AGRICULTURE AND WILDLIFE

Proceedings of the 1984 Annual Meeting of the

MONTANA CHAPTER

OF THE WILDLIFE SOCIETY

February 15-17, 1984

Butte, Montana

FOREWARD

The 1984 Annual Meeting of the Montana Chapter of the Wildlife Society was held February 15-17 at Butte. The theme for the meeting was "Agriculture and Wildlife."

A keynote address was delivered by Keith Kelly, Director, Montana Department of Agriculture. The Chapter presented its Distinguished Service Award to Ken Walchek of the Montana Department of Fish, Wildlife and Parks.

The proceedings were compiled and edited by Program Chairman Arnold Dood. I would like to take this opportunity to thank all of those who presented papers at the meeting and those whose efforts made the annual meeting a success.

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WELCOME TO BUTTE, MONTANA

Terry Lonner[1]

This was presented to The Montana Chapter of the Wildlife Society on February 16, 1984 in Butte, Montana at the Copper King Inn. It was accompanied by a prelude consisting of a series of slides synchronized to the song "America" by Neil Diamond from the movie "The Jazz Singer". After this prelude, the following oration was read with slides presented appropriate to the words. Most of this oration was taken from the book "Mile High Mile Deep" by Richard K. O'Malley, pages 1 through 3, with some additions and deletions.

The prelude was presented by Martha A. Lonner and the oration was done by Terry N. Lonner with assistance from his wife, Martha.

And so it was, people came to America, people settled in many places, but very few places did people settle where there was a common interest with so many ethnic groups and so much diversity and yet so much similarity in trying to make a living and get by. One of these places was Butte. Beginning in 1864 they came and by 1919 there were 100,000 of them:

Such characters lived here as Nickel Annie, Fat Jack Jones the Hack Driver, Shoestring Annie, and people with names like Babich, Balkovetz, Barich, Bechtold, Bjorkman, Bullerdick, Calcaterra, Canalia, Carpino, Costello, Kelly, Dammarell, Dunfee, Eschenbacher, Evankovich, Galletti, Hurlbut, Ignatoz, Johnson, Konecny, Kowalsky, Sakellharts, Koskimaki, Leveaux, Lopez, McGarry, O'Brian, O'Billovich, Olson, Parini, Piazzola, Polkinghorn, Popoff, Quilici, Richter, Salovich, Sullivan, Troglia, Tsimanakis, Murphy, Vukmanovich, Walsh, Yeo and Ziegler.

And some of them grubbed into the hill and found copper. Others came and they ripped the guts out of the hill. They pitched gallows frames and put cages on them. And they went deep into the ground for the copper, always for the copper.

Irishmen working as far south as Leadville, Colorado heard about the Butte strike. And Finns sweating it out in the Mesabi Range of the frozen north in Minnesota heard about it. And the Swedes and the Cornish and the Montenegrins and the Italians and the Yugoslavs and the Norwegians; the Germans, the French, the Polish heard about it. And the Greeks too, but they thought in terms of restaurants; working men have to eat. And the gamblers from everywhere.

They all came to Butte. They filled its streets with the noise of a dozen tongues, and they filled its tunnels and stopes and manways with themselves and the sound of buzzies biting into the rock was loud down below.

And the smelters went up with their stacks vomiting yellow sulphurish smoke that stung and burned and polluted.

The town grew on the side of the hill, perched on its flanks and the shacks sprouted like weeds around the mines. Oh, how green was my valley. There were families that followed and it was Butte all at once. Out of the copper womb.

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[1]Montana Department of Fish, Wildlife and Parks, Bozeman, Montana.

Finntown, Hungry Hill, Dublin Gulch, Stringtown, Butchertown, Dogtown, Centerville, Meaderville, Walkerville, McQueen, Uptown, The Flats, Parrot Flat, the Cabbage Patch.

Talk English at school. Then Czech, Italian, Yugoslavian, Serbian, Finnish, Swedish, Norwegian, Polish, and German at home. The old folks don't talk English so good, Grandma don't know a word, ain't it funny, I wish Grandpa would talk something besides Gaelic, he's been here five years now. Let'em alone, they're old. They're set in their ways and what's wrong with Gaelic anyhow?

Then the whores came!

Mercury Street, Galena Street, The Black Cat, Venus Alley, 14 South Wyoming. The girls tapping with their knitting needles to catch your eye. Two bucks Jack, C'mon in. Show you a good time.

Butte, man she's wide open. Ya wan'na gamble? Step up to the Faro layout. A crop shooter? Roll'em out. Poker? Any way ya want it.

And the Chinese came, the drifters and stayons from the old railroad days. Washee shirtee? Likee noodles, fantan, Chinatown and its twistey turny way off South Main Street.

The gallows frames girted the hill then took it wholly. The Mt. Con, Mt. View, The Leonard, Speculator, Badger, The West Colusa, Granite Mtn., Original, The Berkley, Kelly, and The Neversweat.

Twenty-five miles away the biggest stack in the world went up at Anaconda and the B A & P ore trains rumbled day and night.

Get the rock in the box, where the hell is that Nipper--I need some tools--Ya can't never find a Nipper when ya want him. And the Nipper, who handed out the tools had caches in the mines. If he liked you, you got good tools, if he didn't that's tough Jack. That's all I got right now.

The powder monkeys, they're all nuts anyway and get blowed up sooner or later, swarmed down and the dynamite went into the drill holes.

Count the holes, lad always remember, when she blows count the holes. Ya put a pick in one that didn't go off and your old lady won't recognize you, if ya come hame at all.

Get the rock in the box, bend your back, the car only holds a ton. Get them grizzlies cleared. All right, take five, we got enough done for awhile, gimme a smoke, lad. Muck the rock into the car and away to the station. The chippy takes it up, if you ever rid in a chippy, lad, lay down. The way they hoist them up you'll get your brains knocked out standing up.

And the town grew. She brawled, and fought. And laughed. And tunneled, and blasted, and dug, and shoveled.

Butte, a mile high and a mile deep.

Get the rock in the box, Jack.

Things changed and economies of scale were introduced--hard rock deep shaft mining gave way to open pit mining--and so it was the Berkley Pit began in 1955.

For 27 years men and their giant machines blasted, and scooped and hauled billions of tons of rock 24 hours a day and 7 days a week until 1982 when the hill became silent.

And what now?

While here, I invite you to spend some time up on the Hill, for some of your ancestry probably contributed to its history.

WESTERN REGIONAL WORKSHOP REPORT

Lynn Nielsen[1]

The Western Regional Workshop was held at the Department of Fish, Wildlife and Parks headquarters in Missoula on Wednesday, January 11, 1984. Twenty-nine people were in attendance.

The meeting agenda included four presentations pertinent to the annual theme--agriculture and wildlife. We also heard update, from several agency representatives, concerning the current status of their respective wildlife programs.

Lynn Nielsen reported on the problems of elk depredation in agricultural fields adjacent to the Wallace Ranch, near Drummond, Montana. The Wallace Ranch is a 14,000 acre block that currently supports a herd of 450 elk. The population has been reduced--by hunting and trapping--from recent population levels as high as 700 elk.

Elk are yearlong residents on the Wallace Ranch. Exceptions to yearlong residency include individuals that leave the ranch to calve, individuals that leave the ranch during severe winter weather, and the entire herd that leaves the ranch, during late summer evenings, to forage in the neighboring second growth alfalfa fields. This last exception is the problem.

The Wallace Ranch is not typical yearlong elk habitat. Three factors seem to contribute to yearlong occupancy:

1. The ranch is an established sanctuary--it has been closed to hunting for 30 years.
2. Except for recent leases, the ranch has been ungrazed for 20 years because it currently is not a working ranch. However, there is grazing on adjacent Forest Service allotments, habitats that are more typical of elk summer range.
3. Typical elk summer range on adjacent Forest Service land also has been extremely logged.

Management that has been attempted include:

1. Road closures on adjacent Forest Service land.
2. Walk-in hunts on adjacent winter range.
3. Permanent haystack yard.
4. Late season hunts have been effective when elk are off the ranch, but these have been unpopular.
5. Trapping has been expensive and the elk have become conditioned to the trap and the helicopter.
6. Herders to harass the elk from problem areas.
7. The current proposal is for an experiment with electric fence.

Dave McCleerey reported on the potential for a similar elk depredation problem to develop in the vicinity of the Chamberlain Creek study area. During the last four years, there has been an increasing tendency for elk to congregate in a posted agricultural area, adjacent to the Blackfoot Special Management Area, during the hunting season. These elk include most of the telemetry instrumented animals from the Chamberlain Creek study area. In 1983, attempts to drive the elk from the closed area were unsuccessful. Elk left, but they soon returned.

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[1]Montana Department of Fish, Wildlife and Parks, Deer Lodge, Montana.

So far, the land owner has not complained about depredation. This, in part, is because the current management direction for the posted lands is unclear. If the ranch operation changes, depredation could be a serious problem.

To date, the principle problem is the reduced opportunity for elk hunting in the special management area, because the elk aren't there.

During 1984, hazing and grazing in the posted area will be modified in an attempt to discourage elk use. It also may be possible to modify management of the walk-in hunting area.

Loren Butler, Mountain Scent and Bugle Co., reported on experiments that his company has conducted to reduce agricultural damage.

Mountain Scent has worked primarily with white-tailed deer in the Bitterroot and with lesser numbers of elk and black bear. They have attempted to aversively condition deer to an odor repellant, using their "Spooker System". Deer that approach the haystack are presented with the conditioning odor--a chemical that smells to humans like vanilla--and then are dosed with a high-speed, pneumatic pellet gun and a siren. For this system to be at all effective:

1. Human involvement must be eliminated or the deer will condition to human scent. Therefore, the equipment is operated remotely.
2. The conditioning odor must be unnatural and volatile at low temperatures.
3. Physical contact is required to condition the animal.

Deer begin to habituate to odors within a week. Adversive conditioning has a maximum duration of 3 weeks if the animals are treated twice. However, once individual deer begin to use the haystack, other animals quickly habituate to the odor. If there are no other choices, animals under nutritional stress also habituate to odors.

Conditioning with the "Spooker System" is expensive. Conditioning may be of value to an individual rancher. However, it just moves the animals to other haystacks. Thus, it has limited application where game damage is extensive.

Other research has shown that:

1. Electronic equipment doesn't work well during winter because snow and winter pelts are good insulators.
2. Bear seem to condition more readily than deer. However, with the "Spooker System" there is a greater possibility for eye damage because bear tend to turn toward the gun. For bear, the system has been modified to place the siren and the gun in different locations.
3. Repellants, applied to hay, that are sufficient to discourage deer use also render the hay unfit for livestock.
4. It is possible to imprint captive animals sufficiently that they will starve rather than use a food source. So far, it has not been possible to condition wild animals this effectively.

Presently, 12 states support research to reduce agricultural damage.

Mike Casey, Flathead County Rural Resource Development Council, reported on the recently initiated program to preserve agricultural land in the Flathead Valley.

The Farmland Protective Act of 1981 established legislative support to the concept of preserving prime agricultural land.

The Flathead County Conservation District established the Council because the District is concerned with the loss of prime agricultural land to subdivisions in Flathead Valley. Flathead County has something unique and it is trying to preserve it. There are good opportunities to do so because Flathead County has a diverse economy--supported by timber, Anaconda Aluminum, tourism,

recreation, and agriculture. The agriculture also is diverse--no single crop represents more than 10% of the agricultural income.

The Conservation District is concerned with agricultural land, but it also recognizes the importance of wildlife, soils, clean air and water, and scenic vistas. The District also recognizes the need to relate its program to the desires of the community. Thus, the Council was established as a citizen's committee that represents several diverse interests.

The Council will be attempting to make land appraisals using an established system--LESA (Land Evaluation and Site Assessment). This system rates land according to current soil survey information and community values. It allows for an objective point system for each land use. The value of a system like LESA is that it is legally defensible and it forces County Commissioners to make land use decisions in a consistent fashion.

For landowners to participate in a program to preserve agricultural land, they must be compensated for their equity. The Council is considering a system for Transfer of Development Rights. By this system, low density development rights are assigned to all land. Certain areas are specified where development may occur at a higher density, however the developer must purchase the right to develop from other landowners. Once the rights have been sold, the land associated with those rights may not be developed.

Ron Escano, Northern Region Forest Service, gave a brief report on Habitat Suitability Models. HSI is a tool to identify the amount of suitable habitat available for a species, it is driven by standard habitat data, and is relatively inexpensive to operate on a desk top computer.

Ed Schneegas, Northern Region Forest Service, reported that the Forest Service is moving toward management by objective. For example, the ten Forests in Montana have been evaluated according to their capability to support elk on winter range. Budgets will be allocated according to this capability. Similarly, wildlife budgets among the Regions also will be allocated by objectives.

The Forest Service has developed a "Grizzly Bear Initiative" that outlines necessary programs for grizzly bear. This has been successful in getting money back into the Region for bear work. The Region also has initiated a Grizzly Bear Action Plan.

Last year, Region One had 8 formal and 81 informal consultations with the Fish and Wildlife Service.

Dave McCleerey, BLM, Missoula, summarized the wildlife program of the Butte District, BLM. The organization of the District includes 3 resource areas: Headwater (Butte), Dillon, and the Garnet Resource Area (Missoula).

An extensive inventory of land in the Garnet Resource Area has been completed. Their current direction is to complete an intensive inventory to include: habitat types, habitat components, highlighted wildlife species, T&E species, sensitive species, and nongame species.

The BLM nongame program includes developing policy and management direction for snags, riparian habitat, old-growth, natural park buffers, special habitat features, and forest residues.

The BLM wildlife program also includes monitoring, habitat improvement and habitat planning.

Kleinschmidt Lake (near Ovando) has been developed as a Canada goose nesting habitat. The program has included nest structures and release of young birds. This program resulted in the successful establishment of a breeding population.

Joe Ball of the Cooperative Wildlife Research Unit, assured us that the Unit is alive and well (at least through next fiscal year). The Unit is a cooperative effort--the Fish and Wildlife Service provides 2 salaries and $4,000 operations, MDFWP provides $10,000 operations and supports 1-3 projects, the Wildlife Management Institute contributes $1,000 and the University provides the office and secretary.

The Unit operates primarily on grants and contracts. This source funds 20-30 projects per year, principally graduate students.

Recent press releases concerning the Unit and golden eagles have not been accurate. This spring, Bart will be monitoring sheep losses to golden eagles. Scarecrows may be sufficient to deter eagles from taking lambs. If that doesn't work, it may be possible to identify the offending birds, capture them with a net gun, and relocate them.

Joe's primary interest is with Canada geese in the Flathead Valley. Nest structures work very well with geese, but maintenance is a problem. He is trying to develop a structure that requires maintenance only every 5 years.

Lorin Hicks of Plum Creek Timber Company (formerly Burlington Northern) stated that the Little Sleeping Child land exchange was culminated this year. Plum Creek purchased this Bitterroot Valley elk winter range at subdivision rates, and then traded with the Forest Service for scattered parcels elsewhere in Ravalli County.

The Redgate Special Management Area, which employs the green dot road closure system, was initiated on a block of company land west of Kalispell. Results the first year were encouraging. Plum Creek intends to initiate a similar area near Missoula and two areas in Idaho next year.

The Thompson River deer study, in cooperation with MDFWP and U of M is beginning this year.

Plum Creek also is participating in the bald eagle working group, and programs to monitor water quality in the Madison and Gallatin drainages.

Plum Creek has been intensively surveying winter ranges in company land to evaluate post-sale response. They also plan to burn some winter range in the Libby area next spring.

Mike Aberhold, MDFWP Regional Information Officer, Kalispell, reported on a variety of Department related matters.

The black bear is the "forgotten" big game species in Montana. Future management will be more intense and future seasons will be more restrictive.

The March issue of Montana Outdoors will have an article on bear misidentification. The Department also will have an I&E effort on this problem.

Statewide, the main issue this year has been the mule deer population increase, and associated problems in eastern Montana.

Road management is still the number one wildlife issue in western Montana. The public demand for forest roads already has been satisfied.

Mountain grouse surveys indicate low population levels. The Department is considering a turkey season in northwest Montana.

The nongame funding check-off system goes into effect this year. The first programs to be funded will be in I&E.

There was excellent pheasant hunting at Ninepipe this year, despite no planted birds.

Wayne Kasworm, MDFWP Biologist in Libby, presented an interesting summary of his bear study, funded by U.S. Borax. The grizzly bear recovery plan targeted the Cabinet/Yaak area as one of three places for an intensive recovery effort.

Objectives for the study in the Cabinets are:

1. Trapping black and grizzly bear to identify habitat and movement.
2. Identify conflicts with mining.
3. Develop management recommendations.
4. Evaluate black and grizzly relationships.

Chris Yde, MDFWP Biologist in Kalispell, indicated that the Northwest Power Planning Act, 1980, authorized BPA to fund mitigation for prior hydro-development. The Department is seeking funding from this source. Currently, impact assessments at five Montana sites are being developed. The next phase will be to develop mitigation alternatives to be discussed with the various cooperating agencies.

A COOPERATIVE PERSPECTIVE

Keith Kelly[1]

Being a spokesman for agriculture, I would like for a moment to reflect on the importance of agriculture to the U.S. and more specifically Montana.

Agriculture is the nation's single largest economic sector. From farm to table, it employs 22.5 million people--about 1/4th of the U.S. work force. The U.S. farmer today raises enough food to feed himself and 78 others.

As is true for the country as a whole, Montana's number one industry is agriculture.

Approximately 23,000 families make their living in our Number 1 industry--agriculture--which accounts for 40 percent of the state's economy.

Montana has 93 million acres within its borders with the Continental Divide at our northern and southern borders. Rich minerals and precious metals are locked in these mountains which are covered with vast timber resources.

There are 801,000 Montanans occupying these 93 million acres of land, of which 51 million acres are in private ownership. Of that, 51 million acres are range pastures and woodlands, leaving 13 million acres for crop production.

When you drive for a hundred miles from Helena and pass through only a few communities on your way to the next major town, it may be hard to believe that we may be running short of land for whatever use we desire.

It is this lack of recognition, and of the land resource upon which it depends, that could spell trouble in the future for not only Montanans but for all who eat. The obvious impact of land use changes in Montana is directly related to this problem.

A major area of land use change that has an enormous impact is urban sprawl.

A letter addressed to the Department of Agriculture says: We are traveling through your beautiful state on our vacation and we would like to buy a "small farm" big enough so that we can raise our own food, in the mountains, preferably with a stream or lake on it and close to town where we can sell our excess crops and get a job.

This kind of correspondence is received in the Department nearly every day.

Approximately seventeen percent of our nation's agricultural land is located on the periphery of expanding urban centers. Around nearly every city in the nation you will find that prime agriculture land has signs put up by real estate companies that are attracting families from city centers to move to a "place in the country". As families migrate to suburban areas so move stores, streets, sewers and all of the things that let people live in the country and work in the city, thus bidding land away from agricultural production and wildlife habitat. Therefore, contrary to the statement that agriculture is a renewable resource, it is only renewable if the land is preserved.

The question arises, how then does agriculture impact the wildlife sector?

As you know, much has been said about agriculture being an adversary to wildlife interests. Sometimes it may appear we are on the other side of the fence, but in fact the opposite is true.

The agricultural community and wildlife society have worked cooperatively on many issues.

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[1]Director, Montana Department of Agriculture

The endrin issue beginning in 1981 involved cooperation between the State Department of Agriculture and the Department of Fish, Wildlife and Parks. This effort required coordination at the field level between technical personnel involved in sampling as well as administrative people from both agencies when policy decisions were required. Generally, I think this effort went well and proved that we could work together even though our concerns and approaches were different.

In the whole endrin controversy I feel that the landowners who allowed agency personnel access to their endrin treated acreages deserve our thanks. From their perspective I'm sure they felt that they had the most to lose and least to gain during the process. The environmental samples (including waterfowl and wildlife, soil, vegetation, water, sediment, etc.) that were collected and analyzed for endrin residues in 1981 and 1982 could not have been obtained without their cooperation.

During the 1983 Legislative session several wildlife issues were supported by agricultural interests. These included the Game Farm Bill and the Non-game Wildlife Bill. Conversely, several situations in which agricultural concerns received environmental and wildlife groups support were also addressed. These included:

1. Deer and antelope problem in haystacks in eastern Montana this past winter.
2. Support of the Compound 1080 Columbian Ground Squirrel program.
3. Support of a proposal to use Compound 1080 in single lethal dose baits for coyote management.
4. Support of the greenhouse at Montana State University for biological weed control research.

An excerpt from the "Spirit of GTA" is an excellent summation of the relationship of Agriculture to wildlife preservation.

"Farming is one of the purest forms of free enterprise. The land is a proving ground for the world's most advanced farm technology. Farmers are bold, business risk-takers, who take winning in stride. And accept losses philosophically. They are America's first and foremost environmentalists, respecters of nature and protectors of the land."

The late Wayne Bratten of Winnett County whose grazing land was plowed under after its sale, was a man such as this according to his friend, Bubb Nunn. Nunn says of Wayne, "He was the greatest conservationist you ever seen. When I came here he run about 650 head of cows. A range hog woulda run 1,200 head of cows. He always had grass and took care of everything, the country, his cattle. There wasn't a man who worked for him or anybody that'd ever say that he'd overused this country. He always left enough for the game and everything."

Wayne Bratten was caught up in the sodbusting controversy as was the agricultural and wildlife communities. The cooperation between these groups helped work toward the alleviation of a common problem.

As you can see, the relationship between wildlife interests and agricultural interests are varied and complex. This is particularly true in Montana where the types of agricultural land vary almost as much as the various types of wildlife that use portions of it during the year. When conflicts arise we need to sort out the basic issues and see if we can reach a compromise that takes into account the input from both sides. I believe that we can resolve many of our differences if we can sit down with an open mind and hear each other out. This is at least a beginning.

