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A NEW WILDLIFE RESEARCH LABORATORY

Part I

Undergraduate Thesis in Architectural Design

by 441

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at

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A PROPOSAL

A PROPOSAL

Wildlife is one of Montana's greatest assets, and wildlife needs close observation and care in order to preserve it for the future. At present the Fish and Game Department is in charge of studying and caring for the wildlife and wildlife habitats of Montana.

I feel a need for a facility that symbolizes the role that the Fish and Game Department plays in managing Montana wildlife. The proper facility to act as this symbol would be the Wildlife Research Laboratory, because this is the place that facts are gathered and analysed for determining management methods. This is the facility I will study and design as my architectural thesis project. I will conduct my work in the following manner.

First Quarter (Winter Quarter, 1967)

(1) Inquire into the conditions that create a need for a new Wildlife Research Laboratory.

(2) Propose a suitable site for the new facility.

(3) Investigate the economic and aesthetic conditions that will effect the new building.

(4) Analyze the necessary functions of the Wildlife Research Laboratory.

(5) Determine a program on which to base a suitable design solution.

Second Quarter (Spring Quarter, 1967)

(6) Design a solution for a new Wildlife Research Laboratory under the conditions and the program I determined during winter quarter.

CONDITIONS CREATING A NEED

CONDITIONS CREATING A NEED FOR A NEW WILDLIFE RESEARCH LABORATORY

THE NEED FOR WILDLIFE RESEARCH

Since the white man has come to America many changes of land use have occurred. The forests have been harvested, the valleys have been farmed, and many areas have been covered by man-made reservoirs. These changes have had a great effect on the wildlife and on wildlife habitats. The bison are almost extinct. Elk, bear, wolves, and other wild animals were driven from the prairie. Some animals such as deer have increased in population; because more food grew up in place of harvested forests, and the agricultural crops also provided food for the deer. Wildlife has retreated into smaller areas and these areas are getting smaller all the time. It is therefore necessary to study wildlife in order to insure and support an intelligent management program. (1;3,4)

GENERAL DEFINITION OF WILDLIFE RESEARCH

The Wildlife Research portion of the Montana Fish and Game Department is intended to gather and analyze facts about wildlife and wildlife habitats. The research organization consists of a group of wildlife biologists, each heading a particular survey. The research organization works with Montana State University, Veterinary Research, and other organizations in order to conduct intelligent fact gathering projects. The conclusions from these facts are used to make sound wildlife management decisions.(2;1)

The Fish and Game Department Wildlife Research Laboratory is presently located in Bozeman, Montana on the campus of Montana State University. The Wildlife Research Laboratory gathers and analyzes information on game birds, big game, fur bearing animals, and predators. Other departments of the Fish and Game Department and some federal agencies conduct research on fish. (3)

GENERAL CONDITIONS

Campus planners are trying to locate laboratory facilities such as the Wildlife Research Laboratory on the outer edge of the campus in order that the valuable central portion of the campus can be used for classroom area. (4) This is one reason that the existing Wildlife Research Laboratory should be replaced, but there are several other reasons that create a need for a new Wildlife Research Laboratory. The building is a hazard to campus pedestrian and vehicular traffic; and the building lacks storage room, office room, display room, work room, and several built-in facilities.

The existing building is so close to the corner of Garfield and 11th that several problems are created with pedestrian and vehicular traffic. A sidewalk cannot be placed along the south or west side of the building; therefore, pedestrians must walk on the street to get past the building. This of course is a danger-

ous situation. In order to load or unload a vehicle at the west door of the building the vehicle must be backed across the intersection of Garfield and 11th and up on the lawn in front of the west door. The front of the vehicle usually sticks out on the street. (See figures 1 - 6)

The existing building has two storage rooms totaling approximately 600 square feet. Both areas are completely full, and more items are brought into the laboratory every week requiring additional storage area. Items are now being stored in office rooms, work rooms, and on the floor of the hallway. (See figures 1-2, 7-8.)

There are four rooms used as offices for seven men. Each man should have a separate space to work in, but they are forced to double-up in three of the rooms. There is no privacy in any of the offices. There is also a secretary in two of the office rooms. Neither secretary can serve as a receptionist, because the rooms that they work in are upstairs. (See figures 9 - 10.)

The Wildlife Research Laboratory has many items that should be properly displayed to visitors. These items include antlers, skulls, horns, jaw aging boards, study skins of birds and animals, full bird mounts, charts and diagrams. These items are now crowded into shelves or packed in boxes. Visitors have a difficult

time finding the items that are presently hanging all over the walls of most rooms. I feel that these items should be incorporated into a reception type area where an interested visitor could view the items without wandering throughout the building. (See figures 11 - 12.)

There are three work rooms: the bird room, the food-habits room, and the collection processing room. The bird room takes the overflow from the inadequate food-habits room. Whenever a collection is brought into the laboratory all three work rooms must be used for processing the collection. The collection processing room is also used as the repair and carpentar shop. Each room should be large enough to take care of its entire function. (See figures 13 - 14.)

The Wildlife Research Laboratory would be a more efficient unit if it had a large freezer, a large cooler,and a conference room. A freezer and cooler would be used to store and preserve perishable items such as confiscated game. Whenever a conference is held at the existing laboratory half of the work force has no place to work.

AESTHETIC CONDITIONS

I feel that the existing building does not reflect its function. The existing building was designed as a living house, and therefore does not give the public any idea that it is the facility of the Fish and Game Department that gathers and

analyses facts about Montana wildlife.

