TOPIC 1. CATEGORIES OF ACTIVITIES

Bedding and standing are two basic postures assumed by wild ruminants. There are a large number of references to bedding habits but few that describe standing habits. Walking and running are activities which involve locomotion. There are various gaits and speeds which may be employed. Foraging is a special category by itself because of its importance as a life-support activity.

All individuals participate in most if not all of the activities in these three categories each day. They bed down and rest for part of each day, maintaining various levels of alertness while bedded. They stand for part of each day, sometimes loitering and sometimes alert. They often ruminate while bedding and standing. When they are not bedded or standing, they are moving about. Locomotion may be slow and intermittent as in foraging, slow and steady as in walking, or fast as in trotting, running or bounding.

Sometimes they play, especially the young, with considerable running and jumping. All of these behaviors require the expenditure of energy for muscle tone and for the movement of mass through distance, and descriptions of them are useful when quantifying energy expenditures.

Grooming, urination, and defecation may be considered as maintenance activities. They are necessary activities each day and are usually completed while the animal is standing. Social and other activities are introduced here and discussed further in CHAPTER 5. They involve interactions between individuals in a population or group within a population, such as an age group, herd, or harem. Social activities may involve activities as subtle as head posture or as obvious as playing and frolicking with total abandon.

The physical facts--what few there are--about these activities are discussed in the UNITS which follow. Basic postures--bedding and standing--are discussed in UNIT 1.1. Locomotion--walking and running--is discussed in UNIT 1.2. Foraging--which involves both standing and walking--is discussed in UNIT 1.3, maintenance activities in UNIT 1.4, and social and other activities in UNIT 1.5.

UNIT 1.1: BASIC POSTURES

Wild ruminants bed down and stand in place, without locomotion, at various levels of alertness. Bedding is an easily-recognized activity, and is relatively easy to quantify in terms of energy costs. Standing is not so easily quantified because it may be intermittent with foraging, walking, or running.

Bedded wild ruminants place their legs in different positions, with apparent thermoregulatory effects in some cases. In warm weather, the legs may be extended with the forelegs out in front, much like a dog. They may lie on their side with all four legs extended. Geist (1963) illustrates these postures for moose. In cold weather, the legs are usually tucked under the body, often very tightly. Slight differences in the spacing of the legs result in different amounts of contact by the underside of the body with the ground. The legs can function like "runners," adjustable for distance apart. Raising the body off the ground results in maximum reduction of heat loss to the snow. Further, vasoconstriction in the legs (very difficult to measure) may be employed, reducing temperature gradients between animal and substrate as uncompressed hair is a better insulator than compressed hair.

Bedding apparently involves physical comforts too. Deer sometimes paw the ground before lying down. Bighorn sheep usually scratch in the bed first (Geist 1971). McLean (1940) describes how a very large mule deer buck that was lying down under a juniper got up and pawed some small rocks out of the bed, repeating that three times before being satisfied to remain bedded. I have observed whitetails bedded down for hours, rise to stretch and turn, and bed down in the same bed again.

Bedding may be accompanied by various levels of alertness, and by rumination (see UNIT 1.3). Bedded animals may be quite alert, with head up, ears erect, and eyes wide open, or very unalert and appearing to sleep. Differences in levels of alertness also appear to exist among days; deer seem to be hyperalert on some days for reasons I cannot yet explain. This was discussed briefly in CHAPTER 3, TOPIC 1. There are seasonal differences in levels of alertness that seem to accompany the metabolic rhythms. Winter is a time of depressed metabolism (see PART III, CHAPTER 7) and the general level of alertness appears to be less at times than in the summer. Similar changes are evident in black bears, which do not hibernate, but become lethargic and conserve considerable energy by remaining inactive, depressing metabolism, and depressing rectal temperatures.

Deer often urinate and defecate in the bed when they get up. Sheep and goats do too, and since their beds are used repeatedly, nutrients are concentrated there and earlier and more lush plant growth occurs the following spring. The effect on plant growth is so obvious that bedding sites can be identified as green spots on the mountains for a couple of weeks in early spring (Geist 1971).

Wild ruminants sometimes stand in place, doing little or nothing while simply "loitering" (Townsend and Smith 1933). Loitering has little or no social significance, other than that the animals are relaxed and unaware of danger. Townsend and Smith observed that loitering usually occurred in a sunny area.

Bedding patterns are used in analyses of energy metabolism in PART III, CHAPTER 7 and thermal exchange in PART V, CHAPTER 16. The proportion of time spent in bedding is discussed in TOPIC 2 and used when calculating activity costs and thermal exchange in CHAPTER 7. Standing activities are used in analyses of energy metabolism in PART III, CHAPTER 7 and thermal exchange in PART V, CHAPTER 16. The proportion of time spent in standing is discussed in TOPIC 2 and used when calculating activity costs and thermal exchange in CHAPTER 7.

