first licenses were required - a total of 8 deer of either sex could be taken (Tester 1942, Bergeson 1946).

1900 Limit of 6 deer of either sex was imposed. This limit was further reduced each subsequent year until a limit of 1 deer either sex was initiated. (Tester 1942, Bergeson 1946).

1905 One deer, either sex hunting season initiated (Bergeson 1946).

1923 Wolf Creek Game Preserve established (U.S. Dep. Aric. 1956).

1933 Bucks only hunting season initiated (Drumheller 1936).

1934 U.S. Forest Service[1] - estimated 5525 deer on the Kootenai National Forest (KNF).

1935 U.S. Forest Service - estimated 12,050 deer on the KNF.

Bealey and West (1935) - U.S.F.S. - estimated (strip counts) there were 4919 white-tailed deer and 1116 mule deer within the boundaries of the Fisher River - Wolf Creek winter range (196,352 acres, non-critical).

1936 Drumheller (1936) - U.S.F.S. - conducted an extensive winter range survey in conjunction with all of the ranger districts.

- Fisher River District - 6,000 deer on the district; 16.5 acres winter range per deer (0.06 deer/acre).
- Warland District - 511 white-tailed deer and 698 mule deer observed during the survey.
- Deer mortality from Stonehill to Jennings was reduced from 200 to about 50 head or less.
- Recommended no road construction between the mouth of Pinkham Creek and Tweed Creek.
- Rexford District - observed 214 white-tailed deer and 429 mule deer during band counts.

Bergeson (1942) - 6,000 deer on the Fisher River - Wolf Creek and Dunn Creek area.

U.S. Forest Service - estimated 20,070 deer on the KNF.

1937 U.S. Forest Service[2] - estimated 20,300 deer on the KNF (7,300 mule deer and 13,000 white-tailed deer).

1938 U.S. Forest Service - estimated 6,850 mule deer and 12,000 white-tailed deer on the KNF.

Fisher River District[3] - estimated 700 mule deer and 3,000 white-tailed deer.

1939 U.S. Forest Service - estimated 6,900 mule deer and 7,430 white-tailed deer on the KNF.

Fisher River District - estimated 600 mule deer and 2,500 white-tailed deer.

1940 U.S. Forest Service - estimated 7,300 mule deer and 9,500 white-tailed deer on the KNF.

Fisher River District - estimated 800 mule deer and 3,500 white-tailed deer.

1941 Brink (1941) - U.S.F.S. - estimated 500 mule deer and a negligible number of white-tailed deer on the Ural-Tweed range.

U.S. Forest Service - estimated 7,600 mule deer and 10,000 white-tailed deer on the KNF.

Fisher River District - estimated 900 mule deer and 4,000 white-tailed deer.

1942 Bergeson (1942) - MDFG - estimated there were 3,840 mule deer and 9,705 white-tailed deer in Management Area 3 - the portion of Lincoln County east of the Fisher and Kootenai rivers, including the Pleasant Valley (Flathead County).

U.S. Forest Service - population estimates

- Fisher River District - 800 mule deer and 4,000 white-tailed deer.
- Rexford District - 475 mule deer and 260 white-tailed deer.
- Warland District - 880 mule deer and 1,400 white-tailed deer.

1943 U.S. Forest Service - conducted a random line spot check of the Fisher River winter range. Surveyed 61,000 acres of non-critical winter range and 23,000 acres of critical winter range and estimated 1,695 dead deer - 42 percent of the previous years population estimate. Eighty-eight percent of all dead deer were males.

- Fisher River District - 1,000 mule deer and 2,500 white-tailed deer.

- Rexford District - 350 mule deer and 200 white-tailed deer.

- Warland District - 800 mule deer and 1,200 white-tailed deer.

Bergeson (1943) - MDFG - conducted a winter survey that yielded approximately the same population estimates as in 1942.

1944 U.S. Forest Service - population estimates (population increasing)

- Fisher River District - 1,150 mule deer and 2,750 white-tailed deer.

- Rexford District - 400 mule deer and 240 white-tailed deer.

- Warland District - 750 mule deer and 1,100 white-tailed deer.

Wolf Creek Game Preserve - reopened to hunting.

1945 U.S. Forest Service - population estimates (population increasing).

- Fisher River District - 1,300 mule deer and 3,250 white-tailed deer.

- Rexford District - 450 mule deer and 250 white-tailed deer.

- Warland District - 750 mule deer and 1,100 white-tailed deer.

1946 U. S. Forest Service - population estimates

- Fisher River District - 1300 mule deer and 3,500 white-tailed deer.

- Rexford District - 475 mule deer and 260 white-tailed deer.

- Warland District - 500 mule deer and 1,000 white-tailed deer.

Bowman (1946) - U.S. Forest Service - reported in his management plan for the Kootenai National Forest that "the presence of deer in large numbers on open slopes is inimical to the production of ponderosa pine, since they browse and kill practically all the young trees".

1947 U.S. Forest Service - population estimates.

- Wildlife estimates need to be refined. Bealey and West (1935) estimated 5,000 deer on the Fisher River area and in 1946 L. Adams, after a six month study, estimated the population at 10,000. However, the local people insisted there were more deer in 1935. Game estimates may be as much as 200 to 300 percent off.

- Fisher River District - 1,500 mule deer and 9,800 white-tailed deer.

- Rexford District - 400 mule deer and 200 white-tailed deer.

- Warland District - 400 mule deer and 800 white-tailed deer.

  - November 17-21, 1946 - 104 deer were killed by the railroad between Stonehill and Jennings.

  - Deer population decreased by 15-20 percent due to severe winter.

L. Adams - USFWS - estimated the Wolf Creek herd at 9,800 head (U.S. Dep. Agric. 1948).

1948 Fisher River District - 1,500 mule deer and 5,000 white-tailed deer.

- Revised the estimate for the Fisher River - Wolf Creek herd as the 1947 estimate (L. Adams) was too high.

Rexford District - 3650 mule deer and 175 white-tailed deer.

- A considerable number of fawns were lost on the Kootenai River islands during the flood.

Zajanc - (1948) MDFG - conducted an extensive investigation of the white-tailed deer winter range. The following estimates resulted from the investigation.

- Fisher River (Wapiti Mountain to the Kootenai River) - 7,010 white-tailed deer and 600 mule deer.

- Tobacco Valley/Fortine area - 2,182 white-tailed deer and 2,578 mule deer.

- Gateway to Jennings - 1,258 white-tailed deer and 2,006 mule deer.

1949 U.S. Forest Service - population estimates

- Fisher River District - 1,500 mule deer and 7,000 white-tailed deer.