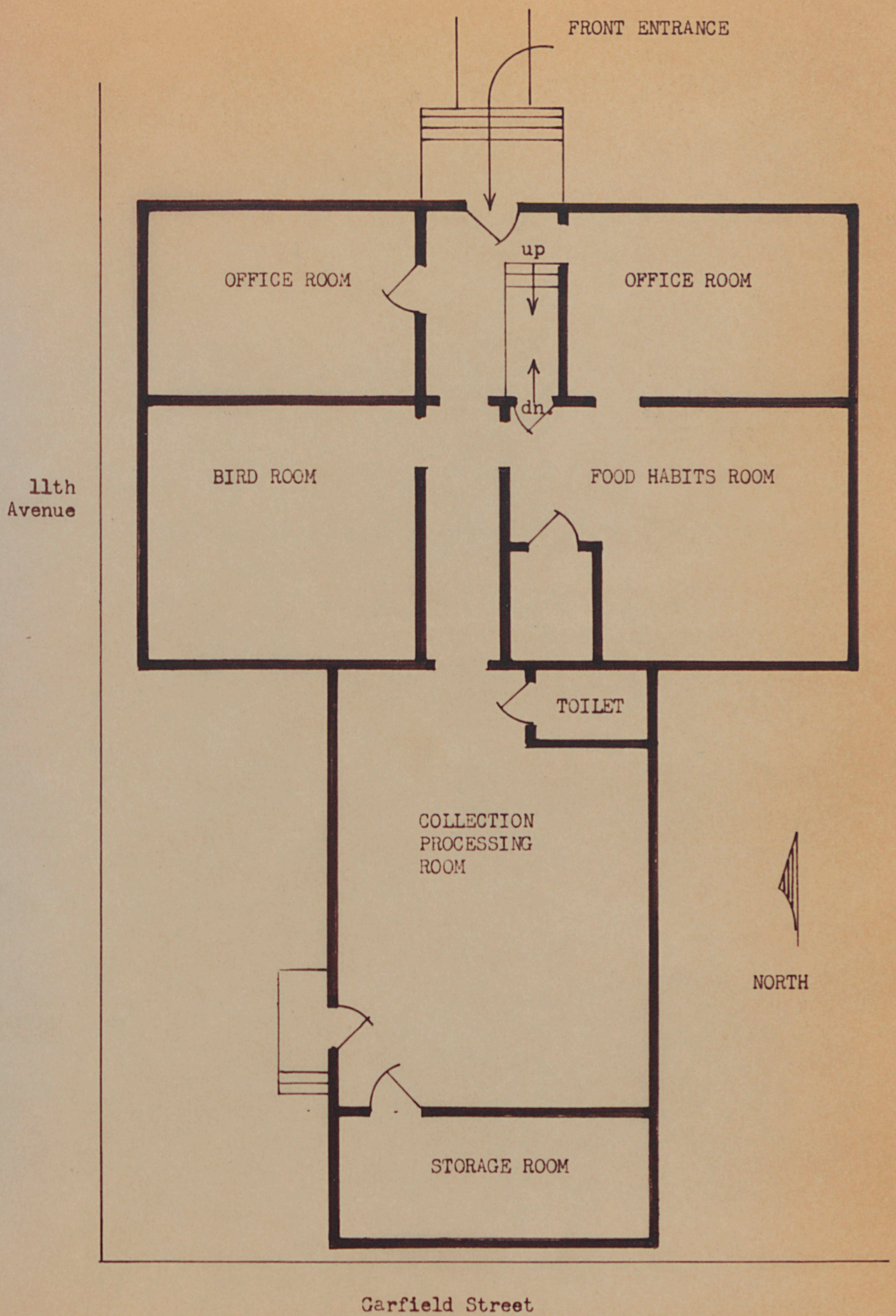


FIGURE 1; FLOOR PLAN OF THE EXISTING WILDLIFE RESEARCH LABORATORY
Scale: 1/8"=1'-0"

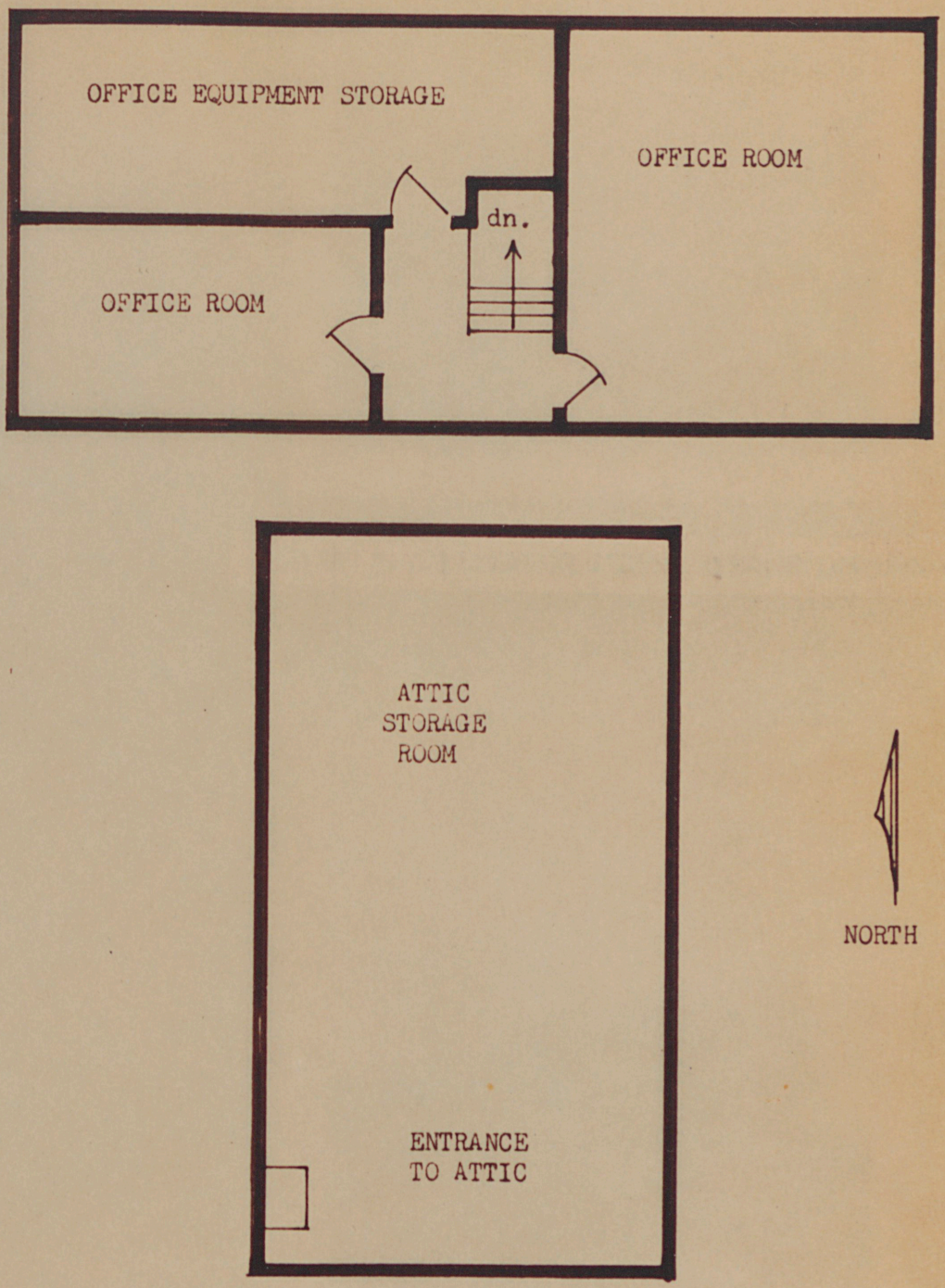


FIGURE 2; SECOND STORY FLOOR PLAN
Scale; 1/8"=1'-0"