WHERE HAVE ALL THE MALLARDS GONE?
An overview of the Problem of Low Waterfowl Recruitment on the North American Prairies

Thomas C. Hinz[1]

As Montana's representative to the Central Flyway Technical Committee, I recently became aware of the problem of poor duck recruitment, particularly in early nesting species such as the mallard. As early as 1980, duck recruitment studies became the primary focus of this group, whose attention was eventually drawn by researchers from the Northern Prairie Wildlife Research Center in Jamestown, North Dakota. These researchers, having investigated the ecology of prairie nesting ducks for 15-20 years, offered suggestions, advice and direction for Central Flyway mallard management. In particular, the work of Harold Duebbert, Al Sargent, Lew Cowardin and Doug Johnson was carefully evaluated by the Technical Committee. The latter two, Cowardin and Johnson, developed a mallard model which offered a predictive tool for evaluating future management options which the Central Flyway management agencies could use to reverse the mallard population trend. The first group of slides presented here are the result of the work of these 4 individuals and outlines the problems of low waterfowl recruitment, the reason for it, and the challenge to management to alleviate it. Simply the problem of low waterfowl recruitment is the result of the loss of upland nesting habitat on the prairies which has caused ducks to nest in the few remaining coverts which also are shared by nest predators, producing sizeable losses. Consequently, the challenge to management is to exercise management options on public and private land to improve recruitment by improving nest success through limiting predation of nests with the use of islands, predator-excluding fence, and through predator control.

The second group of slides outlines the results of a cooperative duck nesting study conducted in Montana and North and South Dakota in 1983. This study was designed by the Central Flyway Technical Committee and was wholly funded by the Central Flyway Council states to evaluate duck nesting success in nine areas of the three major production states. The results have provided an expanded data base from which the Cowardin Mallard Model may draw and in return will serve to provide the means for evaluating the cost effectiveness of implementing management options in the various production areas to produce the most mallards. The Central Flyway Council and Technical Committee will continue to address the mallard problem as its primary concern through:

1. Continued funding of the Cowardin Model.
2. Developing a Central Flyway Mallard Management Plan.
3. Forming a joint Central/Mississippi Flyway Mallard Management Subcommittee.
4. Evaluating the currently available mallard data base and harvest regime to determine what the future mallard hunting regulations should be.

These endeavors will serve as a starting point for North American waterfowl management agencies to correct the population decline of the most prized waterfowl species in North America so as to continue to provide sufficient numbers of mallards for the enjoyment of waterfowl hunters and other users in perpetuity.

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[1]Montana Department of Fish, Wildlife and Parks, Miles City, Montana.

SLIDE SHOW FOR RIPARIAN AND WETLANDS TAX INCENTIVE LEGISLATION

Paul Brouha[1]

SLIDES	1. DEFINITION AND INTRODUCTION
Graphic	1. The riparian area: A network of valuable resources.
Water/riparian/ upland interface	2. Riparian areas are unique portions of our environment in Montana. They support diverse resources and life greatly disproportionate to their small area.
Riparian area in arid country	3. Supplied with the richest soil and an excess of water, they support lush vegetation often in stark contrast to surrounding upland areas, thus making them attractive and extremely productive for a variety of uses.
Lush riparian vegetation	4. Trees, shrubs, and grasses attain their best growth here and wildlife and fish species abound as nowhere else because their basic needs for food, cover, and water are readily met.
Well managed riparian area	5. Man also has been drawn to this area because of its productivity, level terrain, and ease of access. With careful management the area can provide abundantly for man in perpetuity.
Streamside vegetation and clear water	6. Riparian areas are acre for acre the most important lands for producing renewable resources to be found in Montana. Yet as important as they are they add up to less than 1/2% of Montana's land area.
Riparian area in forested land	7. There continues to be considerable controversy as to just what a riparian area is, what it should be, and how to define it, understand it, and manage it properly.
Riparian with lots of sky to print: 1. Definition 2. Values 3. Management 4. Program	8. This presentation is intended to create a better understanding of riparian areas by defining what they are, discussing riparian resource values, highlighting existing management practices, and introducing a voluntary program to foster use of good management practices on these areas throughout Montana.
GRAPHIC Shows riparian area on either side of stream along with adjacent upland	9. Simply, riparian areas are the banks of streams, rivers, lakes, and other wetlands. They are the transition zones between water and adjacent uplands and are identified by soil characteristics and vegetation that requires abundant water.

[1] United States Forest Service, Missoula, Montana.

Marsh area in arid country

10. Montana has a variety of riparian areas associated with lakes, ponds, rivers, streams, marshes, and.....

Wet meadow in timbered area next to stream with moose

11. ....wet meadows. Each riparian area is unique and provides diverse plant, wildlife, fish, soil, and water features.

Broad valley photo

12. Riparian areas vary in topography, shape, size, and form. Some are broad....

Canyon area next to river

13. ....while others are very narrow and consist only of linear strips of vegetation between steep canyon walls.

Waterfowl production area

14. In Eastern Montana wetlands next to pothole lakes and low gradient streams are important riparian areas.

2. VALUES OF RIPARIAN AREAS

Riparian bottom contrasting with upland

15. What are riparian resources? There are many resources dependent on this small land area that are noticeably different from the resources of the adjacent uplands.

Stream with subirrigated vegetation

16. Water- both above and below ground is the most obvious resource.

Lush vegetation after flood has left sediment deposited on it

17. The gentle terrain and dense vegetation provide a zone for intercepting and trapping rich water-borne topsoils from upland slopes.

Streambank vegetation binding and stabilizing bank after a flood

18. The variety of grasses, shrubs, and trees helps slow floodwaters, stabilizes streambanks, and reduces erosion. Over long periods of time stream channels are ever-changing and naturally dynamic. Vigorous riparian vegetation controls and governs this natural process.

Shaded riparian area with stream

19. The moisture and shade from trees and shrubs cools and reduces extreme changes in air, soil, and water temperatures.

Clear water over clean stream gravels

20. Rich spongy soils, mulched and cooled by lush vegetation sustains year-round flows of cool clear water.

GRAPHIC
1. Sediment filter
2. Bank stability
3. Shade
4. Perennial flow

21. In summary natural values of riparian areas are based on vegetation that acts as a sediment filter, promotes streambank stability, provides shade, and perennial flow.

GRAPHIC
Net with physical features on it

22. Such features of water, soil, and vegetation form a balanced environment, a network, highly productive of life. The interrelationship of these features can be likened to a fisherman's net. Each feature makes up a cord of the net. When maintained the net can stand much use with the strength and flexibility provided by the intertwining of its parts.

Net with a strand broken and a resource missing

23. However, if misuse occurs (a strand or two breaks), the net weakens. Without repair and maintenance of any one riparian area feature--soil, water, or vegetation--less life can be supported.

Good trout habitat	24. When the network of physical features is strong, high quality fish habitat develops and aquatic life is healthy.
GRAPHIC Showing stratification	25. Numerous wildlife species are supported by the riparian vegetation. This wildlife diversity results from a varied vegetation structure as well as from having many different species of plants.
Riparian area with six point bull elk	26. Wildlife often use riparian areas as travel lanes, and big game usually bear their young near wet meadows and stream bottoms. Many wildlife managers regard riparian areas as the single most important wildlife habitat.
Road compatibly situated along a stream	27. Riparian areas and their resources are also used by man in a variety of ways; these may include the siting of towns, railroad rights of way, electric transmission lines, and roads.
Compatible logging	28. Harvesting of timber....
Compatible grazing	29. ....grazing of livestock----
Well managed cropland near stream	30. ....planting and harvesting of row and hay crops are also included.
Fisherman next to stream	31. Hunting, trapping, fishing, and other recreational pursuits are other favored uses.
Broad timbered riparian zone	32. Man is attracted to riparian areas because of level terrain, vigorous timber growth....
Alluvial willow and grass flat	33. ....highly palatable forage, productive rock-free topsoils, available water,....
River scene	34. ....and the shear beauty of them.
GRAPHIC 1. Fish 2. Wildlife 3. Man	35. In summary, the interrelationship of physical features provides for many uses by fish, wildlife, and man.

3. DEGRADED AREAS AND LOST VALUES

Close shot of fill slope erosion	36. Disturbance of vegetation and soil are the primary problems that occur in riparian areas. Nearly all of man's activities along streambanks or on adjacent upland slopes affect the vegetation and soil. How far can man go without weakening a cord in the productive network of a riparian area?
Logged out drainage	37. When streamside vegetation is depleted or streamside soils destabilized the whole life support system of the riparian area is harmed. Care must be given when timber is being harvested, ...
Recent construction	38. ....roads are being constructed,....
Livestock grazing	39. ....or when livestock are being grazed.
Grazing under management	40. Grazing use by livestock, if properly controlled and managed, can be a compatible and desirable use of riparian forage.

Over-utilized shrubs and trampled banks

41. Prolonged uncontrolled grazing by livestock or big game in riparian areas however, will result in destruction of grasses, forbs, and shrubs, trampling of streambanks, and the compaction of soil.

Riparian zone grazed to "bluegrass" and bare earth stage

42. When streamside vegetation is destroyed there is nothing to shade and cool the water and soil, nothing to filter sediment from flood waters moving off upland slopes, and nothing to hold streambanks together.

Arid, compacted, dished out, stream channel that has been overgrazed

43. The stream channel often becomes more eroded and "dished out". As the channel widens, the water table drops and the strip of riparian vegetation becomes narrower as upland plants take over the newly dried out areas. In extreme cases year-round stream-flow and all riparian plants may be lost.

Improper road location and timber harvest

44. Similar long-term damage can occur from improper timber harvesting methods, excessive recreation use, and the construction of roads....

Cropland next to stream

45. ....and from land clearing and planting of row crops too close to stream channels.

Channelized stream next to highway

46. Road development, in particular, can drastically change the entire structure of riparian areas, if extensive tracts of vegetation are removed and streams are channelized.

Aerial view of braided stream channel

47. When stream gradients are steepened as often occurs during channelization, water flows much faster and erodes streambeds and banks. The water carries the sediment downstream and deposits it as velocities are again reduced below the channelized section. Unstable braided channels result.

Dewatered channel

48. A final activity that severely weakens and changes the character of the riparian producing network is excessive and poorly timed diversion of stream flows or the drainage of wetlands. The resulting loss of water during critical riparian plant growth stages can cause plant species changes. Upland plant species gradually invade what were once moist sites.

4. MANAGEMENT APPROACHES AND CASE STUDIES

Ranger with tasks

49. These riparian problems are not confined to private lands but occur on public lands throughout Montana as well. The task at hand is to identify harmful activities that reduce the productive capacity and soil and water protection capabilities of riparian areas.

GRAPHIC
Riparian components integrated together

50. Today landowners and managers are not looking to benefit only a single resource, they are identifying ways of achieveing a mix of managed uses on riparian and adjacent water and upland areas that preserves the highly productive riparian area network.

Helicopter logging	51. New methods are being developed in timber harvesting.
Cows grazing	52. The grazing of livestock has recently received a great deal of attention as one use of riparian areas. Several grazing methods have been demonstrated that maintain or improve riparian habitat.
Streambank fencing and vegetation contrast	53. Fencing may be necessary to properly apply a grazing method. In some cases fencing may be required to temporarily or permanently exclude livestock. This method, is expensive and may be impractical, but it should be considered when other alternatives are not available.
Well-managed grazed streamside	54. Proper grazing management systems can be designed to meet riparian vegetation growth requirements. Experience has shown that not just any "rest rotation system" will do the job. A system was designed near Dillon, Montana, so that livestock made heavy use of riparian areas in only one year of three and the area was completely rested one year of three. The remaining year light grazing was scheduled during late fall or spring when animals dispersed into uplands.
Well-managed grazed streamside	55. Deferred rotation and high intensity short-term grazing such as the Savory Method accompanied by herding appears successful in maintaining riparian area resources--even with increased stocking in some cases.
Well planned rock placements with small area of riprap	56. Where channelization is necessary for specific uses, water can be slowed and directed by strategically placed boulders or armored drop structures. These devices will reduce streambed and bank scouring and allow the stream to adjust to its new channel.
Channelized section	57. The public financial burdens that can result from poor riparian area management can be illustrated by the events that occurred on Spring Creek near Lewistown, Montana after a 4200 foot long stream section was straightened and riparian vegetation removed as it was reduced to 2200 feet by a landowner eager to gain an acre of useable ground. Note the bridge in the distance. The picture was taken facing upstream. Several events occurred as a result of this work.
Eroded area upstream	58. The landowner upstream lost eight acres and 20,000 cubic yards of rich topsoil in one year.
Construction work in stream	59. A drop structure and riprap were installed to stop further head cutting. Cost $260,000.
Cracked bridge footings	60. The highway bridge footings were undermined and failed. Replacement cost of the bridge was $199,000.
Channel showing deposition	61. Material that had eroded upstream settled out below the straightened section.

Repaired section	62. As a result the channel had to be dredged, and the streambanks sloped and riprapped at a cost of $166,000.
Well vegetated streambank	63. Had the individual managed his streamside area properly and not channelized it, natural vegetation would have maintained the stability of the streambank and public costs of nearly three quarters of a million dollars would have been avoided.
Stream with flooded riparian	64. While vegetation does much, in flood plains that have high flood peaks from poorly managed watersheds, additional techniques must be used. The mix of vegetation and bank protection structures which require high public or private investment must be carefully planned and engineered.
Damaged streambank and farm buildings	65. An example is Cottonwood Creek near Helena, Montana where a 1975 flood caused extreme erosion and threatened farm buildings.
Plans	66. The site was examined and a plan developed to stabilize the bank and recover resource values while protecting buildings.
Finished construction	67. Logs were cabled into the bank, the banks reshaped and replanted with grasses and woody vegetation in 1976.
1978 scene	68. Between 1976 and 1978 nature cooperated with man and rapid revegetation occurred.
1981 scene	69. By 1981 the tremendous regrowth protected the bank and buildings from another potentially destructive flood.
1981 scene	70. The Cottonwood Creek case exemplifies current thinking about how riparian areas can be restored in contrast to the Spring Creek case where extensive use was made of high cost "hard architecture" techniques such as dredging and riprap. Success of current management techniques is dependent on complimentary upper watershed management to moderate flood peaks.

5. RIPARIAN TAX INCENTIVE LEGISLATION

Yellowstone River scene GRAPHIC NFMA 100 foot management area	71. What can be done to prevent loss of riparian area resource values? What has been done? 72. Concern for the protection and restoration of riparian areas has prompted legislation and direction for improved management of these areas on public lands. The National Forest Management Act of 1976 requires that special attention be given to land and vegetation for at least 100 feet along both sides of streams, lakes, and other bodies of water.
GRAPHIC Executive orders	73. President Carter voiced concern for riparian area management and issued two executive orders on the subject of flood plain and wetland preservation and restoration.

Stream with lush riparian area

74. Other states have recently reflected concern for improved riparian area and wetland management by enacting laws that create tax incentive programs to reward landowners that properly manage qualifying lands.

GRAPHIC
Showing management area

75. The laws provide for property tax exemption on private wetlands and lands adjacent to streams to encourage landowners to protect and restore these areas. Participating landowners pay no property tax on wetlands or on streambed and streambank up to 100 feet landward from each side of the stream channel if the landowner is managing to meet the intent of the law and is enrolled in the voluntary program.

Aerial view of riparian

76. Might such a program be good for Montana?

THE ROLE OF LANDOWNER COOPERATION IN BLACK-FOOTED FERRET RECOVERY

John Cada, Tom Campbell, Tim Clark, and Dennis Flath[1]

Abstract

In an effort to solicit cooperation of the agricultural community in impending black-footed ferret studies, a series of meetings with key leaders and landowners was held. Results of those meetings are described and generally portray a reluctant willingness to cooperate.

Procedures for following through on ferret sightings is presented as well as an established sequence of actions to be followed in the event that presence of a ferret population is confirmed.

The role of key personnel, as well as of participating agencies, is set forth.

Much of Montana's wildlife resides on private land, with some species almost completely dependent upon these lands. Success in maximizing wildlife qualities on these lands depends largely upon cooperation of private landowners. Though conflicts of uses occur, frequently the conflict is mostly perceived or feared. Consequently, many worthwhile wildlife projects are not implemented simply because of their controversial nature. Often times they never develop to the problem/conflict solving stage. An example has been Montana's endangered species program.

Montana has typically approached endangered species projects with caution because of the open resistance from agricultural interests. Until this year, the Department's involvement with endangered species has been the very least controversial: the peregrine falcon (Falco peregrinus) and the bald eagle (Haliaeetus leucocephalus). This year a significant change was made. This paper summarizes the procedure the Department used to initiate a black-footed ferret (Mustela nigripes) study and obtain the support and cooperation necessary for success.

Availability of grant-in-aid funds through Section 6 of the Endangered Species Act specifically for Montana ferret studies was the catalyst which precipitated our involvement in this study. However, before proceeding the Department felt that agriculture should be contacted and offered a role in planning the study procedure. Not only would this study be in jeopardy if a significant negative reaction came from agriculture, but it could also adversely affect implementation of the newly passed nongame income tax checkoff legislation.

Consequently, a meeting was held with all the agricultural leaders in Montana and a Department of Agriculture representative. The purpose was to notify them of the potential project, point out the benefits of and reasons for the project, and to obtain their reaction. A decision to proceed would be based upon their reaction.

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[1]Cada and Flath, Montana Department of Fish, Wildlife and Parks; Clark and Campbell, Biota Consultants.

Our main points were as follows:

1. Ferrets are indeed an endangered species and in need of recovery.
2. The best chance of recovery is now due to the discovery of the ferret population just south of Montana.
3. The Department of Fish, Wildlife and Parks is the proper agency to take the lead in this effort.
4. Our goal is to find ferrets and recover the species so that it can be downlisted or delisted.
5. If we don't do the study, the restrictions on prairie dog control will at least remain the same.

To relieve fears over the implications of ferret presence on or near private property, two Wyoming ranchers were asked to attend the meeting and to relate their experiences and feelings resulting from having ferrets on their lands. Both ranchers indicated positive feelings and no change in their ranching operations as a result of ferrets residing on their land. Also, one of the principle nongovernment researchers on the Wyoming ferret project was invited to attend and discuss their findings, general ferret and prairie dog biology, and his impressions of how private landowners felt about ferret occurrence on their land.

Similarly, the Department felt a need to inform the conservation community about our proposed ferret studies and seek their cooperation. Past experience suggested that negative publicity could seriously jeopardize a project if polarization occurred. Patience and understanding in a cooperative atmosphere is essential.

Conservation groups offered their support and cooperation, and agreed to trust the lead of the Department. This is particularly important where public information such as news releases are concerned because misunderstanding of biological principles often results in misinterpretation of study results. When such misunderstanding is presented to the public, there is a high risk of controversy and conflict, with endangered species often suffering the most severe consequences.

Key personnel representing involved or concerned agencies were also informed in the same manner as the previous 2 groups. Here, the main concern was coordination and cooperation. These personnel are participants in the study procedures and eventual management actions. Consequently it was viewed necessary to detail the role of each in the study procedure. Teamwork is essential, and each teammate must understand his (or her) appropriate role in order for the project to be fruitful. A football team with 11 quarterbacks would never win a game! Each agency must understand its proper role. FWP is responsible for wildlife management, FWS is responsible for migratory species and listed species, and FS and BLM are responsible for habitat management.

In concert with the wishes of agricultural leaders, a series of 9 public meetings was held in eastern Montana. Meeting locations included Roundup, Baker, Miles City (2), Ekalaka, Broadus, Malta, Harlem, and Roy. Public attendance ranged from 1-22. Attendees were presented information about the ferret, study procedures, and what ferret presence would mean. Open discussion was encouraged, and these question-answer sessions proved quite valuable.

Some of the input we received are summarized as follows:

1. Ranchers had few negative feelings toward the black-footed ferret.
2. Most ranchers were very concerned about the present expansion of prairie dog communities on public and private rangeland in Montana.
3. Nearly all those attending the meetings were receptive to having field personnel inventory their lands for ferrets.

4. Agriculture needs assurance that we can do what we promise regarding prairie dog management.
5. Receptiveness to maintaining ferrets and prairie dog populations on rangeland varied greatly among ranchers. Some wanted all prairie dogs removed whereas several indicated interest in maintaining some levels of prairie dogs and ferrets.

Some of the points we brought out which appeared to be well received were:

1. Proceeding with this study is better than doing nothing and hoping the problem will go away.
2. The main objective of the study is to recover the black-footed ferret, thereby to down-list and eventually delist the species.
3. One of the benefits of the study is to identify areas that are void of ferrets.
4. There are no intentions of conducting this study on private property if the landowner does not wish to cooperate. Lessees would be contacted if studies are proposed on public lands.
5. If ferrets are found, we will work closely with the landowner or lessee to ensure his inclusion in future study and management plans.
6. If ferrets are found on or near a ranching operation, both public and agency activities in those areas will be kept to an absolute minimum.

Some important conclusions obtained from the information gathered at the meetings include:

1. We can count on at least reluctant support and cooperation in all areas which potentially may harbor ferrets,
2. Most ranchers attending would willingly report ferret sightings,
3. Follow-up communication with the agricultural community will be necessary to maintain present level of interest and support.

After the public meetings were held, a conference call was made to all the agency cooperators to prioritize locations where field efforts would begin and to develop a set of procedures to follow when ferret sightings and reports were made.

The basic assumptions used in determining priority areas of study were:

1. The choice of study areas at this level will not be affected by land ownership with the possible exception of Indian lands.
2. The study areas will be located in the vicinity where the highest likelihood of finding a ferret population exists.
3. The study area priorities may change whenever new or additional information warrants a change.

Highest priority was assigned to south Fallon and north Carter counties. This area contained the most recent verified ferret observation in Montana and, except for the immediate vicinity of the sighting, had not been intensively surveyed.

The area of second priority included portions of Phillips county. Several ferret reports have come from this area and it contains numerous prairie dog communities. Some of these have had little or no prairie dog control.

The general study objective for the first winter will be to survey these priority areas in an attempt to locate ferrets. First efforts were to obtain maps showing prairie dog distribution, land ownership, obtain history of control, and prairie dog population trends.

In order to ensure optimum use of each cooperator's expertise during the inventory phase of this study, the following activities were assigned to each agency:

1. FWP
   a. Coordinate study activities with consultants, agencies, and landowners,

b. Serve as a clearing house and reaction center for ferret reports and observations,
c. Assist with field activities utilizing FWP nongame biologist and regional wildlife biologists.