- Rexford District - 1,000 black-tailed (mule) deer and 500 white-tailed deer.

- Warland District - 475 mule deer and 950 white-tailed deer.

Schmautz (1949) - MDFG - rigorous winter conditions caused considerable loss in the Lincoln County deer herds.

Schmautz (1950) - MDFG - determined some deer migrate 20-25 miles to get to the lower Fisher River - Wolf Creek area.

Schmautz and Zajanc (1948a) - MDFG - surveyed 9,691 acres of deer winter range on the Fisher River - Wolf Creek area, and determined there were approximately 7,250 white-tailed deer on the area. They classified a total of 13,194 acres as winter range. Over winter mortality for the area was approximately 2200-2400 white-tailed deer.

Schmautz and Zajanc (1946b) - conifer reproduction is least on the ranges receiving the heaviest white-tailed deer use.

Schmautz, Zajanc, and Fish (1950) - MDFG - estimated there were 7,250 white-tailed deer (Lincoln Index) on the Fisher River - Wolf Creek winter range -(including portion along the lower Kootenai). Winter mortality was estimated at 2,400 deer or 33 percent of the herd. Conifer reproduction varied almost directly with browse production.

1950 U.S. Forest Service - No population estimates were available.

Schmautz and Fish (1950) - MDFG - conducted an intensive ground survey of a portion of the Fisher River - Wolf Creek and Horse Range areas.

- Fisher River-Wolf Creek (32 men) - estimated 25-35 percent of animals observed.

- Doe Area - 429 mule deer and 1,816 white-tailed deer.

- Buck Area - 176 mule deer and 396 white-tailed deer.

- Horse Range (6 men - estimated 60-80 percent of animals observed) - 67 mule deer and 620 white-tailed deer.

Schmautz and Zajanc (1950) - MDFG - found that 60 percent of the deer were 4.5 years old or older when the fawns were excluded. This indicated a lower reproductive rate.

Schmautz, Zajanc, and Fish - MDFG. - estimated there were 6000-8000 white-tailed deer in the lower Fisher River (north of Highway 2). In the Horse Range there were an estimated 775-1033 white-tailed deer and 84-112 mule deer. They estimated 1710-2061 deer winter killed in the lower Fisher River.

1951 U.S. Forest Service - population estimates.

- Fisher River District - 2500 mule deer and 9000 white-tailed deer.
- Rexford District - 1000 mule deer and 500 white-tailed deer.
- Warland District - 1200 mule deer and 1400 white-tailed deer.

Zajanc and Schmautz (1951) - MDFG - found the distribution of age classes in the harvest was fairly uniform except for an abundance of the 1/2 year age class.

Montana Department of Fish and Game - estimated there were 7125 mule deer and 10,300 white-tailed deer within the Kootenai Management Unit.[4]

1952 U.S. Forest Service - population estimates

- Fisher River District 2500 mule deer and 8500 white-tailed deer.
- Rexford District - 1000 mule deer and 400 white-tailed deer.
- Warland District - 1600 mule deer and 1200 white-tailed deer.

Montana Department of Fish and Game

- re-initiated the Lincoln County deer study.
- estimated there were 7125 mule deer and 10,850 white-tailed deer within the Kootenai Management Unit.

1953 U.S. Forest Service - population estimates

- Fisher River District - 2500 mule deer and 900 white-tailed deer.

- Rexford District - 1000 mule deer and 400 white-tailed deer.

- Warland District - 1600 mule deer and 1000 white-tailed deer.

Blair and Wilson (1953) - MDFG - reported the forage on the Fisher River-Wolf Creek area was still in critical condition. They experimented with 4 different methods of rejuvenating browse.

Couvillion (1953) - MDFG - observed no winter deer movements due to the mild winter.

1954 U.S ?orest Service - population estimates.

- Fisher River District - 3500 mule deer and 10,000 white-tailed deer.

- Rexford District - 1000 mule deer and 450 white-tailed deer.

- Warland District - 1600 mule deer and 1000 white-tailed deer.

Blair (1954a) - MDFG - conducted an intensive winter survey as part of the Lincoln County deer study. There were an estimated 10,917 white-tailed deer (strip census) occupying a winter range totaling 26,343 (9301 acres of bottomlands, and 17,042 acres of south and west slopes). During the 1953-54 winter conditions forced the deer to concentrate on the bottomlands. Mortality estimates were 921 dead on the bottomlands and 307 dead on the south and west slopes (total - 1228).

Blair (1954b) - MDFG - repeated the three management problems:

> (1) The increase in white-tailed deer numbers; (2) the over-utilization of available browse; and 3) the under harvest of the population. The herd is very reproductive with the 1953 harvest consisting of 70.8% in the 1 1/2, 2 1/2, and 3 1/2 year age classes.

Blair (1954c) - MDFG - reported a total of 26,343 acres of winter range of which 9301 acres (bottomlands) is restricted winter range, inhabited by an estimated 10,917 white-tailed deer (strip census). There was density of 1.17 deer/acre on the restricted winter range during the hardest portion of the winter.

Blair and Wilson (1954) - MDFG - reported 26,343 acres of winter range occupied by 10,917 white-tailed deer (95%

CI=6,742-19,619). This is 2.4 acres/deer. There were no studies on the remaining ranges, however, the populations are probably lower.

Montana Department of Fish and Game - estimated there were 9600 mule deer and 21,200 white-tailed deer within the Kootenai Management Unit.

1955 U.S. Forest Service - population estimates

- Fisher River District - 3500 mule deer and 12,000 white-tailed deer.
- Rexford District - 800 mule deer and 600 white-tailed deer.
- Warland District - 800 mule deer and 1400 white-tailed deer.

Blair (1955a) - MDFG - compiled a comprehensive report on the anticipated impacts of the proposed Libby Dam project. White-tailed deer would be impacted more than any other species due to the loss of priority habitat along the bottomlands. He made an analysis based on 3 management units, of which the Jennings Gateway unit would be impacted the most. Proposed 19 miles of deer-proof fence along the relocated Great Northern Railroad with 4 underpasses to facilitate migrations.

Blair (1955b) -MDFG - delineated 28,000 acres of winter range in the Fisher River - Wolf Creek area, with 9,300 acres as restricted winter range. Recognized three problems with the Fisher River - Wolf Creek area: (1) continued maintenance of excessive numbers of white-tailed deer; (2) continued over-utilization of winter ranges; and (3) deficient annual deer harvest which compounds problems 1 and 2.