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Townsend, M. T., and M. W. Smith. 1933. The white-tailed deer of the Adirondacks. Roosevelt Wild Life Bulletin 6(12):153-325.

REFERENCES, UNIT 1.1

BASIC POSTURES

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ECOLA	53--2	262	270	odvi	activ patt, fawns, s texas	jackson,rm; whit/	1972
JWMAA	27--3	422	427	odvi	nocturnl move, activ rhyth	montgomery,gg	1963
PCGFA	18---	140	152	odvi	telem, movem, behav, flori	jeter,lk; marchin	1964
RWLBA	6---2	153	325	odvi	w-t deer of the adirondcks	townsend,mt; smit	1933
TISAA	62--2	117	119	odvi	day location, beds, fawns	kjos,cg; montgome	1969

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AZWBA	3---	1	109	odhe	mule de, arizona chaparral	swank,wg	1958
CAFGA	20--3	181	282	odhe	life hist, food hab, calif	dixon,js	1934
CAFGA	26--2	139	166	odhe	calif deer, rcky mt mule d	mcclean,dd	1940
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966
JWMAA	41--1	150	151	odhe	birth, first day behavior	truett,jc	1977

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	9---4	295	319	ceel	roosvlt elk, olympic penin	schwartz,je,II; m	1945
JWMAA	15--4	396	410	ceel	biology of the elk calf	johnson,de	1951

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	392	399	alal	observ in yellowstone park	mcmillan,jf	1954
BEHAA	20--3	377	416	alal	behavr no amer moose in bc	geist,v	1963
CAFNA	92--2	189	192	alal	late wintr bedding practic	mcnicol,jg; gilbe	1978
JWMAA	35--1	63	71	alal	telemetry, neast minnesota	vanballenberghe,/	1971
MSFFA	35---	95	100	alal	diurnal activity of moose	geist,v	1959
NCANA	95--5	1153	1157	alal	[number beds per day,wntr]	desmeules,p	1968
TLPBA	14--1	76	104	alal	time-energ budget of a moo	belovsky,ge; jord	1978

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
UABPA	3----	1	44	rata	behavior, barrn-gr caribou	pruitt,wo,jr	1960

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	3----	1	28	anam	literature review,behavior	prenzlow,ej	1965
CGFPA	17---	1	16	anam	some behavior patterns of	prenzlow,ej; gil/	1968

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				bibi			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JOMAA	19--1	88	94	ovca	summer activity yellowston	davis,wb	1938
JWMAA	34--2	446	450	ovca	mvmnt,behav,smmr rang, wyo	woolf,a; oshea,t/	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CAFNA	81--1	1	22	oram	obsrvtns,kootenay nt pk,bc	holroyd,jc	1967
CGFPA	8----	1	23	oram	literature review, ecology	hibbs,ld	1966

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Skinner, M. P. 1924. The American Antelope in Yellowstone National Park. Roosevelt Wildl. Forest Expt. Sta., Syracuse, N.Y. 32 p.

CHAPTER 4, Worksheet 1.1a

Activity-times in the two basic postures

Descriptions of activity-times in the literature are often short on detail. The minimum detail necessary to begin analyses of activity patterns is the determination of times "up and down." Evaluate references describing activities of wild ruminants by recording data in the columns below. If information is given for different levels of activity or locomotion, use WORKSHEET 1.2a rather than this one.

GESP	JDAY	Time up	Time down	Reference

GESP	JDAY	Time up	Time down	Reference

UNIT 1.2: LOCOMOTION

Locomotion includes walking, running, jumping, and climbing. These whole-body movements occur at different rates of speeds, with changes in speed affecting the gait used. Gaits and ways in which they are used are also characteristic of the species.

Walking is an activity of wild ruminants that is part of daily maintenance. Walking is defined as movement occurring when at least two of the feet are on the ground at the same time, whereas running results when one, two or three feet are on the ground at the same time, except when bounding. Running occurs in several different ways. A "trotting" gait may be used when an animal is moving away but not at top speed. Caribou, elk, and moose move very gracefully in this way. It is a fluid gait, similar to that of trotting horses. High speeds are attained by various methods. White-tailed deer bound for several meters, with their feet touching the ground in sequence rather than simultaneously. Mule deer also bound for several meters too, but their feet land simultaneously and the next bound is made as all four legs spring together, like domestic sheep do. The differences between bounding white-tails and mule deer are striking when observed in the field.

Wild ruminants have structural characteristics and skills for movement suitable for the places in which they live. Wild sheep and mountain goats, which live in rugged topographies, have particularly good agility and senses of balance that enable them to move well over steep gradients, and hooves that are well-designed for gripping rugged rocky topography. Geist (1971) calls mountain goats "methodical climbers" who rarely jump or run.

Caribou have large hooves (see Thing 1977 and additional references listed in PART I, CHAPTER 1, UNIT 2.1) compared to those of other ruminants of similar body size, providing some advantages in moving through snow and less tendency to sink on wind-packed snow.