2. FWS
   a. Coordinate study activities with consultants and landowners on BIA lands,
   b. Assist with aerial reconnaissance flights as requested by FWP,
   c. Assist with ferret report evaluations.
3. BLM
   a. Provide maps of all inventoried prairie dog communities in Montana for all ownerships if available. For each prairie dog community this would include: size and shape, year(s), of inventory, history of control (type of poison used, effectiveness of control, etc.), and prairie dog population trends,
   b. Assist with financial support of aerial survey.
4. USFS
   a. Provide maps of all inventoried prairie dog communities in Montana for USFS lands and associated private lands.
5. BIOTA
   a. Provide field services and guidance as requested by the FWP,
   b. Maintain flexibility in their schedule of field activities such that they can be suspended on short notice to accommodate immediate survey needs in lower priority areas.
6. BIA
   a. Provide assistance and guidance when working on or near Indian lands.
7. CMR
   a. Provide guidance and facilities when working on or near the CMR Wildlife Refuge.
8. MDA
   a. Assist with informing the public and agricultural community of the study progress and findings.

It will, of course, be necessary for each agency to maintain a great deal of flexibility during field studies to accommodate the need to respond promptly to new findings as they appear.

A procedure was developed to follow up ferret reports and/or verified sightings. The purpose of this procedure was to establish a sequence of actions that had been formerly agreed upon. Responsibility of each party is defined, thus ensuring a speedy and smooth course of action.

1. The FWP will act as a central clearing house for all ferret reports/sightings and will initiate any response procedure when ferret report/sightings have been made. To expedite transfer of report information within each agency, it is recommended that the first individual obtaining the information contact the FWP directly.
2. Information required should include as a minimum the following:
   a. Name, address and telephone number of the observer (and reporter if different),
   b. Complete description of location of observation as well as geographical location (township, range, section),
   c. Date and time of observation,
   d. Number of animals observed,
   e. Distance to animals,
   f. Length of time observed,
   g. Activity of animal(s),

h. Proximity of nearest prairie dog community,
i. Circumstances of observation.

3. Designated personnel will evaluate the validity of each report, and determine the nature of any follow-up actions. As an aid in determining validity, a scoring system has been devised which considers such variables as observer reliability, location, circumstances of observation, and description of animal.
4. If a follow-up is planned, the FWS, FWP, and Biota will be notified immediately and a decision made as to which of the agencies should begin the followup procedure. If no follow-up is planned, the information will be forwarded to the above parties by mail.
5. A follow-up search in response to a report will be as follows:
   a. One-three (max) of the involved researchers will contact private landowners in the vicinity of the search to inform them of our intentions and to solicit their support,
   b. Up to four field biologists will begin prearranged surveys,
   c. The length of time spent in the area surveying will be dependent upon the judgment of the field researchers.
6. When a ferret sighting is confirmed, immediate confidentiality will be maintained and the following action will be taken:
   a. The FWS will be notified, consulted, and impending procedure will be agreed upon,
   b. The landowner/lessee or public agency landowner will be contacted by FWP within 48 hours, if possible, to work out details of additional efforts,
   c. A low-key assessment of the black-footed ferret population will be conducted by a minimum number of field biologists and will continue for approximately 90 days,
   d. After four to six days, all cooperating agencies will be notified of the preliminary status of the sighting,
   e. Public meetings and news releases will be coordinated by the FWP in cooperation with MDA within 14 to 21 days after verification has been made,
   f. If a population of ferrets is found, meetings with affected landowners and cooperating agencies will be held to develop an interim management plan for each land ownership,
   g. After 120 to 180 days a general plan with action goals for black-footed ferret conservation and recovery will be developed.

January efforts began with private meetings with 3 landowners who own or lease portions of a prairie dog colony where several ferret sightings, including one confirmed (Seaburg 1977), have been made. Much of this colony is presently protected by a US Fish and Wildlife Service easement. All 3 landowners were cooperative in allowing searchers access and providing historical information on ferrets and prairie dogs in the area.

Field efforts began with an aerial survey of approximately 2500 acres of prairie dogs previously located and mapped. This flight was provided by the Miles City Office of the Bureau of Land Management. Following the flight, 7 days were spent searching diurnally for ferret sign (diggings, tracks). Snow conditions during this period were excellent for tracking; 7.5+cm initially, 2 fresh snows of 2+cm each. Diurnal searches were conducted on foot and motorcycle.

Nocturnal spotlight searches were conducted for 3 consecutive nights between dusk and dawn. Spotlighting was done from a moving vehicle and with a portable back-pack unit.

No evidence of recent black-footed ferret presence were found. However, diurnal sign searches produced the discovery of 2 black-footed ferret skulls from the same burrow mound. The cranium of 1 ferret was found on the surface; a second (a mandible) and several long bones were found while sifting soil from the mound. Age of the skulls is unknown but because of the portion of the colony where the discovery was made is only 4 or 5 years old, the skulls are believed no older than this. The age of the ferrets at death is also unknown, but the cranium appears from a relatively young animal based on tooth wear and sagittal crest development.

This effort is yet incomplete, and we intend to expend additional effort in the area, radiating out in concentric circles until we are satisfied that we have properly defined the status of the black-footed ferret in that area.

Although priority areas will receive the most field effort, other areas having had either previous ferret reports and/or large prairie dog communities will be surveyed using aerial reconnaissance during periods of desirable conditions.

Since this study is only in its formative stages, few results are forthcoming. We are optimistic that further efforts will result in location, identification, and appropriate recovery actions for the rarest of the rare, the black-footed ferret.

DISEASE THREATS TO WILDLIFE AND LIVESTOCK

B. F. Newcomb[1]

Livestock and various forms of wildlife utilize common ranges, especially in the Western United States, for their livelihoods. Often domestic ruminants, (cattle, sheep and goats) use common ranges with native wild ruminants, (elk, bison, deer, antelope, Big Horn sheep and Rocky Mountain goats).

Because of similarities arising from common family backgrounds some of these domestic and wild animals may suffer from the same or similar diseases. Depending on the organism causing the disease, at times the identical agent may cause similar disease syndromes in the various species.

At this time, knowledge of morbidity (number of cases of the disease in a herd), mortality (deaths caused by the disease), and incidence (frequency and location of outbreaks) of diseases affecting both wildlife and domestic animals tends to be fragmentary because disease occurrences, particularly in wildlife, have been studied only on a very limited basis.

Usually, unless the disease causes an economic problem in livestock or a zoonotic disease in man or was responsible for a spectacular die-off in wild populations, little notice has been taken of the problem, other than at a very local level, such as in observations by a biologist or incidental findings of a necropsy examination by a veterinarian.

As attention is focused more specifically on conservation of our wildlife resources by many more individuals and organizations than by the usual hunter conservation groups of the past, awareness that wild animals do die of causes other than hunter harvest becomes evident.

Many people not well versed in the ways of nature are totally astounded to find that wildlife, as does any other form of life, succumbs to a plethora of mundane, unromantic causes that range from starvation (in livestock the scientific term for this syndrome is Montana Hollow Belly) to influenzas, bacterial and viral infections, trauma and even old age.

With the concentration of livestock agriculture, increasing numbers of animals on decreasing areas, many of the problems that were once thought to be foreign to an area are now commonplace, and take their toll year after year, adding to production costs.

With increased mobility of livestock as well as concentration of numbers, the chances of exposure to a particular disease have increased markedly in the past 20 to 40 years.

Again, with animal numbers increasing in a particular area, i.e., Yellowstone bison and Jackson Hole elk, cattle in a stockyards, or overstocking a range, the chances of disease transmission within a population increase also.

In areas where wildlife move in with livestock, particularly during the winter feeding period, possibilities of cross-species disease transmission are increased tremendously.

Common use of water (especially stagnant sources), salt and feed sources also serve as points of cross-specific disease spread.

How much transmission of disease from wildlife to domestic animals or from domestic animals really does occur? Other than in the case of very few diseases, I don't really think anyone knows. In the case of rabies in

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[1]D.V.M., Chief, Disease Control Bureau, Montana Department of Livestock

Montana, transmission from a wild reservoir species, in this case, skunks to domestic species and to some other wild species, is the only source known, other than imports from another area.

Do the cattle of Montana present a danger to our large wild ruminants through transmission of several bacterial and viral diseases that can be deadly or debilitating? I don't know.

Do our wild species present an untenable danger to our domestic livestock through transmission of some economically devastating diseases, such as tuberculosis and brucellosis? I don't know.

What would happen if an exotic disease such as Foot and Mouth or Rinderpest were introduced into our domestic livestock populations, ultimately eradicated there but became enzootic in wild ruminants? I don't know, but I can imagine.

These questions and others relating to animal diseases (wild or domestic) cannot be intelligently answered or considered without a considerable amount of cooperation and research jointly carried out by veterinarians in the livestock community and wildlife biologists and veterinarians, of which there are a few, with numbers increasing.

Some of the diseases in question and under suspicion are included hereafter, but this listing is by no means meant to be complete.

Viral Diseases

1. Rabies	A threat to any warm blooded mammal. In Montana the main reservoir is skunks. All cases in other species have resulted from skunk exposure, other than a very few cases that have been imported after exposure elsewhere. Bat rabies is not known to have been the cause of outbreaks in other species.
2. Epizootic Hemorrhagic Disease	A viral disease responsible for die-offs in white-tailed deer and antelope. This disease has been confused with Blue Tongue, a virus disease of sheep, that has also been found in wild animals.
3. Blue Tongue	Virus disease of sheep transmitted by a Culicoides gnat. The viruses causing Blue Tongue and EHD are distinct but similar.
4. Pseudorabies	Virus disease affecting cattle and hogs. Raccoons can be vectors.
5. Malignant Catarrhal Fever	A viral disease of domestic and wild ruminants. Can be a severe disease in cattle. The African strain of MCF has been recently isolated in the Oklahoma City Zoo.
6. IBR, BVD, P13 (Infectious Bovine Rhinotracheitis, Bovine Virus Diarrhea, Parainfluenza Type 3)	All virus diseases of cattle seen throughout the United States in varying degrees. In Montana we have done some limited survey work in wild populations and have demonstrated antibodies to all three virus in a few animals.
7. Hog Cholera	At this time the disease has been eradicated from the United States but is present in Mexico and could transmit through feral and wild porcine.

8.	Contagious Ecthyma	Disease of domestic sheep and goats that has been found in Big Horn sheep.
9.	Exotic Diseases	Foot and Mouth, Rinderpest, Hog Cholera, African Swine Fever all could have impact on United States domestic and wild populations if introduced.

Bacterial Diseases and Other Organisms

1.	Tuberculosis	Can be transmitted from domestic to wild and vice versa under proper conditions. It is of human health significance.
2.	Brucellosis	Is of acute interest to stockmen. It is present in the Jackson Hole elk herd at levels thought to be up to 40-50%. It is of unknown level in the Yellowstone bison herd. Transmission from cattle to bison, bison to cattle, have been documented under natural conditions. Transmission from elk to cattle and vice versa have been carried out under experimental conditions. How much transmission there is under natural conditions is unknown.
3.	Leptospirosis	Spirochetal disease with numerous serotypes. Several known types reservoir in wild animals, many types may affect both domestic and wild species and man.
4.	Anaplasmosis-Protozan Disease	Enzootic in some areas of Montana; can be found in ticks. Effects both domestic and wild animals.
5.	Pasturella multocida and P. hemolytica	Ubiquitous inhabitant of lungs, transmitted readily but is more often a secondary opportunist to other insults. Recent isolation of P. hemolytica in Big Horn. Literature says P. hemolytica rarely found in the wild species.
6.	Black Leg and Malignant Edema	Clostridial diseases that are also ubiquitous and can effect the large ruminants.
7.	Parasites	Can be some transmission but tend to be more host specific.

In conclusion, almost any species is subject to diseases, particularly infectious diseases, that can and do at times effect other similar species.

What the original source of disease might have been at this time is mostly of academic interest. What must be dealt with now is the fact that, given the right circumstances, one species may be a threat to another species since it may serve as a reservoir for a disease that may adversely effect the second species.

This requires that those concerned with each species must work with each other in learning of the problems and discovering a workable middle ground on which the problems effecting both can be handled equitably.

SOME RELATIONSHIPS BETWEEN WHITE-TAILED DEER AND AGRICULTURE ON THE LOWER YELLOWSTONE RIVER

Gary L. Dusek[1]

The journals of Lewis and Clark (Koch 1941) and other early explorers and travelers document the historical occurrence of white-tailed deer (Odocoileus virginianus), or "common deer", along major streams in what is now eastern Montana. Although whitetails disappeared from much of this historic range during settlement, they subsequently recovered and may now be found throughout much of eastern Montana (Allen 1971) where floodplains and islands of major streams still provide important habitat.

White-tailed deer occur along bottomlands of many eastern Montana streams in close association with intensive agriculture. Here, the fertile soil and water, which perpetuate riparian vegetation, and thus provide habitat for whitetails, also are attractive for agricultural cropping. The relationships between deer and agriculture in these floodplain riparian/agricultural habitats are only poorly understood.

In 1980, a study to evaluate the habitat relationships and population ecology of white-tailed deer on floodplain habitats in eastern Montana was established under the statewide deer research project. The study area includes 53 miles of floodplain and islands along the lower Yellowstone River from Glendive to Sidney. This area includes a diversity of riparian and agricultural habitat types as well as an abundance of deer. In addition, in generally understanding deer habitat and agricultural relationships, the findings would provide information valuable in the Department's defense of an instream flow reservation of lower Yellowstone River water for fish and wildlife. Because most bottomlands are subjected to some form of intensive agriculture, it is difficult to ignore the effects of agricultural activities on deer and vice versa.

STUDY AREA

The lower Yellowstone River study area has been described in detail by Swenson (1978) and Dusek (1981). The entire area is intensively farmed and/or ranched with many small economic units as compared to the dryland operations in the adjacent uplands. Agricultural practices are modified by flood irrigation downstream from Intake, a diversion dam located approximately 17 miles downstream from Glendive. The Lower Yellowstone Project includes the dam and main canal, which parallels the river from Intake to 12 miles downstream from Sidney. The project influences a significant change in land use and cropping practices, from domination by livestock production upstream from Intake to domination by intensive farming for cash crops downstream.

Intensive studies were focused on three areas of river that represented varying agricultural practices. The Intake area, located about 2 miles above the diversion dam, was characterized by cattle and hay production of bottomlands and farming of small grains on adjacent uplands. The Elk Island area is located about 20 miles downstream, near Savage, and includes the Elk Island Wildlife Management Area and adjacent private lands. Agriculture is

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[1]Montana Department of Fish, Wildlife and Parks, Glendive, Montana.

dominated by production of cash crops, primarily sugar beets, small grains, and corn. Livestock production is very minor. The third unit is comprised of the Seven Sisters Wildlife Management Area, 10 miles downstream from Elk Island, and surrounding private lands. Agriculture is similar to that on Elk Island.

Successional relationships of the riparian habitat were studied in 1980-81 (Boggs 1983). The successional sequence began on gravel bars where cottonwood (Populus deltoides) and willow (Salix sp) seedlings became established following flooding. As the seedlings matured and sediment and organic matter accumulated, the sites were elevated to a level above that which was flooded each year. Willow disappeared, and, over the next 100-150 years, the cottonwoods matured, became fewer in number, and eventually died out giving way to a shrubland sere. The shrublands in turn gave way to grassland or silver sagebrush (Artemisia cana)-grasslands which appear to represent the topoedaphic climax of the region. On some sites, especially old stream channels, green ash (Fraxinus pennsylvanicus) replaced cottonwood and shrubland communities. Agricultural lands are no longer successionally related to the cottonwood seres.

METHODS

Most procedures used during the course of the study have been described elsewhere (Dusek 1981). Approximately 275 whitetails were captured and individually marked on the 3 study units by mid-February 1984. Of those 95 were equipped with radio collars. The individually marked deer provided information on habitat usage, patterns and movement and/or dispersal, population size and structure, and age-specific mortality and reproductive rates.

Habitat usage was intensively studied as a graduate research project during 1982-84. In these studies, daily and seasonal movements and habitat use were closely monitored on the Intake and Elk Island areas (Herriges 1983) using a ground-based null-peak system that employed 2-3 antenna towers (Pac 1978).

Food habits of whitetails have been studied along the entire river bottom from Glendive to Sidney by analysis of rumens from 80 deer killed on highways, by hunters, or under depredation kill permits. These data were compared with similar information obtained by Allen (1968) for Missouri River bottomlands.

RESULTS AND DISCUSSION

Data from population trend and herd composition surveys suggested that fall population numbers on the lower Yellowstone nearly doubled (3,000-6,000) from 1980 to 1983. This represented density of approximately 120 deer/mile of floodplain in fall 1983. Fawn production and/or survival declined during the same period as determined by fall fawn:adult female ratios: 112:100 in 1980, 68:100 in 1983.

Despite the relatively high deer densities on the river bottom during all years of study, depredations on agricultural crops were not widespread. Complaints about deer depredations have been most numerous where production of livestock and hay, particularly alfalfa, were the major agricultural activities. Deer damage was also a problem during years when the corn harvest was delayed.

If frequencies of complaints indicate landowner intolerance to crop depredations by deer, landowners on the river bottom were somewhat less

intolerant of deer than owners of dryland farms on upland prairies west of the study area. Damage complaints to the MDFWP Regional office Miles City from the upland prairie/agricultural area outnumber those from landowners on the river bottom by a margin of 2 to 1 (MDFWP, unpubl. data). Portions of the Yellowstone River bottom supported densities of 70+ deer/mi.^{2}, whereas an upland prairie/agricultural area near Richey had a white-tail density of 13 deer/mi.^{2} (Dusek 1983).

Telemetry data (Herriges 1983), indicated that deer limited their activity almost exclusively to riparian forest and shrubland habitats during daylight. Adult females appeared to be particularly tied to these communities during the early summer (fawning) period. Use of agricultural fields occurred primarily during hours of twilight and darkness.

Most of the summer deer use of agricultural fields was in alfalfa. In winter deer used a variety of fields, though beet fields appeared to be especially heavily used on segments of river bottom where they occurred.

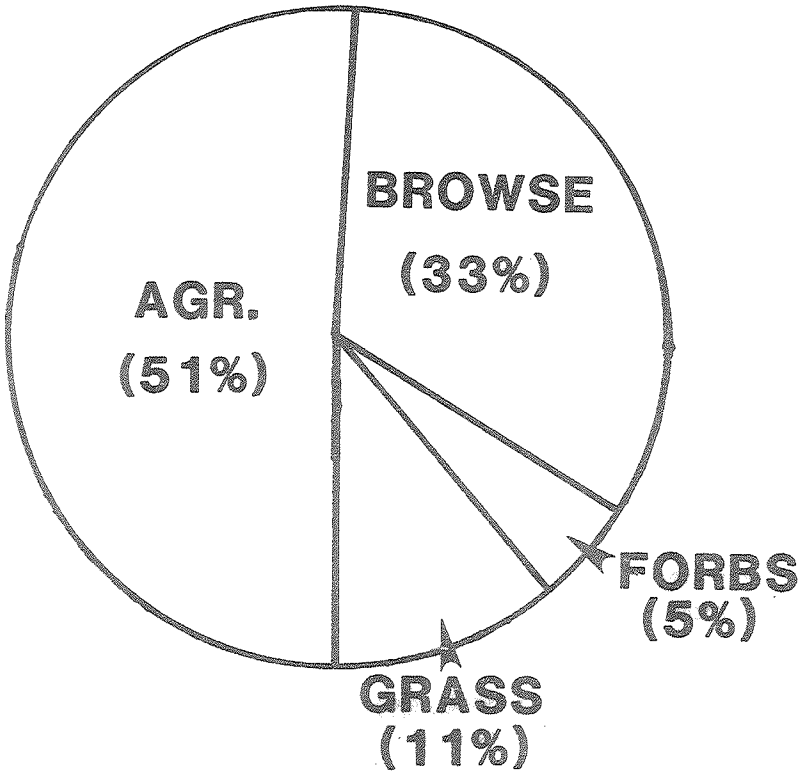
Crop rotation practices may influence circadian movements of deer most significantly during winter when they most heavily used crops that are rotated annually. During winter, radio-collared whitetails continued to forage selectively on the river bottom even under the severest weather conditions.

Agricultural crops accounted for 43.5 percent by volume of the yearlong diet of whitetails on the lower Yellowstone. Browse ranked second, accounting for 37.5 percent. Deer used greater amounts of agricultural crops from late fall to early spring than during the growing season (Figure 1). Data were compiled and analyzed only for these two time periods, within which items used by deer changed very little. Native browse received more use than agricultural crops during the growing season (May-September) when alfalfa accounted for nearly all of the crop forage. From late fall to early spring sugar beets accounted for more than half of the agricultural crops used (Figure 2). Since sugar beets are raised on only about half of the study area, these data may grossly underestimate their use by deer on segments of river bottom where they are raised. Wheat and alfalfa were abundant in rumen samples from areas above Intake.

One question often asked is whether or not a segment of river bottom habitat lacking agricultural crops would support deer at densities similar to those on the lower Yellowstone. I cannot answer the question entirely, though the studies of Allen (1968) and others on the Missouri River indicate it would not. I compared food habits on the lower Yellowstone with those reported by Allen (1968) for a 23 mile segment of Missouri River bottomland above Fort Peck Reservoir (Table 1). Riparian communities on the Missouri were similar to those on the Yellowstone. Agriculturally, approximately 25 percent of the Missouri River bottomlands were in alfalfa meadows while other crops occurred in only minor amounts or were absent. The relative use of forage classes was similar for the two areas in summer. During other seasons, forage use on the Missouri reflected the absence of agricultural crops other than alfalfa (Table 1). Deer used major browse items, including snowberry (Symphoricarpos spp.) and cottonwood, on both areas at about the same frequency. Lower condition indices and lower, more variable fawn production among deer on the Missouri as compared with the lower Yellowstone, suggest that the former existed on a lower nutritional plane. Hamlin (1980) reported a density of 22.5 deer/mi.^{2} on the Missouri bottomlands, considerably less than densities on the lower Yellowstone (Swenson 1978, Dusek 1982).