Neils, Adams, and Blair - J. Neils Lumber Co., USFWS, and MDFG - submitted a report on the management of white-tailed deer and ponderosa pine. The white-tailed deer, with a winter range coinciding with the ponderosa pine timber type, is the main factor limiting ponderosa pine regeneration in this area.

Neils (1955) - J. Neils Lumber Co. - presented a paper on the management of white-tailed deer and ponderosa pine to the Twentieth North American Wildlife Conference.

One deer - either sex - hunting season initiated to curb the population growth.

1956 U.S. Forest Service - population estimates

- Fisher River District - 3500 mule deer and 10,000 white-tailed deer.
- Rexford District - 850 mule deer and 555 white-tailed deer.
- Warland District - 800 mule deer and 1500 white-tailed deer.

U.S. Forest Service - Wildlife Management Plan for the Fisher River District (U.S. Dep. Agric. 1956).

- 10,900 deer utilize 28,160 acres of winter range which is 1.0 deer/2.5 acres during a normal winter.
- Wintering areas for big game species are primarily restricted to the south- and west-facing exposures along the Fisher River and Wolf Creek with additional small ranges extending up the lateral drainages.

1957 U.S. Forest Service - population estimates

- Fisher River District - 3500 mule deer - and 10,000 white-tailed deer.
- Rexford District - 850 mule deer and 550 white-tailed deer.
- Warland District - 800 mule deer and 1200 white-tailed deer.

Montana Department Fish and Game - estimated 9850 mule deer and 17,450 white-tailed deer within the Kootenai Management Unit.

Initiation of a 2 deer, either sex, hunting season.

1958 U.S. Forest Service - population estimates

- Fisher River District - 3500 mule deer and 10,000 white-tailed deer.
- Rexford District - 850 mule deer and 450 white-tailed deer.
- Warland District - 1000 mule deer and 1500 white-tailed deer.

U.S. Forest Service - Limited Wildlife Management Plan - Warland Ranger District (U.S. Dep. Agric. 1958).

- Estimated the carrying capacity at 2000 deer which is equal to the 1957 estimates. The hunter harvest was 560 or 30 percent of the estimated population.

- Fire, the major factor maintaining the ponderosa pine disclimax, has been controlled to burned areas amounting to only a fraction of 1.0 percent of the area annually.

- Current policy is to reserve 40 percent of the available forage of the grazing units for wildlife use.

1963 U.S. Forest Service - Wildlife Management Plan - Libby Ranger District -

- Produced a winter range map based on surveys during the winter of 1953-54, 1955-56, and 1961-62.

- Recommended enlarging the area between Swede, Mountain south to McMillan Creek (7,680 acres) based on surveys during the winter of 1963-64.

1964 Couey and Weckwerth (1964) - MDFG

- Reported the major area for railroad kills is from Stryker to Libby on the Great Northern Railroad (no numbers were given).

1965 Couey and Weckwerth (1965) - MDFG

- Reported the railroad track inspector estimated 375 deer, 6 moose and 19 turkeys were killed by the train between Fortine and Jennings during the 1964-65 winter.

- Two sections of track (5 miles each) were walked with 11.4 deer/mile found in the Fortine area and 3.8 deer/mile found in the Rexford area.

U.S. Forest Service - Wildlife Management Plan, Warland Ranger District (U.S. Dep. Agric. 1965a).

- Reported that mule deer and white-tailed deer at near equal numbers on all ranges except the Ten Mile Creek to Warex Peak segment where mule deer and bighorn sheep still dominate.

- Winter ranges are recovering from the over-utilization the period of peak populations.

- Estimated 20 percent of the critical winter range available to game will be lost following the construction of Libby Dam.

- Suggested treatment of 180 acres of winter range to stimulate browse production to replace that lost to the reservoir. Also suggested terracing or furrowing as a possible management practice for browse stimulation.

U.S. Forest Service - Wildlife Management Plan, Fisher River District (U.S. Dep. Agric. 1965.b).

- Reported the white-tailed deer have historically been the most important big game species in the area. The herds increased so they were over-populated from the 1930's and 40's to present.

U.S. Fish and Wildlife Service (U.S. Dep. Inter. 1965)

- Estimated 1450 white-tailed deer and 1800 mule deer utilize the 12,000 acres of essential winter range to be inundated by the Libby Dam project.

- The reservoir will also impede the seasonal movements of the big game populations.

- Railroad relocation will farther reduce the white-tailed deer winter range by 1800 acres and will cause increased mortality.

1966 U.S. Forest Service - Wildlife Plan - Rexford Ranger District (U.S. Dep. Agric. 1966).

- Reported that when the Libby Dam is completed the reservoir will inundate at least 25 percent of the critical winter game range.

- Big game animals use the Kootenai River bottom and benches even in a normal winter.

1967 Couey and Weckwerth (1967) - MDFG

- Made a check along the Great Northern railroad between Fortine and Rexford and found 5 dead deer in the two, five-mile sample areas.

1968 Weckwerth (1968) - MDFG

- Found 0.4 deer/mile along the Great Northern railroad during the annual check between Fortine and Rexford.

1969 Couey and Weckwerth (1969) - MDFG -

- Found 4.0 deer/mile of railroad track in the sample section south of Rexford.

- One hundred deer were removed from Highway 93 between Eureka and Fortine and 25 between Rexford and Warland.

1970 Trains began using the relocated line through the Fisher River and Wolf Creek winter range.

Firebaugh (1971) - MDFG

- Initiated the deer - railroad relationship study along the Fisher River and Wolf Creek (funded by the U.S. Army Corps of Engineers).

Speed restriction along the new railroad right-of-way was lifted in January.

1971 Flath (1972a) - MDFG - continued the railroad - deer relationships study.

- Reported white-tailed deer habitually return to the same area to winter, and identified 3 migration routes onto the Fisher River-Wolf Creek winter range (Fisher River, Little Wolf Creek and Wolf Creek).

- Estimated 1081 (90% CI: 1005-1157) in the 8.5 square miles of winter range from Butler Creek to Richard's Creek.

- Observed railroad mortalities of 1.59/mile on the control area and 1.01/mile on the study area.

Campbell (1972) - MDFG - initiated a study funded by the U.S. Army Corps of Engineers to evaluate potential improvements to big game winter ranges.

- Fifteen deer (14 mule deer and 1 white-tail deer) were neck banded to study migration patterns.

- A 1/2 mile strip along the west side of the reservoir from Poverty Creek to the Canadian line was used extensively by both mule deer and white-tailed deer.

- Browse was the most important winter forage class, with Oregon grape, ponderosa pine and Douglas-fir composing 97% of the browse consumed.