Walking and running speeds are not well-known for wild ruminants, even though measurements of speeds are very simple in the field. Those of us that spend considerable time in the field should take advantage of opportunities to measure speeds when we see animals walking or running between identifiable points in the field. A stopwatch is all that's needed to measure the time spent moving between points, followed by measurement of distances between points. Speed may be calculated by:

$$\text{speed} = \text{distance}/\text{time}$$

Boertje (1981) used 3.22 km per hr as the average walking speed of caribou based on data for reindeer in Norway. The speed of walking is an important parameter because energy expenditure was a direct linear function of the speed of elk (Robbins et al. 1979).

Loose snow presents a barrier to walking. Increasing depths cause the animals to lift their legs higher (see PART I, CHAPTER 1, UNIT 2.2). In

deep snow, white-tailed deer bound, as do bighorn sheep, but mountain goats plow through it at a walk (Geist 1971). All species will struggle and bound when mired in deep snow, but this very costly activity can continue for a limited time only.

I observed an interesting pattern of white-tailed deer movement through snow in northern Minnesota after fresh snow had accumulated to about 45 cm. A doe and fawn had crossed a plowed road, leaving easily-identified hoof prints. As they entered the woods, the doe continued to walk, dragging her hooves, but the fawn was forced to bound as the 45 cm snow depth was too great to walk through. Thus two deer moved through the same snow but at greatly different activity costs. The social tie was costly to the smaller deer.

Running by wild ruminants is usually thought of as escape behavior. Gaits vary, from a steady trot to long leaps and bounds. Leaps, bounds, and jumps of some wild ruminants can be rather impressive. Leaps of 16 feet (4.9 m) or more are reported for black-tailed deer by Cowan (1956). I have measured leaps of 24 feet (7.4 m) for white-tailed deer. Severinghaus and Cheatum (1956) report running broad jumbs by whitetails of 29 feet (8.9 m) over a 7.5 foot high (2.3 m) windfall, and vertical jumps of 8.5 feet (2.6 m). A bighorn ram in captivity cleared 7.5 feet (2.3 m) (Geist 1971).

How fast can wild ruminants run? Actual measurements are few under natural conditions. Boertje (1981) used Thomson's average trotting/galloping speed of 12 km/hr (7.5 mph) for reindeer in Norway. Wild bison in Wood Buffalo National Park attained a top speed of 56 km/hr (35 mph) (Fuller 1960). Black-tailed deer have been clocked at 14.9 km/hr (24 mph) (Cowan 1956). Murie (1951) cites Cowan (1947) as stating that elk were clocked at speeds up to 45-46 km/hr (28-29 mph).

I observed an interesting chase across a field in western Minnesota some years ago. Two deer, appearing to be a doe and fawn , came over a hill very close to me at high speed. When they came to a 3-strand barbed wire fence bordering a field and adjacent wildlife management area, the doe easily leaped over but the fawn scooted under the lowest strand without breaking stride. A few hairs were found on the wire, and the wire was only 20 inches (51 cm) off the ground! A dog followed in futile pursuit, for the snow barely covered the ground and escape was easy.

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REFERENCES, UNIT 1.3

LOCOMOTION

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953
aubo	stac	hapa	225	anam	hunting pronghorn antelope	popowski,b	1959

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ECOLA	53--2	262	270	odvi	activ patt, fawns, s texas	jackson,rm; whit/	1972
FEPRA	33--2	250	250	odvi	thyroxin lev, seasn, matur	byrne,jj; reinek/	1974
JWMAA	27--3	422	427	odvi	nocturnl mvmnt,activ rhyth	montgomery,gg	1963
PCGFA	18---	140	152	odvi	telem, movem, behav, flori	jeter,lk; marchin	1964

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CAFGA	26--2	139	166	odhe	calif deer, rcky mt mule d	mclean,dd	1940
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	15--4	396	410	ceel	biology of the elk calf	johnson,de	1951
JWMAA	43--2	445	453	ceel	energy expenditure, calves	robbins,ct; cohe/	1960
ZOOLA	41--8	65	71	ceel	pattrns,hrd beh,free-rngng	altmann,m	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	393	399	alal	observ in yellowstone park	mcmillan,jf	1954
BEHAA	20--3	377	416	alal	behavior, north america	geist,v	1963
JWMAA	35--1	63	71	alal	radiotelemetry, ne minneso	van ballenberghe/	1971
TLPBA	14--1	76	104	alal	time-energ budget of a moo	belovsky,ge; jord	1978
ZOOLA	41-14	105	118	alal	ecol,behav,pop dynam,wyomi	denniston,rh,II	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
UABPA	3----	1	44	rata	behavior, barre gr caribou	pruitt,wo,jr	1960
UABPA	18---	1	41	rata	behv, mechn, ener, cratrng	thing,h	1977