In conclusion, my studies and the data presented here provide further documentation of the close association of white-tailed deer and agriculture

PERCENT OF SEASONAL DIET



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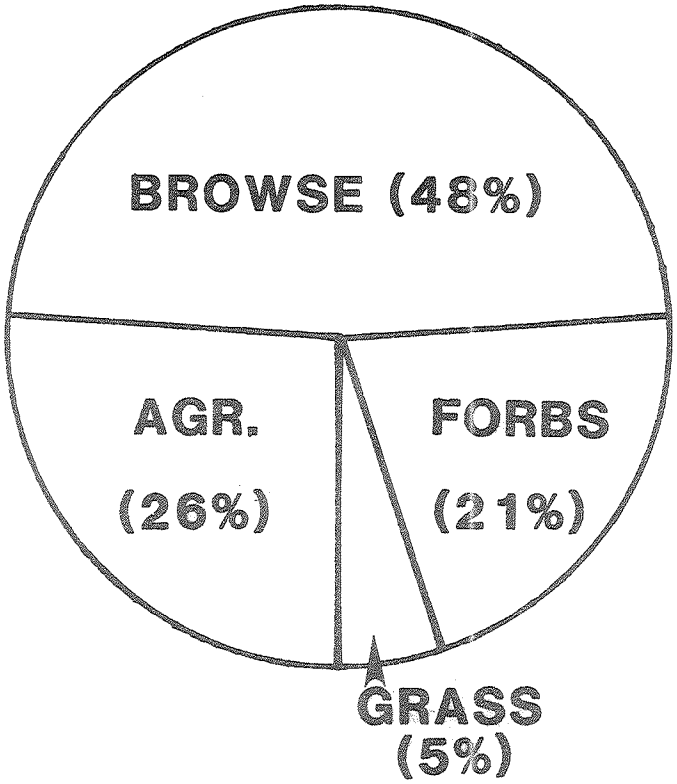
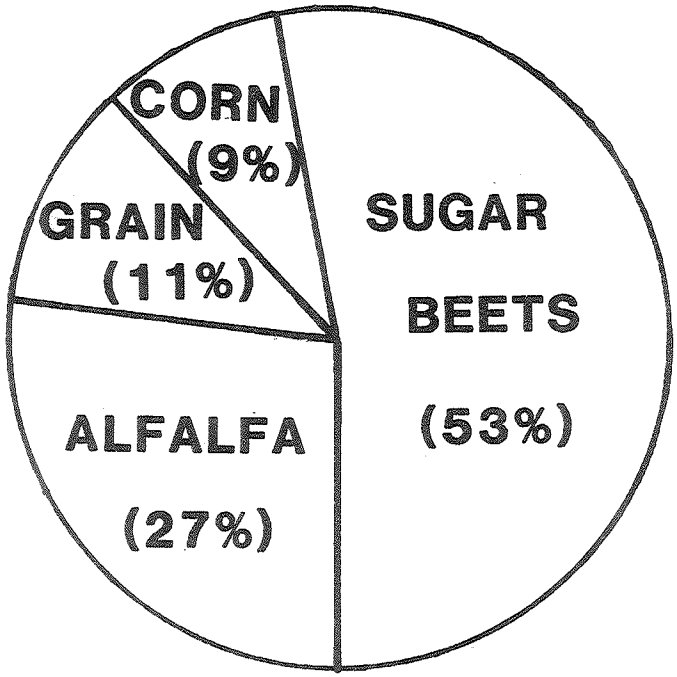


MAY - SEPT.

PERCENT OF AGRICULTURAL CROPS IN SEASONAL DIET



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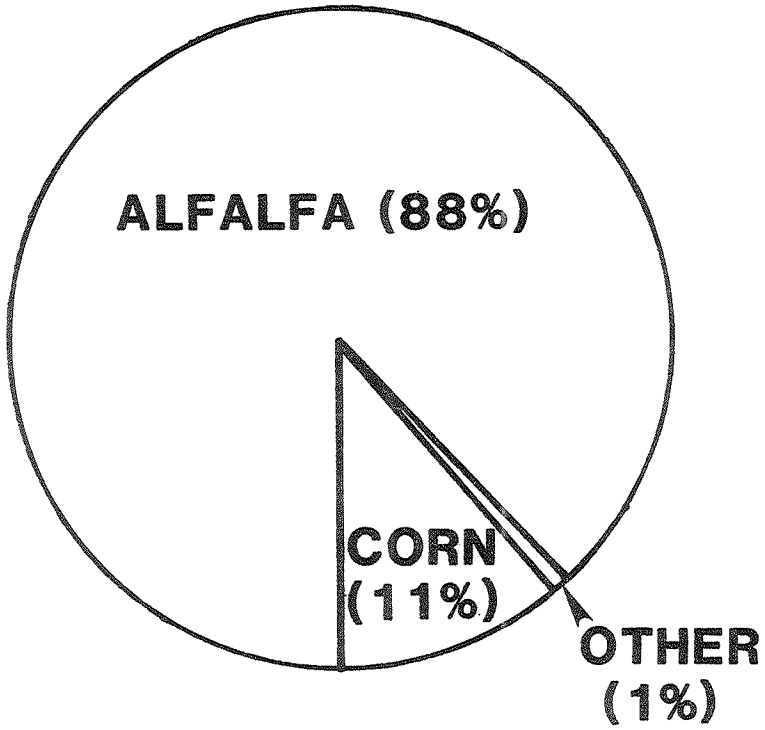

MAY - SEPT.

Table 1. Comparison of seasonal forage use by white-tailed deer on the Yellowstone and Missouri Rivers.

	Summer	Fall	Winter	Spring
Brownse:				
YSR	44[a]	40	48	11
MR[b]	45	81	65	43
Forbs:[c]				
YSR	28	5	7	3
MR	15	10	29	16
Agr. Crops:				
YSR	24	49	35	68
MR	39	7	5	16

[a]Expressed as a percentage of the seasonal diet.

[b]Data is from Allen (1968).

[c]Does not include agricultural crops.

in eastern Montana. Swenson (et al. 1983) indicated that about 71% of the whitetails in eastern Montana winter in association of agriculture of some kind. Agriculture apparently introduces a habitat component or components that enable eastern Montana habitats to sustain greater numbers or densities of deer than would exist otherwise.

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ORGANIC FARMING, REDUCED TILLAGE AND MONTANA WILDLIFE

Terry Cacek[1]

For us non-residents, Montana evokes images of high mountains, tall forests and vast grazing lands. These ecosystems do occupy the greatest portion of Montana. Only 19 percent of Montana's surface area is devoted to crop production (National Agricultural Lands Study 1981), but I believe that farming has had and is having a greater impact on Montana's fish and wildlife than any other industry. You will note that bighorn sheep still grace the high mountains and elk continue to prowl the forests, but only the ghosts of the buffalo haunt the plains.

Many of you have devoted your lives to the protection of Montana's mountain and range ecosystems. Every proposed dam, ski development, and clear cut looms as an intolerable threat. But, from my distant perspective, I see that your forests and range lands are largely intact. A forest can be clear cut and, within a few decades, it is replaced by a new forest somewhat similar to the original. A cow can nip off a blade of grass and it will grow back.

But once the plow bites into the prairie sod, that ecosystem is lost forever. The moldboard plow literally turns the perennial ecosystem upside-down and the farmer replaces it with a fundamentally different and far simpler ecosystem composed of annual grasses. Agriculture has proved incompatible with buffalo, elk, wolves, and grizzly bears.

However, the impacts are not all bad. A mosaic of croplands and rangelands may be more productive than vast expanses of rangelands. Ecologists unfairly condemn croplands for their lack of diversity. But a vast area of rangeland interspersed with a few agricultural monocultures is more diverse than a vast area of rangeland without these monocultures. Pheasants, doves, black-tailed jackrabbits, white-tailed deer, and fox have benefited from agriculture.

The problem of habitat depletion develops when agriculture becomes too intensive. When ecosystems are dominated by wheat, the wheat decreases rather than increases diversity.

Intensification also brings chemicals. Your recent experience with endrin punctuated the dangers of chemicals, so I need not dwell on them.

Intensive agriculture also brings soil erosion. Wind and water erode 5 tons of soil per acre, on the average, from Montana croplands every year (U.S. Department of Agriculture 1980a). The total annual loss from Montana croplands is 75 million tons per year.

Next we have to consider what happens to that 75 million tons of soil. Most of it ends up in your lakes and streams. Almost certainly, this 75 million tons of soil is the worst water pollutant in Montana.

When we consider water use, the numbers become overwhelming. Agriculture accounts for only 19 percent of the land use in Montana but it accounts for 98 percent of the withdrawals of surface water (Guehlstorff personal communication).

The impacts of agriculture on Montana's wildlife are not static, but are in a state of flux. The most abrupt land use change in Montana's history occurred in 1983 when 2.8 million acres of cropland were idled under the U.S. Department of Agriculture's Payment-In-Kind Program and similar programs.

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[1]Agricultural Specialist with the U.S. Fish and Wildlife Service in Denver.

When I sum up the impacts of land use, water use, chemicals, and soil erosion, I must conclude that agriculture is having more impact on Montana wildlife than any other human endeavor.

Unfortunately, fish and wildlife agencies have not responded very well to this situation. The U.S. Fish and Wildlife Service, for example, devotes about 0.5 percent of its personnel to agricultural matters. Of all the papers in the Wildlife Society Bulletin and the Journal of Wildlife Management, only 5 percent deal with the production and maintenance of wildlife in agricultural ecosystems.

In spite of the neglect by our profession, some new agricultural technologies are developing which may, quite by chance, prove beneficial to farm wildlife. These new technologies are reduced tillage and high-tech organic farming.

First, let us consider reduced tillage. The purest form of reduced tillage is no-till or the planting of seed directly into the standing stubble left from the preceeding crop. Tillage is eliminated and weeds are controlled with herbicides. Reduced tillage decreases soil erosion dramatically, often by 95 percent (U.S. Department of Agriculture 1975).

In the case of wheat, reduced tillage results in a decrease in energy consumption (Smith and Fornstrom 1978) and it reduces labor requirements. Therefore, reduced tillage is very attractive to farmers.

Nationwide, 24 percent of all croplands are now farmed with some type of reduced tillage. Montana is lagging behind the Nation, having converted only 9.6 percent of its croplands to reduced tillage. Aside from the 1983 land set-aside program, the conversion to reduced tillage is the most important change in American agriculture in the last decade.

Nevertheless, only three studies have been completed on the impact of reduced tillage on wildlife (Cowan 1982; and Rodgers and Wooley 1983 <2 studies>). Many favorable claims are being made but few of these claims are backed by adequate data. In the Corn Belt and in the winter wheat region, we simply do not know what the net effect of reduced tillage will be on wildlife.

However, the situation is more promising in the spring wheat region which, regrettably, overlies our best duck producing region. This overlap is an unfortunate coincidence because spring wheat provides no nesting habitat. The ground is bare or is tilled during the spring.

With no-till, it is possible to convert from spring wheat to winter wheat, which is planted in the fall. The seed is planted directly into stubble without tillage. The wheat germinates in the fall and grows several inches before freeze-up. During the winter, the stubble traps an insulating blanket of snow which prevents winter kill.

In the spring, the ground is covered with stubble, with green wheat emerging through the stubble by late spring. No tillage occurs throughout the nesting season.

We suspect that winter wheat will not be the best duck nesting habitat, but there could be a lot of it. Montana has 6 million acres of land devoted to spring wheat culture (including duram wheat and fallowed acres) (U.S. Department of Agriculture 1983). Several economic and agronomic considerations will prevent conversion of all this acreage to no-till winter wheat. If only 25 percent was converted, 1.5 million acres of new nesting habitat would be created. The Northern Prairie Wildlife Research Center will initiate studies in North Dakota in the spring of 1984 to assess the value of this habitat.

The important change is not the conversion to no-till but the conversion to winter wheat. No-till is important only because it enables the conversion to winter wheat. The conversion to no-till spring wheat might actually be harmful to wildlife because it could result in massive nest destruction.

Organic farming and reduced tillage are often confused but the two systems are at opposite poles. Reduced tillage substitutes chemicals for tillage. Organic farming is defined as chemical-free farming. Organic farmers forego synthetic fertilizers and pesticides and provide fertility by including nitrogen-fixing legumes in crop rotations. Weeds and insects are controlled by rotating crops and by careful tillage.

Organic farming is the most overlooked conservation farming system in the nation. Research on small plots in Missouri (Miller and Krusekopf 1932; and Jamison et al. 1968) and in the field in Washington (Patten 1982) shows that organic farming rivals reduced tillage for soil conservation. Organic farming is even more energy efficient than reduced tillage (Lockeretz et al. 1976; Pimentel et al. 1983; Smith and Fornstrom 1978; Witmuss et al. 1975).

As with reduced tillage, we have only scant indications of the impact of organic farming on wildlife. Two studies in the Corn Belt revealed several times more breeding birds on organic farms than on adjacent conventional farms (Ducey et al. 1980; Gremaud and Dahlgren 1982). In the Wheat Belt, I believe the increased diversity and the inclusion of legumes in the crop rotation would increase both winter cover and nesting cover.

Currently, less than one percent of the cropland nationwide is farmed organically (U.S. Department of Agriculture 1980b) but interest is growing rapidly. The future of organic farming may be tied to the price of energy. If energy prices increase rapidly, as occurred in the early 1970's, all farmers will be forced to move toward organic technology as a means of economic survival.

Unfortunately, most wildlife managers perceive agricultural trends as givens--as uncontrollable forces to which we sometimes react but that we cannot control. In reality, agriculture may be the most manipulated industry in the U.S.A. Governments determine or effectively influence the number of acres planted and what is planted. Governments influence the sizes of the overseas market for grain, which chemicals may be used and how they are used, which acres are plowed and which are preserved in natural habitat. Governments influence the choice of soil conservation practices and the development of new production technology. The list goes on and on. Governments respond to the needs of people, including their need for wildlife if those needs are clearly and forcefully presented.

Even at the local level, there is a great deal we can do to influence agricultural trends. The U.S. Fish and Wildlife Service manages over 4000 acres of cropland in Montana. This land is broken into dozens of scattered parcels. Our goal is to turn these parcels into demonstrations of farming systems that are good for farmers and good for wildlife.

The Service also has requested money for the purchase of no-till equipment for use on our refuges and to rent to private farmers on demonstration bases.

Finally, we can influence agriculture through research. The Service has provided money to Montana State University for research on the use of a fungus, Sclerotina sp., for control of Canada thistle. The Service also funded several studies on organic farming at Iowa State University and a study of biological control of leafy spurge at North Dakota State University.

Nationwide, farm wildlife populations have declined with the intensification of agriculture. The major strategy of wildlife managers has been to

remove a few acres from crop production through land acquisition and to set these acres aside as wildlife refuges. Now, with organic farming and no-tilled winter wheat, we have the opportunity once again to produce both wildlife and crops on the same acres. Wildlife managers can set back and watch this happen and possibly watch it go awry. Or, managers can get involved, speed up the conversion process, and develop farming systems with maximum benefits for wildlife. The latter seems by far the more desirable.

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PRESERVATION OF WILDLIFE HABITAT, A COUNTY LAND USE PLANNING PERSPECTIVE

T. Mike Casey[1]

When I was first asked to address the Montana Wildlife Society on the efforts of the Rural Resource Development Council in Flathead County, I was concerned that such a talk at this time might be premature since we are only 3 months along on our program. We are, however, using a tool known as LESA (Land Evaluation and Site Assessment) which is a program that will soon become commonplace. Therefore, I felt that if nothing else, exposure to our use of LESA may be beneficial to you.

Flathead County is situated in the northwestern part of the state. Our initial study area is essentially the private non-corporate land holdings on the main Valley floor. The better soils of the county are sporadically distributed throughout that area. Much of the study area has undergone subdivision activity. The vast majority of this subdivision activity has been accomplished by using the occasional sale and family transfer subdivision exemption.

This type of activity lead the Flathead Conservation District to request county funding to develop a land use management program which will curb this type of activity while at the same time providing some windfall of speculative gain to the landowner. After the county granted funds for such an effort, the Rural Resource Development Council (RRDC) was set up. The Council is a 12-member board made up of a cross-section of interest and occupation from within the county.

LESA is a tool that was originated by the U.S. Soils Conservation Service in the wake of the 1981 Federal Farmland Preservation Policy Act. It was developed as a tool to assist local officials to make consistently objective decisions about the preservation of agricultural lands.

LESA is a two part process: Land Evaluation and Site Assessment. The Land Evaluation portion deals exclusively with soils properties. The Site Assessment portion deals with land use. The two parts each have a total maximum point value of 100 and 200 points, respectively.

Site Assessment should consider many different factors. The LESA handbook suggests the 16 following factors:

1. Percentage of area in agriculture
2. Percentage of land adjacent to site in agriculture
3. Percentage of land commercially farmed
4. Size of site
5. Zoning for site
6. Distance to urban area
7. Availability of ag. support system
8. Compatibility with comprehensive plan
9. Transportation
10. Availability of central sewage system
11. Soil suitability for on-site sewage disposal

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[1]Director of Rural Resource Development Council, Flathead County, Kalispell, Montana.

12. Impact on historical/cultural feature
13. Environmental impacts
14. Compatibility with adjacent land uses
15. Availability of zoned land for planned use
16. Compatibility with municipal plan

That number has, however, ranged from 6 to 40 when LESA has been developed in various parts of the country.

It is the Site Assessment portion of LESA which allows for building in wildlife considerations either implicitly or explicitly.

Explicitly by simply listing such considerations as separate factors. Implicitly by assigning high point values to those factors which are important to wildlife. We are including considerations for various different types of terrestrial habitats; however, within the portion of Flathead County that we are addressing, perhaps the most significant wildlife contribution we could make is to water quality and subsequently fisheries.

Water quality is a major issue in Flathead County, not only to the general 'quality of life' for it's inhabitants and visitors, but for it's salmon and their spawning. This issue will be addressed in part, by using the suggested factors such as 'soil suitability for on site septic disposal' and 'availability of central sewage system' as well as adding factors such as flood plane considerations.

After the LESA system has been tailored to our area we must address the difficult question of what land use management plan(s) to use to preserve those areas which have been designated by LESA. The following is a list of the tools currently being used across the country in attempts to preserve agricultural lands.

1. Conventional Zoning
   - A. Exclusive Zoning
   - B. Non Exclusive Zoning
   - C. Compensable Zoning
2. Fee Simple Purchase and Leaseback
3. Purchase of Development Rights (PDR)
4. Transfer of Development Rights (TDR)
5. Cluster Provision
6. Prime Land Transfer Fee
7. Agricultural Districts
8. Land Banking
   - A. Public
   - B. Private
9. Conservation Easement
10. Capital Improvements Review Commission
11. Differential Assessment
    - A. Preferential Assessments
    - B. Deferred Taxation
    - C. Restrictive Agreements
12. Capital Gains Taxes
13. Income Tax Credit

Many of these may not be suitable for our use for a number of reasons; political incompatibility, cost, lack of enabling state legislation. The three we are examining the closest at this time are conservation easements, cluster provisions, and transfer of development rights.

We are currently in the process of developing a land trust to act as the receiving body for conservation easements. The conservation easement generally appeals to three types of donors. Number one, the corporation looking for a

tax break by reducing the value of land which they do not intend to develop e.g., a large privately owned interest with timber holdings whose values have become inflated due to land speculation. Number two, the benefactor looking to preserve a unique piece of land for future generations. The last, a farmer or rancher who wishes to lower inheritance taxes in order to pass his holdings on to his heirs. It is fairly obvious that the majority of land within our study areas wouldn't fit into any of these three categories.

The cluster provision allows an agricultural land owner to sell smaller homesites in less agriculturally important areas of his land. This allows him to keep the rest of his land in production as opposed to selling the entire ranch off in large lots which in all likelihood will not be put to any real agriculturally productive use.

The third method we are examining is the transfer of development rights concept or TDR as it is usually called. This concept is much like the cluster provision except it allows the development to be moved to separate ownerships. This is comparable to the sale of a water or mineral right only in the case of TDR's it is the right to develop that that is removed from the property. The real issue here is creating an environment where there is an incentive to purchase these rights or 'receiver zones' as they are called. This is usually accomplished by allowing developers in these designated 'receiver zones' to develop to a higher density than would have otherwise been allowed.

There are no easy answers to the problems that face Flathead County but we hope that through our efforts a program can be implemented which accomplishes our goals. What is at stake here has a value which is impossible to determine, but unfortunately has a price tage that is all too real.

ESTIMATING BIOMASS AND PREY ABUNDANCE FOR CARNIVORE STUDIES WITH COMMENTS ON WAYS AGRICULTURE CAN AFFECT THE PREY SUPPLY

R. J. Douglass[1]

INTRODUCTION

Small animals such as rodents and passerine birds form an essential component of the prey base for many mammalian and avian predators. Small mammals in particular have been found to be major prey items for and can affect population densities of coyotes (Canis latrans), (Wagner 1978, Johnson and Hansen 1979); weasels (Mustela frenate) and ermine (M. erminea), (Errington 1967; Maher 1967); and many species of raptors (Phelan and Robertson 1978). Because of this relationship between predators and prey, many studies of carnivorous mammals and raptors include studies of small mammals. Although relationships between small mammal populations and predator behavior or populations are frequently found in such studies, some alterations in the approach to investigating small mammal populations may help clarify the relationships between prey and predator populations.

Generally when determination of prey abundance is required a simple sampling scheme is devised based on four assumptions. These are:

1. The sampling scheme accurately reflects prey abundance or at least reflects changes in relative abundance.
2. The abundance of small mammals in the sample area reflects abundance for the entire predator study area.
3. The abundance of small mammals during the sampling period represents abundance for the entire period during which the predators are studied.
4. The abundance of small mammals reflects their availability to predators.

In this paper I examine these assumptions in light of an extensive prey base study conducted in the Piceance Basin, Colorado and a study conducted in South Dakota. The data from the Piceance study are also used to show some possible relationships between various predators and small mammals. Finally, the effect of agriculture on prey availability is discussed.

METHODS

Data for this paper were collected in the Piceance Basin, Colorado during 1980 and 1981 and in the Black Hills, South Dakota during 1983. The methods employed were the same in both areas with the exceptions that only one grid was trapped in South Dakota and at two week intervals for six trapping periods. The following describes the methods used in Colorado.