1972 Flath (1972b) - MDFG - continued investigations for the railroad-deer relationships study.

- Estimated there were 135 deer/square mile on the Fisher River-Wolf Creek winter range.

- Observed railroad mortalities of 1.65 deer/mile on the control compared to 1.93 deer/mile on the study area.

- Browse formed the bulk of winter food habits, with Douglas-fir important until receding snows exposed Oregon grape in late winter.

Campbell (1973) - MDFG - continued investigations from the big game habitat improvement study.

- Identified the West Kootenai and Canoe Gulch as two areas that should receive priority during the land acquisition process (mitigation), with the Dunn Creek and Ten Mile-Sutton Creek units to receive secondary priority.

- Observed deer movements of up to 23 miles for mule deer and 25 miles for white-tailed deer.

- Use of the wintering areas declining due to population decrease or dispersal over a larger area because of the Libby Dam project.

1973 Flath (1974) - MDFG - continued the railroad-deer relationships study.

- Three years data indicated the presence of trains on the relocated railroad grade had had no effect on the positioning of deer on the winter range.

- A correlation between the level of deer use and the number of train casualties was found

- The highest deer kill along the new line (1.93 deer/mile in 1972) was lower than the average annual kill along the old Great Northern line (4.9 deer/mile).

- Presence of a migration route from the Fisher River-Wolf Creek winter range up the sides of the impoundment area as far as Warland Creek was discovered. This indicated deer which once wintered along the Kootenai River now move to the Fisher River-Wolf Creek area.

Campbell and Knoche (1974) - MDFG - continued the investigations related to the evaluation of big game habitat improvement.

- Found light use of the winter ranges which was related to the mild winter, deer dispersal, and/or a population decline.

- Found marked deer returned to specific wintering areas with insignificant movement across the impoundment area.

- Observed varying results within the different treatment areas and made recommendations for future manipulations.

1974 Flath - MDFG - continued the railroad deer relationship study.

Knoche (1974) - MDFG - continued the evaluation of big game habitat improvement.

- Observed the use of the winter ranges adjacent to the reservoir was increasing, but was below previous years.

- Browse production estimates indicated bitterbush production was greatest on topped segments, while serviceberry and chokecherry production was stimulated by both burning and topping.

1975 Knoche (1975) - MDFG - continued work on the railroad-deer relationship study which concluded June 30, 1975.

Firebaugh, Flath, and Knoche (1975) - MDFG - compiled the final report for the railroad deer relationships study.

- Presence of the railroad had no measurable effect on the distribution of deer on the winter range.

- Density of deer adjacent to the railroad is related to the number of deer killed by the trains. Can not directly correlate the mortalities along the old grade and the relocated grade, because the number and type of trains has not remained consistent.

- The deer population has a low reproductive rate; however, the majority of the hunter harvest is 2 1/2 years old or younger indicating good reproduction.

- Browse is an important winter food with grasses utilized during mid to late winter when snow depths are minimal. Forbs are important as food during the spring "green-up".

- Due to the location of the railroad grade in the drainage bottom there will be concentrations of deer along it (and corresponding higher train caused mortalities) during periods of severe weather.

- Since deer adhere to traditional wintering sites, attempts to attract them to presently used areas would have marginal results and are not recommended.

Knoche and Brown (1975) - MDFG - completed the work related to the evaluation of big game habitat improvements.

- Use of control areas continued to be as great or greater than the spring broadcast burn areas.

- Bitterbush production could be stimulated with topping while serviceberry and chokecherry responded favorably to either spring broadcast burning or topping.

- Recommended thinning and logging operations on winter ranges adjacent to the reservoir should be investigated to determine optimum size and ratios of conifer thickets to cleared areas.

Footnotes

[1]Population estimates for the Kootenai National Forest for 1934-1936 are from U.S. Dep. Agric. (1937).

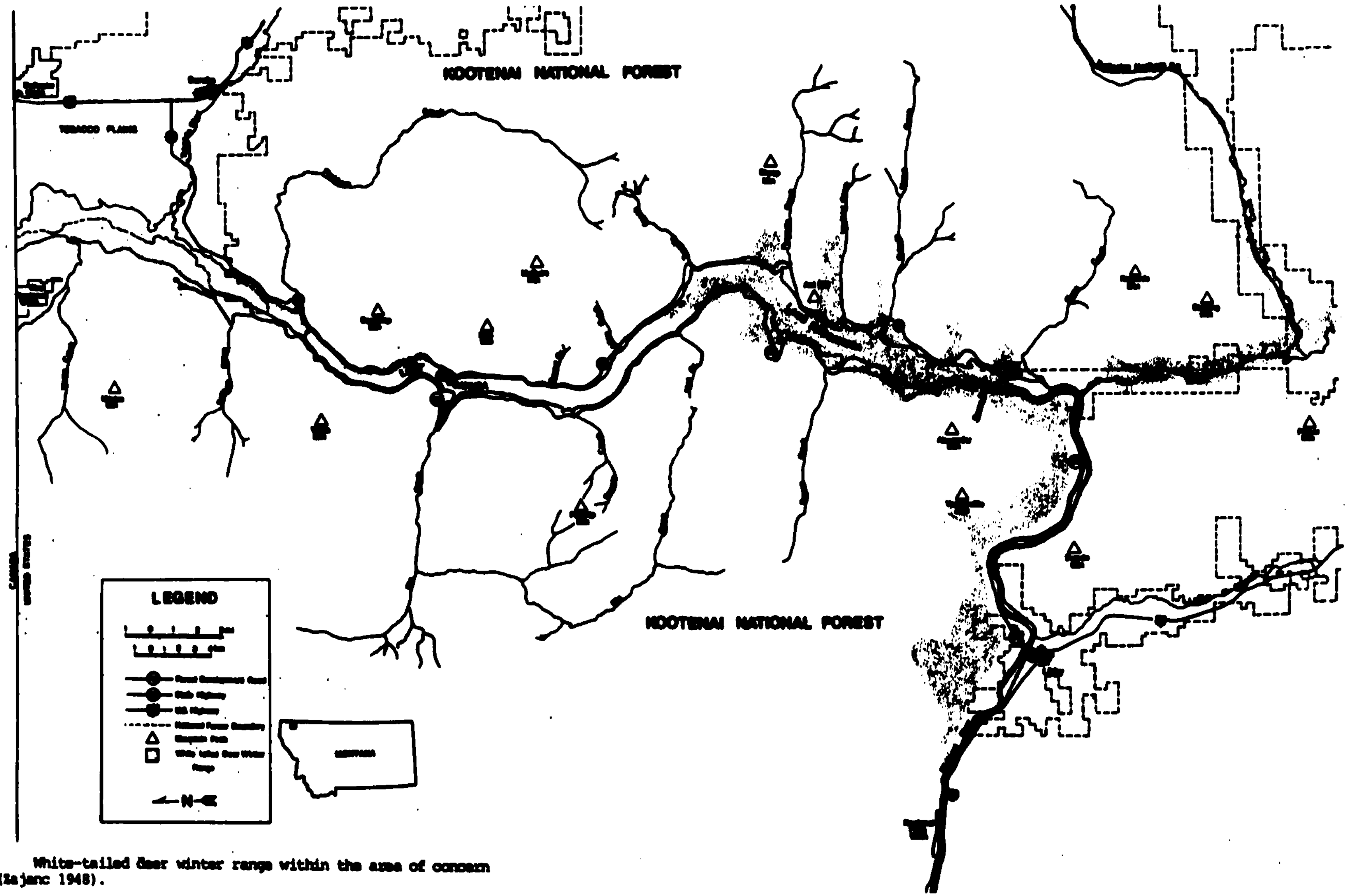
[2]Population estimates for the Kootenai National Forest for 1937-1958 are from the Annual Wildlife Report prepared by the ranger districts.