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	3----	1	28	anam	literature review,behavior	prenzlow,ej	1965
CGFPA	17---	1	16	anam	some behavior patterns of	prenzlow,ej; gil/	1968
JWMAA	31--2	347	351	anam	innovatns, trappng, hndlng	spillett,jj; zobe	1967

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ATICA	13--1	3	19	bibi	behav, socl organiz, canad	fuller,wa	1960

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	34--2	446	450	ovca	mvmnt, behav,smmr rang,wyo	woolf,a; oshea,t/	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	8---- 1		23	oram	literature review, ecology	hibbs,ld	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JRMGA	19--4	200	204	doca	use of mountain slope	cook,cw	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JOMAA	41--1	112	112	mamm	locmtr speeds large nrthrn	pruitt,wo	1960

CHAPTER 4, Worksheet 1.2a

Locomotor activities of wild ruminants

Tabulate the following information as activity-times from references in the literature.

GESP	JDAY	Time bedded	Time active	Activity	Reference

GESP	JDAY	Time bedded	Time active	Activity	Reference

UNIT 1.3: FORAGING AND RUMINATION

Wild ruminants spend much of their active time foraging for food. They are usually very selective as they forage, choosing not only the kinds of plants but also the parts of plants to ingest. This is different from domestic ruminants which graze much less selectively, especially early in the grazing season. Later in the season, cattle avoid coarse stems and unpalatable forbs.

Bedded animals ruminate, or "chew their cud." This may occur during a large proportion of the time spent bedded. A deer observed by McLean chewed its cud an average of 33 chews to a cud (R = 29-37). Rumination patterns are discussed in PART III, CHAPTER 6, UNIT 1.1.

Wild ruminants alter their foraging behavior in response to range conditions. In early spring when small areas of new plant growth appear between snow patches, the animals actively seek the green succulent forage. This preferred forage is present in small quantities early in the growing season. Later, when there is an abundance of new growth, foraging periods are interrupted with periods of loitering and other non-foraging behavior.

Wild ruminants are usually quite alert when foraging, looking about frequently. When there are several in a group, they collectively provide almost continuous coverage of the surrounding area. Their alertness varies between days, conditions, age, sex, reproductive status, and other factors. The learned experiences of individuals are also important. If snowmobiles have been associated with a supply of artificial feed, then deer will be attracted to their noise. Chain saws used in felling trees have a similar effect as the tops of the trees become good sources of forage.

Bison in South Dakota learned to associate the sounding of a truck horn with their daily supply of hay in the winter, and I have observed them running from the surrounding hills to mill around the hay truck as the bales were dropped to the ground. Such artificial feeding was used as a management practice, keeping the bison in selected areas when there was snow on the ground. If they were not fed, they would tend to range more widely in search of snowless areas to forage in. Bison were quite migratory before settlers began using the land for farming and ranching, moving seasonally in relation to range conditions. Meagher (1973) indicates that in mild to average winters in Yellowstone, snow depths did not limit forage availability. They cleared snow up to 2.5 feet deep by swinging their heads in a sideways motion.

Foraging speeds are quite variable, depending on forage density, the time spent searching in relation to the time spent standing and eating. Boertje (1981) estimated the grazing speed of caribou to be 0.13 $\pm$ 0.08 km per hour.

Caribou are well-known for "cratering," or digging through the snow to feed on lichens. Removal of snow from an area about 0.50 meters in diameter to depths of 0.20 meters requires some effort. The energy cost of cratering

has been etimated by Thing (1977) who concluded that energy expenditure of free grazing during the early winter seems to be about the same as in the summer (229 kcal per hour of foraging). It does not seem right that the cost of grazing with snow present, resulting in 90 craters per day, should be no more than the cost of grazing in the summer. Since summer, early winter, and late winter costs were all estimated by calculations, it may be that the summer estimate was high, or that the early winter estimates were low. In late winter, when snow density was 0.32 gm cm^{-3}, cratering was estimated to cost 287 kcal per hour of foraging.

Wild ruminants on browse diets rise up on their hind legs to reach browse that is much higher (see CHAPTER 1, UNIT 2.2) than can be reached when standing on all four. This brings up an important point when defining the environment of an animal. The animal determines its environment by its abilities to relate to habitat components. If an animal stands on its hind legs to reach forage, its forage supply is enlarged accordingly.

Standing up on the hind legs is a learned behavior that can be used to advantage. It is an example of a behavioral act that is ultimately limited by physical capabilities and genetic characteristics in relation to current conditions. If the forage is so depleted that animals must reach for it, however, the range is overbrowsed.

A thick crust of snow and ice elevates the animals to a new height level. Crust conditions cannot be counted on, however, and the forage that is out of reach when standing at ground level should not be considered part of the forage supply. It is better to be conservative when evaluating the importance of these temporary advantages. Spiker (1933; 368) recognized the danger of a snow crust for white-tailed deer, pointing out that "The snow crust, however, is seldom thick enough to be generally dependable, and a deer in hasty flight may break through with possible injury to its legs."