Rodent populations were sampled by standard live-trapping techniques. Ten trapping grids were constructed in six habitats (sagebrush, pinyon-juniper, chained pinyon-juniper, greasewood-sage bottom, wash (within the greasewood-sage bottom), and bald). Eight of the grids contained 100 trap stations in a 10 X 10 configuration and spaced at 15-m intervals. Two grids (wash and bald) each contained two parallel rows of traps, spaced at 15-m intervals. This

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configuration was required for the grids to accommodate the shape of the habitats being sampled. Assuming a 7.5-m band (0.5 the distance between traps) around the periphery of each grid, the area sampled by each grid was 2.2 ha. I sampled every grid each month from August 1980 through July 1981. I placed one Sherman live-trap (8 X 8 X 25.5 cm) at each trap station. Traps were covered with 30 X 30 cm pieces of plywood to protect them from the sun. Peanut butter and rolled oats were used as bait. For nesting material, I added synthetic cotton batting. Traps were set for three days each month and then removed from grids.

I placed an individually-numbered eartag on each animal that was captured and the following data were recorded: tag number, species, whether it was new or recaptured, location on grid, weight, sex, and breeding condition (testis--abdominal or scrotal; vagina--perforate or non-perforate; nipples--large or small; pubic symphysis--open or closed; whether it was pregnant). I recorded these data for every first capture of every animal each month. During subsequent captures during the month, I recorded only the tag number and location of capture.

Because of non-random sampling problems (Krebs 1966) I did not use Lincoln index mark-recapture population estimating techniques. Instead I used the minimum number known to be alive (MNA) (Chitty and Phipps 1966) during each monthly trapping period as an estimate of the population size. Densities were obtained by dividing the population size by the area of the grid. The number of individuals captured per 100 trap-nights (no/100TN) was also calculated for comparisons with MNA.

Data were sorted and summarized using computer programs provided by C.J. Krebs of the University of British Columbia.

RESULTS

Many studies of predator prey studies have relied on cursory prey base estimates. Todd et al. (1981) snap-trapped once per year in a coyote study, Hamerstrom (1979) used 1200 trap-nights per year to indicate prey abundance in a study of raptors, Phelan and Robertson (1978) used an intensively trapped live trapping grid but sampled at five month intervals and Tapper (1979) simply used sign (runs and burrows) as indicators of density. Do these cursory samples accurately reflect prey abundance? This question contains questions concerning the first three assumptions stated above.

To examine this question and the assumptions, I compare the assumptions to field data collected in the Piceance Basin. Population densities represented by MNA are within 10% of the actual density if trappability exceeds 50%, (Hilborn et al. 1976). Because trappability for deer mice (Peromyscus maniculatus) and least chipmunks (Eutamius minimus) exceeded 50%, I consider the population estimates in the Piceance Basin to be very near true densities.

Concerning the first assumption, if a simple one time sampling is used the density will always be underestimated because not all animals are trappable. If a mark recapture-technique is employed it is impossible to determine how the estimate compares to reality because of problems of non random sampling (Krebs, 1966). Specifically, trappability may not be equal between marked and unmarked animals or between the mark period and the recapture period. However, if sampling is repeated at regular intervals, it may be possible to obtain an indication of trends. Figure 1 presents a comparison of the MNA for deer mice and least chipmunks and a commonly used index (number of individuals/100 trap-nights [Ind/100TN]). Changes in Ind/100TN for both deer mice and least chipmunks parallel the MNA estimates for some

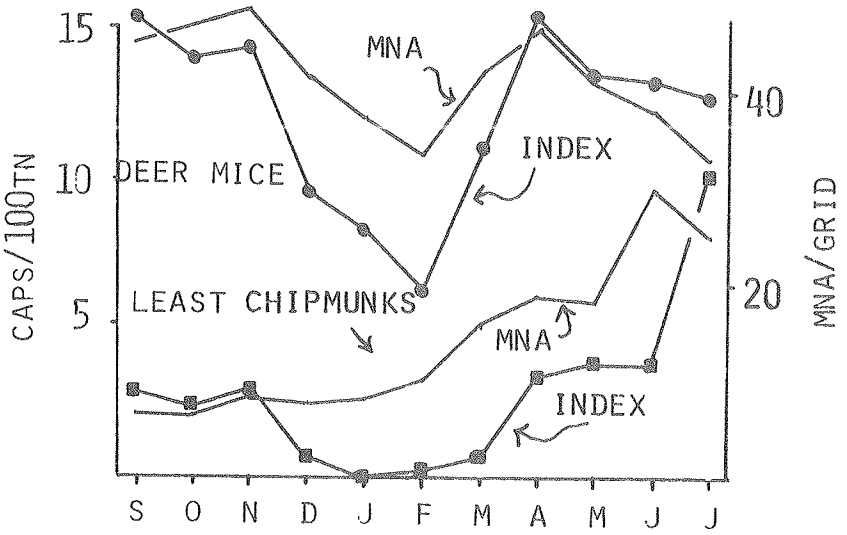

FIGURE. 1. COMPARISON OF DENSITY AND AN INDEX OF ABUNDANCE.

parts of the year. During winter months, however, the index indicates a decrease in population that is greater than that indicated by the MNA. This is because deer mice are somewhat less trappable when it is cold and least chipmunks are hibernating and are not trappable at all during this period. In calculating MNA, animals that are present but not captured are included in the population. Chipmunks that were captured on a given grid both before and after hibernation were considered to be present but not trappable. Apparently an index if frequently determined, may provide approximations of population trends during some months.

The assumption that a sample is representative of an entire study area seems questionable at the outset because of habitat effects. In the Piceance Basin during May (a time when predators and raptors require substantial food supplies for young) population densities of deer mice varied among habitats from 9/ha to 57/ha and populations of least chipmunks varied from 2/ha to 18/ha. Even within similar habitats (though in different locations) deer mouse densities were as different as 2/ha and 10/ha in similar habitats. The assumption that a single sample in one location represents an entire study area is probably invalid especially for large study areas.

The assumption that a once per year or infrequent sampling accurately reflects year long population trends is counter to demonstrated large and rapid fluctuations in small mammal populations (Krebs and Myers, 1974). Figure 2 shows biweekly MNA estimated for long-tailed voles (Microtus longicaudis) in South Dakota. In a six-week period the population increased from 23 to 80 and in two more weeks decreased to 35. Changes of this magnitude and duration are very common in microtines (Krebs and Myers 1974). Obviously if a population of rodents can increase by 348% in six weeks and then decrease by 44% in two weeks, sampling once during the year or even during the breeding season for raptors or mammalian carnivores will not provide an estimate indicative of the period in question.

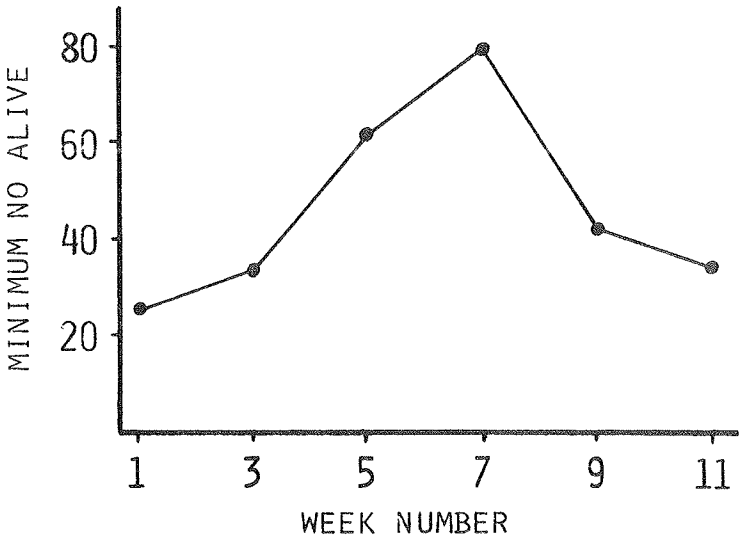

FIGURE 2. POPULATION DENSITIES OF LONG-TAILED VOLES IN SOUTH DAKOTA

To examine the assumption that abundance reflects availability I compared the number of individuals disappearing from the population each month to monthly populations. I calculated a correlation coefficient (based on Piceance Basin data) with monthly density versus number disappearing during that month. In doing this I assumed that all animals disappearing were susceptible to predation and it is obvious the ones remaining were not subject to predation. Susceptibility to predation (number disappearing) is related to abundance but the correlation is not particularly strong. For deer mice in the Piceance Basin, the r^2 for density versus number leaving the population was 0.36 ($P<0.05$) and for least chipmunks $r^2 = 0.41$ ($P<0.05$). One reason the correlation is not stronger is that population dynamics were variable over the year that I sampled (Figure 3). For example, during winter months populations of deer mice were fairly high but survival was also high (it actually equalled 100% on some grids). During summer months populations were about at the same level as winter months but survival was lower (i.e. more animals left the population). This results in similar densities providing quite different numbers of animals susceptible to predation.

Another view of this is shown in Figure 4. In this situation, density in sagebrush habitats and pinyon-juniper habitats was found to be equal. However, the dynamics producing that density were quite different. More animals survive from month to month in sagebrush than in pinyon-juniper. This suggests that even though these two habitats may have similar densities of deer mice, sagebrush has fewer susceptible to predation.

In summary, simple samping schemes are probably inadequate to fully describe important aspects of prey population dynamics. Simple indices if derived frequently enough may provide trend data under certain conditions. Sampling in one and/or small areas for one or a few sampling periods during the study may be misleading in regards to the spatial and temporal distribution

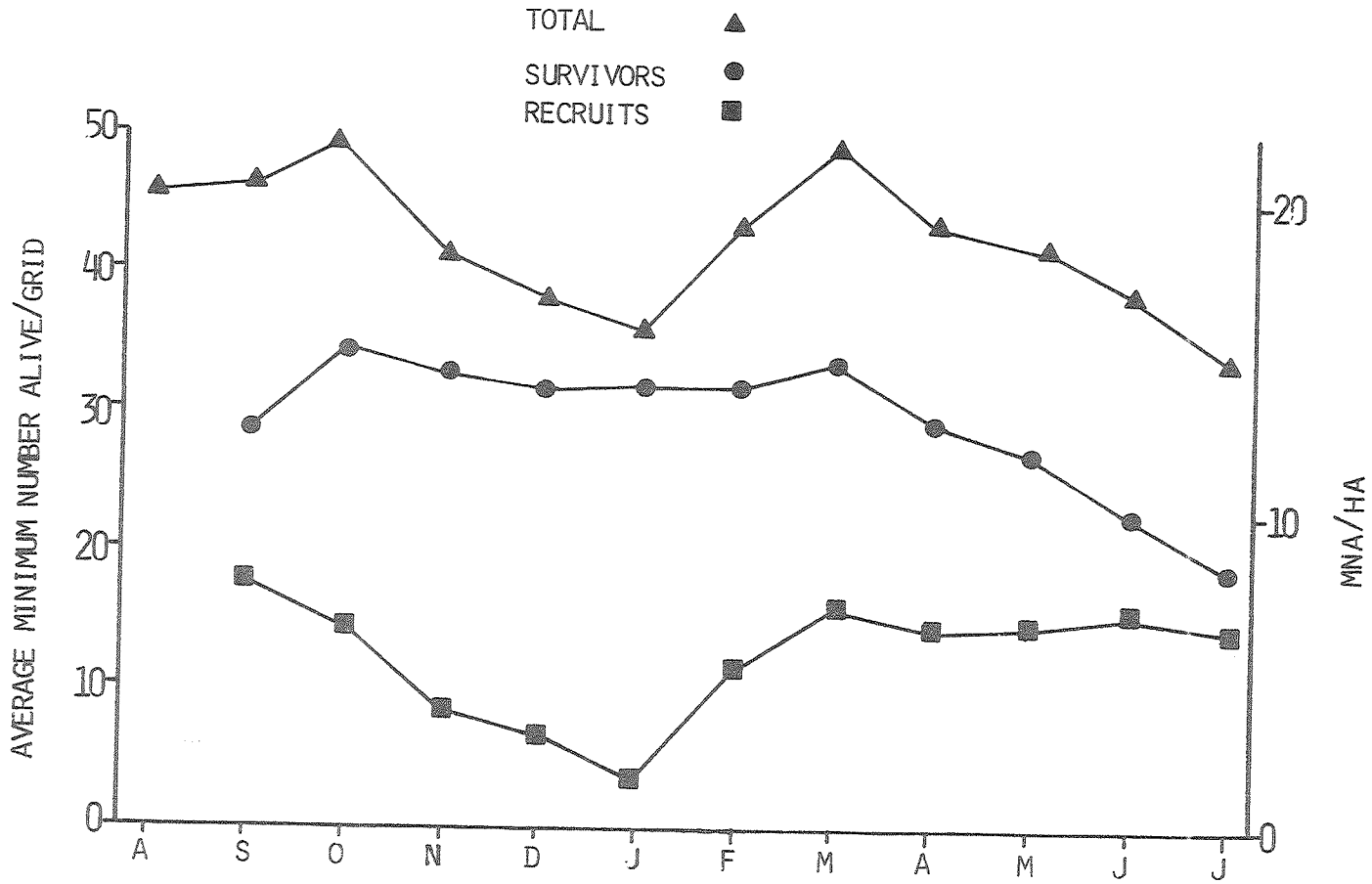

FIGURE 3. DENSITIES OF DEER MICE IN THE PICEANCE BASIN, COLORADO, DURING 1980 AND 1981

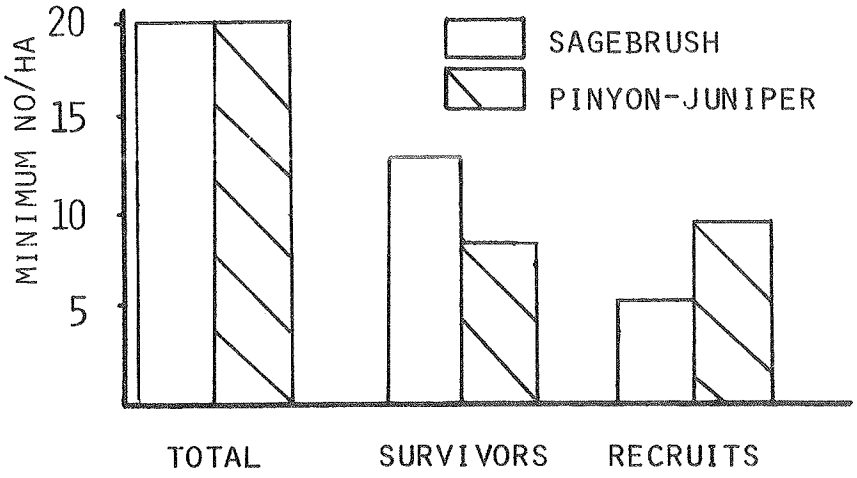

FIGURE 4. DEER MOUSE POPULATIONS ON TWO LIVE-TRAPPING GRIDS.

of prey species. Finally, population density may not be the only factor important in predicting availability to predators because density is really a dynamic feature resulting from the balance of recruitment and survival.

Dynamics of prey populations determined over a period of time can be very useful in predator studies. As an example of the potential importance of rodents to carnivores, I examined the population dynamics and biomass of rodents in the Piceance Basin.

To do this I examined the biomass of rodents that disappeared from the population on a monthly and annual basis as well as by habitat type. I limited the discussion to the three most common species (deer mice, least chipmunks, and golden-mantled ground squirrels [Spermophilus lateralis]).

I assumed that the availability of rodents to predators equals the number of individuals disappearing from the population on each grid. This number represents a maximum availability to predation. It undoubtedly overestimates the predation on species like deer mice, where a certain portion of the population trapped each month is comprised of transient animals that leave the population but do not die (Terman 1968, Fairbairn 1977). However, transients have been found to be much more susceptible to predation than resident animals (Metzgar 1967).

Figure 5 shows the monthly estimated biomass of the three most common rodents that was available to predation on the study area. The estimated biomass for each species is based on the number and estimated mean weights of individuals disappearing from trapping grids, projected to the total area of each habitat. The total numbers of deer mice, least chipmunks, and golden-mantled ground squirrels were multiplied by 0.016 kg, 0.032 kg and 0.165 kg to provide biomass estimates.

The total biomass of rodents lost from the population on the Piceance study area (7000 ha) was quite variable with a low of 320 kg from December to January and a high of 2300 kg in May and June. The increase in biomass available to predators during the Spring coincides with periods when mammalian carnivores (coyotes, foxes, weasels, etc.) and raptors (hawks, owls) are

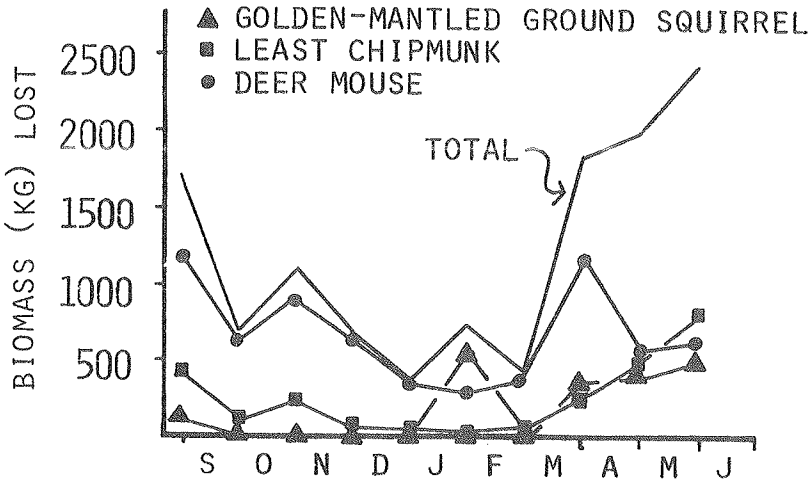

FIGURE 5. BIOMASS LOST FROM RODENT POPULATIONS IN THE PICEANCE BASIN, COLORADO DURING 1980-1981.

producing young and thus increasing their energy requirements. The low rodent availability in mid-winter suggests that some of the predators may move out of the area (migrating raptors) and/or switch to alternate prey (e.g., coyotes to deer and lagomorphs).

As another example of how rodents could affect carnivores I examined their potential effect on coyotes. I assumed that all rodents that disappeared each month were consumed by coyotes. Hilton (1978) suggested that coyotes consume about 0.72 kg/day. At this consumption rate the rodents on the Piceance study area would support approximately 14 coyotes from December to January and about 98 from May to June. This suggests that there might have been a shortage of food for coyotes during winter, but a surplus by late spring. If more coyotes than expected survived the winter by using alternate prey (deer carrion, etc.), then the spring surplus might not exist.

Prey availability probably can be affected by agricultural practices. Rodent populations have been found to respond to various types of agricultural or range management practices including livestock grazing (e.g. Phillips 1936; Smith 1940; Black 1968; Grant et al. 1982), snowpack augmentation (Sleeper et al. 1974), fire (e.g. Baker and Frischknecht 1973; Reynolds 1979; O'Meara et al. 1981). All of these studies reported changes in population dynamics or modifications of complete rodent communities. These changes undoubtedly affected predator-prey relationships in the affected areas.

An indirect way of predicting effects of agriculture on prey supply is to examine the relationship between prey population dynamics and habitat features that may be affected by agriculture. For example, several researchers (e.g. Dueser and Shugart 1979; Llewellyn 1981; Carey et al. 1980) using multivariate analysis have found that the occurrence of individual rodent species is associated with several specific habitat features within a given grid. Also, Birney et al. (1976) found that characteristics of microtine population dynamics were related to the amount of grass litter in a given habitat.

If rodents and rodent population dynamics are truly associated with specific habitat variables, then changes in these variables (e.g. caused by agriculture) should reflect changes in distribution and population dynamics of rodents. Many of the variables reported in these studies could conceivably be susceptible to change if subjected to impacts such as grazing and range improvements.

I found population variables of deer mice and least chipmunks to be correlated (multiple regression)with several habitat variables in the Piceance Basin. Deer mouse density was negatively associated with the number of other species of rodents in the environment (Table 1). Probably more important in respect to prey supply is the association of shrubs, bare ground and the population turnover rate. Presumably if agricultural practices altered these habitat features, the turnover rate and therefore supply of prey to predators would be affected. Population variables of least chipmunks also were found to be associated with some habitat variables (Table 2). Grass production and percent cover of dead wood accounted for the most variation in population variables. Grass production is a primary concern for grazing and attempts to increase this frequently result in production of substantial dead wood in the form of herbicide-killed sagebrush and chained pinyon and juniper.

Table 1. Multiple regression of deer mouse population variables vs habitat variables.

Pop. var.	Hab. var.	Variation explained	Cumulative var. exp.
	# Rod. spp.		85%
$\bar{X}$ density	% Dead wood	5%	90%
	% Dead wood		52%
Turn. rate	Sm. shrub	18%	70%
(Rec./sur.)	% Bare gr.	14%	84%
	Lrg. shrub	7%	91%

Table 2. Multiple regression of least chipmunk population variables vs habitat variables.

Pop. var.	Hab. var.	Variation explained	Cumulative var. exp.
	%Dead wood		82%
$\bar{X}$ density	Grass prod.	11%	93%
Turn. rate	Grass prod.		42%
	Grass prod.		60%
Rec. rate	%Dead wood		81%

In summary, agriculture probably does affect the supply of prey in many ways including directly (poisoning) and indirectly by modification of prey habitat which can result in modified prey population dynamics.

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DEER, AGRICULTURE, AND HOUSING DEVELOPMENTS IN THE GALLATIN VALLEY, MONTANA

William Vogel[1]

INTRODUCTION

Very little was known about deer ecology in an environment that was primarily agricultural with an increasing amount of housing development. So in the spring of 1981 this study was initiated in the Gallatin Valley to describe the effects of housing developments and agriculture on an increasing deer population. Twenty years ago whitetailed deer (Odocoileus virginianus) were scarce, according to long term residents, but during the study they were more abundant than mule deer (O. hemionus).

Funding by the Montana Department of Fish, Wildlife and Parks and the Montana Agricultural Experiment Station with the help and advice of Dr. Harold Picton contributed to the completion of this project. I would like to thank Dr. Richard Mackie for review of this manuscript.