[3]The population estimates for the Fisher River district from 1938-1941 were obtained from the U.S. Dep. Agric. (1956).

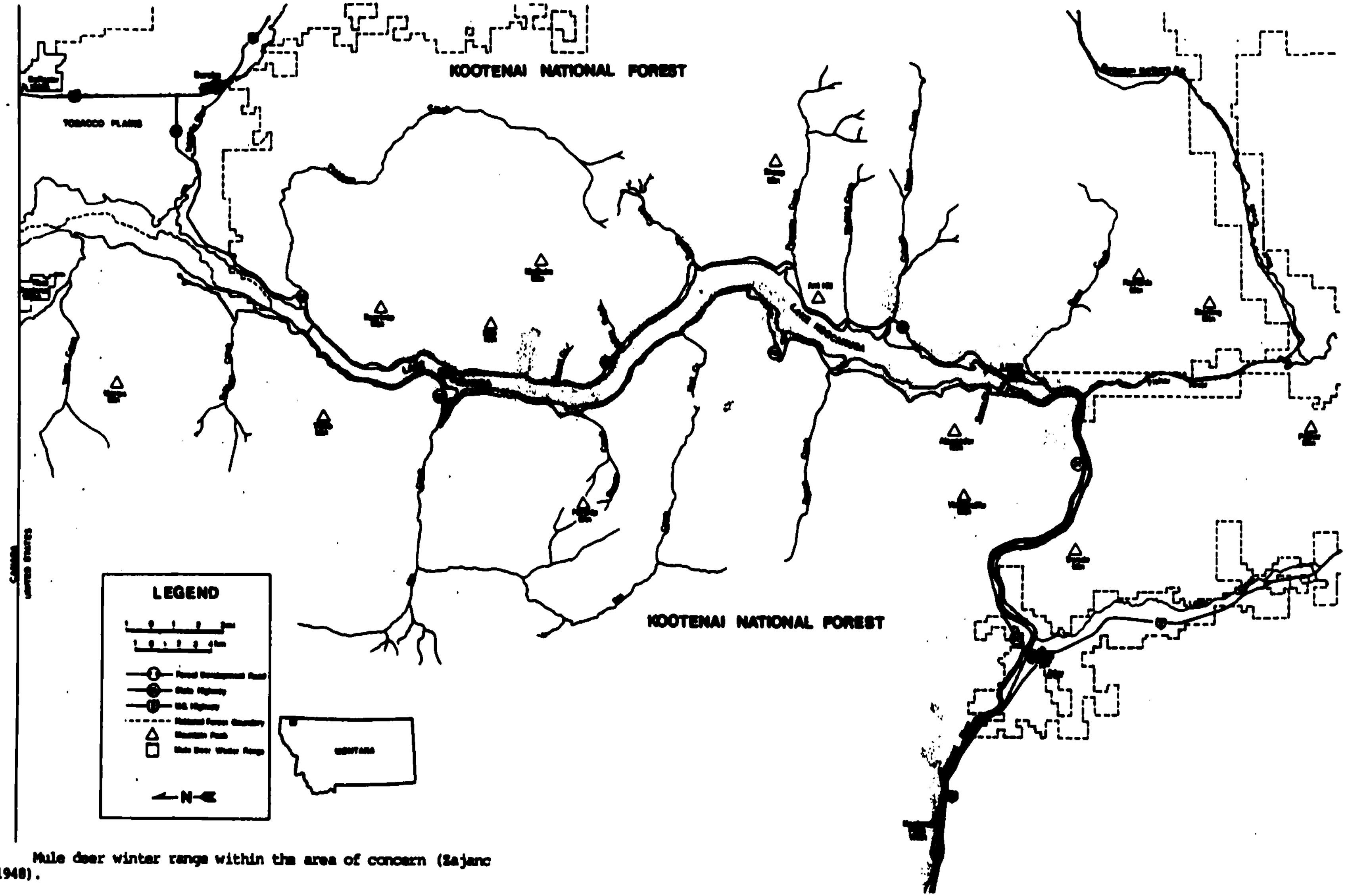
[4]Population estimates by the Montana Department of Fish and Game for 1951, 1952, and 1954 were obtained from the Quarterly Reports, Wildlife Restoration Division, for the respective year.