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Spiker, C. J. 1933. Some late winter and early spring observations on the white-tailed deer of the Adirondacks. Roosevelt Wildl. Bull. 6(2): 327-385.

Thing, H. 1977. Behavior, mechanics, and energetics associated with winter cratering by caribou in northwestern Alaska. Biol. Pap. Univ. Alaska No. 18. 41 p.

REFERENCES, UNIT 1.3

FORAGING

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953
aubo	qupr	oton	166	obmo	muskoxen,biol,taxon,canada	tener,js	1965

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	27--3	422	427	odvi	nocturnl mvmnt, actv rhyth	montgomery,gg	1963
JWMAA	34--2	431	439	odvi	wint feeding pattr, penned	ozoga,jj; verme,l	1970
PCGFA	18---	140	152	odvi	telem, movem, behav, flori	jeter,lk; marchin	1964
RWLBA	6---2	327	385	odvi	wntr, sprng obsrv, adirndk	spiker,cj	1933
TISAA	62--2	117	119	odvi	day location, beds, fawns	kjos,cg; montgome	1969

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AZWBA	3---	1	109	odhe	mule de, arizona chaparral	swank,wg	1958
CAFGA	26--2	139	166	odhe	calif deer, rcky mt mule d	mclean,dd	1940
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966
ECMOA	15--2	109	139	odhe	ecol relns food, coast, bc	cowan,imt	1945
JOMAA	38--2	247	253	odhe	observatns, behavr, penned	browman,lg; hudso	1957
JWMAA	34--4	852	862	odhe	response kaibab deer,manag	hungerford,cr	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BEHAA	74--3	294	309	ceel	social rank & food access	appleby,mc	1980
JWMAA	9---4	295	319	ceel	roosvlt elk, olympic penin	schwartz,je,II; m	1945
JWMAA	15--4	396	410	ceel	biology of the elk calf	johnson,de	1951
ZOOLA	41--8	65	71	ceel	pattrns,brd beh,free-rngng	altmann,m	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	392	399	alal	observ in yellowstone prk	mcmillan,jf	1954
AMNAA	96--1	229	232	alal	clf learn eat by fllw mthr	edwards,j	1976
BEHAA	20--3	377	416	alal	behavior, north america	geist,v	1963
CAFNA	83--4	339	343	alal	observ, feeding on aquatic	ritcey,rw; verbee	1969
CAFNA	90--4	475	476	alal	behavior, calf, ontario	croskery,p	1976
CAFNA	92--3	252	258	alal	summer movements, feeding	joyal,r; scherrer	1978
ECOLA	34--1	102	110	alal	feeding habits, yellowston	mcmillan,jf	1953
IUNRA	24...	690	....	alal	social organization	geist,v,ed; houst	1974
JWMAA	35--1	63	71	alal	radiotelemet, ne minnesota	vanballenberghe,/	1971
MUZPA	25---	1	44	alal	moose of isle royale	murie,a	1934
TLPBA	14--1	76	104	alal	time-energ budget of a moo	belovsky,ge; jord	1978
VLUBB	22-15	74	82	alal	[elk behav, leningr, russ]	timofeeva,ek	1967
ZOOLA	41-14	105	118	alal	ecol,behav,pop dynam,wyomi	denniston,rh,II	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
NPOAA	1974-	129	138	rata	mnth patt, feed intk, rein	nyholm,es	1976
UABPA	3----	1	44	rata	behavior, barren gr caribo	pruitt,wo,jr	1960
UABPA	18---	1	41	rata	behv,mechan, enrg, cratrng	thing,h	1977

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	3----	1	28	anam	literature review,behavior	prenzlow,ej	1965
CGFPA	17---	1	16	anam	some behavior patterns of	prenzlow,ej; gil/	1968
JAPEA	12--2	411	420	anam	doca, compar foragng behav	ellis,je; travis,	1975

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
NPSMD	1----	1	161	bibi	bison, yellowstone nat prk	meagher,mm	1973
PIAIA	76---	245	262	bibi	bull behavior traits	herrig,dm; hauge	1969

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JOMAA	18--2	205	212	ovca	prelim study, yllwstn n pk	mills,hb	1937
JOMAA	19--1	88	94	ovca	summer activity, yellowstn	davis,wb	1938
JWMAA	34--2	446	450	ovca	mvmnt, beha, smmr rang,wyo	woolf,a; oshea,t/	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				ovda			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	40--1	151	162	obmo	rata, sum rang reltns, nwt	wilkinson,pf; sh/	1976
PASCC	21---	122	122	obmo	rata, snow cover, foraging	lent,pc; knutson,	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	37--3	353	362	oram	forage, habit pref, alaska	hjeljord,o	1973

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JRMGA	19--4	200	204	doca	use of mountain slope	cook,cw	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CJZOA	53--4	378	384	ungl	activ pat at mineral licks	carbyn,ln	1975

CHAPTER 4, Worksheet 1.3a

Foraging times of wild ruminants

References containing information on the five major activities--bedding, standing, walking, foraging, and running--may be tabulated here.