DESCRIPTION OF STUDY AREA

The Gallatin Valley is a representative, primarily agricultural, intermountain valley with high quality forage in a diverse matrix of cover, native range, and fields. These fields consist mainly of hay and small grain. Irrigated and subirrigated pastures are common with dairies being a major land use. In the last 20 years, farms have decreased in number and increased in size, while the total amount of farmland has decreased (Montana Agricultural Statistics 1950-1981). From 1970 to 1980 there was a 53.4% increase in the number of rural residents (U.S. Bureau of the Census 1950-1980) and during this time subdivision lands increased dramatically.

METHODS

In 1981 whitetails were trapped, marked, and released during 2 helicopter drive net operations. One near Reese Creek, in the northeast part of the valley and the other around Pine Butte on the southwestern edge. In 1982 cannon nets and Clover traps were used. Whitetails were trapped in 2 areas, near Penwell Bridge on the East Gallatin River and along Sourdough Creek south of Bozeman. Mule deer were trapped in the Valley Center area. Six AVM radio beacons were placed on adult whitetail does in 1981 and 10 Telonics transmitters with tip switches were put out in 1982, 4 of the 10 were put on mule deer. Five mule deer and 24 whitetails were fitted with individually recognizable collars.

Instrumented deer were relocated from the air and from the ground. Telemetry data were biased as to the effects of housing upon deer, especially in 1981, when radioed deer, located on the northeast and southwest edges of the valley, were using draws away from houses during the day that hampered locations and at night came out near housing where locations were easily obtained. All aerial locations were taken in the mornings.

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Observations were made by surveying 21 study plots, fields of 20-40 acres with adjacent cover. A spotlight with a red filter was used in observations after dark. Observations were also made by driving routes and flying aerial surveys. Activity habits (moving or still) of instrumented deer were monitored over 24 hour periods. Different deer were monitored in different parts of the study area throughout any given day and night. Three or more deer were monitored during every 2 hour span. Data from 209 deer carcasses, collected and necropsied within the study area from 1976 to 1982, were analyzed for such parameters as diet, productivity, population structure, and distribution.

RESULTS

Population Structure

Fifteen percent of the adult whitetail does collected from area roads were over 3 years old while 48% of the mule deer in this sample were over 3 years of age (Vogel 1983). Age distribution among females and age specific reproduction data led to an estimated production rate of 1.62 fawns per whitetail doe and 1.23 for mule deer at fawning. In an intensive flight survey during August 21, 22, and 23 of 1981 fawn doe ratios of 0.98 for whitetails and 0.57 for mule deer indicated that these values have not decreased since a similar survey in 1977. This 1981 survey led to an estimated mortality rate of 40% for whitetails and 54% for mule deer over the first 90 days of life. No earlier estimate of mortality could be made since fawns were secretive and observed ratios did not peak until this time. Due to their sedentary nature, young fawns were not prone to vehicle collision. However older fawns and males were dominant classes in this sample.

Males experienced greater mortality and were more secretive than females. Forty-six percent of the yearling males collected in 1981 and 1982 were collected in the 4 week periods of late May and early June. This corresponded with the onset of fawning behavior in does and the tendency for males to wander.

Use of Agriculture

Hay stacks were only observed to be fed upon during the winter and spring and then only on second and third cuttings of alfalfa. Deer use of stacks increased with increasing snow depth.

Loose stacks were most vulnerable, especially when they were clumped so deer could use them for security, rather than having them lined up in a row. Rectangular bales decayed or were fed upon heavily by deer if left scattered in the field. Scattered round bales provided interspersion of types, less agonistic behavior so more deer could feed at once, thermal cover, and a small patch downwind of the bales that was clear from snow.

Observations indicated that if depredation is a problem stacks should be placed further from cover, closer to houses, panelled, or a stock pile system should be used.

For maintenance of root carbohydrate reserves and the health of the stands it is often recommended that alfalfa not be cut in the month previous to the first killing frost. New shoots of alfalfa might provide deer with alternative foraging options away from stacks when snow depth is not excessive. This hay can always be grazed by cattle. This stock pile system could prevent the cost of harvesting hay that deer might eat anyway.

Mule deer appeared to use haystacks more and to feed upon them more aggressively than whitetails.

Use of Cover Types

There were differences in the use of cover types between the 2 species of deer but most of these were attributable to differences in the distribution of these cover types relative to the ranges of these 2 species of deer.

When housing was abundant deer used cover much more. As the observability of deer in cover increased the apparent use of areas near housing also increased and the avoidance of housing decreased. This explained why deer seen from routes appeared to avoid houses more than those seen during flights and much more than those located by telemetry; because deer in cover (near houses) were more easily detected by flights and telemetry. Spotlighting was also efficient at locating deer in cover due to the reflection of the tapetum.

Home ranges were found to be linear in shape in developed areas; primarily because cover occurred along draws and streams and deer used this cover more in developed areas.

Cover type use was dependent on such factors as distance from housing, amount of cover associated with that particular cover type, and seasonally available supply of forage; such as when winter wheat begins greening up. Small grain formed 42% of volume of whitetailed deer rumen samples in March.

Food Habits

Mule deer in the valley differed as much or more from mule deer outside the valley as they did from whitetails. For instance, mule deer in the valley made the most use of forbs, over twice that of mule deer outside the valley, while whitetails were intermediate in their use of forbs.

Alfalfa and small grain use was highest from September through March. Although studies of penned deer have shown a decrease intake during this time, I noticed an increase in volume of rumen contents and a diet of easily digestible materials with a rapid turnover indicating an increase in dry matter intake.

Lowering of the basal metabolic rate and conservation of energy is a strategy often used by deer to survive winters. But where disturbances frequently cause a raising of the metabolic rate and a shift to less economical activity patterns this system may not be consistent with the survival of deer; especially if high quality forage can be obtained throughout the winter.

Activity Patterns

Deer were moving less often where housing was dense. This does not mean that they were less active or expended less energy. Deer were more nocturnal where housing was dense. This displays a need to protect winter range from development since during the winter and spring deer are less nocturnal and active more often; especially from noon to 1 hour after sunset, the warmest part of the day. Whitetails were active more often than mule deer, especially nights and mornings. As a side note; deer were more nocturnal during the semilunar period centered on the full moon and crepuscular on the other semilunar period centered on the new moon. These interpretations of activity level were verified by direct observations while monitoring deer and similar trends were also found in other nighttime observations.

Effects of Housing

Widely distributed housing contributed more rapidly to the loss of deer habitat, especially when placed on high quality deer habitat and prime agricultural land. Farms had less of a negative effect than residential areas and houses with no ties to agriculture. This was due to any 1 or a combination of 3 factors:

1. A more even distribution of farms.
2. Activities around farms were more predictable and as such less detrimental.
3. A high quality supply of forage is associated with farms such as labor intensive crops like irrigated alfalfa.

Deer reacted differently toward housing depending on the habitat and the overall extent of development in the general area. Most of the development in the valley was occurring on the better soils for farming and on the best deer habitat.

Whitetails averaged 6 times as many houses within 800 meters as did mule deer, indicating greater tolerance of housing. Whitetails were also more nocturnal and had a younger age distribution, greater production, and lower mortality for the first 90 days. All of these characteristics fit with Geists (1971) description of a species habituated to disturbances.

The effects of the location and distribution of housing upon deer was described in greater detail by Vogel (1983).

CONCLUSION

Agriculture and deer can coexist very easily if certain basic problems can be solved. The main aspect to be addressed to increase compatability is the depredation by deer of crops, especially hay stacks. Depredation on stacks could be decreased by proper management of wildlife, sound farming practices, and some additional effort.

The major determinants of the impacts of housing developments upon deer were the location and distribution of the housing. Houses should not be built on the best agricultural land or on the best deer habitat forcing deer and farming to exist on marginal lands. Housing was most detrimental to deer when it was widely spread out and in densities of around 10 to 20 houses per section because that is enough to impact deer negatively and still effect a wide area. Presently tracts of land over 20 acres do not require public review and such regulations have only encouraged the destruction of farmland and deer habitat at an accelerated pace. Deer and agriculture have the capabilities to be compatible with each other but not with indiscriminate and unregulated housing developments.

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AN OVERVIEW OF THE CURRENT ENDRIN SITUATION

Philip Schladweiler[1]

To gain a better understanding of the situation in 1981 when endrin use on small grains in Montana became an issue, a little background information on endrin and its history is in order.

Endrin belongs to a group of pesticides known as chlorinated hydrocarbons, which also includes DDT. More specifically, it belongs to the cyclodiene group of chlorinated hydrocarbons, along with aldrin, dieldrin, chlordane, heptachlor and some other less well-known compounds (Brooks 1974). These chemicals were all synthesized in the late 1940's and share similar characteristics of broad-spectrum insecticidal activity, persistence, affinity for fatty tissues, and a tendency to bioaccumulate through food chains. Endrin was introduced and registered for use for cutworm and grasshopper control in cereal grains in the Great Plains in 1951. It's use rapidly expanded through the 1950's and early 1960's. Endrin has been recommended for cutworm control in Montana by the Cooperative Extension Service, and others, since 1954. It was the only chemical registered for control of pale western cutworm in Montana in 1981.

Endrin is the most acutely toxic chlorinated hydrocarbon to a wide variety of wildlife, with birds being especially susceptible. Due to this toxicity, endrin was also registered as a rodenticide and an avicide. Although registered in Montana for both of these uses, only very limited amounts of endrin were ever used for either purpose in the state. Velsicol Chemical Corporation has not registered endrin as an avicide for the last couple of years, and according to the Montana Department of Agriculture (MDA) such use would be cancelled upon registration of endrin for this use in the future (G. Algard, pers. comm.). Endrin is still registered as a rodenticide in Montana, although new administrative rules proposed by the MDA will call for immediate cancellation of this use upon adoption of the rule.

Endrin gained public recognition in the late 1950's and early 1960's when it was identified as the cause of massive fish kills along the Atchafalaya and Mississippi Rivers (Graham 1970:97-102, Rowe et al. 1971). Largely as a result of these fish kills, actions to restrict certain endrin uses began in the late 1960's. Endrin came under close EPA scrutiny in the early 1970's, and they issued a "rebuttable presumption against registration and reregistration" (RPAR) in 1976.

As a result of the RPAR process, all but a few uses of endrin were cancelled in 1979 (Federal Register 1979). Permitted uses included: as a rodenticide in apple orchards; on cotton west of Interstate 35; on small grains for grasshoppers in Montana only and for army and pale western cutworms in all states; and minor uses on a few other crops. Most wildlife people in Montana were aware that endrin uses had been cancelled, and assumed that the ban was a total one. Thus, there was a great deal of surprise and consternation expressed when it was discovered that potentially large acreages in the state might be treated with endrin in 1981.

The Montana Department of Fish, Wildlife and Parks (MDFWP) first learned of anticipated endrin use in late February 1981, when Union Carbide Company

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requested a "special local need" registration for use of carbaryl to control armyworms in cereal grains. MDFWP responded with, 1) support of this request, 2) opposition to the use of chlorinated hydrocarbons, and 3) a request to be informed when and where endrin might be applied. Our next involvement occurred in late March 1981 when a fish die-off was reported in Sunday Creek, north of Miles City. It was subsequently learned that another, previously unreported fish kill had occurred in this vicinity about 2 weeks earlier. Samples of dead or dying fish collected from the site of the second fish kill 5 days after spraying confirmed the presence of endrin and toxaphene. Two composite samples of several fish each, collected and analyzed by the MDA on a whole body basis, contained 0.16 ppm and 2.3 ppm of endrin.

Most of you are aware of subsequent events, so I won't bother you with details. More specific information is available in our final report (Schladweiler and Weigand 1983).

Our monitoring efforts following 1981 spraying resulted in the discovery of residues of 17 other chlorinated hydrocarbons. As a result of this monitoring effort, studies conducted in 1982 on experimental plots treated with endrin and 2 alternative chemicals, and subsequent literature review and discussions with pesticide-wildlife researchers, we reached several conclusions and made a series of recommendations in our report. These recommendations and some of the rationale on which they are based, will be briefly presented here and then I will conclude with the situation as it exists today.

RECOMMENDATIONS

1. The manufacture and use of endrin and heptachlor should be immediately and permanently terminated.
   This recommendation is based on the availability of efficacious, cost effective alternatives, which means that endrin and heptachlor and the hazards they pose to wildlife and human health are no longer necessary. Although the currently most viable alternatives do not yet have permanent EPA registration, MDA has been granted annual exemptions to use them in Montana.

2. When a pesticide's registration for use is cancelled for any reason, all use of that chemical should be terminated immediately. Cancellation actions should include provisions for locating, retrieving, and safely disposing of existing inventories of the compound and for reimbursing producers, dealers, and applicators for those inventories.
   There is generally ample time between the time an agency first proposes to restrict or ban the use of a chemical and the actual date that such actions become final, for stocks on hand to be used and not replenished. For example, the EPA gave notice of its intent to cancel all registered uses of heptachlor and chlordane in November 1974 (Federal Register 1976). Actual cancellation became effective on 1 September 1982, with the provision that existing stocks of heptachlor formulated prior to 2 June 1982, could be used until exhausted. The MDA estimated that, as of summer 1982, a 3-year supply of heptachlor existed in a several-state area that included Montana. Provisions such as this allow individuals to legally stockpile several year's supply of a chemical that is technically banned. Similarly, new administrative rules proposed by the MDA would suspend the right to sell or otherwise distribute, purchase or use endrin on small grains to control army and pale western cutworms on the effective date

of the rule. Existing stocks, however, could be used for a period of up to 2 years from the effective date of the rule.
Cancellation actions such as these are commendable and certainly a step in the right direction. However, provisions allowing for use of existing stocks of such compounds promotes and abets continued exposure of people and wildlife to those chemicals for economic convenience, and prolongs human risks while at the same time disrupting state and federal wildlife management programs. If reimbursement procedures existed, the economic incentive would be removed and there would be no need to allow any future use.

3. Additional field research into alternative methods of cutworm, wireworm, and other pest insect control is needed. Such research should concentrate on developing and/or evaluating methods such as: highly selective species-specific insecticides which do not harm the pest' insects natural enemies or other nontarget wildlife; nonlethal control chemicals such as deterrents or repellents, behavior modifiers which interrupt mating cycles, oviposition, sociality, dispersal, aggregation, etc.; and cultural practices such as crop rotation, trap or lure crops, timing or tillage or other tillage practices, livestock grazing, burning, etc. as they affect populations of the insects being studied. In many cases what is really needed is basic life history research on the insect in question. Much of this type of research was virtually eliminated with the advent of modern control chemicals.

4. Establish a working group of professionals from the Montana Departments of Agriculture, Fish Wildlife and Parks, and Health and Environmental Sciences with authority to: a) review currently registered pesticides or those proposed for first time registration with respect to their impacts on environmental components and human health, including identification of suitable alternatives; b) initiate a pesticide reporting system that includes an action plan for addressing problems such as severe pest outbreaks or significant use of pesticides that might impact wildlife or human health; c) maintain liaison with other agencies and institutions regarding pesticide studies, registrations, and research needs; d) develop and maintain close coordination on pesticide-fish and wildlife-human health research efforts in Montana. Although this recommendation is very similar to a bill that was defeated by the 1983 Montana Legislature, we still feel that such a group is needed. In the event a similar bill is introduced into the 1985 legislature, we recommend its support by this chapter.
The following 3 recommendations will be discussed together.

5. Periodic sampling of Montana wildlife for chlorinated hydrocarbon residue testing should be continued.

6. Cautionary warnings to Montana upland bird and waterfowl hunters should be issued annually prior to the opening of those respective hunting seasons until residue test results indicate potential human health risks have subsided.

7. Pesticide residue action levels should be established for wild game meat. The issue of potential hazards to humans from eating chemically-

contaminated upland game birds and waterfowl will, of necessity, continue to be addressed by the Montana Fish and Game Commission. Residue data are necessary for interpretation and recommendations by human health authorities. If residue action levels existed for wild game meat, they would be extremely valuable to state health and wildlife agencies in decision-making regarding the taking, sale, and consumption of fish and game.

8. The EPA should accelerate efforts to eliminate sources of hazardous pesticides available to wildlife and humans.
For example, PCB's are documented carcinogens and appeared at elevated levels in many Montana wildlife samples. Although usually associated with industrial areas, PCB's were detected in resident wildlife in Montana. Because PCB's affects on animals tend to be additive to those of other compounds that are present, a general cleanup of their sources is needed. The EDB situation is another recent example of the need to rid the environment of hazardous substances. Keep in mind that no action was taken on the federal level until a few states had acted unilaterally. This prompted additional demands that federal action levels for EDB be established, which eventually occurred.

9. The manufacture of DDT should be banned in the United States and globally.
Occasional residues of DDT in resident wildlife and high residue levels and frequency of occurrence of DDT in migratory birds in Montana indicate some local availability of DDT, and its use in other states or countries. Despite the fact that DDT has been banned in the United States since 1972, recent press reports of increased DDT levels in Texas and New Mexico wildlife point out that the problem is not strictly a local one. Speculation on the source of this "fresh" DDT ranged from drainage from the Mexican side of the Rio Grande to old storage or production facilities, etc., with only 1 or 2 people suggesting the most probable source--illegal use by U.S. farmers. The EPA discounted the possibility of DDT being smuggled into the U.S. from Mexico, and put the blame on another insecticide that contains small amounts of DDT as a contaminant.

10. There should be efforts at the national level to establish and fund a cooperative state-federal program to expand research and monitoring efforts on pesticides and their effects on agricultural production, human health, and fisheries and wildlife.
Currently, most insect pest control research is conducted or supported by major chemical companies, and is therefore primarily interested in chemical control methods. The aim of this recommendation is to provide a source of funding that would promote research into other control methods that do not rely so heavily on chemical poisons.

CURRENT SITUATION WITH RESPECT TO ENDRIN IN MONTANA

The MDFWP Final Endrin Report is done.

The MDA has issued a report on their 1982 field studies of endrin and 2 alternative chemicals in which we participated.

The MDA prepared administrative rules which were enacted 31 March 1982 and which restrict the use of endrin for controlling cutworms in small grains in Montana. They also prepared a Preliminary Environmental Review and

determined that certain segments of the proposed rules had potentially significant environmental impacts. They further determined that the rule restricting endrin use in Montana should be addressed by an Environmental Impact Statement (EIS). The Draft EIS was released in July 1983 and proposed further new administrative rules suspending the sale and use of endrin for control of cutworms in small grains. The chief features of the proposed new rules are:

1. The right to sell or otherwise distribute, purchase or use endrin for use on small grains to control army and pale western cutworms in Montana, except as provided, is suspended on the effective date of this rule.
2. Existing stocks of endrin may be used in compliance with additional restrictions, and by certified applicators for a period not to exceed 2 years from the effective date of the rule. Thereafter, any remaining stocks must be disposed of according to EPA and Dept. of Health and Environmental Sciences statutes or returned to the manufacturer.
3. The additional restrictions would include reporting all intended uses prior to application, and extend the "buffer zone" restriction to include private bodies of water.
4. The cancellation of endrin for grasshopper control in small grain, enacted by rule on 31 March 1982, would be continued.
5. The endrin registration for vole control in orchards would be cancelled immediately.
6. Once an effective alternative cutworm control chemical is registered by EPA and Montana, the endrin registration for small grains will be cancelled.
7. If EPA does not register or grant specific exemptions for effective alternatives, then the sale and use suspension, or registration cancellation for endrin will automatically be vacated and the right to sell and use endrin would be reinstated with the same restrictions for use of existing stocks as provided by the rule, and such other restrictions as may be further promulgated by rule.

The MDA lacked both the money and manpower to totally revise their DEIS and print a new Final EIS. They intend to issue new rules almost identical to those just outlined above, except that I was assured that the provision for automatic reinstatement of endrin use would be removed.

The MDA and Brigham Young University conducted further field studies in summer 1983. These included endrin and one of the alternatives we studied in 1982. They have just completed residue tests from samples already collected and have one set of samples (1 year postspray) yet to collect and test. The MDA and BYU are meeting February 16-17 to exchange data and discuss the formate in which to present it to the EPA. Their final report will not be available until at least fall 1984.

Platt Chemical Company, one of the 2 companies with endrin products registered for cutworm control in small grains in Montana, has chosen not to reregister their endrin product in Montana this year. When this occurs, existing stocks of that product can only be used for 1 year. After that it becomes an illegal product.

The MDA has again requested a Section 18 "specific exemption from registration" for the use of permethrin and chlorpyrifos, the same products as have been granted these exemptions for use on cutworms in the last 2-3 years. They do not foresee any problems with these exemptions being granted again this year.

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CANADA GOOSE NESTING AND BROOD HABITAT USE RELATED TO WATER LEVEL FLUCTUATIONS OF FLATHEAD RIVER

Jim Claar, Joe Ball, Dennis Mackey and Shari Gregory

No Paper Submitted

THE MONTANA BALD EAGLE WORKING GROUP--
SLIDE TAPE PROGRAM

Ron Escano

CIRCLE WEST - A CASE STUDY OF BUREAUCRATIC SORCERY

Ron Stoneberg[1]

The starting point for this tale was probably the release of the North Central Power Study in 1971. This study, while not the start of coal development in Montana by a long shot, was the Greytak of the Northern Great Plains coal industry. Like Greytak, magnitude was the key to the public's reaction. One result of the massive public outcry was a moratorium on the leasing of federal coal which was imposed in 1971. This remained in effect for eight years during which time the Department of the Interior worked to compress the demands of various special interest groups into a workable coal leasing program. The result was the Coal Management Regulations released by then Interior Secretary Cecil Andrus in 1979.

The moratorium coincided with the rise of the so called 'environmental movement'. You've heard of the dirty '30's, now we have the clean '70's. One of the main standard bearers for the environmental movement has continually been the wildlife resource. In a majority of the environment-industry dramas staged during the past decade, wildlife played a leading role. In many of the court battles, wildlife was sitting in the plaintiffs chair. People from all walks of life were publicly extolling the virtues of wildlife. Predictably some professional wildlife biologists felt threatened by this invasion of their domain. A few even actively opposed it. However, in spite of this, the tide of sentiment resulted in the adoption of some very good legislation, rules, regulations, etc. specifically designed to protect wildlife.