APPENDIX C

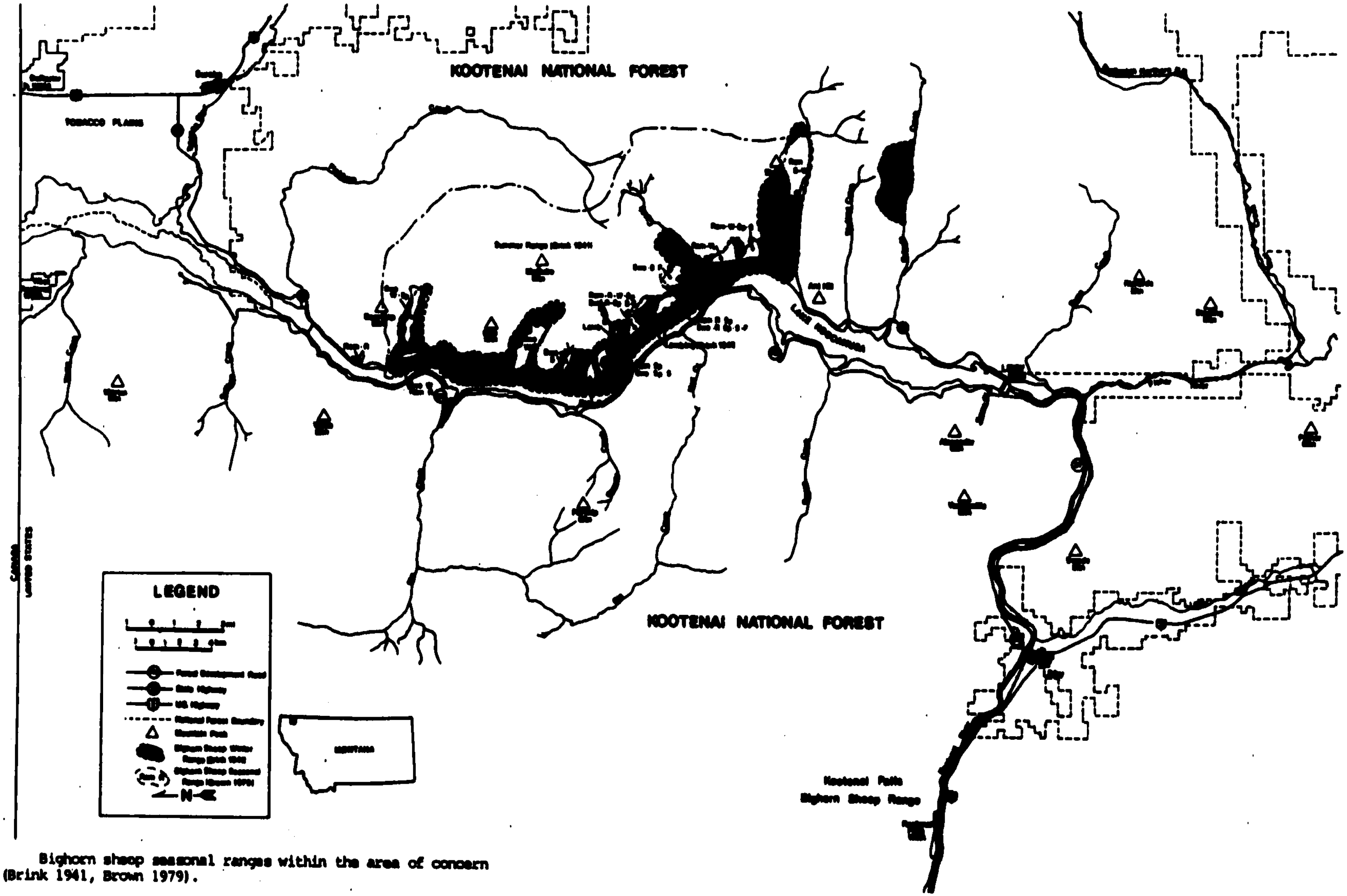
Big game seasonal distribution maps.



White-tailed deer winter range within the area of concern (Zajanc 1948).



Mule deer winter range within the area of concern (Zajanc 1948).



Bighorn sheep seasonal ranges within the area of concern (Brink 1941, Brown 1979).

APPENDIX D

History of the Ural-Tweed bighorn sheep population and related studies.

1934 U.S. Forest Service[1] - estimated 145 bighorn sheep within the Kootenai National Forest[2] (KNF).

1935 Bealey and West (1935) - U.S.F.S. - the herd is increasing and spreading out.

1936 Drumheller - (1936) U.S. F.S. - Estimated 53 bighorn sheep in the Rexford District and observed sheep 31 during drainage searches on the Warland District.

U.S. Forest Service - estimated 128 bighorn sheep within the KNF.

1937 Ensign (1937) - U.S.F.S. - conducted an intensive winter bighorn sheep survey. Actual count : 97 (16 rams, 49 ewes, 22 lambs). Illegal kill was thought to be high.

U.S. Forest Service[3] - estimated 100 bighorn sheep within the KNF.

1938 U.S. Forest Service - estimated 120 bighorn sheep within the KNF.

1939 U.S. Forest Service - estimated 110 bighorn sheep within the KNF.

1940 I. Anderson (1940) - U.S.F.S. - estimated the population at 100 animals, and the numbers have been decreasing during the last 20 years.

U.S. Forest Service - estimated 130 bighorn sheep within the KNF.

1941 Brink (1941) - U.S.F.S. - conducted an intensive winter and spring survey of the herd. He estimated the population at 100 head (25 mature rams, 50 ewes, 25 yearlings). He did not include the 1941 lamb crop in his estimate.

U.S. Forest Service - estimated there were 150 bighorn sheep within the KNF.

1942 U.S. Forest Service - estimated there were 155 bighorn sheep within the KNF.

1943 U.S. Forest Service - estimated there were 145 bighorn sheep within the KNF.

1944 U.S. Forest Service - estimated there were 150 bighorn sheep within the KNF.

1945 U.S. Forest Service - estimated there were 150 bighorn sheep within the KNF.

1946 Couey (1950) - MDFG - estimated 150 bighorn sheep in the Ural-Tweed population.

U.S. Forest Service - estimated - 152 bighorn sheep within the KNF.

1947 U.S. Forest Service - estimated 80 bighorn sheep were found within the Rexford District. No estimate was made for the Warland District.

1948 Zajanc (1948) - MDFG - estimated there were 168 bighorn sheep within the population. During winter surveys, he found an average of .0071 sheep/acre for the 23,680 of winter range (Brink 1941).

1949 U.S. Forest Service - estimated 90 head on the Rexford District. No estimate was available for the Warland District.

1950 Couey (1950) - Rocky Mountain bighorn sheep in Montana - estimated there were approximately 125 sheep in the Ural-Tweed herd and it had decreased in the previous fifty years. Two rams were transplanted to the Gallatin area. Forty-two sheep were observed on a MDFG aerial survey, and 5 sheep were reported west of the Kootenai.

1951 U.S. Forest Service - estimated 350 sheep within the Warland District. No estimate was available for the Rexford District.

Montana Department of Fish and Game - estimated 351 sheep in the Kootenai Management Unit[4] (KMU).

1952 U.S. Forest Service - estimated 315 sheep in the Rexford and Warland districts.

Montana Department of Fish and Game - estimated there were 390 sheep in the KMU.

1953 Couvillion (1953) - MDFG - made an effort to re-identify the summer range delineated by Brink (1941). Inspected approximately 1/3 of the range and observed only 5 sheep.

U.S. Forest Service - estimated 410 bighorn sheep within the KNF.

The bighorn sheep transplant into the Kootenai Falls area was initiated.