GESP	JDAY	BDNG	STNG	WKNG	FGNG	RNNG	References

GESP	JDAY	BDNG	STNG	WKNG	FGNG	RNNG	References

CHAPTER 4, Worksheet 1.3b

Equations representing activity patterns through the year

The tabular data in the previous WORKSHEET should be evaluated for possible representation with equations as discussed in Moen (1978). Derive the equations and complete the numerical statements below for the fraction of each day spent in the five different activities.

FTBD =

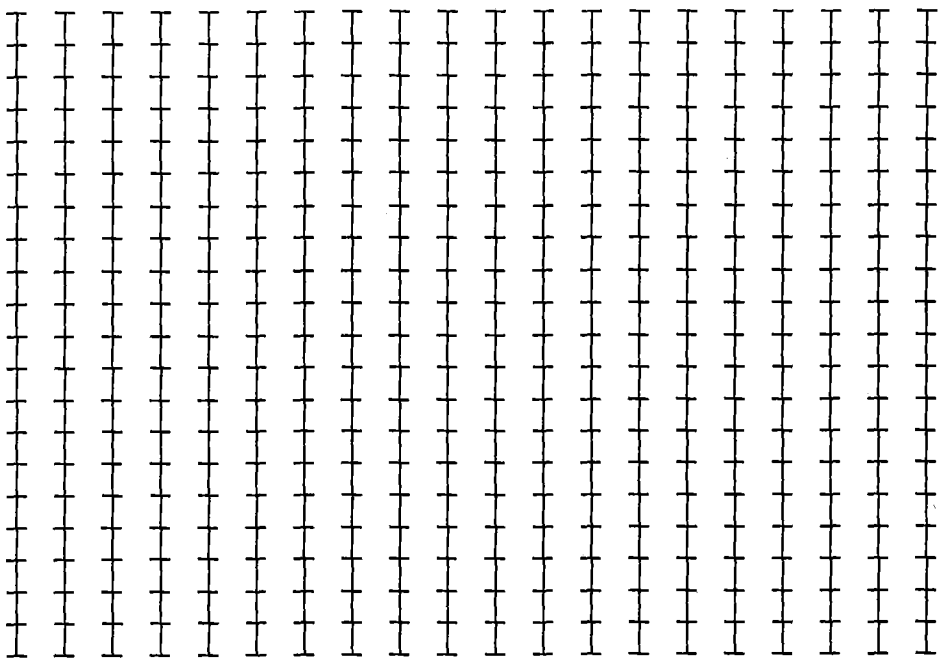
FTSD =

FTWD =

FTFD =

FTRD =

Plot the patterns below. Additional grids are on the next page.



Literature Cited

Moen, A. N. 1978. Seasonal changes in heart rates, activity, metabolism, and forage intake of white-tailed deer. J. Wildl. Manage. 42(4):715-738.

UNIT 1.4: MAINTENANCE ACTIVITIES

Grooming, urinating, and defecating are part of daily body maintenance. Grooming often occurs when animals rise leisurely fter a bedding period. Various parts of the body may be licked. Sometimes posts or trees are used for rubbing, which may be part of grooming. Other "comfort movements" may also be considered a part of grooming and maintenance behavior. An animal may arise from its bed, stretch, yawn, shake, urinate, defecate, lick parts of its body, and scratch or rub itself or on another object.

Geist (1963) noted that rubbing of the velvet-covered antlers was the most commonly seen comfort movement among bulls in spring and summer. They usually rubbed the antler tips on a raised hind leg rather than on a hard object such as a dead branch. One can logically surmise that the growing antlers "itch" because the use of a hind leg as a rubbing post stops after the velvet has been shed. The use of a hind leg as a rubbing post allows the moose to have more control over the pressure exerted than if it were rubbing on a foreign object such as a branch. This is important in order to avoid damage to the antlers.

Urinating and defecating are maintenance activities that may occur at any time, but usually occur at the beginning or end of an activity period in moose (Geist 1963) and in other wild ruminants too.

Urination and defecation postures in moose are described by Geist (1963). He noted that the urination posture is very rigid, and is dominant over feeding and walking. Defecation may occur while feeding or walking, an observation on moose that also applies to white-tailed deer from my observations. Geist observed that moose may urinate on their hind legs when alarmed, but did not observe rub-urinating as reported by Müller-Schwarze (1971) for black-tailed deer and my observations of white-tailed deer.

Urinations also occur in scrapes, wallows, and rutting pits. Geist (1963) reports this for moose and Severinghaus and Cheatum (1956) for white-tailed deer. This is discussed further in UNIT 1.5.

LITERATURE CITED

Geist, V. 1963. On the behaviour of the North American Moose (Alces alces andersoni Peterson 1950) in British Columbia. Behaviour 20(3/4):377-415.