FIGURE 3; EXISTING WILDLIFE RESEARCH LABORATORY



FIGURE 4; EXISTING WILDLIFE RESEARCH LABORATORY



FIGURE 5; DRIVE WAY AND LOADING FACILITIES



FIGURE 6; SIDEWALK



FIGURE 7; STORAGE ROOM



FIGURE 8; HALLWAY



FIGURE 9; OFFICE ROOM



FIGURE 10; OFFICE ROOM



FIGURE 11; EXISTING DISPLAY FACILITIES



FIGURE 12; EXISTING BIRD DISPLAYS



FIGURE 13; COLLECTION PROCESSING ROOM



FIGURE 14; FOOD HABITS STUDIES ROOM

LOCAL CONDITIONS

LOCAL CONDITIONS

GEOGRAPHIC

Bozeman, Montana is located in the south-east corner of Gallatin Valley at latitude 45 degrees 42 minutes and longitude 111 degrees and 31 minutes at an elevation of approximately 4800 feet above sea level. The Bridger Mountain Range lies to the northeast of Bozeman, and the Gallatin Mountain Range lies to the southwest of Bozeman. (5;1.1)

CLIMATE

The climate of Bozeman consists of generally severe winters and warm pleasant summers. The average temperature in winter is approximately 25 degrees with occasional lows of minus 35 degrees. January temperature averages have exceeded 30 degrees. The average snowfall is 30-50 inches falling mostly between November and March. The winter ground frost depth is about two feet. Periods of extremely high temperatures and high humidity conditions are rare in the summer time. Temperatures may reach 100 degrees during the summer time, but this condition does not last more than a week. More than one-half of the annual precipitation of 18 inches falls during May through July. The average mean temperature is 43 degrees. The growing season extends from about May 28 to about September 12. (16;122-123)

SUN ANGLES

The low sun angle of 20 degrees occurs in December, and the high sun angle of 68 degrees occurs in June. These angles occur at twelve noon. (7,p.18)

POPULATION

The city of Bozeman has a population of about 15,500; and Gallatin county has a population of about 25,000. Montana State University which is located in Bozeman has a population of about 6500 students.(15;p.1)

TRANSPORTATION

The many and varied transportation facilities that serve The Bozeman area are a good reason that Bozeman is a good location for the Fish and Game Department's Wildlife Research Laboratory. The Wildlife Research Laboratory conducts and coordinates field work all over the state. The transportation facilities include U.S. Highway 10, which is part of the Interstate system; and U.S. Highway 191. These highways provide connections with highways No. 89 north and No. 287 north. The Milwaukee Railroad provides freight service, and the Northern Pacific Railroad provides passenger service to the Bozeman area. Northwest Orient Airlines provides passenger service to the Gallatin Valley; and two base operators provide charter, crop spraying, instruction, and air ambulance service.(5;p.2)

WILDLIFE

The area around Bozeman contains an abundance of wildlife. The Gallatin River is rated as the fourth best trout stream in the country. The near-by Madison River is rated as the best trout stream in the United States. Ducks, geese, pheasants,and other game birds;as well as mountain lions, bobcats, deer, elk, moose, antelope, bighorn sheep, mountain goats, coyotes, and other game can be found in the Bozeman area. The managemant of all this game and the management of the game in the rest of the state is done within the organization of the Fish and Game Department by analysing factual information obtained by game managers and project biologists. The Fish and Game Wildlife Research Laboratory gathers and processes collections from wildlife in Montana, Yellowstone Park, and occasionally neighboring states. (2;.1-4)

OTHER

The Fish and Game Wildlife Research Laboratory should be located near Montana State University because many graduate wildlife students are doing their thesis projects through the Fish and Game Department, and these students must use the facilities of the Wildlife Research Laboratory.(3)

SITE CONDITIONS

SITE CONDITIONS

GENERAL

I was advised by a member of Montana State University's planning board to locate my site somewhere on the edge of the campus; because campus planners are trying to locate laboratory facilities on the edge of the campus in order to conserve the central portion of the campus for class room space. He also stated that all university animals and university farm buildings are going to be moved west of the campus in the vicinity of the Veterinary Research building west of 19th Avenue.(4)

I selected a site on the corner of Linclon Street and 19th Avenue. (See figures 15,16) This site is within easy walking distance for the university students that work part-time at the Wildlife Research Laboratory. This site is also convenient for the graduate wildlife students that are doing their thesis projects through the Fish and Game Department. This location is also convenient to Veterinary Research. Veterinary Research provides autopsy and investigatory work on diseased wildlife for the Wildlife Research Laboratory. (8)

The legal description of the site is as follows: SW 4, NW 4, Section 13, Township 2 South, Range 5 East. This property is owned by the state of Montana.(9)

ORIENTATION

Since the site is in the southwest corner of a plot of land surrounded by roads it is evident that the building will be oriented towards the West or South. Vehicular access will be off of the less-travelled Lincoln Street.

ADJACENT ENVIRONMENT

The area directly to the east of the site is now occupied by pig pens and high rise student dormitories. The land to the south is privately owned residential lots and houses. The land to the west is used for university pasture land; and this land is also the site of the Veterinary Research building. The land to the north of the site is university pasture land. The land to the north of the site is schedualed to be the site for married student housing. (See figures 17-20.)

TOPOGRAPHY, VEGETATION, AND NATURAL FEATURES

The site has a general slope from southwest corner to the northeast corner of 1.76 percent. The site has no protection from the prevailing northwest winds, but there are trees on the south side of Lincoln Street. These trees will protect the sight from storm winds that come from the south, southwest, and southeast. There is no protection from westerly storm winds. At present the site is covered with grass, the only trees on the site are along the west edge as shown on figure 16.

SOIL ANALYSIS

The soil under this site consists of about two feet of clay covering a gravel base of unknown depth. The water table in the area is approximately four feet below the surface during the dry seasons and about three feet below the surface during the summer irrigation seasons. (7;25)

ZONING REQUIREMENTS

County or city zoning laws do not apply to this site because the site is state owned. Federal fire and building codes do apply to the site. (9)