Last year, you may recall, Ray Hoem from the BLM talked about one such set of rules. The unsuitability criteria contained in the Federal Coal Lease Regulations broke important new ground and went a long way in providing a means to protect existing wildlife values. For the first time wildlife was put on an equal footing with coal. Previous regulations approached the problem by asking how to build a mine or facility that would minimize the damage to wildlife. Their bottom line was the mine or facility would be built. The bottom line with the unsuitability criteria, however, could be no mine or facility. This was a major breakthrough.

We will concern ourselves today with one specific criterion, number 15, that addresses resident wildlife species. It reads as follows, "Federal lands which the surface management agency and the state jointly agree are fish and wildlife habitat for resident species of high interest to the state and which are essential for maintaining these priority wildlife species shall be considered unsuitable. Examples of such lands which serve a critical function for the species involved include:

1. Active dancing and strutting grounds for sage grouse, sharp-tailed grouse and prairie chicken,
2. Winter ranges most critical for deer, antelope and elk, and
3. Migration corridors for elk.

A lease may be issued if, after consultation with the state, the surface management agency determines that all or certain stipulated methods of coal mining will not have a significant longterm impact on the species being protected."

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While I realize there are loopholes here big enough to drive Big Bertha the dragline through, I concentrate on the intent. As I see it, the intent is to protect major or important wildlife areas from the ravages of strip mining. Now lets look at an example of how it works in practice.

The process began for the Circle West tract, located in McCone county west of the town of Circle, in late 1979 with the release of an innocuous appearing document called the Redwater Management Framework Plan (MFP). In it the BLM attempted the herculean feat of developing a land use plan for management of both the surface and subsurface resources under their control. Needless to say, the result was quite interesting. In the surface management section they suggested improving wildlife habitat by planting food and cover crops as well as providing salt and grit. Taking salt to McCone county is a little like taking ice to the eskimos. They also suggested fertilization of fisheries ponds to stimulate growth of food and cover vegetation. I was particularly interested in the section dealing with timber management. The last time we had a timber harvest in McCone county was when they put the telephone lines underground.

While the decisions and rationales presented in the surface management section ranged from outrageous to fantastic, they were really superfluous. The purpose of the MFP was to meet the requirements of the coal lease regulations. Actually the MFP was two separate books under one cover. Apparently the fact the objectives of the two were often at odds was not a concern. I was reminded of this conflict when reviewing the section dealing with controlling off-road vehicle use. This immediately raised the question, does a dragline qualify as an ORV?

Of significance to us was the fact the unsuitability criteria were applied to lands overlying federal coal. In the Circle unit, two antelope wintering areas resulted in the withdrawal of 688 acres of federal coal. Buffer zones around three sharp-tailed grouse dancing grounds removed an additional 770 acres. Those of you wondering how the removal of a little over a section of land would provide any protection for a free ranging antelope herd can relax. The range was on the edge of a coal seam in an area not being considered for leasing.

Although the best available data were used, it was apparent the data base were inadequate for a complete application of the criterion. Comments to this effect were submitted at the MFP hearings by MDFWP and assurances were received that, "unsuitability criteria can be applied during land use planning, activity planning, leasing, and up to the time of mine plan submission."

In spite of its shortcomings, a significant aspect of the MFP action was the setting of a precedent in the application of the unsuitability criteria. It indicated antelope winter ranges and sharp-tailed grouse dancing grounds met the requirements of criterion 15.

The next step in the leasing process was the determination of Logical Mining Units (LMU). The 'Circle West' unit was split into two tracts, Circle West I north of Nelson Creek and Circle West II to the south. Circle West III was a combination of the two tracts.

Ongoing data collections by the MDFWP identified the area south of Nelson Creek as a major all season pronghorn antelope range. This information was relayed to the BLM and it was acknowledged in the Site Specific Analyses (SSA) for the tracts. However, the decision to apply unsuitability criterion 15 was deferred to the final EIS.

In 1982 BN hired a private consulting firm, Beak Consultants, Inc., to provide a counter balance to my claims. Their study centered on the Circle West south (II) tract and basically reinforced what I had found.

The draft EIS released in July 1982 recognized the significance of the Circle tract to resident wildlife when it stated, "the Circle III trust contains some of the most important wildlife habitat in the Fort Union region. The destruction of this habitat would severely impact the high value pronghorn herd by destroying their winter range and year-round habitat." Although this would appear to satisfy the requirement of unsuitable to mine under criterion 15, no such designation was proclaimed. Instead, the draft EIS recommended leasing the Circle West tracts but attached "special stipulations" to protect the critical antelope range. The details of these "special stipulations" were not presented for a very good reason. They had not yet been formulated.

In January 1983, an interagency meeting was convened to legitimize the process by producing a set of guidelines. The one condition insisted on by the MDFWP delegation was specifically designated involvement by their agency in the negotiations concerning stipulation adherence. Unfortunately, the draft passed through the dentist's office. The final guidelines replaced specific state agencies approval, agreement and evaluation by a general "consultation with the State of Montana."

This nifty little maneuver enabled the BLM to circumvent the intent of the unsuitability criteria. The criteria were designed to protect critical wildlife areas from coal mining. The stipulations provided a means for mitigating losses.

Inconsistencies and omissions associated with the application of criterion 15 were documented in detail by MDFWP. These extensive comments were included, unabridged, in the State's comments on the draft EIS and were forwarded to the BLM by Governor Schwinden. However, they were not afforded the courtesy of an honest reply. Instead, the BLM dismissed all concerns by stating, "unsuitability determination is a part of the land use planning process and is not a part of activity planning which is what the draft EIS addresses." This was in direct contradiction to their earlier reply to MDFWP comments on the land use planning process.

As the BLM was patching together the Fort Union coal lease sale to satisfy Interior Secretary Watt's voracious appetite, the Burlington Northern Railroad (BN) made them an offer they couldn't refuse. BN, through its subsidiary, Meridian Land and Mineral Company, proposed getting rid of the checkerboard ownership pattern in the Circle West area by exchanging mineral rights with the BLM. When the dust had settled, two tracts had been delineated with Nelson Creek the dividing line. BN graciously conceded first choice of tracts to the BLM. The MDFWP recommended the federal government select the south tract based on resident wildlife values. Much to my surprise this was the tract selected.

The original Redwater MFP identified three sharp-tailed grouse dancing grounds in the Circle West area. Federal coal underlying a 1/2-mile radius around each ground was withdrawn from the lease process based on unsuitability criterion 15, "to preserve the integrity of these dancing grounds." As previously mentioned, it would appear a precedent was established. However, as happened with antelope, such was not the case.

In the spring of 1982, MDFWP conducted an intensive lek survey in the Circle West area north of Nelson Creek. Five previously located grounds were checked and six new ones located. An additional ground was located in 1981 and not checked in 1982. One of the new leks was over federal coal in the

middle of the north tract. Another ground, dismissed as inactive in an earlier BLM report, was occupied in 1982. The draft EIS acknowledged receipt of information concerning these dancing grounds but protection through the unsuitability process was not provided. Instead, they opted to substitute mitigation of losses for protection and included these grounds in the "special stipulations" game.

It would appear the BLM was more concerned about the "integrity" of the sharp-tailed grouse dancing grounds around the edge of a coal tract than of the ones located within a logical mining unit. However, the mineral exchange would reduce this to a moot point as all covenants and stipulations would be removed from the federal coal transferring to private ownership. Resident wildlife on the north tract would be the losers should the exchange be ratified.

Conditions of the exchange necessitated an expanded south tract boundary. This compelled the BLM to reopen the book and to initiate action to amend the Redwater MFP. To satisfy the letter of the federal coal lease regulations, the "new" coal acreages had to pass through the famous screening process of public involvement and environmental impact assessment. Unfortunately the process was reduced to an exercise in futility when it was announced at the outset the tract would be offered for lease in 1984. The screens may have been in place but the mesh was large enough to allow the predetermined decision to pass through.

The draft amendment to the MFP was released in November 1983. I was both pleased and surprised to find the entire north half of the south tract was declared unsuitable to mine based on criterion 15. This amounted to about 10,000 acres. However, before I went out to celebrate I read the fine print. "Cooperatively, BLM and Montana Fish, Wildlife and Parks Department developed a stipulation to coal leasing that would mitigate for deer, antelope, and sharp-tailed grouse displacement and habitat loss caused by surface mining. In order to protect the habitats of resident wildlife species of high state interest, that stipulation will be applied as a condition to leasing this tract." This contains a false statement which has been repeated many times since by the decision makers of both agencies. They claim this system will protect existing resident wildlife species. The unsuitability criteria, properly applied, protects the resident resource. The stipulations mitigate for a loss. The first sentence of the stipulations says, "The lessee shall be required to mitigate for deer, antelope, and sharp-tailed grouse habitat loss where applicable and the resultant loss or displacement of these species due to surface coal mining operations." The stipulations are a means to determine how much the lessee is willing to pay. They make no pretention to protect the existing resource.

This is where it now stands as we anxiously await the release of the final amendment.

What transpired these past few years in the Circle West conflict is indicative of the type of protection wildlife can expect in the face of impending industrial development. In other coal fields and other states resource managers point with pride at examples of mitigated conflicts. What they forget is that mitigation almost always means a loss to some resource. I won't quarrel that the process may work in some places. What I question is how it works when you are in an either/or situation. The Circle West charade provided an answer.

First, we had an excellent regulation developed during the height of the environmental movement. The unsuitability criteria put wildlife on an

equal footing with coal. The importance of the south tract to the resident antelope population was never seriously challenged. Everyone agreed this was a major antelope range. Secondly, there was a decision, lease coal, made on the banks of the Potomac. These two forces met on the south tract of Circle West. The battle lines were clearly drawn for a classic, test case, confrontation.

What happened was just about what everyone expected. The south tract will be offered for lease. But, you might ask, what about this great regulation, the unsuitability criteria? Admittedly this caused the regulatory agency considerable consternation. Their first reaction, predictably, was to try to ignore it. This tactic was confounded, however, by the actions of an idealist nuisance from MDFWP stationed in the Circle area. When it became apparent wildlife was edging out coal the legitimate process had to be aborted. The convoluted gyrations of the BLM as it attempted to extricate itself from this proverbial rock and a hard place had to have been an embarrassment to any conscientious resource person. It was not to the MDFWP credit that they concurred with this maneuver. The lesson to be learned here is that when push comes to shove wildlife generally comes out the loser. What disturbed me was that wildlife biologists were doing much of the shoving.

It is very possible private individuals, sportsman groups, environmentalists, etc. may petition to have this area declared unsuitable without stipulations. This would by typical since many of the past gains for wildlife were made by this avenue. Is this not a sad commentary on the state of our profession when state and federal wildlife biologists have to hide behind the skirts of the public and let them do our job for us?

TENTATIVE RESULTS OF THE NORTHWESTERN GRIZZLY BEAR ECOSYSTEM POPULATION REVIEW

Cliff Martinka and Bob Klaver

No Paper Submitted

IDENTIFICATION OF PEREGRINE FALCON NESTING HABITAT

Ted Wenzel

No Paper Submitted

THE VALUE OF BIG SAGEBRUSH (ARTEMESIA TRIDENTATA) AS A FORAGE SOURCE FOR MULE DEER

Joel Peterson[1]

The competition of big sagebrush with other range vegetation for water, nutrients and space brings this plant repeatedly under attack by many range managers and the ranching community. Its general low suitability as livestock forage also lends to its unpopularity.

Wildlife managers defend this plant as being valuable food and cover for a variety of species. Land and livestock managers often dispute at least some of these claims. Perhaps the most common dispute is the value of sagebrush to big game as a substantive forage source. Common negative arguments are: 1) sagebrush is "unpalatable" and "undigestible" to native ungulates such as mule deer, 2) sagebrush is only used as a "filler", and 3) sagebrush is a "starvation food". Persons using these arguments most often attempt to substantiate their claims by citing the Nagy group (e.g., Nagy et al. 1964, and Nagy and Tengerdy 1968). These researchers reported that sagebrush contains volatile oils (monoterpenoids) that inhibit bacterial activity in the rumen of deer. They strongly suggested that rumens containing significant amounts of sagebrush (15 to 50%) could have impaired digestion, and that greater amounts could cause the death of the animal. In a later report, Nagy (1979) concluded that sagebrush digestibility ranges only from fairly poor to poor.

The fact that mule deer commonly utilize significant amounts of sagebrush on most Montana winter ranges leads one to question the findings and/or assumptions of these reports. In fact, these earlier observations are not at all in tune with a number of other studies, including more updated research. For instance, a study in Nevada (Tuellier 1979) reported deer having a diet of 68% big sagebrush from one range were in as good or better condition (relative to tail fat deposits) than deer from a range where sage provided only 28% of the diet. (Deer in that study were collected into March.)

This report documents more recent research and additional literature review that lends the credibility to sagebrush that it deserves. Key points considered by these studies in determining the value of sagebrush as forage include: 1) digestibility, 2) nutritional value, and 3) preference.

DIGESTIBILITY

In Utah, Welch and McArthur (1979), who have done considerable research on this subject, concluded "...we are not sure that monoterpenoids in big sagebrush are causing digestive problems in mule deer. Evidence in the literature can be used to argue both sides of the question. We believe that Wallmo et al. (1977) and Dietz and Nagy (1976) are premature in claiming that the monoterpenoids in big sagebrush are toxic to mule deer...." It was noted that procedures used in the studies "...to demonstrate possible suppression of digestion by monoterpenoids were conducted under severe conditions--conditions probably not encountered by mule deer on winter ranges." It was

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pointed out that some of the Nagy studies used monoterpenoid levels four to eight times greater than levels found in big sagebrush tissues.

Recent evidence indicates there may not even be enough volatile oils reaching the rumen to cause the previously conjectured digestive problems. While researching sagebrush digestibility and monoterpenoid content, Welch and Pederson (1981) discovered that significant amounts of volatile oils were not showing up in the rumen contents. Cluff et al. (1982) found a reduction of 80% of the monoterpenoids in forages consumed. These and other researchers (i.e., White, Welch and Flanders, 1982; Van Soest, 1981) show conclusively that monoterpenoids are volatilized (passed off as vapor) during mastication, eructation, rumination or absorption. As a result, very little volatile oil reacts with rumen content.

In contrast to the findings of Nagy et al., neither the in vitro nor in vivo digestibility trials of big sagebrush by a series of researchers (Smith 1950; Bissell et al. 1955; Smith 1952; Smith 1957; Dietz et al. 1962; Regelin et al. 1974; Sheehey 1975; Urness et al. 1977; Striby et al. 1982; and Pederson et al. 1982) support the contention that monoterpenoids are interfering with digestion in mule deer (Table 1). In fact, in vitro dry matter digestibility of big sagebrush was found to be the highest of all shrub species tested. (Other species tested included: aspen, rose, serviceberry, and chokecherry). In vivo digestibility trials with mule deer show big sagebrush second only to curlleaf mahogany in total digestible nutrients (Table 2). In vivo digestion trials (using mule deer) conducted by Smith (1950), Bissell et al. (1955) and Dietz et al. (1962) determined the total digestible nutrient content of big sagebrush to be 70.2%, 55.9% and 58.9%, respectively. (The differences are probably the result of seasonal and genetic variation in sampled plots.) In contrast, high quality alfalfa has a total digestible nutrient content of about 53% (Morrison 1961; National Academy of Sciences, 1964). Further evidence of the high digestibility of sagebrush comes from an in vitro study of elk winter forage in Wyoming (Tables 3 and 4). Ward (1971) found sagebrush had the highest digestible dry matter of all species tested. (Other species tested included: bluebunch wheatgrass, Indian ricegrass, needle-and-thread, common sunflower, antelope bitterbrush, and rabbitbrush).

NUTRITIONAL VALUE

So far we've shown that deer are able to adequately digest big sagebrush; but does it do them any good? A study in Colorado by Carpenter et al. (1979) found wintering mule deer actually gained weight during the period of increased sagebrush consumption (Figure 1). Other studies, such as the ones described below, document the important forage value of big sage.

Welch and McCarther (1979) found the midwinter protein content of sagebrush (12.4%) was above levels reported for other species, including curlleaf mahogany (10.6%), chokecherry (9.1%), cliffrose (8.4%), bitterbrush (8.3%), true mountain mahogany (7.7%), juniper (6.2%), gamble oak (5.4%), and dormant grass (3.7%) (Bissell et al. 1955; Smith 1952; Smith 1957; National Academy of Sciences 1964; and Dietz et al. 1962) (See Table 5). Welch et al. (1979) agree with Thompson et al. (1973) that a 9.5% crude protein level of 55% digestibility will maintain most wintering mule deer. Of the species mentioned above, only big sagebrush and curlleaf mahogany met or exceeded the protein needs of wintering mule deer. They pointed out that, with a 12.4% midwinter crude protein content and a 0.53 coefficient of digestion, big sagebrush will help raise the dietary crude protein level of wintering mule deer.

Table 1. In Vitro Digestibility of Shrub Dry Matter by Mule Deer Inoculum.

Shrub	Dry Matter Digestibility (expressed as %)
Big Sagebrush	58.4
Aspen	57.4
Rose	54.5
Serviceberry	54.5
Curlleaf Mahogany	53.5
Chokecherry	51.3
Russet Buffaloberry	49.6
Willow	46.5
Snowberry	41.0
Blueberry	33.3
Bitterbrush	30.0
Mountain Mahogany	28.5

Source: Welch and McArthur, 1979
References cited in above work.

Table 2. In Vivo Digestibility of Shrubs by Mule Deer.

Shrub	Total Digestible Nutrients (expressed as %)
Curlleaf Mahogany	64.8
Big Sagebrush	63.4
Mountain Mahogany	48.4
Cliffrose	47.2
Bitterbrush	46.0
Chokecherry	38.9
Oak	36.2

Source: Welch and McArthur, 1979.
References cited in above work.

Table 3. Average Percentages of In Vitro Digestible Dry Matter of Forage Plants Collected on Sheep Mountain (Wyoming) and Digested with Steer and with Elk Inoculum.

Plant Species/Date of Collection	Average Digestibility (expressed as %)
Bluebunch Wheatgrass:	
11-15-68	49.6
01-07-69	47.2
03-12-69	48.4
Bluestem Wheatgrass:	
11-15-68	43.4
01-07-69	50.4
03-12-69	52.3
Indian Ricegrass:	
11-15-68	47.0
01-07-69	47.0
03-12-69	49.0
Needle-and-Thread:	
11-15-68	45.5
01-07-69	48.1
03-12-69	51.9
Common Sunflower:	
11-15-68	50.4
01-07-69	44.2
03-12-69	44.1
Antelope Bitterbrush:	
11-15-68	22.2
01-07-69	23.4
03-12-69	24.7
Rubber Rabbitbrush:	
11-15-68	47.0
01-07-69	43.9
Big Sagebrush:	
11-15-68	47.7
01-07-69	52.8
03-12-69	59.2

Source: Ward, 1971.

Table 4. Average Percentages of In Vitro Digestible Dry Matter of Forage Plants Collected From Savage Run and From Deerhorn-Elkhorn Point (Wyoming) and Digested With Steer Inoculum and With Elk Inoculum.

Plant Species/Date of Collection		Average Digestibility (expressed as %)
Savage Run:		
Bluebunch Wheatgrass	03-06-69	43.4
Cheatgrass Brome	03-06-69	56.7
Indian Ricegrass	03-06-69	46.3
Saskatoon Serviceberry	03-06-69	34.2
Red-Osier Dogwood	03-06-69	40.2
Antelope Bitterbrush	03-06-69	33.2
Big Sagebrush	03-06-69	59.6
Deerhorn-Elkhorn Point:		
Bluebunch Wheatgrass	12-02-68	46.2
	12-19-68	46.6
Antelope Bitterbrush	12-02-68	24.0
Big Sagebrush	12-19-68	49.5

Source: Ward, 1971.

Table 5. The Ability of Shrubs to Meet the Protein Requirements of Wintering Mule Deer.

Shrub	Actual Crude Protein	Coefficient of Digestion	Protein Requirement	Meets or Exceeds Requirement
Big Sagebrush	12.4 %	0.533	9.7 %	Exceeds
Curlleaf Mahogany	10.6	.543	9.6	Exceeds
Chokecherry	9.1	.484	10.7	Deficient
Mountain Mahogany	7.7	.457	11.4	Deficient
Bitterbrush	8.3	.473	11.0	Deficient
Cliffrose	8.4	.398	13.1	Deficient
Dormant Grass	3.7	.316	16.5	Deficient
Juniper	6.2	.102	50.9	Deficient
Gamble Oak	5.4	.107	48.6	Deficient

Source: Welch and McArthur, 1979.
7 studies cited in above work.