Müller-Schwarze, D. 1971. Pheromones in black-tailed deer (Odocoileus hemionus columbianus). Animal Behaviour 19(1):141-152.

Severinghaus, C. W. and E. L. Cheatum. 1956. The white-tailed deer. Pages 57-186 In The Deer of North America, W. P. Taylor, Ed. The Stackpole Co., Harrisburg, PA. 668 p.

REFERENCES, UNIT 1.4

MAINTENANCE ACTIVITIES

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				odvi			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ANBEA	19--1	141	152	odhe	pheromones in black-t deer	muller-schwarze,d	1971
CAFGA	26--2	139	166	odhe	calif deer, rcky mt mule d	mclean,dd	1940
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966
ECMOA	15...	109	139	odhe	ecol relns food, coast, bc	cowan,imt	1945
JOMAA	38--2	247	253	odhe	observatns, behavr, penned	browman,lg; hudso	1957

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				ceel			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--3	392	399	alal	some obsrvatns, yellowston	mcmillan,jf	1954
BEHAA	20--3	377	416	alal	behavr no amer moose in bc	geist,v	1963
ZOBEA	12--2	219	250	alal	ethologcl obsrvtns, n amer	geist,v	1966

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CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

                      rata


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

AMNAA 43--2 257  354  anam lif hstry,ecol,rng use,tex buechner,hk       1950

CGFPA 3---- 1    28   anam literature review,behavior prenzlow,ej      1965
CGFPA 17--- 1    16   anam some behavior patterns  of prenzlow;ej gil/ 1968


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

                      bibi


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

JOMAA 19--1 88   94   ovca summer activity yellowston davis,wb         1938


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

                      ovda


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

                      obmo


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

                      oram


CODEN VO-NU BEPA ENPA ANIM KEY WORDS---------------- AUTHORS---------- YEAR

ZETIA 43--2 188  213  mure socl behav captiv muntjacs barrette,c       1977
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UNIT 1.5: SOCIAL AND OTHER ACTIVITIES

Social activities of wild ruminants include playing, which is age and time-of-year dependent, fighting, reproductive activities, which are sex, age and time-of-year dependent (discussed in CHAPTER 5, TOPIC 1), and various levels of gregariousness that are species and time-of-year dependent.

Play, or "ludic behavior" (Berlyne 1960), is interesting behavior to observe because it seems to be so enjoyed by the participants. Play is not a matter of immediate life or death, but is a voluntary activity that seems to have "enjoyment" as its main purpose. It is more common for the young of a species to play than for the adults, but play behavior may occur in all ages.

What is the significance of play? Since play behavior incorporates actions used in later life when developing social rankings and escape from predators, it is important for developing action and reaction programs (Geist 1971) to be stored in their memories. Another potentially significant importance of play is given by Geist concerning the need to put stress on bones for proper growth. Thus animals which exercise frequently should have a more optimally functioning skeleton. He noted a surprisingly high frequency of broken legs among Banff bighorns, and ". . . a low quality population with somewhat listless lambs . . ." Muller-Schwarze (1978) concluded that play is related to a general readiness to be active. Individuals with less than adequate energy intakes would be expected to play less then, an hypothesis that seems to be borne out by field observations.

Play behavior of white-tailed deer includes running, jumping, chasing, playful fighting, and other interactions that appear to be done for the sheer joy of doing them. Fawns will play until panting for breath, and sometimes stimulate adults to play too. I have observed adult deer playing in the shallow water of a lake on a hot summer day, running and splashing in the water like children. Similar accounts of playing both on land and water are given by Severinghaus and Cheatum (1956).

Geist (1971) notes such activities as running, frolicking, bounding into the air, turning about, etc. as part of the play behavior of wild sheep. Lambs begin playing within a few hours after birth. Adult sheep rarely play, and ewes play less than rams. Play was more common on cool than hot summer days, and rare in winter.

There is a near elimination of play behavior in the winter by white-tailed deer (Moen 1978). Such a response appears to be part of the energy conservation adaptation employed in the winter. Snow conditions can markedly increase energy expenditures; a reduction in activity and avoidance of high-cost behavior acts is logical. Play seems to be the first activity to go, and running is done only when necessary to escape predators or other harrassments.

Play, then, appears to be common among juveniles, less common among adults, and very rare in the winter.

LITERATURE CITED

Berlyne, D. E. 1960. Conflict, Arousal and Curiosity. McGraw Hill Book Co., New York. 350 p.

Geist, V. 1971. Mountain Sheep. The University of Chicago Press, Chicago. 683 p.

Moen, A. N. 1978. Seasonal changes in heart rates, activity, metabolism, and forage intake of white-tailed deer. J. Wildl. Manage. 42(4):715-738.

Muller-Schwarze, D. 1978. Play deprivation in deer. Pages 287-305 In Evolution of Play Behavior. D. Muller-Schwarze, Ed. Dowden, Hutchinson, and Row, Inc., Stroudsberg, PA. 396 p.