1954 Montana Department of Fish and Game - estimated 345 bighorn sheep in the KMU (Ural Tweed and Kootenai Falls).

U.S. Forest Service - estimated 420 bighorn sheep in the Rexford and Warland districts.

First hunting season since 1915 opened for 3/4-curl or better rams (Anon. 1975). Hunting was restricted to the area east of the Kootenai River with a harvest of 3 rams.

1955 Couey (1955a) - MDFG (Montana Bighorn Sheep) - estimated the population consisted of approximately 100 sheep and was decreasing.

Blair (1955a) - MDFG - estimated there were between 150 and 175 bighorn sheep in the population.

U.S. Forest Service - estimated 305 sheep in the Rexford and Warland districts.

Harvest consisted of two rams.

1956 U.S. Forest Service - estimated there were 305 bighorn sheep in the Rexford and Warland districts.

L. W. Lewis - Forest Administrator Warland District - personal communication to Buechner (1960) believed there were approximately 300 sheep on the Ural-Tweed range.

Harvest estimate - 2 rams

1957 Montana Department of Fish and Game - estimated there were 385 bighorn sheep in the KMU (Ural Tweed and Kootenai Falls).

U.S. Forest Service - estimated there were 305 bighorn sheep in the Rexford and Warland districts.

Hunt area was expanded to include all of Lincoln County and the west central portion of Flathead County.

Harvest estimate - 4 rams (entire area).

1958 U.S. Forest Service - estimated 330 bighorn sheep in the Rexford and Warland districts.

Harvest estimate - 6 rams (entire area).

1959 Harvest estimate - 6 rams (entire area).

1960 Harvest estimate - 8 rams (6 from Ural-Tweed).

1961 Hunt unit was subdivided; however, the permits were still good for both portions.

Harvest estimate 7 rams (3 from Ural-Tweed).

1962 Harvest estimate - 10 rams (4 from Ural-Tweed).

1963 July - Agreement between Montana Department of Fish and Game and the U.S. Forest Service to transplant 6 rams into the Ural-Tweed range. Five rams from the National Bison Range were released at Sutton Creek. One was later harvested near Waldo, British Columbia during the fall of 1963. None were ever harvested from the Ural-Tweed herd (Weckwerth 1983, per. commun).

Harvest estimate - 7 rams (2 from Ural-Tweed)

1964 Harvest estimate - 7 rams (1 from Ural-Tweed)

1965 U.S. Fish and Wildlife Service (U.S. Dep. Inter. 1965) - estimated there were 170 sheep in the Ural-Tweed population.

U.S. Forest Service - Sheep observed on the westside of the Kootenai River and they have been observed moving back and forth across the United States - Canada border. Recommended a study be initiated before the construction of Libby Dam and Highway 37.

Harvest estimate (U.S.F.S.) - 6 rams, most from the Warland area - (none reported harvested by MDFG - Job Completion Report.)

1966 Harvest estimate - No rams harvested from the entire area.

1967 Harvest estimate - One ram (None from the Ural-Tweed).

A more restricted season, only 10 permits compared to 30 for the previous 7 years, was initiated. The Kootenai Falls area receives the majority of the pressure and the majority of the rams harvested from now to the closure of the Ural-Tweed area are from the Kootenai Falls area.

1973 Hunt area 100 was formed and hunting was closed in the Ural-Tweed area.

1976 Brown (1978) - MDFG - classified 48 bighorn sheep in December 1977 (25 ewes, 16 lambs, 7 rams) - however, there were repeat observations (G. Brown 1983, pers. commun.).

October - start of bighorn sheep study funded by U.S. Army Corps of Engineers.

1979 Brown (1979) - MDFWP - finished bighorn sheep study and estimated a maximum population of 25 sheep.

1981 22 bighorns observed on the Ural-Tweed range.

1983 Brown (1983, pers. commun.) - MDFWP - (personal communication) - estimated the population at 25 sheep.

Footnotes

[1]Population estimates for the Kootenai National Forest for 1934-1936 are from Dep. Agric. (1937).

[2]Previous estimates were not used as the Forest boundaries were realigned in 1934.

[3]Population estimates for the Kootenai National Forest for 1937-1958 are from the Annual Wildlife Reports prepared by the ranger districts.

[4]Population estimates by the Montana Department of Fish and Game for 1951, 1952, and 1954 were obtained from the Quarterly Reports, Wildlife Restoration Division, for the respective year.

APPENDIX E, Table 1

Fire incidence on Ural-Tweed bighorn sheep range for the period 1940-1977 (Brown 1979).

No.	Year	Cause	Acres	Location	No.	Year	Cause	Acres	Location
1	1940	Lightning	Spot	Beartrap	36	1959	Railroad	Spot	Ural
2	1940	Lightning	Spot	Sutton Cr.	37	1960	Railroad	5.0	Inch Mtn.
3	1940	Lightning	Spot	Flat Cr.	38	1960	Lightning	.25	Sheep Mtn.
4	1940	Lightning	Spot	Peck Gulch	39	1960	Lightning	.2	Sheep Cr.
5	1940	Lightning	Spot	Inch Mtn.	40	1961	Lightning	18.0	Sheep Mtn.
6	1940	Lightning	Spot	Flat Cr.	41	1961	Lightning	Spot	Warex Mtn.
7	1944	Lightning	Spot	Flat Cr.	42	1961	Lightning	Spot	Inch Mtn.
8	1945	Lightning	Spot	Beartrap	43	1961	Lightning	Spot	Volcour
9	1945	Railroad	90.0	Tweed Cr.	44	1963	Lightning	.5	Cadette Cr.
10	1945	Smoking	15.0	Tweed Cr.	45	1963	Lightning	Spot	Ural
11	1946	Lightning	8.0	Stone Hill	46	1964	Railroad	1.0	Cadette Cr.
12	1947	Lightning	Spot	Sheep Mtn.	47	1965	Lightning	Spot	Peck Gulch
13	1947	Lightning	Spot	Fivemile Cr.	48	1966	Lightning	Spot	Ural
14	1947	Lightning	8.5	Fivemile Cr.	49	1967	Lightning	.3	Warex Ridge
15	1949	Lightning	0.3	Warex Ridge	50	1967	Lightning	.3	Sheep Mtn.
16	1949	Lightning	Spot	Stenerson	51	1967	Lightning	Spot	Sheep Mtn.
17	1952	Lightning	Spot	Stenerson	52	1967	Lightning	.14	Sheep Cr.
18	1952	Lightning	Spot	Stenerson	53	1968	Lightning	.5	Holdup Gulch
19	1955	Railroad	Spot	Sheep Cr.	54	1968	Lightning	Spot	Cadette Cr.
20	1956	Lightning	Spot	Stone Hill	55	1968	Lightning	Spot	Blue Sky Cr.
21	1956	Lightning	Spot	Volcour	56	1970	Lightning	Spot	Allen Gulch
22	1957	Lightning	Spot	Beartrap	57	1970	Lightning	.1	Ural
23	1957	Lightning	Spot	Ellsworth	58	1970	Railroad	12.0	Stone Hill
24	1957	Lightning	1.8	Allen Gulch	59	1970	Railroad	10.0	Holdup Gulch
25	1957	Lightning	.5	Tenmile Cr.	60	1970	Equipment	43.0	Tweed Cr.
26	1957	Lightning	.3	Warex Mtn.	61	1971	Slash	2.75	McGuire Cr.
27	1958	Railroad	1.0	Allen Gulch	62	1971	Lightning	.20	Blue Sky Cr.
28	1958	Railroad	Spot	Sheep Cr.	63	1973	Lightning	.5	Warex Mtn.
29	1958	Lightning	Spot	Stenerson	64	1973	Smoking	17.0	Volcour
30	1958	Lightning	Spot	McGuire Cr.	65	1973	Lightning	.2	Blue Sky Cr.
31	1958	Lightning	Spot	Inch Mtn.	66	1973	Lightning	.6	Sheep Mtn.
32	1958	Railroad	1275	Stone Hill	67	1975	Slash	1.0	Sutton Cr.
33	1958	Lightning	Spot	Beartrap	68	1975	Lightning	Spot	Inch Mtn.
34	1958	Lightning	Spot	Beartrap	69	1977	Lightning	.75	McGuire Cr.
35	1959	Unknown	Spot	Tenmile Cr.					