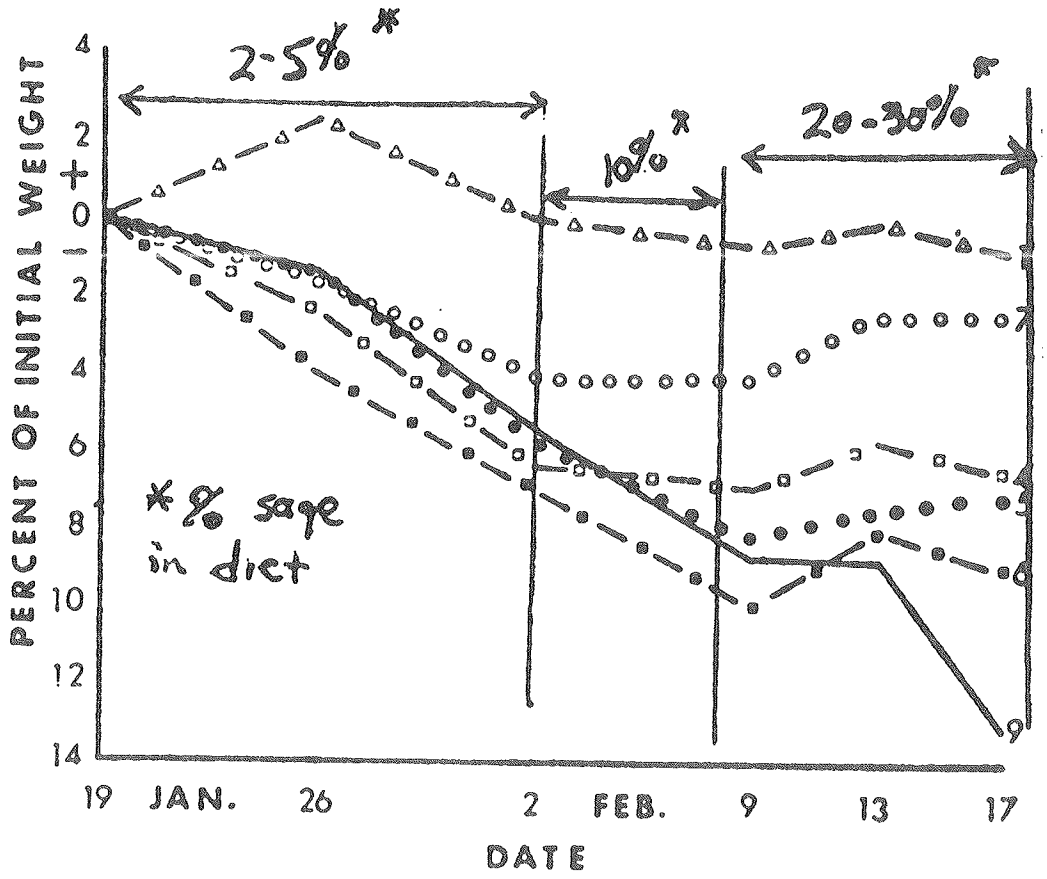

Fig. 1. Weight Changes For Six Mule Deer At Pasture During 30-Day Period.

(Carpenter, et al. 1979)

Research conducted in Utah on nutrition requirements of domestic sheep (Cook and Harris 1968) show that shrubs (as a group including big sagebrush) provide the necessary protein levels required for gestation and lactation (Figure 2)--forbs and grasses exhibited deficiencies in both areas. Further, they found the shrub group provided more adequate levels of both phosphorus (important for antler development and metabolism, among other things) and carotene (important source of vitamin A) than either forbs or grasses (Figures 3 and 4). Only in the area of digestible energy were shrubs generally providing less than the other groups (Figure 5).

PREFERENCE

Mule deer often utilize sagebrush to varying degrees relative to their use of other available species. From fall through spring I have not found deer avoiding sagebrush even though they at times make much greater use of species they apparently find more desirable.

A number of researchers (Smith 1950; Nagy et al. 1964; Nagy and Tengerdy 1968; Dietz and Nagy 1976) feel that because of low "palatibility", mule deer only consume sagebrush in late winter or early spring after the more preferable browse has been eaten. The inference of these reports is that mule deer

(Cook & Harris 1968)

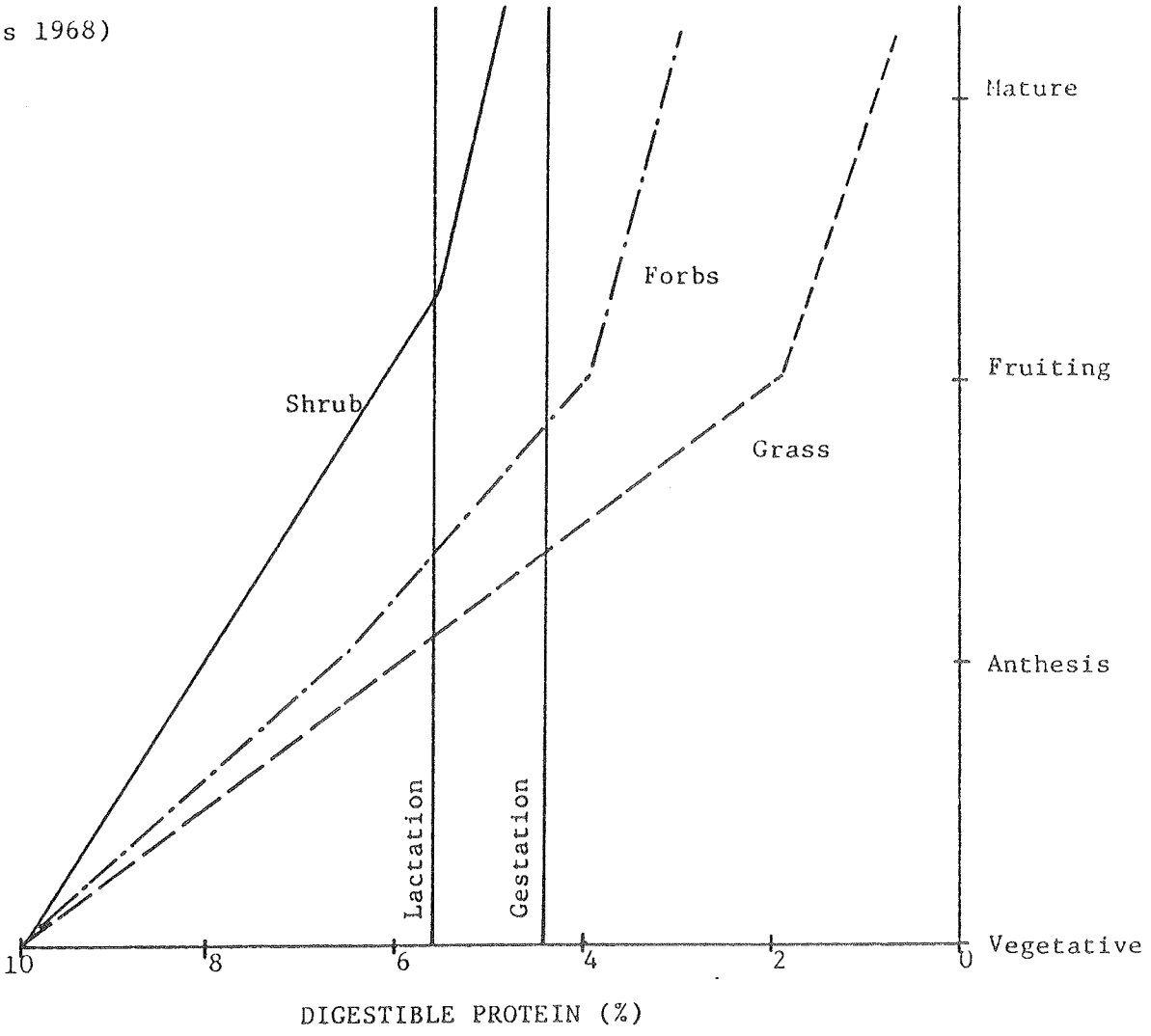

Fig. 2. The Correlation Between Digestible Protein (%) and Plant Phenology As It Relates To Gestation And Lactation In Domestic Sheep.

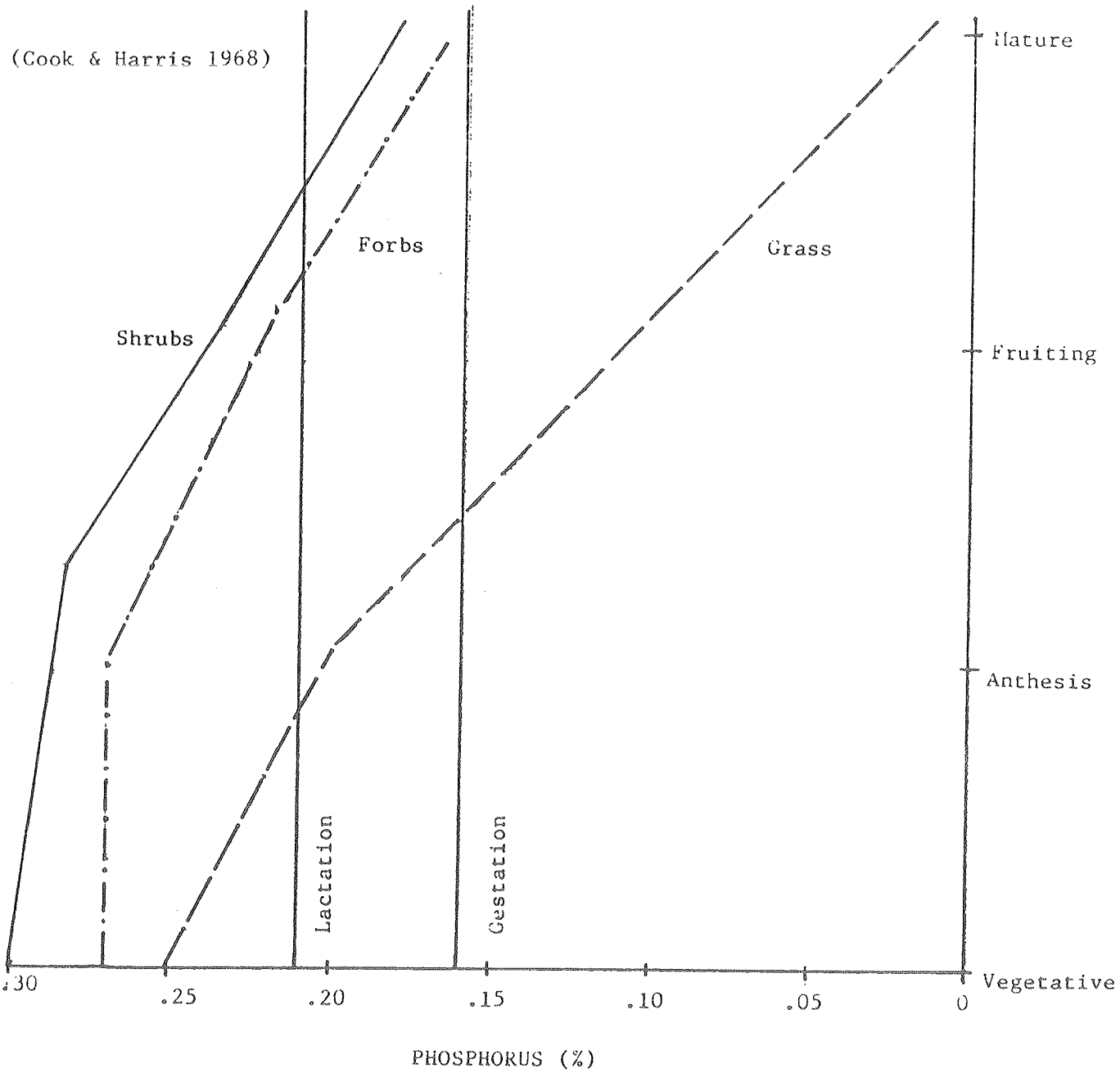

Fig. 3. The Correlation Between Phosphorus (%) And Plant Phenology As It Relates To Gestation And Lactation In Domestic Sheep.

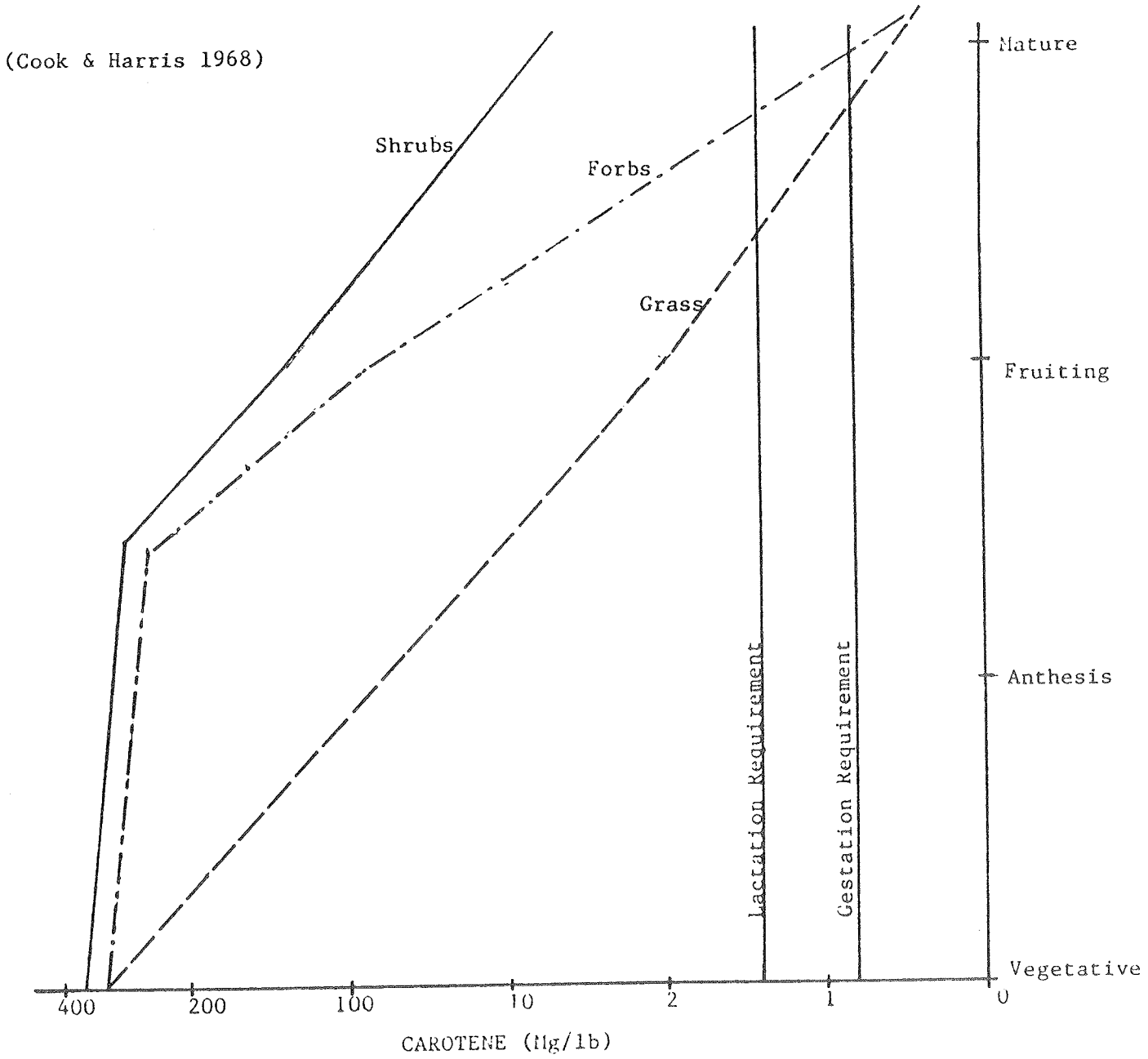

Fig. 4. The Correlation Between Carotene (Mg/lb) And Plant Phenology As It Relates To Gestation And Lactation In Domestic Sheep.

(Cook & Harris 1968)

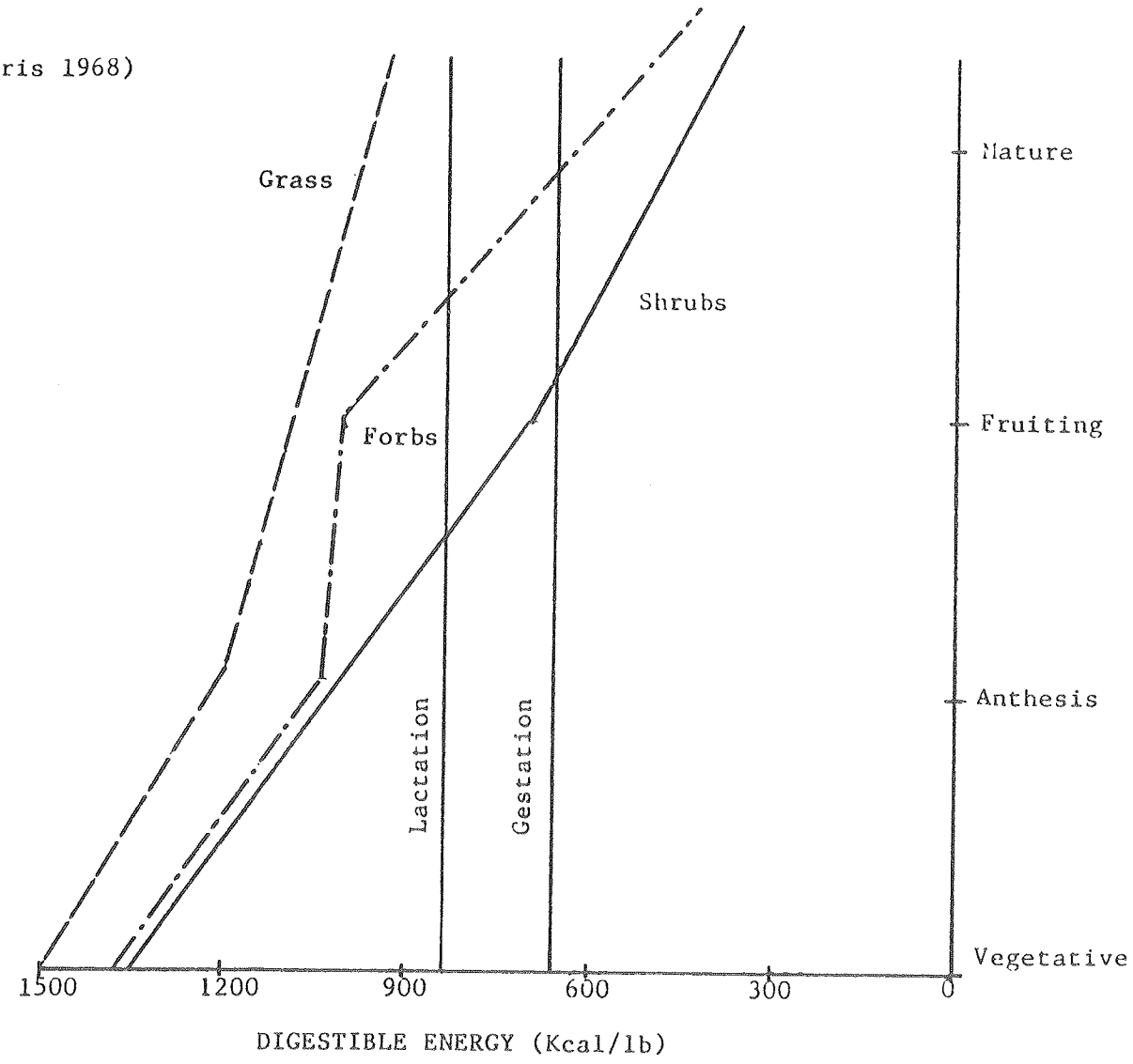

Fig. 5. The Correlation Between Digestible Energy (Kcal/lb) and Plant Phenology As It Relates To Gestation And Lactation In Domestic Sheep.

will not consume sagebrush until it is nearly the only item left available. This contrasts with findings by other researchers (e.g., Welch and Andrus 1977) who found that vaseyana big sagebrush was heavily browsed soon after deer arrived on the winter range in one study area--other browse species were not utilized until later. In a further study, Welch et al. (1981) reported[1] deer utilized more than 50% of the current year's growth of four accessions of big sagebrush before the start of winter. Research on the preferability of of several Artemesia species (Sheehy 1975), shows deer readily made use of sagebrush even though other foods such as grain, alfalfa and alfalfa pellets were made available to them. Other workers (Medin 1980 and Kufeld et al. 1973) report significant use of sagebrush during various periods of the year besides winter despite the ready availability of other desirable plant species. I also have observed deer feeding significantly on sagebrush from fall through spring when other desirable species were available. One deer rumen I collected during April, when forb and grass green-up were abundant, contained 30% sagebrush. This mule deer was a healthy adult animal prior to being killed by a mountain lion.

It is apparent that deer will utilize sagebrush during the fall-spring period when other species are available. Deer, however, are possibly like most animals, including humans--there are certain items of food that we and they prefer to eat over others. This preference often has no correlation with the nutritional value or digestibility of the food item.

Deer exhibit a diversity of preference for the variety of big sagebrush. One study (Sheehy and Winward 1981) found mule deer preferred low sagebrush (Artemesia arbuscula), Mountain Big Sage (A. tridentata ssp. vaseyana), Foothill Big Sage (variety of vaseyana), and Bolander Silver Sage (A. cana spp. bolanderi) (Table 6). They showed an intermediate preference for Basin Big Sage (A. tridentata ssp. tridentata) and Wyoming Big Sage (A. tridentata spp. wyomingensis), and least preference for Black Sagebrush (A. nova). They and other researchers found preference for taxa varied widely among accessions of sagebrush within the same species or sub-species. In other words, vaseyana sagebrush from one area might be highly sought after, but only lightly utilized in another area. This variation in use is occasionally observed between similar plants on the same site. While the actual reason why one plant or set of plants are selected over others is not well understood, Sheehy and Winward (1981) produced evidence they felt links this variation to each plant's genetic makeup. Although there is some disagreement as to the role of volatile oils and selection, there is significant evidence that preference is not directly tied to monoterpenoid content (Welch et al. 1981). Welch and McArthur (1979) point out that since variation in selection does occur among accessions of big sagebrush, one should not jump to hasty conclusions about desirability for any taxon without taking that variability into account.

SUMMARY

The literature clearly provides a basis of fact that sagebrush is a nutritional and digestible forage source for mule deer. The premise that sagebrush is detrimental to deer if it makes up the majority of that animal's diet is unfounded. Animal condition (fat reserves) upon entering the winter season is a critical factor in determining over-sinter survival. However,

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[1] Similar plants, but taken from different collection sites; a probable variation of ecotypes or genotypes.

Table 6. Mule Deer Preference for Various Varieties of Big Sagebrush.

High Preference	Moderate Preference	Least Preference
Low Sagebrush (A. arbuscula)	Basin Big Sagebrush (A. tridentata spp. tridentata)	Black Sagebrush (A. Nova)
Mountain Big Sagebrush (A. tridentata spp. vaseyana	Wyoming Big Sagebrush (A. tridentata spp. wyomingensis)	
Foothill Big Sagebrush (variety of vaseyana)		
Bolander Silver Sagebrush (A. Cana spp. bolanderi)		

Source: Sheehy and Winward, 1981.

winter ranges with forage plants high in nutritional quality will help big game animals maintain their physical condition and lessen the drain on their fat reserves. Big sagebrush, commonly found on many of Montana's winter ranges, is a key component in providing this important winter sustenance.

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