Severinghaus, C. W. and E. L. Cheatum. 1956. Life and times of the white-tailed deer. Pages 57-186 In W. P. Taylor, ed. The Deer of North America. The Stackpole Company, Harrisburgh, Pa. 668 p.

REFERENCES, UNIT 1.5

SOCIAL AND OTHER ACTIVITIES

BOOKS

TYPE	PUBL	CITY	PGES	ANIM	KEY WORDS----------	AUTHORS/EDITORS--	YEAR
aubo	ucap	beca	567	odhe	a herd of mule deer	linsdale,jm; tomi	1953
edbo	dohr	stpa	369	----	evolution of play behavior	muller-schwarze,d	1978
aubo	oxup	oxen	688	----	animal play behavior	fagen,rm	1981

SERIALS

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BEHAA	31--2	144	162	cerv	play deprivation in deer	muller-schwarze,d	1968

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BEHAA	31--2	144	162	od--	play deprivation in deer	muller-shwarze,d	1968

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	80--5	534	537	odvi	playing by w-t deer, s tex	michael,ed	1968
ECOLA	53--2	262	270	odvi	activ patt, fawns, s texas	jackson,rm; whit/	1972
JWMAA	27--3	422	427	odvi	nocturnl mvmnt, actv rhyth	montgomery,gg	1963
JWMAA	42--4	715	738	odvi	seas chang,hrt rt,actv,mtb	moen,an	1978
PCGFA	18---	140	152	odvi	telem, movem, behav, flori	jeter,lk; marchin	1964
SCIEA	215--	85	87	odvi	play beh,food shortg,fawns	muller-schwarze,/	1982
TISAA	62--2	117	119	odvi	day location, beds, fawns	kjos,cg; montgome	1969

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BZOBA	20--1	282	289	odhe	[play behav, gen activity]	muller-schwarze,/	1969
CAFNA	89--2	149	156	odhe	play activities, nw oregon	miller,fl	1975
CGFPA	7----	1	26	odhe	literature review,behavior	dorrance,mj	1966
JOMAA	37--2	143	164	odhe	behav,w/ ref to popul ecol	dasmann,rf; taber	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNTA	111--	395	414	ceel	age-depend sched, play beh	fagen,r	1977
ANBEA	28--4	1290	1290	ceel	ontog play beh, bimodl age	fagen,rm	1980
JWMAA	15--4	396	410	ceel	biology of the elk calf	johnson,de	1951
ZOOLA	41--8	65	71	ceel	pattrns,hrd beh,free-rngng	altmann,m	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNAA	52--2	392	399	alal	observ in yellowstone park	mcmillan,jf	1954
BEHAA	20--3	377	416	alal	behavr no amer moose in bc	geist,v	1963
CAFNA	87--3	321	321	alal	associatn of calf and bull	lynch,gm; labonte	1973
CAFNA	90--4	475	476	alal	behavior, calf, ontario	croskery,p	1976
JWMAA	35--1	63	71	alal	radiotelemet, ne minnesota	van ballenberghe/	1971
NCANA	101--	325	369	alal	mother infant relations in	stringham,sf	1974
NCANA	101--	371	377	alal	behv chng, age, domesticat	knorre,ep	1974
TLPBA	14--1	76	104	alal	time-energ budget of a moo	belovsky,ge; jord	1978
ZOOLA	41-14	105	118	alal	ecol,behav, pop dynam wyom	denniston,rh,II	1956

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	31--1	150	159	rata	results, tagging, manitoba	miller,dr; robert	1967
UABPA	3----	1	44	rata	behavior, bar grou caribou	pruitt,wo,jr	1960

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
CGFPA	3---- 1		28	anam	literature review,behavior	prenzlow,ej	1965
CGFPA	17--- 1		16	anam	some behavior patterns of	prenzlow,ej; gil/	1968

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
PIAIA	76---	245	262	bibi	bull behavior traits	herrng,dm; hauge	1969
ZETIA	30--4	416	419	bibi	rel, dominance, play behav	lumia,ar	1972

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
JWMAA	34--2	446	450	ovca	mvmnt,beh,summer rang,wyom	woolf,a; oshea,t/	1970

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
XNFSA	5---- 1		238	ovda	the wolves of mt mckinley	murie,a	1944

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				obmo			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
				oram			

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ZSAEA	33--2	116	121	bibo	[wisent, willingn to play]	mohr,e	1968

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
BVJOA	110..	46	68	doca	play, analysis, britain	brownlee,a	1954
JRMGA	19--4	200	204	doca	use of mountain slope	cook,cw	1966

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
ANBEA	26--3	678	684	dosh	sex diff,dev chng, juv act	sachs,bd; harris,	1978

CODEN	VO-NU	BEPA	ENPA	ANIM	KEY WORDS----------	AUTHORS----------	YEAR
AMNTA	79---	523	541	----	currnt concepts, anim play	beach,fa	1945