AVAILABILITY OF UTILITIES

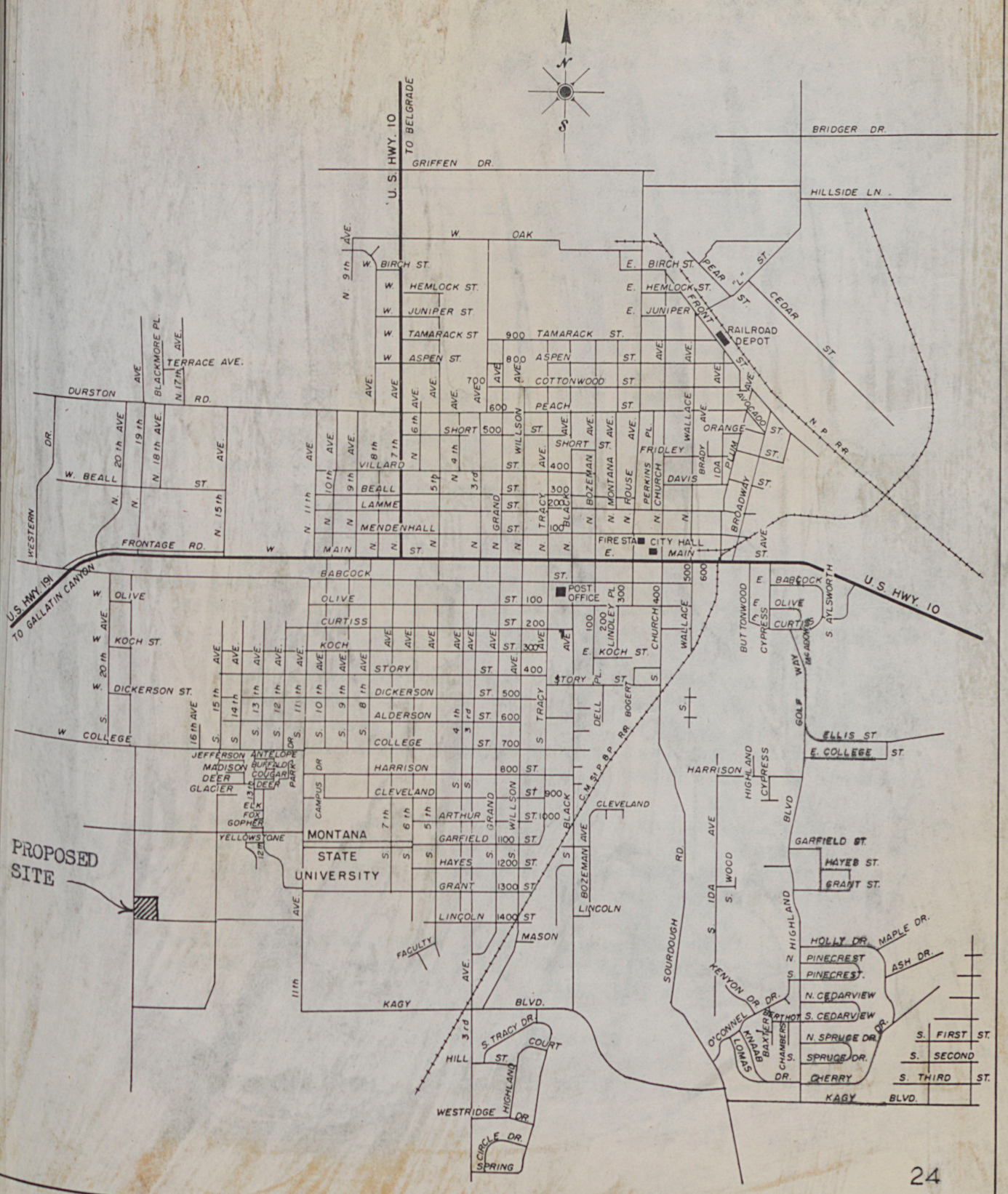
The nearest sewer line follows 19th Avenue until it reaches Veterinary Research. (See figure 16.) Water and gas are available from lines on the west side of 19th Avenue in the vicinity of Veterinary Research. Power lines run along the west side of 19th Avenue.(10)

PROPOSED SIZE OF THE SITE

The site is 300 feet by 300 feet. I will not use this much area in the final design, but I am allotting that much area in which to find a suitable arrangement of building, parking, and open areas. The additional portion of the site could be used for other purposes or for future expansion of the building and parking area.

(FIGURE 15)

MAP OF BOZEMAN MONTANA



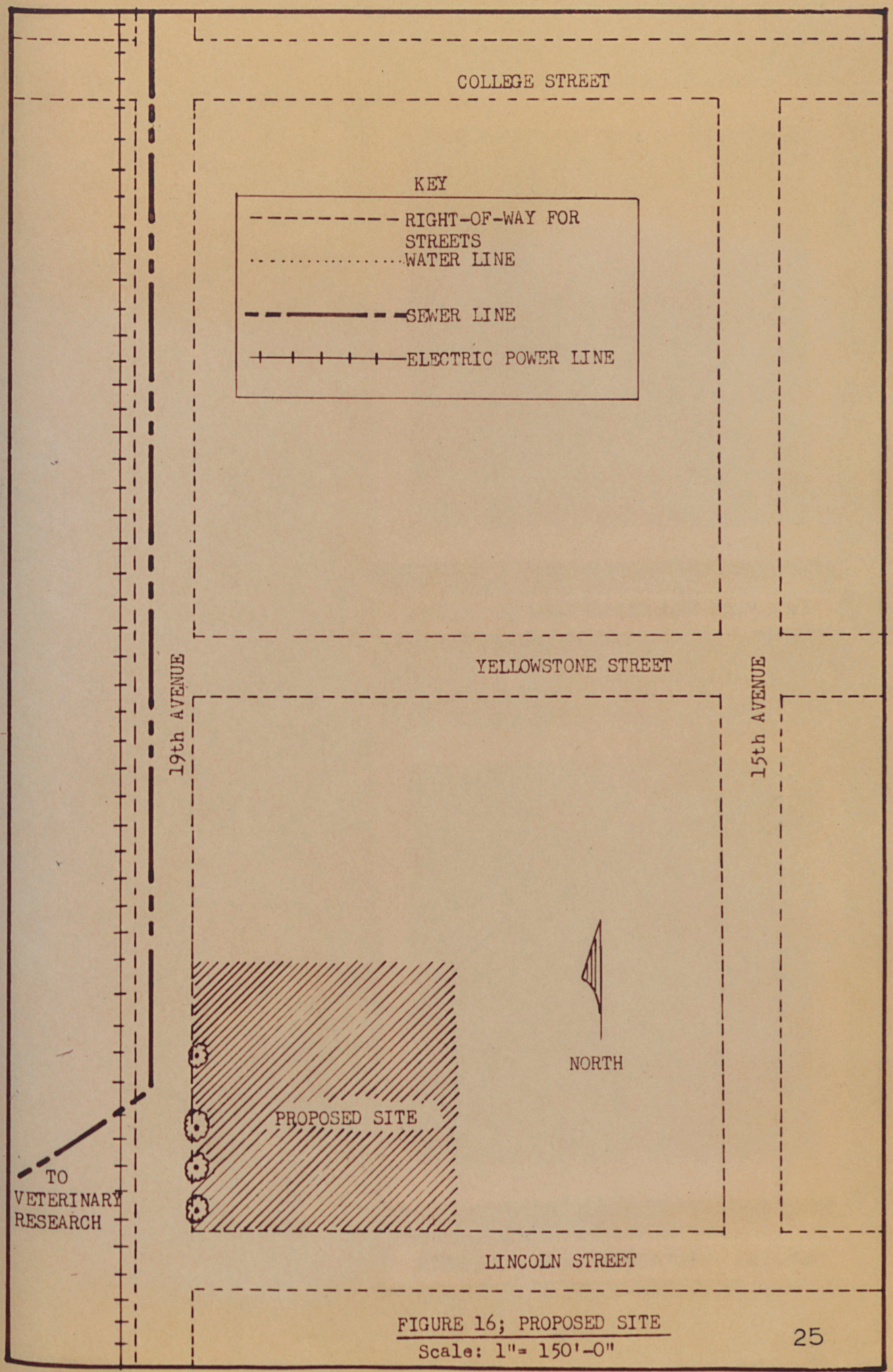


FIGURE 16; PROPOSED SITE
Scale: 1"= 150'-0"