REQUESTS FOR FORMAL REVIEW - LIBBY PROJECT

Mr. John Wood, Field Supervisor
U. S. Fish and Wildlife Service
Ecological Services
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101

Mr. Paul Brouha - no comments received
U. S. Forest Service
P. O. Box 7669
Missoula, Montana 59807

Forest Supervisor
Attention: Mr. Alan Christensen
Kootenai National Forest
P. O. Box AB
Libby, Montana 59923

Mr. James W. Van Lobern Sels - no comments received
Brigadier General
Attention: Mr. Ed Mains, NPD-PL-ER
U. S. Army Corps of Engineers
North Pacific Division
P. O. Box 2870
Portland, Oregon 97208

Mr. James Flynn, Director
Attention: Dr. Arnold Olsen
Montana Department of Fish, Wildlife and Parks
1420 East Sixth Avenue
Helena, Montana 59620

JUL 1 1 1984

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Ecological Services
Federal Building, Room 3035
316 North 26th Street
Billings, Montana 59101-1396

IN REPLY REFER TO:

ES

July 6, 1984

Mr. James R. Meyer
Department of Energy
Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208

Dear Mr. Meyer:

We have reviewed the document entitled "Wildlife Impact Assessment and Summary of Previous Mitigation Related to Hydroelectric Projects in Montana: Libby Dam" prepared by the Montana Department of Fish, Wildlife, and Parks (MDFWP).

We have worked closely with MDFWP personnel during the preparation of this assessment, and we concur with their findings. In those areas of differing results between this report and the Fish and Wildlife Coordination report of 1965, we informally agree with the current report.

We will continue to cooperate with MDFWP in preparing mitigation plans to compensate for the losses documented in their report.

Sincerely,

John G. Wood
Field Supervisor
Ecological Services

cc: Director, Montana Department of Fish, Wildlife, and Parks, Helena, MT
Field Supervisor, USFWS, Helena, MT (SE)
Al Christianson, U.S. Forest Service, Kootenai National Forest, Libby, MT
Regional Director, USFWS, Denver, CO (HR)
Larry Lockard, Northwest Montana Fish and Wildlife Center, Kalispell, MT

JUL 17 1984

United States Department of Agriculture
Forest Service
Kootenai NF
RR 3, Box 700
Libby, MT 59923

Reply to: 2600

Date: July 11, 1984

Department of Energy
Bonneville Power Administration - PJS
ATTN: Jim Meyer
P.O. Box 3621
Portland, OR 97208

Dear Jim:

I have reviewed the final report entitled, "Wildlife Impact Assessment and Summary of Previous Mitigation Related to Hydroelectric Projects in Montana: Libby Dam," by the Montana Department of Fish, Wildlife, and Parks. Since I was involved in reviewing drafts of this document, I am familiar with its content and format and have no further specific comments to make regarding the final document. I feel that the Montana Department of Fish, Wildlife, and Parks has done a commendable job in assembling the limited data available and in developing a rational approach to identifying wildlife losses related to the project.

Sincerely,

Alan G Christensen

ALAN G. CHRISTENSEN
Wildlife Biologist

FS-6200-28(7-82)

Montana Department
of
Fish, Wildlife & Parks

Helena, MT 59620
July 9, 1984

Mr. Jim Meyer
Bonneville Power Adm. - PJS
P.O. Box 3621
Portland, OR 97208

Dear Mr. Meyer:

The Libby Dam hydroelectric project had a detrimental impact on the wildlife population utilizing the project area prior to inundation. The project inundated 28,850 acres of diverse wildlife habitats, which provided seasonal habitat components for a diversity of wildlife species. This impact assessment, developed through extensive coordination with the federal agencies involved in the operation of the project or the management of the wildlife resource, provides a comprehensive assessment of the impacts to selected target species. These species were considered to be the primary species impacted by the development of the hydroelectric project. Comments received on the original draft of the assessment, as well as those received during coordination meetings held during the current process were incorporated into this final assessment.

Many of the impacts identified in this assessment are different from those in the original impact assessment prepared by the U.S. Fish and Wildlife Service in 1965, which focused primarily on the impacts to only five big game species. This document, however, summarizes the best available information, including a thorough review of the available site-specific information and literature pertinent to the target species, and determines the impacts based on this information. The original assessment determined some of the target species, i.e., black bear, would not be impacted, while in reality the inundated habitats were important seasonal habitats for this species. Also, the original assessment did not state the methods of analysis and assumptions that were utilized, while this document outlines these in detail.

This document represents Phase I of an ongoing process to achieve complete mitigation for the impacts to the wildlife resource resulting from the construction of the Libby Dam project. The impacts identified in this document represent realistic goals for mitigating the detrimental impacts to the wildlife resource. Although the U.S. Army Corps of Engineers previously funded mitigation projects, additional mitigation has to be accomplished