FIGURE 17; VIEW TO THE EAST FROM SITE



FIGURE 18; VIEW TO THE NORTH FROM SITE



FIGURE 19; VIEW TO THE WEST FROM SITE



FIGURE 20; VIEW TO THE SOUTH FROM SITE



FIGURE 22; VIEW TO THE WEST ACROSS SITE



FIGURE 21; VIEW TO THE SOUTH ACROSS SITE

THE FUNCTION OF THE BUILDING

* FUNCTIONS OF THE WILDLIFE RESEARCH LABORATORY (8)

GENERAL DESCRIPTION

The Wildlife Research Laboratory is the center of local field work, coordinator, and collector of information from all over the state on many types of Montana Wildlife. The several functions that are carried on within the laboratory are: initial processing of collected material; food habit studies; game bird studies, including the stuffing of birds; making of displays and special items; office functions; and display of data and collected materials.

COLLECTION PROCESSING ROOM

State biologists collect much of their data by gathering special parts of animals that are killed by hunters or by getting these animals themselves with permission of the Fish and Game Department. These collected parts are brought into the laboratory; and are processed as fast as possible to prevent them from spoiling before measuring, weighing, and chemical analyzing can be done by the work force. Processing these parts requires the following facilities: freezer; cooler; tables; weighing scales; band saw; bug room; and easily cleaned floors and walls. The freezer and cooler would be used to preserve and store perishable items. Tables and counter tops are used for organizing collected material, and the tables and counter

* I have worked part-time in the existing Wildlife Research Laboratory since January, 1965, under the supervision of Kenneth Greer; Therefore, I am familiar with the functions of the laboratory.

tops are used for cutting tables. The band saw is used to trim bones. The "bug room" houses a type of insect that eats all the flesh off the collected bones and skulls.

FOOD HABITS ROOM

Food habit studies require several operations that call for several different facilities. The first operation is to obtain the food sample from the animal in its natural habitat. These samples are collected from animals killed by hunters or from animals taken by the biologists with permission from the Fish and Game Department. These food samples are then brought to the Wildlife Research Laboratory and the digestive fluids are washed out of the samples and formaldehyde is added to prevent spoilage. Storage space is neccessary for washed samples because it is usually some time before the sample goes to the next process. The next process, separating, is the process of putting each type of vegetation in the food sample in a separate container. These samples are also stored in formaldehyde and stored until they can be identified. The person that is identifying these samples must have access to a herbarium and a microscope. After the sample is identified it is stored until it can be measured for volume. The volume of a sample is found by displacing water in a graduated cylinder. The laboratory has several sets of beakers, graduated cylinders, strainers and and small instruments for finding the volume of food samples.

Convenient storage is neccessary for empty containers. After After the sample has been measured, it is then dried and packaged for storage. Food habit studies are done on elk, deer, moose, bighorn sheep, mountain goats, and all sorts of game birds. I feel that food habit studies will done on all types of Montana wildlife in the future as a part of good, complete game management.

BIRD ROOM

Much work is done on game birds at the Wildlife Research Laboratory such as determining age, stuffing, and displaying. Each year a group of biologists from all over the state come to the Wildlife Research Laboratory to determine the ages of game birds and to discuss their projects with one another. The regular work force of the Wildlife Research Laboratory prepares study skins and full mounts of Montana game birds. These study skins and full mounts should be for the inspection of all the visitors to the laboratory. At present they are not readily seen by visitors.

SHOP

Jaw aging boards, boxes for the bird study skins, canine boxes, and many such items are made at the Wildlife Research Laboratory. A jaw aging board is a box that contains in an orderly fashion jaws from young to old animals. These aging

boards are used at checking stations by the attendants to determine the ages of wildlife killed by hunters. The boxes for the bird study skins are used in the same manner. Canine boxes are used by biologists when determining the ages of live elk, or determining the ages of elk killed by hunters that did not retrieve the jaw of their kill but did obtain the canine teeth. A small wood-working shop would greatly enhance the building of these items.

OFFICE ROOMS

The existing laboratory houses the offices for five state biologists, laboratory supervisor, and two secretaries. The biologists spend most of their time in their offices analysing and writing reports on data obtained from field work or collections. Many publications are prepared in these offices. Each office has storage for pertinent data and collected items.

CONFERENCE ROOM

The Fish and Game Wildlife Research Laboratory should have a conference room, because state biologists meet several times a year in the existing laboratory; and many more meetings are held in other buildings because of the lack of room in the present laboratory.

DISPLAY AREA

Many items should properly be displayed to the visitors

and to people attending conferences at the laboratory. These items include: elk and deer antlers; jaw aging boards for elk, deer, bighorn sheep, mountain goats, and moose; skulls of bear, bobcats, mountain lions, and just about all small game animals; hides of many fur-bearing animals; and many charts showing different aspects of Montana wildlife.

STORAGE

All collected items are stored in storage areas until the specific study that these items support is completed and published, and in some cases these items are stored indefinitely.

It is difficult to determine the area needed to perform the functions of the laboratory, because the many different studies require different volumes of collected material. In the future game management should increase in popularity with the public and also in effectiveness. These factors will definitely cause an increase in the number of studies being done and also an increase in needed floor space.

PERSONNEL FACILITIES

A place to hang coats is neccessary for those working in the laboratory. Convenient storage for protective aprons and gloves should be provided in pertinent locations. Toilet facilities will also be neccessary.

THE PROGRAM

PROGRAM

To devise a program for a new Wildlife Research Laboratory I have determined the ideal area for each function at its present volume of work. The assistant laboratory supervisor felt that these ideal areas would carry the expected increase of surveys on Montana wildlife. (B) At present each area is not large enough to house its entire function. For example, food studies must be done in the bird room or collection processing room because the is not sufficient room in the food habits room.

To better show the relationships within each function I have broken each function into its distinct parts. The proposed Wildlife Research Laboratory should be able to conduct the following operations: processing of field collections, complete studies of the food habits of Montana wildlife, complete studies on Montana game birds, storing of all important items, and conducting conferences. Office areas should be provided for the biologists; laboratory supervisors; and graduate wildlife students, that are doing their thesis projects on Montana wildlife. Facilities for the comfort of those working and visiting at the laboratory should be provided. These facilities would include bathroom; coat storage; protective clothing storage; first aid; and coffee maker with storage for cups, cream, sugar, and coffee.

OFFICE AREAS

240 square feet for one secretary acting as a receptionist.

200 square feet for wildlife research coordinator

200 square feet for laboratory supervisor

4 offices of 150 square feet for project biologists

150 square feet for assistant laboratory supervisor

5 spaces of 60 square feet for graduate wildlife students.

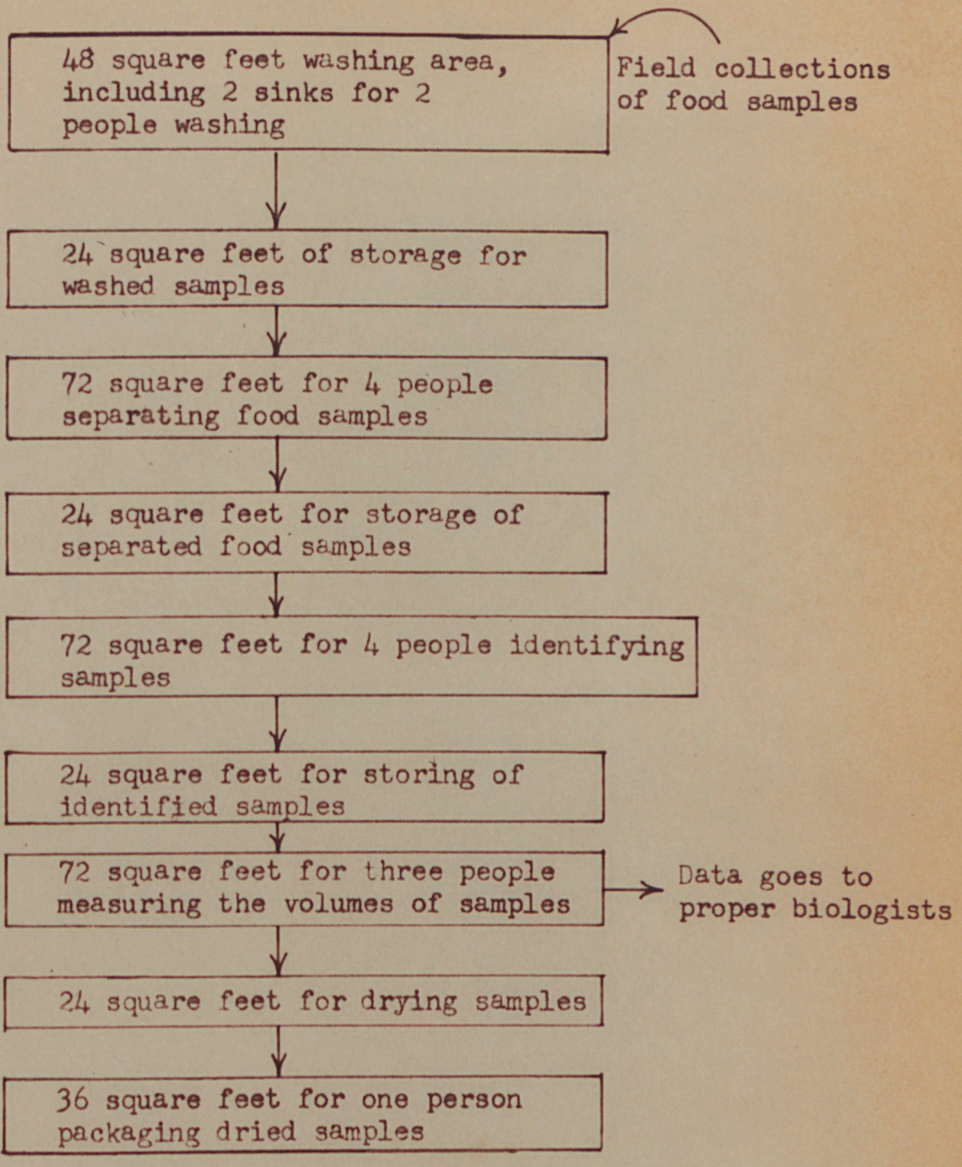
The office of the laboratory supervisor should have 60 lineal feet of book shelves.

The office of the wildlife research coordinator should have 80 lineal feet of bookshelves.

Total area required for office space = 1690 square feet.

Total number of people in offices = 13

FOOD HABITS STUDIES



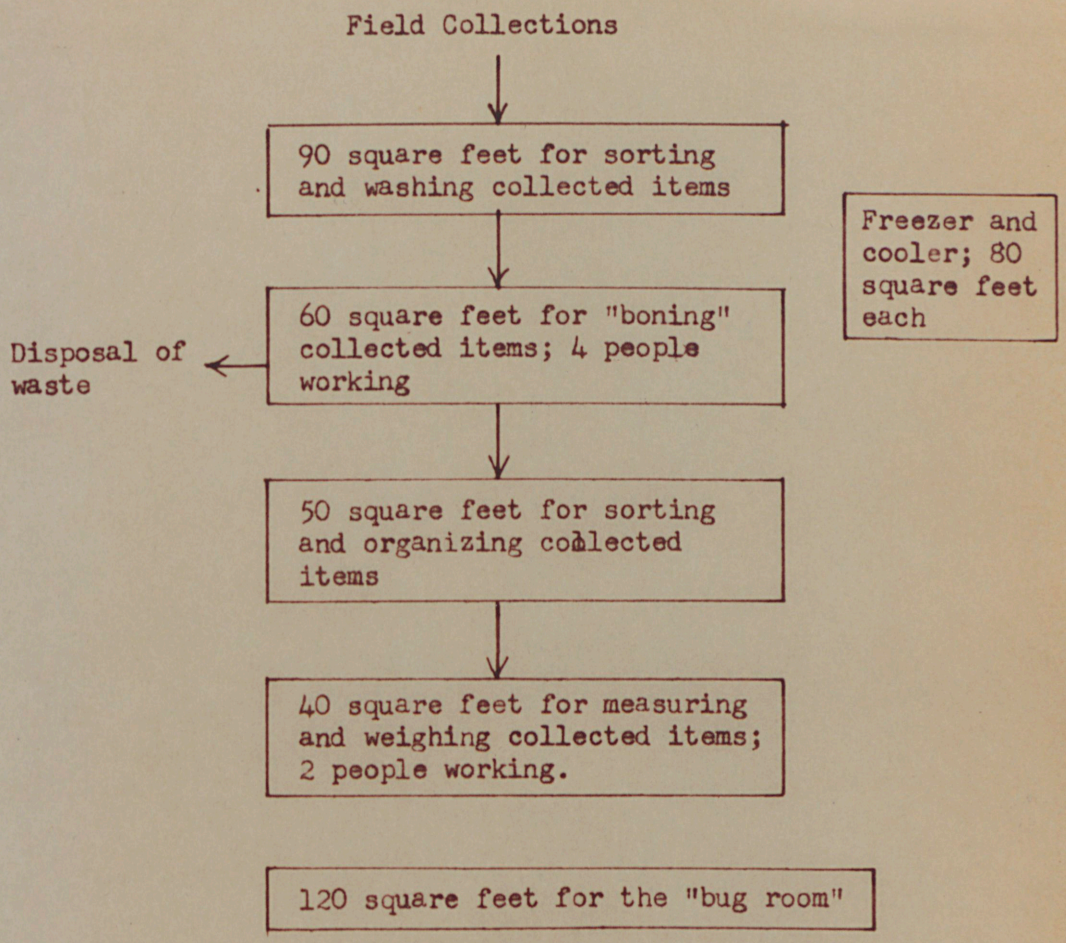
to large storage room

Total area required for food habits studies = 396 square feet

Total area does not include circulation area.

Total people working = 14

PROCESSING OF COLLECTED ITEMS



Total area needed = 520 square feet

Total workers = 6

The area shown does not include circulation area.

STUDIES ON MONTANA GAME BIRDS

Field collections of birds or portions of birds

↓

Cooling or freezing

↓

72 square feet for stuffing and curing of bird skins. This includes storage space for the tools needed to do this work. 2 people working

240 square feet for determining the ages of game birds killed by hunters. This operation is not a daily occurance, but do to the volume of bird wings that have to be inspected it requires its own area. About 10 biologists take part in the operation.

50 square feet of display shelves should be provided for bird displays.

Total area of "bird room" = 362 square feet

Total permanent workers = 2

Total temporary workers = 10

CONFERENCE ROOM

The existing laboratory does not have a conference room, but I feel that such a room would be beneficial to the function of the proposed Wildlife Research Laboratory. The biologists at the laboratory could conveniently prepare presentations to give to other biologists, wildlife clubs,or general public. This conference room should have facilities for showing movies, slides, charts and photographs. This conference room could also serve as a display room and a coffee room for the workers.The conference room should comfortably seat 50 people in auditorium fashion. Seating arrangements should be as flexible as possible. I suggest a room approximately 20 feet by 30 feet.
Total square feet of the conference room = 600 square feet.

STORAGE ROOM

The existing storage room has an area of approximately 600 square feet, and it is quite evident that it could be much larger. Each day items are brought into the laboratory that should be stored, but because of the shortage of storage room many items must be thrown away. An intelligent estimate of the actual area needed to satisfy storage needs is impossible to determine, because it is difficult to determine what sort of items will be studied and therefore stored away . I therefore selected 1000 square feet for the area of the storage,

room, because it will take care of the present storage load and the storage load for some time in the future.

Total square feet of storage room = 1000 square feet.

PERSONNEL FACILITIES

Coat storage for the coats of thirty employees and fifty visitors should be provided. Visitor's coat storage could be in the conference area.

Both a men's and women's toilet should be provided. The men's toilet should include a stool, wash basin, and urinal. The women's toilet should include a stool and wash basin. First aid supplies could be kept in these rooms. Each toilet should have an area 50 square feet.

Total area for bathroom facilities = 100 square feet.

Parking for 30 cars should be provided on the site.

TOTAL AREA AND TOTAL PERSONNEL

TOTAL AREA = 4668 square feet. This figure does not include circulation between the different functions.

TOTAL WORK FORCE = 35 . This figure represents the number of people required to have all operations acting at one time to full capacity, except the conference room and bird room.

AESTHETICS

AESTHETICS

AESTHETICS OF THE SURROUNDINGS

Whenever a building is built it becomes a part of its surroundings. Completeness and unity can be achieved by keeping a certain character within the structures of a certain area. This was the idea of the designers that designed the first few buildings on the campus of Montana State College. I feel that Montana Hall, Lewis Hall, Herrick Hall, The gymnasium, the Student Union Building, and Roberts Hall all have a common character that reflected the surrounding country. Now the new library, the field house, Ried Hall, Veterinary Research, and the new dormitories are mixed with these older buildings. The designers of these new structures were trying to carry through the character of the old by using brick, but it is evident that they created a totally different character. Therefore a totally new character is created by the joining of the old and the new; and it is this resultant feeling that I should portray in the design of the proposed Wildlife Research Laboratory.

MATERIALS

I feel that the only common bond of all the campus buildings is the brick. Therefore, I will use brick in some manner on the exterior of the Wildlife Rearch Laboratory. The shape

of the building should somehow protray the character of the country side. Indigenous materials should be used as much as possible. Wood for example has been used successfully on the student union addition. Stone could be used although it has not been used much on campus. Interior materials will be selected to fulfill functional aspects, such as, maintenance and durability. Economy will also have to be considered.

AESTHETICS OF THE PROPOSED BUILDING

When I am designing this building I will naturally consider all the basic design principles such as balance, color harmony, proportion, etc.. These principles will contribute towards a good building design; but to be successful the building should reflect a certain feeling or emotion. Since the Fish and Game Department is supported by public money, and since the Fish and Game Department is subject to public scrutiny I want the exterior of the building to reflect its feeling on the public. The feeling should give the public confidence in the management decisions of the Fish and Game Department. I am by no means saying that the appearance of the building will be the sole influence on public opinion, but it will help. The proposed research laboratory should be outstanding enough to attract the attention of the public, thereby, letting the

public know that the Fish and Game Department does have a facility that intelligently formulates game management methods. On the other hand it should not be extravagant because this would have a bad effect on public opinion. The location of the Wildlife Research Laboratory near the university will help reflect a sense of knowledge. This sense of wisdom and knowledge concerning wildlife should carry into the reception area and in the conference room. This could possibly be accomplished by displaying diagrams and charts concerning wildlife in the reception area and the conference area.

The initial processing room is usually a scene of blood and bloody portions of many different types of Montana wildlife, and sometimes the odor of these items is revolting. To be successful this room should have a clean and sterile feeling. It should also be easy to clean and sterilize. It will also be important to eliminate the odor of the collected material.

The food habits room will require a cheerful, lively, and bright feeling because working on food samples is a very boring and sleep inducing job. This room should be light colored and should not have too many color value variations. Value variations cause eye strain.(11;2-3),

The bird room should also be lively, cheerful, and bright; but this room should also have the quality of a hunter's den.

The quality of a hunter's den will give interest to the bird room, as well as,to the rest of the laboratory. The display of stuffed birds and bird study skins will possibly be enough to give the bird room this warm quality of a hunter's den.

The office rooms will be designed to be as functional as possible, but they will be designed in such a way that the individual will be able to control the feeling of his particular space. I feel that this can be done by allowing the individual to arrange the furniture, choose the color, and possibly control lighting within his space.

The aesthetics of most storage rooms is a gloomy, stuffy and dark sort of feeling. This feeling is the feeling that I will try to avoid when designing the large storage room for the proposed laboratory. A well ordered and clean feeling should prevail in the storage room.

The methods and materials of achieving the desired goals will be determined in detail during the design process. The meanings of the words used to describe the desired goals will probably not be clear until the design solution is completed .

ECONOMIC CONSIDERATIONS

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MAINTAINING THE LABORATORY

The Wildlife Research Laboratory is not paid for services rendered. The people that work in the laboratory are paid from the budgets of the different wildlife surveys in Montana. Therefore, the Wildlife Research Laboratory will not pay for itself directly. Hopefully, the laboratory will pay for itself indirectly by improving hunting condition, and consequently increasing income to the Fish and Game Department.

COST ESTIMATION

The actual cost of the Wildlife Research Laboratory cannot be accurately determined until the building is designed. A preliminary estimate can be found, but one must keep in mind that an early estimate would probably be very inaccurate. If the estimate is too high and the designer follows this estimate, the quality of the building would be higher than necessary. If the estimate is too low the quality and possibly necessary facilities would have to be sacrificed. The building should be designed to fulfill all necessary functions and aesthetic requirements to near perfection. Then the design and an accurate estimate could be presented to the client at one time. Both long and short range economy should be considered by the designer as he designs and selects materials for the structure. If a high

cost material requires less maintenance than a low cost material it is possible that the high cost material would be the most economical over a long period of time; however, if there is no appreciable difference between the two materials concerning durability and maintenance the low cost material would naturally be used.

In determining the cost of this structure I will assume it to be similar to an office and medical office building. I will also assume the building to be no better than good class B medical construction nor lower than low cost class B medical construction. The following chart shows the cost of each type, and was obtained from reference(12;p. 7, Section 15).

TYPE OF CONSTRUCTION		COST
Good Class B Medical Construction		$27.87 /sq ft
Exterior	Interior	
Good metal and glass good brick and concrete panels	good plaster and veneers, acoustic tile, carpetting and vinyl asbestos	
Low Cost Class B Medical Construction		$16.99 /sq ft
Exterior	Interior	
cheap brick, concrete block, very plain lift slab	low cost finishes and partitions, acoustic tile, asphalt tile	

The average cost of the two types of construction is $22.43 per square foot of floor area.

From the program I have estimated the area of the proposed Wildlife Research Laboratory to be about 5000 square feet of floor area. A preliminary estimate can be found by multiplying this area times the cost per square foot.

The preliminary estimate of cost = $112,150.00.

SOURCE OF FUNDS

The funds for a new Wildlife Research Laboratory would be obtained from the State of Montana with the approval of the state legislature. The legislature would approve and appropriate a sum of money based on preliminary estimates. Then an architect would be selected to design the building. The resulting design would be let out for bids; and the contractor with the lowest bid would be given the contract at a bid opening in the capitol building in Helena. (13;42-43)

The proposed site for the new Wildlife Research Laboratory is owned by the state, and will not require additional funds.

APPENDIX

REFERENCES

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4. James Gough, Head of the Architecture Department and Member of the Campus Planning Committee at Montana State University; A personal interview at Montana State University; January, 1967.

5. Chamber of Commerce pamphlet on Bozeman; Basic Information for Bozeman, Montana; Gallatin County and Trade Area; 1966.

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10. City Engineer, A personal interview at Bozeman's City Hall, February,1967.

11. Hugo Eck, Physiological and Psychological Effects in Illumination. A pamphlet for Architecture 315; 1964.

12. Marshall Evaluation System. Marshall and Stevens Publication Co., January, 1965.

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SUMMARY

SITE

This is a written summary of my solution of a new Wildlife Research Laboratory for Bozeman. The site, plan, function and aesthetics will be discussed.

Since the site was relatively flat, I was free to arrange parking, circulation and building in any position that I pleased. I felt that the building should be oriented towards the more heavily traveled 19th avenue. But, for safety reasons I felt access to the site should be from the less traveled Lincoln street. This created the problem of entering the site to the side of the building which could cause confusion to people unfamiliar with the site. I therefore placed the parking lot directly in front of the building so that after one has parked the entrance to the building is obvious. The parking lot is excavated to approximately three feet below the level of the floor of the building and the highway is about five feet above the floor height. This makes a difference of eight feet between the parking lot and the highway. Therefore, the view of the building from 19th avenue will not be hampered by cars in the parking lot. The parking lot to the east of the building is

for employees cars and for the State vehicles. The rear entrance which will be used by the employees and for loading and unloading collected items cannot be seen by passing motorists.

Trees were located to screen the parking lots from traffic on Lincoln street and 19th avenue. These trees were placed in random groups rather than orderly groups in order to give a nature like setting.

PLAN and FUNCTION

The plan of the building consists of four strips: a storage strip, laboratory strip, visitor oriented strip, and the office strip. In plan these areas form a large square. In section each strip shows its importance by the relationship of their ceiling heights. The least dramatic area is the storage area and it consequently has the lowest ceiling. The office area and laboratory area are equally significant and therefore have equal ceiling profiles. The visitor oriented area should impress the visitor and therefore has the highest ceiling height. The large volume of air in the laboratory will also help maintain a fresh atmosphere. The front entry is in the display area. The receptionist is immediately available to someone entering the building and she is also handy to the laboratory supervisor.and the research coordinator for typing, etc.

The resulting design has a total area of 6,720 square feet of floor area which is 1,720 square feet above the original estimate. The cause of this difference was my failure to include in my original estimate the 128 square feet of the utility room and the 832 square feet of circulation space around the conference room and utility core.

AESTHETICS

The exterior of the building conveys a sense of knowledge and formalism. I feel the use of brick and the location of the building so near the University creates this feeling. The brick has a warm enough feeling to give the building a tie with nature but also the formalism of the brick gives the building dignity. Stone would have had a closer tie to nature, but stone would not have the dignity of brick. Concrete would have had a stern dignity but no tie to nature.

The building was set into the earth mounds and the monumental effect of the skylighted roof was created to make the public aware of this building and to make it outstanding enough to be remembered as the place that wildlife management methods are researched. Since the function of the building has to do with nature and wildlife I feel that the earth mounds and the wood shingles are appropriate methods to symbolize the tie between the building and nature.

The interior of the building is constructed of wood to give the functions an appropriate setting. The wood is light colored and there are sufficient general lighting elements to maintain a bright cheerful atmosphere throughout the entire structure. Individual lamps are used for close work such as separating or identifying rumen samples.

The general office area can be arranged by the biologists that work in this area by moving the furniture elements within the area; other than this flexibility the biologist cannot control the aesthetics of their individual offices. The offices of the laboratory supervisor and the research coordinator are more private than the other office area. The laboratory supervisor and research coordinators will be able to control the aesthetics of their individual offices.

The interior of the structure is flooded by north light from the skylights which dramatize the central portion of the building. The skylights provide a very effective tie with nature.

The conference room was lowered into the ground in order to avoid giving the interior a tight closed in feeling, and also to provide display surfaces on the walks above the conference room.

The processing room was sealed off with glass to keep odors out of the rest of the laboratory, while maintaining the open feeling of the interior.

In conclusion, I feel that my design solution functions successfully and symbolizes the role that the Fish and Game Department plays in managing Montana Wildlife.

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